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An American National Standard

Standard Test Methods for Bicycle Forks[1]

This standard is issued under the fixed designation F2273; 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 These test methods describe mechanical tests for determining the following performance properties:

1.1.1 Compression Load,

1.1.2 Bending Load,

1.1.3 Impact Resistance, and

1.1.4 Fatigue Life.

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

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E4 Practices for Force Verification of Testing Machines

F2043 Classification for Bicycle Usage

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *bicycle fork (fork)*—the mechanism between the head tube and the front axle, including the steerer tube, crown, triple clamps, shock absorbers, lower tubes, and upper tubes.

3.1.2 *steerer tube*—the structural fork component typically housed inside the bicycle head tube, connected to the fork crown. The steerer tube transmits steering inputs from the rider to the fork and connects the fork to the bicycle frame by means of headset bearings.

3.1.3 *fork crown (crown)*—the primary structural fork component responsible for connecting the steerer tube to the fork upper tube(s) or fork blades.

3.1.4 *lower triple clamp*—See *fork crown*. The lower crown of a two-crown suspension fork.

3.1.5 *upper triple clamp*—the secondary structural fork component responsible for connecting the steerer tube to the upper tube(s).

3.1.6 *dropout*—the fork component used to support the front wheel(s) at the axle(s).

3.1.7 *dropout centerline*—the front hub mounting axis that passes through both right and left dropouts.

3.1.8 *tire clearance*—the distance between the top surface of the tire and the bottom surface of the fork crown with no compressive force applied to the fork.

3.1.9 *crown-to-axle clearance*—the distance between the fork axle centerline and the bottom surface of the crown with no compressive load applied to the fork.

3.1.10 *head set*—the bearing cup, cones, and other supporting components for allowing rotation of the fork about the steering axis.

3.1.11 *limit trip or stop*—a deflection of the fork, which exceeds the allowable displacement values and causes the machine to stop running.

4. Summary of Test Methods

4.1 *Compression Load Test*—This test method compresses the fork. The distance from the bottom surface of the crown to the axle centerline is measured.

4.2 *Bending Load Test*—This test method restrains a fork by the steerer tube and applies a load perpendicular to the steerer tube axis at the point on the dropout centerline centered between the two dropouts. The deflection at the dropout centerline perpendicular to the steerer tube axis is measured.

4.3 *Impact Resistance Test*—This test method restrains a fork by the steerer tube in horizontal orientation; a weight is dropped from a prescribed height onto a fixture attached to the fork dropouts in line with the dropout centerline. Permanent deflection at the dropout centerline perpendicular to the steerer tube axis is measured. The ability of the connection between the steerer tube and crown to support torque applied about the axis of the steerer tube is also checked.

4.4 *Fatigue Test*—This test method restrains a fork by the steerer tube and applies a fully reversed load perpendicular to the steerer tube axis at the point on the dropout centerline centered between the two dropouts. The test is stopped either at

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[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.

failure as defined by the criteria below or at 250 000 cycles, whichever come first. The number of cycles is recorded.

5. Significance and Use

5.1 These tests are used to determine the performance of a bicycle fork.

6. Apparatus

6.1 *Compression Load Test*:

6.1.1 A fixture similar to Fig. 1 will be required.

6.1.2 The application of the load shall be applied to the top of the crown and along the centerline of the steerer tube (Fig. 1).

6.1.3 If necessary, then either a roller or linkage system shall be used to allow translation of the dropouts while the fork is compressed.

6.1.4 The distance from the dropout centerline to the nearest surface of the crown on steerer tube centerline shall be measured (Fig. 1).

6.2 *Bending Load Test*:

6.2.1 A fixture similar to that shown in Fig. 2 will be required to position a fork such that the steerer tube axis is horizontal and such that the fork is restrained by the steerer tube using bearings.

6.2.2 Bearing separation shall be 150 mm as shown in Fig. 2. Forks that require bearing installation not consistent with Fig. 2 shall be constrained in a manner consistent with their normal use.

