Where to draw the line on safety clearances from electricity assets

March 2024

Endeavour Energy

POWER together

Purpose

This brochure is designed to give guidance and information to anyone proposing to work or undertake activities near Endeavour Energy's overhead or underground electricity assets.

It is intended as a quick reference guide on basic safety and the location of assets., and highlights key issues around particular types of development and risk areas and how to minimise their impact. It does not claim to authorise or agree safe systems of work or contain all of the information required to complete work near or within clearances of Endeavour Energy's electricity assets. It does however provide information of other documents and contacts where you can get more detailed advice.

The requirements for maintaining safe distances from electricity assets are detailed in the State Environmental Planning Policy (Transport and Infrastructure) 2021 (Part 3, Division 5 – Electricity transmission or distribution, Subdivision 2 – Development likely to affect an electricity transmission or distribution network), which requires local councils to seek comments from Endeavour Energy before approving any development application where electricity infrastructure is present.

Under the provision of the Electricity Supply Act 1995 (NSW), buildings or structures too close to electricity infrastructure may under Section 49 'Obstruction of electricity works be regarded as interfering with electricity works and Endeavour Energy may issue a written notice to 'modify or remove the structure or thing'.

It is not intended as an exhaustive list of matters for consideration. Further advice is available via:

- Endeavour Energy's website http://www.endeavourenergy.com.au .
- General enquiries
    - Call: 133 718 (Monday to Friday - 8am to 6pm)
    - Or use the email enquiry form available via the following link: https://www.endeavourenergy.com.au/contact-us/general-enquiry

Full details about safe work practices, including penalties for non-compliance, are set out in the Safe Work Australia document *Working in the vicinity of overhead and underground electric lines guidance material*. The document can be viewed at the following link:

https://www.safeworkaustralia.gov.au/collection/working-vicinity-overhead-and-underground-electric-lines-guidance-material

Disclaimer

This document, and the information it contains, may change as new information becomes available or if circumstances change.

Anyone proposing to rely on or use the information in this document should independently verify and check the accuracy, completeness, reliability and suitability of that information for their own purposes.

Managing risks in Endeavour Energy's network

Endeavour Energy is responsible for powering NSW's fastest growing regions, sustaining the jobs and lifestyles of 2.7 million Australians. Our network spans more than 25,000 sq km and includes communities from the central west of NSW, to the Blue Mountains, Greater Western Sydney, Southern Highlands, Illawarra and South Coast of NSW. We supply electricity to support major infrastructure including rail, hospitals, data centres, advanced manufacturing and fully automated distribution centres; and support the growth of these regions to ensure that our customers can draw from energy that supports a sustainable future.

Our critical electricity infrastructure includes more than 430,000 power poles and streetlight columns, 207 major substations and 32,600 distribution substations connected by nearly 60,600 kilometres of underground and overhead cables which are integrated with renewable energy sources, including 220,000 residential solar connections, industrial solar and large-scale batteries.

The management of public safety risks posed by the Endeavour Energy network involves elements associated with both the management of the network assets; and the ability of the company to influence the behaviour of the public in the vicinity of the network. This document aims to help provide guidance and assistance for members of the public throughout various stages of design, maintenance and construction related activity,

Ensuring you are in the clear

All buildings and other structures must comply with minimum safety clearances from overhead electricity conductors.

The minimum distances from the closest conductor to the building or other structures must be maintained during strong winds or high operating temperatures. Under these conditions, the conductor can swing or sag considerably towards the building or structure.

The minimum safety clearances are shown in the table and illustrations in this brochure. They have been prepared to suit Endeavour Energy's asset construction practices.

High risk activities that impact Minimum Safety Clearances

- Knock-down/rebuilds, where a single storey home is replaced by a larger double storey home, or where land is rezoned to allow multi-storey construction, such as apartments or town houses
- Moving the location of a driveway or building driveways close to pillars or poles
- Installing a tall antenna in areas where broadcast reception is poor
- Erecting a flagpole
- Any building work near underground or overhead power lines
- Work on roof spaces, guttering or facia boards where overhead service lies connect
- Erecting a cubby house
- Raising the ground level below power lines
- Erecting metal fences or scaffolding close to poles or lines
- Excavating near poles or underground cables and assets (retaining walls, fencing, etc.)
- Using a crane near overhead lines
- Vegetation management near powerlines
- Installation of a swimming pool in most cases is generally unsuitable for installation near electricity assets and rarely allowed

Easements

Endeavour Energy's preference is to install electricity distribution infrastructure on public land such as within a Council reserve and public road. Sometimes Endeavour needs to install new infrastructure to supply customers or to maintain or improve equipment for existing services on private land and this may require the creation of an easement.

