



SURFACE VEHICLE RECOMMENDED PRACTICE

J2562™

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Superseding J2562 APR2016

Biaxial Wheel Fatigue Test

RATIONALE

This document has been updated to add a reference to SAE J3204.

FOREWORD

This wheel fatigue test simulates wheel road loads by applying variable radial and lateral loads through a tire and wheel assembly. The scalable test load sequence is developed for individual wheels based on data obtained while running established vehicle durability schedules.

1. SCOPE

This SAE Recommended Practice provides uniform laboratory procedures for biaxial fatigue testing of wheels intended for normal highway use and temporary use on passenger car vehicles and light trucks and minimum cycle requirement for ferrous wheels for ballasted passenger car applications. The appendices provide scalable load files that are applicable to ballasted passenger cars and ballasted light trucks. A load file for unballasted passenger cars will be added to this document.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1982 Nomenclature - Wheels for Passenger Cars, Light Trucks and Multipurpose Vehicles

2.1.2 ISO Publications

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

ISO 3911 Wheel/Rims - Nomenclature, Designation, Marking and Units of Measurement

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SAE WEB ADDRESS:

Full document details: SAE J2562_202107

For more information on this standard, visit
https://www.sae.org/standards/content/J2562_202107

Documents

Document Sharing Hub

2.1.3 Tire and Rim Association Publications

Available from The Tire and Rim Association, Inc., 175 Montrose West Avenue, Suite 150, Copley, OH 44321, Tel: 330-666-8121, www.us-tra.org.

The Tire and Rim Association Inc., Year Book

2.2 Related Publications

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

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J3204 Aftermarket Composite Wheels Made of Matrix Material and Fiber Reinforcement Intended for Normal Highway Use - Test Procedures and Performance Requirements

Archibald, K., Schnaidt, W., Wallace, R., and Archibald, K., "Minimum Cycle Requirement for SAE J2562," SAE Technical Paper 2014-01-0073, 2014, <https://doi.org/10.4271/2014-01-0073>.

Fischer, G. and Grubisic, V., "Cast Aluminum Wheels for Trucks and Buses — Testing and Evaluation," SAE Technical Paper 841705, 1984, <https://doi.org/10.4271/841705>.

Fischer, G. and Grubisic, V., "Design Criteria and Durability Approval of Wheel Hubs," SAE Technical Paper 982840, 1998, <https://doi.org/10.4271/982840>.

Fischer, G., Hasenmaier, W., and Grubisic, V., "Proof of Wheel Fasteners by Multiaxial Tests in the Biaxial Wheel Test Rig," SAE Technical Paper 1999-01-0781, 1999, <https://doi.org/10.4271/1999-01-0781>.

Grubisic, V. and Fischer, G., "Automotive Wheels, Method and Procedure for Optimal Design and Testing," SAE Technical Paper 830135, 1983, <https://doi.org/10.4271/830135>.

Grubisic, V., Fischer, G., and Heinritz, M., "Design Optimization of Forged Wheel Hubs For Commercial Vehicles," SAE Technical Paper 841706, 1984, <https://doi.org/10.4271/841706>.

Nurkala, L. and Wallace, R., "Development of the SAE Biaxial Wheel Test Load File," SAE Technical Paper 2004-01-1578, 2004, <https://doi.org/10.4271/2004-01-1578>.

2.2.2 Fraunhofer Institut Betriebsfestigkeit (LBF) Publications

Available from Fraunhofer Institut für Betriebsfestigkeit (LBF), Bartningstrasse 47, Darmstadt D-64289, Germany.

Eisenkolb, R. and Schwendemann, H., "Numerical Estimation of Tilt Angle for Load Program Testing" Biaxial Wheel/Hub Test Facility Proceedings of the 5th International User Meeting, 13 September 2001, Darmstadt, Germany.

3. DEFINITIONS

3.1 BIAXIAL TEST MACHINE

A machine for evaluating the fatigue life of the wheel under combined radial and lateral loads applied to a rotating tire-wheel assembly through the tire.

