Australian Standard®

NON-DESTRUCTIVE TESTING—DETERMINATION OF THICKNESS

Part 3 — USE OF ULTRASONIC TESTING

This Australian standard was prepared by Committee MT/7, Non-destructive Testing of Metals and Materials. It was approved on behalf of the Council of the Standards Association of Australia on 24 June 1985, and published on 6 September 1985.

The following interests are represented on Committee MT/7:

Australian Atomic Energy Commission
Australian Institute for Non-destructive Testing
Australian Pipeline Industry Association
Australian Welding Institute
Bureau of Steel Manufacturers of Australia
Commonwealth Aircraft Corporation Limited
Confederation of Australian Industry
Department of Defence
Department of Industrial Relations, N.S.W.
Electricity Supply Association of Australia
Institute of Australian Foundrymen
Metal Trades Industry Association of Australia
Ministry of Employment and Training Victoria
National Association of Australian State Road Authorities
National Association of Testing Authorities, Australia
Pipeline Authority
Railways of Australia Committee
Society of Automotive Engineers — Australasia

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PREFACE

This standard was prepared by the Association's Committee on Non-destructive Testing of Metals and Materials, at the request of industry. It provides a method for the measurement of thickness by non-destructive testing, and is one of a series of standards on thickness measurements; others in the series are as follows:

Part 1 Determination of the Wall Thickness of Pipe by the Use of Radiography

Part 2 Determination of the Remaining Wall Thickness of Corroded Pipe by the Use of Radiography

During preparation of the standard, consideration was given to the following documents issued by the Japanese Society for Non-destructive Inspection:

NDIS 2105 — Evaluation of Performance Characteristics of Portable Pulse-echo Ultrasonic Thickness Meter

NDIS 2408 — Thickness Measuring Method using Portable Pulse-echo Ultrasonic Thickness Meters.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
NON-DESTRUCTIVE TESTING — DETERMINATION OF THICKNESS

PART 3 — USE OF ULTRASONIC TESTING

1 SCOPE. This standard sets out five methods for the determination of thickness of material based on the use of ultrasonic pulse-echo principles where scanning and reflecting surfaces are substantially parallel. The methods are as follows:

(a) Single spot — single measurement (SS).

(b) Single spot — double measurement (SD).

(c) Multiple spot measurements (MS).

(d) Close grid survey method (CG).

(e) Open grid method (OG).

NOTES:

1. Supplementary information required to augment the standard is set out in Appendix A.
2. Factors affecting the results and order of accuracy achieved are given in Appendix F.

2 APPLICATION. Methods described in this standard are suitable for the determination of thickness of materials where surface temperature is within the range of -10°C to 60°C and where the velocity of sound through the material is either known or can be determined.

The methods may be used where surface temperature is lower than -10°C, or higher than 60°C, but in such cases special precautions are required.

The methods may also be used where Base Line Survey or Key Point Survey concepts are applied as follows:

2.1 Base Line Survey. Base Line Survey entails the measurement of components at nominated locations on new items or alternatively at the time of commissioning of new plant. Results can then be kept on record for comparison against subsequent measurements taken after service use. In addition, initial survey results can be compared to nominated design or drawing thicknesses for construction checking purposes.

2.2 Key Point Survey. Key Point Survey entails routine repeat testing at specific nominated positions on operating components. The locations of key test points are usually determined from anticipated performance characteristics of the component or alternatively from the performance history of the component. Duration between surveys is similarly determined. The Key Point Survey concept allows component performance to be monitored in terms of section loss at the test location, thus allowing maintenance and repair scheduling to be carried out on an ordered basis.

In the application of this standard, the order of accuracy shall be the accuracy of the test equipment. Additional factors affecting ultimate accuracy of the test depend upon conditions peculiar to individual applications, such as the state of the reflecting and contact surfaces. Flat, smooth surfaces are ideal for accurate measurements whereas irregular surfaces can cause variable ultrasonic response (see Appendix C).

Small pits or pinholes may not be detected because of insufficient reflecting surface.

NOTE: Guidance on the determination of thickness at elevated temperatures is given in Appendix B.

3 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 1929 Non-destructive Testing — Glossary of Terms

AS 2083 Calibration Blocks and Their Methods of Use in Ultrasonic Testing.

4 DEFINITIONS. For the purpose of this standard, the terms and definitions given in AS 1929 and the following apply:

4.1 Nominal thickness (T_n) — specified material thickness at the time of manufacture.

NOTE: Nominal thickness is usually specified in product standards and shown on drawings.

4.2 Indicated thickness (T_i) — thickness indicated by the ultrasonic test before the application of correction factors.

4.3 Reported thickness (T_r) — indicated thickness corrected for material and temperature variations between the material under test and the calibration block.

4.4 Testing authority — test laboratory or establishments which provide non-destructive testing services.

4.5 Delay block spacer — a block of material used between the test surface and the probe to prevent overheating of the probe and for measuring thin sections.

5 EQUIPMENT.

5.1 General. Ultrasonic instruments for thickness determinations shall use one of the following systems:

(a) A-scan presentation.

(b) Digital display.

(c) Meter display.

5.2 A-scan presentation.

5.2.1 *General.* Equipment shall be capable of displaying an ultrasonic echo with sufficient definition to permit measurements within ±1 percent over the test range.