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NEW ZEALAND ELECTRICAL

CODE OF PRACTICE

for

ELECTRICAL SAFE DISTANCES

NZECP 34:2001

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ELECTRICAL SAFE DISTANCES

Issued by:
Manager, Standards and Safety,
Ministry of Consumer Affairs,
Wellington, New Zealand

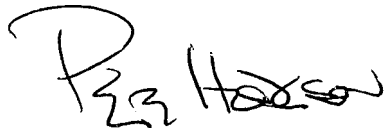
THE ELECTRICITY ACT 1992

Approval of the New Zealand Electrical Code for Practice for Electrical Safe Distances 2001 *(NZECP 34:2001)* and the revocation of the New Zealand Electrical Code of Practice for Electrical Safety Distances 1993 *(NZECP 34:1993)*

Pursuant to section 38 of the Electricity Act 1992, I hereby revoke the New Zealand Electrical Code of Practice for Electrical Safety Distances 1993 *(NZECP 34:1993)* and approve the New Zealand Electrical Code of Practice for Electrical Safe Distances 2001 *(NZECP 34:2001)*.

The New Zealand Electrical Code of Practice for Electrical Safe Distances 2001 *(NZECP 34:2001* was published by the Manager, Standards and Safety, Ministry of Consumer Affairs, acting under delegated authority *(pursuant to section 41 of the State Sector Act 1988)* from the Chief Executive, Ministry of Economic Development on the 3rd day of August 2001.

Dated this 21st day of December 2001.



Minister of Energy

COMMITTEE REPRESENTATION

This Code of Practice was prepared by the Ministry of Consumer Affairs, in consultation with the following:

The Building Industry Authority
Transpower New Zealand Ltd
Electricity Engineers' Association of NZ (Inc)
Institution of Professional Engineers NZ
Tranz Rail Ltd
Telecom NZ Ltd
Telstra Saturn

REVIEW

This Code of Practice will be revised as occasions arise. Suggestions for improvements of this Code are welcome. They should be sent to the Manager, Standards and Safety, Ministry of Consumer Affairs, PO Box 1473, Wellington.

CONTENTS

TABLES

FIGURES

INTRODUCTION

This Electrical Code of Practice (Code) sets minimum safe electrical distance requirements for overhead electric line installations and other works associated with the supply of electricity from generating stations to end users.

The minimum safe distances have been set primarily to protect persons, property, vehicles and mobile plant from harm or damage from electrical hazards. The minimum distances are also a guide for the design of electrical works within substations, generating stations or similar areas where electrical equipment and fittings have to be operated and maintained.

The Code has been designed to include, in its various sections, requirements that were previously contained in the Electricity Regulations 1997 (the Regulations). Compliance with this Code is mandatory.

- **Section 1** is a general section, including this Code's scope, interpretation and glossary.
- **Sections 2** and **3** cover the safe distance requirements for building works and excavation near overhead electric line support structures. It also covers the construction of buildings and other structures near conductors and the installation of conductors near existing buildings and similar structures.
- **Section 4** covers the requirements for maintaining safe distances between conductors and the ground and water, including restrictions on material being deposited under or near conductors.
- **Section 5** covers the responsibilities of parties who work or operate mobile plant near overhead electric lines and other electrical works.
- **Sections 6 – 8** cover the requirements for safe design and installation of overhead electric and telecommunications systems and other electrical works and controls on access to conductors.
- **Section 9** covers minimum safe approach distance requirements for persons working near exposed live parts.
- **Section 10** covers the responsibilities of owners of electricity supply works for inspection and maintaining records.

SECTION 1
SCOPE, INTERPRETATION, GLOSSARY AND GENERAL

1.1. SCOPE

1.1.1 This Code covers safety issues, in so far as they relate to safe distances to overhead electric lines, telecommunication lines, line equipment and fittings, and personnel working on or near to such lines equipment.

1.1.2 This Code sets out minimum requirements in respect of the following matters:

(a) Excavations or construction near overhead electric line supports;
(b) Limits for construction near conductors;
(c) Limits for the installation of conductors near existing buildings and similar structures;
(d) The separation and height of conductors above ground etc;
(e) The separation of overhead telecommunications lines and conductors;
(f) Overhead electric line access, supports and stays;
(g) Limits on material deposited or placed under or near an overhead electric line;
(h) Operation of mobile plant near conductors;
(i) Safe distances for the design of substations, switchyards and switchboards;
(j) Minimum approach distances to exposed live parts; and
(k) Inspection and records.

1.1.3 The content of this Code does not exempt any person from compliance with any statutory requirements in respect of the matters in clause 1.1.2.

1.1.4 This Code does not apply to:

(a) Distance limits for large loads (e. g. buildings and over-dimension loads) travelling down roads.
(b) Optical fibre ground wire or optical fibre cables that are contained in or wrapped around any conductor.
(c) Hazards from trees.

1.2. INTERPRETATION

The Electricity Act 1992 and the Electricity Regulations 1997 contain definitions that are to be used in conjunction with this Code. These include: associated equipment; direct contact; electrically safe; exposed conductive part; fittings; high voltage; indirect contact; insulated; live or alive; live part; low voltage, and works.

In this Code, unless the context otherwise requires:

1.2.1 **Bare conductor** - means a conductor without covering or not insulated.

1.2.2 **Competent employee** – means an employee who can demonstrate to their employer, at any time, that they have the necessary knowledge, skills and experience to carry out electrical or telecommunications work in the vicinity of overhead electric lines, or exposed live metal, safely and to the standards used by the employer.

1.2.3 **Conductor** – means a wire, cable or form of metal designed for carrying electric current but does not include the wire of an electric fence.

1.2.4 **Distance** (for conductors) - unless otherwise specified, means the distance under the worst case

combination of maximum sag, load current, solar radiation, climatic conditions, etc, and in which the conductor creep process is complete (in the case of a line crossing another line, the worst case is that which results in the minimum spacing between the two lines).

1.2.5 **Mobile plant** - means cranes, elevating work platforms, tip trucks or similar plant, irrigation booms, any equipment fitted with a jib or boom and any device capable of being raised and lowered.

1.2.6 **Overhead electric line** – means conductors and support structures.

1.2.7 **Telecommunication line** - means any overhead wire or wires or conductors of any kind (including a fibre optic cable) used or intended to be used for the transmission or reception of signs, signals, impulses, writing, sounds or intelligence of any nature by means of any electromagnetic system. It includes any pole, insulator, casing, fixture, or other equipment used or intended to be used for supporting, enclosing, surrounding, or protecting any such wire or conductor; and also includes any part of a line.

1.2.8 **Traction systems** - means any overhead conductor or fitting for any train, locomotive, tram, trolley bus or electric overhead travelling crane.

1.3. GLOSSARY OF ABBREVIATIONS USED IN THIS CODE

a.c.	Alternating current
d.c.	Direct current
LV	Low voltage
kV	Kilovolts
m	Metres
mm	Millimetres
V	Volts

SECTION 2
MINIMUM SAFE DISTANCES FOR EXCAVATION AND CONSTRUCTION NEAR OVERHEAD ELECTRIC LINE SUPPORTS

2.1 GENERAL

2.1.1 This section outlines the requirements for building or excavation near overhead electric line support structures (towers, poles and stay wires). The minimum safe distances are designed to limit the chance of damage or hazards being created by the building or excavation. The minimum distances also ensure that the support structures can be accessed for inspection and maintenance.

