

Australian Standard[®]

**Grade S fire resistant and antistatic
requirements for conveyor belting and
conveyor accessories**



This Australian Standard® was prepared by Committee RU-002, Conveyor and Elevator Belting. It was approved on behalf of the Council of Standards Australia on 11 July 2012. This Standard was published on 3 September 2012.

The following are represented on Committee RU-002:

- Australian Chamber of Commerce and Industry
- Department of Industry and Investment, NSW
- Department of Labour, New Zealand
- Engineers Australia
- NSW Department of Industry and Investment
- TestSafe Australia

Additional Interests:

- Australasian Institute of Mining and Metallurgy
 - Australasian Plastics and Rubber Institute
 - Australian Coal Association
 - Australian Industry Group
 - Bureau of Steel Manufacturers of Australia
 - Department of Employment, Economic Development and Innovation
 - Energy Networks Association
 - The Institute of Quarrying Australia
-

This Standard was issued in draft form for comment as DR AS 4606.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting www.standards.org.au

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.org.au, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard[®]

Grade S fire resistant and antistatic requirements for conveyor belting and conveyor accessories

Originated as AS 4606—2000.
Second edition 2012.

COPYRIGHT

© Standards Australia Limited

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, unless otherwise permitted under the Copyright Act 1968.

Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 978 1 74342 218 2

PREFACE

This Standard was prepared by the Standards Australia Committee RU-002, Conveyor and Elevator Belting, to supersede AS 4606—2000, *Fire resistant and antistatic requirements for conveyor belting used in underground coal mines*.

The objective of this Standard is to contemporize requirements for fire resistant and antistatic conveyor belting to ensure safe belting is supplied to industry.

This Standard was initially developed for the underground coal mining industry and has been contemporized to reflect requirements for fire resistant and anti-static conveyor belting and accessories as may be required for use in potentially explosive atmospheres.

Mandatory statements in notes to figures are deemed to be requirements of this Standard.

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.

CONTENTS

	<i>Page</i>
1 SCOPE	4
2 APPLICATION	4
3 REFERENCED DOCUMENTS	4
4 DEFINITIONS	5
5 TYPE TESTING	6
6 TEST REQUIREMENTS	12
7 MANUFACTURE AND SUPPLY	18
8 PERIODIC CONFIRMATION FOR CONTINUED USE OF BELT	20
9 RECORDS TO BE KEPT	20
10 MARKING AND DESIGNATION	21

APPENDICES

A	SAMPLE PROFORMA FOR INFORMATION TO BE GIVEN TO THE TESTING AUTHORITY	23
B	SAMPLE PREPARATION AND TEST PIECE SIZES FOR TESTING	25
C	EXAMPLES OF RANGE CONFORMANCE	30
D	RISK—NON-METALLIC CONVEYOR IDLERS AND STRUCTURE	34
E	SAMPLE PRO FORMA FOR CERTIFICATE OF CONFORMANCE	37
F	STEEL CORD BELT FINGER BURN TEST SAMPLE ORENTATION	40

STANDARDS AUSTRALIA

Australian Standard

Grade S fire resistant and antistatic requirements for conveyor belting and conveyor accessories**1 SCOPE**

This Standard sets out minimum safety requirements for fire resistant and antistatic conveyor belting and conveyor accessories (Grade S).

NOTE: For other conveyor belting properties and other grades, reference should be made to AS 1332 and AS 1333.

2 APPLICATION

This Standard applies to conveyor belts and conveyor accessories used in underground coal mines.

It may be relevant in other situations where there is the hazard of a potentially explosive atmosphere. A risk assessment process should be used to determine whether Grade S belting or Grade S accessories are required in these environments.

NOTES:

- 1 This Standard does not apply to idlers or conveyor structure made from or covered with non-metallic materials. Appendix D provides guidance on the hazards and risks associated with the use of such products.
- 2 This Standard is intended to apply to all conveyor belts including conventional and non-conventional belts such as cable and pouch belts.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1199	Sampling procedures for inspection by attributes
1199.0	Part 0: Introduction to the ISO 2859 attribute sampling system
1199.1	Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
1332	Conveyor belting—Textile reinforced
1333	Conveyor belting of elastomeric and steel cord construction
1334	Methods of testing conveyor and elevator belting
1334.9	Part 9: Determination of electrical resistance of conveyor belting
1334.10	Part 10: Determination of ignitability and flame propagation characteristics of conveyor belting
1334.11	Part 11: Determination of ignitability and maximum surface temperature of belting subjected to friction
1334.12	Part 12: Determination of combustion propagation characteristics of conveyor belting
4024	Safety of machinery
4024.1	Part 1: General principles (series)
AS/NZS	
1020	Control of undesirable static electricity
3678	Structural steel—Hot-rolled plates, floorplates and slabs

