



# NS179

## Vegetation Safety Clearances

December 2010



## SUMMARY

Network Standard NS179 covers the vegetation clearance requirements for vegetation in the vicinity of high voltage and low voltage lines, poles, attachments to poles, streetlights, standards and towers.

## ISSUE

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## INTERPRETATION

In the event that any user of this Standard is uncertain about any information or provision, the user should request clarification from Ausgrid. Ausgrid's interpretation shall then apply as though it was included in the Standard.

Network Standard  
NS179  
Vegetation Safety Clearances  
December 2010

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## SCOPE

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This Network Standard specifies Ausgrid's requirements for clearance of vegetation from the vicinity of Ausgrid's poles, lines, street lights and towers. It applies to all situations requiring clearance of vegetation from the vicinity of high voltage and low voltage lines, poles, attachments to poles, streetlights, standards and towers, which are or will become part of Ausgrid's network.

This Network Standard applies to all persons with responsibility for clearing vegetation from the vicinity of Ausgrid's poles and associated attachments, lines, street lights, standards and towers, including Ausgrid staff, Contractors and Accredited Service Providers.

## GENERAL

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In this document, the word 'vegetation' refers to all plant life including, but not limited to, trees, palms, vines, shrubs, and grasses such as bamboo but not lawns.

This Network Standard does not address safe working requirements for vegetation clearance work. Safe working requirements are addressed in legislation, Ausgrid's Electrical Safety Rules and WorkCover guides and codes.

This document shall be read in conjunction with the following Ausgrid Network Standards:

- NRS 102 Working on Poles with Mobile Phone Transmitter Installations
- NS125 Specification for low Voltage Overhead Conductors
- NS126 Specification for the Design & Construction of High Voltage Overhead Mains
- NS135 Specification for the Design & Construction of Overhead Subtransmission Mains
- NUS146 Safety Inspection Procedures for Working on Poles
- NS156 Working Near or Around Underground Cables
- NS 201 All Dielectric Self Supporting Fibre Optic Cabling for Installation on Distribution Assets
- NS 209 Operating Cranes & Plant in Proximity to Overhead Power Lines

## DEFINITIONS

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<b>ADSS cable</b>	All Dielectric Self Supporting fibre optic cable as defined in Ausgrid's Network Standard NS 201.
<b>Aerial Bundled Cable (ABC)</b>	Two or more cores twisted together into a single bundled cable assembly. Two types of ABC are used:  Low voltage ABC which meets the requirements of AS3560  High voltage ABC which meets the requirements of AS3599 Part 1 or Part 2
<b>Bush Fire Prone Area</b>	An area of land that can support a bush fire or is likely to be subject of a bush fire attack as defined by the NSW Rural Fire Service. Bush fire prone land maps are prepared by local councils across the State of NSW and are certified by the Commissioner of the NSW Rural Fire Service.
<b>Clearances</b>	The space surrounding the overhead power line conductors and other electrical equipment, which is to be maintained clear of any foliage. The extent of this space is dependent on the line type, maximum sag, conductor voltage, re-growth characteristics of the trees, and the period till the next planned inspection
<b>Covered Conductor</b>	A conductor around which is applied a specific thickness of insulating material. AS3675 specifies two types of covered conductor:  CC where the nominal covering thickness is independent of working voltage  CCT where the nominal covering thickness is dependent on the working voltage
<b>Insulated</b>	Continuously covered with a fully rated insulation material of the appropriate grade for the voltage at which the overhead line is operated
<b>Local Councils</b>	The councils constituted pursuant to the <i>Local Government Act 1993</i> .
<b>Non-urban Area</b>	Areas outside urban areas.
<b>Urban Area</b>	A built-up area as designated by street lighting or subdivision into small allotments or other areas agreed to by the Network Operator and the local council.
<b>Vegetation</b>	All plant life including, but not limited to trees, palms, vines, shrubs and grasses such as bamboo but excluding lawns
<b>Water Crossing Sign</b>	A notice located adjacent to bodies of water, warning of the presence of overhead or underground electricity power lines crossing the body of water.

## VEGETATION SAFETY CLEARANCES

### 1.1 General Requirements

Vegetation management work must comply with all relevant legislation. Any work within three metres of Ausgrid's mains must only be performed by persons individually authorised by Ausgrid and in accordance with Ausgrid's Electrical Safety Rules.

Minimum vegetation clearances must be maintained at all times in accordance with Table 1(a) (urban areas), Table 1(b) (bush fire prone areas) and Note 1.

