

Australian/New Zealand Standard™

Cellulose-cement products

Part 1: Corrugated sheets



S t a n d a r d s Australia



STANDARDS
NEW ZEALAND
Whakaputa Aotearoa

AS/NZS 2908.1:2000

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee BD/40, Fibre Cement Building Products. It was approved on behalf of the Council of Standards Australia on 3 March 2000 and on behalf of the Council of Standards New Zealand on 4 April 2000. It was published on 12 May 2000.

The following interests are represented on Committee BD/40:

Australian Building Codes Board
Australian Chamber of Commerce and Industry
Australian Institute of Building
Federation of Wall and Ceiling Industries, Australia and New Zealand
Housing Industry Association, Australia
New Zealand Manufacturers Federation
Master Builders, Australia

Keeping Standards up-to-date

Standards are living documents which 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 Standards may also be withdrawn.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 which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Australia web site at www.standards.com.au or Standards New Zealand web site at www.standard.co.nz and looking up the relevant Standard in the on-line catalogue.

Alternatively, both organizations publish an annual printed Catalogue with full details of all current Standards. For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia International or Standards New Zealand at the address shown on the back cover.

Australian/New Zealand Standard™

Cellulose-cement products

Part 1: Corrugated sheets

First published in Australia as AS 2908—1987.
Revised and redesignated as AS 2908.1—1992.
Jointly revised and designated as AS/NZS 2908.1:2000.

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, PO Box 1055, Strathfield, NSW 2135 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 3327 1

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD/40, Fibre Cement Building Products, to supersede AS 2908.1—1992, *Cellulose cement products, Part 1: Corrugated sheets*.

The objective of this Standard is to provide users with the characteristic requirements and methods of test for corrugated cellulose-cement sheets for use primarily as roofing and cladding.

The sheets specified in this Standard may be installed in accordance with AS/NZS 1562.2, *Design and installation of sheet roofing and wall cladding, Part 2: Fibre-reinforced cement*. So that the best use is made of corrugated cellulose-cement sheets for roofing and cladding, it is recommended that this series be read in conjunction with AS/NZS 1562.2.

This Standard is the first part in a series of cellulose-cement products Standards, which comprises the following:

AS/NZS

- 2908 Cellulose-cement products
- 2908.1 Part 1: Corrugated sheets (this Standard)
- 2908.2 Part 2: Flat sheets (identical with ISO 8336:1993)

The objectives of this revision are—

- (a) to develop it as a Joint Australian/New Zealand Standard; and
- (b) to update the Standard with the newly developed technology and information.

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 REFERENCED DOCUMENTS	4
3 CLASSIFICATION	4
4 COMPOSITION	4
5 PHYSICAL REQUIREMENTS	5
6 DIMENSIONS AND TOLERANCES	5
7 BENDING STRENGTH.....	6
8 WATERTIGHTNESS.....	6
9 RESISTANCE TO HOT WATER SOAKING.....	6
10 MARKING.....	6
 APPENDICES	
A MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD	7
B REFERENCED DOCUMENTS	9
C DETERMINATION OF THE STRENGTH OF CORRUGATED CELLULOSE- CEMENT SHEETS	10
D DETERMINATION OF THE WATERTIGHTNESS OF CORRUGATED CELLULOSE-CEMENT SHEETS.....	13
E DETERMINATION OF RESISTANCE TO HOT WATER SOAKING OF CORRUGATED CELLULOSE-CEMENT SHEETS	15

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Cellulose-cement products

Part 1: Corrugated sheets

1 SCOPE

This Standard sets out requirements for corrugated cellulose-cement sheets for use primarily as roofing and cladding. It also applies to autoclaved sheets in which the cement is partially replaced by ground silica.

This Standard covers sheets that are finished with one of the following:

- (a) Their natural colour.
- (b) Colouring matter added to their composition.
- (c) Coloured or uncoloured adherent coatings on their surfaces.

This Standard does not apply to asbestos-fibre-reinforced sheets.

NOTE: Advisory information on alternative methods of determining compliance with this Standard is given in Appendix A.

2 REFERENCED DOCUMENTS

A list of documents referred to in this Standard is given in Appendix B.

3 CLASSIFICATION

Corrugated sheets covered by this Standard shall be divided into three classifications according to the depth of corrugation, as given in Table 1.

NOTE: It is recommended that the classification of a corrugated sheet material be specified in all appropriate technical literature.

