SFI FOUNDATION INC.™

# QUALITY ASSURANCE SPECIFICATIONS™

SFI TECHNICAL BULLETIN 5.0 EFFECTIVE: JANUARY 30, 1991*

SUBJECT: Vehicle Road Wheels

## 1.0 GENERAL INFORMATION

SFI Technical Bulletin 5.0 consists of test procedures for vehicle road wheels.

## 2.0 OBJECTIVE

SFI Technical Bulletin 5.0 consists of two test procedures for vehicle road wheels. One tests the dynamic cornering fatigue of the wheel and the other is a test of dynamic radial fatigue. A procedure for each test is contained herein.

## 3.0 TESTING

Equation values not specified here shall be given in the specifications utilizing this technical bulletin.

### 3.1 DYNAMIC CORNERING FATIGUE

#### 3.1.1 APPARATUS

The test machine shall be one with a driven rotatable device and a means to impart a constant bending moment to a wheel.

3.1.2 REFERENCE TIRE DIAMETER

For any wheel, the load will change in relation to the rolling radius of the tire. When a wheel is rated using one rolling radius, the load rating will decrease or increase as the rolling radius increases or decreases, respectively. To provide a uniform method of evaluating vehicle road wheels, this technical bulletin assumes that the manufacturer will provide a reference tire size for use in calculating the test load for each wheel size. Use Equation 1 to determine the value of the rolling radius to be used in determining the test load.

$$\mathbf{RR = 0.5 \times (D_s + DF)} \qquad \mathbf{(1)}$$

Where RR = Rolling radius, inches (millimeters {mm}).
$D_s$ = Maximum tire diameter to be used on the wheel model, inches (mm).
DF = Design factor, inches (mm).

The resultant value for the rolling radius is considered conservative, since no allowance or consideration is given for tire deformation under load.

3.1.3 TEST LOAD DETERMINATION

The bending moment shall be determined from Equation 2.

$$\mathbf{BM_{ft\text{-}lb} = \frac{L \times [(\mu \times RR) + D] \times S}{12}} \qquad \mathbf{(2)}$$

$$\mathbf{BM_{N\text{-}m} = \frac{L \times [(\mu \times RR) + d] \times S}{1000}}$$

Where

BM = Bending moment, foot-pounds {ft-lb}(newton-meters{N-m}).
L = Load rating of the wheel, pounds {lb} (newtons {N}); specified by the wheel manufacturer.
RR = Rolling radius, inches (mm); from Equation 1.
$\mu$ = Coefficient of friction; assume a constant value of 0.70.
S = Acceleration factor.
d = Offset, inches (mm). Use absolute (positive) values only; specified by the wheel manufacturer.

### 3.1.4 PROCEDURE

The rim flange of the wheel shall be clamped securely to the rotatable device. A rigid load arm shaft and adapter assembly shall be attached to the mounting surface of the wheel using a minimum of new grade five studs and new mounting hardware according to the wheel manufacturer's instructions, except that the initial lug nut/bolt torque shall equal 115 percent of the manufacturer's minimum recommended torque for that type and size of fastener. Force shall be applied to the load arm shaft by means of a bushing or bearing at a specified distance of 36 ±1 inches (914.4 ±25.4 mm) from the mounting surface of the wheel. Final clamped position of the wheel to the rotating device, without load, shall provide a concentricity at the point of load of 0.005 inches (0.127 mm) maximum total indicator reading, when measured statically (i.e. hand rotation of the turntable). The loading system shall maintain the bending moment to within ±2.5 percent. Perform the test in accordance with industry accepted methods. In the event the deflection, as measured at the point of load, increases to ten percent of the initial full load deflection before reaching the required number of cycles, the test shall be stopped and the wheel inspected for signs of failure. If no signs of failure are in evidence, the test shall be continued with allowable deflection at point of load increasing to 20 percent above the initial full load deflection. If the deflection increases to 20 percent above the initial full load deflection before the required number of cycles are reached, the wheel shall be considered to have failed the test, whether or not there are signs of failure. In the event of stud breakage in the course of the test, the manufacturer has the option of replacing the stud and continuing the test, or disqualifying the test and testing another wheel sample.

## 3.2 DYNAMIC RADIAL FATIGUE

### 3.2.1 APPARATUS

#### A. TEST MACHINE

The test machine shall be one with a driven rotatable drum which presents a smooth surface wider than the loaded test tire contact patch. The suggested diameter of the drum shall be 67.23 inches (1707.6 mm). The test wheel and tire holding fixture must provide loading normal to the surface of the drum, and in line radially with the center of the test wheel and the drum. The loading system should maintain the specified load within ±2.5 percent.

B. TEST TIRES

Tires shall be radial ply, if available, or the wheel manufacturer's recommended test tire for the wheel size being tested. Inner tubes shall not be used when testing tubeless type tires. Recommended tire pressure is 65 pounds per square inch (448 kilopascals); cold. This may be varied, when necessary, as a special condition to improve test tire life. If the wheel manufacturer recommends that the wheels are not for use with radial tires, then radial tires cannot be used in this test.

3.2.2 TEST LOAD DETERMINATION

The radial load shall be determined from Equation 3.

$$R = L \times K \qquad (3)$$

Where

R = Radial load, lb (N).
L = Load rating of the wheel, lb (N). Must be the same as the value for L used in the dynamic cornering fatigue test.
K = Acceleration factor.

3.2.3 PROCEDURE

The wheel shall be installed on the test machine using new mounting hardware according to the wheel manufacturer's mounting instructions, except that the initial torque on lug nuts/bolts shall be 115 percent of the manufacturer's minimum recommended torque for that type and size fastener. Perform the test in accordance with industry accepted methods.

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