

NOT MEASUREMENT
SENSITIVE

MIL-STD-1312-32
30 APRIL 1997

DEPARTMENT OF DEFENSE

TEST METHOD STANDARD

FASTENER TEST METHOD

METHOD 32

BARREL NUT TEST



AMSC N/A

FSC 53GP

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Systems Engineering and Standardization Department (SESD), Code 93, Lakehurst, NJ 08733-5100, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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1. SCOPE

1.1 Applicability. This method covers a procedure for testing barrel nuts in tension at room temperature. This procedure is intended to define the test required to determine the tensile strength of the barrel nut itself, not the strength of the fastener in a structural joint.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

MILITARY

MIL-STD-45662 Calibration System Requirements

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the standardization Document Order Desk, 700 Robbins Avenue Bldg 4D, Philadelphia PA 19111-5094)

2.2 Non-Government publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the document which are DOD adopted are those listed in the issue of the current DODISS cited in the solicitation. Unless otherwise specified, the issues not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E4 Standard Method of Verification of Testing Machines
 ASTM E83 Method of Verification and Classification of Extensometers

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. DEFINITIONS

Not applicable.

4. GENERAL REQUIREMENTS

4.1 Test apparatus.

4.1.1 Testing machine. The testing machine shall be capable of applying a tensile load at a controllable rate. The calibrating system for the machine shall conform to the requirements of MIL-STD-45662. Its accuracy shall be verified every 6 months by a method complying with ASTM E4, using a calibration device which shall have been calibrated by the National Bureau of Standards not more than 2 years prior to its use. The yield loads, ultimate loads and structural failure loads of the fasteners tested (see 5.4) shall be within the loading range of the testing machine as defined in ASTM E4.

4.1.2 Deflecting measuring device. The deflectometer shall be capable of installation so as to measure the relative movement between the test fixture and bolt retention cup and shall operate in conjunction with a recording device which plots applied load as a function of deflection. Load and extension ranges shall be used which give the initial portion of the load-extension curve a slope between 45 and 60 degrees.

4.1.3 Test fixtures. Test fixtures similar to those shown in figure I and 2 shall be used in the performance of the testing described herein. Unless otherwise specified, the nut holder shall be fabricated of steel and heat treated to Rockwell hardness C 41-44.

4.1.4 Test bolts. The bolt used for testing of the barrel nut shall be of sufficient strength to ensure nut failure without permanent elongation of the bolt. Tests resulting in bolt failure shall not be considered a satisfactory test of the nut.

5. DETAIL REQUIREMENTS

5.1 Test procedure.

5.1.1 Test Setup. A typical setup is depicted in Figure 1. The general arrangement of the apparatus within the test machine is subject to its equipment provisions and constraints. Appropriate safety precautions should be taken when testing these multiple-piece nuts.

5.1.1.1 Thread engagement. The bolt and nut assembly shall be tested with at least two thread pitches of the bolt extending through the nut.

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5.2 Loading rate. Tension load shall be applied to the fastener slowly and evenly. The rate of loading shall be in accordance with Table I. Fasteners larger or smaller than those in Table I shall be tested at rates producing 100,000 pounds/minute (+10 percent) per square inch of nominal shank area.

5.3 Load-deflection curves. Load-deflection curves shall be made by autographic recording. The movement sensing element shall be so installed as to measure the relative movement between the movable crosshead and the stationary crosshead. The fixture will have the capability of being non-yielding at ultimate load.

5.4 Failing load determination. When a structure failure occurs before the ultimate or fracture load, it may be detected on the load-deflection curve as a peak load followed by severe permanent deformation without increase in load or with a decrease in load. A sample load-deflection curve illustrating a "structural failure" is shown on Figure 3. The first peak load shall be designated as the "structural failure load" and the highest peak shall be the ultimate load.