2.1.2 Excavations and other works near overhead electric line supports can compromise the structural integrity of the overhead electric line.

2.1.3 Metallic or conducting paths near overhead electric line supports can transfer voltage potentials that could create step and touch currents during earth fault conditions.

2.1.4 Any consent and associated conditions given under this section shall be reasonable, and shall not be unreasonably withheld.

2.2 EXCAVATION NEAR OVERHEAD ELECTRIC LINE SUPPORTS

2.2.1 Subject to clause 2.2.2, prior written consent of the pole owner shall be obtained for any excavation or other interference with the land near any pole or stay wire of an overhead electric line where the work:

(a) is at a greater depth than 300mm within 2.2 m of the pole or stay wire of the line; or

(b) is at a greater depth than 750 mm between 2.2 m and 5 m of the pole or stay wire; or

(c) creates an unstable batter.

2.2.2 Clause 2.2.1 does not apply to vertical holes, not exceeding 500 mm diameter, beyond 1.5 m from a pole or stay wire.

2.2.3 Prior written consent of the tower owner shall be obtained for any excavation or other interference with the land near any tower supporting an overhead electric line where the work:

(a) is at a greater depth than 300 mm within 6 m of the outer edge of the visible foundation of the tower; or

(b) is at a greater depth than 3 m between 6 m and 12 m of the outer edge of the visible foundation of the tower; or

(c) creates an unstable batter.

2.2.4 Nothing in clauses 2.2.1 - 2.2.3 applies in respect of normal agricultural cultivation or the repair, sealing, or resealing of the existing surface of any road, footpath, or driveway.

2.2.5 Figures 1 and 2 provide a quick reference to the minimum safe distances for excavation near overhead electric line supports.

2.3 INSTALLATION OF CONDUCTIVE FENCES NEAR OVERHEAD ELECTRIC LINE SUPPORTS

2.3.1 Fences of conductive materials shall not be attached to any tower or conductive pole of a high voltage overhead electric line.

2.3.2 Fences of conductive materials should not be constructed within 2.2 m of any tower or conductive pole of a high voltage overhead electric line between 1 kV - 50 kV.

2.3.3 Except with the prior written consent of the overhead electric line owner, fences of conductive

materials shall not be constructed within 5 m of any tower or conductive pole of a high voltage overhead electric line of 66 kV or greater. As part of the consent, the overhead electric line owner may prescribe the design of any such fence to be constructed within this 5 m distance.

2.3.4 Where the construction of an overhead electric line would cause a contravention of the principles of clause 2.3.3, the line owner shall, at the line owner's cost, carry out an engineering study and undertake such remedial work as is necessary to maintain electrical safety.

2.3.5 Figures 1 and 2 provide a quick reference to the minimum safe distances for installation/ construction of conductive fences near overhead electric line supports.

2.4 CONSTRUCTION OF BUILDINGS AND SIMILAR STRUCTURES NEAR OVERHEAD ELECTRIC LINE SUPPORTS

2.4.1 Except with the prior written consent of the overhead electric line owner, no building or similar structure shall be erected closer to a high voltage overhead electric line support structure than the distances specified in Table 1. The distances in Table 1 are to be measured from the closest visible edge of the overhead electric line support foundation, and the nearest part of the outermost part of the building. Refer to section 3 of this code for minimum safe distances between buildings (and other structures) and conductors.

TABLE 1 MINIMUM SAFE DISTANCES BETWEEN BUILDINGS AND OVERHEAD ELECTRIC LINE SUPPORT STRUCTURES

Circuit Voltage	Pole	Tower (pylon)
11 kV to 33 kV	2 m	6 m
Exceeding 33 kV to 66 kV	6 m	9 m
Exceeding 66 kV	8 m	12 m

2.4.2 Figures 1 and 2 provide a quick reference to the minimum safe distance requirements for the construction of buildings and other structures near overhead electric line supports.

FIGURE 1 MINIMUM SAFE DISTANCES FOR EXCAVATION AND CONSTRUCTION NEAR POLES OR STAY WIRES

ANY WORKS
Prior written consent from line owner required for excavation or interference with any land near a pole or stay wire of an overhead electric line where the work creates an **unstable batter**.

Section 2.2.1 (c)

ANY WORKS
Prior written consent from line owner required for excavation or interference with any land at a greater depth than **750mm between 2.2m and 5m** of a pole or stay wire of an overhead electric line*

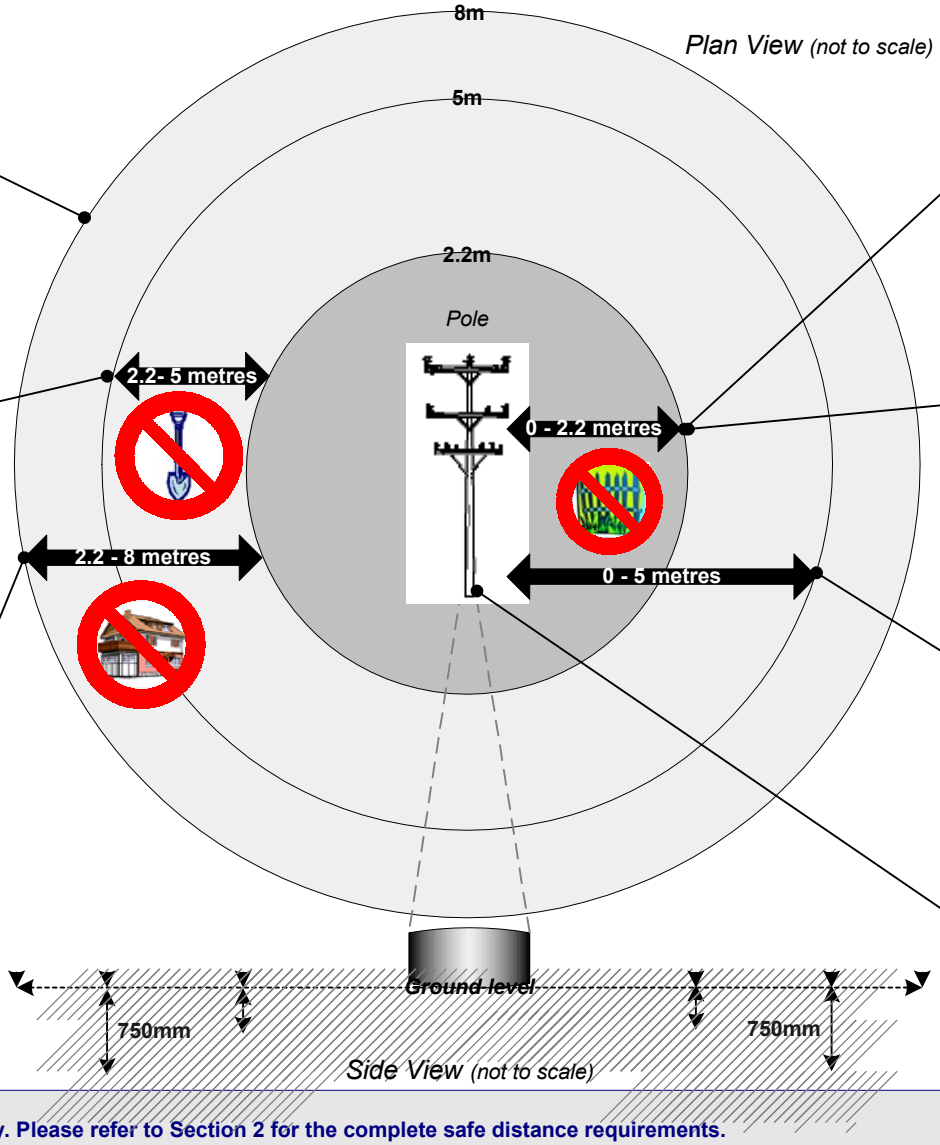
Section 2.2.1 (b)

CONSTRUCTION
Except with the prior written consent of the line owner, no building or similar structure shall be erected closer to a pole or staywire than:

- **2.2m** (11 kV- 33 kV lines)
- **6m** (33 kV - 66 kV lines)
- **8m** (Exceeding 66 kV)

Distances to be measured from closest visible edge of an pole foundation, and the nearest part of the outer most part of the building.

