

Australian/New Zealand Standard™

Methods of test for pulp and paper

Method 407: Ring crush test



AS/NZS 1301.407:2017

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee PK-019, Methods of Test for Pulp and Paper. It was approved on behalf of the Council of Standards Australia on 2 March 2017 and by the New Zealand Standards Approval Board on 7 March 2017.
This Standard was published on 2 May 2017.

The following are represented on Committee PK-019:

Appita
Monash University
New Zealand Paper Forum
Scion

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 Standards may also be withdrawn.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 Web Shop at www.saiglobal.com or Standards New Zealand web site at www.standards.govt.nz and looking up the relevant Standard in the on-line catalogue.

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 Standards Australia or the New Zealand Standards Executive at the address shown on the back cover.

This Standard was issued in draft form for comment as DR AS/NZS 1301.407:2016.

Australian/New Zealand Standard™

Methods of test for pulp and paper

Method 407: Ring crush test

First published in Australia as AS P1.P407m—1962.
First published in New Zealand as Appita P407ts—1962.
Jointly revised and designated AS/NZS 1301.407s:1993.
Third edition 1997.
Jointly revised and designated AS/NZS 1301.407:2017.

COPYRIGHT

© Standards Australia Limited

© The Crown in right of New Zealand, administered by the New Zealand Standards Executive

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 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, PO Box 1473, Wellington 6140.

ISBN 978 1 76035 733 7

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee PK-019 Methods of Test for Pulp and Paper, to supersede AS/NZS 1301.407s:1997.

The objective of this Standard is to provide a measure of the resistance to crushing due to in-plane compressive forces that can occur during shipment or storage of fibreboard shipping containers.

This Standard is an adoption with national modifications and has been reproduced from ISO 12192:2011, *Paper and board—Determination of compressive strength—Ring crush method* and has been varied as indicated to take account of Australian/New Zealand conditions. The modifications are specified in the normative Appendix ZZ. Modifications to the design and use of a mechanical test piece feeder are provided in the informative Appendix ZA.

Similar Standards that are also used in place of this Standard are TAPPI T818, *Ring Crush of Paperboard (flexible Beam Method)* and TAPPI T822, *Ring Crush of Paperboard (Rigid Support Method)*.

As this Standard is reproduced from an International Standard, the following applies:

- (A) In the source text ‘International Standard’ should read ‘this Australian/New Zealand Standard’.
- (B) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian Standard</i>
ISO		AS/NZS
		1301 Methods of test for pulp and paper
186	Paper and board—Sampling to determine average quality	1301.417s Sampling to determine average quality
534	Paper and board—Determination of thickness, density and specific volume	1031.426s Paper and board—Determination of thickness, density and specific volume

Only normative references that have been adopted as Australian/New Zealand Standards have been listed.

CONTENTS

1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Principle	2
5	Apparatus	2
6	Sampling	4
7	Conditioning	4
8	Preparation of test pieces	4
9	Procedure	4
10	Calculation of results	5
10.1	Ring crush resistance	5
10.2	Ring-crush-resistance index	6
11	Test report	6
Annex A (informative)	Precision	7
Bibliography		10

INTRODUCTION

Fibreboard shipping containers are frequently subjected to in-plane compressive forces during shipment or storage. Therefore, resistance to crushing is an important measure of the performance characteristics of the containers.

The resistance to crushing depends on the design of the containers and on the in-plane crush resistance of the components of the board from which it is made. The in-plane crush resistance of these components can be measured by the ring crush test.

AUSTRALIAN/NEW ZEALAND STANDARD

Methods of test for pulp and paper**Method 407:
Ring crush test****1 Scope**

This International Standard specifies a method for the determination of the edgewise compressive strength (ring crush resistance) of paper and paperboard, especially board used in the manufacture of fibreboard shipping containers.

This International Standard is applicable to all paper and paperboard with a thickness in the range 100 µm to 580 µm. For samples having a thickness below 280 µm, test values can result from a combination of both buckling failure and pure compression.

NOTE For samples having a thickness exceeding 580 µm, strain within the sample arising from bending the test piece into a cylinder might affect the test result (see References [6] and [7] in the Bibliography).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 186, *Paper and board — Sampling to determine average quality*

ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

ISO 534, *Paper and board — Determination of thickness, density and specific volume*

ISO 13820, *Paper, board and corrugated fibreboard — Description and calibration of compression-testing equipment*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1**compressive strength**

maximum compressive force per unit length that a test piece of paper or board can withstand until the onset of failure

NOTE The compressive strength is expressed in kilonewtons per metre.

3.2**ring crush resistance**

maximum compressive force per unit length that a narrow test piece bent into the form of a cylinder (ring) can withstand on its edge without failure under the conditions defined in this International Standard

NOTE The ring crush resistance is expressed in kilonewtons per metre.

3.3**ring-crush-resistance index**

ring crush resistance divided by the grammage

NOTE The ring-crush-resistance index is expressed in kilonewton metres per gram.

4 Principle

A test piece of paper or board, in the form of a narrow strip held in a ring form, is subjected to an increasing edgewise compressive force until the onset of collapse.

The ring crush resistance is calculated from the maximum compressive force and the length of the test piece.

5 Apparatus

5.1 Cutting device, consisting of a die cutter, capable of accurately cutting the test pieces to the specified dimensions with clean, sharp, parallel and straight edges. Other cutting devices, such as a double-knife cutter, may be used provided they can be shown to give similar test results.

5.2 Test-piece holder (see Figure 1), consisting of a base block (item 1 in Figure 1), preferably cylindrical, having a cylindrical recession which, together with a removable central disc (item 3 in Figure 1), forms an annular groove (item 5 in Figure 1).

The recession shall have an inside diameter of $49,30 \text{ mm} \pm 0,05 \text{ mm}$ and be $6,35 \text{ mm} \pm 0,25 \text{ mm}$ deep with its bottom parallel to the base of the block to within $0,01 \text{ mm}$. The disc (item 3 in Figure 1) is $6,35 \text{ mm} \pm 0,25 \text{ mm}$ thick. To accommodate test pieces of various thicknesses, discs of various diameters shall be provided, so that the width of the groove (item 5 in Figure 1) formed between the edge of the disc and the wall of the cylindrical recess may be adjusted to be at least 150 %, but not more than 175 %, of the calliper of the test piece being tested. Suitable disc diameters are given in Table 1.

A centring pin (item 4 in Figure 1) is fixed in the exact centre of the cylindrical recess. The pin can be recessed from the base of the block but shall not protrude from the bottom. Each disc shall have a hole of slightly larger diameter at its exact centre to accommodate the pin, which will then correctly centralize the disc and provide a uniform annular groove.