



## Standard Specification for Fitness Equipment<sup>1</sup>

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### INTRODUCTION

The goal of this specification is to promote proper design and manufacturing practices for stationary fitness equipment. Through these specifications this standard aims to assist designers and manufacturers in producing functional, safe products under proper operations. This standard specifies safety requirements that are generally applicable to all stationary fitness equipment. For specific types of fitness equipment, these requirements shall be supplemented or superseded by the requirements of specific standards that have been issued to cover these specific types or groups of fitness products. Where specific standards exist, this standard should be used in conjunction with the other standards. Special care is required in applying this standard alone to equipment for which no specific standard exists.

The equipment user must recognize, however, that a standard alone will not necessarily prevent injuries. Like other physical activities, exercise involving fitness equipment involves the risk of injury, particularly if the equipment is used improperly.

### 1. Scope

1.1 This specification establishes parameters for the design and manufacture of fitness equipment as defined in 3.1.9.

1.2 It is intended that these fitness products be used in an indoor setting or environment.

1.3 It is the intent of this specification to specify products for use by individuals age 13 and above.

1.4 This standard is to be used in conjunction with Test Methods **F2571**.

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

1.6 *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.*

1.7 *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.*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee **F08** on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee **F08.30** on Fitness Products.

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## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

[F1749 Specification for Fitness Equipment and Fitness Facility Safety Signage and Labels](#)

[F2571 Test Methods for Evaluating Design and Performance Characteristics of Fitness Equipment](#)

### 2.2 ANSI Standards:<sup>3</sup>

[ANSI B29.1 Precision Power Transmission Roller Chains, Attachments and Sprockets](#)

### 2.3 European Standards:<sup>4</sup>

[EN 957-1 Stationary Training Equipment-Part 1: General Safety Requirements and Test Methods](#)

## 3. Terminology

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

3.1.1 *accessible area, n*—area accessible to the user or third party when the equipment is in normal use, during setting up, grasping, or adjusting of equipment or position of the body.

#### 3.1.1.1 Discussion—

This area encompasses a region from the floor to a height of 1800 mm (71 in.) above the floor. This does not include areas that are accessible during the initial assembly.

3.1.2 *applied handgrips, n*—handgrip that is formed, molded, or attached to a support, component, or structure.

3.1.3 *consumer fitness equipment, n*—fitness equipment intended for use by one person or one family unit.

3.1.4 *corner, n*—intersection of three planes or surfaces on a single component.

3.1.5 *cycle, n*—movement of a point or load from a starting position and back to the same starting position. The cycle being executed through the full range of intended motion.

3.1.6 *edge, n*—intersection of two planes or surfaces on a single component.

3.1.7 *entrapment; entrapped, n*—area that captures and requires force in excess of one pound state of an object that requires force to remove the test finger in EN 957-1 object from where it is caught.

3.1.8 *extrinsic loads, n*—all loads applied to the machine or user means in addition to the ~~users~~user's body weight.

3.1.9 *fitness equipment, n*—mechanical device or hardware designed for use in exercising specific or multiple muscles of the body.

#### 3.1.9.1 Discussion—

Not to include toys used for recreation, jump ropes, outdoor or indoor playground equipment or facilities, bicycles or other fitness soft goods such as gloves, belts, apparel, balls, and so forth.

3.1.10 *general warning label, n*—label designed within the scope of this specification and Specification **F1749** which is affixed to a portion of the fitness equipment and draws attention to potential hazards associated with the use of that equipment.

3.1.11 *guard, n*—cover or enclosure that limits access to, without the use of tools, an otherwise accessible area.

3.1.12 *inaccessible area, n*—area inaccessible to the user of the machine but accessible to technicians or service personnel.

3.1.13 *institutional fitness equipment, n*—fitness equipment intended for use by numerous persons in a commercial or institutional facility, as opposed to home environment.

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

<sup>4</sup> Available from European Committee for Standardization (CEN), 36 rue de Stassart, B-1050, Brussels, Belgium, <http://www.cenorm.be>.

3.1.14 *integral handgrips*, *n*—handgrips that are created by, coating, texturing or other means, the material of a component or support structure.

3.1.15 *intended use*, *n*—use of the fitness equipment as described in the manual or as is readily apparent from the intended use as fitness equipment.

3.1.16 *intrinsic loads*, *n*—the loads applied to fitness equipment due only to the user’s body weight.

3.1.17 *maximum specified load*, *n*—maximum working load for the machine as set by the manufacturer.

