Australian Standard®

Methods for bend and related testing of metals

Part 3: Tubular products

This Australian Standard was prepared by Committee MT/6, Mechanical Testing of Metals. It was approved on behalf of the Council of Standards Australia on 18 October 1988 and published on 13 March 1989.

The following interests are represented on Committee MT/6:

Aluminium Development Council

Bureau of Steel Manufacturers of Australia

CSIRO, Division of Applied Physics

Confederation of Australian Industry

Department of Defence

Federal Chamber of Automotive Industries

Institute of Metals and Materials, Australasia

Metal Trades Industry Association of Australia

National Association of Testing Authorities, Australia

Railways of Australia Committee

Society of Automotive Engineers—Australasia

University of Sydney

University of Wollongong

This Standard was issued in draft form for comment as DR 86135.

Australian Standard®

Methods for bend and related testing of metals

Part 3: Tubular products

First published as AS 2505.3—1989.

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7262 5434 7

PREFACE

This Standard was prepared under the direction of the Standards Australia Committee on Mechanical Testing of Metals. Whereas previously, bend tests for different products were specified in various product Standards, this Standard, for ease of reference, has consolidated all bend and related tests on metallic tubular products.

Hence this Standard is designed to be used in conjunction with various appropriate product Standards.

This Standard is one of the series AS 2505, *Methods for bend and related testing of metals*.

Other Standards in the series are as follows:

AS
2505.1 *Sheet, strip and plate*

2505.2 *Bars, rods and solid shapes*

2505.4 *Wire*

2505.5 *Torsion and wrapping tests on wire*

During preparation of the Standard, consideration was given to the following ISO Standards:

ISO
8491 *Metallic materials—Tube (in full section)—Bend test*

8492 *Metallic materials—Tube—Flattening test*

8493 *Metallic materials—Tube—Drift expanding test*

8494 *Metallic materials—Tube—Flanging test*

CONTENTS

STANDARDS AUSTRALIA

Australian Standard

Methods for bend and related testing of metals

Part 3: Tubular products

1 SCOPE. This Standard sets out four test methods for determining the resistance of metallic seamless and welded tubes to plastic deformation.

NOTES

1. Criteria for assessment of results of tests are not included; they are set out in appropriate product Standards.
2. Appendix A contains advice and recommendations on information which should be supplied by the purchaser at the time of enquiry or order.

2 DEFINITIONS. For the purpose of this Standard, the definitions below apply.

2.1 Test sample—a portion of metal or product, or items selected from a batch or group by a sampling procedure.

2.2 Test specimen—a portion, or a single item, taken from a test sample for the purpose of applying a particular test.

2.3 Test piece—a piece taken from each test specimen, and suitably prepared for testing.

3 NOTATION. The quantity symbols used in this Standard are listed below.

D —original external diameter of tube
D_u —ultimate external diameter after testing
H —distance between platens
L —length of test piece
R —radius of the flange
a —wall thickness of tube
r —internal radius of bend
α —angle of bend
β —conical angle of the mandrel

4 APPARATUS. The test apparatus shall be of such construction that test pieces can be appropriately controlled during the performance of the test, and be of adequate design to ensure reproducibility of results. The required apparatus is shown in Figures 1, 2, 3 and 4 as appropriate to the specific test methods.

All mandrels and drift surfaces shall have an N4 finish (R_a = 0.2 μm) or smoother, and a surface hardness of 600 HV minimum.

5 TEMPERATURE OF TEST PIECE. The temperature of the test piece at the beginning of the test shall be room temperature which, unless otherwise specified in the product Standard, shall be between 4°C and 40°C.

In the event of dispute, the temperature of the test piece at the beginning of the test shall be 20 ± 5°C.

6 BEND TEST (FULL SECTION).

6.1 Test piece selection and preparation. The test piece shall be selected and prepared for testing as specified in the relevant product Standard. If not specified, the test piece shall be taken from a portion of straight tube, and be of length suitable for the test to be carried out in the bending machine.

6.2 Test procedure. The full-section bend test shall be carried out as follows:

(a) Insert the test piece in the bend test machine using a grooved former of specified radius (see Figure 1).

Where welded tubes are being tested, position the weld in relation to the plane of bending as specified in the product Standard.

Where not specified in the product Standard, place the weld at 45 degrees to the contact line at the start of the test.

(b) Bend the tube until the angle of bend reaches the value specified in the product Standard.

(c) Remove the force and examine the external bent portion of the test piece for cracks, or as required by the product Standard.

6.3 Interpretation. Cracks which require magnification to render them visible shall be disregarded, unless the product Standard specifies otherwise.

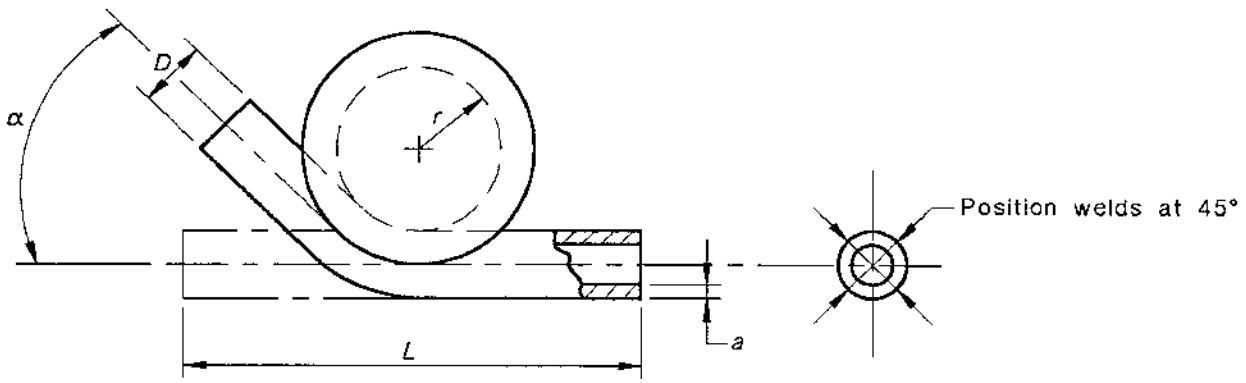

FIGURE 1 BEND TEST (FULL SECTION)