Section 2.4.1 Table 1



ANY WORKS
Prior written consent from pole owner required for excavation or interference with any land at a greater depth than **300mm within 2.2m** of the pole or stay wire of an overhead electric line*

Section 2.2.1 (a)

Conductive fences should not be constructed within **2.2m** of any conductive pole of a high voltage overhead electric line between **1 kV - 50 kV**

Section 2.3.2

FENCES
Prior written consent from line owner required to construct conductive fences within **5m** of a conductive pole of a high voltage overhead electric line of **66 kV** or greater. The line owner may prescribe the design of such a fence

Section 2.3.3

FENCES
Conductive fences shall not be attached to any conductive pole of a high voltage overhead electric line.

Section 2.3.1

Notes
- **This diagram is for quick reference only. Please refer to Section 2 for the complete safe distance requirements.**
- Nothing in clauses 2.2.1 - 2.2.3 applies in respect of normal agricultural cultivation or the repair, sealing, or resealing of the existing surface of any road, footpath, or driveway (Section 2.2.4).

* Clause 2.2.1 does not apply to vertical holes, not exceeding 500 mm diameter, beyond 1.5m from the pole or stay wire.

FIGURE 2 MINIMUM SAFE DISTANCES FOR EXCAVATION AND CONSTRUCTION NEAR TOWERS

ANY WORKS
Prior written consent from tower owner required for excavation or interference with any land near any tower supporting an overhead electric line where the work is at a greater depth than **300mm** within **6m** of the outer edge of the visible foundation of the tower

Section 2.2.3(a)

ANY WORKS
Prior written consent of the tower owner required for any excavation or other interference with the land near any tower supporting an overhead electric line where the work is at a greater depth than **3m**, between **6 - 12m** of the outer edge of the visible foundation of the tower

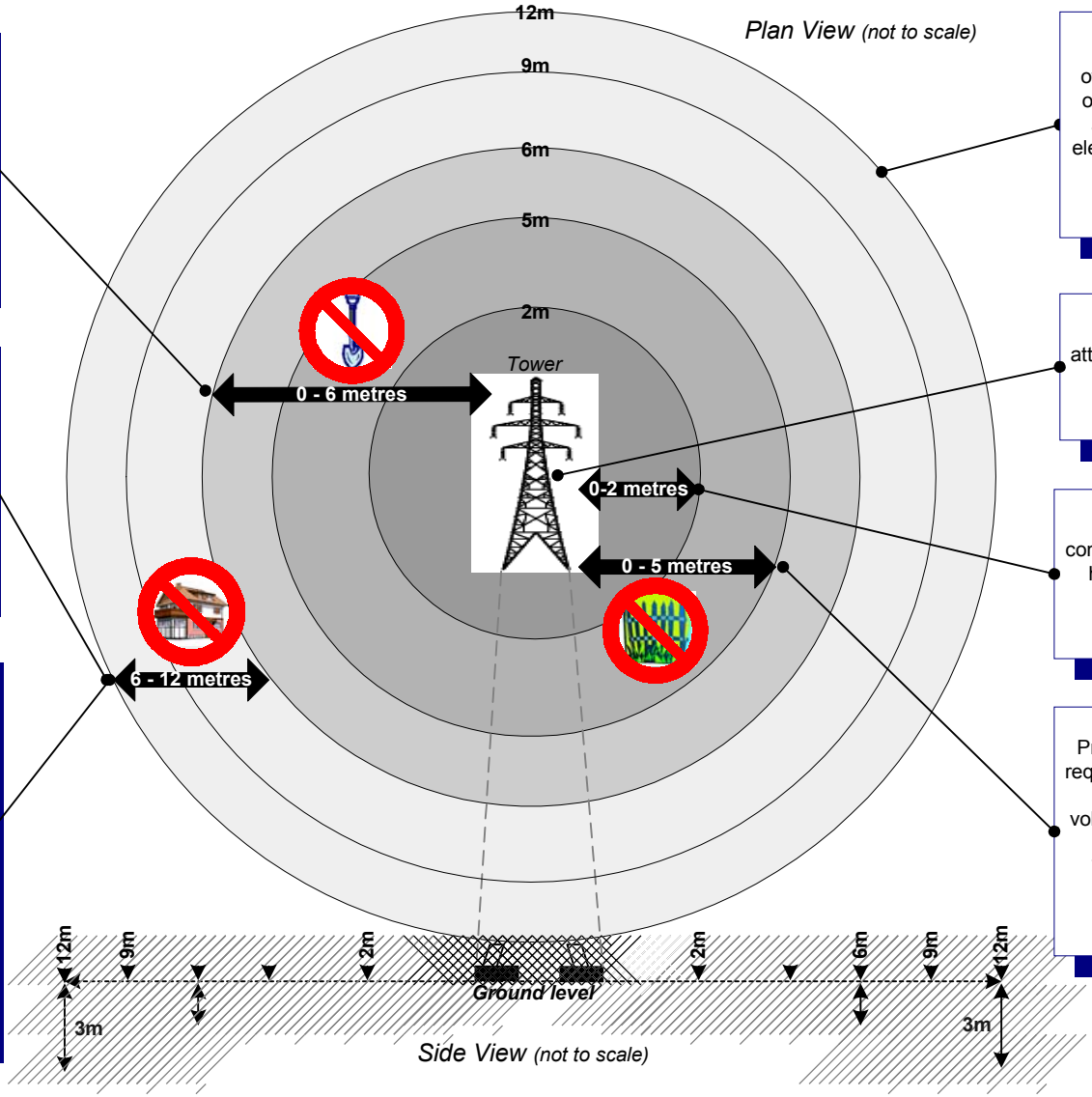
Section 2.2.3(b)

CONSTRUCTION
Except with the prior written consent of the line owner, no building or similar structure shall be erected closer to a tower of an overhead electric line than:

- **6m** (11 - 33 kV lines)
- **9m** (33 - 66 kV lines)
- **12m** (Exceeding 66 kV)

Distances to be measured from the closest visible edge of a tower, and the nearest part of the outermost part of the building

Section 2.4.1 Table 1



ANY WORKS
Prior written consent of the tower owner required for any excavation or other interference with the land near any tower supporting an overhead electric line where the work creates an **unstable batter**

Section 2.2.3(c)

FENCES
Conductive fences shall not be attached to any tower of a high voltage overhead electric line

Section 2.3.1

FENCES
Conductive fences should not be constructed within **2m** of any tower of a high voltage overhead electric line between **1 kV - 66 kV**

Section 2.3.2

FENCES
Prior written consent from line owner required to construct conductive fences within **5m** of any tower of a high voltage overhead electric line of **66 kV or greater.**
The line owner may prescribe the design of such a fence

Section 2.3.3

- **This diagram is for quick reference only. Please refer to Section 2 for the complete safe distance requirements.**
- Nothing in clauses 2.2.1 - 2.2.3 applies in respect of normal agricultural cultivation or the repair, sealing, or resealing of the existing surface of any road, footpath, or driveway (Section 2.2.4).