TABLE I. Tension load rates.

| Nominal diameter (Inch) | Load rate Pounds per minute (Kilograms per minute) | Nominal diameter (Inch) | Load rate Pounds per minute (Kilograms per minute) |
|----------------------------|--|----------------------------|--|
| .1900 | 2,800 (1,270) | .7500 | 44,000 (19,900) |
| .2500 | 5,000 (2,270) | .8750 | 60,000 (27,200) |
| .3125 | 7,700 (3,490) | 1.0000 | 78,000 (35,400) |
| .3750 | 11,000 (4,990) | 1.1250 | 100,000 (45,400) |
| .4375 | 15,000 (6,800) | 1.2500 | 122,000 (55,300) |
| .5000 | 19,600 (8,890) | 1.3750 | 148,000 (67,100) |
| .5625 | 24,800 (11,200) | 1.5000 | 176,000 (79,800) |
| .6250 | 30,600 (13,900) | | |

NOTE: As an alternate loading method, the rate of loading can be determined as a constant head travel that gives strain rates consistent with the above load rates in the elastic range.

5.5 Number of specimens. Unless otherwise specified in the detail specification or purchase order, a minimum of five specimens shall be tested for each fastener diameter and test condition.

5.6 Yield load. The yield load shall be determined by the Johnson's two-thirds approximate method, as shown on Figure 4. On the load-deflection plot of 5.3, draw a line (line A) with two-thirds the slope of the straight portion of the curve. Parallel to this line and tangent to the load deflection curve, draw another line (line B). The point of tangency of line B with the curve represents the yield load.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

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6.1 Intended use. This standard sets forth a standard test method to determine the tensile strength of barrel nuts.

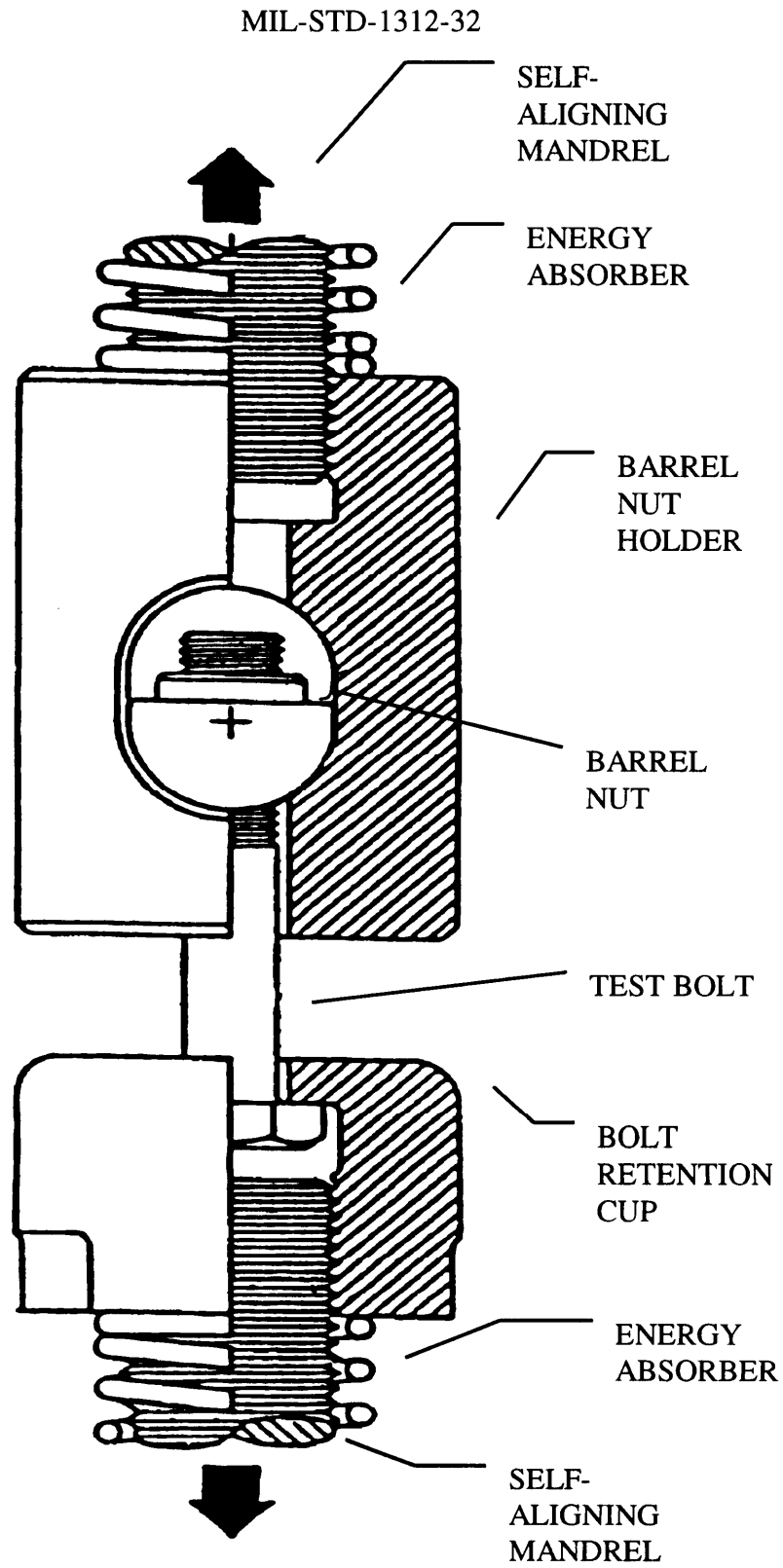
6.2 Issue of DODISS. When this standard is used in acquisition, the issue of the DODISS to be applicable to this solicitation must be cited in the solicitation (see 2.1.1 and 2.2).

