



Metallic materials — Drop weight tear test for steels



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Preface

This Standard was prepared by Standards Australia Committee MT-006, Mechanical Testing of Metals, to supersede AS 1330—2004, *Metallic materials—Drop weight tear test for ferritic steels*.

The objective of this revision is to expand the range of applicable pipe sizes and to revise the test procedure used in this test method.

In the preparation of this Standard, reference was made to recent research and the following standards:

ASTM E436, *Standard test method for drop-weight tear tests of ferritic steels*

EN 10274, *Metal materials — Drop weight tear test*

API RP 5L3, *Recommended practice for conducting drop-weight tear tests on line pipe*

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

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NOTES

Australian Standard®

Metallic materials — Drop weight tear test for steels

1 Scope

This Standard specifies the method for conducting a drop weight tear test (DWTT) for carbon steel, low alloy steel, and similar materials. In particular, it applies to testing line-pipe, and strip or plate intended for line-pipe of 150 mm in diameter or greater but excludes the testing of weld metal. Where thickness is greater than 19 mm, an alternative method is permitted.

NOTE 1 Difficulty may be experienced in applying this test to material of thickness less than 5 mm.

This test may be used to determine the appearance of propagating fractures over the temperature range where the fracture mode changes from brittle (cleavage or flat) to ductile (shear or oblique).

NOTE 2 The test should be used for the following purposes:

- (a) For research and development, to study the effect of metallurgical variables such as composition or heat treatment, or of fabricating operations on the mode of fracture propagation.
- (b) For evaluation of materials for service, to indicate the suitability of materials for service applications by indicating fracture propagation behaviour at the service temperature(s).
- (c) For information or specification purposes, to provide a manufacturing quality control technique when suitable correlations have been established with service behaviour.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

3.1

anvil

part of the testing machine used to support the test piece during impact

3.2

cleavage area

area of the fractured surface of the test piece that has broken in a brittle manner and is normally identified by a shiny crystalline appearance

3.3

fracture appearance transition temperature

FATT

temperature required to cause a specified percentage of the fracture to occur by shear

EXAMPLE For 40% shear fracture at $-20\text{ }^{\circ}\text{C}$, this would be expressed as $\text{FATT}(40) = -20\text{ }^{\circ}\text{C}$.

3.4

gull-wing

specimen of pipe with the curvature undeformed in the test region and the remainder of the coupon bent such that the supported regions lie in the plane of the hammer

Note 1 to entry: A detailed description for forming a gull-wing test piece is given in [Appendix C](#).

3.5**hammer**

part of the test machine which strikes the test piece

3.6**may**

indicates the existence of an option

3.7**platen**

flat shaped tool to conduct flattening of the test specimen

3.8**sample**

portion of material or a group of items selected from a batch or group by a sampling procedure

3.9**shall**

indicates that a statement is mandatory

3.10**shear area**

area of the fractured surface of the test piece that has broken in a ductile manner and is normally identified by a grey silk-like appearance

3.11**should**

indicates a recommendation

3.12**striker**

part of the hammer which contacts with the test piece

3.13**test piece**

piece of steel prepared for testing following the procedure specified in this Standard

3.14**test specimen**

portion of material or single item taken from the sample for the purpose of applying a particular test

4 Symbols and abbreviated terms

The following symbols and abbreviated terms are used in this document:

a	Depth of pressed notch, in mm
L	Length of test piece, in mm
L_c	Minimum length of undeformed central portion of test piece, in mm
R_h	Radius of curvature of striker
R_n	Root radius of pressed notch
R_s	Radius of curvature of anvil support
S	Span between anvils, in mm
T	Thickness of test piece, in mm

W	Width of test piece, in mm
θ	Angle of pressed notch

5 Apparatus

5.1 Testing machine

The testing machine may be a falling weight type or a pendulum type. Other types of testing machine, e.g. with hydraulic actuators, may be used providing it can be demonstrated that their impact velocity and dynamic performance conform to the requirements of [Clause 5.3](#).

5.2 Anticipated fracture

The energy available at impact shall be greater than the anticipated fracture absorption energy of the test piece.

NOTE 1 To ensure regular crack propagation, an available energy of 1.5 times the absorbed energy is generally sufficient. If the absorbed energy is not measured, the minimum required impact energy may be estimated from the Charpy V-notch energy adjusted for the test piece cross-sectional fracture area.

NOTE 2 As a guide to the design of the equipment, it has been found that approximately 2800 J is required to completely fracture a steel test piece of up to 13 mm thickness with a tensile strength of up to 700 MPa.

5.3 Test machine setup

This test involves fracturing a test piece containing a pressed notch by supporting it near its ends and impacting it behind the notch; see [Figure 1](#).