Designation: F724 – 23

Standard Test Method for Outdoor Evaluation of Tire Sidewall Component Cracking Resistance[1]

This standard is issued under the fixed designation F724; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers procedures for evaluating passenger car tires for sidewall component integrity and cracking resistance, using an outdoor roadwheel.

1.2 This test method evaluates the resistance of tire sidewalls to dynamic weathering, atmospheric ozone cracking, fatigue cracking, or openings of splices within, or of junctures between, sidewall components and cracking at molded sidewall elements.

1.3 This test method is useful for evaluating tire black sidewalls, white, or other colored, sidewalls, and coverstrips.

1.4 This test method is limited to comparative performance testing between a "control" sidewall component or assembly and one or more experimental alternatives that are built onto the same tire ("multisection") or onto tires that are identical in all respects other than the sidewall variation.

1.5 This test method is not applicable to evaluation of sidewall resistance to abrasion, as may be experienced in severe cornering or curb scuffing.

1.6 The values stated in SI units are to be regarded as the standard.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For specific precaution statements, see 5.2.

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment

D1171 Test Method for Rubber Deterioration—Surface Ozone Cracking Outdoors (Triangular Specimens)

F538 Terminology Relating to Characteristics and Performance of Tires

3. Terminology

3.1 *Definitions:*

3.1.1 *black sidewall, n*—a sidewall on which only black compounds comprise the outer visible surface of a tire. **F538**

3.1.2 *clinch strip, n*—high-modulus or high-hardness compound applied between the carcass and the sidewall in the bead area to reinforce the bead. **F538**

3.1.3 *coverstrip, n*—a thin layer of black compound that covers the unexposed white sidewall portion of a finished tire. **F538**

3.1.4 *crazing, n*—minute, closely grouped, generally superficial cracks that usually result from light-activated oxidation. **F538**

3.1.5 *flex cracking, v*—cracking primarily caused by application of mechanical stress-strain cycling. **F538**

3.1.6 *juncture, n*—the interface between two different tire components or different compounds within the same component. **F538**

3.1.7 *juncture cracking, n*—a crack with opening originating at a juncture between two components. **F538**

3.1.8 *juncture opening, n*—a separation developing in a juncture. **F538**

3.1.9 *rim strip, n*—a layer of compound, with or without fabric reinforcement, that is applied at the bead to protect the carcass plies against damage from mounting tools and from rim chafing during service. **F538**

[1] This test method is under the jurisdiction of ASTM Committee F09 on Tires and is the direct responsibility of Subcommittee F09.30 on Laboratory (Non-Vehicular) Testing.

Current edition approved May 1, 2023. Published May 2023. Originally approved in 1981. Last previous edition approved in 2016 as F724 – 94a (2016). DOI: 10.1520/F0724-23.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.10 *sidewall, n—of a tire*, that portion of a tire between the tread and the bead. **F538**

3.1.11 *sidewall component, n*—an individual part of the sidewall construction, either a separate compound or a separately assembled piece. **F538**

3.1.12 *sidewall rubber, n*—the exterior rubber layer of a tire that extends over the sidewall part of the carcass. **F538**

3.1.13 *splice, n*—the joint formed either by overlapping or butting the ends of a given tire component in the course of assembling the tire. **F538**

3.1.14 *splice crack, n*—a crack originating at a splice. **F538**

3.1.15 *splice opening, n*—a parting of a splice along the interface of the assembled ends of a given component. **F538**

3.1.16 *veneer, n*—a thin layer of rubber covering the surface of the tire sidewall. **F538**

3.1.17 *weather cracking, n*—distinct surface cracks induced by action of ozone in those areas of sidewall that are under tension; the cracks usually form perpendicularly to the direction of stress.

3.1.18 *white sidewall, n*—a sidewall that contains a white (or light-colored) compound as a part of the total sidewall. **F538**

4. Significance and Use

4.1 Test Methods D1149 and D1171 can be used to evaluate different aspects of fatigue and weather cracking resistance of sidewall component materials in the form of test specimens. The present method applies to complete tires that are subjected to actual weather exposure conditions. The present method is satisfactory for research and development purposes but is not applicable to regulatory statutes or purchase specifications until standard classifications of state of cracking, similar to those in Test Method D1171, can be established.

5. Apparatus

5.1 *Outdoor Roadwheel*—An apparatus situated outdoors and consisting of:

5.1.1 One or more smooth steel road wheels of specified diameter. The road wheel(s) shall be wide enough to extend beyond the test tire foot print width. The road wheel diameter shall be no less than 610 mm (24 in.). Smaller diameter wheels may produce excessive flexing and premature extraneous tire failure.

5.1.2 Satellite stations for loading several test tires against the road wheel with known constant force.

5.1.2.1 Each satellite station can individually unload and withdraw the tire from contact with the road wheel in the event of an inflation pressure loss or other potentially catastrophic occurrence.

5.1.2.2 The tire-loading system may be done by any system that provides a constant force to maintain the desired tire deflection throughout the test.

5.1.3 A drive motor that can drive the road wheel(s), within ±1 % of a set test speed for extended periods of time. A commonly used speed is 48 km/h (30 mph).

5.1.4 System for determining accumulated cycles of rotation of each test tire.

5.2 *Safety Precautions:*

5.2.1 The apparatus shall be surrounded by a suitable enclosure to trap tire fragments in the event of a catastrophic failure during the test.

5.2.2 The controls for the apparatus shall be situated outside the enclosure.

6. Sampling

6.1 A sampling plan is not applicable since this test method is intended for research and development testing only. Test specimens (see Section 7) shall be tested simultaneously with a control specimen for direct comparison of relative performance.

7. Test Specimens

7.1 A test specimen shall be a given assembly of sidewall components, specific as to component formulations, assembly cross-section geometry, and preparation procedure. The test specimen may cover the entire sidewall circumference of the test tire and be compared with a control tire or it may cover a section of the sidewall and be compared with a control section and other test specimen sections built onto the same (multisection) tire.

7.2 A test specimen section shall cover ¼ of the circumference of the tire sidewall.

7.3 In multisection tire tests, only specimens on the same side of the tire shall be compared directly.

8. Selection and Preparation of Test Tires

8.1 For tire-to-tire comparative tests, all test tires shall have been manufactured within a 4 week period based on the date code and subjected to the same pretest conditions, particularly as related to heat and ultraviolet exposure.

8.2 Multisection test tires shall have been prepared with the test components (for example, varied compounds) having the same cross-sectional profile and dimensions, so as to avoid extraneous mechanical stress variability between the components, unless the profile variation is a test variable.

8.3 The test component surfaces of tires shall be washed with water to remove any temporary protective coating but shall not be subjected to solvent or other surface treatment (in the process of mounting, etc.) that may affect performance unless this is a part of the experimental study.

9. Procedure

9.1 Mount a test tire on a rim contour as described by the TRA Yearbook[3] for its particular size. For tire-to-tire comparative tests, rims shall be of the same width.

9.2 Mount the tire with the valve at a convenient reference point for describing the locations of cracks or other degradation as they occur.

9.3 The tire shall be inflated to 138 kPa (20 psi) at 38 ± 3 °C. This pressure facilitates the desired deflection of the tire

[3] Available from the Tire and Rim Association, Inc., 4000 Embassy Parkway, Suite 390, Akron, OH 44333.