



AS/NZS 3000:2000
(Incorporating Amendment Nos. 1, 2 and 3)

Australian/New Zealand Standard™

Wiring rules



Standards Australia



STANDARDS
NEW ZEALAND
Pūrongo Aotearoa

This is a preview. [Click here to purchase the full publication.](#)

Wiring Rules

AS/NZS 3000:2000

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL/1. It was approved on behalf of the Council of Standards Australia on 23 August 1999 and on behalf of the Council of Standards New Zealand on 06 September 1999. It was published on 15 September 1999, however it is designated a year 2000 edition.

The following interests are represented on Committee EL/1:

The Association of Consulting Engineers Australia
Australian Building Codes Board
Australian Electrical and Electronic Manufacturers Association
Communications, Electrical Plumbing Union
Electrical Contractors Association of New Zealand
Electrical Contractors Association Qld
Electrical Safety Organization (New Zealand)
Electricity Supply Association of Australia
Institute of Electrical Inspectors
Institution of Engineers Australia
Insurance Council of Australia Limited
Ministry of Commerce NZ
National Electrical Contractors Association of Australia
New Zealand Council of Elders
New Zealand Electrical Institute
Regulatory Authorities (Electrical)
Telstra Corporation Limited.

Review of Standards. To keep abreast of progress in industry, Joint Australian/New Zealand Standards are subject to periodic review and are kept up to date by the issue of amendments or new editions as necessary. It is important therefore that Standards users ensure that they are in possession of the latest edition, and any amendments thereto.

Full details of all Joint Standards and related publications will be found in the Standards Australia and Standards New Zealand Catalogue of Publications; this information is supplemented each month by the magazines 'The Australian Standard' and 'Standards New Zealand', which subscribing members receive, and which give details of new publications, new editions and amendments, and of withdrawn Standards.

Suggestions for improvements to Joint Standards, addressed to the head office of either Standards Australia or Standards New Zealand, are welcomed. Notification of any inaccuracy or ambiguity found in a Joint Australian/New Zealand Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

This Standard was issued in draft form for comment as DR 98164.

AS/NZS 3000:2000
(Incorporating Amendment Nos 1, 2 and 3)

Australian/New Zealand Standard™

ELECTRICAL INSTALLATIONS
(known as the Australian/New Zealand
Wiring Rules)

Originated as part of AS CC1—1931.
Previous edition AS 3000—1991.
Jointly revised and designated AS/NZS 3000:2000.
Reissued and incorporating Amendment No. 1 (September 2001).
Reissued incorporating Amendment No. 2 (April 2002).
Reissued incorporating Amendment No. 3 (July 2003).

COPYRIGHT

© Standards Australia/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Jointly published by Standards Australia International Ltd, GPO Box 5420, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 2934 7

This is a preview. [Click here to purchase the full publication.](#)

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL/1, Wiring Rules, to supersede, in Australia, AS 3000 — 1991, *Electrical installations — Buildings, structures and premises (known as the SAA Wiring Rules)* and, in New Zealand, selected parts of NZS 3000:1997 *Electrical installations — Buildings, structures and premises (known as the NZS Wiring Rules)* as nominated by the appropriate regulator.

This Standard incorporates Amendment No. 1 (September 2001) and Amendment No. 2 (April 2002) and Amendment No. 3 (July 2003). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

This edition of the Standard is based on the following considerations:

- (a) Requests from large sections of the electrical industry for a document more relevant to the present electrical regulatory structure.
- (b) Requests for a joint Australian/New Zealand document.
- (c) Experience gained in the application of the tenth (1991) edition as expressed to Standards Australia.

During preparation of this Standard, reference was made to IEC 60364, *Electrical installations of buildings* (all parts), BS 7671:1992, *Requirements for electrical installations* and the *National Rules For Electrical Installations* (Second Edition) of Ireland, and acknowledgment is made of the assistance received from these sources.