AS/NZS

60079 Explosive atmospheres

60079.0 Part 0: Equipment—General requirements

HB 18 Conformity assessment

HB 18.28 Guide 28: Guidance on third-party certification scheme for products

AS/NZS ISO

9001 Quality management systems—Requirements

9004 Managing for the sustained success of an organization—A quality management approach

31000 Risk management—Principles and guidelines

ISO

284 Conveyor belts—Electrical conductivity—Specification and test method

2878 Timber—Classification into strength groups

4589 Plastics—Determination of burning behaviour by oxygen index

4589-2 Part 2: Ambient-temperature test

4 DEFINITIONS**4.1 Carcass**

The reinforcement material found on the inside of a completed conveyor belt, and may include polymer impregnated tension member, e.g. skim material.

NOTE: The carcass provides the tensile strength necessary to move the belt.

4.2 Certificate of conformance

A certificate issued by an independent type testing facility, see Clause 5.5, or a competent person to verify the conveyor belt or conveyor accessory complies with the type testing requirements specified in Clause 5 of this Standard.

4.3 Competent person

A person who has acquired through training, qualification, experience or a combination of these, the knowledge and skill enabling that person to correctly perform the required task.

4.4 Covers

Material(s) covering the carcass of the conveyor belt.

4.5 Explosive atmospheres

Mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour, dust, fibres or flyings which, after ignition, permit self-sustaining propagation.

[AS/NZS 60079.0]

4.6 Grade S

A material property grading of belting and accessories indicating fire resistant and antistatic properties in accordance with this Standard.

4.7 Conveyor accessories

Non-metallic conveyor accessories typically in contact with the conveyor belt which are in small quantities.

NOTES:

- 1 For example scraper blades, ploughs, skirt rubbers, pulley lagging, belt slicing kits and belt repair kits.

- 2 It is necessary to ensure an acceptable risk with regard non-metallic conveyor accessories which are in contact with the conveyor belting. Such risks are associated with combustibility (initiation and propagation of fire), static electricity and toxicity of the products of combustion.
- 3 Non-metallic materials in large quantities, such as non-metallic conveyor idlers and structure, are not considered 'conveyor accessories' and compliance with the testing regime specified in this Standard does not address the risk. Refer to Appendix D for guidance.

4.8 Production acceptance testing

Testing of production runs or batch testing of conveyor belts and conveyor accessories.

NOTE: The purpose of acceptance testing is to verify a manufactured belt or conveyor accessory complies with this Standard.

4.9 Pulley lagging

Non-metallic material placed around or covering the steel shell of a pulley.

NOTE: This may be a drive pulley, snub pulley or bend pulley.

4.10 Type testing

Initial and periodic independent testing on conveyor belt constructions or conveyor accessory materials.

NOTE: The purpose of type testing is to assure the belt design or conveyor accessory complies with this Standard.

4.11 Unrelated

Where the legal entity(s) that the testing facility is part of is not related by ownership, by control (e.g. through common personnel) or by other influence to the legal entity(s) that are responsible for manufacture or supply of the items submitted for testing.

5 TYPE TESTING

5.1 General

All conveyor belting (Grade S) and conveyor accessories being supplied for use shall be initially and periodically type tested to independently confirm the conveyor belting or conveyor accessory complies and remains in compliance with this Standard.

NOTE: For non-conventional belts, the regulator may vary the tests stipulated in this Standard.

As a minimum, but not limited to, type testing shall be carried out—

- (a) before any belting construction or accessory is supplied for use on the first occasion in an underground coal mine or other potentially explosive atmospheres, as described in Clause 2;
- (b) at least every 5 years;
- (c) where the conveyor belt or conveyor accessory is to be manufactured at an alternative factory;
- (d) where there is a change in supply of raw materials that may affect the performance;
- (e) where there is a change or difference in the manufacturing process, which may affect the performance; and
- (f) where the manufacturer/supplier becomes aware of circumstances where product has been supplied and subsequently found to be non-compliant to this Standard.