SECTION 3
SAFE DISTANCE REQUIREMENTS BETWEEN CONDUCTORS AND BUILDINGS (AND OTHER STRUCTURES)

3.1 GENERAL

3.1.1 This section sets safe distance requirements for the construction of buildings and other structures near existing conductors, to prevent inadvertent contact with or close approach to conductors. At higher voltages, contact may be made via a power discharge across the gap.

3.1.2 This section also sets safe distance requirements for the location and construction of conductors near existing buildings and other structures.

3.1.3 The construction of buildings, scaffolding and other structures shall be in accordance with the Building Code.

3.1.4 This section does not apply to telecommunications lines.

3.2 PROCESS FOR ESTABLISHING SAFE DISTANCES

3.2.1 Prior to any planned construction, the following process must be undertaken to comply with the Code. The landowner/ building owner shall:

3.2.1.1 Establish, if necessary with the assistance of the overhead electric line owner, whether the proposed building/structure is at a greater distance from the conductor than the recommended distances for new buildings from conductors under normal conditions specified in Table 2.

3.2.1.2 If the proposed building/structure is at a greater distance, then no further action is required by the building owner to comply with this section of the Code with regard to conductor distances.

3.2.1.3 If the proposed building/structure does not (or may not) comply with the requirements of Table 2, then the overhead electric line owner shall be consulted. A specific engineering study must be carried out by a competent person, to establish actual distances in accordance with the requirements of Table 3 (refer section 3.3). Table 3 sets out the minimum safe distances (which are closer than those specified in Table 2) under worst case conditions.

3.2.1.4 Based on the outcome of the engineering study, which shall be provided by the landowner/building owner, the overhead electric line owner will advise whether:-

(i) the proposed building/structure complies with Table 3 and construction can proceed without restriction; or

(ii) temporary arrangements during building construction need to be made, with the written agreement of the overhead electric line owner, to restrain conductor movement or to provide suitable insulation that will allow closer approach to conductors than those specified in Table 2. As part of the written agreement, the overhead electric line owner may prescribe reasonable conditions for the temporary arrangements; or

(iii) the proposed building/structure does not comply with Table 3 requirements, and therefore construction is prohibited.

3.2.2 For any overhead electric line owner planning to build a new conductor near to an existing building, a similar process to that set out in clause 3.2.1 must be followed, the costs of any

necessary engineering study being borne by the line owner.

3.3 SAFE DISTANCES FROM CONDUCTORS WITHOUT ENGINEERING ADVICE

3.3.1 Table 2 sets out the safe distances from conductors under normal conditions without engineering advice for conductor spans up to 375 m with supporting structures at equal elevation.

TABLE 2 SAFE DISTANCES FROM CONDUCTORS WITHOUT ENGINEERING ADVICE

Circuit voltage	Maximum span length (m)	Minimum distance beneath conductors under normal conditions (m)	Minimum distance to the side of conductors under normal conditions (m)
Not exceeding 1 kV	50	4	3.5
Exceeding 1 kV but not exceeding 11kV	80	5.5	5
Exceeding 11 kV but not exceeding 33 kV	125	7	8.5
Exceeding 33 kV but not exceeding 110 kV	125	7.5	9.5
Exceeding 110 kV but not exceeding 220 kV	125	8.5	11
275 kV d.c. & 350 kV d.c.	125	8.5	7.5
Not exceeding 33 kV	250	8	12
Exceeding 33 kV but not exceeding 110 kV	250	8.5	12.5
Exceeding 110 kV but not exceeding 220 kV	250	10	14
275 kV d.c. & 350 kV d.c.	250	10	11
Not exceeding 33 kV	375	9.5	20.5
Exceeding 33 kV but not exceeding 110 kV	375	10	21
Exceeding 110 kV but not exceeding 220 kV	375	11	22.5
275 kV d.c. & 350 kV d.c.	375	10.5	18
For all other spans		Engineering advice required	

(voltages are a.c. except where specified as d.c.)

NOTES

(a) Observance of potential conductor motion is required to ensure safe distances during construction.

(b) Where supporting structures are not located on equal elevations, a specific engineering study may be required to ensure distances are in accordance with Table 3.

3.4 MINIMUM SAFE DISTANCES OF CONDUCTORS FROM BUILDINGS AND OTHER STRUCTURES WITH SPECIFIC ENGINEERING ADVICE

3.4.1 Table 3 sets out the minimum safe distance of distances for conductors from buildings and other structures where a detailed engineering assessment has been carried out.

3.4.2 The minimum safe distances from a conductor of an overhead electric line to any structure, building or line support *(other than a support for the line under consideration or any line crossing the line under consideration)* shall not be less than those specified in Table 3.

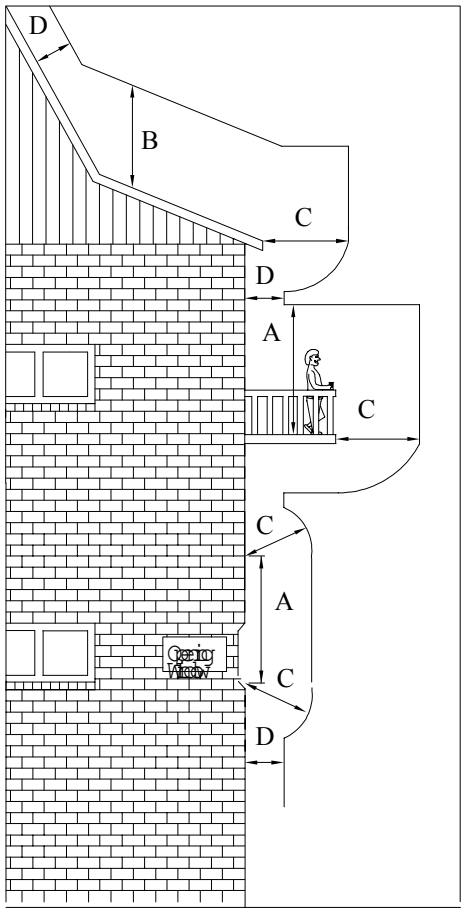
3.4.3 The Table 3 distances do not apply to insulated conductors or cables supported along the façade of a structure or building.

3.4.4 Figures 3 and 4 illustrate the application of the Table 3 to a particular building. The letters A to D refer to the distances A to D as set out in Table 3.

3.4.5 The distances specified in A and B of Table 3 shall also be maintained above an imaginary horizontal line extending outward for the distance specified in C.

3.4.6 For Figure 4, the greater distance of either A, or B (from Table 3) plus the height of the balcony, shall apply, as this latter calculation may result in a distance greater than A.

