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Australian Standard 2207—1980

METHODS FOR THE ULTRASONIC TESTING OF FUSION WELDED JOINTS IN STEEL

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Atomic Energy Commission

Australian Institute for Non-Destructive Testing

Australian Welding Institute

Bureau of Steel Manufacturers of Australia

Confederation of Australian Industry

Department of Defence

Department of Labour and Industry, N.S.W.

Department of Labour and Industry, Victoria

Electricity Supply Association of Australia

Institute of Australian Foundrymen (N.S.W. Division)

National Association of Testing Authorities

Railways of Australia Committee

Society of Automotive Engineers—Australasia

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AUSTRALIAN STANDARD

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AS 2207—1980

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PREFACE

This edition of this standard was prepared by the Association's Committee on Non-destructive Testing to replace the 1979 edition which was a revision of AS B261, Part 1—1968.

During the preparation of the 1979 edition the committee considered the testing methods written into overseas standards, and practices which have evolved in the field of non-destructive testing in Australia, including the following standards:

JIS Z2344	Ultrasonic Testing of Metals by the Pulse Echo Technique
BS 3889	Methods for Non-destructive Testing of Pipes and Tubes Part 1A—Ultrasonic Testing of Ferrous Pipes (excluding Cast)
AS 1710	Method for Ultrasonic Testing of Carbon and Low Alloy Steel Plate, and Classification of Quality

Consideration was also given to recommendations of the British Welding Institute and to technical literature on the subject, especially the work of Mr C. Abrahams of the United Kingdom. Acknowledgement is made of the assistance received from these sources.

The standard covers the use of pulse-echo ultrasonic testing equipment under direct contact conditions. It describes various test methods (using ultrasonic sound waves) which may be specified by manufacturers, inspecting authorities, or purchasers for the testing of welded structures.

The standard has been arranged in a new format and contains methods specified in more detail than previously. New methods have been introduced for the sizing of discontinuities based on a 20 dB intensity drop system.

Details and examples are given for the use of reflectivity diagrams for both normal and angle probes. A nomograph has also been included for different probe sizes when determining compensation for curvature.

Additional guidelines have also been introduced for use by purchasers, designers and testing authorities.

The standard has been written to include standard test methods. Methods which use grass, natural discontinuities or corner reflectors as reference or calibration standards are considered to be non-preferred methods and have not been included because they cannot be related back to a 1.5 mm side-drilled hole because the response obtained may not be consistent.

The successful application of ultrasonic testing depends upon the technical competence of the testing personnel and on their ability to interpret test results. It is essential that testing personnel be conversant with the test equipment and be capable of demonstrating to the satisfaction of interested parties their technical competence and interpretive ability (see also Appendix A).

It is emphasized that diagnosis of the nature of discontinuities located by ultrasonic testing can be made only by consideration of both metallurgical and ultrasonic factors. Consideration should therefore be given to the method of welding, and the type, position and probable distribution of any discontinuities likely to be present. The procedure also depends upon the fact that a suitable design is essential, cooperation between design and non-destructive testing specialists at an early stage is recommended.

It should be noted that facilities for non-destructive testing are afforded by laboratories registered by the National Association of Testing Authorities, Australia, for the field and class of testing covered by this standard.

To avoid unnecessary rejection of satisfactory welds this edition introduces a 20 percent threshold limit for Level 1 testing. Level 4 testing has been amended to provide for a threshold cut-off at 20 percent of the evaluation sensitivity.

To avoid possible confusion in the interpretation of requirements for surface preparation the requirements have been more carefully outlined.

Procedures for the testing of fillet welds in lap joints and web/flanges have also been updated.

This standard may require reference to the following Australian standards:

AS 1554	SAA Code for Welding in Building
AS 1929	Glossary of Terms Used in Non-destructive Testing
AS 2083	Calibration Blocks and their Method of Use in Ultrasonic Testing
AS Z5	Glossary of Metal Welding Terms

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SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard sets out methods for manual ultrasonic testing of full or partial penetration, fusion welded joints in steels of thickness not less than 6 mm, using A-scan presentation.

This standard precludes the testing of longitudinal welds where—

(a) radius of curvature on fabrications is less than 125 mm; and

(b) the ratio of thickness to outside diameter on tubular fabrications over 250 mm diameter exceeds 0.22.

NOTES:

1. The methods described in this standard assume that ultrasonic testing personnel can interpret indications given by a test and can distinguish between cracks and other discontinuities.
2. Supplementary information required to establish appropriate test methods is set out in Appendix A.

1.2 APPLICATION. Procedures described in this standard enable the test operator to determine the location, size and subsequent identification of discontinuities in seven different types of weld configurations designated by letter as follows:

*Weld designation**	*Description*	*Test method designation*
BCD	Butt weld—double preparation—complete penetration	A
BCS	Butt weld—single preparation	B
TC	Tee butt weld—complete penetration	C
TP	Tee butt weld—incomplete penetration	D
TT	Tee butt weld—cruciform joint	E
T (C or P)	Butt weld—set through (including nozzles)	F
C (C or P)	Butt weld—set on (including nozzles)	G

NOTE: The examination of other weld types may be derived from the seven weld types specified.

The actual method to be used and the sentencing of discontinuities shall be in accordance with the relevant product specification, application code, contract or order.

Levels 1, 2 and 3 specify a threshold sensitivity below which no discontinuities other than cracks are reported.

Above the threshold for Level 1 all discontinuities are sized for length and height using a beam profile method.

Above the threshold for Levels 2 and 3 all discontinuities are evaluated for length only using a beam profile method. For these levels the threshold sensitivity is constant irrespective of thickness.

Level 4 testing uses a number of reference levels which vary with metal thickness and requires the evaluation of discontinuities with a reflectivity equal to or greater than 20 percent of the reference level.

Level 5 testing may involve the use of a higher or lower evaluation sensitivity than those specified in this standard.

1.3 DEFINITIONS. For the purpose of this standard the terms and definitions given in AS 1929 and AS Z5 apply (see Appendix F for symbols and notations).

*Aligned with AS 1554.