



# Standard Specification for Nonpowered Bicycle Trailers Designed for Human Passengers<sup>1</sup>

This standard is issued under the fixed designation F 1975; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers nonpowered trailers intended to be pulled behind bicycles in order to transport one or two children with accessory loads with a maximum weight of 45.4 kg (100 lb). It includes test methods for confirming that this specification is satisfied.

1.2 The values stated in SI units are to be regarded as the standard. The units given in parentheses are for information only.

1.3 The following caveat pertains only to the test methods portion, Section 5, of this specification: *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:<sup>2</sup>

- B 117 Practice for Operating Salt Spray (Fog) Apparatus
- D 1230 Test Method for Flammability of Apparel Textiles
- D 4329 Practice for Fluorescent UV Exposure of Plastics
- G 23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials<sup>3</sup>

### 2.2 ANSI Standard:<sup>4</sup>

ANSI Z535.4, Product Safety Signs and Labels

### 2.3 Federal Standards:<sup>5</sup>

Title 16, CFR 1500.3(b)(4)(i) Hazardous Substance

Title 16, CFR 1500.3(c)(6)(vi) Flame Testing

Title 16, CFR 1500.44 Flammability

Title 16, CFR 1500.48 Sharp Points

Title 16, CFR 1500.49 Sharp Edges

Title 16, CFR 1501 Small Parts

Title 16, CFR 1303 Lead in Coatings

Title 16, CFR 1512 Requirements for Bicycles, Sections: 1512.18(n), Reflector Test

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *backrest, n*—the segment of the seat that is designed to support the occupant's back. This may or may not include support for the upper body, including the head and neck.

3.1.2 *bicycle trailer (trailer), n*—a transporting device designed to provide a restrained seating position to one or more occupants, with fastening arrangements for attaching the device, and towing it, behind a bicycle.

3.1.3 *hard horizontal surface, n*—a surface, perpendicular to the direction of gravity, such as level ground or building floor, whose surface is either concrete, pavement, or similar rigid material whose deflection, while carrying the weight of a fully loaded trailer, does not exceed 12.7 mm (0.5 in.) from the unloaded horizontal plane at any point.

3.1.4 *normal use, n*—applications described as intended use for the product found within the manufacturer's instructional literature.

3.1.5 *normal use temperatures, n*—temperature range within which it should be anticipated that the trailer may be used to transport children. The range is from  $-7 \pm 2^\circ\text{C}$  to  $+50 \pm 2^\circ\text{C}$ .

3.1.6 *occupant, n*—a child or person who is restrained in a seated position inside the trailer and whose skills do not contribute to the overall operation and performance of the vehicle.

3.1.7 *restrain, v*—to prevent the occupant(s) of the trailer from leaving the seated position on the seat of the trailer by means of a restraint system (designed by the manufacturer) when used in accordance with the manufacturer's instructions.

3.1.8  *rider, n*—a person whose skills contribute to the overall operation and performance of the vehicle.

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

<sup>3</sup> Withdrawn. The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

<sup>5</sup> *Code of Federal Regulations*, available from U.S. Government Printing Office, Washington, DC 20402.

3.1.9 *seated height space, n*—a dimension of space that is within the protective structure of a trailer. This space is the measured height of the occupant's protective cavity, measured from the seat bottom and along the backrest to the top of the space allowed for occupants.

3.1.10 *test dummy, n*—a dummy that shall be of a design consistent with the use of the trailer seat and restraint system. It shall have adequate head/neck, shoulder, and arm geometry to ensure proper application of the upper body restraints. The weight of the dummy shall be 22.7 kg (50 lb). The upper legs, measured perpendicularly from the dummy's back, shall extend a minimum of 375 mm (14.8 in.). The dummy's back is the surface of the dummy that is in contact with the seat back when the dummy is seated. The dummy's bottom is the surface of the dummy that is in contact with the seat bottom when the dummy is in the seated position. The weight distribution throughout the dummy shall result in a center of gravity position that is  $230 \pm 10$  mm ( $9.1 \pm 0.4$  in.) from the dummy's bottom and  $130 \pm 10$  mm ( $5.0 \pm 0.4$  in.) from the dummy's back when in the seated position.

3.1.11 *tongue, n*—a rigid structure or pole that extends from the frame of the trailer to the hitch to the bicycle.

3.1.12 *useful product lifecycle, n*—allowable range of time for continued use of product from date of manufacture as described within the manufacturer's instructional literature.

#### 4. Requirements

4.1 *General*—Bicycle trailers shall be designed and manufactured in such a way that components with which an occupant may come in contact do not cause injury when used in accordance with the manufacturer's instructions. Exposed surfaces shall be free from burrs, sharp edges, and points. Refer to Title 16, CFR 1500, Parts 48 and 49, and Title 16, CFR 1501. No openings with which the occupants' hands can come in contact shall have dimensions between 6 mm (0.236 in.) and 13 mm (0.512 in.). Trailers shall be equipped with rear reflectors; side reflectors are required on wheels. Refer to Title 16, CFR 1512, Parts 16 and 18(n). The manufacturer shall warn the rider that a load added to the bicycle will alter the stability and riding characteristics of the bicycle.

