(R) WHEELS/RIMS—TRUCKS—TEST PROCEDURES AND PERFORMANCE REQUIREMENTS—SAE J267 JAN91

SAE Recommended Practice

Report of the Wheel Committee, approved September 1971, completely revised by the Truck and Bus Chassis Committee December 1983. Completely revised by the SAE Truck & Bus Wheel Subcommittee of the SAE Truck & Bus Chassis Committee January 1991. Rationale statement available.

1. Scope—This SAE Recommended Practice provides uniform laboratory procedures for fatigue testing certain production disc wheels, and demountable rims intended for normal highway use on trucks, buses, truck-trailers, and multipurpose passenger vehicles. This document does not cover bolt together divided wheels or other special application wheels and rims.

2. References

2.1 Applicable Documents—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

SAE J328—Wheels—Passenger Cars—Performance Requirements and Test Procedures

SAE J393—Nomenclature—Wheels, Hubs, and Rims for Commercial Vehicles

SAE J1204—Wheels—Recreational and Utility Trailer Test Procedure

ISO 3006—Road Vehicles—Passenger Car Wheels—Test Methods

ISO 3894—Road Vehicles—Commerical Vehicles—Wheels/Rims—Test Methods

OSHA Standard 29 CFR Part 1910.177—Servicing of Multi-Piece and Single-Piece Rim Wheels

3. Test Procedures

3.1 Wheels/Rims for Test—Use only fully processed wheels/rims which are representative of production parts intended for vehicle application. New wheels/rims and new related components of multi-piece rims will be used for each test.

3.2 Cornering Fatigue Test, Disc Wheels—The cornering fatigue test shall be conducted by one of the following methods as specified by the wheel manufacturer.

NOTE—Both test methods have been proved valid; however, there is

not necessarily a correlation between the two tests in number of cycles and/or load.

3.2.1 CORNERING FATIGUE—40 Degree Loading Method

3.2.1.1 *Equipment*—The test machine shall be such that either the wheel rotates under the influence of a stationary bending moment and axial load, or the stationary wheel is subjected to an axial load and rotating bending moment (see Figure 1).

3.2.1.2 *Procedure*—The rim shall be clamped securely to the test device. A rigid load arm shaft with a test adaptor with a mounting surface representative of production hubs shall be attached to the mounting surface of the wheel, using studs and nuts representative of those specified for the wheel. These wheel nuts shall be torqued to the torque limits specified in Table A1 of the Appendix for the stud size and type of nut. The mating surfaces of the test adaptor and wheel shall be free of excessive buildup of paint, dirt, or foreign material. The final clamped position of the wheel without load shall not exceed an eccentricity of 0.254 mm (0.010 in) total indicator reading, normal to the point of loading. The load system shall maintain the specified load within ±3%. The nominal angle of the test load resultant will be 40 degrees from a plane through the center of the rim as shown in Figure 1.

3.2.1.3 *Test Load and Reference Arm Determination*—The test load and reference arm are determined as follows:

$$D = (S)L \qquad \text{(Eq.1)}$$

where:

D = diagonal test load resultant, N (lbf)

S = accelerated test factor

L = load rating of the wheel as specified by the wheel manufacturer, N (lbf)

Reference arm = (slr) tan (40 degrees) + d

slr = largest static loaded radius of the tires to be used on the wheel as specified by the current Tire & Rim Association

