AS 1768—1991
NZS/AS 1768—1991

Australian Standard®
New Zealand Standard

Lightning protection

This Standard was prepared under a joint arrangement by Standards Australia and the Standards Association of New Zealand. It was approved for publication on behalf of the Council of Standards Australia on 18 September 1991 and on behalf of the Standards Council of New Zealand on 6 September 1991. It was published on 9 December 1991.

The following organizations are represented on the Committees responsible for this Standard:

Standards Australia Committee EL/24, Protection Against Lightning

Association of Consulting Engineers Australia

Australian Corrosion Association

Australian Electrical and Electronic Manufacturers Association

Australian Institute of Petroleum

Building Owners and Managers Association of Australia

Confederation of Australian Industry

Department of Defence

Department of Minerals and Energy, N.S.W.

Department of Administrative Services—Australian Construction Services

Electricity Supply Association of Australia

Institution of Engineers Australia

Public Works Department, N.S.W.

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Standards Association of New Zealand Electrotechnical Board, 60/–, was responsible for coordinating the New Zealand participation.

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This Standard was issued in draft form for comment in Australia as DR 90070 and in New Zealand as DZ 6110.

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In Australia
First published as AS MC1—1969.
Revised and redesignated AS 1768—1975.
Second edition 1983.
Third edition 1991.

In New Zealand
First published as NZS/AS 1768—1991.

PUBLISHED JOINTLY BY:

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(Standards Association of Australia), 1 The Crescent, Homebush, NSW, Australia

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Level 10, Standards House,
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Wellington 6001 New Zealand

ISBN 0 7262 7132 2

PREFACE

This Standard is issued as a joint Standard under the terms of the Memorandum of Understanding between Standards Australia and the Standards Association of New Zealand with the objective of reducing technical barriers to trade between the two nations. It was prepared by the Standards Australia Committee on Protection against Lightning and, in Australia, it supersedes AS 1768–1983.

This Standard is intended to provide authoritative guidance on the principles and practice of lightning protection for a wide range of structures and systems, but excludes those owned or operated by public utilities and statutory authorities. It is not intended for mandatory application but, if called up in a contractual situation, compliance with this Standard requires compliance with all relevant clauses of the Standard. Alternative methods of protection to those described in this Standard will be the subject of future consideration.

In general, it is not economically possible to provide total protection against all the possible damaging effects of lightning, but the recommendations in this Standard will reduce the probability of damage to a low level, and will minimize any lightning damage that does occur. Guidance is given to methods of enhancing the level of protection against lightning damage, if this is required in a particular situation.

Following a review of submissions relating to AS 1768–1983, several changes and additions have been made to this Standard. Information is given on the protection of persons and equipment within buildings from the harmful effects of lightning strikes to the building, or to electrical power or communication services entering the building from remote sites. Revised recommendations are given relating to the compatibility of materials used in lightning protection systems, especially from the point of view of minimizing galvanic corrosion of components. In addition, changes have been made to recommendations for protection of the sides of tall buildings.

Unless it has been specified that lightning protection must be provided, the first decision to make is whether the lightning protection is needed. Section 2 provides guidance to assist in this decision. Section 3 provides advice on the protection of persons from lightning, mainly relating to the behaviour of persons when not inside substantial buildings. Once a decision is made that lightning protection is necessary, Section 4 will provide details on interception lightning protection for the building or structure. This includes information on the size, material, and form of conductors, the positioning of air terminations and downconductors, and the requirements for the earth termination. Persons and equipment within buildings can be at risk from the indirect effects of lightning and Section 5 gives recommendations on the protective measures that may need to be applied.

Section 6 describes methods of lightning protection of various items not covered in earlier sections, such as communications aerials, chimneys, boats, fences, and trees. A new clause has been included on methods for protecting domestic dwellings, where a complete protection system may not be justified, but some protection is considered desirable.

Section 7 sets out recommendations for the protection of structures with explosive or highly flammable contents. Section 8 gives advice on inspecting, testing, and maintaining lightning protection systems.

A number of appendices are included which provide additional information and advice. The appendices form an integral part of this Standard unless specifically stated otherwise, i.e. appendices identified as 'informative' only provide supportive or background information and are therefore not an integral part of this Standard.

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard sets out guidelines for the protection of persons and property from hazards arising from exposure to lightning. The recommendations specifically cover the following applications:

(a) The protection of persons, both outdoors, where they may be at risk from the direct effects of a lightning strike, and indoors, where they may be at risk indirectly as a consequence of lightning currents being conducted into the building.

(b) The protection of a variety of buildings or structures, including those with explosive or highly-flammable contents, and mines.

(c) The protection of sensitive electronic equipment (e.g. facsimile machines, modems, computers) from overvoltages resulting from a lightning strike to the building or its associated services.

The nature of lightning and the principles of lightning protection are discussed and guidance is given to assist in a determination of whether protective measures should be taken.

The recommendations in this Standard do not apply to the protection of large scale power or communications systems, nor do they apply to the protection of special structures such as oil and gas platforms.

1.2 APPLICATION This Standard does not override any statutory requirements but may be used in conjunction with such requirements.

Compliance with the recommendations of this Standard will not necessarily prevent damage or personal injury due to lightning but will reduce the probability of such damage or injury occurring.

1.3 REFERENCED DOCUMENTS The documents referred to in this Standard are listed in Appendix F.

1.4 DEFINITIONS For the purpose of this Standard, the definitions below apply.

1.4.1 Air termination—a conductor or rod of a lightning protection system, positioned so as to intercept a lightning discharge, which establishes a zone of protection.

1.4.2 Air termination network—a network of air terminations and interconnecting conductors which forms the part of a lightning protection system which is intended to intercept lightning discharges.

1.4.3 Base conductors (base tapes)—conductors placed around the perimeter of a structure near ground level interconnected to a number of earth terminations to distribute the lightning currents amongst them.

1.4.4 Bond (bonding conductor)—a conductor intended to provide electrical connection between the lightning protection system and other metalwork and between various metal parts of a structure or between earthing systems.

1.4.5 Downconductor—a conductor which connects an air termination with an earth termination.

1.4.6 Earth impedance (Z)—the electrical impedance of an electrode or structure to earth, derived from the earth potential rise divided by the impulse current to earth causing that rise. It is a relatively complex function and depends on—

(a) the resistance component (R) as measured by an earth tester;

(b) the reactance component (X), depending on the circuit path to the general body of earth; and

(c) a modifying (reducing) time-related component depending on soil ionization caused by high current and fast rise times.

1.4.7 Earth potential rise (EPR)—the increase in electrical potential of an earth electrode or earthed structure, with respect to distant earth, caused by the discharge of current to the general body of earth through the impedance of that electrode or structure.

1.4.8 Earthing boss (terminal lug)—a metal boss specially designed and welded to process plant, storage tanks, or steelwork to which earthing conductors are attached by means of removable studs and nuts or bolts.

1.4.9 Earthing conductor—the conductor by which the final connection to an earth electrode is made.