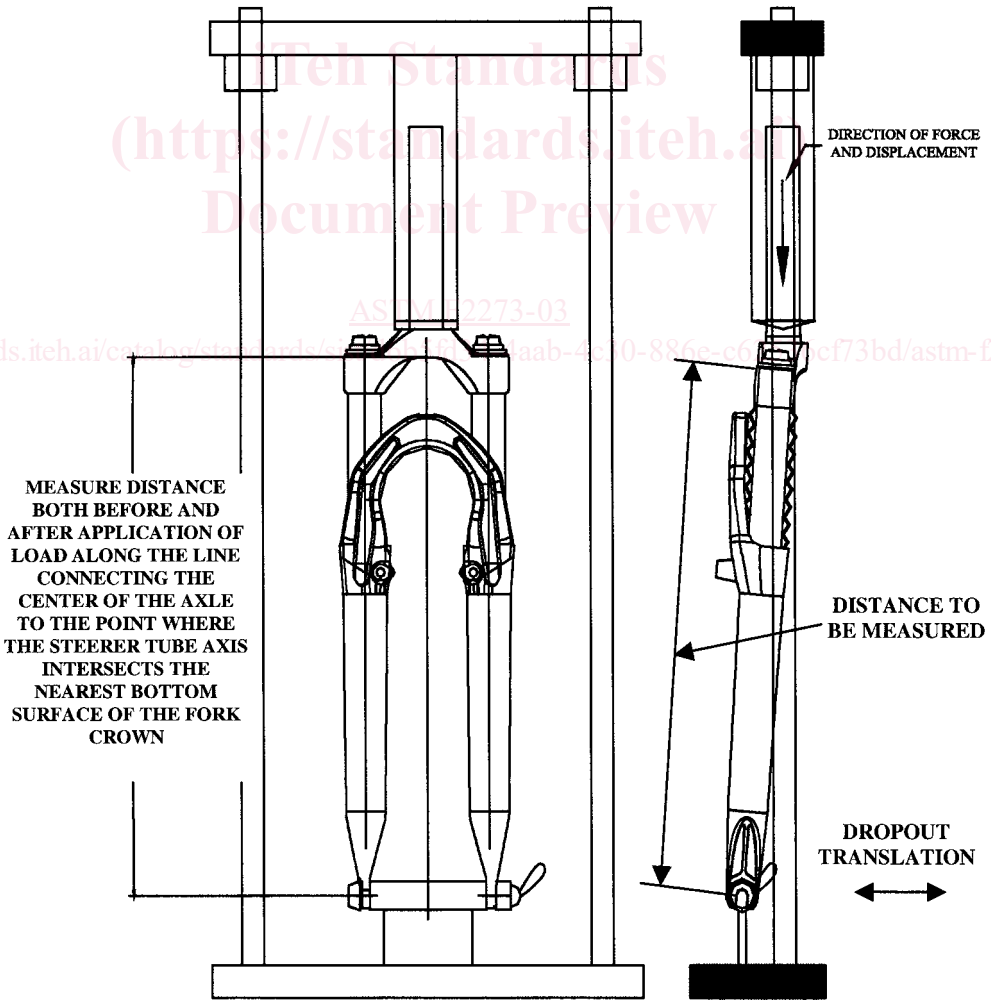
6.2.3 The load shall be applied at the dropout centerline in a direction perpendicular to the steerer (Fig. 2).

6.2.4 The dropout centerline shall be free to translate parallel to the steerer tube with either a roller or linkage system.

6.2.5 Deflection at the dropout centerline shall be measured perpendicular to the steerer tube.

6.3 *Impact Resistance Test*:

6.3.1 A fixture similar to that shown in Fig. 2 will be required to position a fork such that the steered tube axis is horizontal and such that the fork is restrained by the steerer tube using bearings. The fork shall be constrained so that it



NOTE—For some fork designs, a dropout support that allows translation may be required.

