

Australian/New Zealand Standard™

**Electrical installations—Classification of
the fire and mechanical performance of
wiring system elements**



AS/NZS 3013:2005

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-037, Special Wiring Systems. It was approved on behalf of the Council of Standards Australia on 13 July 2005 and on behalf of the Council of Standards New Zealand on 29 July 2005. This Standard was published on 22 August 2005.

The following are represented on Committee EL-037:

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Australian Electrical and Electronic Manufacturers Association
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CSIRO Manufacturing & Infrastructure Technology
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Australian/New Zealand Standard™

Electrical installations—Classification of the fire and mechanical performance of wiring system elements

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PREFACE

This Standard was prepared by the Standards Australia/Standards New Zealand Committee EL-037 on Special Wiring Systems to supersede [AS/NZS 3013:1995](#), *Electrical installations—Classification of the fire and mechanical performance of wiring systems* one year from publication. During this period, it is anticipated that regulatory authorities and others will accept wiring systems to either publication.

This Standard will be referenced in the Building Code of Australia by way of BCA Amendment thereby superseding [AS/NZS 3013:1995](#) which will be withdrawn 12 months from the date of publication of this Standard.

This revision was undertaken to make the following changes to the testing regime:

- (a) Allow individually tested elements to be combined to construct a wiring system. This removes the situation in the previous edition whereby it was inferred that the total system must be tested, and that installations must be configured as tested. Previously the onus of testing had fallen on cable companies and the contractor had to make a judgement as to the effect on installations that have deviated from the ‘as tested’ wiring system.
- (b) Define a test installation that is more repeatable between tests and test houses, and that is more representative of installation practice. This is a result of the extensive testing conducted since the introduction of the first edition in 1990.
- (c) Define the cables to be tested so that they are more representative of those most commonly used.
- (d) Remove ambiguity regarding different cable types.

The need to maintain circuit integrity in buildings, oil rigs, ships, and other structures under fire conditions may be required by regulations and codes for wiring systems associated with firefighting, evacuation, emergency equipment, essential services and other safety functions.

While there are some Standards available for fire testing of cables (e.g. [IEC 60331](#), *Fire-resisting characteristics of electric cables*; [IEC 60332](#), *Tests on electric cables under fire conditions*; and [BS 6387](#), *Specification for performance requirements for cables required to maintain circuit integrity under fire conditions*), it was considered that these did not form an adequate basis for a system of classification. For this reason, [AS 1530.4](#), *Fire-resistance test of elements of building construction* has been used as the basis of fire protection classification of wiring system elements in this Standard. Testing in a horizontal furnace has been prescribed since it was considered that this represents the most onerous condition.

This Standard provides a system of classification of the degree of protection inherent in wiring system elements against accidental mechanical damage. It does not consider protection against deliberate tampering. The levels of mechanical protection are specified in terms of impact energies and cutting forces.

Appendices designated as ‘normative’ are essential to the understanding or implementation of this Standard. Appendices designated as ‘informative’ give additional information, recommendations, guidelines or other non-mandatory statements.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Electrical installations—Classification of the fire and mechanical performance of wiring system elements**

SECTION 1 SCOPE AND APPLICATION

1.1 SCOPE

This Standard sets out a classification system for wiring system elements. The classification is according to the wiring system's ability to—

- (a) maintain circuit integrity under fire conditions for a specified period; and
- (b) maintain circuit integrity against mechanical damage of specified severity.

It specifies type tests to classify the performance of the various types of wiring system elements.

If an assembled wiring system is tested to this Standard, the classification achieved cannot be assigned to any one of its individual elements. The wiring system classification achieved shall only be applicable to the assembled wiring system as tested.

This Standard does not address the screening function of screened cables after exposure to fire conditions.

NOTE: Elements of a wiring system might need replacement after exposure to fire conditions or mechanical damage.

1.2 APPLICATION

This Standard is referenced in the Building Code of Australia.

This Standard applies only to the testing and classification of wiring systems elements that are in all other respects safe and suitable for their intended use and comply with other relevant Standards.

A wiring system is then assembled using the individual elements and a fire and mechanical performance classification for the assembled system is established.

The fire protection classification of a wiring system shall not be greater than the fire protection classification of its lowest classified element.

The mechanical protection classification of an assembled wiring system shall not be less than the mechanical protection classification of its highest classified element. For example, if a cable of low classification is protected by an enclosure of higher classification the assembled system is assigned the classification of the enclosure.

The use of wiring system elements tested in accordance with this Standard may not be necessary where parts (or components) of building construction provide satisfactory protection against fire conditions and mechanical damage.