If there's an easement on your property, it will be registered on your land title. To check always refer to the relevant property title for encumbrances and the associated deposited plan and / or the dealing document. Not all easements for electricity infrastructure will necessarily benefit Endeavour Energy and as an example for low voltage service conductors the easement may benefit adjoining land/lot.

The point of attachment for a property's electricity supply is normally located near the front boundary or in the front setback of the property and does not require an easement to be granted.

Endeavour Energy has developed a brochure 'Living with Easements' explaining the types of easements and activities that may be prohibited or allowed within an easement, which can be downloaded from:

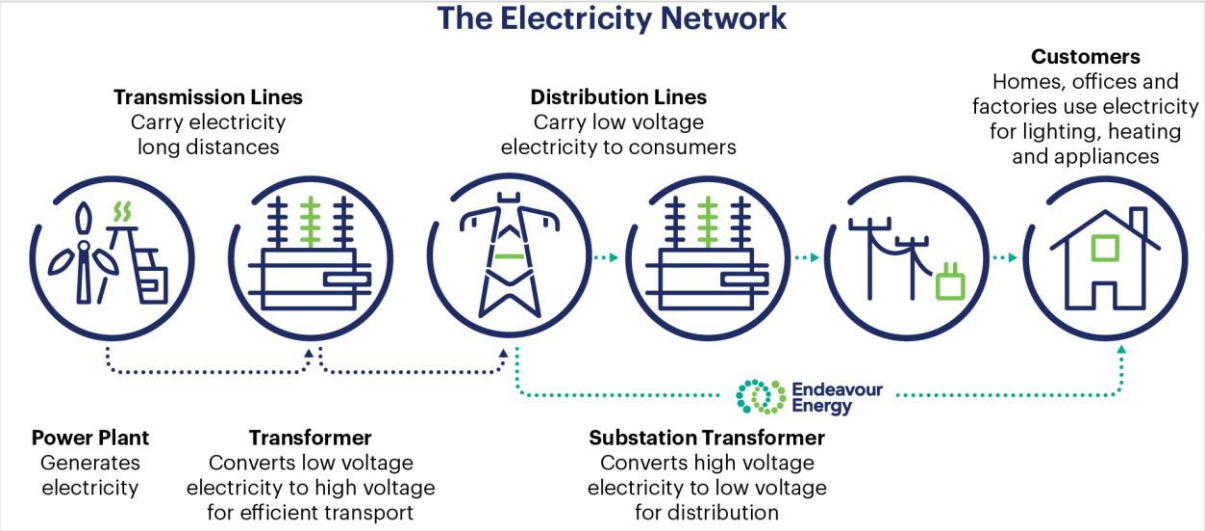
https://www.endeavourenergy.com.au/__data/assets/pdf_file/0029/58835/Endeavour-Energy-Living-with-Easements-Sep23.pdf

Types of electricity assets

Traditional supply of , electricity involves distribution of electricity generated a long way from homes and businesses, at high voltages to bulk supply points over the transmission system operated by Transgrid. From here Endeavour Energy transports electricity to our sub-transmission and zone substations, which usually service entire suburbs, transform electricity to mid voltage levels (11,000 or 22,000 volts).

When electricity arrives at the location where it is required, distribution substations further transform the electricity to 400 or 230 volts.

Underground cables and/or overhead power lines then carry this low voltage electricity to the customer connection points located on the customer's premises to service their electricity load.



The following sections provides details of typical underground and overhead electricity assets. Underground assets are more prevalent in urban areas but often both types of electricity assets may be present.

Overhead electricity assets

Overhead electricity assets consist of two main parts – poles (or sometimes towers for transmission voltage) and conductors (or powerlines / wires). Poles are typically made of timber, concrete or composites and towers are typically steel lattice structures mounted on concrete foundations.

Their design varies due to factors such as voltage, conductor type and the strength of structure required. Conductors, which are the 'live' part of the overhead line, hang from poles and towers on insulators. In addition to power, some underground line routes have earth cables and pilot / telecommunications cables.

Transmission, high voltage and low voltage overhead power lines in Long Street Smithfield. There are also high voltage underground cables coming from the pole going to the padmount substation. Source: Google Maps Street View.

Pole mounted substation in Wellington Street Riverstone. Source: Google Maps Street View.

