SURFACE VEHICLE RECOMMENDED PRACTICE

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Test Procedures for Shear Strength of Automotive Brake Pads and Brake Lining Assemblies

RATIONALE

This document is being Stabilized because the test procedure is mature and no revisions are anticipated.

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1. SCOPE

This SAE Recommended Practice covers equipment capabilities and the test procedure to quantify and qualify the shear strength between the friction material and backing plate or brake shoe for automotive applications. This SAE Recommended Practice is applicable to: bonded drum brake linings; integrally molded disc brake pads; disc brake pads and backing plate assemblies using mechanical retention systems (MRS); coupons from drum brake shoes or disc brake pad assemblies. The test and its results are also useful for short, semi-quantitative verification of the bonding and molding process.

This Recommended Practice is applicable during product and process development, product verification and quality control. This Recommended Practice does not replicate or predict actual vehicle performance or part durability.

1.1 Purpose

The purpose of this test is to quantify the load required to cause a shear failure at the interface of the friction material and backing plate or brake shoe. The test also provides a qualification of the failure mode on the assembly at the different layers or components. Test parts can be of different types and in different conditions: new or used from vehicle or inertia-dynamometer test, prototype or production, complete assemblies or segments, and with or without special treatment like thermal, environmental or corrosion exposure.

2. REFERENCES

2.1 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.1.1 ISO Publication

Copies of these documents are available online at http://webstore.ansi.org/.

ISO 6312:2001(E) Road vehicles—Brake linings—Shear test procedure for disc brake pad and drum brake shoe assemblies

2.1.2 JIS Publication

Available from Japanese Standards Association, 4-1-24 Akasaka Minato-ku, Tokyo 107-8440, Japan, Tel: +81-3-3583-8005, www.jsa.or.jp.

JIS D4422-1990 Shear Strength Test Procedure for Drum Brake Shoe Assemblies and Pads for Automobiles (Reaffirmed: 1995)

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3. DEFINITIONS

3.1 COUPON

Segment cut from a larger original drum shoe or disc pad.

3.2 OFFSET

Distance measured from the exposed surface of the backing plate to the shear ram edge. See Figure 4.

3.3 MECHANICAL RETENTION SYSTEM (MRS)

Attachment method where mechanical protrusions on the backing plate aid the retention of the friction material or the underlayer.

3.4 NORMAL LOAD

Fixed load perpendicular to the shear load for disc brake pads or flat coupons.

3.5 SHEAR FAILURE

Shear failure is an observable movement of the friction material or complete shear from the backing plate or brake shoe.

3.6 SHEAR LOAD

Peak load observed during the test at the time of a shear failure.

3.7 SHEAR STRENGTH

Force per unit area of the shear load divided by the sample or coupon area at the attachment layer.

4. EQUIPMENT

The equipment for performing this test shall be a compression, tensile, or similar (shear) test machine with the following minimum capabilities:

4.1 Provide a fixture that holds the disc brake pad or shoe assembly firmly

4.2 System or mechanism to provide a normal load of 0.5 N/mm^2 ± 0.15 N/mm^2 (72.5 psi ± 22 psi) at right angle to the shear load on the friction material face for disc brake pads. Note that force application is dependent on pad area at the backing plate.

4.3 Movable ram to apply shear load to the friction material at a constant speed rate of 10 mm/min ± 1 mm/min (0.40 ± 0.04 in/min) or constant load rate 4500 N/s ± 1000 N/s (1000 lbf/s ± 225 lbf/s); hand-operated pumps or shock loads are not allowed

4.4 Generate a constant ram speed or loading rate from zero (0) load to a load sufficient to shear the friction material from the backing plate or brake shoe

5. TEST FIXTURES AND SAMPLE PREPARATION

5.1 Sampling and Sample Preparation

Perform a visual inspection of the samples prior to testing. Remove shims, clips, or nibs to ensure proper contact and squareness on the test fixture. When testing using field-returned or tested parts, verify parts for appropriate flatness and parallelism. Perform surface grind if necessary.

Unless otherwise specified for the project, test five samples.