FIGURES 3 AND 4 BUILDING ELEVATION AND BALCONY SECTION



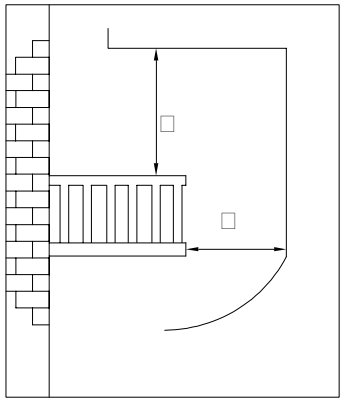


TABLE 3 MINIMUM SAFE DISTANCES OF CONDUCTORS FROM BUILDINGS AND OTHER STRUCTURES WHERE SPECIFIC CALCULATION OF CONDUCTOR MOVEMENT HAS BEEN CARRIED OUT

Safe distance conditions	Not exceeding 1 kV			Exceeding 1 kV		Exceeding 1 kV but not exceeding 33 kV	Exceeding 33 kV but not exceeding 110 kV	Exceeding 110 kV but not exceeding 220 kV	Exceeding 220 kV a.c. or d.c.
	Insulated m	Bare neutral m	Bare active m	Insulated with earthed screen m	Insulated without earthed screen m	Bare or covered m	Bare m	Bare m	Bare m
A Vertically above those parts of any structure normally accessible to persons	2.7	2.7	3.7	2.7	3.7	4.5	5	6.5	7
B Vertically above those parts of any structure not normally accessible to persons but on which a person can stand	0.1	2.7	2.7	0.1	2.7	3.7	4.5	6	6.5
C In any direction (other than vertically above) from those parts of any structure normally accessible to persons, or from any part not normally accessible to persons but on which a person can stand	0.1	0.9	1.5	0.1	1.5	2.1	3	4.5	5
D In any direction from those parts of any structure not normally accessible to persons	0.1*	0.3*	0.6*	0.1	0.6	1.5	2.5	3.5	4
E In any direction from the ground	Refer to Table 4								

* This distance can be further reduced to allow for termination at the point of attachment

SECTION 4
SAFE DISTANCES OF CONDUCTORS FROM THE GROUND AND WATER

4.1 GENERAL

4.1.1 This section sets the minimum safe clearance distances for conductors from the ground and water, including minimum safe distances for any excavations or other alterations.

4.1.2 Unless specifically identified, the requirements of this section do not apply to traction system conductors or to telecommunications lines, substations and generating stations.

4.2 MINIMUM SAFE DISTANCES OF CONDUCTORS FROM THE GROUND AND POOLS

4.2.1 Conductors of any overhead electric line, including any switching connections and transformer connections mounted on poles or structures, shall have distances from the ground not less than specified in Table 4.

4.2.2 Table 4 does not apply to existing overhead electric line conductors, or their replacement, where those conductors complied with the Regulations in existence at the time of their installation.

4.2.3 Conductors shall not be installed less than 5 m above the water level of any swimming pool.

4.3 MATERIAL DEPOSITED UNDER OR NEAR OVERHEAD ELECTRIC LINES

4.3.1 No material shall be deposited under or near an overhead electric line so as to reduce the conductor distance to ground to less than the distances required by Table 4 of this Code.

TABLE 4 MINIMUM SAFE DISTANCES OF CONDUCTORS FROM THE GROUND

Circuit voltage	Vertical distance to ground (m)			Radial distance (m)
	Across or along roads or driveways	Any other land traversable by vehicles (including mobile plant) but excluding across or along roads or driveways	Any land not traversable by vehicles (including mobile plant) due to its inaccessibility (e.g. steepness or swampiness)	In any direction other than vertical on all land
Not Exceeding 1 kV and insulated	5.5	4.0	2.7	2
Not Exceeding 1 kV	5.5	5.0	4.5	2
Exceeding 1 kV but not exceeding 33 kV	6.5	5.5	4.5	2
Exceeding 33 kV but not exceeding 110 kV	6.5	6.5	5.5	3
Exceeding 110 kV but not exceeding 220 kV	7.5	7.5	6.0	4.5
Exceeding 220 kV a.c. or d.c.	8.0	8.0	6.5	5

NOTES:

(a) Voltages are a.c. except where specified as d.c.

(b) The term ground includes any unroofed elevated area accessible to plant or vehicles.

(c) Distances specified in Table 4 are for conductors that have fully undergone mechanical creep (permanent elongation). This is deemed to have occurred after 10 years in service.

4.4 SAFE DISTANCES OF CONDUCTORS OVER NAVIGABLE WATERWAYS AND BOAT RAMPS

4.4.1 The height of conductors over a navigable waterway shall be determined in consultation with the Maritime Safety Authority of New Zealand (MSA). The booklet titled "New Zealand System of Buoys and Beacons", produced by MSA, shall be used as a guide.

4.4.2 Where conductors are installed over a boat ramp, suitable notices shall be provided on either side of the ramp, to provide a warning of the conductors' presence and an indication of the conductors' height and voltage.

4.4.3 No overhead conductors shall be installed within 9 m in any direction of a boat ramp.

4.4.4 Overhead conductors installed between 9 and 12 m of a boat ramp shall be insulated.

4.4.5 No boat ramp shall be constructed within 9 m in any direction of an overhead electric line without prior written consent of the electric line owner.

4.5 SAFE DISTANCES OF CONDUCTORS OVER RAILWAY TRACKS

4.5.1 The safe distances above rail level at the crossing of the railway for all overhead electric line conductors, when at maximum sag, shall not be less than those specified in Table 5. Where electric traction is in use, refer also to clause 6.2.2.

TABLE 5 MINIMUM DISTANCES VERTICALLY ABOVE RAILWAY TRACKS

Conductors	Distance (m)
Earthed conductors	5.5
Stay wires	5.5
Conductors up to and including 33 kV	6.5
Conductors above 33 kV but not exceeding 220 kV	7.5
Conductors above 220 kV a.c. or d.c.	8

SECTION 5
SAFE DISTANCES FOR THE OPERATION OF MOBILE PLANT NEAR CONDUCTORS

5.1 GENERAL

5.1.1 This section does not apply to live line work or to any conductor forming part of the mobile plant or any collector wire, insulated cable, or flexible cord used for the purpose of supplying electricity to the mobile plant.

5.1.2 Mobile plant working near an electric overhead electric lines can damage the line and be hazardous for the plant operator, the mobile plant and people in the vicinity.

5.1.3 Conductors can be displaced from their normal position by wind or temperature change. This requires special consideration by mobile plant operators.

5.1.4 This section does not apply while mobile plant is in transit on a road and the relevant requirements of the Traffic Regulations 1976 are observed.

5.2 MINIMUM APPROACH DISTANCE

5.2.1 The distance between any live overhead electric line and any part of any mobile plant or load carried shall be **"AT LEAST 4.0 METRES"**, unless the operator has received written consent from the overhead electric line owner allowing a reduced distance.

5.2.2 When an approval has been obtained pursuant to clause 5.2.1, and subject to clause 5.5.1, the minimum approach distance between a conductor and any mobile plant shall not be less than specified in Table 6.

5.2.3 Figure 5 provides a quick reference guide to the minimum safe distances for use of mobile plant near conductors of overhead electric lines.

5.3 WORKING ABOVE OVERHEAD ELECTRIC LINES

5.3.1 Mobile plant or any load carried shall not operate above the conductors of any overhead electric line unless the operator has received written consent from the overhead electric line owner to work above the overhead electric line.

