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An American National Standard

Standard Specification for Fitness Equipment[1]

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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 may be supplemented or modified 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 3.1.8.

1.2 It is the intent of this specification to specify products for use by individuals age 12 and above.

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

1.4 *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]

F 1749 Specification for Fitness Equipment and Fitness Facility Safety Signage and Labels

2.2 *European Standards*

EN 957–1 Stationary Training Equipment-Part 1: General Safety Requirements and Test Methods[3]

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

3.1.6 *entrapment*, *n*—area that captures and requires force in excess of one pound to remove the test finger in EN 957-1.

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

3.1.8 *fitness equipment*, *n*—mechanical device or hardware designed for use in exercising specific or multiple muscles of

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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.

[3] Available from CEN Management Centre, 36 rue de Stassart, B-1050, Brussels, Belgium.

the body. 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.

3.1.9 *general warning label*, *n*—label designed within the scope of this specification and Specification F 1749 which is affixed to a portion of the fitness equipment and draws attention to potential hazards associated with the use of that equipment.

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

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

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

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

3.1.14 *intrinsic loads*, *n*—the loads applied to fitness equipment due only to the users body weight.

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

3.1.16 *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.

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

3.1.18 *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.

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

3.1.20 *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.

3.1.21 *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.

3.1.22 *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.

3.1.23 *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.

3.1.24 *site specific label*, *n*—label designed within the scope of this specification and Specification F 1749 which is affixed to a portion of the strength equipment and draws attention to a potential hazard in the immediate area of the label.

3.1.25 *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.

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

4. Design and Construction Requirements

4.1 *Stability*:

4.1.1 Fitness equipment shall be stable while in storage, unloaded, and in the intrinsically and extrinsically loaded use conditions.

4.2 *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.

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 *Moving Parts in Accessible Areas*:

4.4.1 *Rotating and Reciprocating Points*—The distance between movable components or between a movable and a fixed component shall be at least 60 mm (2.36 in.) except as follows:

4.4.1.1 If only the fingers are at risk, the dimension shall not be less than 25 mm (0.98 in.).

4.4.1.2 If the distance between the moving part and a rigid part, or between two moving parts, does not change during use or setup, the distance shall be greater than 25 mm (0.98 in.) or less than 9.5 mm (0.37 in.).

4.4.1.3 Open and obvious stops are excluded. However, if the stop is physically part of the moving user means, then it shall pass no closer than 25 mm (0.98 in.) to any fixed frame members throughout its range of travel.

5. Guarding, Enclosures, and Spacing

5.1 *Squeeze, Shear, and Crush Points*—Squeeze, shear, and crush points between moving components, between moving components and fixed components, or between a moving component and the floor shall be guarded. If the function of the fitness equipment does not allow guarding, then the minimum clearance shall be 60 mm (2.36 in.) except as follows.

5.1.1 If only the fingers are at risk the dimension shall not be less than 25 mm (0.98 in.).

5.1.2 If third party access is prevented by the user's body position, and where the user is able to immediately stop the movement, the distance shall not be less than 25 mm (0.98 in.).

5.1.3 Open and obvious stops are excluded. However, if the stop is physically part of the moving user means, then it shall pass no closer than 25 mm (0.98 in.) to any fixed frame members throughout its range of travel.

5.2 *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.

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

5.3 *Handgrips/Foot Support*:

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

5.3.2 *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.

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

5.3.4 *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.

5.4 *Load Development and Transmitting Components*:

5.4.1 *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.

5.4.2 *Chain or Gear Drives*—Chain or gear drives on fitness equipment shall be guarded. Pull in points created by chain and gear drives shall not be contacted by the test finger in EN 957-1.

5.5 *Loading*:

5.5.1 *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 or permanent deformation. The loading factor stated above shall be 2.5 for consumer fitness equipment and 4 for institutional fitness equipment.

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

5.5.2.1 The test load to be applied for 5.5.2 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.

5.5.2.2 Extrinsic loads calculated in 5.5.2.1 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.

5.5.3 *Endurance Loading*—The components of fitness equipment that provide a resistance means and the components that transmit that load shall not fail when cycled as intended by the manufacturer at maximum user load for a minimum of 80 % of the range. The number of cycles shall be a minimum equivalent to 20 min of exercise, times three times per week, times 52 weeks, times a safety factor of two. For example, if the fitness equipment is used for 60 cycles during a normal 20 min exercise regime as specified by the manufacturer, the cycle test would require a minimum of 60 by 3 by 52 by 2 which equals 18 720 cycles. As a minimum, institutional fitness equipment shall withstand 250 000 cycles at the maximum specified load over a minimum of 80 % of the possible range of movement and consumer fitness equipment shall withstand 14 000 cycles at the maximum specified load over a minimum of 80 % of the possible range of movement.

5.5.3.1 When the equipment consists of two or more separate functional units or exercise stations, each station shall withstand the endurance load test. When more than one function is to be tested, any common components (ropes, belts, selector pins, pulleys, and so forth) may be replaced prior to commencing the next test.

5.5.3.2 Fitness equipment may have several exercise stations sharing a common frame. In this case, the frame shall withstand 500 000 cycles for institutional fitness equipment and 28 000 cycles for consumer fitness equipment. The frame may be replaced during the test period if the number of stations to be tested causes the frame to experience cycles in excess of the numbers stated above.

5.5.3.3 Tests for endurance shall apply loads to the machine in the same manner that the machine is loaded when it is operated in accordance to the manufacture's operation instructions.

5.5.3.4 After the test, the equipment shall be capable of normal function.

6. Documentation

6.1 If the fitness equipment requires assembly, instructions for multiple operations, or warnings for safe operation, an owners/users manual shall be provided. The first topic of the manual shall be a comprehensive listing of the warnings applicable to the product. It shall also include a review of the warnings placed on the fitness equipment and the placement locations.