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5.2 Drum Brake Shoes Fixture

Use a movable ram that contacts the edge of the lining for its full length and thickness within 1 mm ± 0.2 mm (0.040 inch ± 0.008 inch) of the shoe table or rim; See Figure 1. The ram shall contact the lining on its entire width in the direction of the shear load. Apply the load in a direction perpendicular to the plane of the shoe web; support the shoe to maintain uniform loading along the length of the lining or segment; avoid distortion of the shoe table or shoe web during the test.

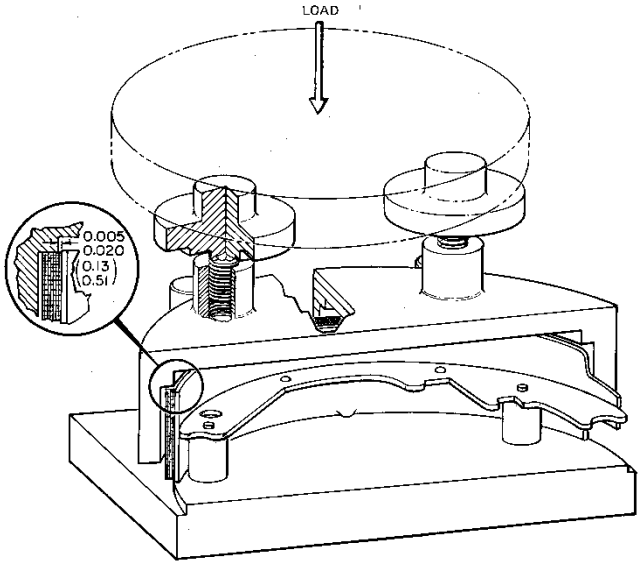


Figure 1 - Bond plane shear test - drum brake

5.3 Disc Brake Pads Fixture

Use a movable ram that contacts the edge of the lining for its full length and thickness within 1 mm ± 0.2 mm (0.040 inch ± 0.008 inch) of the backing plate. The movable ram shall conform adequately to the lining edge contour to avoid crushing of the lining edge prior to failure. See Figures 2 through 5. The ram shall contact the lining edge along the axis perpendicular to the ram travel direction. Other offsets different from 1 mm ± 0.2 mm (0.040 inch ± 0.008 inch) are acceptable to accommodate different attachment systems like MRS. Document and report the actual offset if different from the standard value.

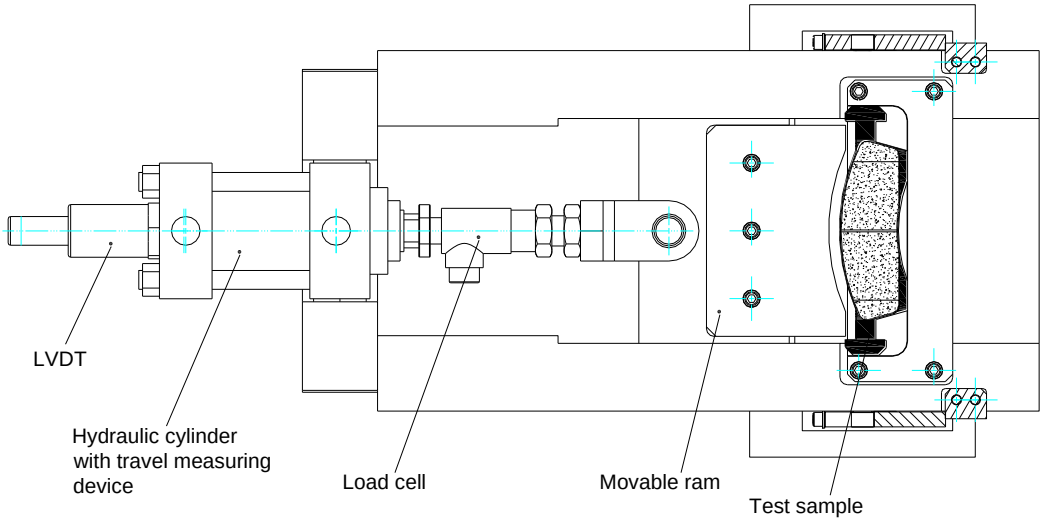


Figure 2 - Disc brake shear test fixture

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