5.3.2 The use of helicopters above overhead electric lines is governed by the Civil Aviation Rules.

5.4 CONSENT FOR REDUCED MINIMUM APPROACH DISTANCES

5.4.1 The application for written consent from the overhead electric line owner shall be made with reasonable notice.

5.4.2 The overhead electric line owner's written consent shall advise:

(a) The voltage of the overhead electric line and the minimum approach distance to be observed, which shall not be less than the requirements of Table 6; and

(b) Any other reasonable conditions to be observed while working in proximity to, or above, the overhead electric line.

(c) The section of line to which the consent applies.

TABLE 6 REDUCED MINIMUM APPROACH DISTANCES
(where written consent has been obtained)

Circuit voltage	Minimum approach distance (m)
Not exceeding 1 kV – insulated conductor	0.15
Not exceeding 1 kV – conductor not insulated	1.0
Exceeding 1 kV but not exceeding 66 kV	1.0
Exceeding 66 kV but not exceeding 110 kV a.c. or d.c.	1.5
Exceeding 110 kV but not exceeding 220 kV a.c. or d.c.	2.2
Exceeding 220 kV d.c. but not exceeding 270 kV d.c.	2.3
Exceeding 270 kV d.c. but not exceeding 350 kV d.c.	2.8
Exceeding 350 kV d.c. or 220 kV a.c.	4

5.5 REDUCED MINIMUM APPROACH DISTANCES FOR COMPETENT EMPLOYEES

5.5.1 Where the operator of any mobile plant is a competent employee working on, or in the proximity of, an overhead electric line, the approach distances may be reduced in accordance with the safety practices determined by the overhead electric line owner.

5.5.2 Direct contact of insulated elevating work platform with live conductors shall be acceptable only under approved live working procedures. Whenever a special reduced minimum approach distance is applied, the maximum practicable clearance from conductors shall be maintained.

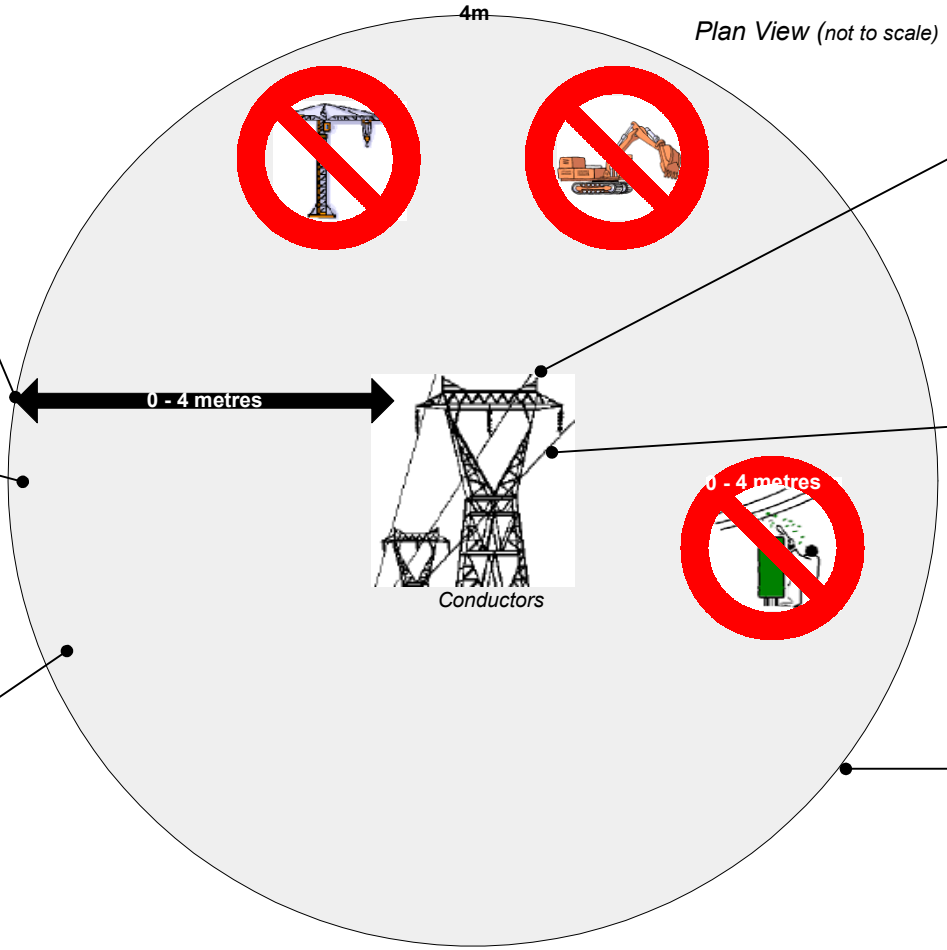
5.6 OTHER REQUIREMENTS

5.6.1 Where any mobile plant is likely to be used at any time in the proximity of overhead electric lines, the owner or operator of such device shall affix an approved warning notice in a conspicuous place as near as practicable to the operator's position. The notice shall be maintained in a legible condition and shall state:

"WARNING, KEEP CLEAR OF POWER LINES".

5.6.2 Any mechanically operated hedge cutter used under or in close proximity to any overhead electric line shall be operated to prevent hedge clippings or other material being thrown into contact with the conductors or creating any other hazard.

FIGURE 5 MINIMUM SAFE DISTANCES FOR THE OPERATION OF MOBILE PLANT NEAR CONDUCTORS



ALL WORKS
The distance between any live overhead electric line and any mobile plant or load carried shall be **at least 4m**, unless the operator has written consent from the overhead electric line owner

Section 5.2.1

ALL WORKS - REDUCED DISTANCES
When approval is obtained pursuant to clause 5.2.1, and subject to clause 5.5.1, the minimum approach distance between a conductor and any mobile plant shall not be less than specified in Table 6

Section 5.2.2

REDUCED DISTANCES FOR COMPETENT EMPLOYEES
Where the operator of any mobile plant is a competent employee working on, or near, an overhead electric line, approach distances may be reduced in accordance with safety practices determined by the electric line owner

Section 5.5.1

WORKING ABOVE OVERHEAD LINES
Written consent from line owner required for the operation of mobile plant or any load carried **above** the overhead electric line

Section 5.3.1

HEDGE CUTTERS
Mechanically operated hedge cutters used in close proximity to overhead lines shall be operated to prevent hedge clippings or other material from being thrown into contact with the conductors or creating any other hazard

Section 5.6.2

WARNING NOTICE
Where mobile plant is likely to be used close to overhead electric lines, the owner or operator of such device shall affix a warning notice in a conspicuous place as near as practicable to the operator's position, stating:

'WARNING, KEEP CLEAR OF POWER LINES'

Section 5.6.1

Notes

- **This diagram is for quick reference only. Please refer to Section 5 for the complete minimum safe distance requirements.**
- Mobile Plant includes cranes, loaders, excavators, drilling or pile driving equipment or other similar device.
- The provisions of Section 5 do not apply to live line work or to any conductor forming part of the mobile plant or any collector wire, insulated cable, or flexible cord used for the purpose of supplying electricity to the mobile plant (section 5.1.1) or while mobile plant is in transit on a road and the relevant requirements of the Traffic Regulations 1976 are observed (section 5.1.4).

SECTION 6
MINIMUM SAFE DISTANCES BETWEEN CONDUCTORS OF DIFFERENT CIRCUITS, TELECOMMUNICATION LINES AND STAY WIRES

6.1 GENERAL

6.1.1 This section sets minimum safe distances for overhead electric lines to prevent conductors contacting other conductors, or stay wires, or approaching sufficiently close to cause a fault condition. This section also applies to telecommunications lines.