TABLE 1
PROFILE DEPTH CLASSIFICATION

Profile class	Corrugated depth, mm	
	Less than	Not less than
1	50	45
2	60	50
3	75	60

4 COMPOSITION

Corrugated cellulose-cement sheets complying with this Standard shall consist primarily of an inorganic hydraulic binder, or a calcium silicate formed by a chemical reaction of a siliceous and calcareous material, reinforced by cellulose fibres to which other organic or synthetic fibres may be added. The addition of process aids, fillers and pigments, which are compatible with the cellulose-cement mixture, is acceptable.

5 PHYSICAL REQUIREMENTS

Corrugated sheets shall generally be rectangular in shape and shall be corrugated such that the crowns of the corrugations are parallel within the tolerances specified in Clause 6. The finished sheets shall be clean, with neatly trimmed edges and free from visible defects.

6 DIMENSIONS AND TOLERANCES

The dimensions and tolerances on corrugated cellulose-cement sheets shall be as follows:

- (a) *Length*: 1200 mm to 3000 mm rising by increments of 300 +5, -10 mm.
- (b) *Width*—
 - (i) *Class 1*: 1080 +10, -5 mm.
 - (ii) *Class 2*: 1150 +10, -5 mm.
 - (iii) *Class 3*: 1105 +10, -5 mm.
- (c) *Thickness*—when measured at *T*, as shown in Figure 1: 6.0 + 1.5, -0 mm.
- (d) *Pitch*—when measured at *P*, as shown in Figure 1:
 - (i) *Class 1*: 150 +0, -10 mm.
 - (ii) *Class 2*: 180 +0, -10 mm.
 - (iii) *Class 3*: 210 +0, -10 mm.
- (e) *Depth*—when measured at *D*, as shown in Figure 1:
 - (i) *Class 1*: 50 +0, -6 mm.
 - (ii) *Class 2*: 60 +0, -8 mm.
 - (iii) *Class 3*: 75 +0, -10 mm.

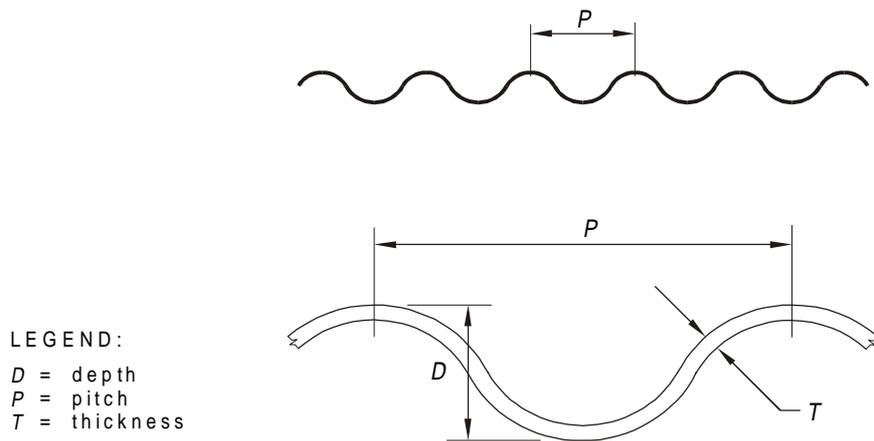


FIGURE 1 DEPTH, PITCH AND THICKNESS MEASURING POINTS

7 BENDING STRENGTH

When corrugated cellulose-cement sheets are tested in accordance with Appendix C, the ultimate bending strength per metre width of three test pieces shall not be less than that specified in Table 2 for each profile class.

TABLE 2
BENDING STRENGTHS

Profile class	Ultimate bending strength, N/m	
	Minimum average three test pieces	Minimum any individual test pieces
1	4 900	4 200
2	6 200	5 300
3	8 500	7 300

8 WATERTIGHTNESS

When corrugated cellulose-cement sheets are tested in accordance with Appendix D, moisture may appear on the underside of the sheet, but no droplets of water shall be visible.

9 RESISTANCE TO HOT WATER SOAKING

When corrugated cellulose-cement sheets are tested in accordance with Appendix E, the test pieces, after immersion in hot water, shall comply with the following:

- (a) They shall not show visible cracks, structural alteration or delamination.
- (b) Their mean bending strength per unit width shall be not less than 90% of the mean bending strength per unit width required in Clause 7.
- (c) Their mean bending strength per unit width shall be not less than 80% of the mean bending strength per unit width of the reference test pieces.