Working with safety near Low Voltage Overhead Service Conductors

Low voltage overhead services conductors (sometimes referred to as service mains) are the overhead conductors (there may be more than one) from an Endeavour Energy distribution pole to a customer connection point (also referred to as point of attachment) on a building, structure or pole.

Low voltage service conductors and customer connection points must comply with the 'Service and Installation Rules for New South Wales'. The Service and Installation Rules (Rules) for New South Wales cover the requirements for the connection of electrical installations to the distribution network. The Rules are used by electricians and Accredited Service Providers.

https://www.energy.nsw.gov.au/nsw-plans-and-progress/regulation-and-policy/service-and-installation-rules

The point of attachment (POA) is where the electrical wires attach to a home or building.

When work is being carried out near the point of attachment, special care must be taken to avoid contact with these electrical wires, and the mounting bracket, or to avoid damaging them.

The safe distance from a point of attachment varies depending on the activity being performed.

Refer to the Safe Work NSW Work Near Overhead Powerlines Code of Practice for specific advice.

Care must be taken with activities such as:

- Cleaning leaves from guttering.
- Painting gutters, facades and eaves.
- Pruning trees and shrubs (particularly around the electrical wires).
- Attaching aluminium cladding to facades and the eaves.
- Replacing the guttering.

Safe Approach Distances

Ordinary Persons

Table 1 below (extracted from the Safe Work NSW Work Near Overhead Powerlines Code of Practice) provides approach distances for:

- Ordinary persons performing work near overhead power lines, (including plant, hand tools, equipment or any other material held by a person); or
- Cranes (and their loads) and items of mobile plant operated by an ordinary person near overhead power lines

TABLE 1

Approach distances for work performed by Ordinary Persons

Nominal phase to phase a.c. voltage (volts)	**Approach distance (m)**
Up to and including 132,000	3.0
Above 132,000 up to and including 330,000	6.0
Above 330,000	8.0
Nominal pole to earth d.c. voltage (volts)	**Approach distance (m)**
Up to and including +/- 1500 Volts	3.0

Additional information can be found in the SafeWork – Work Near Overhead Power Lines Code of Practice and must be adhered to at all times.

Approach distances for work near low voltage overhead service lines

Ordinary Persons (m)				
Hand held tools	Operation of crane or mobile plant	Handling of metal materials (Scaffolding, roofing, guttering, pipes, etc)	Handling of non-conductive materials (Timber, plywood, PVC pipes and guttering, etc)	Driving or operating vehicle
0.5	3.0	4.0	1.5	0.6

Extract of SafeWork NSW Work Near Overhead Powerlines: Code of Practice 2006, Section 8.2, Table 4 'Approach distances for work near low voltage overhead service lines'.

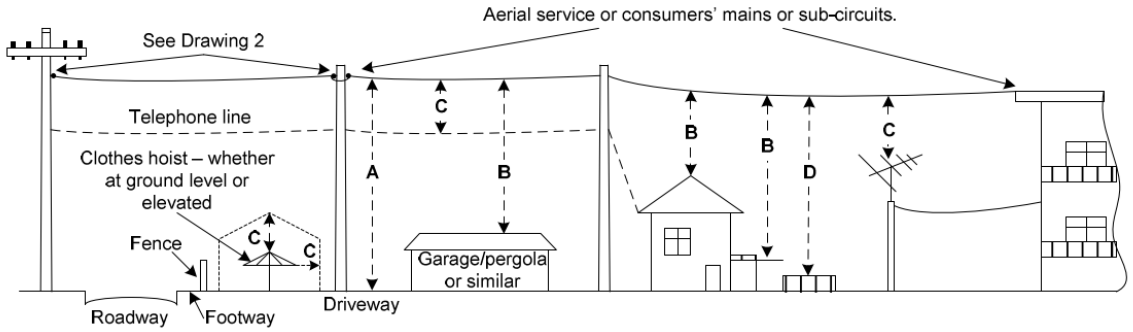
Minimum Clearance over Structures, Roads and Driveways

The minimum safety clearances over structures, roads and driveways are shown in the following drawings.

Remember – these are the minimum safety distances. The minimum safety distance is 3 metres, in some cases, the distance may increase to ensure public safety.