NOTE: For range type testing this will only affect a nonconforming belt construction and not the entire range. The range certificate of conformance should be re-issued.

5.1.1 *Samples for conveyor belt type testing*

All conveyor belt samples supplied for testing shall be produced on production line equipment using processes identical to those used to supply to industry. Laboratory-produced conveyor belt samples shall not be supplied for type testing. Samples shall be selected from the same roll.

5.2 *Individual conveyor belt type testing*

The conveyor belting shall be tested as supplied.

The conveyor belting shall pass all tests specified in Clause 6.1.

5.3 *Conveyor belt range type testing*

5.3.1 *General*

Where a range of conveyor belting is to be tested, all conveyor belts in the range shall be manufactured from the same materials (carcass materials and cover materials) and from the same factory.

The conveyor belting range shall pass all tests stipulated in Clause 6.1.

The range of samples shall include belting with the thinnest covers as supplied by the manufacturer. The sample with the greatest strength shall be tested with the minimum covers allowable for the range.

NOTES:

- 1 The test facility may require more samples for testing than those provided by the manufacturer/supplier.
- 2 For example of the application of sampling requirements for ranges, see Appendix C.

Conveyor belting to be tested for a specified range (number of tests and parameters) shall be selected in accordance with Clause 5.3.2 to Clause 5.3.4.

5.3.2 *Steel cord belting*

Steel cord conveyor belt samples shall have the same carcass and cover materials.

In order to obtain a range certificate involving a carcass strength ratio of not greater than 2:1 between the maximum and minimum strengths, the maximum and minimum strengths shall be tested.

Where the carcass strength ratio between the maximum and minimum strengths exceeds 2:1 across the range, additional constructions shall be tested to maintain a maximum strength ratio of 2:1 between samples.

5.3.3 *Solid woven belting*

Solid woven conveyor belt samples shall have the same carcass, impregnated material and cover materials.

In order to obtain a range certificate involving a carcass strength ratio of not greater than 2:1 between the maximum and minimum strengths, the maximum and minimum strengths shall be tested.

Where the carcass strength ratio between the maximum and minimum strengths exceeds 2:1 across the range, additional constructions shall be tested to maintain a maximum strength ratio of 2:1 between samples.

5.3.4 *Ply belting*

Ply conveyor belt samples shall have the same carcass type, skim material and cover materials.

In order to obtain a range test certificate, the following shall apply:

- (a) Samples shall be selected to include—
 - (i) the maximum and the minimum strength in each range of ply (column(s) of Table 1); or
 - (ii) where the range is only across one nominal strength per ply (a row of Table 1), the maximum and minimum number of plies.
 - (b) Where the range includes any belts from the ‘shaded zone’ in Table 1, at least one belt tested shall be selected from this zone for each range of ply (column of Table 1).
 - (c) One sample shall be tested from a production run as supplied to industry. Where the range includes any belt from the ‘shaded zone’ this sample shall be from the shaded zone for each range of ply (column of Table 1).
 - (d) Additional constructions shall be tested to maintain a maximum strength ratio of 2:1 between samples.
- NOTE: For examples of the application of sampling requirements for ranges, see Appendix C.
- (e) Where different weaves are being supplied within the range, at least one of each weave shall be tested.

TABLE 1
TYPICAL PLY BELT STRENGTHS

Nominal strength per ply kN/m	Nominal strength of belt carcass kN/m		
	3 ply	4 ply	5 ply
160	X	630	800
200	600	800	1000
250	750	1000	1250
315	1000	1250	1600
350	1150	1400	1750
400	1200	1600	2000
450	1350	1800	2250
500	1500	2000	2500
630	X	2500	X
750	X	3000	X
800	X	3200	X

NOTES:

- 1 The ‘shaded zone’ above indicates belt designs most typically used in underground coal mines.
- 2 ‘X’ in a table cell above means that (at the time of writing) the indicated belt design was not known to be supplied to the Australian market.

5.4 Conveyor accessories-type testing

Materials of construction of conveyor accessories shall be tested as supplied. The conveyor accessories shall pass the requirements for the following tests in accordance with Clause 6.2:

- (a) Electrical resistance.

- (b) Oxygen index.
- (c) Ignitability and flame propagation characteristics (finger burn test).