The presentation of this edition differs from previous editions of AS 3000. Sections 1 to 5 cover essentially the same aspects of the subject as Sections 1 to 5 of the previous edition but there is no close correlation between clause numbers. Other major changes to the content of the previous edition include the following:

- (i) The introduction of internationally accepted performance based requirements for the integration of the characteristics of protective devices with the earthing system impedance (fault-loop impedance), touch-voltage limits and maximum disconnection times under fault conditions (see Clause 1.7.4.3).
- (ii) The deletion of many prescriptive 'work practices' and the allowance of alternative methods provided they satisfy the fundamental requirements of Section 1.
- (iii) The introduction of a new Section 6, covering visual inspection and testing.
- (iv) The introduction of an IEC-style Section 7 containing particular requirements for special locations and situations, e.g. swimming pools, extra-low voltage installations and emergency systems.

- (v) The deletion of the limited range of current-carrying capacities for cables and busbars.
- (vi) The inclusion of guidance on the calculation of maximum demand in Appendix C.
- (vii) The application of the requirements to electrical installations which might affect livestock.

Some of these provisions were included in NZS 3000.

Equations have been given the same number as the clause in which they appear.

An electric shock survival (resuscitation) chart is provided only for guidance; persons associated with the installation and repair of electrical installations and electrical equipment should obtain training in resuscitation methods.

This Standard may be applied through legislative requirements, as indicated in Clause 1.2. As this Standard supersedes AS 3000—1991, in Australia, and NZS 3000:1997, in New Zealand, it would normally apply to electrical installations from its date of publication, but it is recommended that it not be applied on a mandatory basis before a date at least six months after publication. However, if work on an installation was commenced before publication of this edition, the relevant regulatory authority or electricity distributor may grant permission for the installation to be completed in accordance with AS 3000—1991 or NZS 3000:1997.

The attention of users of this Standard is drawn to Doc 3000 N (2000) *What's new in the Wiring Rules*, which outlines the major changes to this Standard as compared to AS 3000—1991.

Supplement No 1 (1991), which contained current-carrying capacities for cables with imperial dimensions, has been withdrawn.

All Rulings to AS 3000—1991 have either been incorporated into this Standard or withdrawn. New Rulings will be prepared as requested and when published will be available for purchase from Standards Australia or Standards New Zealand.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

The term, 'informative' has been used in this Standard to define the application of the appendix to which it applies. An 'informative' appendix is only for information and guidance.

CONTENTS

	<i>Page</i>
FOREWORD	11
SECTION 1 SCOPE AND FUNDAMENTAL SAFETY PRINCIPLES	
1.1 SCOPE	12
1.2 APPLICATION	12
1.3 REFERENCED DOCUMENTS	13
1.4 DEFINITIONS	13
1.5 ALTERATIONS, ADDITIONS AND REPAIRS	27
1.6 ALTERNATIVE ARRANGEMENTS	28
1.7 PROTECTION FOR SAFETY	28
1.8 DESIGN OF AN ELECTRICAL INSTALLATION	38
1.9 SELECTION OF ELECTRICAL EQUIPMENT	41
1.10 INSTALLATION OF ELECTRICAL EQUIPMENT	43
1.11 INSPECTION AND TESTING	44
SECTION 2 SELECTION AND INSTALLATION OF SWITCHGEAR AND CONTROLGEAR	
2.1 GENERAL	46
2.2 COMMON REQUIREMENTS	46
2.3 DEVICES FOR PROTECTION AGAINST INDIRECT CONTACT	47
2.4 DEVICES FOR PROTECTION AGAINST OVERCURRENT	47
2.5 PROTECTION AGAINST EARTH LEAKAGE CURRENT	53
2.6 PROTECTION AGAINST OVERVOLTAGE	55
2.7 PROTECTION AGAINST UNDERVOLTAGE	56
2.8 DEVICES FOR ISOLATION AND SWITCHING	57
2.9 SWITCHBOARDS	66
SECTION 3 SELECTION AND INSTALLATION OF WIRING SYSTEMS	
3.1 GENERAL	72
3.2 TYPES OF WIRING SYSTEMS	72
3.3 EXTERNAL INFLUENCES	72
3.4 CURRENT-CARRYING CAPACITY	79
3.5 CONDUCTOR SIZE	82
3.6 VOLTAGE DROP	84
3.7 ELECTRICAL CONNECTIONS	85
3.8 IDENTIFICATION	87
3.9 INSTALLATION REQUIREMENTS	88
3.10 ENCLOSURE OF CABLES	97
3.11 UNDERGROUND WIRING SYSTEMS	100
3.12 AERIAL WIRING SYSTEMS	105
3.13 CABLES SUPPORTED BY A CATENARY	111