3.2 CURB

A radially inward extension of the drum designed to contact the tire sidewall for reaction of lateral load

3.3 TEST LOAD SEQUENCE

A series of “block cycle” radial and lateral loads, tilt angles, wheel revolutions, and drum speed combinations that correlate to specific vehicle road load occurrences.

3.4 TIRE CONTACT PATCH LOADS

Orthogonal radial, lateral and fore-aft wheel plane loads that act at the center of the interface between the tire and road surface.

3.5 RATED WHEEL LOAD

Design load for wheel as specified by manufacturer equal to 1/2 the maximum gross axle weight rating.

3.6 RADIAL TEST LOAD

Radial load applied by test machine through the tire contact patch.

3.7 LATERAL TEST LOAD

Lateral load applied by test machine through the tire sidewall adjacent to the tire contact patch.

3.8 RADIAL BASE LOAD

Radial wheel load that must be scaled for vehicle application and design load.

3.9 LATERAL BASE LOAD

Lateral wheel load that must be scaled for vehicle application and design load.

3.10 TILT ANGLE

Wheel camber angle when inside biaxial test machine drum (inboard lateral loads use negative tilt angles).

3.11 INBOARD LOAD

Lateral load vector acting at the tire contact patch toward the vehicle. This is the lateral load the tire-wheel assembly experiences when it is on the outside of a turn.

3.12 OUTBOARD LOAD

Lateral load vector acting at the tire contact patch away from the vehicle. This is the lateral load the tire-wheel assembly experiences when it is on the inside of a turn.

3.13 ZERO LATERAL LOAD

Lateral load when the tire-wheel assembly is driven straight (no cornering or toe).

3.14 SCALED BASE LOAD SEQUENCE REPEAT

It is the minimum sequence that contains the correct proportion of all loads and cycles.

For ballasted passenger cars, it is the completion of the high speed load sequence eight times and completion of the medium speed load sequence once as described in SAE J2562, Appendix A.

For ballasted light truck, it is the completion of the high speed load sequence 11 times and completion of the medium speed load sequence once as described in SAE J2562, Appendix B.

3.15 SILHOUETTE TEST ADAPTER

A fixture that interfaces the test machine and the test wheel, designed to simulate the stiffness of the vehicle hub, made from a material to enhance its fatigue life. The key dimensions required to simulate the front-axle hub that is used with the wheel are shown in Figure 1.