5.5 Test facility

The test facility used for type testing shall—

- (a) be unrelated to the organization manufacturing the conveyor belt or conveyor accessory;
- (b) be unrelated to the organization supplying the conveyor belt or conveyor accessory; and
- (c) be a laboratory accredited by signatories to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) for the specific tests as described in this Standard.

NOTE: In Australia, ILAC (MRA) accredited bodies include National Association of Testing Authorities (NATA).

5.6 Information to be given to testing facility

5.6.1 General

The applicant shall be—

- (a) the person or company who is responsible for the manufacture or supply/import of the conveyor belt or conveyor accessories; and
- (b) an Australian registered company or real person that resides in Australia.

NOTES:

- 1 Workplace health and safety legislation in Australia imposes a duty on suppliers/importers to ensure the designer's/manufacture's obligations are met. In relation to Grade S belting and conveyor accessories, the applicant will need to ensure the quality of the product supplied is identical to that which was type tested.
- 2 For prototype testing the applicant may be an overseas corporation.

5.6.2 Conveyor belt testing

The following information shall be given to the testing facility prior to the commencement of any type tests:

- (a) Applicant's legal name and trading name.
- (b) Applicants contact details and authorized representative.
- (c) Manufacturer's legal name.
- (d) Location of plant (factory) where conveyor belting was manufactured.
- (e) Purpose of test (i.e. initial type testing, 5 yearly type testing or prototype testing).
- (f) Belt construction (i.e. solid woven, ply, steel cord).
- (g) Belt designation.
- (h) Carcass material, including warp and weft (where applicable) and thickness.
- (i) Carcass weave (where applicable).
- (j) Carcass impregnation or polymer impregnation material (skim material), material identification number and thickness.
- (k) Top cover compound(s)/material(s), identification number(s) and thicknesses.
- (l) Bottom cover compound(s)/material(s), identification number(s) and thicknesses.
- (m) Steel cord diameter and construction (where applicable).

- (n) Manufacturer's reference number for the sample supplied (e.g. roll number).
- (o) Colour.
- (p) Confirmation that samples have been produced on manufacturing equipment using manufacturing processes and from the same roll (see Clause 5.2).

NOTE: Appendix A gives a sample pro forma for sending conveyor belt information to the testing facility.

5.6.3 Conveyor accessories

The following information shall be given to the testing facility prior to the commencement of any tests:

- (a) Applicant's legal name and trading name.
- (b) Applicants contact details and authorized representative.
- (c) Manufacturer's legal name.
- (d) Location of plant (factory) where the conveyor accessory was manufactured.
- (e) Purpose of test (i.e. initial type testing, 5 yearly type testing or prototype testing).
- (f) Material(s) used in construction and relevant identification number(s).
- (g) Manufacturer's reference number for the sample supplied (e.g. batch number).

5.7 Supply of samples to testing facility

Samples for certification testing by the test facility shall be provided by the manufacturer/supplier.

NOTE: Appendix B gives a list for sample sizes for each test specified.

Supply of samples to the testing facility shall be accompanied by—

- (a) a manifest of the contents of the shipment; and
- (b) all the information specified in Clause 5.6.2 or a unique identifier that relates the samples to this information.

NOTE: This information need only be packaged with the samples, not on the samples themselves.

5.8 Certificate of conformance—Type testing

5.8.1 General

A certificate of conformance for type testing shall be provided by either—

- (a) a testing facility meeting the requirements of Clause 5.5, or
- (b) an independent competent person.

NOTE: The competent person should be a person who has educational or vocational qualifications in a relevant engineering discipline and has sufficient skills and knowledge of this Standard and the stipulated testing Standards to independently verify that the conveyor belt or conveyor accessories, as stated in the certificate of conformance, comply with this Standard.

Where a competent person makes the statement they shall view all type test certificates in order to confirm compliance to this Standard. A copy of all test certificates shall be appended to their certificate of conformance for type testing.

5.8.2 Issuing a certificate of conformance

For conveyor belts, the following items shall be checked before a certificate of conformance for type testing is issued:

- (a) For each belt construction, all test pieces shall be taken from the same sample or roll.

- (b) All tests from an appropriate testing facility (see Clause 5.5).
- (c) For range certificates, the types of belt tested are in accordance with Clause 5.3.
- (d) The information in Clause 5.6 is provided.
- (e) All test samples pass the relevant tests stipulated in Clause 6.
- (f) For range certificates, the same factory has made all belts.
- (g) The materials of construction are identical for all tests.
- (h) The factory that manufactured the belt has current quality assurance certification for the manufacturing of conveyor belt.
- (i) The belt has been manufactured during the currency of the factory's quality assurance certification.