10 MARKING

The following information shall be marked on each sheet:

- (a) The manufacturer's distinguishing mark.
- (b) The lot identification.
- (c) The profile class.

NOTE: Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, packaging or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

APPENDIX A
MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD
(Informative)

A1 SCOPE

This Appendix sets out the following different means by which compliance with this Standard can be demonstrated by the manufacturer or supplier:

- (a) Evaluation by means of statistical sampling.
- (b) The use of a product certification scheme.
- (c) Assurance using the acceptability of the supplier's quality system.
- (d) Other such means proposed by the manufacturer or supplier and acceptable to the customer.

A2 STATISTICAL SAMPLING

Statistical sampling is a procedure which enables decisions to be made about the quality of batches of items after inspecting or testing only a portion of those items. This procedure will only be valid if the sampling plan has been determined on a statistical basis and the following requirements are met:

- (a) The sample shall be drawn randomly from a population of product of known history. The history shall enable verification that the product was made from known materials at essentially the same time, by essentially the same processes and under essentially the same system of control.
- (b) For each different situation, a suitable sampling plan needs to be defined. A sampling plan for one manufacturer of given capability and product throughput may not be relevant to another manufacturer producing the same items.

In order for statistical sampling to be meaningful to the customer, the manufacturer or supplier needs to demonstrate how the above conditions have been satisfied. Sampling and the establishment of a sampling plan should be carried out in accordance with AS 1199, guidance to which is given in AS 1399.

A3 PRODUCT CERTIFICATION

The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the stated Standard.

The certification scheme should meet the criteria described in SAA HB18.28 in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective quality planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

A4 SUPPLIER'S QUALITY SYSTEM

Where the manufacturer or supplier can demonstrate an audited and registered quality management system complying with the requirements of the appropriate or stipulated Australian or international Standard for a supplier's quality system or systems, this may provide the necessary confidence that the specified requirements will be met. The quality

assurance requirements need to be agreed between the customer and supplier and should include a quality or inspection and test plan to ensure product conformity.

Guidance in determining the appropriate quality management system is given in AS/NZS ISO 9000.1 and AS/NZS ISO 9004.1.

A5 OTHER MEANS OF ASSESSMENT

If the above methods are considered inappropriate, determination of compliance with the requirements of this Standard may be assessed from the results of testing coupled with the manufacturer's guarantee of product conformance.

Irrespective of acceptable quality levels (AQLs) or test frequencies, the responsibility remains with the manufacturer or supplier to supply products that conform to the full requirements of the Standard.

APPENDIX B
REFERENCED DOCUMENTS

(Normative)

The following documents are referred to in this Standard:

AS

- | | |
|------|--|
| 1199 | Sampling procedures and tables for inspection by attributes |
| 1399 | Guide to AS 1199—Sampling procedures and tables for inspection by attributes |
| 2193 | Methods for calibration and grading of force-measuring systems of testing machines |

AS/NZS

- | | |
|------------|--|
| ISO 9000 | Quality management and quality assurance standards |
| ISO 9000.1 | Part 1: Guidelines for selection and use |
| ISO 9004 | Quality management and quality system elements |
| ISO 9004.1 | Part 1: Guidelines |

SAA

- | | |
|----------|--|
| HB 18 | Guidelines for third-party certification and accreditation |
| HB 18.28 | Guide 28—General rules for a model third-party certification scheme for products |

APPENDIX C

DETERMINATION OF THE STRENGTH OF CORRUGATED CELLULOSE-
CEMENT SHEETS

(Normative)

C1 SCOPE

This Appendix sets out the method for determining the strength of corrugated cellulose-cement sheets.

C2 PRINCIPLE

A test piece is soaked in water for a prescribed period. It is then placed on two supports and a load is applied at midspan over its full width until failure. A measure of the bending strength is calculated from the ultimate load and the width of the test piece.

C3 APPARATUS

The following apparatus is required:

- (a) A testing machine (see Figure C1) complying with the requirements for Grade B of AS 2193 and incorporating the following:
 - (i) Two parallel rigid rectangular supports fixed at 995 ± 2 mm clear span. The dimensions of each support are as follows:
 - (A) *Width*: not less than 50 mm.
 - (B) *Depth*: not less than 150 mm.
 - (C) *Length*: not less than the width of the test piece.
 - (ii) A self-aligning, rigid loading beam placed parallel to and equidistant from the supports. The dimensions are as follows:
 - (A) *Width*: 230 ± 1 mm.
 - (B) *Length*: not less than the width of the test piece.
 - (iii) Three strips of felt, soft fibre or rubber for placing between the supports, the loading beam and the test piece. The dimensions of each strip are as follows:
 - (A) *Width*: not less than that of the supports or loading beam, as appropriate.
 - (B) *Thickness*: not exceeding 12.5 mm.
 - (C) *Length*: not less than the width of the test piece.
- (b) A corrosion-resistant trough or bath at least 900 mm × 150 mm × 1400 mm deep.
- (c) Means to ensure that no air is entrapped on the surface of or between the test pieces, and that there is free access of water to all test piece surfaces. All test pieces need to be completely immersed.
- (d) Clean or lime-saturated fresh water at ambient temperature.
- (e) Means of cutting corrugated cellulose-cement sheets.
- (f) A linear measuring device, such as sliding callipers, graduated in millimetres.

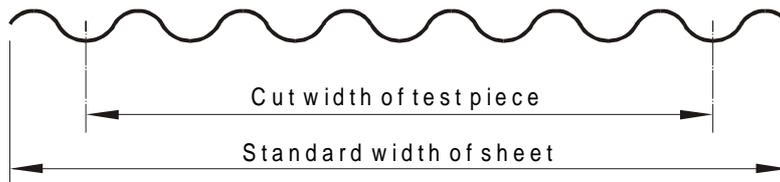


FIGURE C2 CUTTING OF TEST PIECE TO WIDTH

C6 PROCEDURE

The procedure shall be as follows:

- (a) Immerse the three pieces in water at ambient temperature for not less than 24 h.
- (b) Remove one of the test pieces from the water, allow to drain, but ensure that it remains wet until placed on the supports of the testing machine.
- (c) Place the test piece on the supports of the testing machine so that the axes of the corrugations are at right angles to them (see Figure C1).
- (d) Through the loading beam, apply the load at a uniform rate of approximately 10 kN/min until the test piece fails.
- (e) Record the load (L) at which failure occurs, in newtons.
- (f) Measure and record to the nearest millimetre the actual width (w) of the test piece adjacent to the break.
- (g) Calculate the load per metre ($L/w \times 10^3$) required to break the test piece, in newtons per metre.
- (h) Repeat Steps (b) to (f) for the other two test pieces.

C7 REPORT

The report shall include the following:

- (a) The identity of the lot or consignment, from which the sample sheets selected in Paragraph C4 were taken.
- (b) The sheet classification.
- (c) The breaking load per metre for each test piece, in newtons per metre.
- (d) The mean of the breaking load per metre of the three test pieces, in newtons per metre, i.e. the breaking load for the lot or consignment.
- (e) Reference to this Standard, i.e. AS/NZS 2908.1.

APPENDIX D
DETERMINATION OF THE WATERTIGHTNESS OF CORRUGATED
CELLULOSE-CEMENT SHEETS

(Normative)

D1 SCOPE

This Appendix sets out the method for determining the watertightness of corrugated cellulose-cement sheets.