4.2 *Equipment*—Trailers shall be equipped with the following equipment: seating area, footrest area, space for helmeted head, devices that reduce contact of the hands and feet with moving or movable components of the trailer or the bicycle that could cause injury, and adjustable belt(s) or other capturing devices designed to restrain the occupant when seated.

4.3 *Attachment*—The attachment process for connecting the trailer to the bicycle shall be of a simple and secure procedure. If tools are required for attachment, attaching shall be accomplished with common household tools.

4.4 *Dimensions*—Backrests shall have a minimum height of 350 mm (13.8 in.). The seated height space shall be a minimum of 55 cm (22 in.).

#### 4.5 Materials:

4.5.1 All nonmetallic materials that compose structural components will be subjected to either (1) 100 h of accelerated weathering in accordance with Method 1 of Practice G 23, or (2) 60 h of accelerated weathering in accordance with Practice D 4329. The material sample will then be subjected to a tensile

strength test with increasing load until failure. An identical sample of the same material, not subjected to the accelerated weathering test, will then be subjected to the same tensile strength test. The failure load of the accelerated weathering sample shall be a minimum of 60 % of the failure load of the unweathered sample.

4.5.2 All metallic materials from structural components shall be tested in accordance with the Salt Spray Test in Practice B 117 for a period of 96 h. Materials should be placed in the test environment in a condition consistent with their application on the trailer, with surface coatings and openings sealed or open as in normal use. After exposure to the salt spray, inspect for evidence of corrosion. No corrosion beyond 20 % of the primary metal material wall thickness is permitted. Painted portions shall comply with Title 16, CFR 1303.

4.5.3 Mechanical properties of materials used in the construction of bicycle trailers shall not fail under normal use applications, and within useful product lifecycle, as a result of exposure to the temperature variances defined as normal use temperatures in 3.1.5.

4.5.4 Materials known to be a hazardous substance, as defined in Title 16, CFR 1500.3(b)(4)(i), shall not be used.

4.5.5 Materials other than fabrics shall not support flame propagation in excess of the requirements of Title 16, CFR 1500.3(c)(6)(vi) when flame tested to Title 16, CFR 1500.44. Fabrics shall achieve a Class 1 rating when tested in accordance with Test Method D 1230.

#### 5. Test Methods

5.1 *Strength Tests*—The dummy, or dummies, to be used in the following tests shall comply with the dummy specification in 3.1.10.

##### 5.1.1 Restraint System Test:

5.1.1.1 Erect the trailer in the manufacturer's suggested use position. Remove the trailer tongue. Restrain a dummy into each seating position in accordance with the manufacturer's instruction for maximum occupancy.

5.1.1.2 Elevate the trailer, as shown in Fig. 1, from the rear, so that the orientation toward the ground is the same as the trailer's direction of forward motion when attached to a bicycle (front-most structure of the trailer is closest to the impact surface). The impact surface is a hard material, concrete or similar. The drop height is 1.2 m (3.9 ft).

5.1.1.3 By convenient method, release the trailer to drop onto the surface.

5.1.1.4 Inspect the trailer structure. No part of the occupant's protective structure shall have deformed more than 25 mm (1.0 in.), or separated. No part of the restraint system shall have separated.

##### 5.1.2 Structural Integrity in Rollover:

5.1.2.1 Erect the trailer in the manufacturer's suggested use position. Remove the wheels.

5.1.2.2 Place the trailer, as defined by 5.1.2.1, onto the 45° incline test table shown in Fig. 2. Fix the trailer to the test table at the wheel attachment points using dummy wheel hubs, and at the tongue attachment point to the trailer, using a dummy trailer tongue.

5.1.2.3 Position the lever arm with slide over the topmost point of the trailer frame, as shown. The slide has bearings

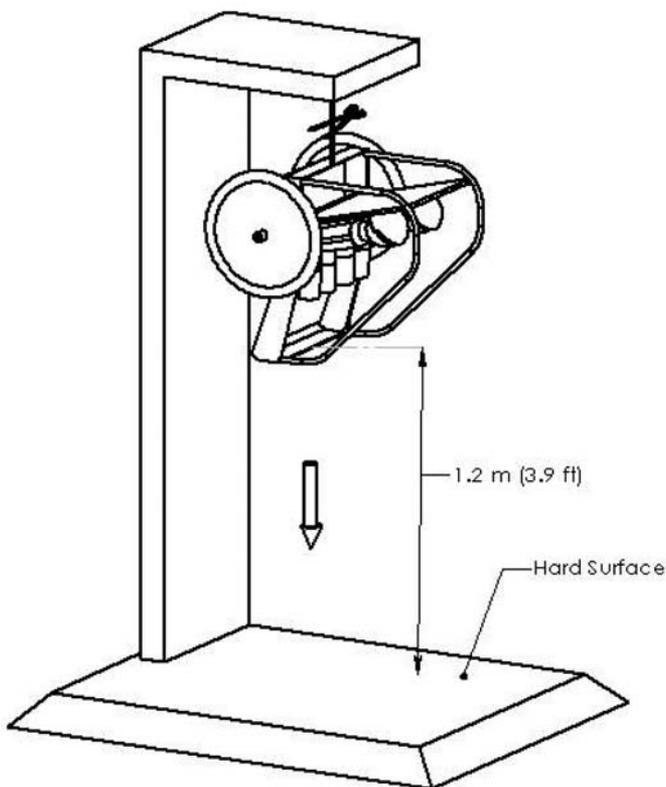


FIG. 1 Elevating the Trailer

permitting it to roll along the lever as load is applied. With the weight of the lever arm and the slide resting on trailer frame, mark the position of the slide, along the lever arm. This is the initial position mark.

