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> NASM1312-13 STANDARD PRACTICE

FASTENER TEST METHODS METHOD 13 DOUBLE SHEAR TEST



THE INITIAL RELEASE OF THIS DOCUMENT SUPERSEDES MIL-STD-1312-13A DESIGNATION FOR THIS TEST METHOD REMAINS MIL-STD-1312-13

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1. SCOPE

- 1.1 This specification defines the procedure and apparatus for testing fasteners in double shear in a half-hole fixture.
- 1.2 Recommendations for improvements or corrections of this specification should be directed to an NASC representative of a using aerospace company or to the Executive Secretary of the National Aerospace Standards Committee.
- 1.3 Specifications listed herein, of issue in effect on date of price inquiry are a part of this specification to the extent indicated. In case of conflict, the requirements herein shall take precedence.
- 1.4 All test equipment and test procedures shall meet and/or comply with applicable environmental and occupational safety hazard requirements and statutes.

2. REFERENCED DOCUMENTS

- 2.1 American Society for Testing and Materials (ASTM) ASTM E4 - 01, Standard Practice for Force Verification of Testing Machines
- 2.2 American Society of Mechanical Engineers ASME Y14.5M - 1994, Dimensioning and Tolerancing
- 2.3 National Conference of Standards Labs NCSL Z540.1-1994, Calibration Laboratories and Measuring and Test Equipment -General Requirements

3. DEFINITIONS

- 3.1 The ultimate double shear load in pounds is the highest load attained at any time during the test.
- 3.2 The ultimate single shear load in PSI (Pound per Square Inch) is calculated by dividing the highest load attained in pounds at any time during the double shear test by two (2) times the actual shank diameter area.

4. GENERAL REQUIREMENTS

4.1 Test Apparatus

- 4.1.1 The testing machine shall be capable of applying a compressive load at a controllable rate. The calibrating system for the machine shall conform to ANSI Z540.1. Its accuracy shall be verified every twelve (12) months by a method complying with ASTM E4, utilizing calibration equipment which has been calibrated by, or its accuracy is traceable to, the National Institute of Standards and Technology (NIST) not more than two (2) years prior to its use. The fastener or test specimen loads shall be within the range of the testing machine as defined in ASTM E4.
- 4.2 Test Fixtures
- 4.2.1 Test fixtures shall be in accordance with FIGURES 1 through 4 except as noted in TABLE II, Note 3.

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4.3 Test Specimen

- 4.3.1 Test specimens shall be processed from the same heat of material as that used in the fabrication of the fastener production lot, fabricated to the same shank or grip diameter as required for the fastener lot being tested, and thermally processed, coated and/or plated with the fastener manufacturing lot. Final product fasteners from the same manufacturing lot may be used as test specimens if the configuration satisfies the requirements on this specification.
- 4.3.2 Test Specimens Length Limitations: Unless otherwise specified, in the procurement specification and/or product standard or document, the test specimen shall have a minimum length of two (2) unthreaded shank diameters excluding the fillet radius and shank to thread transition area.

5. DETAILED REQUIREMENTS

- 5.1 TEST PROCEDURE: The fastener or test specimen shall be placed in the receiving half-holes of the fork portion of the fixture with neither threads nor fillet radius in bearing.
- 5.1.1 The blade (guillotine) portion of the fixture shall be placed in position on the specimen and the test machine activated to provide contact of all load bearing surfaces of the machine, fixture, and specimen prior to applying the test load.
- 5.1.2 The test load shall be applied at the uniform rate specified in TABLE I within a load rate tolerance of ± 10%. Load rates for larger or smaller size fasteners or test specimens shall be calculated to give an initial stress rate of 100,000 pounds per minute per square inch of the nominal double shear area (two times the nominal diameter cross sectional area).
- 5.1.3 The testing laboratory, at their option, may use a constant strain rate which will produce the specified load rate (±10%) in the elastic range. That is, the strain rate shall be equal to the initial stress rate of 100,000 pounds per minute per square inch divided by the elastic modulus in shear.
- 5.1.4 The applied load may be discontinued upon obtaining the specification minimum test load requirement if the product specification requirement is for a verification of the minimum shear value. The test may be continued to a point in which the stress-strain curve is flat or to total shear rupture of the specimen if maximum data is desired. Performing tests to total shear rupture can deteriorate the integrity of the shear dies.