Drawing 1: Minimum safety clearances over structures

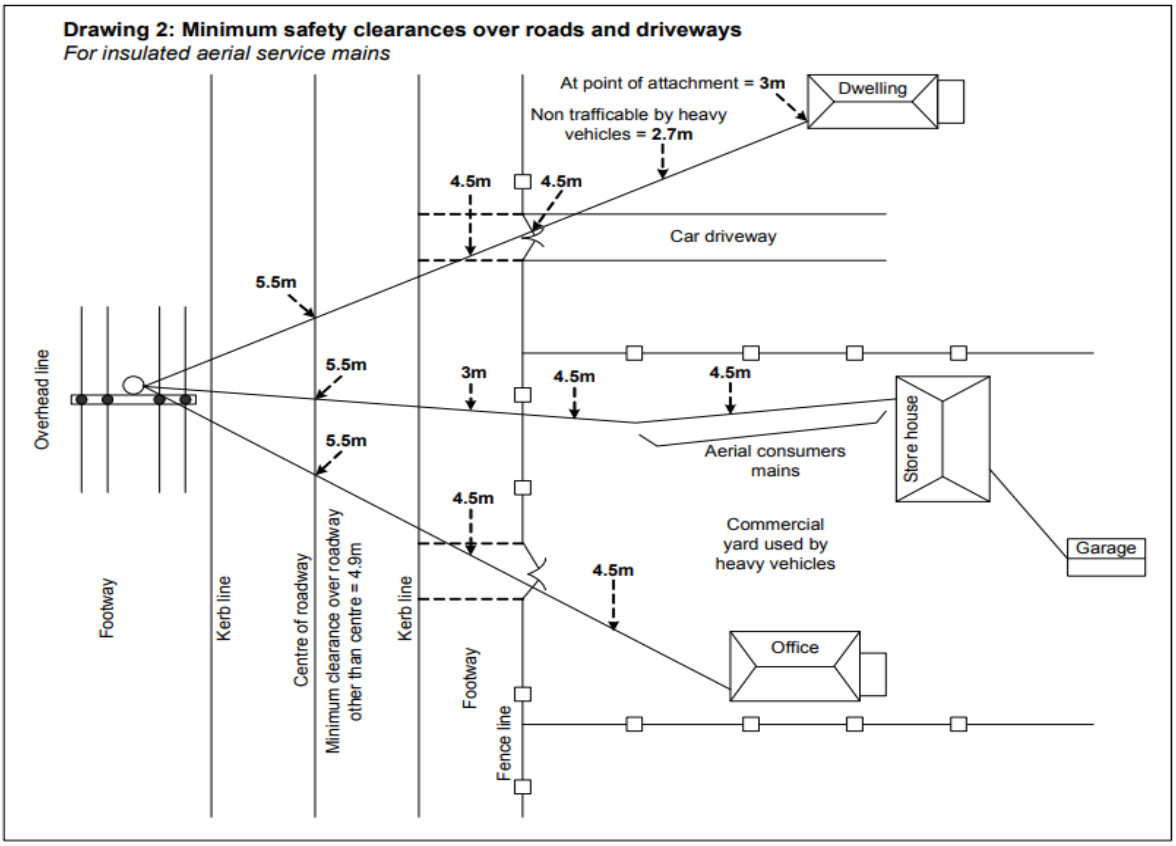
Aerial consumers' and service mains



Application / Type of aerial conductor	Minimum height above buildings, structures, ground or elevated areas (mm)		From, **buildings, TV/ radio** antenna or stay wire and **telephone lines** (mm).	Above water level in swimming pool, above walkway around pool	Above areas where irrigation pipes are used, or above areas where sail craft are used
	Over ground	Over roofs			
	A	B	C	D	
Bare or insulated live conductors	Bare 5500 Insulated 4500	3700	2000 3000 for clothes lines	Not permitted	Refer to Integral Energy

Drawing 2: Minimum safety clearances over roads and driveways

For insulated aerial service mains



Look up and Live

Before undertaking work on a site with overhead power lines, the location of powerlines can be checked with the free Look up and Live app which is available via the following link: www.lookupandlive.com.au

The Look up and Live map is an interactive geospatial map that has been developed to display the electricity networks of various distributors including Endeavour Energy.

It is a simple worksite planning tool which provides information on powerline safety and allows specific information to be obtained from Endeavour Energy concerning how to minimize the risk of contact while working in proximity to the electricity network.

When onsite, there are several ways to identify the location of electricity infrastructure to keep your workers and contractors safe. Here are the key ones:
Pre-plan your job by consulting with Endeavour Energy. We provide advice to the building industry, councils or any other organisation or individuals working near our overhead network.

Place an enquiry by completing a Request for Safety Advice and emailing it to construction.works@endeavourenergy.com.au

Develop site plans identifying the location of electrical infrastructure and effectively communicate these plans to staff. Keep the plans available.