**Table 1a: Minimum Vegetation Clearances Urban Areas**

Conductor Type and Voltage	Minimum Vegetation Clearances				
	At support structure and 1/6 <sup>th</sup> either side	Along middle 2/3 of span, of length:-			
		<100m	100 - 200m	200 - 300m	>300m
ABC / insulated XLPE service lines less than 1000V	0.5m	0.5m	1m	N/A	N/A
Bare LV and service lines Up to and Including 1000V	1m	1.5m	2.5m	4m	N/A
Covered LV and service lines up to and Including 1000V	0.6m	1m	2.5m	N/A	N/A
Bare > 1000V up to and including 22kV	1.5m	2.5m	3.5m	5m	5.5m for spans up to 400m + additional 2m for each 100m thereafter until easement limit
Bare 33kV - 66kV inclusive	2m	3m	4m	6m	6.5m for spans up to 400m + additional 2m for each 100m thereafter until easement limit
Bare 132kV	3m	4m	5m	6.5m	7m for spans up to 400m + additional 2m for each 100m thereafter until easement limit
11kV ABC / screened CC or CCT	1m	2m	2.5m	N/A	N/A
Unscreened CC 11kV – 22kV inclusive	1m	2m	2.5m	N/A	N/A

**Table 1b: Minimum Vegetation Clearances – Non-Urban / Bush Fire Prone Areas**

Conductor Type and Voltage	Minimum Vegetation Clearances				
	At support structure and 1/6 <sup>th</sup> either side	Along middle 2/3 of span, of length:-			
		<100m	100 - 200m	200 - 300m	>300m
ABC / insulated XLPE service lines less than 1000V	1m	1m	1.5m	N/A	N/A
Bare LV and service lines Up to and Including 1000V	1.5m	2m	3m	4.5m	N/A
Covered LV and service lines up to and Including 1000V	1m	1.5m	3m	N/A	N/A
Bare > 1000V up to and including 22kV	2m	3m	4m	5.5m	6m for spans up to 400m + additional 2m for each 100m thereafter until easement limit
Bare 33kV - 66kV inclusive	3m	4m	5m	7m	7m for spans up to 400m + additional 2m for each 100m thereafter until easement limit
Bare 132kV	4m	5m	6m	7.5m	8m for spans up to 400m + additional 2m for each 100m thereafter until easement limit
11kV ABC / screened CC or CCT	1.5m	2.5m	3m	N/A	N/A
Unscreened CC 11kV – 22kV inclusive	1.5m	2.5m	3m	N/A	N/A

Note 1: A relevant re-growth allowance must be added to the clearances specified in Tables 1a and 1b in order to maintain these minimum clearances at all times.

Clearances for spans longer than 300 metres are based on Integral Energy Drawing No.11983 (see Appendix A) for spans up to 700 metres. For spans greater than 700, vegetation should be cleared to easement boundaries.

### 1.1.1 Access Tracks

Unrestricted access to Ausgrid's overhead mains and line supports must be available at all times to enable staff and contractors to carry out line inspections and clearing work. Where required, vegetation shall be cleared to maintain a 4 metre wide by 4 metre high access corridor enabling vehicle access to any given section of a pole or tower line. If vehicle access is not possible due to vegetation density or

terrain factors, then a pedestrian access track shall be created and maintained to enable the passage of personnel and equipment.

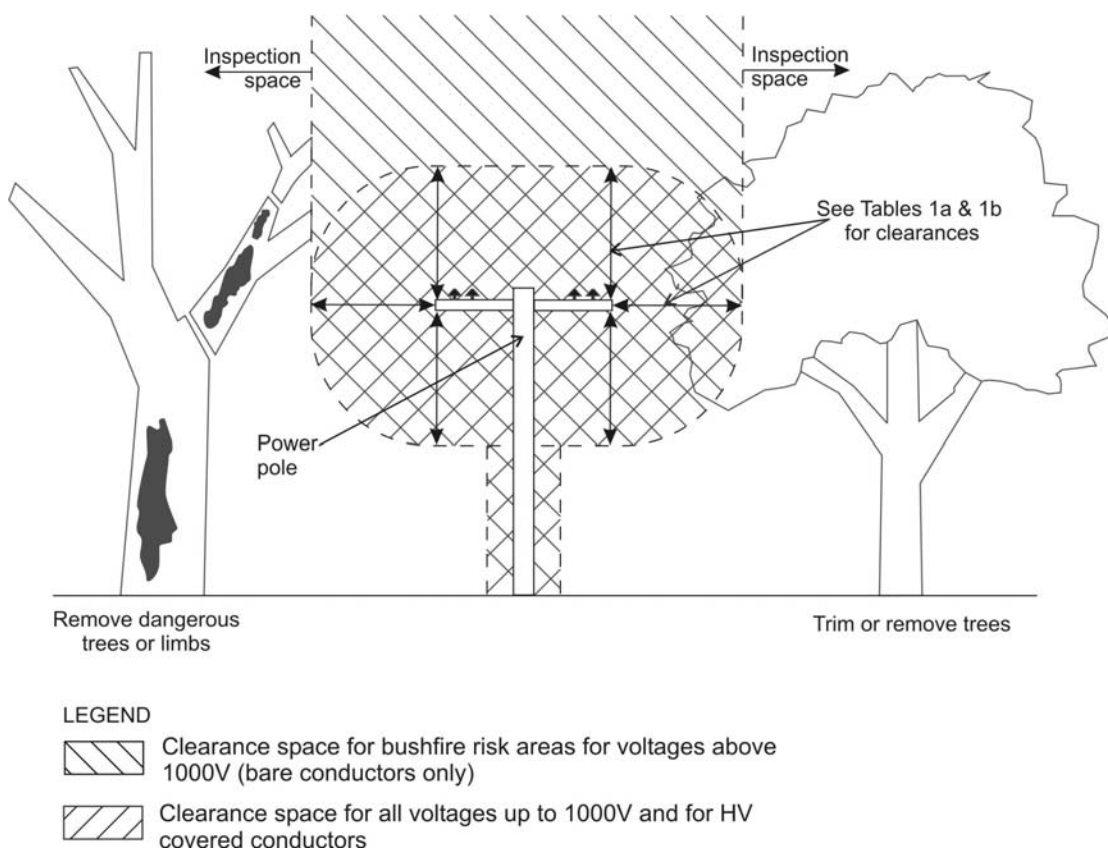
Appropriate signage shall be placed at the entrance of each access track identifying the line and support structures and the distance involved.