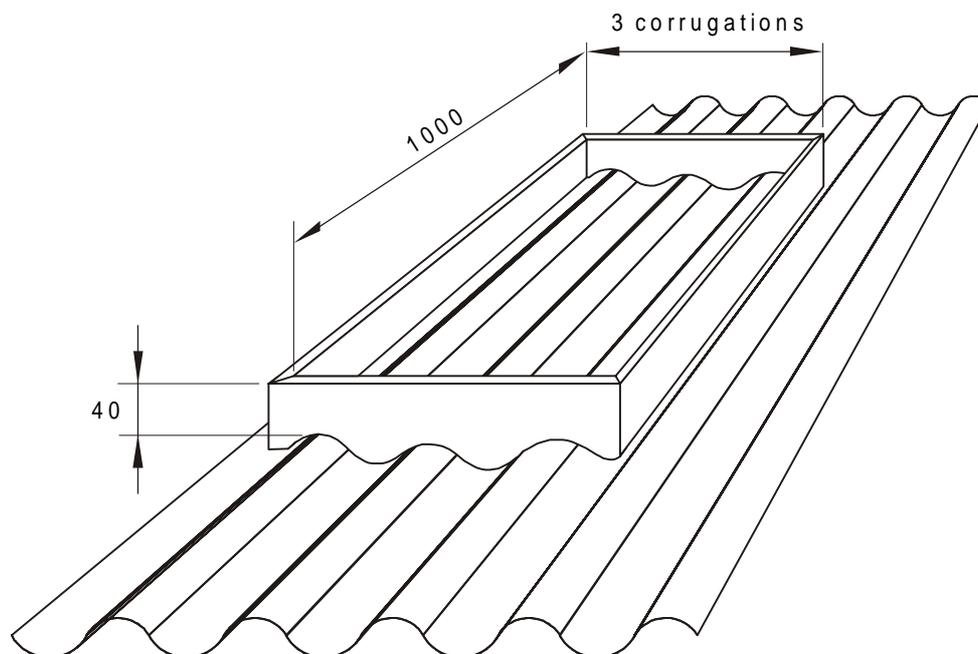
D2 PRINCIPLE

A frame is fitted to the presentation side of a conditioned test piece and then filled with water to a specified depth. After a prescribed period, the other side of the test piece is examined for water penetration.

D3 APPARATUS

The following apparatus shall be required:

- (a) An impermeable frame with watertight joints, the form and dimensions of which are shown in Figure D1.
- (b) Sealing material capable of effecting a watertight joint between the frame and the test piece.
- (c) Sufficient clean, fresh water at ambient temperature to fill the frame to a depth of 20 mm above the tops of the corrugations.



DIMENSIONS IN MILLIMETRES

FIGURE D1 DETERMINATION OF WATERTIGHTNESS OF CORRUGATED SHEETS

D4 SAMPLING

When there is a change in formulation or processing, select one sheet from a production lot that satisfies the strength requirements of Clause 7 of this Standard.

D5 TEST PIECE

The test piece shall be taken from the sheet selected in accordance with Paragraph D4 and it shall be not less than 1200 mm in length in the direction of the corrugations. It shall be prepared as follows:

- (a) Examine the test piece to ensure that it is free from any coating or sealing not normal to the product and likely to prevent entry of water.
- (b) Mark the test piece to identify it with the lot from which it was taken.

NOTES:

- 1 An indelible pencil is suitable.
 - 2 The marks should not be scratched in.
- (c) Condition the test piece for a least five days at a temperature of $23 \pm 5^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$.

D6 PROCEDURE

The procedure shall be as follows:

- (a) Support the test piece horizontally.
- (b) Seal the frame to the presentation surface of the test piece, ensuring a watertight joint.
- (c) Fill the frame, with clean and fresh water, to a height of 20 mm above the tops of the corrugations.
- (d) Maintain the ambient temperature at $23 \pm 5^{\circ}\text{C}$ and the relative humidity at $50 \pm 5\%$.
- (e) After a period of 24 h, examine the underside of the test piece for water droplets and record.

D7 REPORT

The report shall include the following:

- (a) The identity of the lot from which the sheet was selected.
- (b) The sheet classification.
- (c) Whether or not droplets of water were observed on the underside of the test piece.
- (d) Reference to this Standard, i.e. AS/NZS 2908.1.

APPENDIX E

DETERMINATION OF RESISTANCE TO HOT WATER SOAKING OF CORRUGATED CELLULOSE-CEMENT SHEETS

(Normative)

E1 SCOPE

This Appendix sets out the method for determining the resistance of cellulose-cement corrugated sheets to soaking in hot water.

E2 PRINCIPLE

Two sets of test pieces are selected. One set is immersed in a water bath at an elevated temperature for the prescribed period. The other set is wrapped in plastic sheeting for a prescribed period and then immersed in a water bath at ambient temperature for another prescribed period. Both sets are examined for physical deterioration. The mean bending strengths of the sets are determined and compared with each other and the mean strength requirements specified in Clause 7 of this Standard.

E3 APPARATUS

In addition to the apparatus specified in Paragraph C3 of Appendix C, the following are also required:

- (a) A corrosion-resistant trough or bath at least 900 mm × 150 mm × 1400 mm deep capable of maintaining a temperature of $60 \pm 2^\circ\text{C}$, with water circulation. An automatic water level control is desirable.
- (b) A corrosion-resistant trough or bath at least 900 mm × 150 mm × 1400 mm deep. An automatic water level control is desirable.
- (c) Plastic wrapping of sufficient size to cover one set of test pieces completely.

E4 SAMPLING

When there is a change in formulation or processing, not less than six sample sheets shall be selected from a production lot satisfying the strength requirements of Clause 7 of this Standard. The sample sheets shall have been consecutively manufactured.