6.3 Test report. The test report shall contain the following:

- a. Fastener description.
 1. Part number.
 2. Lot identification.
 3. Manufacturer.
 4. Material
 5. Heat treatment Level
 6. Measured shank Diameter
 7. Grip Length
- b. Test Machine
 1. Model and serial number
 2. Calibration Date
- c. Loading Rate or strain rate
- d. Ultimate loads
- e. Yield loads
- f. Installation procedure
- g. Fixture used
- h. Structural failure load
- i. Mode of failure
- j. Load deflection curve
- k. Strain magnification factor
- m. Cause and duration of any interruptions during the test
- n. Results of all inspections

6.4 Subject term (key word) listing.

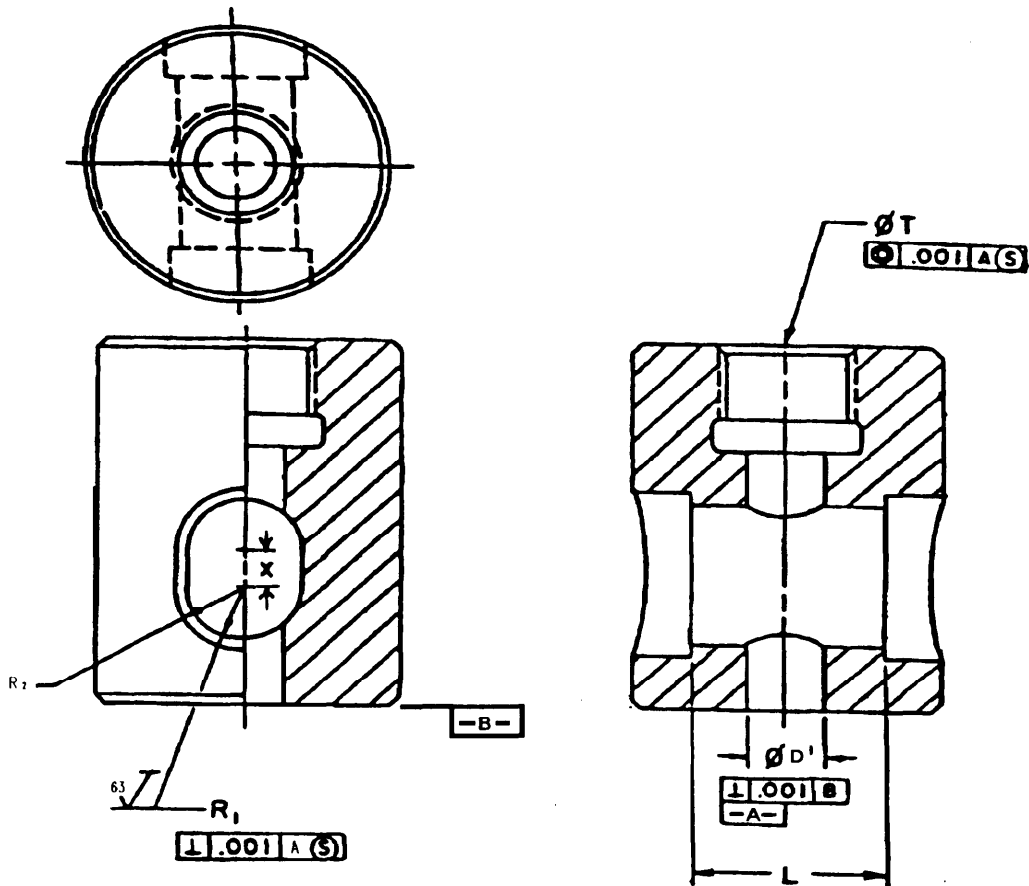
Tensile test
Tensile strength



a.

FIGURE 1. TEST SETUP

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| | |
|-----------------------|--|
| $\varnothing D'$ MIN. | = BARREL NUT NOMINAL THREAD SIZE +.015 |
| L MIN. | = MAX. BARREL NUT LENGTH |
| $\varnothing T$ | = THREAD SIZE (OPTIONAL) |
| R_1 | = MAX. BARREL NUT RADIUS +.0015 |
| R2 MIN. | = $R_1 +.030$ |
| X | OPTIONAL |

