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DROPWEIGHT TEST FOR NIL-DUCTILITY TRANSITION TEMPERATURE OF FERRITIC STEELS

METRIC UNITS

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Aluminium Development Council
Associated Chambers of Manufactures
Australian Institute of Metals
Australian and New Zealand Railways Conferences
Australian Welding Research Association
Bureau of Steel Manufacturers of Australia
CSIRO, National Standards Laboratory
Department of Defence Standardization Committee
Department of Manufacturing Industry
Federal Chamber of Automotive Industries
Metal Trades Industry Association of Australia
National Association of Testing Authorities, Australia
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PREFACE

This standard was prepared by the Association's Committee on Mechanical Testing of Metals, under the direction of the Metals Standards Board.

The dropweight test (DWT) described in this standard is based largely on ASTM Specification E208 which originated in the United States Naval Laboratory* but has significant modifications developed in the Engineering Laboratories of the Snowy Mountains Hydro-Electric Authority†.

The essential feature of the test is the injection of a small brittle crack from an artificial crack-starter into test material while the test material is yielding in tension ahead of the crack front. The test result, the nil-ductility transition temperature, is defined as the temperature at which the material ceases to show ductility in the presence of the small brittle crack. Thus the test is a measure of resistance to the propagation of a small running brittle crack.

The main modification to the ASTM test has been the addition of the pressed notch crack-starter which has been found to be useful for the testing of steels and weld metal whose fracture toughness is significantly altered due to heating during the deposition of the ASTM brittle weld bead. Research has shown that for certain steels this crack-starter gives nil-ductility transition temperatures comparable with those determined with the brittle bead crack-starter.

The data obtained from this test are useful in the design of structures against brittle fracture. For example, when the design basis assumes that in the worst situation a significant defect exists to form a small running crack at yield stress, steel which has sufficient fracture toughness to arrest a small propagating crack at the minimum service temperature could be used. For other design bases the data may also be utilized as shown in the references below*.

This dropweight test should not be confused with the dropweight tear test (DWTT) (see AS 1330) or dynamic tear test (DT) which use different test pieces and loading arrangements.

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* PELLINI, W.S. and PUZAK, P.P., 'Fracture Analysis Diagram Procedures for the Fracture-safe Engineering Design of Steel Structures', *Welding Research Council Bull.* **88**, May 1963.

† HERBERT, D.C., BILSTON, K.J. and WARD, K.R., 'Notch Ductility of the Welded Steel Joint', *AWRA Bull.*, Vol. 1, No 3, August 1967 and *Australian Welding Journal*, Vol. 11, No 1, September 1967.

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