



Standard Test Methods for Evaluating Design and Performance Characteristics of Fitness Equipment¹

This standard is issued under the fixed designation F2571; 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.

INTRODUCTION

The goal of these tests is to provide reliable and repeatable methods for the evaluation of fitness equipment. The equipment users must recognize, however, that conformance to a standard will not necessarily prevent injuries. Like other physical activities, exercise involving fitness equipment involves the risk of injury, particularly if the equipment is not maintained or used properly.

1. Scope

1.1 These test methods specify procedures and apparatus used for testing and evaluating fitness equipment for compliance to Specification [F2276](#). Both design and operational parameters will be evaluated. Where possible and applicable, accepted test methods from other recognized bodies will be used and referenced.

1.2 It is the intent of this standard to specify test methods for fitness products for use by individuals age 13 and above.

1.3 *Requirements*—Fitness Equipment is to be tested for all of the following parameters:

- 1.3.1 Stability.
- 1.3.2 Edge and Corner Sharpness.
- 1.3.3 Tube Ends and Holes.
- 1.3.4 Function of Adjustments and Locking Mechanisms.
- 1.3.5 Handgrip Design and Retention.
- 1.3.6 Foot Supports.
- 1.3.7 Load Development and Transmitting Systems.
- 1.3.8 Chain and Gear Drive Design.
- 1.3.9 Entrapment Zones and Guarding.
- 1.3.10 Loading:
 - 1.3.10.1 Intrinsic Loading.
 - 1.3.10.2 Extrinsic Loading.
 - 1.3.10.3 Handlebar Loading.
 - 1.3.10.4 Endurance Loading.
 - (1) Seat frame endurance loading.
- 1.3.11 Switch and switch actuation mechanism endurance.

¹ These test methods are under the jurisdiction of ASTM Committee [F08](#) on Sports Equipment, Playing Surfaces, and Facilities and are the direct responsibility of Subcommittee [F08.30](#) on Fitness Products.

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- 1.3.12 Electrical Guarding.
- 1.3.13 Maximum Surface Temperature.
- 1.3.14 Documentation and Warnings Verification.

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

1.5 *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
 - [F1749](#) Specification for Fitness Equipment and Fitness Facility Safety Signage and Labels
 - [F2276](#) Specification for Fitness Equipment
- 2.2 *European Standards*:³
 - [EN 957-1](#) Stationary Training Equipment - Part 1: General Safety Requirements and Test Methods
- 2.3 *UL Standards*:⁴
 - [UL 1439](#) Standard for Safety Test for Sharpness of Edges on Equipment
 - [UL 1647](#) Motor-Operated Massage and Exercise Machines
 - [UL 60335](#) Standard for Safety of Household and Similar Electrical Appliances

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 Available from European Committee for Standardization (CEN), 36 rue de Stassart, B-1050, Brussels, Belgium, <http://www.cenorm.be>.

⁴ Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, <http://www.ul.com>.