### 1.1.2 Easements

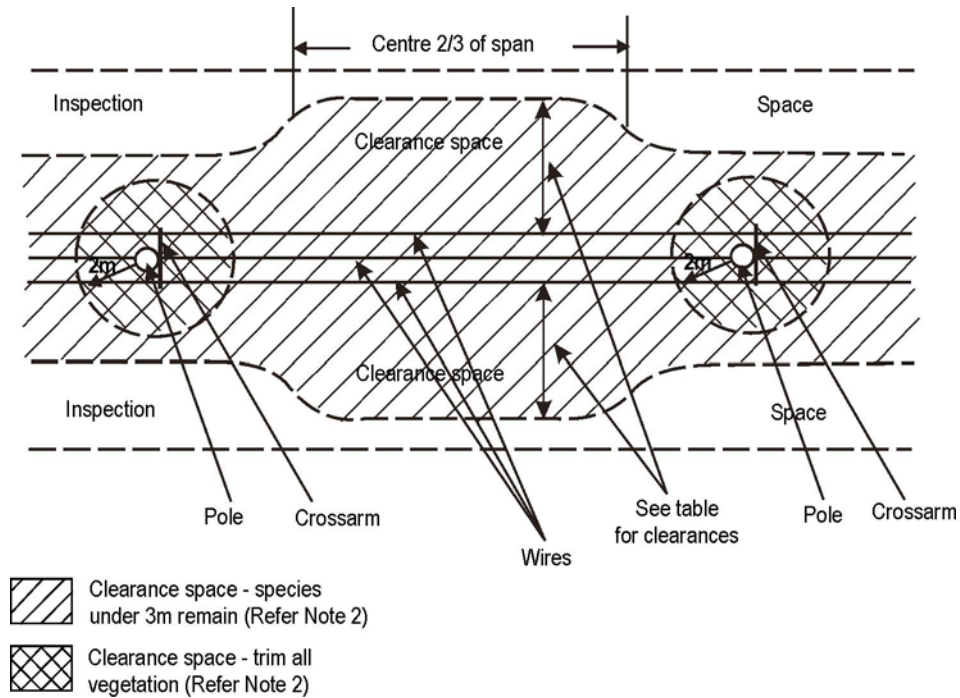
Where Ausgrid has established cleared easements, the contractor is responsible for maintaining clearing of easements annually with the works to be carried out between the beginning of May and completed by 30 September. The easements must be maintained to the specified width to the sky using nominated methods proposed by the contractor and subject to approval by Ausgrid which may include machinery, herbicide application or other proposed methods

## 1.2 Pole Lines - Bare and Covered Conductors

Vegetation safety clearances for bare and covered conductors, poles and attachments shall be in accordance with the requirements specified in Table 1 and Figures 1(a) and 1(b).



**Figure 1(a): Vegetation clearances – pole lines with bare and covered conductors (elevation view)**



**Figure 1(b): Vegetation clearances - pole lines with bare and covered conductors (plan view)**

In bush fire risk areas where clearing to sky is not possible, all dead and obviously dying branches which overhang may otherwise interfere with the mains must be removed.

