AS 1768:2021

Australian STANDARD®

STANDARDS Australia

Lightning protection

AS 1768:2021

This Australian Standard® was prepared by EL-024, Protection Against Lightning. It was approved on behalf of the Council of Standards Australia on 23 November 2021.

This Standard was published on 3 December 2021.

The following are represented on Committee EL-024:

Australian Chamber of Commerce and Industry
Australian Industry Group
Clean Energy Council
Communications, Electrical and Plumbing Union — Electrical Division
Consult Australia
Department of Regional NSW
Electric Energy Society of Australia
Energy Networks Australia
Engineers Australia
Institute of Electrical and Electronics Engineers
Master Builders Australia
National Electrical and Communications Association
Rail Industry Safety and Standards Board
Resources Safety & Health Queensland
University of New South Wales
University of Queensland

This Standard was issued in draft form for comment as DR AS 1768:2021.

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:
www.standards.org.au

ISBN 978 1 76113 625 2

Lightning protection

Originated in Australia as AS MC1—1969.
Revised and redesignated as AS 1768—1975.
Third edition 1991.
Jointly revised and redesignated as AS/NZS 1768(Int):2003.
Jointly revised and redesignated as AS/NZS 1768:2007.
Revised and redesignated as AS 1768:2021.

Preface

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee EL-024, Protection Against Lightning, to supersede AS/NZS 1768:2007.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this document as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this document is to provide requirements for and guidance on lightning protection for a wide range of structures and systems.

This document is a major revision of previous versions, which seeks to align with IEC standards. The major change is to recognize modern building practices and acknowledge that many modern buildings are inherently self-protecting.

This document is accompanied by a spreadsheet to be used to calculate the risk index for lightning protection.

The spreadsheet can be obtained on purchase of the document as a zip file for PDF purchasers, to be downloaded from the website of purchase. Delivery methods for any additional files may change over time.

The spreadsheet can only be used or reproduced by an authorized user in a way that meets the requirements of this document. It cannot be used for any other purpose.

Standards Australia Limited accepts no responsibility arising out of or in connection with the use of the additional files or access to any third party software.

The terms “normative” and “informative” are used in Standards 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 for information and guidance only.

Contents

Introduction

Thunderstorms and lightning are natural phenomena and are largely unpredictable. As such, there are no proven devices or methods capable of preventing, deflecting or attracting lightning flashes. Direct and nearby cloud-to-ground lightning discharges can be hazardous to people, structures and installations. Conformance with this document will not necessarily prevent damage to assets or personal injury but will reduce the probability of damage and injuries.

A lightning protection system is designed to intercept a lightning strike, by placing air terminals at the points on a structure most likely to be struck, conduct the energy safely to earth and dissipate the energy into the ground. Additional measures aim to safely dissipate any energy impressed onto power or data lines, which would otherwise damage equipment within a structure.

Australian Standard®

Lightning protection

Section 1 Scope and general

1.1 Scope and application

1.1.1 Scope

This document specifies requirements for the design, installation, maintenance and testing of lightning protection on common structures, and for electrical and electronic systems within those structures.

These requirements cover the following:

(a) Assessment of risk.

(b) Protection of structures.

(c) Protection of electrical and electronic equipment.

(d) Testing and maintenance.

(e) Personal safety.

1.1.2 Application

This document applies to conventional lightning protection systems (LPSs) that comprise air terminals, downconductors, earth termination networks and surge protective devices (SPDs).

This document does not endorse nor imply the endorsement of non-conventional LPSs that comprise air terminals which claim enhanced performance, or downconductors which claim enhanced magnetic screening over conventional systems. The performance of such systems is outside the scope of this document.

For conformance to this document, air terminals shall be placed in accordance with Section 3.

The protection of specific occupancies is provided for in the following appendices:

(a) Appendix I for specific structures.

(b) Appendix J for structures with explosive or flammable contents.

(c) Appendix K for wind turbines.

(d) Appendix L for high voltage power systems.

(e) Appendix M for lightning risk in mines.

(f) Appendix N for solar photovoltaic installations.

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS/NZS 3000, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*

AS/NZS 3008.1.1, *Electrical installations — Selection of cables, Part 1.1: Cables for alternating voltages up to and including 0.6/1 kV — Typical Australian installation conditions*

AS/NZS 4065, *Concrete utility services poles*

1.3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

1.3.1
air terminal
conductor or natural element positioned to intercept a lightning discharge which establishes a zone of protection

1.3.2
air terminal network
network of air terminals and interconnecting conductors, either specifically installed or natural elements, which form the part of an LPS that is intended to intercept lightning discharges

1.3.3
arc distance
air clearance path
straight-line distance from metal to metal across the insulator

1.3.4
basic impulse level
BIL
standard lightning impulse test value for substation primary plant which has a 10 % probability of insulation damage for a lightning impulse wave shape of 1.2/50 µs

Note 1 to entry: Also known as “lightning impulse withstand voltage” in other standards.

1.3.5
bond
bonding conductor
conductor providing electrical connection between the LPS and other metalwork or between earthing systems, not intended to carry the full discharge current

1.3.6
compact earth termination network
special earthing design for lightning transients that takes into account the critical length, ensuring the value of impedance does not exceed the low-frequency resistance value

1.3.7
covered conductor thick
CCT
unscreened conductor around which a specified thickness of insulating material for the nominal working voltage is applied

1.3.8
critical flashover voltage
CFO
50 % probability flashover voltage for lightning impulse wave shape of 1.2/50 µs

1.3.9
currents and voltages
1.3.9.1
impulse discharge current
$\boldsymbol{I_{imp}}$
peak value of a 10/350 µs current waveform that any one branch of an SPD can withstand after a graduated test sequence

1.3.9.2
maximum continuous operating voltage
$\boldsymbol{U_c}$
maximum r.m.s. or d.c. voltage that can be continuously applied to the SPD's mode of protection

1.3.9.3
maximum discharge current
$\boldsymbol{I_{max}}$
peak value of an 8/20 µs current waveform that any one branch of an SPD can withstand at least once

1.3.9.4
nominal surge current
$\boldsymbol{I_n}$
peak value of an 8/20 µs current waveform that any one branch of an SPD can withstand at least 15 times

1.3.9.5
rated impulse withstand voltage
$\boldsymbol{U_w}$
highest peak value of impulse voltage of prescribed form and polarity which does not cause breakdown of insulation to earth under specified conditions

Note 1 to entry: AS/NZS 61439.1:2016 Appendix G provides a table of typical values of U_w.

1.3.9.6
rated load current
$\boldsymbol{I_L}$
maximum continuous rated r.m.s. or d.c. current that can be supplied to a resistive load connected to the protected output of a two port SPD

1.3.9.7
voltage protection level
$\boldsymbol{U_p}$
maximum voltage to be expected at the SPD terminals due to an impulse stress with defined voltage rise time and/or with a current of defined amplitude and wave shape

Note 1 to entry: The test conditions for parameters I_{imp}, I_{max}, I_n and U_p are defined in IEC 61643-11.

1.3.10
distributed facilities
standalone structures that are interconnected with electrically conductive services within a facility boundary

1.3.11
downconductor
conductor or natural element that connects an air terminal network with an earth termination network