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**Mechanical and Material
Requirements for Wheel
Bolts — SAE J1102**

SAE STANDARD

APPROVED OCTOBER 1974

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Report of the Iron and Steel Technical Committee
approved October 1974.

1. SCOPE - This SAE Standard covers the chemical, metallurgical and mechanical requirements for two types of passenger car and truck wheel bolts, as follows:

(a) Nonserrated shank bolts which are heat treated

(b) Serrated shank bolts which are case hardened

2. MATERIALS AND PROCESSES

2.1 STEEL CHARACTERISTICS

2.1.1 Bolts in sizes through 14 mm or 9/16 inch diameter shall be made of killed steel with carbon content of 0.28 to 0.47, sulfur 0.058 max., and phosphorus 0.048 max.

2.1.2 Bolts in sizes over 14 mm or 9/16 inch diameter shall be made of a medium carbon alloy steel (carbon content 0.28 to 0.55), fine grain with hardenability that will produce a minimum hardness of Rockwell C47 at the center of a transverse section one diameter from the threaded end of the bolt after oil quenching.

2.1.3 The preceding analyses are product analyses (percent by wt) and refer to individual determinations on uncarburized or core portion of bolts.

2.2 HEADING PRACTICE - Bolts in sizes through 20 mm or 3/4 inch shall be cold headed. Larger sizes may be hot or cold headed, at option of the manufacturer.

2.3 THREADING PRACTICE - All bolts, regardless of size shall be roll threaded.

2.4 HEAT TREATMENT PRACTICE

2.4.1 Nonserrated shank bolts shall be heat treated, quenched in a liquid medium and tempered at a minimum tempering temperature of 425°C (800°F).

2.4.2 Nonserrated shank bolts shall conform to Class C Decarburization (as described in SAE J121), unless otherwise specified.

2.4.3 Serrated shank bolts shall be carburized in a non-nitriding atmosphere to a total case depth of 0.10 - 0.30 mm (0.004 - 0.012 in), oil quenched and tempered at a minimum tempering temperature of 450°C (850°F). Case depth shall be measured on the body or head of the bolt.

2.5 SURFACE DISCONTINUITIES - Bolts in sizes up to 24 mm (1 in) inclusive, and lengths up to 150 mm (6 in) inclusive shall not have surface discontinuities exceeding the limits specified in SAE J1061. Surface discontinuities for other sizes and lengths shall be within limits specified by purchaser.

3. MECHANICAL AND PERFORMANCE REQUIREMENTS

3.1 PROOF LOAD - 600 MPa for metric bolts 85 ksi for inch bolts

3.2 AXIAL TENSILE STRENGTH- 830 MPa for metric bolts 120 ksi min. for inch bolts

3.3 CORE HARDNESS- Rockwell C25-34.

3.4 SURFACE HARDNESS SERRATED SHANK BOLTS ONLY- Rockwell 15N77 min.

3.5 BEND TEST- Bolts shall withstand a 10 deg bend without breaking into separate parts.

3.6 SERRATION TEST (SERRATED SHANK BOLTS ONLY) - Bolts shall assemble in a test plate without visual evidence of surface stripping of the serrations.

4. TEST METHODS

4.1 PROOF LOAD- Same as defined in SAE J429.

4.2 AXIAL TENSILE STRENGTH - Same as defined in SAE J429.

4.3 CORE HARDNESS- Same as defined in SAE J429.

4.4 SURFACE HARDNESS- Tests to determine surface hardness shall be conducted on the ends, hexagon flats or unthreaded and nonserrated portion of shanks,

in accordance with SAE J417. Proper correction factors shall be used when hardness tests are made on curved surfaces, per ASTM E18.

4.5 BEND TEST- The test bolt shall be threaded or clamped into a hardened block or other suitable device with three threads exposed. A force perpendicular to the centerline of the bolt shall be applied against the bolt head and continued until the plane of the bearing surface under the bolt head is permanently bend through 10 deg.

4.6 SERRATION TEST (SERRATED SHANK BOLTS ONLY)- The test bolt shall be pressed into a hole in a steel plate or appropriate wheel, hub or axle flange until the head is seated by applying an axial compression load to the head of the bolt. The bolt shall then be removed and visually examined for evidence of serration stripping.

If a wheel hub or axle flange is used it shall be of the same material and hardness required for the part into which the bolt is normally assembled in production. If plate is used, it shall be 12.7 mm (0.5 in) thick with hardness of Brinell 269-285. The hole size shall be as specified by the purchaser; however, if not specified the diameter shall be the average of the mean major and mean minor serration diameters.

5. MARKING

5.1 Nonserrated shank bolts shall be marked with three radial lines 120 deg apart.

5.2 Serrated shank bolts shall be marked with three radial lines spaced 165-30-165 deg apart.

5.3 Bolts with metric series threads shall be marked also with the letters "METRIC".

5.4 Markings shall be located on the top of the head and may be either raised or depressed at the option of the manufacturers.

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