AS 3670—1989

Australian Standard®

Non-destructive testing—Ultrasonic testing of universal beams and columns

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The following interests are represented on Committee MT/7:

Australian Institute for Non-destructive Testing

Australian Nuclear Science & Technology Organization

Australian Pipeline Industry Association

Australian Welding Institute

Bureau of Steel Manufacturers of Australia

Department of Defence

Department of Industrial Relations & Employment, N.S.W.

Department of Labour, Vic.

Electricity Supply Association of Australia

Institute of Australian Foundrymen

Metal Trades Industry Association of Australia

National Association of Australian State Road Authorities

National Association of Testing Authorities, Australia

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PREFACE

This Standard was prepared by the Standards Australia Committee on Non-destructive Testing of Metals and Materials as the result of a request from the steel industry to provide a standard method for the non-destructive testing of hot-rolled steel sections, in particular, universal beams and columns.

CONTENTS

STANDARDS AUSTRALIA

Australian Standard

Non-destructive testing—Ultrasonic testing of universal beams and columns

1 SCOPE. This Standard sets out methods for the manual ultrasonic testing of steel universal beams and columns for detecting laminar, inclusion cluster and inclusion stringer type discontinuities, and defines one quality level (Level 1) in terms of freedom from specific discontinuities.

NOTE: Appendix A contains advice and recommendations on information which should be supplied by the purchaser at the time of enquiry or order.

2 REFERENCED DOCUMENTS. The following documents are referred to in this Standard:

AS
1929 Non-destructive testing—Glossary of terms

2083 Calibration blocks and their methods of use in ultrasonic testing

3 DEFINITIONS. For the purpose of this Standard, the definitions given in AS 1929 and those below apply.

3.1 Discontinuity indication—the appearance of an echo on the flaw detector screen (using A-scan presentation) between the surface position and the back echo position, or a reduction of the original back echo.

NOTE: Care needs to be taken when observing a reduction of the original back echo without the simultaneous appearance of a discontinuity echo, since a loss of coupling efficiency may also cause this effect.

3.2 Significant discontinuity—at the sensitivity levels specified in Clause 5.5, any lamination, inclusion cluster or inclusion stringer type discontinuity (see Clauses 3.3, 3.4 and 3.5) which exceeds the requirements specified in Section 7.

3.3 Lamination—at the sensitivity levels specified in Clause 5.5, any discontinuity causing total reflection of acoustic energy for a probe movement of 5 mm in a direction transverse to the major dimension of the discontinuity.

NOTE: Care needs to be exercised in assessing a lamination where it is located exactly in the centre of the section thickness, due to the fact that the back wall echoes are replaced by multiples of the flaw echo.

3.4 Inclusion cluster—at the sensitivity levels specified in Clause 5.5, a discontinuity for which individual discontinuity echoes are at least 50 percent of the reduced back echo, or which causes at least a 50 percent reduction in the back echo obtained from a discontinuity free area of the section.

NOTE: Discontinuities separated by less than 12 mm are considered continuous.

3.5 Inclusion stringer—a discontinuity producing an linearity indication of the inclusion cluster type for which any movement of the probe transverse to the direction of rolling causes a loss of indication.

4 EQUIPMENT.

4.1 General. The ultrasonic testing system shall be capable of displaying the presence of discontinuities described in this Standard and of delineating their boundary contours in the plane of the web or flange of the beam or column.

4.2 Probes.

4.2.1 *General.* Normal compression probes designed to operate at frequencies nominally within the range of 2 MHz to 5 MHz shall be used. For scanning and evaluation, the probes shall be either twin or single as specified in Table 1.

TABLE 1

TYPES OF PROBES USED FOR TESTING

Web or flange nominal thickness mm	Probe type and frequency
≥ 5 ≤ 15	Twin, 4 MHz to 5 MHz
> 15 ≤ 40	Twin or single, 2 MHz to 5 MHz
> 40	Twin or single, 2 MHz to 3 MHz

4.2.2 *Protective diaphragms.* Single probes used for contact testing may be fitted with a protective diaphragm, provided that adequate sensitivity and resolution are retained.

4.2.3 *Probe size.* Areas of individual transmitters or receivers shall be—

(a) between 50 mm^2 and 350 mm^2 for twin probes; and

(b) between 300 mm^2 and 650 mm^2 for single probes.

4.3 Presentation. A-scan presentation shall be used.

4.4 Gain control. A gain control, calibrated in steps not exceeding 2 dB, shall be used for measuring the ratios of ultrasonic amplitudes.

Suppression should not be used. If used, its effect on vertical and horizontal linearity shall be known and recorded.

4.5 Couplant. A couplant with good wetting characteristics and compatible with the steel under test shall be used.

4.6 Equipment checks. The equipment parameters specified in Table 2 shall be checked in accordance with AS 2083.

TABLE 2

EQUIPMENT CHECKS

Equipment parameter	Requirement or acceptable variation
Horizontal linearity	±2% deviation over full screen width
Vertical linearity	±2 dB between 30% and 100% graticule height
Resolution	Echoes resolved from 4 mm step, (see Clause 7.2 of AS 2083)
Overall system gain	20 dB minimum