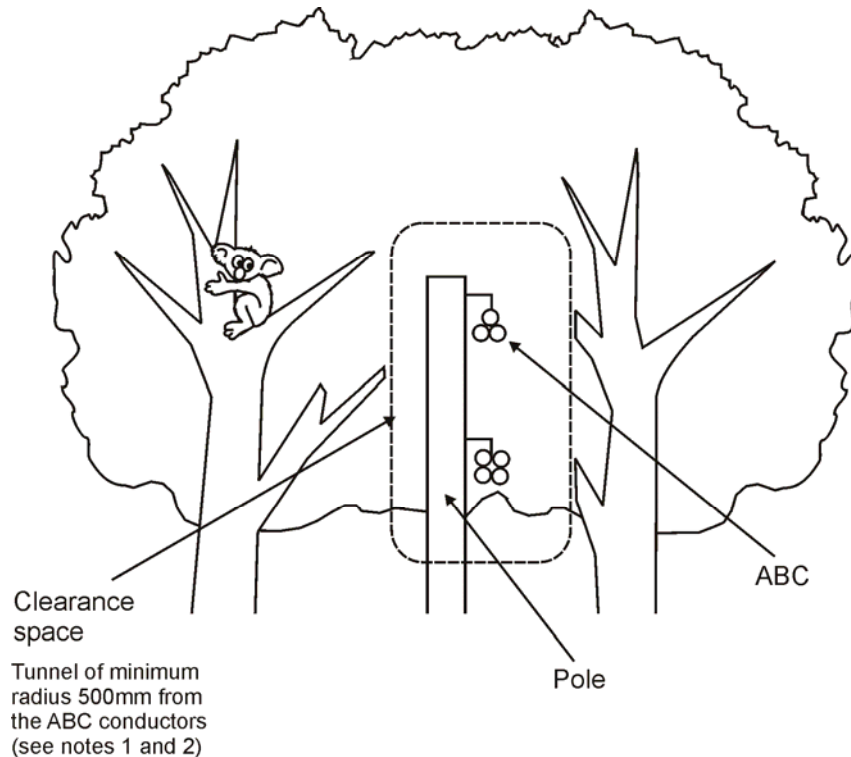
The contractor may request approval from Ausgrid to allow tree trunks or major branches of large healthy trees to remain within the specified clearance space provided:

- No one climbing the trunks or branches will be able to come into contact with the power lines
- There will be no threat posed to the power lines
- There will be no risk of bushfire being caused by the trunks or branches
- Water crossing signs will not be obscured

A minimum vegetation clearance of 2m shall be maintained around poles, standards and stay wires. Where it is impractical for this clearance to be achieved, vegetation shall be trimmed so that the pole, standard or stay wire can be safely accessed. Vegetation must be trimmed to enable each pole to be safely accessed from a ladder and to enable a below ground line inspection of the pole to be carried out. Trees and tree branches must be trimmed where necessary to prevent unauthorised access to pole steps or other pole attachments that are normally out of reach.

### 1.3 Aerial Bundled Cable Systems

Vegetation safety clearances for aerial bundled cable systems shall be in accordance with the requirements specified in Table 1 and Figure 2 and Note 3.



