Designation: E 208 – 95a (Reapproved 2000)

Standard Test Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels[1]

This standard is issued under the fixed designation E 208; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

INTRODUCTION

This drop-weight test was developed at the Naval Research Laboratory in 1952 and has been used extensively to investigate the conditions required for initiation of brittle fractures in structural steels. Drop-weight test facilities have been established at several Naval activities, research institutions, and industrial organizations in this country and abroad. The method is used for specification purposes by industrial organizations and is referenced in several ASTM specifications and the ASME Boiler and Pressure Vessel Code. This procedure was prepared to ensure that tests conducted at all locations would have a common meaning.

1. Scope

1.1 This test method covers the determination of the nil-ductility transition (NDT) temperature of ferritic steels, ⅝ in. (15.9 mm) and thicker.

1.2 This test method may be used whenever the inquiry, contract, order, or specification states that the steels are subject to fracture toughness requirements as determined by the drop-weight test.

1.3 The values stated in inch-pound units are to be regarded as the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions:*

2.1.1 *ferritic*—the word ferritic as used hereafter refers to all α-Fe steels. This includes martensitic, pearlitic, and all other nonaustenitic steels.

2.1.2 *nil-ductility transition (NDT) temperature*— the maximum temperature where a standard drop-weight specimen breaks when tested according to the provisions of this method.

3. Summary of Test Method

3.1 The drop-weight test employs simple beam specimens specially prepared to create a material crack in their tensile surfaces at an early time interval of the test. The test is conducted by subjecting each of a series (generally four to eight) of specimens of a given material to a single impact load at a sequence of selected temperatures to determine the maximum temperature at which a specimen breaks. The impact load is provided by a guided, free-falling weight with an energy of 250 to 1200 ft-lbf (340 to 1630 J) depending on the yield strength of the steel to be tested. The specimens are prevented by a stop from deflecting more than a few tenths of an inch.

3.2 The usual test sequence is as follows: After the preparation and temperature conditioning of the specimen, the initial drop-weight test is conducted at a test temperature estimated to be near the NDT temperature. Depending upon the results of the first test, tests of the other specimens are conducted at suitable temperature intervals to establish the limits within 10°F (5°C) for break and no-break performance. A duplicate test at the lowest no-break temperature of the series is conducted to confirm no-break performance at this temperature.

3.3 In 1984, the method of applying the crack-starter weld bead was changed from a two-pass technique to the current single-pass procedure, and the practice of repair-welding of the crack-starter weld bead was prohibited. For steels whose properties are influenced by tempering or are susceptible to temper embrittlement, the nil-ductility transition (NDT) temperature obtained using the single-pass crack-starter weld bead

[1] This test method is under the jurisdiction of the ASTM Committee E28 on Mechanical Testing and is the direct responsibility of Subcommittee E28.07 on Impact Testing.

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