Designate and mark out travel paths around the site away from overhead powerlines. These can be used for moving ladders or long objects, and operating tip trucks, elevated platforms, drilling or excavating machinery, backhoes etc.

Use visual indicators such as tiger tails, signage, spray paint or bunting to highlight the presence of overhead powerlines, underground cables, and electrical infrastructure.

Remember that tiger tails and covers are not insulators, and their presence does not mean you can work closer to powerlines. They simply provide a visual indicator to alert you to the presence of powerlines and they do not make powerlines safe to touch under any circumstances.

Use range-limiting devices on excavators and cranes to assist in maintaining clearances from powerlines.

Avoid contact with the point of attachment (where the power comes into a building). If you cannot maintain the required clearances, arrange for a power outage by calling Endeavour Energy on 131 003. Assign an observer, whose only job is to monitor and ensure safe clearances are maintained between operating machinery and powerlines

Always report any contact with powerlines immediately to Endeavour Energy on 131 003.

Underground Electricity Assets

Underground electricity assets include but are not limited to cables (in addition to power, some underground line routes have earth cables and pilot / telecommunications cables), conduits, pillars, streetlight columns, switch station, padmount and indoor substations all of which are ‘live’ and ever-present parts of the electricity distribution network.

Cables can be laid in a range of locations such as the road, footpath, council parks, private property or in bridges and tunnels, and consist of a conducting core surrounded by layers of insulation and armour. Underground electrical cables are not necessarily protected by concrete, covered with slabs, marker tapes or other indicators of their presence and are frequently not enclosed in conduits.

Working near a cable may result in electric shock even if no contact is made with the core of the ‘live’ cables. In addition to personal loss and serious injury, repairs to underground cables and equipment are expensive.

Low voltage pillar, streetlight column and padmount substation at Goodison Street North Kellyville.
Source: Google Maps Street View.

Underground Services

Care must also be taken to ensure that building or excavation activities do not infringe on underground cable, ducts, and protective overs.

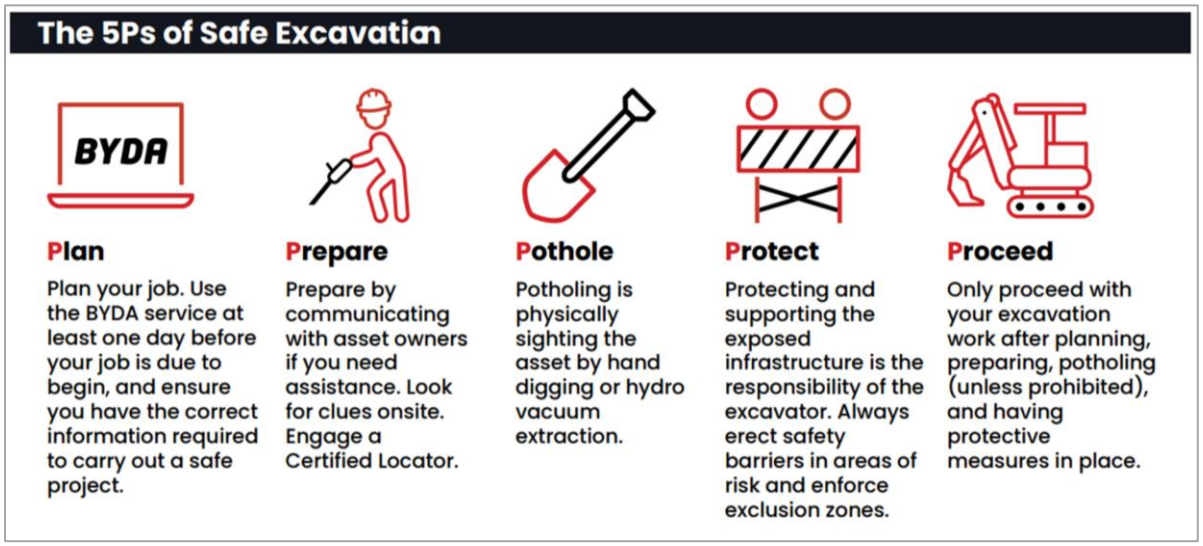
The definition of 'excavation' or 'penetration of ground' regarding requirement for BYD or DA notification is any work involving the penetration of the ground or surface of the earth including cutting or caisson, chasing, boring, piering or the digging of trenches, ditches, shafts, wells, tunnels, drifts and rises below the finished levels of the ground surface or finished ground levels. This also includes works involving the movement or placement of soil or other surface materials by removing, boring, or forcing objects into the ground or the surface of the earth.