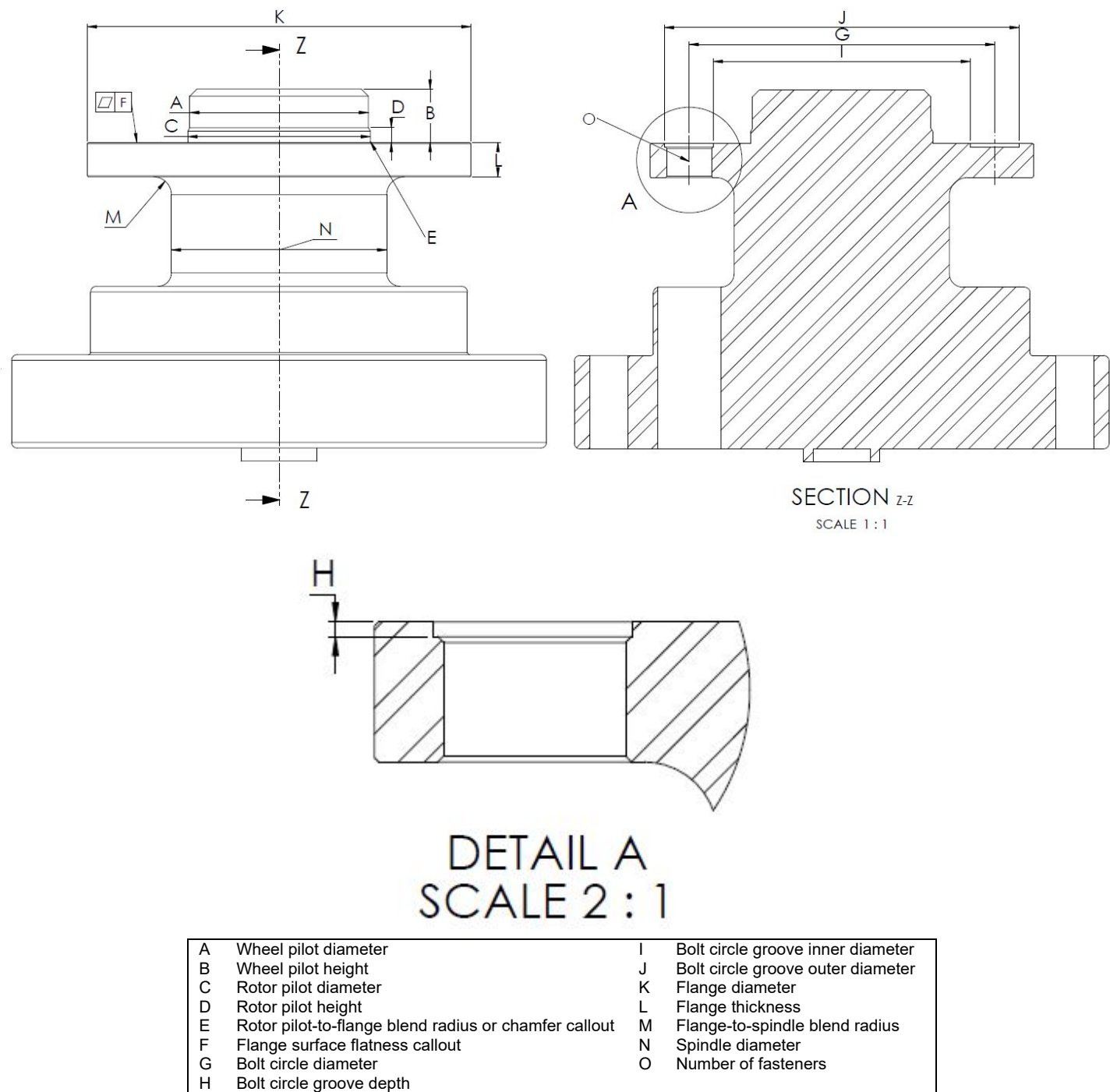


Figure 1 - Silhouette adapter

NOTE: Review hub drawing for features not shown on the Figure 1 that could significantly affect the stiffness of the Silhouette fixture.

4. SYMBOLS

$F_{L,B}$ = Lateral base load (N)

$F_{L,T}$ = Lateral test load (N)

$F_{R,B}$ = Radial base load (N)

$F_{R,T}$ = Radial test load (N)

F_W = Rated wheel load (N)

$K_{L,i}$ = Lateral inboard load scale factor

$K_{L,o}$ = Lateral outboard load scale factor

$K_{L,z}$ = Lateral zero load scale factor

$K_{R,i}$ = Radial inboard load scale factor

$K_{R,o}$ = Radial outboard load scale factor

$K_{R,z}$ = Radial zero lateral load scale factor

θ = Tilt angle (degrees)

5. TEST REQUIREMENTS

5.1 Equipment

5.1.1 Biaxial Fatigue Test Machine

- 5.1.1.1 Cantilevered, internal drum (see Figures 2 and 3) with inboard and outboard curbs as detailed in Figure 4. The tire outside diameter is recommended to be within 50 to 80% of the drum internal diameter for wheel stress reproduction.