3.1.18 *maximum tension developed*, *n*—maximum static tensile load experienced by a connector, fitting, rope, belt, chain, or other means, during use of the machine at the maximum specified load for the machine including all extrinsic loads.

3.1.19 *owner’s/user’s manual*, *n*—documentation supplied and intended by the manufacturer to convey information, including safety features and warnings, to the owner/user about the equipment.

3.1.20 *pinch point*, *n*—location between two moving components or the location between a moving and fixed component that, when entered, causes a portion of the body to become entrapped.

3.1.21 *pulley*, *n*—component that guides ropes or belts and redirects the forces of the rope or belt.

3.1.22 *pull in point*, *n*—location between two moving components, or the location between a moving and a fixed component, that when entered causes a portion of the body to be pulled into and entrapped between the components.

3.1.23 *range of movement*, *n*—space in which the user or part of the user is moving when using the machine in accordance to the instructions supplied by the manufacturer.

3.1.24 *resistance means*, *n*—for the purpose of this specification, the device or system that, when varied by the user, increases or decreases the force encountered by the user through the user means. For the purpose of the specification, such means include weights, pneumatic cylinders, or electronic systems and their controls.

3.1.25 *shear point*, *n*—location at which parts move past one another or past a fixed point in such a manner that, when entered, causes a portion of the body to become entrapped in a scissors action between the components.

3.1.26 *site specific label*, *n*—label designed within the scope of this specification and Specification **F1749** which is affixed to a portion of the strength equipment and draws attention to a potential hazard in the immediate area of the label.

3.1.27 *stationary training equipment*, *n*—equipment that is used to exercise or to train muscles or muscle groups that does not travel or move across the ground as a unit during use.

3.1.28 *third party*, *n*—someone other than the user who is in the immediate area of the fitness equipment when it is in use.

3.1.29 *training envelope*, *n*—maximum space in which the user and machine components traverse when the machine is operated in accordance with the instructions.

3.1.30 *user weight (maximum)*, *n*—manufacturer defined weight of the exerciser that the equipment was designed to safely accommodate.

#### **4. Design and Construction Requirements**

4.1 ~~Stability~~—*Stability*—Fitness equipment shall be stable while in storage, unloaded, and in the intrinsically and extrinsically loaded use conditions.

## 4.2 ~~Support:~~ Support—

4.2.1 ~~Fitness equipment shall support the user and any additional loads applied by the user in normal operation without breakage. Examples include: seats, foot rests, backrests, etc.~~ Fitness equipment shall support the user and any additional loads applied by the user in normal operation without breakage. Examples include seats, footrests, backrests, etc.

## 4.3 *Edges, Corners, and Tube Ends:*

4.3.1 *Edges*—All edges in accessible areas shall be free of burrs and sharp edges.

4.3.2 *Corners*—All corners in accessible areas shall be radiused or chamfered.

4.3.3 *Tube Ends*—Tube ends in the exposed accessible areas shall be closed off either by other components or by plugs. Plugs shall remain in place during normal operation and storage.

## 4.4 *Guarding and Entrapment in Accessible Areas:*

4.4.1 *General*—Pinch, shear, ~~and crush~~ crush points, and pull-in points in the accessible area as defined in 3.1.1, 3.1.20, and 3.1.25 shall be avoided or guarded. In the event that the hazard ~~can not~~ cannot be removed or guarded, a ~~site specific~~ site-specific warning label shall be present alerting the user or third party to the presence of the hazard. Guarding is not required if a minimum clearance between affected components of 60 mm (2.36 in.) can be maintained. Exceptions to this requirement are as follows:

4.4.1.1 *Fingers*—If during operation or adjustment of the equipment the only portion of the body that could become entrapped is the fingers then the spacing between the affected components shall be less than 9.5 mm (0.37 in.) or greater than 25 mm (0.98 in.).

4.4.1.2 *Third Party Access*—If during the intended use of the product, third party access to the affected area of the machine is prevented by the user's body placement or if the user can immediately stop the movement of the affected components then the spacing between the affected components shall be at least 25 mm (0.98 in.).

4.4.1.3 *Component(s) Moving Past Fixed Component(s)*—In general, the guidelines in the previous sections shall be followed. However, if during the intended operation or adjustment, a component moves past a fixed component in such a manner that no shear or pinch points are created, then the spacing between the fixed component and the moving component shall be less than 9.5 mm (0.37 in.) or greater than 25 mm (0.98 in.).

4.4.1.4 *Component Stops*—Open and obvious stops for moving components are excluded.