6. NOTES

- 6.1 TEST REPORT: The test report shall include the following data as a minimum.
 - a) Fastener or test specimen description.
 - b) Part Number.
 - c) Material.
 - d) Manufacturer.
 - e) Minimum double shear load specified (if applicable).
 - f) The maximum applied load to each fastener or test specimen.
- 6.2 Unless otherwise specified by the purchase contract and/or product specification, the actual diameter of each fastener or test specimen need not be reported. If the reported test data is expressed in pounds per square inch (PSI), the actual diameter of each fastener or test specimen shall be used in the calculation to develop the pound per square inch (PSI) value.

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| IADLE | - DUUDLE | SHEAK LUP | AD MAIES |
|----------|-----------|-----------|-----------|
| NOMINAL | LOAD RATE | NOMINAL | LOAD RATE |
| DIAMETER | LB/MIN | DIAMETER | LB/MIN |
| .125 | 2,480 | .563 | 49,600 |
| .156 | 3,840 | .625 | 61,200 |
| .164 | 4,200 | .750 | 88,000 |
| .188 | 5,600 | .875 | 120,000 |
| .250 | 10,000 | 1.000 | 156,000 |
| .313 | 15,400 | 1.125 | 200,000 |
| .375 | 22,000 | 1.250 | 244,000 |
| .438 | 30,000 | 1.375 | 296,000 |
| .500 | 39,200 | 1.500 | 352,000 |

TABLE 1 - DOUBLE SHEAR LOAD RATES





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| NOMINAL | ØD | | S | T | W | R |
|----------|----------|--------------|--------|--------|--------|-----------|
| FASTENER | | AAINIBAI INA | +.0010 | +.0000 | +.0010 | REFERENCE |
| SIZE | MAXIMUNI | MILAUNON | 0000 | 0010 | 0000 | |
| .112 | .1130 | .1123 | .056 | .1120 | .1130 | .156 |
| .125 | .1260 | .1253 | .063 | .1250 | .1260 | .156 |
| .138 | .1390 | .1383 | .069 | .1380 | .1390 | .188 |
| .156 | .1573 | .1566 | .078 | .1563 | .1573 | .188 |
| .164 | .1650 | .1643 | .082 | .1640 | .1650 | .188 |
| .188 | .1885 | .1878 | .094 | .1875 | .1885 | .219 |
| .190 | .1910 | .1903 | .095 | .1900 | .1910 | .219 |
| .250 | .2510 | .2503 | .125 | .2500 | .2510 | .281 |
| .313 | .3135 | .3128 | .156 | .3125 | .3135 | .344 |
| .375 | .3760 | .3753 | .188 | .3750 | .3760 | .406 |
| .438 | .4385 | .4378 | .219 | .4375 | .4385 | .468 |
| .500 | .5010 | .5003 | .250 | .5000 | .5010 | .531 |
| .563 | .5635 | .5628 | .281 | .5625 | .5635 | .594 |
| .625 | .6260 | .6253 | .313 | .6250 | .6260 | .656 |
| .750 | .7510 | .7503 | .375 | .7500 | .7510 | .781 |
| .875 | .8760 | .8753 | .438 | .8750 | .8760 | .906 |
| 1.000 | 1.0010 | 1.0003 | .500 | 1.0000 | 1.0010 | 1.031 |
| 1.125 | 1.1260 | 1.1253 | .563 | 1.1250 | 1.1260 | 1.156 |
| 1.250 | 1.2510 | 1.2503 | .625 | 1.2500 | 1.2510 | 1.281 |
| 1.375 | 1.3760 | 1.3753 | .688 | 1.3750 | 1.3760 | 1.406 |
| 1.500 | 1.5010 | 1.5003 | .750 | 1.5000 | 1.5010 | 1.531 |

TABLE II - DOUBLE SHEAR FIXTURE DIMENSIONS

Notes: 1. The chamfer, radius or edge break of the ØD half-hole edges of the blade or fork shall be .005. The fixture shall be reworked when the edge wear results in a chamfer, radius or edge break of .010 on any portion of the half-hole edges. In case of controversy, the ØD half-hole edges of the blade and fork shall be .005 maximum.

- 2. The depth of the ØD half-hole centerline in both the blade (.5D) and the fork (.000 to .060) may be increased as a result of rework due to wear, but shall not be increased to a point where any part of the fastener or test specimen makes contact with any part of the test fixture other than the designed load bearing surfaces.
- 3. For fixture sizes other than those listed, the proportions specified in TABLE II shall be maintained.
- 4. The "R" dimension in FIGURE 4 defines the radius in the fixture base. This radius shall be modified as necessary to prevent contact with the test specimen.
- 5. Alternative fixture configurations utilizing dowel fixture guides may be used as long as the relationship of the blade and fork remains as shown in FIGURE 1, 2, and 3.

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