For conveyor accessories, the following items shall be checked before a certificate of conformance for type testing is issued:

- (i) Test pieces shall be taken from the same batch number.
- (ii) All tests are from an appropriate testing facility (see Clause 5.5).
- (iii) The information in Clause 5.6 is provided.
- (iv) All test samples pass the relevant tests stipulated in Clause 6.
- (v) The materials of construction are identical for all tests.
- (vi) The factory that manufactured the conveyor accessory has a quality management system which covers the manufacturing of the conveyor accessory (see Clause 7.1.2).

5.8.3 *Conveyor belting certificate of conformance*

The certificate of conformance shall specify—

- (a) the relevant conveyor belt/range information as set out in Clause 5.6.2;
- (b) the 5 year expiry date;
NOTE: The expiry date is calculated as being 5 years from the earliest date a sample was tested as part of the type testing.
- (c) the conforming range and designation of conveyor belting that conforms with the Standard, as set out in Clause 5.3;
- (d) a list of all belts that were tested supporting this statement;
- (e) the minimum cover thickness, top and bottom;
- (f) the weave types;
- (g) the oxygen index for each belt tested; and
- (h) a statement that the conveyor belt, or specified conveyor belt range conforms to this Standard.

NOTE: An example of a certificate of conformance is given in Appendix E.

5.8.4 *Conveyor accessories certificate*

The certificate of conformance shall specify the identification of the conveyor accessories.

The certificate of conformance shall specify—

- (a) the relevant conveyor accessory information as set out in Clause 5.6.3;
- (b) the 5 year expiry date;
- (c) the legal name of the conveyor accessory manufacturer and supplier;

- (d) the location of the factory where the conveyor accessory was manufactured;
- (e) the oxygen index across the range and the lowest for the range;
- (f) any variations to testing that may have occurred by the test facility; and
- (g) a statement the specified conveyor accessory conforms to this Standard.

6 TEST REQUIREMENTS

6.1 Conveyor belting

6.1.1 General

For each belt construction, all test pieces shall be taken from the same sample or roll.

NOTE: See Appendix B for sample preparation and test piece sizes.

6.1.2 Combustion propagation characteristics (*Gallery test*)

When tested in accordance with AS 1334.12, a length of test piece, not less than 250 mm, shall remain undamaged over its full width after all visible flame and visible glow have disappeared.

The overall width of the test sample shall be nominally 1050 mm except where the belt is supplied for use at widths less than 1050 mm in which case the belt shall be tested at the supplied width.

6.1.3 Ignitability and maximum surface temperature of belting subjected to friction (*Drum friction test*)

6.1.3.1 General

When tested in accordance with AS 1334.11, the surface temperature of the drum shall not exceed 325°C, and there shall be no visible flaming or visible glowing.

The drum shall be manufactured from Grade 250 mild steel with less than 0.2% carbon content in accordance with AS/NZS 3678.

NOTE: Solid woven and ply belts of 2000 kN/m strength or greater may be too inflexible to wrap around the test drum, thus creating point contact and not achieving a uniform contact around the drum. The point contact can create a hot spot which would not normally occur if uniform distribution contact was achieved.

6.1.3.2 Ply belting

For conveyor belting of ply construction 2000 kN/m or greater, the belt may be split between the plies, removing up to half of the number of plies. When a belt is split between the plies it shall not pass the test by breakage. Both top and bottom covers shall be tested. Where this option is applied, it shall be noted in the test report.

6.1.3.3 Solid woven belting

For conveyor belting of solid woven construction of 2000 kN/m strength or greater, the drum friction test may also be passed by one of the following methods:

- (a) The belt may be slit on the face not being tested to allow the belt to wrap around the drum. After the test, the slits shall not be visible from the side being tested. When a belt is slit it shall not pass the test by breakage. Top and bottom covers shall be tested on different samples. Where this option is applied, it shall be noted in the test report.

or

- (b) Where the initial sample is tested and the belt breaks within the duration of the test but fails the test due to—
 - (i) the drum exceeding 325°C, but not greater than 340°C; or
 - (ii) there being visible glowing, due to ‘hot spot’ from an inflexible belt.