



Standard Specification for Nonpowered Bicycle Trailers Designed for Human Passengers¹

This standard is issued under the fixed designation F1975; 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 specification covers a nonpowered trailer intended to be pulled behind a bicycle in order to transport one or two children with an accessory load of 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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

- B117 Practice for Operating Salt Spray (Fog) Apparatus
- D1230 Test Method for Flammability of Apparel Textiles
- D4329 Practice for Fluorescent Ultraviolet (UV) Lamp Apparatus Exposure of Plastics
- G23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure

¹ This specification is under the jurisdiction of ASTM Committee F08 and is the direct responsibility of Subcommittee F08.10 on Bicycles.

Current edition approved Aug. 1, 2023. Published August 2023. Originally approved in 1999. Last previous edition approved in 2015 as F1975 – 15. DOI: 10.1520/F1975-15R23.

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.

of Nonmetallic Materials (Withdrawn 2000)³

2.2 ANSI Standard:⁴

ANSI Z535.4, Product Safety Signs and Labels

2.3 Federal Standards:⁵

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 for towing behind a bicycle, which provides a restrained seating position to one or more occupants, with fastening arrangements for attaching the device.

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

³ The last approved version of this historical standard is referenced on www.astm.org.

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

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

transport children. The range is from $-7 \pm 2^{\circ}\text{C}$ to $35 \pm 2^{\circ}\text{C}$ ($-19.4 \pm 4.6^{\circ}\text{F}$ to $95 \pm 4.6^{\circ}\text{F}$).

3.1.6 *occupant, n*—a child or person who is restrained in a seated position inside the trailer and whose efforts 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 effort and skills contribute to the overall operation and performance of the vehicle.

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 ± 1 kg (50 ± 2.2 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 ± 10 mm (9.1 ± 0.4 in.) from the dummy's bottom and 130 ± 10 mm (5.1 ± 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 of the trailer.

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

4. Requirements

4.1 *General*—A bicycle trailer shall be designed and manufactured in such a way that when used in accordance with the manufacturer's instructions, components with which an occupant may come in contact do not cause injury. 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.). A trailer shall be equipped with a rear reflector; 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*—A trailer shall be equipped with the following equipment: seating area, footrest area, space for helmeted head, devices that protect the hands and feet from 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*—The backrest shall have a minimum height of 350 mm (13.8 in.). The seated height space shall be a minimum of 550 mm (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 G23, or (2) 60 h of accelerated weathering in accordance with Practice D4329. 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 of structural components shall be tested in accordance with the Salt Spray Test in Practice B117 for a period of 96 h. Materials shall 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 wall thickness of the metal material is permitted. Painted portions shall comply with Title 16, CFR 1303.

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

4.5.4 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 D1230.

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 configuration. 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.

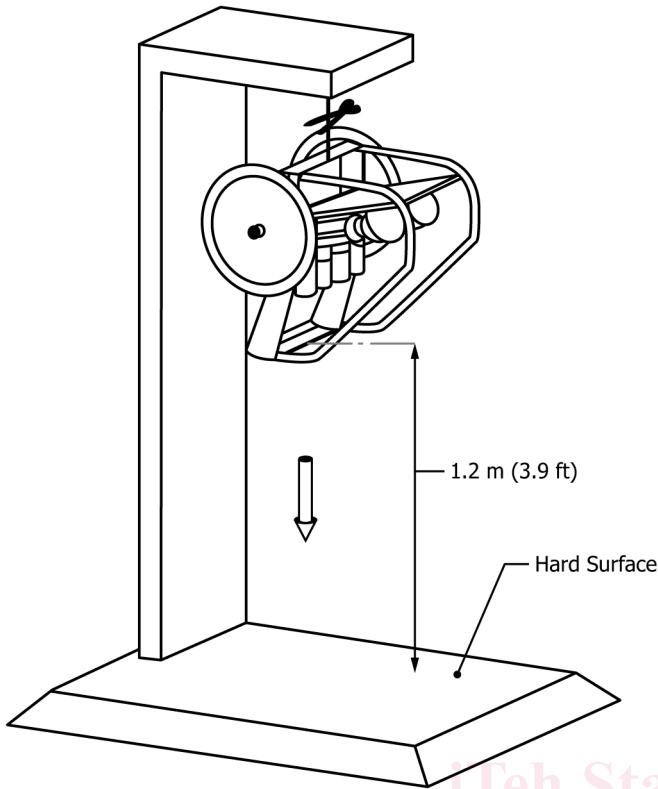


FIG. 1 Elevating the Trailer

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

5.1.2 Structural Integrity in Rollover:

5.1.2.1 Erect the trailer in the manufacturer's suggested use configuration. 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 of the trailer using a dummy trailer tongue.