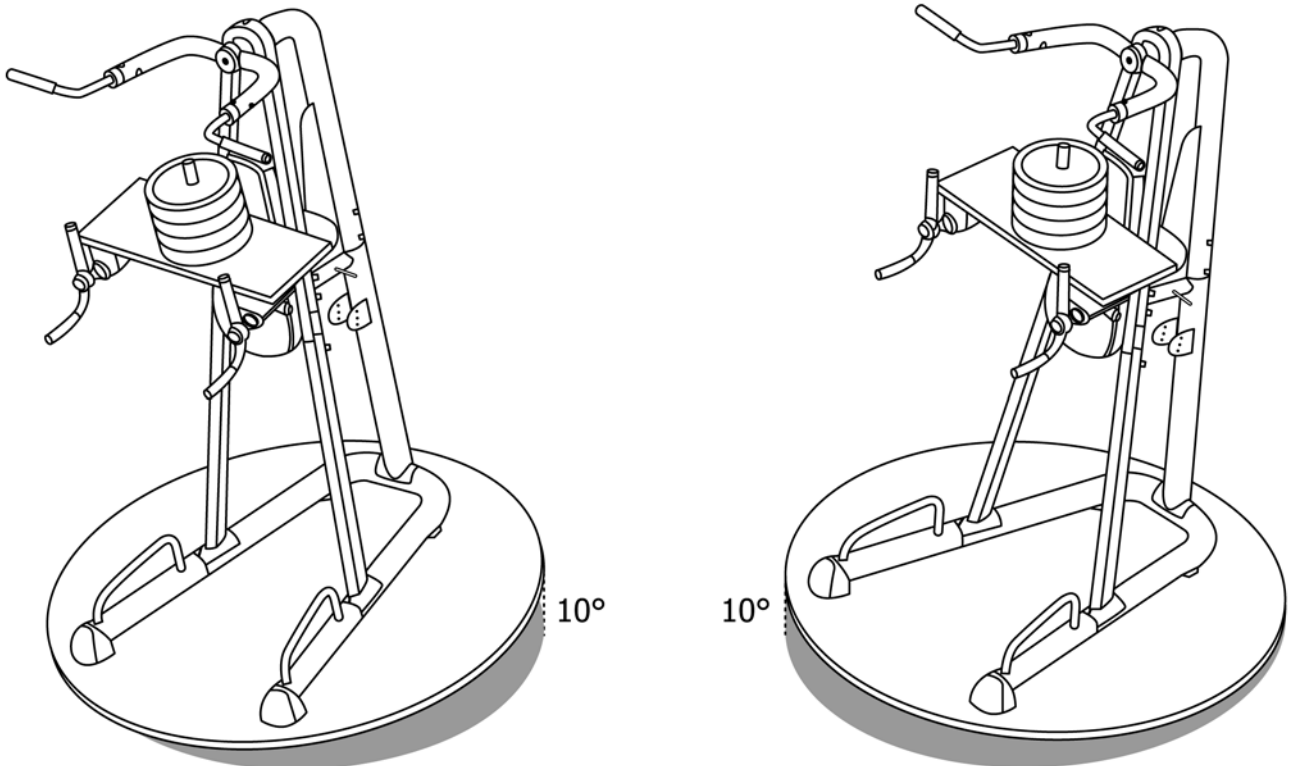


FIG. 1 Tilt Test Illustration Represents Testing the Verticle Knee Raise Station

2.4 ANSI Standards:⁵

ANSI B29.1 Precision Power Transmission Roller Chains, Attachments and Sprockets

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *breakage, n*—separation or damage to the structure or components such that they will no longer support the applied load.

3.1.2 *user means, n*—portion of the fitness equipment that the user operates to perform the desired function of the machine. Examples include handles, lifting arms and rollers.

4. Significance and Use

4.1 The purpose of these tests are to provide valid and repeatable methods for the evaluation of fitness equipment assembled and maintained according to the manufacturer’s specifications. Use of these test methods in conjunction with Specification F2276 is intended to maximize the reliability of fitness equipment design and reduce the risk of serious injury resulting from design deficiencies.

5. Certification

5.1 These test methods permit self-certification. It is recommended that each manufacturer employ an independent labo-

ratory to evaluate and validate that their designs and test procedures conform and comply to these test methods and Specification F2276.

6. Sample Preparation

6.1 Assemble and adjust the fitness equipment according to the manufacturer’s instructions. On machines that are fully assembled, verify according to the manufacturer’s instructions that all components are functioning and that they have been adjusted and aligned properly. Unless otherwise stated, the machine must pass the tests without adjustment from this initial condition.

6.2 The individual test methods will describe any variations or modifications that are allowed or are required to the test sample.

7. Test Methods and Procedures

7.1 Stability:

7.1.1 Fitness equipment that is designed for the user to maintain balance as part of its function is not required to meet the stability test (that is, a balance board is not tested for stability).

7.1.2 Fitness equipment shall be tested with and without the simulated user load in the orientation that is least stable.

7.1.3 *Apparatus and Set-Up*—Refer to Fig. 1. Place sample on a non-skid surface inclined at 10° in the orientation that is least stable. The sample shall rest on the supporting surface without anchoring unless the installation instructions for the machine require that the sample be anchored to the floor. If this

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

is the case, then anchor the specimen per the manufacturer's recommendations. Determine how the user is placed on the machine to perform the exercise (that is, seated, standing, or prone) and then determine how the user's body weight is distributed onto the user support surfaces. For the simulated use test, a method of applying a steady state load equal to the maximum specified users weight or 100 kg (220 lb), whichever is greater, simulating the user's weight and its distribution in the vertical direction at the point(s) of user contact must be provided. As an example, for a seated user, the user support surface shall be adjusted to the uppermost position (if adjustable) and the center of gravity of the load shall be positioned approximately 300 mm (12 in.) above the user support surface. Possible methods of providing this load include but are not limited to dead weights.

7.1.4 Calibration—Using an angle measuring instrument accurate to within 0.1°, verify the non skid surface is 10 ± 0.5°. Calibrate the load measurement apparatus to confirm accuracy to within ±20 N (4.5 lb) at the specified load of the maximum specified user weight or 100 kg (220 lb), whichever is greater.