NOTE: The degree of protection against fire conditions and mechanical damage required of a wiring system or its elements is dependent on the application. Appendix F describes methods of protection of wiring system elements against the fire conditions and mechanical damage for which testing may not be considered necessary.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- | | |
|--------|---|
| 1074 | Steel tubes and tubulars for ordinary service |
| 1530 | Methods for fire tests on building materials, components and structures |
| 1530.4 | Part 4: Fire-resistance tests of elements of building construction |

AS/NZS

- | | |
|--------|---|
| 1125 | Conductors in insulated electric cables and flexible cords |
| 2053 | Conduits and fittings for electrical installations (all parts) |
| 3000 | Electrical installations (known as the Australian/New Zealand Wiring Rules) |
| 3187 | Approval and test specification—Mineral-insulated metal-sheathed cables |
| 3808 | Insulating and sheathing materials for electric cables |
| 5000 | Electric cables—Polymeric insulated |
| 5000.1 | Part 1: For working voltages up to and including 0.6/1 (1.2) kV |

1.4 DEFINITIONS

For the purpose of this Standard the definitions given in [AS/NZS 3000](#) and those below apply:

1.4.1 Busway

A wiring system comprising rigid conductors spaced apart, rigidly supported on insulating material within a duct, trunk or similar enclosure.

1.4.2 Cable

A single core, or two or more cables cores laid up together, either with or without fillings, reinforcements, or protective coverings.

1.4.3 Cable core

The conductor with its insulation but not including any mechanical protective covering.

1.4.4 Cable, mineral insulated metal sheathed (MIMS)

A cable having compressed powdered mineral insulation enclosed in metal sheathing. Such cable may be either single-core or multicore. Such cable may be bare sheath or PVC served.

1.4.5 Circuit integrity

The ability of an electrical circuit to perform the function for which it has been designed.

1.4.6 Element of a wiring system

A part or component of the wiring system.

1.4.7 Enclosed wiring system

A wiring system protected by means of an enclosure against fire conditions and mechanical damage.

1.4.8 Enclosure

A part providing protection against fire conditions and mechanical damage and against contact with live parts.

1.4.9 Fixings

Devices such as screws, bolts and anchors used to fix supports to a building or other structure.

1.4.10 Saddles

Supports which are intended for use with a cable or conduit.

1.4.11 Sample

A representative part taken from a product for testing purposes.

1.4.12 Shall

Indicates that a statement is mandatory.

1.4.13 Test specimen

Example: A part of a sample to which a test is applied for the Fire Test for Group 1 cables, the sample is the '35 mm² single core cable (manufacturers part number)' The specimen is any one of the three cables required for the test.

1.4.14 Submitter

An organization or individual that submits a sample cable, busway, wiring enclosure support or fixing to a testing authority for testing in accordance with this Standard.

1.4.15 Supports

Items, such as saddles, cable trays, cable ladders, brackets and cable ties, used to support wiring enclosures, cables or busways.

1.4.16 Unenclosed wiring system

A wiring system directly exposed to fire conditions or mechanical damage.

1.4.17 Wiring enclosure

A pipe, tube, duct, conduit or cable trucking, fixed or supported in position for the housing or protection of sheathed or unsheathed cables.

1.4.18 Wiring system

An arrangement of cables, busways, supports, fixings and enclosures, all of which are part of the wiring system.

1.4.19 Live part

A conductor or conductive part intended to be energized in normal use, including a neutral conductor and conductive parts connected to a neutral conductor.

Notwithstanding the above, for the purpose of this Standard, the following are not considered live parts:

- (a) Earthing conductors.
- (b) The MEN connection and the neutral bar or link at which the MEN connection is made.
- (c) The sheath of an MIMS cable and associated conductive fittings used as a combined neutral and protective earthing conductor in an ESR system.
- (d) Conductive supports and enclosures associated with unprotected consumer mains which are earthed in accordance with [AS/NZS 3000](#).

SECTION 2 TESTING OF WIRING SYSTEM ELEMENTS

For wiring system elements to use the classification system provided in this Standard, the elements shall have been tested and have passed the tests detailed in the following Appendices:

- (a) Appendix A Fire test method—Cables and busways.
- (b) Appendix B Water test method —Cables and busways.
- (c) Appendix C Fire test method—Supports and fixings.

A cable tray ladder of greater engineered strength may be substituted for a lighter section than that tested in accordance with Appendix C, provided the originally tested loads are not exceeded and that the design and construction characteristics are identical.

Supports and fixings are deemed to be suitable for use with cables or busways if the calculated load for the cables or busways is equal to or less than the load used in the test.

- (d) Appendix D Mechanical test method—Impact test—Cables, busways and enclosures.
- (e) Appendix E Mechanical test method—Cutting test—Cables and enclosures.
- (f) Appendix F Applications guide.