	<i>Page</i>
3.14 EMERGENCY SYSTEMS	111
3.15 BUSBAR TRUNKING SYSTEMS (BUSWAYS), INCLUDING RISING MAINS SYSTEMS.....	113
3.16 EARTH SHEATH RETURN (ESR) SYSTEM.....	113
SECTION 4 INSTALLATION OF APPLIANCES AND ACCESSORIES	
4.1 GENERAL.....	114
4.2 ELECTRICAL EQUIPMENT REQUIRING PROTECTION AGAINST INJURY FROM MECHANICAL MOVEMENT	114
4.3 ELECTRICAL EQUIPMENT REQUIRING PROTECTION AGAINST THERMAL EFFECTS.....	115
4.4 ELECTRICAL EQUIPMENT REQUIRING PROTECTION AGAINST EXPLOSION	123
4.5 TRANSFORMERS	123
4.6 CAPACITORS.....	126
4.7 BATTERIES.....	127
4.8 ALTERNATIVE SUPPLY SYSTEMS.....	127
4.9 SOCKET-OUTLETS.....	129
4.10 OTHER ELECTRICAL EQUIPMENT.....	132
4.11 CONNECTION OF ELECTRICAL EQUIPMENT.....	133
SECTION 5 EARTHING ARRANGEMENTS AND EARTHING CONDUCTORS	
5.1 GENERAL.....	134
5.2 EARTHING ARRANGEMENTS.....	134
5.3 MULTIPLE EARTHED NEUTRAL (MEN) SYSTEM.....	135
5.4 EARTHING REQUIREMENTS	135
5.5 EARTHING CONDUCTORS	137
5.6 EARTHING SYSTEM PARTS	143
5.7 EARTHING OF ELECTRICAL EQUIPMENT	155
5.8 EQUIPOTENTIAL BONDING.....	159
5.9 PROTECTION BY ELECTRICAL SEPARATION.....	163
5.10 OTHER EARTHING ARRANGEMENTS.....	163
SECTION 6 TESTING AND VERIFICATION	
6.1 GENERAL.....	164
6.2 VISUAL INSPECTION	164
6.3 TESTING	166
SECTION 7 REQUIREMENTS FOR SPECIAL ELECTRICAL INSTALLATIONS OR LOCATIONS	
7.1 LOCATIONS CONTAINING BATHS, SHOWERS OR OTHER FIXED WATER CONTAINERS	172
7.2 SWIMMING POOLS, PADDLING POOLS AND SPA POOLS OR TUBS.....	183

	<i>Page</i>
7.3 LOCATIONS CONTAINING SAUNA HEATERS.....	190
7.4 REFRIGERATION ROOMS	193
7.5 LOCATIONS WHERE GENERAL HOSING DOWN OPERATIONS ARE CARRIED OUT	195
7.6 FOUNTAINS AND WATER FEATURES.....	196
7.7 EXTRA-LOW VOLTAGE ELECTRICAL INSTALLATIONS	199
7.8 HIGH VOLTAGE ELECTRICAL INSTALLATIONS	203
7.9 HAZARDOUS AREAS.....	216
7.10 EMERGENCY SYSTEMS	218
7.11 SPECIFIC ELECTRICAL INSTALLATION STANDARDS	227
APPENDICES	
A LIST OF REFERENCED DOCUMENTS.....	229
B CIRCUIT ARRANGEMENTS.....	234
C CALCULATION OF MAXIMUM DEMAND	244
D AERIAL LINES DATA	262
INDEX	272
ELECTRIC SHOCK SURVIVAL	292