7.1.5 Procedure—Test the sample as follows:

7.1.5.1 If the equipment has a storage position that is different than the use position, place or adjust the machine into that position. With the tilt surface inclined to 10° verify that the sample does not tip over.

7.1.5.2 Reposition the sample into the use position. With the sample machine [no user load applied] positioned on the tilt surface verify that the sample does not tip over with the tilt surface inclined to 10°.

7.1.5.3 Using an appropriate load apparatus such as dead weights, distribute a vertical load equal to the maximum specified user weight or 100 kg (220 lb), whichever is greater (±5 %), in a non-impact manner to the specimen where the user contacts the machine during normal operation. [If only a portion of the user's body is supported by the machine during operation, the simulated user weight shall be decreased by the appropriate amount.] Raise and support any adjustable devices or other user means to simulate the furthest point in the range of travel so that its orientation would cause the least stable condition as encountered during normal operation as shown in **Fig. 1**. Verify that the sample does not tip over.

7.1.6 Pass/Fail Criteria—In none of the above test conditions shall the sample tip over.

7.1.7 Precision and Bias—No information is presented about either the precision or bias of the test for measuring stability since the test result is non-quantitative.

7.2 Edge Sharpness:

7.2.1 The purpose of this test is to verify that there are no edges in the accessible area that would constitute a risk of injury. Where there is uncertainty, a sharp-edge tester as specified by UL 1439 is to be employed.

7.2.2 Apparatus and Set-Up—The sample shall be set up as described in **6.1**.

7.2.3 Calibration—Calibrate sharp-edge tester per UL 1439.

7.2.4 Procedure—Examine the accessible areas by visual and tactile means to ensure all parts are burr-free, rounded or otherwise insufficiently sharp to constitute a risk of injury.

Wherever there may be uncertainty as to the sharpness of an edge, use the edge tester and conduct the test per UL 1439.

7.2.5 Pass/Fail Criteria—Use the pass fail criteria of UL 1439 to determine if the sample passes this test.

7.2.6 Precision and Bias—No information is presented about either the precision or bias of the test for evaluating sharp edges since the test result is non-quantitative.

7.3 Corner Sharpness:

7.3.1 This test is a visual inspection of the sample to ensure that all corners in the accessible areas are radiused or chamfered.

7.3.2 Apparatus and Set-Up—The sample shall be set up as described in **6.1**.

7.3.3 Calibration—No calibration required. Visual inspection only.

7.3.4 Procedure—Inspect all corners to verify that the corners have been radiused or chamfered.

7.3.5 Pass/Fail Criteria—All corners in the accessible area shall be radiused or chamfered.

7.3.6 Precision and Bias—No information is presented about either the precision or bias of the test for evaluating corners since the test result is non-quantitative.

7.4 Tube Ends and Non-Functional Holes:

7.4.1 This test is a visual inspection of the unit to ensure that all tube ends and non-functional holes in the accessible area are closed off. Holes smaller than 9.5 mm (0.37 in.) are excluded. Seat or other adjustment holes are exempt from this test.

7.4.2 Apparatus and Set-Up—The sample shall be set up as described in **6.1**.

7.4.3 Calibration—No calibration required. Visual inspection only.

7.4.4 Procedure—Inspect all tube ends and surfaces in the accessible area to verify that the ends and non-functional holes are closed off by other components, caps, plugs, or covers.

7.4.5 Pass/Fail Criteria—All tube ends in the accessible area shall be closed off or the EN 957-1 test probe shall not be able to be inserted.

7.4.6 Precision and Bias—No information is presented about either the precision or bias of the test for evaluating tube end closure since the test result is non-quantitative.

7.5 Adjustment and Locking Mechanism Function:

7.5.1 This test is a visual and physical inspection of the adjustment or locking mechanisms, or both, used throughout the sample. The purpose is to ensure that the design prevents inadvertent disengagement, and that the adjustment or locking means do not interfere with the user's operation of the machine.

7.5.2 Apparatus and Set-Up—The sample shall be set up as described in **6.1**. Obtain instructions or a descriptive explanation of the function of the adjustment or locking systems used on the sample from the manufacturer.

7.5.3 Calibration—No calibration required. Visual and function inspection only.

7.5.4 Procedure:

7.5.4.1 Inspect each adjustment or locking point on the sample machine and ensure that it positively locks into position and that it cannot be disengaged unless the retention system is