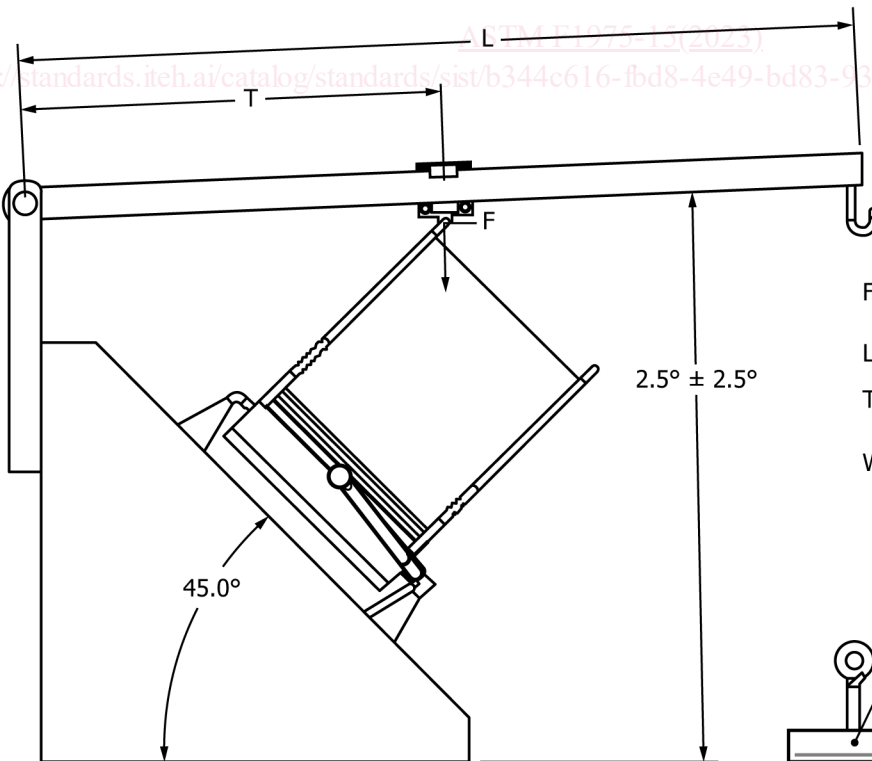
5.1.2.3 Position the lever arm with the sled placed over the topmost point of the trailer frame, as shown. The sled has bearings permitting it to roll along the lever as a load is applied. With the weight of the lever arm and the sled resting on the trailer frame, mark the position of the sled, along 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 arm. 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 the pivot point to the weight attachment point. Determine the 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 arm, 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.).



- F = load on trailer from weight of lever arm and sled (kg)
- L = Length of lever arm (cm)
- T = Distance along lever arm from pivot to contact point of trailer. (cm)
- $W = T \times (70 - F) / L$ (kg)