5.1.2.4 Measure the load,  $F$ . This is the force applied at the contact point by the combined weight of the lever arm and sled. This force shall be less than 20 kg (44 lb).

5.1.2.5 Determine the appropriate amount of weight to hang from the end of the lever bar. Measure the distance along the lever from the pivot point to the trailer contact point, this is measure  $T$  in Fig. 2. Then measure the length,  $L$ , along the lever arm from pivot point to weight attachment point. Determine to size of the weight,  $W$ , from the calculation in Fig. 2.

5.1.2.6 Place the weight  $W$  at the end of the lever bar, Fig. 3, for 15 s then remove. The trailer must support that weight, statically, for 10 s of that period. Leave the lever arm and sled resting on the trailer. Mark the position of the sled along the lever arm. This is the final position mark.

5.1.2.7 The distance between the initial position mark and final position mark shall be less than 80 mm (3.1 in.).

### 5.2 Tipover Resistance Tests:

5.2.1 *Tilting Procedure*—Tilt the table until the uphill wheel starts to lift off the table. The tilt rate should be sufficiently slow, so that the point at which the uphill tire lifts off can be easily identified. Record the angle at which the uphill tire lifts off the table. Repeat the tilting of the table two more times. The results of these tests should agree within  $\pm 1.0^\circ$ . If they do not, verify that the dummy is properly restrained. (There should be no excess slack in the restraint system and the dummy should be properly seated.) Also verify that the trailer is correctly

assembled. (There should be no excess play in any of the joints.) Record and average the test results.

5.2.2 *Single-Occupant Trailer Test*—Erect the trailer in the manufacturer’s suggested use configuration and inflate the tires to the maximum suggested air pressure. Restrain a dummy into the seat restraints as suggested by the manufacturer. The minimum allowable tilt angle for the single-occupant trailer is  $30.0^\circ$ .

5.2.3 *Double-Occupant Trailer Test (Fully Loaded)*—Erect the trailer in the manufacturer’s suggested use configuration and inflate the tires to the maximum suggested air pressure. Restrain two dummies into the seat restraints as suggested by the manufacturer, to bring the trailer to maximum occupancy as defined by the manufacturer. The minimum allowable tilt angle for the fully loaded double-occupant trailer is  $30.0^\circ$ .

5.2.4 *Double-Occupant Trailer Test (Single-Occupant Manufacturer’s Suggested Positioning)*—Erect the trailer in the manufacturer’s suggested use configuration and inflate the tires to the maximum suggested air pressure. Restrain one dummy into the seat restraints and seating position for a single passenger as suggested by the manufacturer. The minimum allowable tilt angle for the double occupant trailer when loaded with a single occupant in the manufacturer’s suggested position is  $30.0^\circ$ .

5.2.5 *Double-Occupant Trailer Test (Single-Occupant Downhill Seating Position)*—Erect the trailer in the manufacturer’s suggested use configuration and inflate the tires to the maximum suggested air pressure. Restrain one dummy into the seating position on the downhill side of the trailer, as the table is tilted. Attach the seat restraints as suggested by the manufacturer for this seating position. The minimum allowable tilt angle for the double-occupant trailer when loaded with a single occupant on the downhill side of the trailer is  $25.0^\circ$ .

### 5.3 Coupling Security Test:

5.3.1 Erect the trailer in the manufacturer’s suggested use position. Inflate tires to maximum suggested air pressure. Restrain a dummy into each seating position in accordance with the manufacturer’s instruction for maximum occupancy. By convenient method place an additional 5.7 kg (12.5 lb), per dummy, onto the trailer seat.

5.3.2 Fasten the trailer as shown in Fig. 4 to the rear bicycle frame portion of the test fixture. The test fixture must comply with the specifications found in Fig. 5. Measure the horizontal position of the hitch relative to a convenient part of the rear bike frame.

5.3.3 Fix a rail or barrier device along the path of the trailers left or right wheel to prevent trailer side-to-side motion during the test. (Trailers with tongues designed to approach the bicycle on the right side, will tend to motion left during this test.)

5.3.4 Start the test. Allow the test to run for a duration of 100 000 cycles.

5.3.5 Inspect the trailer tongue, hitch and mounting hardware for attaching the trailer to the tongue. No part of the construction shall have separated or incurred a fracture or crack. Repeat the horizontal hitch placement measurement of 5.3.2. The difference in this measure, before after and during the test, shall not exceed 15 mm (0.6 in.).