This Standard does not provide for mechanical testing of fixings or supports.

SECTION 3 CLASSIFICATION SYSTEM

3.1 DESIGNATION

3.1.1 General

The basic designation used to indicate the ability of the elements of a wiring system to maintain circuit integrity under fire conditions for a specified period and to maintain circuit integrity against mechanical damage of specified severity shall consist of a code of four characters.

3.1.2 Basic designation

The designation shall consist of the following characters—

- (a) the characteristic letters 'WS' (wiring system);
- (b) followed by a first characteristic numeral, where applicable (see Clause 3.2);
- (c) followed by a second characteristic numeral, where applicable (see Clause 3.3); and
- (d) a supplementary letter 'W' which may be added, where applicable (see Clause 3.4.).

3.1.3 Single characteristic numeral designation

Where an element classification is indicated by only one characteristic numeral, the letter 'X' shall be used in the position normally occupied by the omitted characteristic numeral, e.g. WSX5 or WS2X.

3.2 FIRST CHARACTERISTIC NUMERAL

3.2.1 Purpose

The first characteristic numeral represents the time for which cables and busways are able to maintain circuit integrity under specified fire conditions. It also represents the time that the supports and fixings are able to support their nominated load under specified fire conditions.

3.2.2 Ability to maintain circuit integrity

When tested in accordance with Appendix A, cables and busways shall maintain circuit integrity for the minimum time specified in Table 3.1 in order to be assigned the associated characteristic numeral.

3.2.3 Compliance

Compliance of a wiring system element with a stated degree of fire protection means that the element also complies with degrees of protection of lower rank in Table 3.1, i.e. of a lower numeral, and therefore tests for degrees of protection of lower rank need not be conducted.

TABLE 3.1
DEGREE OF PROTECTION INDICATED
BY THE FIRST CHARACTERISTIC NUMERAL
(Protection against fire conditions)

First characteristic numeral	Minimum time for which the test is conducted min
1	15
2	30
3	60
4	90
5	120

3.3 SECOND CHARACTERISTIC NUMERAL

3.3.1 Purpose

The second characteristic numeral represents the degree of mechanical impact and cutting force to which an element of a wiring system can be subjected to the criteria specified without failure.

3.3.2 Test conditions

Table 3.2, columns 2 and 3 give details of the minimum impact energies and cutting force criteria for the wiring system element.

3.3.3 Compliance

Compliance of an element of a wiring system with a stated degree of mechanical protection means that the element of a wiring system also complies with degrees of protection of lower rank in Table 3.2, i.e. of lower numeral, and therefore tests for degrees of protection of lower rank need not be conducted.

3.3.4 Classification

Impact and cutting tests shall be performed and the results recorded. The wiring system element classification is taken to be the lowest of the two results.

The cutting test (Appendix E), is not a classification criteria for busways. The mechanical classification for busway systems is determined from the impact test (Appendix D) alone.

TABLE 3.2
DEGREES OF PROTECTION INDICATED BY THE
SECOND CHARACTERISTIC NUMERAL
(Protection against mechanical damage)

1	2	3	4
Second characteristic numeral	Test criteria		Level of impact protection
	Impact test (Appendix D) J	Cutting test (Appendix E) kN	
1	2.5	0.3	light
2	15	1.0	moderate
3	50	5.0	heavy
4	500	5.0	very heavy
5	5 000	5.0	extremely heavy

NOTE: Appendix F provides guidance on the use of the classification system.

3.4 SUPPLEMENTARY LETTER W

3.4.1 Purpose

The supplementary letter W, when added to the basic designation, represents the ability of cables and busways to maintain circuit integrity when subject to the fire test in accordance with Appendix A, followed by a water spray test in accordance with Appendix B.

3.4.2 Ability to maintain circuit integrity

The addition of the supplementary letter W to a cable or busway classification means that the cable or busway is able to maintain circuit integrity when—

- (a) tested against exposure to fire conditions in accordance with Appendix A for the period specified by the first characteristic numeral (see Clause 3.2); and
- (b) then subjected to a water spray test, as specified in Appendix B.