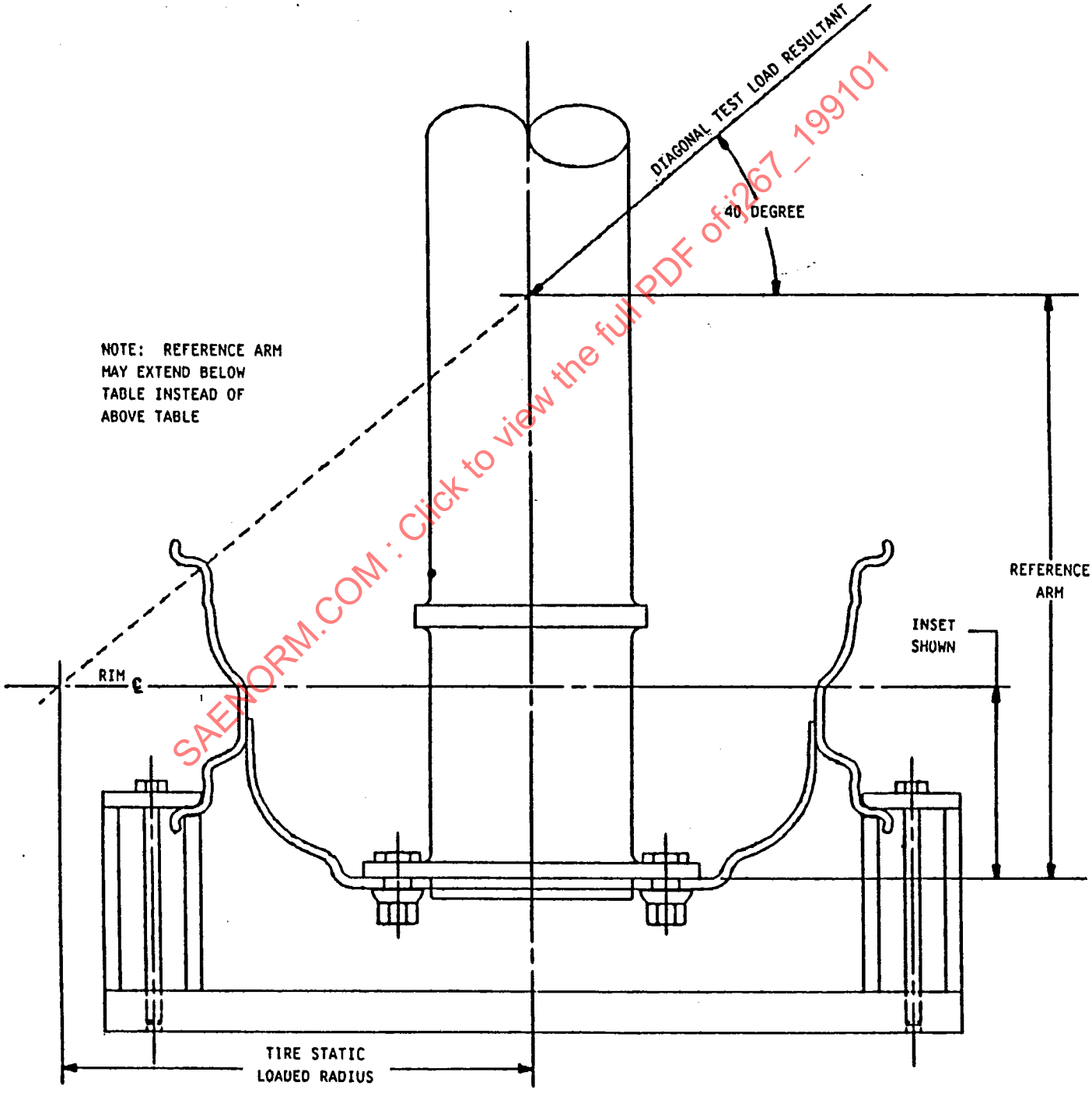

FIGURE 1—CORNERING FATIGUE, 40 DEGREE LOADING METHOD (TYPICAL SET-UP)

Yearbook or the vehicle/wheel manufacturer, mm (in). Use the values of slr found in Table A2 of the Appendix.

tan (40 degrees) = tangent of 40 degrees = 0.84

d = inset or outset (positive for inset, negative for outset) of the wheel, mm (in). If wheel may be used as inset or outset, use inset (see SAE J393).

3.2.1.4 *Test Load Factors and Cycle Requirements*—See Table 1.

3.2.2 CORNERING FATIGUE—90 Degree Loading Method

3.2.2.1 *Equipment*—The test machine shall be such that either the wheel rotates under the influence of a stationary bending moment, or the stationary wheel is subjected to a rotating bending moment. (See Figure 2.)

3.2.2.2 *Procedure*—The rim shall be clamped securely to the test device. The wheel orientation for testing is dependent on the test fixture. A rigid load arm shaft with a test adaptor with a mounting surface representative of production hubs shall be attached to the mounting surface of the wheel, using studs and nuts representative of those specified for the wheel. These wheel nuts shall be torqued to the torque values specified in Table A1 of the Appendix for the stud size and the type of nut. The mating surfaces of the test adaptor and wheel shall be free of excessive buildup of paint, dirt, or foreign matter. The final clamped position of the wheel without load should not exceed an eccentricity of 0.254 mm (0.010 in) total indicator reading normal to the shaft axis at the point of loading. The load system shall maintain the

TABLE 1—TEST LOAD FACTORS AND CYCLE REQUIREMENTS FOR CORNERING FATIGUE TEST, 40 DEGREE LOADING METHOD

Disc Wheel Description	Disc Wheel Description	Disc Wheel Description	Disc Wheel Description	Disc Wheel Description	Disc Wheel Description	Performance Requirements	Performance Requirements
Material	Bolt Circle mm	Bolt Circle in	Rim Diameter Size Code mm	Rim Diameter Size Code in	Inset/ Outset	Accelerated Test Factor	Min Cycle Life
Ferrous	Less than 285.75	Less than 11.25	406 and greater[1]	16 and greater[1]	All	1.6	20 000
Ferrous[2]	222.25	8.75	380	15	All	1.6	20 000
Ferrous	All except 222.25	All except 8.75	Less than 406	Less than 16	All	[3]	[3]
Ferrous	285.75 and greater	11.25 and greater	All[1]	All[1]	All	1.9	30 000

[1] Exclude 444.5 mm (17.5 in) diameter and larger with rim width of 266.7 mm (10.50 in) and wider (wide base tire wheels).
[2] Wheels used for low platform trailers.
[3] Use 90 degree loading method, see 3.2.2.

