AS/NZS 4676:2000

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Australian/New Zealand Standard™

Structural design requirements for utility services poles

Standards Australia

STANDARDS NEW ZEALAND
Paerewa Aotearoa

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee CE/19, Utility Services Poles. It was approved on behalf of the Council of Standards Australia on 21 May 2000 and on behalf of the Council of Standards New Zealand on 16 May 2000. It was published on 30 August 2000.

The following interests are represented on Committee CE/19:

Bureau of Steel Manufacturers of Australia
Concrete Pipe Association of Australasia
Electricity Engineers Association of New Zealand
Electricity Supply Association of Australia
National Precast Concrete Association of Australia
New Zealand Concrete Society
New Zealand Heavy Engineering Research Association
New Zealand Timber Industry Federation
University of Technology Sydney

Additional interests participating in the preparation of this Standard:

Australian Aluminium Council
AUSTROADS
National Association of Forest Industries

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PREFACE

This Standard was prepared by the Joint Standards Australia/ Standards New Zealand Committee CE/19, Utility Services Poles.

The objective of this Standard is to provide power authorities, manufacturers, and designers, with the requirements for the design and installation of utility services poles.

This Standard is intended for use in conjunction with the following Standards:

AS
2209 Timber poles for overhead lines

AS/NZS
4065 Concrete utility services poles

4677 Steel utility services poles

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance

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Structural design requirements for utility services poles

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out general requirements for structural design and minimum design loads applicable to pole structures supporting—

(a) street or floodlighting;

(b) road or railway signalling equipment;

(c) aerial conductors carrying electric power, or communication signals;

(d) equipment for communication through the atmosphere; or

(e) any combination of these.

This Standard does not apply to lattice towers, guyed masts, masts or flag poles.

NOTES:

1 Design requirements for steel lattice towers and masts for communication purposes are given in AS 3995.

2 For information on the additional loads induced by the temporary attachment of flags or banners to utility services poles see Clause 3.8.

1.2 GENERAL

The structural design of utility services poles shall be based on accepted principles of structural mechanics taking due account of environmental and site factors for the particular locations in which the poles will be situated and their expected service life.

Design shall be either by calculation in accordance with Sections 2 to 5 inclusive, or by load testing in accordance with Section 7.

NOTE: A pole supplier should elect to use the calculation method for poles that are required in limited numbers, and to select the load-test method for poles that are required in sufficiently large numbers so that the expense of testing may be offset by potential material savings.

1.3 REFERENCED DOCUMENTS

The documents referred to in this Standard are listed in Appendix A.

1.4 DEFINITIONS

For the purpose of this Standard the definitions given in AS 1158.1, AS 1798 and those below apply.

1.4.1 Guyed/stayed

Stabilized above ground level against lateral forces by one or more steel cables, which are anchored at their lower ends to the ground or other permanent construction.

1.4.2 Guyed mast

A guyed lattice structure that relies on one or more sets of guys for its stability against multi-directional lateral forces.

1.4.3 Lattice towers/masts

Towers or masts in which the principal structural members are interconnected solely by triangulated bracing.

1.4.4 Pole

A freestanding structure that resists vertical loads as a column with or without bending, and resists lateral loads as a cantilever beam with or without torsion.

1.4.5 Guyed/stayed pole

A pole stabilized by one or more guys, for the purpose of resisting all, or part, of the resultant force from the applied forces.

1.4.6 Tower

A freestanding lattice structure, the lateral cross-sections of the structure generally being triangular, square or rectangular.

1.5 NOTATION

The quantity symbols used in this Standard shall have the meanings ascribed to them below.

The dimensional units for length, force and stress, in all expressions or equations in this Standard, shall be taken as metres (m), kilonewtons (kN) and megapascals (MPa) respectively. The dimensional units of stress raised to a fractional power shall be taken as megapascals.

Where non-dimensional ratios are involved, the numerator and denominator shall both be expressed in identical units.

A_b	=	the contact face area of footing bearers (see Appendix I) (m2)
A_f	=	the area of one face of a banner or flag (see Appendix G) (m2)
A_{fb}	=	the minimum plan area of the underside of a footing (m2)
b	=	the effective width of an embedment (see Appendix I); or
	=	the dimension of a banner or flag at right angles to the wind (see Appendix G) (m2)
b_p	=	the overall horizontal dimension of the pole cross-section perpendicular to the direction of the wind (m)
C	=	$f_{bu}.b$ (see Appendix I)
C_D, C_{df}	=	wind-drag factors
D	=	the overall depth of embedment of a pole or its footing (see Appendix I); or
	=	the sag of an aerial cable or conductor (m)
d_c	=	nominal overall diameter of an aerial cable (m)
d_{cs}	=	the nominal overall diameter of an iced cable (m)
E	=	Young's elastic modulus of elasticity
F_a	=	aerial cable loads generally, or their action effects
F_{aG}	=	the self-weight of a cable of length L_{eg} (kN)

F_{aR}	=	the resultant total load on an aerial cable or conductor, which acts in the plane of the catenary (see Appendix F) (kN)
F_{aS}	=	the dead load of snow and ice on a cable of length L_{eg} (kN)
F_{aT}	=	the actions or action effects caused by cable temperatures Ts or $T_{min.}$ (kN; kNm)
F_{aW}	=	horizontal wind load on an aerial cable pole, due to wind perpendicular to the spans of the supported cables
F_{eq}	=	earthquake loads generally, or their action effects (kN; kNm)
F_{gt}	=	the sum of the vertical components of guy or stay tension (kN)
F_{v}	=	the sum of the vertical forces on a pole other than Fgt (kN)
F_{wf}	=	the total wind force on a banner or flag (see Appendix G) (kN)
f_{b}	=	the permissible bearing strength of a foundation material at the serviceability limit state (kPa)
f_{bu}	=	the permissible bearing strength of a foundation material at the strength limit state, assumed equal to 1.5 f_{b} (kPa)
f'_{c}	=	the characteristic compressive strength of concrete after 28 days (MPa)
G	=	dead loads generally, or their action effects (kN; kNm)
H_{R}	=	the resultant of the horizontal forces (loads) acting on a pole (see Appendix I) (kN)
h_{i}	=	the height difference
h_{r}	=	the vertical height above ground level at which H_{R} acts (kN)
h_{p}	=	the height of a pole above ground level (m)
k_{I}	=	the wind resistance factor
K_{T}	=	topographical factor (see Appendix E)
K_{Z}	=	a terrain category/height factor (see Appendix E)
k_{d}	=	the degradation factor (see Appendix D)
k_{e}	=	a wind-gust factor
k_{wj}	=	relative absorption of a test specimen after time 'j' (see Appendix H)
L_{eg}	=	the effective span for dead-load (weight span) (see Figure 3.7.2) (m)
L_{ew}	=	the effective (ruling) span for calculating cable tensions from wind-loads (m)
L_{g}	=	the horizontal distance from the centre-line of a pole to the lowest point of the catenarys, formed on either side of it, of the aerial cable it supports (see Figure 3.7.2) (m)
L_{i}	=	the horizontal length of the 'i'th span in a line of poles supporting aerial cables (m)
L_{w}	=	the wind span (m)
L_{1}, L_{2}	=	the horizontal distances from the pole being considered to the next pole upline and downline respectively (m)
$M*$	=	the design actions in bending, as determined from the relevant design load combination (kNm)
M_{I}	=	structure importance multiplier
m_{0}, m_{1}, m_{2}, m_{3}	=	mass of a test specimen at different times (see Appendix H) (g)