4.4.1.5 *Chain or Gear Drives*—Chain or gear drives on fitness equipment shall be guarded in accordance with ANSI B29.1.

4.5 *Overheating*—No external nonmetallic surface shall achieve a temperature exceeding 85°C (185°F). No external metallic surface shall achieve a temperature exceeding 60°C (140°F).

4.6 *Control Panel*—If it is intended for the user to vary the function of the equipment during its intended use, then the control panel shall be readily accessible by the user during the equipment's intended use.

4.7 *Switches and Switch Actuation Mechanisms*—For motorized fitness equipment, switches, and switch actuation mechanisms for controlling the stop, pause, or end functions of the motorized system, shall function properly as follows:

4.7.1 *Consumer Fitness Equipment*—3 times/h × 5 h/week × 52 weeks/year × 1 yr × a safety factor of 2 = 1560 actuations.

4.7.2 *Institutional Fitness Equipment*—3 times/h × 50 h/week × 52 weeks/year × 3 years × 1 yr × a safety factor of 2 = 46 800 actuations.

4.8 *Adjustment and Locking Means*—All adjustment and locking means shall function securely at all adjustment positions. The possibility of inadvertent disengagement shall be reduced by spring retention, clamps, or other means.

4.8.1 Adjustment knobs and levers shall not interfere with the user's range of movement.

4.9 *Handgrips/Foot Support:*

4.9.1 *Integral Handgrips*—Integral handgrips, if required for proper use as defined by the manufacturer, shall be conspicuous and shall reduce slippage during normal use.

4.9.2 *Applied Handgrips*—Applied handgrips shall be of a material that reduces slippage and shall withstand an applied force of 90 N (20.2 lb) without movement in the direction of the applied force.

4.9.3 *Rotating Handgrips*—Rotating handgrips shall be constrained against lateral movement along their rotational axis and be constructed of a material that reduces slippage.

4.9.4 *Foot Support*—Bars or plates designed to support the user's feet during exercise shall be fitted with or be of a material or surface type or configuration that reduces slippage.

4.10 *Load Development and Transmitting Components:*

4.10.1 *Ropes, Belts, Chains, and Other Means*—Including all attachment devices (links, shackles, end fittings, and termination means) shall not fail with a load equal to six times the maximum static tension developed by the machine during normal operation.

4.10.2 *Chain or Gear Drives*—Chain or gear drives on fitness equipment shall be guarded in accordance with ANSI B29.1.

4.11 *Electrical Components*—Electrical components shall be guarded to prevent inadvertent contact with hazardous electrical elements.

**5. Loading**

5.1 *Intrinsic Loading*—All user supporting surfaces for consumer and institutional fitness equipment shall be able to withstand a single static load equal to a loading factor times the greater of 135 kg (300 lb), or the maximum specified user weight, as set forth by the manufacturer, at the point of user contact without breakage. The loading factor stated above shall be 2.5 for consumer fitness equipment and 4 for institutional fitness equipment. [ASTM F2276-23](https://standards.iteh.ai/catalog/standards/sist/75721570-8020-4cf7-bd20-3b53a5c43c1e/astm-f2276-23)

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5.2 *Extrinsic Loading*—The fitness equipment and user supports shall not break when loaded by a maximum specified user weight person and the maximum extrinsic load as specified by the manufacturer.

5.2.1 The test load to be applied for 5.2 is specified by the following equation:

$$F_{test} = [W_p + 1.5F_a] S \quad (1)$$

where:

$F_{test}$  = the total reactionary load to be applied during the test, expressed in kilograms or pounds depending on factor  $S$  and the values  $W_p$  and  $F_a$ ,

$F_a$  = the maximum user applied load at the point of user contact with the machine for the maximum capacity of the machine as stated by the manufacturer, expressed in kilograms or pounds,

$W_p$  = the proportionate amount of the user's body weight being applied to the machine component being tested. This value is to be expressed as the proportionate amount of either 135 kg (300 lb) or the maximum user weight as specified by the manufacturer, whichever is greater,

1.5 = dynamic coefficient, and

$S$  = factor of safety. This shall be 4 for institutional fitness equipment and shall be 2.5 for consumer fitness equipment.

5.2.2 Extrinsic loads calculated in 5.2.1 are to be applied to all machine components receiving extrinsic loads from operation of the machine according to the manufacturer's operating instructions. Examples of areas to conduct this testing include seats and lifting arms.

5.3 *Handlebar Loading*—Handlebars that support fully the user's body weight, shall meet the loading parameters of 5.1 without