FIG. 1 Typical Compression Test Apparatus

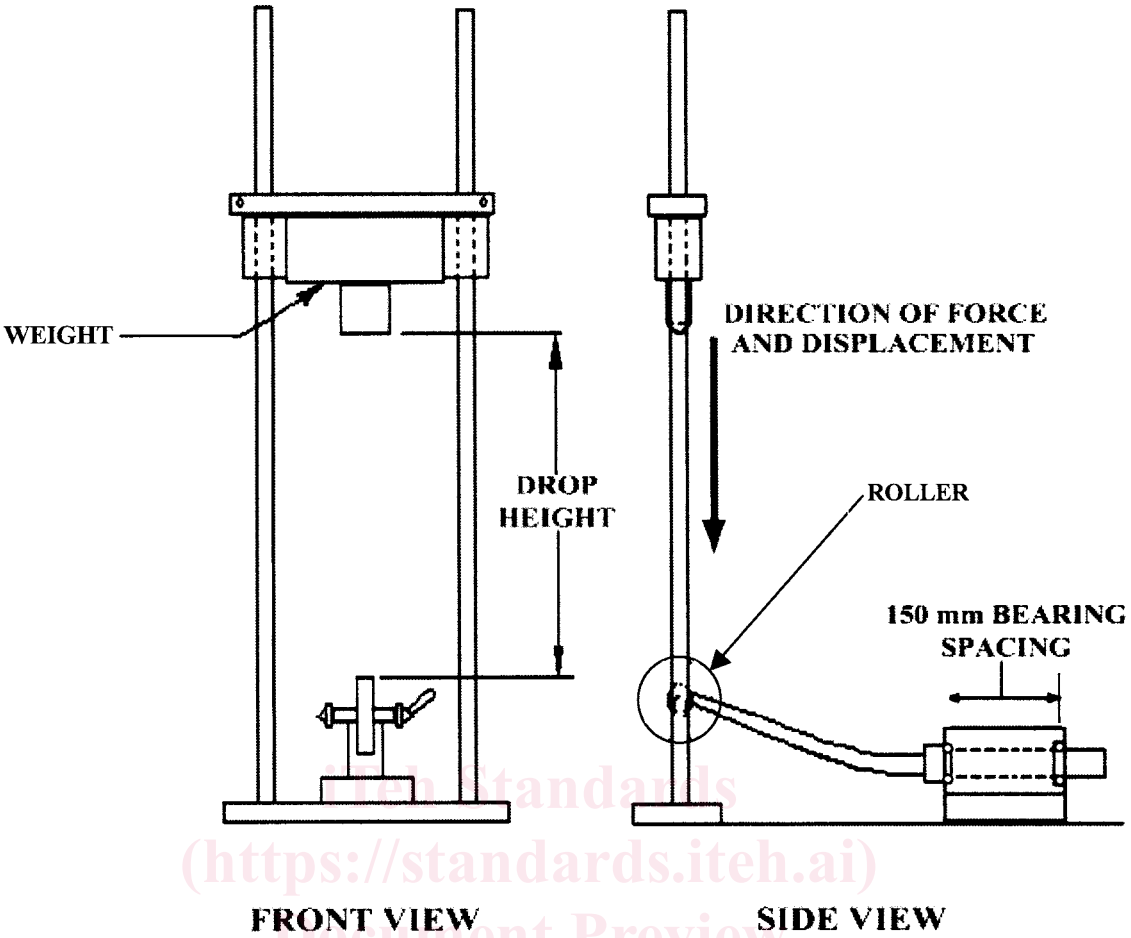


FIG. 2 Bending Load and Impact Test Setup

cannot rotate about the steerer tube axis and the dropout centerline is maintained horizontal.

6.3.2 Bearing separation shall be 150 mm, as shown in Fig. 3. Forks that require bearing installation not consistent with Fig. 3 shall be constrained in a manner consistent with their normal use.

6.3.3 The application of the impact shall be perpendicular to the steerer tube axis at the dropout centerline, centrally located between the dropouts (Fig. 2).

6.3.4 A roller is required (Fig. 2) and must be of sufficient diameter to ensure that the impactor comes to rest on the roller following impact.

6.3.5 The height of the roller above the support base should be such that the roller does not contact the base during the test.

6.3.6 Deflection at the dropout centerline in a direction perpendicular to the steerer tube axis shall be measured.

6.3.7 An apparatus capable of checking whether the connection between the steerer tube and crown can support a prescribed torque applied to the steerer tube about its axis is also required.

6.4 *Fatigue Test*:

6.4.1 A fixture similar to Fig. 3 will be required to restrain the suspension fork by the steerer tube using bearings as shown.

6.4.2 Bearing separation shall be 150 mm as shown in Fig. 3. Forks that require bearing installation not consistent with Fig. 3 shall be constrained in a manner consistent with their normal use.

6.4.3 The force shall be applied at the dropout in a direction perpendicular to the axis of the steerer tube. An actuator that is capable of providing a fully reversed force of constant amplitude will be used.

6.4.4 The dropout centerline shall be free to translate perpendicular to the direction of load application.

6.4.5 The ability of the actuator to produce the required amount of force shall be verified per Practices E4.

7. Test Specimens

7.1 *Preparation of Specimens*:

7.1.1 The forks shall be set to the maximum fully extended length.

7.2 *Fork Adjustment*:

7.2.1 The fork shall be tested with the standard spring rate and all preload and damping shall be adjusted to the minimum settings.

7.2.2 All fasteners shall be assembled to manufacturer's specifications.