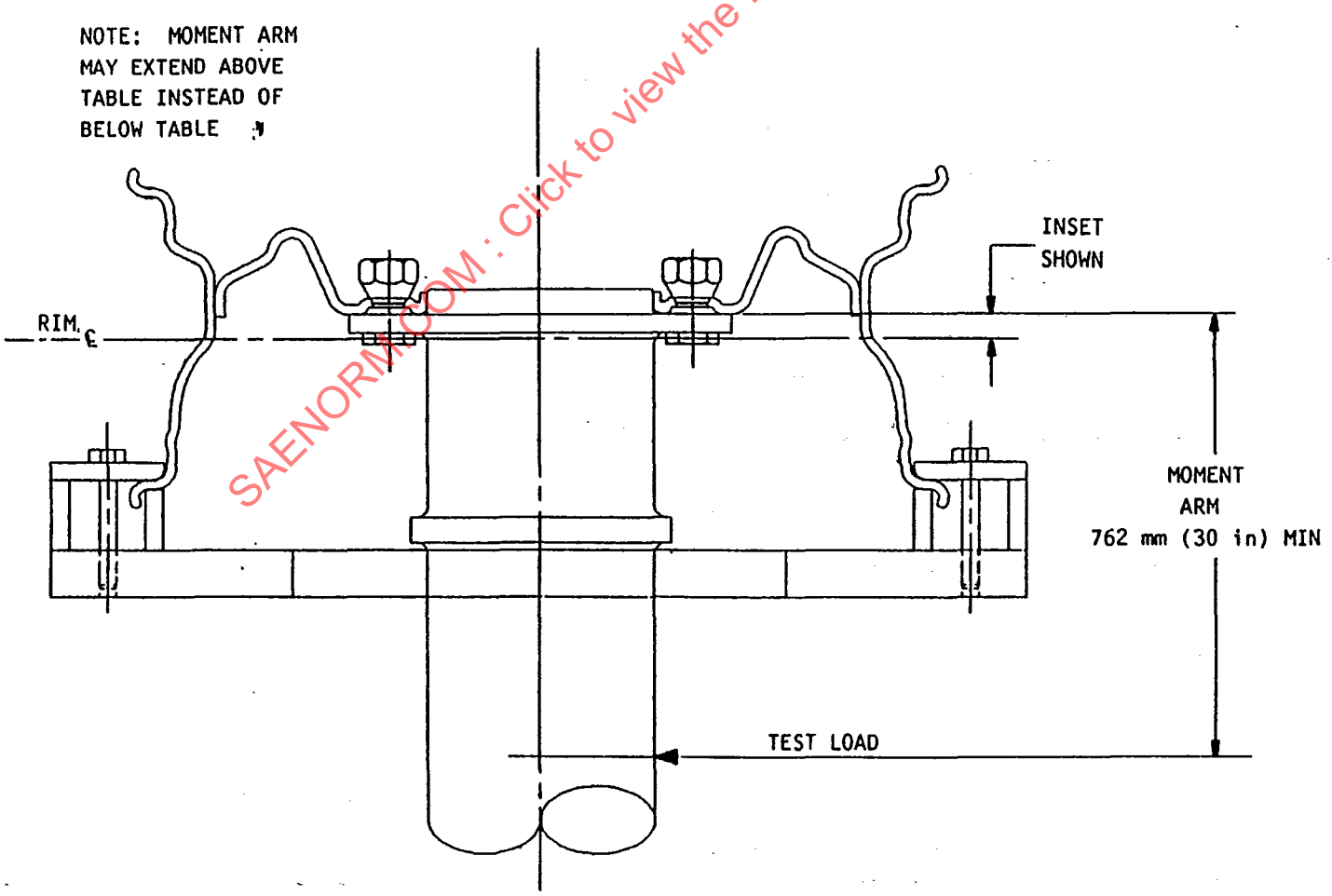

FIGURE 2—CORNERING FATIGUE, 90 DEGREE LOADING METHOD (TYPICAL SET-UP)

specified load within ±3%. The application of the test load will be parallel to a plane through the center of the rim as shown in Figure 2.