LIST OF TABLES

	<i>Page</i>
3.1 ACCEPTABLE TYPES OF CABLE WIRING SYSTEMS.....	74
3.2 EXAMPLES OF METHODS OF INSTALLATION OF WIRING SYSTEMS.....	76
3.3 LIMITING TEMPERATURES FOR INSULATED CABLES.....	80
3.4 NOMINAL MINIMUM CROSS-SECTIONAL AREA OF CONDUCTORS	82
3.5 COLOURS OF CABLE CORES	87
3.6 UNDERGROUND WIRING SYSTEM	102
3.7 UNDERGROUND WIRING SYSTEM CATEGORIES	104
3.8 MINIMUM AERIAL CONDUCTOR CLEARANCES.....	108
3.9 AERIAL CONDUCTOR MAXIMUM SPANS	109
3.10 SPACING BETWEEN AERIAL CONDUCTORS AT SUPPORTS.....	109
4.1 TEMPERATURE LIMITS IN NORMAL SERVICE FOR PARTS OF ELECTRICAL EQUIPMENT WITHIN ARM'S REACH.....	116
5.1 MINIMUM COPPER EARTHING CONDUCTOR SIZE	138
7.1 GUIDANCE ON THE SELECTION AND INSTALLATION OF ELECTRICAL EQUIPMENT	177
7.8.1 TYPICAL VALUES OF K FOR CALCULATION OF COPPER EARTHING CONDUCTORS	213
7.8.2 SUBSTATION EARTHING—NEUTRAL CONNECTING CONDUCTORS	213
B4.1 MAXIMUM VALUES OF FAULT LOOP IMPEDANCE (Z_s) AT 230 V a.c.	239
B5.1 MAXIMUM CIRCUIT LENGTHS, IN METRES, FOR DIFFERENT SIZES OF CONDUCTORS AND PROTECTIVE DEVICES USING APPROXIMATE MEAN TRIPPING CURRENTS (I_a)	243
C1 MAXIMUM DEMAND—SINGLE AND MULTIPLE DOMESTIC ELECTRICAL INSTALLATIONS.....	245
C2 MAXIMUM DEMAND—NON-DOMESTIC ELECTRICAL INSTALLATIONS.....	249
D1 STRINGING DATA FOR AERIAL LINES.....	263
D2 MINIMUM SIZE OF INTERMEDIATE, TERMINAL OR ANGLE POSTS FOR AERIAL CONDUCTORS—INSULATED HARD-DRAWN COPPER CONDUCTORS—SQUARE SAWN UNTREATED TIMBER POSTS	264
D3 MINIMUM SIZE OF INTERMEDIATE, TERMINAL OR ANGLE POSTS FOR AERIAL CONDUCTORS—INSULATED HARD-DRAWN COPPER CONDUCTORS—ROUND UNTREATED TIMBER POLES	265

A3

	<i>Page</i>
D4 MINIMUM SIZE OF INTERMEDIATE, TERMINAL OR ANGLE POSTS FOR AERIAL CONDUCTORS—INSULATED HARD-DRAWN COPPER CONDUCTORS—ROUND, FULL-LENGTH PRESERVATIVE-TREATED POLES.....	266
D5 MINIMUM SIZE OF INTERMEDIATE, TERMINAL OR ANGLE POSTS FOR AERIAL CONDUCTORS—INSULATED HARD-DRAWN COPPER CONDUCTORS—STEEL POLES AND PIPES	267
D6 MINIMUM SIZE OF INTERMEDIATE, TERMINAL OR ANGLE POSTS FOR AERIAL CONDUCTORS—BARE ALUMINIUM CONDUCTORS—SQUARE SAWN UNTREATED TIMBER POSTS	268
D7 MINIMUM SIZE OF INTERMEDIATE, TERMINAL OR ANGLE POSTS FOR AERIAL CONDUCTORS—BARE ALUMINIUM CONDUCTORS—ROUND UNTREATED TIMBER POLES	269
D8 MINIMUM SIZE OF INTERMEDIATE, TERMINAL OR ANGLE POSTS FOR AERIAL CONDUCTORS—BARE ALUMINIUM CONDUCTORS—ROUND, FULL-LENGTH, PRESERVATIVE-TREATED POLES	270
D9 MINIMUM SIZE OF INTERMEDIATE, TERMINAL OR ANGLE POSTS FOR AERIAL CONDUCTORS—BARE ALUMINIUM CONDUCTORS—STEEL POLES AND PIPES.....	271