NOTE: DIMENSIONING PER Y14.5M-1982

FIGURE 2. TEST FIXTURE CHARACTERISTICS

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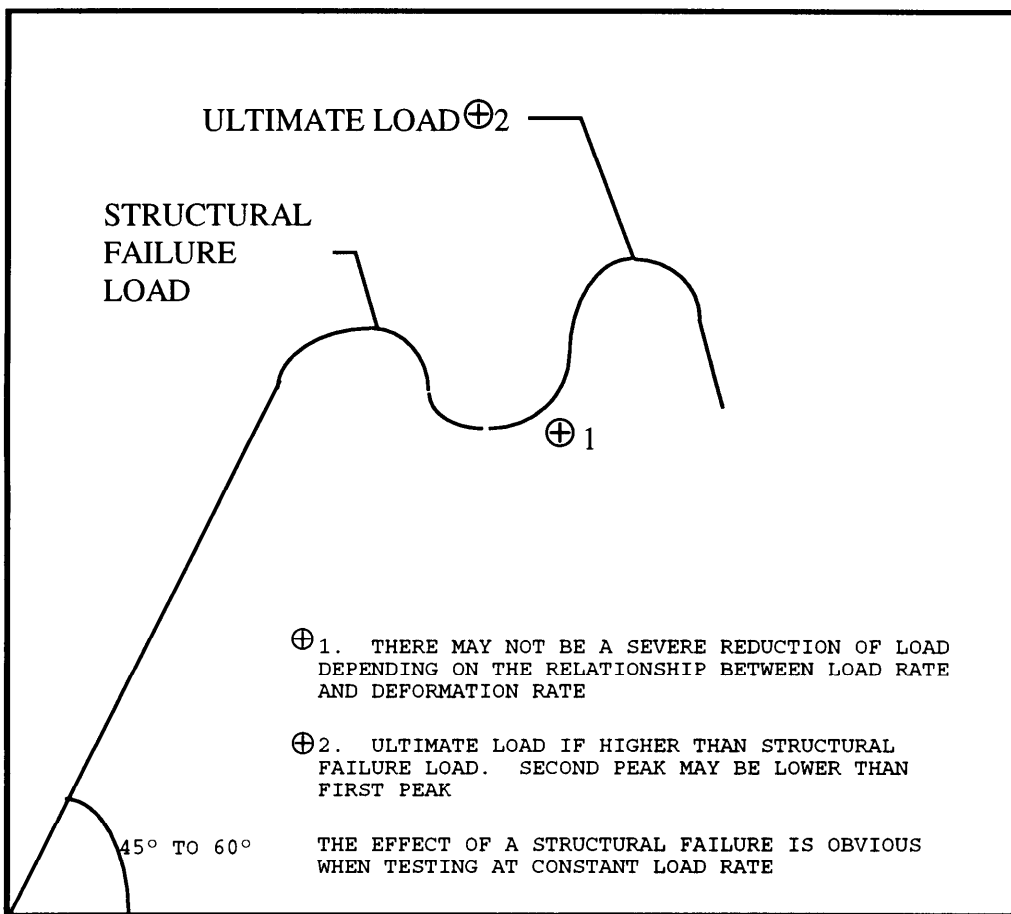
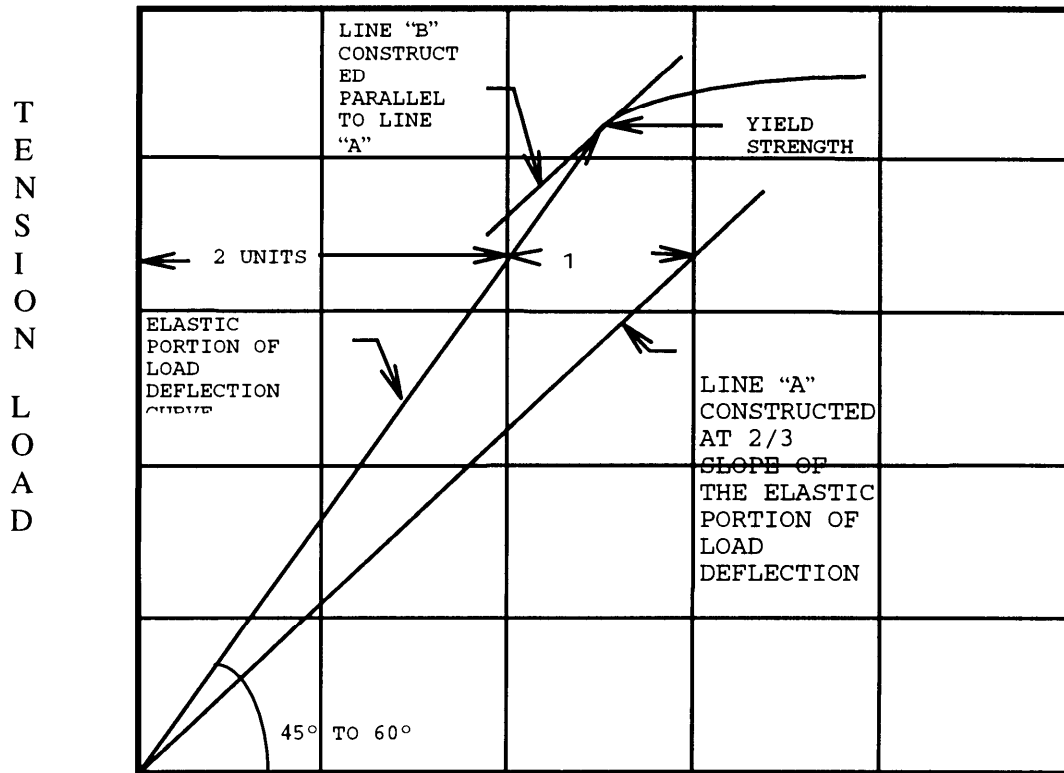


FIGURE 3. SAMPLE LOAD DEFLECTION CURVE

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FASTENER DEFLECTION OR DEFORMATION

FIGURE 4. JOHNSON'S TWO THIRDS APPROXIMATE METHOD FOR DETERMINATION OF YIELD LOAD

Custodians:

Army - AV
Navy - AS
Air Force - 11

Preparing Activity:

Navy - AS

Agent:

DLA - IS

Review activities:

Army - AR
Navy - SH
DLA - IS

(Project 53GP-0277)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3 and 8. In block 1, both the document number and revision letter should be given.
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I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER **MIL-STD-1312-32**

2. DOCUMENT DATE (YYMMDD) **970430**

3. DOCUMENT TITLE: **FASTENER TEST METHOD, METHOD 32 BARREL NUT TEST**

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach sheets if needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

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7. DATE SUBMITTED (YYMMDD)

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