W test load to apply to end of lever arm

FIG. 2 Roll Test Before Load is Applied

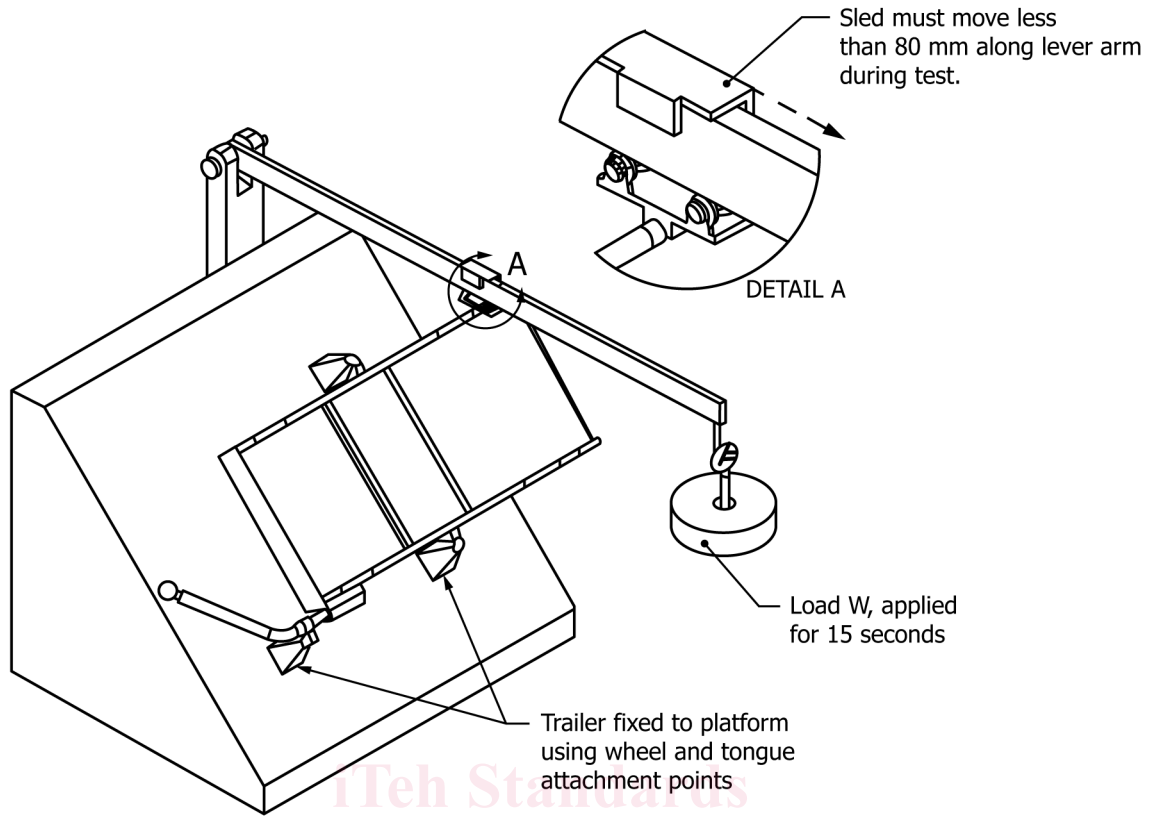


FIG. 3 Roll Test During Load Application

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 that the angle of the table at which the uphill tire lifts off can be easily identified.

5.2.2 *Single or Multiple-Occupant Trailer Test*—Erect the trailer in the manufacturer's suggested use configuration and inflate the tires to the trailer manufacturer's suggested air pressure. Restrain a dummy or dummies into the most onerous seating position (worst case as defined by the manufacturer). The minimum allowable tilt angle for the single-occupant trailer is 25°.

5.3 *Coupling Security Test:*

5.3.1 Erect the trailer in the manufacturer's suggested use configuration. Inflate the tires to the trailer manufacturer's 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 side-to-side motion of the trailer during the test. (A trailers with a tongue designed to approach the bicycle on the right side will tend to move left during this test.)

5.3.4 Start the test and set the motor to run at 60 ± 2 rpm. Allow the test to run for a duration of 100 000 cycles.

5.3.5 Inspect the trailer tongue, hitch, and tongue mounting hardware. No part of the construction shall separate or incur a fracture or crack. Repeat the horizontal hitch placement measurement of 5.3.2. The difference in this measurement, before and after the test, shall not exceed 15 mm (0.6 in.).

5.4 *System Fatigue Test (Axle/Frame):*

5.4.1 The test equipment shall be capable of simulating the passing of the trailer over a bump. The device is a drum with the trailer positioned so the wheel or wheels sit atop the drum (Fig. 6). The placement of the wheel axle shall be between 25 and 50 mm (1.0 to 2.0 in.) rearward in the horizontal direction from the highest point on the drum. The minimum width of the flywheel shall be wide enough to permit the trailer to move side-to-side a distance of 150 mm (6 in.) in either direction. The drum shall have one cleat if testing a single-wheel trailer and two cleats if testing a two-wheel trailer. The cleat shall be no less than 38 mm (1.5 in.) high and no greater than 100 mm (3.9 in.) in the direction of motion. The leading edge shall be inclined at 45° from horizontal, and the drop at the trailing edge shall be 90° from horizontal. The single cleat shall be centered across the trailer path and occupy the minimum width of the flywheel. The two cleats shall each be a minimum of 300 mm (11.8 in.) long and centered perpendicular to the track of each trailer wheel in a manner where the first cleat strikes the wheel on one side only, and proceeds to strike the next evenly spaced cleat at no less than a distance of 1016 mm (40 in.). The horizontal speed at which the trailer's axle approaches the cleat