Before undertaking any work in the vicinity of underground cables, advice should be obtained from the ***Before You Dig Australia (BYDA)*** service.

Before You Dig is a FREE national referral service supported by Endeavour Energy and other major service providers that supplies plans of where electricity, water, gas and telecommunications cables and assets are located, so you know whether it is safe to dig. Contact BYDA on 1100 (Free call) for information, and download the BYDA App on iOS or Android, or visit www.byda.com.au and register to get plans sent to your email address.

NSW legislation requires people who are planning excavation work to obtain copies of underground electricity cable plans from Before You Dig Australia. The plans must be no more than 30 days old when excavation commences.

The aim of the legislation is to ensure workers can establish the exact location of cables and avoid coming into contact or damaging them. It also ensures worker safety and prevents disruption to Endeavour Energy's electricity network.



Excavation Near Overhead Structures

All persons proposing excavation work deeper than 150mm (300mm without machinery or power tools) are required to contact BYD before commencing work.

Section 49A ‘Excavation work affecting electricity works’ of the of Electricity Supply Act 1995 (NSW) covering the carrying out or proposed carrying out of excavation work in, on or near electrical infrastructure allows Endeavour Energy to serve written notice to modify or not to carry out the excavation work.

Trenching adjacent to existing structures presents a stability hazard on the structure as the ground conditions are compromised. It is critical that sufficient fill remain around the base of the structure maintaining a zone of influence ratio of at least 1:1.

For example: if the excavation is 1m deep, 1m of ground fill must remain around the structure.

Where this cannot be achieved, and/or where ground conditions are adversely affected; you must contact Endeavour Energy to assess the structure and supporting of the structure via mechanical means.

This excavation for a basement at 6 Sorrell Street Parramatta NSW for a mixed use 8 storey development in 2015 was identified by Endeavour Energy’s Regional Services North as being unsafe due to the integrity of padmount substation 7858 located on the adjoining lot being compromised and access not being available. This resulted in the ‘switching out’ of the substation from the network until the site conditions were again deemed to be safe.

Vegetation Management

Please think carefully about the suitability of trees before planting in close proximity to electricity distribution infrastructure. Large trees planted pose significant challenges for Endeavour Energy, and for this reason it recommends the following be avoided:

- Planting of trees which exceed 3 metres in mature height (without the need for pruning) under overhead power lines. Power poles may also carry telecommunications infrastructure below the power lines which may also be impacted.
- Planting of trees closer than their mature height to the closest conductor i.e., should the tree fall over, it should not damage the overhead power lines.
- Planting of trees within 5m of a power pole.
- No plants with significant root systems that grow greater than 400 millimetres below ground level be planted near underground cables.
- Planting of trees too close to streetlight columns that will require regular pruning to prevent foliage from blocking the light.

Endeavour Energy are responsible for managing vegetation in areas outside the customer's property boundaries. Customers are responsible for keeping trees that grow on their property a safe distance from overhead power lines.

Note: Private property includes the shared parcels within a strata plan not just the individual dwelling parcels of the strata.

You cannot trim your trees yourself if:

- The tree or branch to be pruned is closer than 3 metres to any power line.
- Any part of your body or equipment comes within 3 metres of any power line.
- The tree or branch is above your service line.

Should you ever need to trim or remove trees on your own premises, Endeavour Energy recommends that you have the work done by an accredited contractor with a minimum of Certificate II ESI - Powerline Vegetation Control from a Registered Training Organisation.

Further details of Endeavour Energy's vegetation management practices can be found on: https://www.endeavourenergy.com.au/safety/vegetation-management

Public Safety Resources

Workers involved in work near electricity infrastructure run the risk of receiving an electric shock and causing substantial damage to plant and equipment. Please find attached copies of Endeavour Energy's public safety training resources, which were developed to help general public / workers to understand why you may be at risk and what you can do to work safely.

The public safety training resources are also available via Endeavour Energy's website under 'Home > Safety' or via the following link:
https://www.endeavourenergy.com.au/safety

Endeavour Energy developed a Public Safety Plan that details how we will invest and tailor activities to target at risk groups through safety awareness campaigns, educational programs, asset management programs, business processes and promote safe behaviours to reduce interaction with electricity infrastructure:

- Endeavour Energy Public Safety Plan FY24
  https://www.endeavourenergy.com.au/__data/assets/pdf_file/0018/70119/Public-Safety-Plan-FY24.pdf

SafeWork provides key safety information on how to protect persons from the risks arising when working or undertaking activities near overhead power lines and underground cables including:

- Safe Work Australia - General guide for working in the vicinity of overhead and underground electric lines"
  https://www.safeworkaustralia.gov.au/resources-and-publications/guidance-materials/general-guide-working-vicinity-overhead-and-underground-electric-lines

- SafeWork NSW Work Near Underground Assets – Guide 2007
  https://www.safework.nsw.gov.au/__data/assets/pdf_file/0009/54378/SW08773-Work-near-underground-assets-guide.pdf

- SafeWork Australia – Excavation Code of Practice
  https://www.safework.nsw.gov.au/__data/assets/pdf_file/0019/52147/Excavation-work-COP.pdf

- SafeWork NSW Work Near Overhead Power Lines: Code of Practice 2006
  https://www.safework.nsw.gov.au/__data/assets/pdf_file/0020/52832/Work-near-overhead-power-lines-code-of-practice.pdf

In addition, the following documents to support safety in design and construction:

- Australian / New Zealand Standard AS/NZS 7000 – 2016: 'Overhead line design'

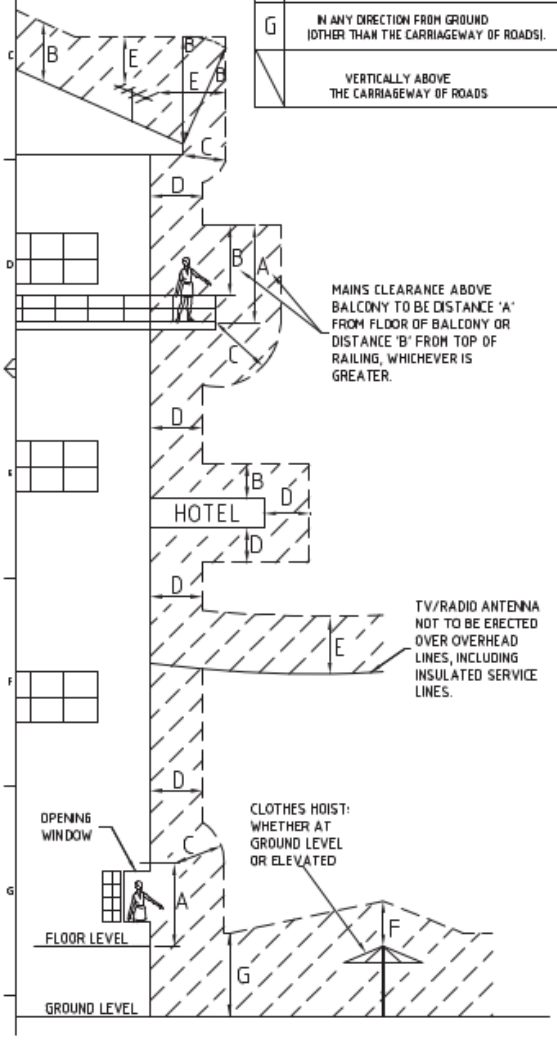
  If you would like to read an entire document, you will have to purchase the standard from Standards Australia https://www.standards.org.au or alternatively some libraries maintain access to Australian Standards.

- Energy NSW 'Service and Installation Rules for New South Wales' which cover the requirements for the connection of electrical installations to the distribution network
  https://www.energy.nsw.gov.au/nsw-plans-and-progress/regulation-and-policy/service-and-installation-rules

Appendices

Endeavour Energy Drawing 86232 ‘Overhead Lines Minimum Clearances Near Structures’