**Figure 2: Vegetation clearances - aerial bundled cables**

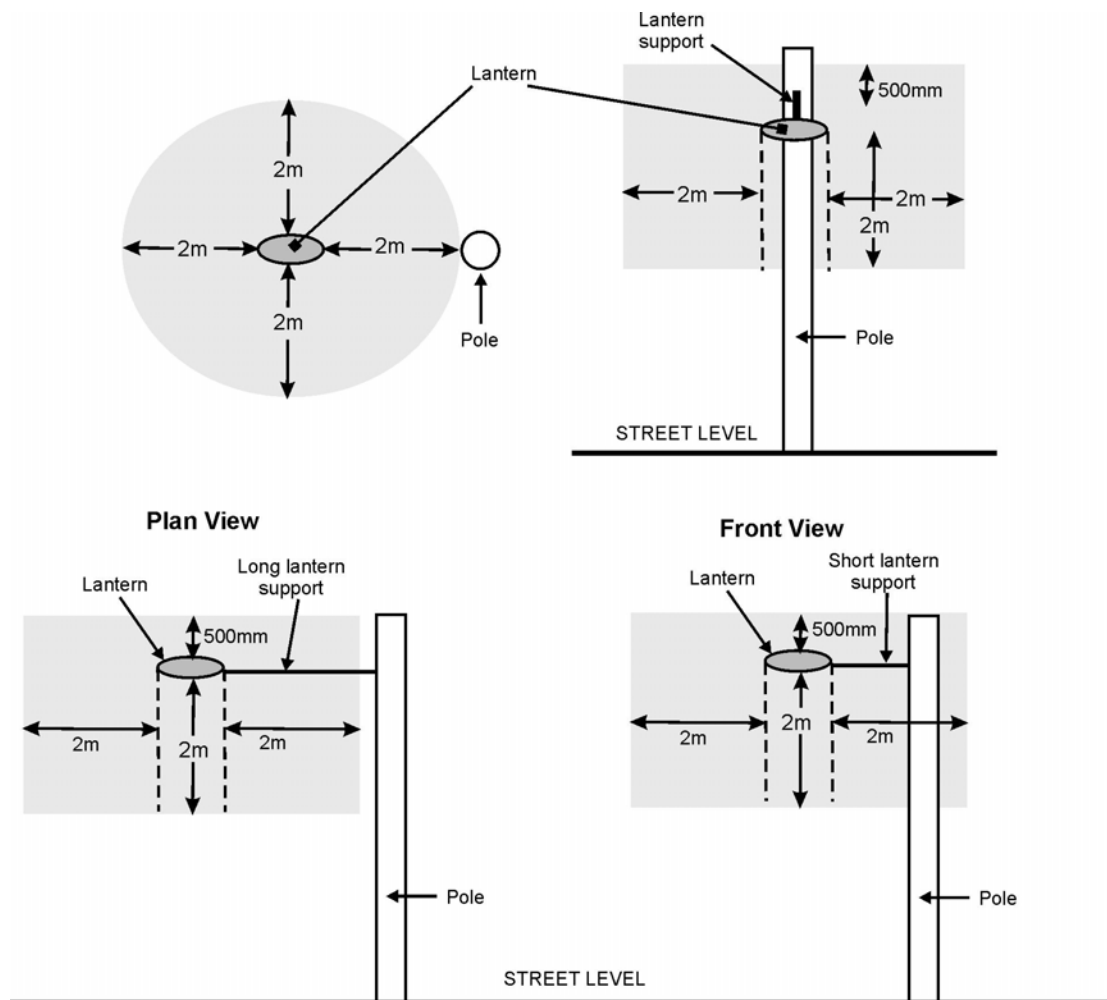
Note 3: Branches may remain in the specified clearance space if they are less than 15mm in diameter and not in constant contact with the cable. Leaves and twigs are permitted to remain in the clearance space.

Vegetation and branches which overhang or nearly overhang the clearance space and which are obviously likely to break and fall onto the conductors should be trimmed and/or removed.

Trim or remove vegetation where required to facilitate access to support structures for construction, maintenance and operation of the network.

## 1.4 Street Lights

Vegetation trimming clearances for street lights shall be in accordance with Figure 3 and Note 4 below.



**Figure 3: Vegetation clearances – street lights**

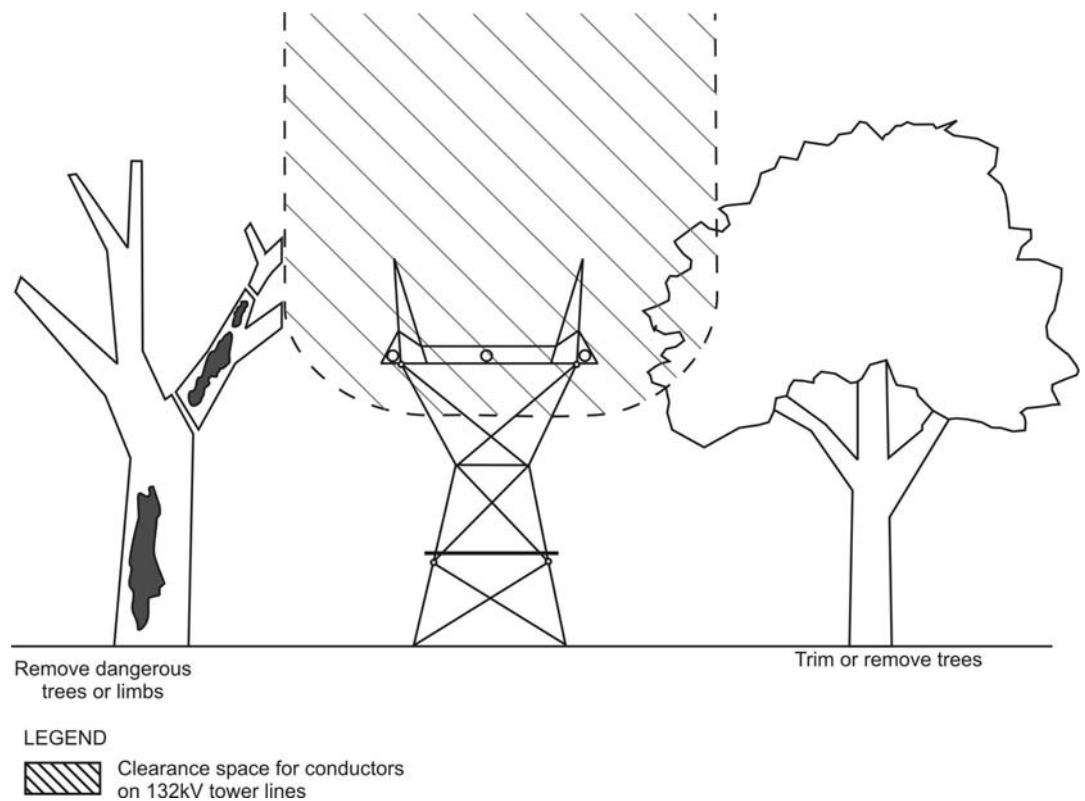
Note 4: Vegetation shall be trimmed to allow a minimum of 2m horizontal clearance from the head of the lantern and extending in the vertical plane from 500mm above the lantern to 2m below the lantern.