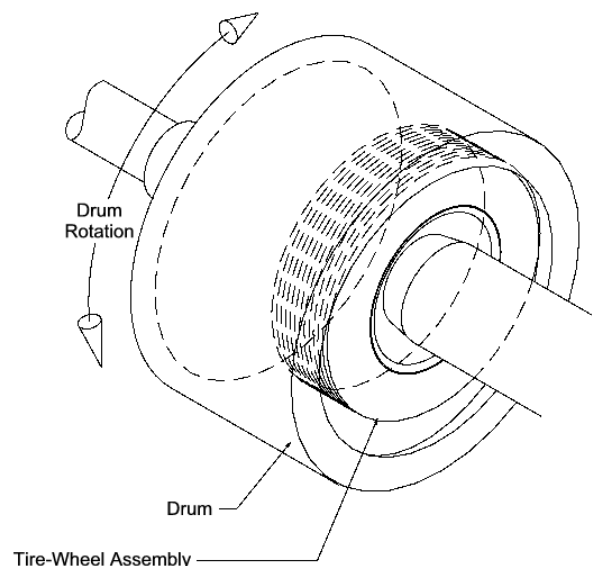


Figure 2 - Internal drum

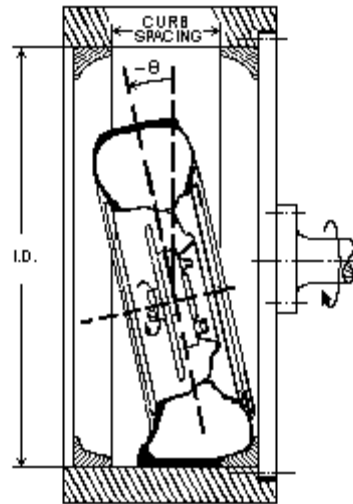


Figure 3 - Detail cross-section of typical tire-wheel assembly inside drum with inboard lateral load

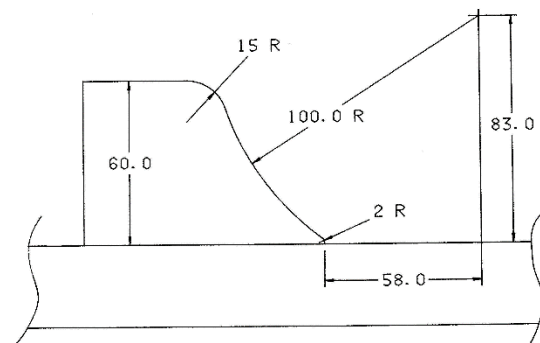


Figure 4 - Detail cross-section of typical drum inboard and outboard curb

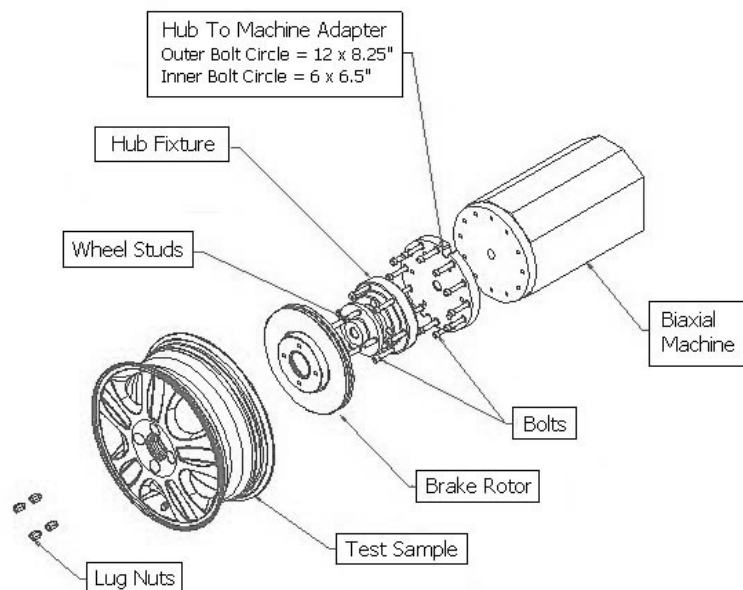


Figure 5 - Typical wheel, brake rotor, hub fixture, adapter, and machine spindle assembly