APPLICATION \ NOMINAL VOLTAGE (U) & CONDUCTOR		U ≤ 1000V			U > 1000V		1000V < U ≤ 33kV	33kV < U ≤ 132kV
		INSULATED (mm)	BARE NEUTRAL (mm)	BARE ACTIVE (mm)	INSULATED WITHOUT EARTHED SCREEN (mm)	INSULATED WITH EARTHED SCREEN (mm)	BARE CONDUCTORS (mm)	BARE CONDUCTORS (mm)
A	VERTICALLY ABOVE THOSE PARTS OF ANY STRUCTURE NORMALLLY ACCESSIBLE TO PERSONS	2700	2700	3700	3700	2700	4500	5000
B	VERTICALLY ABOVE THOSE PARTS OF ANY STRUCTURE NOT NORMALLY ACCESSIBLE TO PERSONS BUT ON WHICH A PERSON MAY STAND	2000	2700	2700	2700	2700 NOTE 4	3700	4500
C	IN ANY DIRECTION (OTHER THAN VERTICALLY ABOVE) FROM THOSE PARTS OF ANY STRUCTURE NORMALLY ACCESSIBLE TO PERSONS, OR FROM ANY PARTS NOT NORMALLY ACCESSIBLE TO PERSONS BUT ON WHICH A PERSON CAN STAND	1000	900 NOTE 5 (1000)	1500	1500	1500 NOTE 4	2100	3000
D	IN ANY DIRECTION FROM THOSE PARTS OF ANY STRUCTURE NOT NORMALLY ACCESSIBLE TO PERSONS	100 NOTE 2	300 NOTE 2	600 NOTE 2	600	100	1500	2500
E	IN ANY DIRECTION FROM ANY PART OF AN OUTDOOR TELEVISION ANTENNA OR PART OF A STAYWIRE	1800	1800	1800	3000	3000	3000	3000
F	IN ANY DIRECTION FROM CLOTHES LINE	2000	3000	3000	3000	3000	3000	3000
G	IN ANY DIRECTION FROM GROUND (OTHER THAN THE CARRIAGEWAY OF ROADS).	5500 NOTE 6	5500	5500	5500 NOTE 5 (7500)	5500	5500 NOTE 5 (7500)	6700 NOTE 5 (7500)
	VERTICALLY ABOVE THE CARRIAGEWAY OF ROADS	5500	5500	5500	6000 NOTE 5 (7500)	5500	6700 NOTE 5 (7500)	6700 NOTE 5 (7500)



GENERAL NOTES

1. THE POINT OF ATTACHMENT IS HERE DEFINED AS THE POINT AT WHICH Endeavour Energy'S AERIAL SERVICE MAINS JOIN ONTO THE CONSUMERS BUILDING OR STRUCTURE OR ELSE THE FIRST POLE PAST THE BOUNDARY OF THE CONSUMERS PREMISES.
2. THIS CLEARANCE MAY BE REDUCED TO ALLOW FOR TERMINATION AT POINT OF ATTACHMENT.
3. FOR CLEARANCE REQUIREMENTS OF INSULATED AERIAL SERVICE MAINS, REFER Endeavour Energy'S DRAWING 011985.
4. HIGH VOLTAGE NON-METALIC SCREENED AERIAL BUNDLED CONDUCTOR (NMS-HV ABC) IS CLASSIFIED AS INSULATED WITH EARTHED SCREEN FOR CLEARANCE PURPOSES, EXCEPT FOR DIMENSIONS B & C.
5. TO KEEP LINES BEYOND THE REACH OF PERSONS, THE DESIGN CLEARANCES (SHOWN IN BRACKETS) REQUIRED BY Endeavour Energy IN THESE SITUATIONS ARE GREATER THAN THOSE REQUIRED BY INDUSTRY GUIDELINES.
6. DOES NOT INCLUDE INSULATED SERVICE LINES.

MINIMUM CLEARANCE REQUIREMENTS

MINIMUM SAFE CLEARANCES ARE SPECIFIED IN ELECTRICITY SUPPLY (SAFETY & NETWORK MANAGEMENT) REGULATION 2008, & GUIDELINES FOR DESIGN & MAINTENANCE OF OVERHEAD DISTRIBUTION & TRANSMISSION LINES (ENA C(b)1-2006).
DETAILS SHOWN ON THIS DRAWING COMPLY WITH ENDEAVOUR ENERGY PRACTICE.

THESE CLEARANCES ARE THE MINIMUM NECESSARY WHEN ANY Endeavour Energy OVERHEAD LINE WILL BE IN ITS CLOSEST POSITION TO THE BUILDING OR OTHER STRUCTURE DURING STRONG WINDS OR MAXIMUM OPERATING TEMPERATURE (EXCLUDING FAULT CURRENTS OR EMERGENCY LOAD CURRENTS). UNDER THESE CONDITIONS, CONDUCTOR MAY SWING OR SAG CONSIDERABLY TOWARDS THE BUILDING OR STRUCTURE COMPARED WITH NORMAL CONDITIONS.
ADEQUATE ALLOWANCE SHOULD BE MADE FOR THIS POSSIBLE SWING OR SAG OF CONDUCTORS.

OVERHEAD LINES MUST NOT COME WITHIN HATCHED AREAS.
MINIMUM CLEARANCES SHOWN ARE FOR Endeavour Energy OVERHEAD LINES UP TO THE POINT OF ATTACHMENT (AS DEFINED IN NOTE 1).
MINIMUM CLEARANCES PAST THE POINT OF ATTACHMENT ARE TO BE IN ACCORDANCE WITH SAA WIRING RULES (AS/NZS3000).

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