## 1.5 132kV Tower Lines

Minimum vegetation safety clearances for tower lines must be in accordance with Table 1a or 1b and Note 5.

### 1.5.1 132 kV Conductors and Earthwires

Vegetation safety clearances for 132 kV conductors and earth wires shall be in accordance with Table 1 and associated notes and Figure 4.



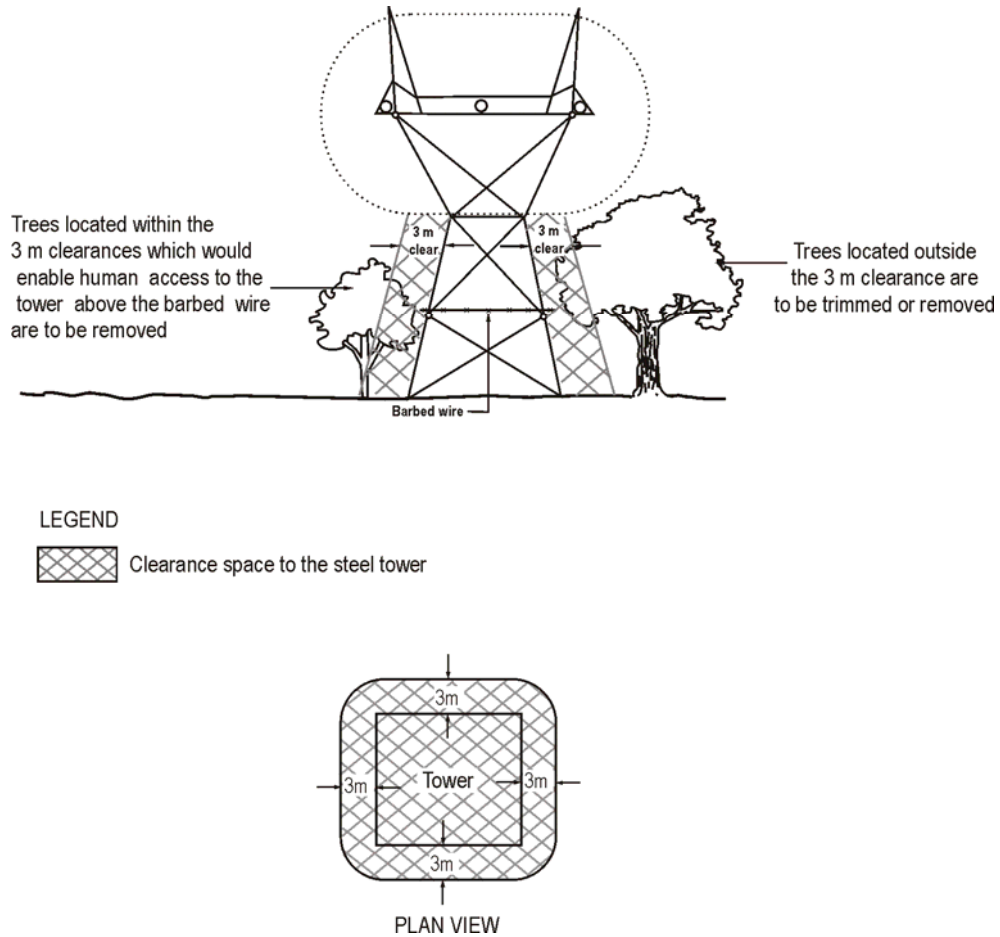
**Figure 4: Vegetation clearances - 132kV conductors and earth wires on steel towers**

Note 5: All vegetation beneath a tower line that can grow to a mature height exceeding 3 metres shall be removed to the horizontal extent of minimum clearances specified in Table 1a or 1b or increased as determined appropriate by the arborist.

Any dead or hazardous trees or limbs outside the required safety clearance but within the inspection space (or line easement) that present a risk to workers shall be removed as advised by the arborist.

### 1.5.2 132 kV Tower Structures

Vegetation safety clearances for 132 kV steel towers shall be in accordance with the requirements of Figure 5 and Note 6 that follows.



**Figure 5: Vegetation clearances - 132kV steel towers**

Note 6: Vegetation shall remain clear from inside the perimeter of each steel tower and a minimum of 3 metres from each tower leg at all times.