6.1.2 The requirements of this section do not apply to substations and generating stations and unless specifically identified, traction system conductors.

6.1.3 The distances specified in Table 7 do not apply where the conductors of all relevant circuits are insulated. In the case of any of the insulated conductors operating at a voltage in excess of 1 kV, the conductor, or bundle of conductors, shall include an earth screen.

6.1.4 Where two circuits of different voltage cross each other, are attached to the same support, or share spans, the conductors of the higher voltage circuit should be placed above those of the lower voltage circuit. Earth wires may be above power circuits.

6.1.5 Telecommunications lines shall always be below power circuits.

6.2 CONDUCTORS OF DIFFERENT CIRCUITS ON DIFFERENT SUPPORTS *(UNATTACHED CROSSINGS)*

6.2.1 Under still air conditions, the vertical distance between any conductor or telecommunications line of the lower circuit at minimum sag and any point to which a higher circuit conductor may sag under the influence of short time overload current and solar radiation shall not be less than specified in Table 7.

6.2.2 The minimum vertical distance to a traction system is 2 m.

TABLE 7 MINIMUM VERTICAL DISTANCES BETWEEN CONDUCTORS *(unattached crossings)*

Higher voltage of either circuit	Minimum distance between conductors (unattached crossing) (m)
Below 1 kV a.c.	0.6
1 kV to 33 kV a.c.	1.2
Exceeding 33 kV but not exceeding 66 kV a.c.	1.8
110 kV a.c.	2.4
220 kV and 270 kV d.c.	2.8
350 kV d.c.	4

6.3 CONDUCTORS *(SAME OR DIFFERENT CIRCUITS)* ON THE SAME SUPPORT *(ATTACHED CROSSINGS)* INCLUDING SHARED SPANS

6.3.1 Where a detailed engineering study of the over-voltages and the conductor motion has not been undertaken, the distances between conductors of different circuits at any point on the same support under normal working conditions shall not be less than specified in Table 8.

TABLE 8 MINIMUM SAFE DISTANCES BETWEEN CONDUCTORS
(attached crossings)

Higher voltage of either circuit	Lower voltage of either circuit	Distance between circuits (m)
Not exceeding 33 kV a.c.	Less than 1 kV	1.0
	Greater than 1 kV	1.2
Exceeding 33 kV but not exceeding 110 kV a.c.	Less than 1 kV	1.5
	Greater than 1 kV	2.0
Exceeding 110 kV a.c. or d.c.	All	2.5

6.3.2 The distances in Table 8 may be reduced if a detailed engineering study of the maximum probable over-voltages and conductor motion establishes that there will be no adverse effects from a shorter distance.

6.3.3 Where lines operate at less than 1 kV, adequate measures should be taken to protect against unacceptable voltage rise between the lower voltage line and any structure energised due to the occurrence of a fault on the higher voltage line.

6.3.4 Where conductors are taken down a pole or other support to or from a transformer or other fittings, the distance between any conductors *(not being insulated to full working voltage)* shall be not less than the following:

(a) 600 mm between any line of low voltage and a line of 11 kV.

(b) 750 mm between any line of low voltage and a line of 22 kV.

(c) 900 mm between any line of low voltage and a line of 33 kV.

6.3.5 A reduced distance may be used at or near the terminals of any such transformer or other fittings where those terminals have a lesser distance between them than the minimum distance specified.

6.4 TELECOMMUNICATION LINES NEAR CONDUCTORS AND STAY WIRES

6.4.1 Subject to clauses 6.4.2 and 6.4.3, the minimum distance at any time between any telecommunication line *(including traction communication lines or signal wires)* and a conductor or stay wire shall not be less than the distances specified in Table 7.

6.4.2 Notwithstanding the distance specified in Table 7, at a shared support, the minimum distance of:

(a) a telecommunications line from a high voltage conductor that is not insulated shall not be less than 1.6 m; and

(b) a bare telecommunications line from a bare low voltage conductor shall not be less than 1.2 m.

(c) a covered telecommunications line from a bare low voltage conductor shall not be less than 0.6 m.

(d) For insulated conductors, and/or covered low voltage conductors, and covered telecommunications conductors, the distance shall not be less than 300 mm. This distance also applies to shared spans.

6.4.3 The minimum distance requirements specified in Table 7 between conductors and telecommunication lines do not apply to fibre optic cables that are:

(a) bound to a live conductor for support; or

(b) contained inside the lightning protection or earth conductor.

6.4.4 A bare catenary wire supporting a telecommunication line is deemed not to be bare for the purpose of this sub-section if the catenary is earthed at not less than every 10th pole in straight runs and at every pole when a cross-over or tee junction occurs.

SECTION 7
DESIGN AND INSTALLATION REQUIREMENTS FOR SUPPORTS AND STAY WIRES OF OVERHEAD ELECTRIC LINES, AND CONTROL OF ACCESS

7.1 SUPPORTS

7.1.1 All supports *(including stay wires, stay anchors, and other supporting equipment)* for conductors shall be so located as to avoid undue obstruction to pedestrian or vehicular traffic.

7.1.2 Poles or other supports shall not be erected closer than 4 m to the centre of the nearest railway track *(being measured horizontally from the centre of the nearest two rails to the nearest face of the pole or other support)* unless by agreement with the owner of the railway.

7.1.3 Live conductive parts less than 4.5 m above ground level, and attached to any pole or other support, shall be protected in such a manner as to prevent any accidental contact in reasonably foreseeable circumstances.

7.1.4 Any metal attached to a pole or other support, that is placed less than 2.5 m above ground level and that could become accidentally charged, shall be in direct contact with the earth, earthed or else adequately protected to prevent human contact.

7.2 STAY WIRES

7.2.1 Any stay wire less than 2.5 m from the ground in any direction that is likely to be a hazard shall be conspicuously marked.

7.2.2 Stay wires that are less than 2.5 m from the ground shall be earthed unless they are in direct contact with the earth. Alternatively, an insulator having a wet flashover value not less than that of the overhead electric line shall be inserted in the stay in a suitable position.

7.2.3 Stay wires that are erected across the part of any public road used by vehicular traffic shall have a minimum vertical distance above the ground of 5.5 m.

7.2.4 Stay wires shall not be less than 300 mm from any bare telecommunications line.

7.3 CONTROL OF ACCESS

7.3.1 Every conductor of an overhead electric line shall be so erected that it is not readily accessible to any person without the use of a climbing device.

7.3.2 Climbing steps on overhead electric line support structures shall not be placed at a height of less than 3 m above ground level.

SECTION 8
SAFE DISTANCES FOR THE DESIGN OF SUBSTATIONS, GENERATING STATIONS, SWITCHYARDS AND SWITCHROOMS

8.1 GENERAL

8.1.1 Safe distances in substations, generating stations, switchyards and switch-rooms where access to electricity supply works is required for operation, maintenance and installation activities, undertaken by competent employees, shall be suitable for the activities being undertaken and shall allow safe and unobstructed egress in emergency situations.

8.2 METALCLAD SWITCHGEAR

8.2.1 At the front of any low voltage and high voltage metalclad switchgear, there shall be a clear and unobstructed passageway at least 1 m wide and 2.5 m high.

8.2.2 Where frequent access is required for work at the sides or rear of any metalclad switchgear, there shall be clear and unobstructed passageways at least wide 1 m wide and 2.2 m high.