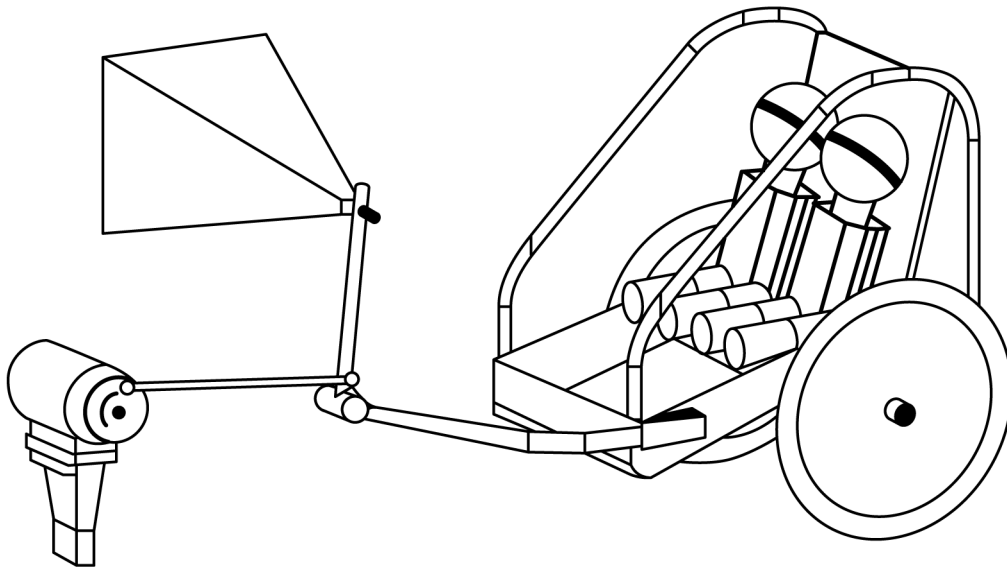


FIG. 4 Test Setup for Attaching Trailer to Typical Axle/Chainstay Mounted Coupling System

MEASUREMENTS IN MOTOR POSITION SHOWN:

- A: 330 ± 25 mm (13 ± 1.0 inch)
- B: 330 ± 25 mm
- C: 330 ± 25 mm
- D: 625 ± 50 mm (25 ± 2 inch)
- E: 320 ± 50 mm

IA–BI < 10 mm, IA–CI < 10 mm, IB–CI < 10 mm

R: $51 +0.5 -0.5$ mm (2 ± 0.020 inch)
 L: > 250 mm (> 10 inch)

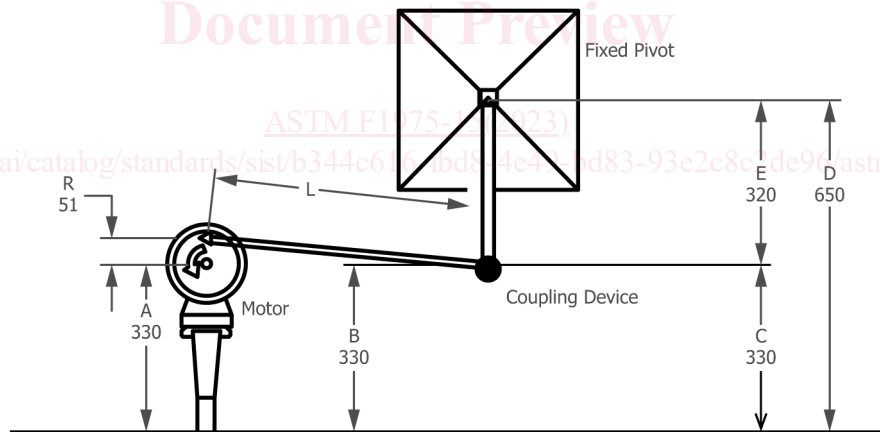


FIG. 5 Coupling System Test Setup

shall be no more than 13 km/h (8 mph) and no less than 12 km/h (7.5 mph). The speed shall be set in this range to avoid harmonic resonance of the trailer. If multiple cleats for a single-wheel trailer or multiple sets of cleats for a two-wheel trailer are employed, the spacing shall ensure that each cleat strikes no less than a distance of 1016 mm (40 in.) after the previous cleat.

5.4.2 Erect the trailer in the manufacturer’s suggested use configuration and restrain a dummy or dummies into the seat to attain full occupancy of the trailer. If the manufacturer has specified a separate location and capacity for cargo that is in addition to occupant capacity, then enough weight shall be

added to the defined cargo area(s) to bring the total weight up to the manufacturer’s total specified cargo and occupant weight. The total dummy and cargo weight shall meet or exceed the manufacturer’s specified maximum occupant and cargo weight. Inflate the tire(s) to the pressure stated on the tire sidewall or the trailer manufacturer’s recommended tire pressure, whichever is higher. Mount the trailer onto the test equipment as previously described, and conduct the test for 20 000 wheel system impacts.

5.4.3 Remove the trailer from the test equipment and inspect the wheel and frame assemblies. No part of these assemblies shall fail, or incur a fracture or a crack. Inspect the