Towers located in easements on urban residential property may have had screening vegetation planted within 3 metres from a tower leg. Where the contractor and or arborist considers that such planted vegetation does not pose a threat to the tower, hinder authorised access to the tower or enable or facilitate unauthorised climbing of the tower, the vegetation may remain. In these cases such vegetation must be kept a minimum of 1m clear of the tower steelwork at all times and additional conditions such as the shape and height for the vegetation may apply.

## 1.6 ADSS Fibre Optic Communications Cables

Increasing numbers of Ausgrid's poles also support Ausgrid's ADSS fibre optic cable used for protection and ancillary communications purposes. A typical ADSS installation is shown in Figure 6. ADSS is 15mm in diameter and black in colour with a hard sheath. Installation height varies from 300mm or more below the lowest conductors to the top of a pole (Refer to Ausgrid's Network Standard NS 201 for additional information on ADSS cable).

In any case satisfactory clearance should be achieved under normal line vegetation clearance practice, however, where ADSS is installed along with covered conductors (eg. ABC or CCT), particularly in dense bushland, a clearance window must be maintained in a similar manner specified in Figure 2 of Section 4.3.

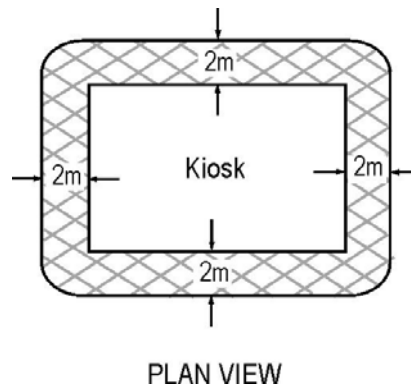
**Note:** Special care must be exercised at all times when using machinery and equipment in the vicinity of ADSS cable to avoid any risk of damage. ADSS cable is more prone to damage than power conductors and because of the important function these cables provide, any damage could lead to catastrophic effects in the network.



*Figure 6: Typical ADSS installation*

## 1.7 Kiosk Substations

Vegetation safety clearances for kiosk substations shall be in maintained at all times in accordance with Figure 7.



*Figure 7: Vegetation clearances – Kiosk substations and Distribution Pillars*

## 1.8 Water Crossing Signs

Water crossing signs are located adjacent to bodies of water to warn of the presence of underground or overhead Ausgrid electricity power lines crossing the body of water.

Vegetation must be cleared to ensure that the entire face of a water crossing sign is visible from:

- Any point within 45 degrees from each side of the surface of the sign.
- Water level up to 5 metres above the surface of the water, where the sign faces the surface of the water.

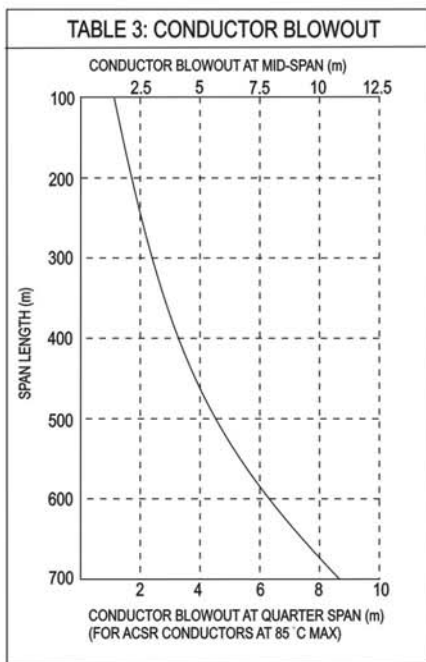
Any vegetation which encroaches or is likely to encroach into the clearance space during the growing/inspection cycle (typically one year) must be trimmed.

Refer also to the reference to water crossing signs in Figures 1(a) and 1(b) Note 2.

# APPENDIX A CLEARANCES FOR SPANS OVER 150M

SPAN	SAG
150m TO 300m	2.0m
300m TO 700m	2.5m

VOLTAGE	CLEARANCE AT POLE TO NEAREST CONDUCTOR
1000V UP TO 22kV	1.5m
ABOVE 22kV UP TO 66kV	2.25m
132kV	3.0m



- NOTES**
- TO ESTABLISH TREE TRIMMING BOUNDARIES REQUIRES THE CALCULATION OF THREE DIMENSIONS CALLED "A", "B" AND "C" AS DEFINED HERE:

DIMENSION "A" IS THE MINIMAL ADDITIONAL CLEARANCE REQUIRED VERTICALLY BENEATH THE SPAN TO ALLOW FOR MAXIMUM OPERATING REQUIREMENTS. THIS IS ILLUSTRATED ON THE PROFILE SKETCH BELOW AS THE DIFFERENCE BETWEEN CONDUCTOR AND CLEARANCE CURVE.