E5 TEST PIECES

The test pieces are prepared as follows:

- (a) Examine each sample sheet from which the test pieces are to be taken and ensure that it is free from any coating or sealing not normal to the product and likely to prevent entry of water.
- (b) From each sample, cut a length, in the direction of the corrugations, not less than 1200 mm and not more than 1350 mm.
- (c) Reduce both edges of the sample by cutting along the axes of the outer valleys, as shown in Figure C2. This forms one test piece.
- (d) Mark the test pieces to identify them with the lot from which they were taken.

NOTES:

- 1 An indelible pencil is suitable.
 - 2 The marks should not be scratched in.
- (e) Repeat Steps (a) to (d) for the other test pieces.

E6 PROCEDURE

The procedure is as follows:

- (a) Divide the test pieces into two equal sets and designate the sets 'reference' and 'hot water immersion' respectively.
- (b) Wrap the reference set in plastic sheeting and store at ambient temperature. After 56 d, unwrap the set and immerse in water at ambient temperature for 48 h.
- (c) Immerse the hot water immersion set in water at $60 \pm 2^\circ\text{C}$ for 56 ± 2 d.
- (d) Remove both sets from the water and allow to drain.
- (e) Examine the hot water immersion set for cracks, structural alterations and delaminations. Record any occurrences.
- (f) Place a test piece on the supports of the testing machine so that the corrugations are at right angles to them (see Figure C1, Appendix C).
- (g) Through the loading beam, apply a load at a uniform rate of approximately 10 kN/min until the test piece fails.
- (h) Record the load at which failure occurs, in newtons.
- (i) Measure and record to the nearest millimetre the actual width adjacent to the break of the test piece.
- (j) Calculate the load per metre required to break the test piece, in newtons per metre.
- (k) Repeat Steps (f) to (j) for the remaining hot water immersion test pieces.
- (l) Repeat Steps (f) to (j) for all the reference test pieces, in one day.

E7 REPORT

The report shall include the following:

- (a) The identity of the lot from which the sheets were selected.
- (b) The sheet classification.
- (c) The breaking load for each test piece.
- (d) The mean breaking load per metre for the hot water immersion test pieces, in newtons per metre.
- (e) The mean breaking load per metre for the reference test pieces, in newtons per metre.
- (f) The difference of the mean breaking loads expressed as a percentage of the mean breaking load per metre of the reference test pieces.
- (g) Occurrence of cracks, structural alterations and delaminations.
- (h) Reference to this Standard, i.e. AS/NZS 2908.1

Standards Australia

Standards Australia is an independent company, limited by guarantee, which prepares and publishes most of the voluntary technical and commercial standards used in Australia. These standards are developed through an open process of consultation and consensus, in which all interested parties are invited to participate. Through a Memorandum of Understanding with the Commonwealth government, Standards Australia is recognized as Australia's peak national standards body.

Standards New Zealand

The first national Standards organization was created in New Zealand in 1932. The Standards Council of New Zealand is the national authority responsible for the production of Standards. Standards New Zealand is the trading arm of the Standards Council established under the Standards Act 1988.

Australian/New Zealand Standards

Under an Active Co-operation Agreement between Standards Australia and Standards New Zealand, Australian/New Zealand Standards are prepared by committees of experts from industry, governments, consumers and other sectors. The requirements or recommendations contained in published Standards are a consensus of the views of representative interests and also take account of comments received from other sources. They reflect the latest scientific and industry experience. Australian/New Zealand Standards are kept under continuous review after publication and are updated regularly to take account of changing technology.

International Involvement

Standards Australia and New Zealand are responsible for ensuring that the Australian and New Zealand viewpoints are considered in the formulation of international Standards and that the latest international experience is incorporated in national and Joint Standards. This role is vital in assisting local industry to compete in international markets. Both organizations are the national members of ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission).

Visit our Web sites

www.standards.com.au

www.standards.co.nz



S t a n d a r d s Australia

PO Box 1055 Strathfield NSW 2135

Administration

Phone (02) 9746 4700

Fax (02) 9746 8450

Email mail@standards.com.au

Customer Service

Phone 1300 65 46 46

Fax 1300 65 49 49

Email sales@standards.com.au

Internet www.standards.com.au



STANDARDS

NEW ZEALAND

Paerewa Aotearoa

Level 10 Radio New Zealand House

155 The Terrace Wellington 6001

(Private Bag 2439 Wellington 6020)

Phone (04) 498 5990

Fax (04) 498 5994

Customer Services (04) 498 5991

Information Service (04) 498 5992

Email snz@standards.co.nz

Internet www.standards.co.nz

This page has been left intentionally blank.