3.4.3 Compliance

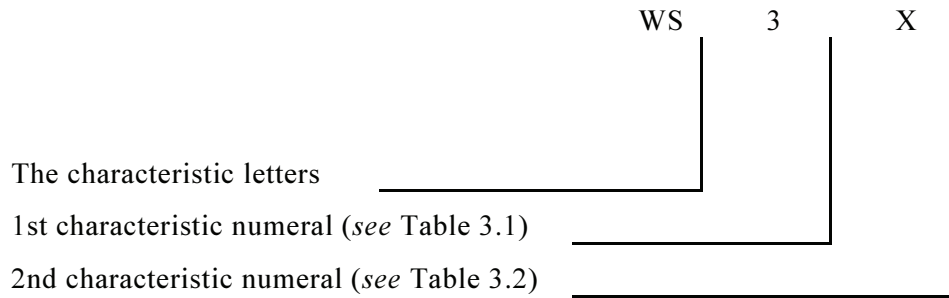
Compliance of an element of a wiring system to a 'W' classification means that the element is able to maintain circuit integrity in accordance with Clause 3.4.2. Tests for first characteristic numeral of lower rank classification need not be conducted.

The water spray test need not be performed on supports and fixings. Supports and fixings are deemed to comply and may be assigned a supplementary letter 'W' in their classification.

3.5 EXAMPLES OF CLASSIFICATIONS

Example 1:

Cables or busways, which maintain circuit integrity for 60 min when tested in accordance with Appendix A, would be designated WS3X, where the symbols are represented as follows:



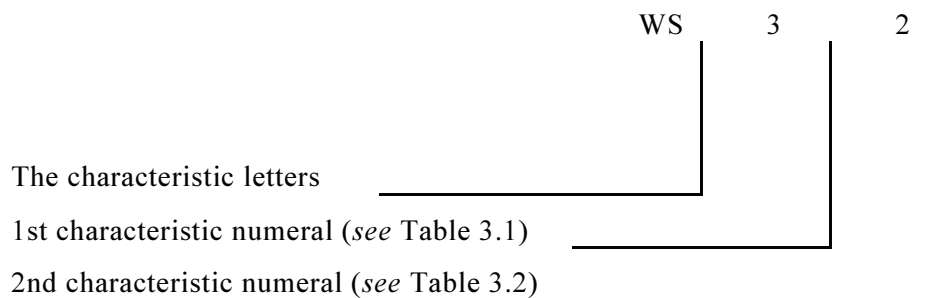
(X denotes that the second characteristic numeral has not been assessed)

Example 2:

Cables or busways which—

- (a) maintain circuit integrity for 60 min when tested in accordance with Appendix A; and
- (b) maintain circuit integrity when subject to the impact energies and cutting force criteria of Table 3.2 and tested in accordance with Appendix D and E for cables, and Appendix D only for busways.

would be designated WS32, where the symbols represent:



Example 3:

Cables or busways which—

- (a) maintain circuit integrity for 90 min when tested in accordance with Appendix A; and
- (b) continue to maintain circuit integrity when the test in accordance with Appendix A is followed by the water spray test in accordance with Appendix B; and
- (c) maintain circuit integrity when subject to the impact energies and cutting force criteria of Table 3.2 and tested in accordance with Appendix D and E for cables, and Appendix D only for busways.

would be designated WS44W, where the symbols represent:

	WS	4	4	W
The characteristic letters				
1st characteristic numeral (<i>see</i> Table 3.1)				
2nd characteristic numeral (<i>see</i> Table 3.2)				
Supplementary letter W				

APPENDIX A

FIRE TEST METHOD—CABLES AND BUSWAYS

(Normative)

A1 SCOPE

This Appendix sets out a test method that is used to assess the ability of cables and busways to maintain circuit integrity under fire conditions.

A2 APPLICATION

This method applies to unenclosed cables and busways.

While the test is performed utilizing a common installation configuration, the successful completion of this test qualifies the cables and busways for all unenclosed installation methods of the respective cables or busways.

A3 PRINCIPLE

Specimens of a cable or busway are placed in a furnace, which is programmed to follow a standard time–temperature curve, in order to determine the ability of cables or busways to maintain circuit integrity under fire conditions.

A4 TEST SPECIMENS

A4.1 General

Test specimens shall include all elements for which classification is sought including any joints or components forming part of the wiring system.

A4.2 Cables

A4.2.1 Groups for qualification

Cable types shall be divided into the following groups, based on the cable construction:

Group 1	Single-core for use as live conductors
Group 2	Multicore with or without earth, cross-sectional area greater than 6 mm ²
Group 3	Multicore with earth, cross-sectional area equal to or less than 6mm ²
Group 4	Multicore without earth, cross-sectional area equal to or less than 6 mm ²
Group 5	Single-core mineral insulated metal sheathed (MIMS)
Group 6	Multicore mineral insulated metal sheathed (MIMS)

NOTE: Earthing conductors intended for use with single-core cables need not be tested.

The requirements for each group are as follows:

- (a) For qualification of Group 1, the specimens to be tested shall be three single-core 35 mm² cables arranged in a trefoil configuration. This shall qualify all other single core sizes, with the following exceptions:
 - (i) Tests on any other size of cable specifically qualify that size only.