3.2.2.3 *Test Load and Bending Moment Determination*—The test load is determined by:

$$\text{Test load} = \frac{M}{\text{Moment arm}} \text{ (See Figure 2)} \qquad \text{(Eq.2)}$$

M is determined by the formula:

$$M = [\mu\ (\text{slr}) + d]\ (S)\ L \qquad \text{(Eq.3)}$$

where:

M = bending moment, N.m (lbf-in)

μ = coefficient of friction developed between tire and road (0.7)

slr = largest static loaded radius of the tires to be used on the wheel as specified by the current Tire & Rim Association Yearbook or the vehicle/wheel manufacturer, mm × 10^{-3} (in). Use the values of slr found in Table A2 of the Appendix A.

d = inset or outset (positive for inset, negative for outset) of the wheel, mm × 10^{-3} (in). If wheel may be used as inset or outset, use inset (see SAE J393).

S = accelerated test factor

L = Load rating of the wheel as specified by the wheel manufacturer, N (lbf)

3.2.2.4 *Test Load Factors and Cycle Requirements*—See Table 2.

3.2.3 TEST TERMINATION DEFINITION

1. Inability of wheel to sustain load.
2. A visually detected fatigue crack penetrating through a section.

3.3 Radial Fatigue Test, Disc Wheels and Demountable Rims

3.3.1 EQUIPMENT—The test machine shall be one with a driven, rotatable drum which presents a smooth surface wider than the loaded test tire section width. The suggested diameter of the drum is 1707.6 mm (67.23 in) which results in 186 revolutions per km (300 revolutions per mile). The test wheel (single application) and tire 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 axes of the drum and the test wheel must be parallel.

3.3.2 PROCEDURE—Tires selected for this test shall be representative of a size and construction approved by the Tire & Rim Association, Inc. and the wheel/rim manufacturer for the wheel/rim under test. For disc wheels, the test adaptor shall be representative of production hubs using studs and nuts representative of those specified for the wheel. For demountable rims, the test adaptor shall be representative of production spoke wheels using studs, nuts, and clamps representative of those

TABLE 2—TEST LOAD FACTORS AND CYCLE REQUIREMENTS FOR CORNERING FATIGUE TEST, 90 DEGREE LOADING METHOD

Disc Wheel Description	Disc Wheel Description	Disc Wheel Description	Disc Wheel Description	Disc Wheel Description	Disc Wheel Description	Performance Requirements	Performance Requirements
Material	Bolt Circle	Rim Diameter Size Code mm	Rim Diameter Size Code in	Inset/Outset mm	Inset/Outset in	Accelerated Test Factor	Min Cycle Life
Ferrous	All	330, 356, 381	13, 14, 15	Less than 101.6	Less than 4	1.60	18 000
Ferrous	All	406 and larger[1]	16 and larger[1]	Less than 101.6	Less than 4	1.45	30 000
Ferrous	All	All[1]	All[1]	101.6 or more	4 or more	1.10 1.30	60 000 40 000
Aluminum	All	406	16	127 or more	5 or more	1.35 1.63	250 000 80 000
Aluminum	All	445 and larger[1]	17.5 and larger[1]	All	All	1.35	250 000

[1] Exclude 444.5 mm (17.5 in) diameter and larger with rim width of 266.7 mm (10.50 in) and wider (wide base tire wheels).

TABLE 3—TEST INFLATION PRESSURES

Max. Inflation Pressure Rating kPa	Max. Inflation Pressure Rating psi	Minimum Test Pressure
0 through 310	0 through 45	450 kPa (65 psi)
Over 310	Over 45	1.2 × Max. Inflation Pressure Rating

TABLE 4—TEST LOAD FACTORS AND CYCLE REQUIREMENTS FOR RADIAL FATIGUE TEST

Wheel/Rim Description	Wheel/Rim Description	Wheel/Rim Description	Wheel/Rim Description	Wheel/Rim Description	Wheel/Rim Description	Performance Requirements	Performance Requirements
Material	Bolt Circle	Rim Diameter Size Code mm	Rim Diameter Size Code in	Inset/Outset[1] mm	Inset/Outset[1] in	Accelerated Test Factor	Min Cycle Life
Ferrous	All	330, 336, 381, 406, 419[2], 444[2] Full Drop Center 381, 406 Semi Drop Center	13, 14, 15, 16, 16.5[2], 17.5[2] Full Drop Center 15, 16 Semi Drop Center	All	All	2.2 1.8	500 000 1 000 000
Ferrous	All	381, 432, 457, 508, 559, 610 Flat Base 444HC, 495, 572, 622 Drop Center	15, 17, 18, 20, 22, 24 Flat Base 17.5HC, 19.5, 22.5, 24.5 Drop Center	All	All	2.0 1.9 1.8 1.7 1.6	500 000 600 000 700 000 850 000 1 000 000
Aluminum	All	406	16	127 or more	5 or more	2.8 2.0	100 000 1 000 000
Aluminum	All	445 and larger	17.5 and larger	All	All	2.8 2.0	100 000 1 000 000

[1] Offset for demountable rims.

[2] 248 mm (9.75 in) rim width and narrower.