DIMENSION "B" IS THE MINIMUM CLEARANCE REQUIRED HORIZONTALLY FROM THE OUTSIDE CONDUCTOR AT THE MIDDLE OF THE SPAN (CALLED THE MID-SPAN POINT).

DIMENSION "C" IS THE MINIMUM CLEARANCE REQUIRED HORIZONTALLY FROM THE OUTSIDE CONDUCTOR AT A DISTANCE OF ONE QUARTER OF THE SPAN LENGTH, MEASURED FROM THE STRUCTURES AT EACH END OF THE SPAN.

- DIMENSION "A" IS CALCULATED WITH CONDUCTOR AT REST USING THE FORMULA:

$$\text{DIMENSION "A"} = \text{CONDUCTOR SAG FROM TABLE 1} + \text{CONDUCTOR CLEARANCE FROM TABLE 1} + \text{TREE REGROWTH (2 YEARS)}$$

FOR EXAMPLE: SUPPOSE A 132kV SPAN IS 320m LONG,  
DIMENSION "A" = 2.5m + 3.0m + 1.5m = 7.0m MINIMUM

- DIMENSION "B" IS CALCULATED WITH THE CONDUCTOR AT REST, (ASSUMING A PARABOLIC SWING), USING THE FORMULA:

$$\text{DIMENSION "B"} = \text{CONDUCTOR BLOWOUT AT MID-SPAN FROM TABLE 3} + \text{CONDUCTOR CLEARANCE FROM TABLE 2} + \text{TREE REGROWTH (2 YEARS)}$$

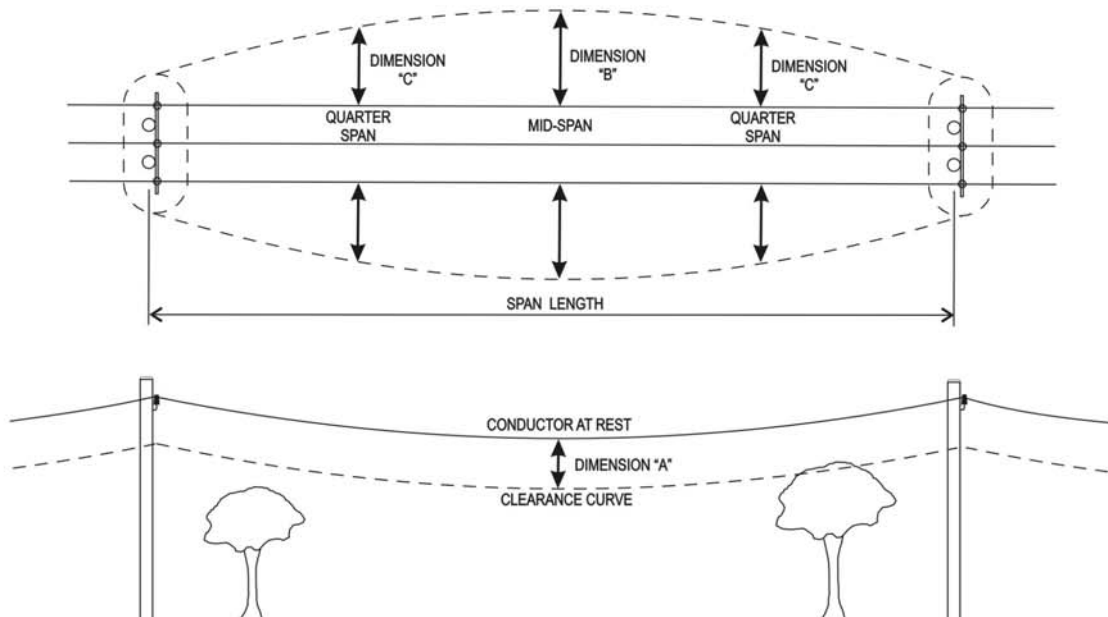
FOR EXAMPLE: 132kV SPAN 320m LONG AS BEFORE,  
DIMENSION "B" = 3.75m + 3.0m + 1.5m = 8.25m MINIMUM.

- DIMENSION "C" IS CALCULATED WITH THE CONDUCTOR AT REST, (ASSUMING A PARABOLIC SWING), USING THE FORMULA:

$$\text{DIMENSION "C"} = \text{CONDUCTOR BLOWOUT AT QUARTER SPAN FROM TABLE 3} + \text{CONDUCTOR CLEARANCE FROM TABLE 2} + \text{TREE REGROWTH (2 YEARS)}$$

FOR EXAMPLE: 132kV SPAN 320m LONG AS BEFORE,  
DIMENSION "C" = 2.75m + 3.0m + 1.5m = 7.25m MINIMUM.

- TREE TRIMMING BOUNDARY REQUIREMENT TO BE INCREASED BY AN ADDITIONAL 0.5m IN FIRE HAZARD AREAS.





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