8.3 BARE CONDUCTORS WITHIN EARTHED ENCLOSURES

8.3.1 This subsection does not apply to bare conductors on or within panels or within fenced enclosures within buildings.

8.3.2 Any passageway at the side of or under any earthed enclosure containing bare conductors shall be clear and unobstructed and at least 800 mm wide and 2.2 m high.

8.4 BARE CONDUCTORS IN SUBSTATIONS, SWITCHYARDS, GENERATING STATION BUILDINGS AND OTHER LOCATIONS

8.4.1 In substations, switchyards, generating station buildings and other locations where there are bare conductors, the design and layout of the conductors shall be such that persons can carry out work without hazard.

8.4.2 Safety to persons shall be maintained by the provision of adequate distances to live parts for maintenance, vehicular access and pedestrian access, and if necessary to barriers or fences.

8.4.3 In fenced or other enclosed areas where access is restricted to situations where all conductive parts have been de-energised, distances may be reduced below those required by clauses 8.4.1 and 8.4.2, in accordance with a specific engineering design.

8.4.4 The distance from any bare conductor to any boundary fence or wall or similar enclosure boundary shall not be less than specified in Table 3.

8.4.5 The distances specified in Table 3 are generally applicable for bare conductors adjacent to substation buildings or other structures. These distances do not apply for situations where conductors are supported on buildings or other structures and may be reduced with a specific engineering design.

SECTION 9
MINIMUM SAFE APPROACH DISTANCE LIMITS FOR PERSONS WORKING NEAR EXPOSED LIVE PARTS

9.1 GENERAL

9.1.1 This section sets out minimum safe approach distances limits for persons working near exposed live parts.

9.1.2 Minimum safe distances limits are provided for non-competent persons. Reduced safe distances are provided for where;

(a) the owner of the live parts gives written permission; and

(b) competent employees are working near exposed live parts.

9.1.3 Minimum safe distances from exposed live parts shall be maintained at all times. Where necessary, insulating barriers shall be used to maintain minimum safe approach distances.

9.1.4 This section does not apply to work near conductors of extra-low voltage, or live line or live substation work.

9.1.5 Figure 6 illustrates the measurement of minimum safe approach distances from exposed live parts.

9.2 MINIMUM APPROACH DISTANCE LIMITS FOR NON-COMPETENT PERSONS WORKING NEAR EXPOSED LIVE PARTS

9.2.1 For non-competent persons working near exposed live parts, where written consent from the owner of the live parts has not been obtained, the minimum safe approach distances limits are:

(a) For circuit voltages 110 kV and below - 4 m.

(b) For circuit voltages above 110 kV - 6 m.

9.2.2 Where written consent from the owner of the live parts has been obtained, the minimum safe approach distance limits for non-competent persons working near exposed live parts shall not be less than those specified in Table 9.

TABLE 9 MINIMUM SAFE APPROACH DISTANCE LIMITS FOR PERSONS FROM EXPOSED LIVE PARTS (*Where consent from the owner of the live parts has been obtained)*

Circuit Voltage	Distance Limits (m)
Below 1 kV	0.5
11 kV	1.5
22 kV	2.0
33 kV	2.5
66 kV	3.0
110 kV	4.0
220 kV and above	6.0

9.3 MINIMUM SAFE APPROACH DISTANCE LIMITS FOR COMPETENT EMPLOYEES FROM EXPOSED LIVE PARTS

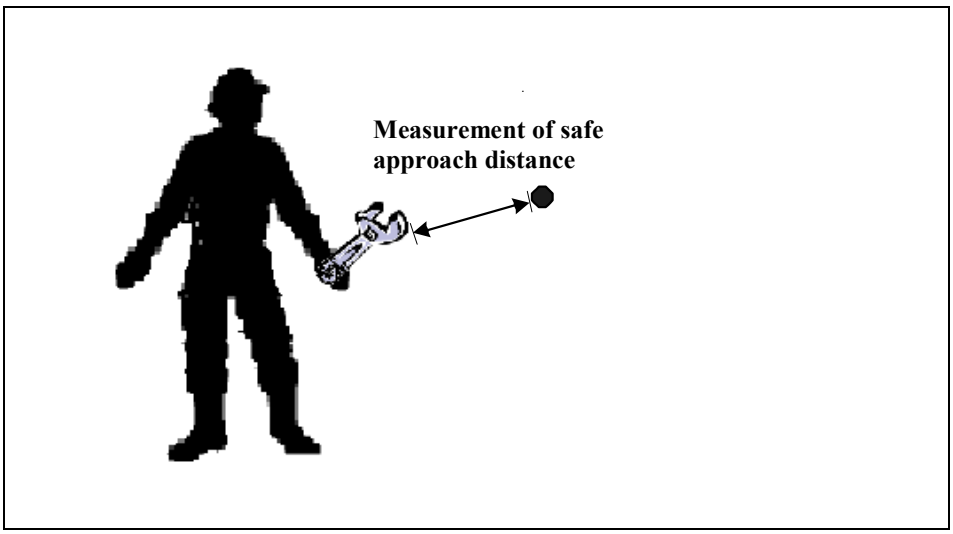
9.3.1 The minimum safe approach distance limits for competent employees carrying out electrical or telecommunications work near exposed live parts shall not be less than those set out in Table 10.

9.3.2 The minimum safe approach distance for competent employees shall be maintained by keeping all parts of the body, clothing and any hand held tools (except those tools designed for contact with live parts) beyond the safe distances set out in Table 10.

TABLE 10 MINIMUM SAFE APPROACH DISTANCE LIMITS FOR COMPETENT EMPLOYEES FROM EXPOSED LIVE PARTS

Nominal Voltage	Distance Limits (m)
Not exceeding 1 kV a.c. or d.c.	0.15
Exceeding 1 kV but not exceeding 6.6 kV a.c. or d.c.	0.25
Exceeding 6.6 kV but not exceeding 11 kV a.c. or d.c.	0.3
Exceeding 11 kV but not exceeding 22 kV a.c. or d.c.	0.45
Exceeding 22 kV but not exceeding 33 kV a.c. or d.c.	0.6
Exceeding 33 kV but not exceeding 50 kV a.c. or d.c.	0.75
Exceeding 50 kV but not exceeding 66 kV a.c. or d.c.	1
Exceeding 66 kV but not exceeding 110 kV a.c. or d.c.	1.5
Exceeding 110 kV but not exceeding 220 kV a.c. or d.c.	2.2
Exceeding 220 kV d.c. but not exceeding 270 kV d.c.	2.3
Exceeding 270 kV d.c. but not exceeding 350 kV d.c.	2.8
Exceeding 220 kV a.c or 350 kV d.c.	4

FIGURE 6 MEASUREMENT OF MINIMUM SAFE APPROACH DISTANCES



SECTION 10
REQUIREMENTS FOR INSPECTION AND RECORDS

10.1 INSPECTION

10.1.1 The owners of electrical works shall inspect and review overhead electric line installations at intervals not exceeding five years to ensure that the requirements of sections 2 to 8 have not been compromised by changed circumstances.

10.2 RECORDS

10.2.1 The following records shall be maintained to ensure that safe minimum distances are not compromised and to provide information to other parties:

(a) Asset register;

(b) Results of periodic inspections; and

(c) Dispensations or justifications for reduced distances (where applicable).