INTERNATIONAL

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# Standard Test Method for Transverse Rupture Strength of Cemented Carbides[1]

This standard is issued under the fixed designation B406; 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 U.S. Department of Defense.*

## 1. Scope

1.1 This test method[2] covers the determination of the transverse rupture strength of cemented carbides.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI values in parentheses are provided for information only.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[3]

B276 Test Method for Apparent Porosity in Cemented Carbides

2.2 *ISO Standard:*[4]

ISO-3327 Hardmetals—Determination of Transverse Rupture Strength

## 3. Significance and Use

3.1 This test method is used as a means of determining the quality of cemented carbide grade powders by measuring their sintered strength. It is performed on test specimens prepared to specified shape, dimensions, and surface finish; test specimens may be prepared from finished parts if size permits. There is no known standard material for this test method. The transverse rupture strength of cemented carbides is not a design value.

3.1.1 Most commercial cemented carbides have mechanical behavior that is best classified as brittle (negligible ductility). Fracture strengths are dependent on internal or surface flaws. Examples of incoherent internal flaws are macropores, Type B porosity (see Test Method B276), and inclusions of foreign particles. Such flaws are randomly distributed spatially and in size within the sintered material. This imparts a statistical nature to any transverse rupture strength measurement.

3.1.2 The stress distribution in a beam in three-point loading is non-uniform. It increases linearly along the span to a maximum at the center, and varies linearly through any section from compression on the top to tension on the bottom. The maximum tensile stress therefore occurs at center span in the bottom most fibers of the sample, and is defined as the transverse rupture strength at failure. Failure is initiated at a random flaw site, which is most probably not coincident with the maximum stress. This imparts an additional statistical nature to transverse rupture strength measurements.

## 4. Apparatus

4.1 Either a specially adapted machine for applying the load or a special fixture suitable for use with a conventional load-applying machine may be used. In either case, the apparatus shall have the following parts:

4.1.1 Two ground-cemented-carbide cylinders 0.250 ± 0.001 in. (6.35 ± 0.02 mm) in diameter, at least 0.500 in. (13 mm) in length with the long axes parallel, and center to center spacing of 0.563 ± 0.005 in. (14.3 ± 0.1 mm).

4.1.2 A movable member (free to move substantially only in a line perpendicular to the plane established by the axes of the two cylinders) containing a 0.4 ± 0.05-in. (10 ± 1.3-mm) cemented-tungsten-carbide ball or a ground-cemented-carbide cylinder of the same dimensions as, and with axis parallel to, those of the two previously mentioned cylinders (see 4.1.1). This ball or cylinder shall be so positioned that movements of the member will cause the ball or cylinder to contact a specimen placed on the two lower cylinders at the midpoint of the span between them.

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[1] This test method is under the jurisdiction of ASTM Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.06 on Cemented Carbides.

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[2] This test method is comparable to ISO-3327.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.