



Standard Specification for Selectorized Strength Equipment¹

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INTRODUCTION

The goal of this specification is to promote proper design and manufacturing practices for selectorized strength training equipment. Through these specifications, this specification aims to assist designers and manufacturers in reducing the possibility of injury when these products are used in accordance with the operational instructions.

The equipment user must recognize, however, that a standard alone will not necessarily prevent injuries. Like other physical activities, exercise involving selectorized strength training equipment involves the risk of injury, particularly if the equipment is used improperly or not properly maintained. In addition, users with physical limitations should seek medical advice and instruction from the fitness facility prior to using this equipment. Certain physical conditions or limitations may preclude some persons from using this equipment as intended by the manufacturer, and using this equipment may increase the risk of injury.

1. Scope

1.1 This specification establishes parameters for the design and manufacture of selectorized strength training equipment as defined in 3.1.

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 standard to specify fitness products for use only by individuals age 13 and older.

1.4 This standard is to be used in conjunction with Specification F2276, Test Methods F2571, and Test Method F2277.

1.5 This standard takes precedence over Specification F2276 and Test Methods F2571 in areas that are specific or unique to selectorized strength training equipment.

1.6 This specification² establishes additional requirements for the design of commercial fitness equipment for use by people with functional limitations or impairments.

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

1.8 *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.*

1.9 *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:*³

F1749 Specification for Fitness Equipment and Fitness Facility Safety Signage and Labels

F2276 Specification for Fitness Equipment

F2277 Test Methods for Evaluating Design and Performance Characteristics of Selectorized Strength Equipment

F2571 Test Methods for Evaluating Design and Performance Characteristics of Fitness Equipment

F3021 Specification for Universal Design of Fitness Equipment for Inclusive Use by Persons with Functional Limitations and Impairments

¹ 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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³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Terminology

3.1 Definitions:

3.1.1 *assist means, n*—mechanism that the user engages on the machine to assist them in getting into and out of the loaded starting position.

3.1.2 *bilateral, adj*—relating to use of both sides of the body, that is, both hands, arms, or legs.

3.1.3 *cam, n*—rotational component controlling the resistance to the user.

3.1.4 *consumer selectorized strength equipment, n*—selectorized strength equipment intended for home use or for use in a home environment.

3.1.4.1 *Discussion*—Since significant differences can arise between consumer and institutional selectorized strength equipment, the products must be clearly identified as not for commercial use.

3.1.5 *field of view, n*—field of view of the user defined by an arc of 150°. Seventy-five degrees on each side of the user's midline (sagittal plane).

3.1.6 *foot support, n*—machine component(s) contacting the feet during operation, entry, and exit from the machine.

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

3.1.8 *median plane, n*—plane of reference that divides the midline of the body of the user into equal right and left halves.

3.1.9 *rope, n*—for the purpose of this specification, a cord comprised of intertwisted synthetic or natural fibers or steel wires used for the transmittal of load from the resistance means to the user means.

3.1.10 *selector pin, n*—the component used to select resistance on weight based selectorized strength equipment.

3.1.11 *selectorized strength equipment, n*—strength equipment where the resistance means is an integral part of the machine and may be varied easily by the user.

3.1.12 *strength equipment, n*—fitness equipment designed to strengthen one or more groups of muscles anaerobically.

3.1.13 *unilateral, adj*—relating to use of one side of the body, that is, one hand, arm, or leg.

3.1.14 *user means, n*—movable component or assembly that the user contacts to perform the exercise.

4. Design and Construction Requirements

4.1 Construction:

4.1.1 *Weights*—Weights shall move only when displaced intentionally. Weights shall move freely along their guide means and return to the resting point. The travel of the weights shall be controlled by the user such that no uncontrolled pendulum swing shall occur.

4.1.2 *Weight Selector Pin*—Weight selector pins shall be fitted with a positive retention means.

4.1.3 *Starting Position Assist*—If the user cannot (after adjusting the machine according to the manufacturer's instruc-

tions) attain the loaded starting position for the machine, then the machine shall be provided with an assist means.

4.1.4 *Ropes, Belts, Chains, or Other Load Transmission Components*—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 operation and shall pass the endurance guidelines set forth in 4.4.1. All end terminations shall not be subjected to cyclic bending under normal machine operation as defined by the manufacturer.

4.1.5 *Pulleys*—Pulleys for rope/belt drive machines shall rotate freely under all extrinsic loads.

4.1.5.1 *Wire Rope Pulleys*—The groove radius, r , of the pulley for wire rope driven machines shall meet the wire rope manufacturer's guidelines and allow for passing of the endurance guidelines set forth in 4.4.1. The dimensions shall lie within the range given:

$$\frac{C_d}{2} + 5\% \text{ to } \frac{C_d}{2} + 15\% \quad (1)$$

with $C_d/2 + 10\%$ being the optimum. C_d is defined as the nominal wire rope diameter including coating. The tread diameter, d , of the pulley shall be a minimum of 18 times greater than the bare wire rope diameter (without coating). See Fig. 1.

4.1.5.2 *Belt Pulleys*—The diameter of the pulley shall be of sufficient size to yield a belt life meeting the parameters specified in 4.4.1. Belt pulleys shall be designed to prevent disengagement through the use of groove, flanges, or other means.

4.1.6 *Rope/Belt Guards*—Disengagement of ropes/belts shall be prevented by the provision of adequate retention guards or enclosures.

4.2 Entrapment Points:

4.2.1 *General Comments*—Unlike other machinery, selectorized strength equipment is fully controlled by the user of the equipment. It is therefore assumed that the user shall take responsibility for his/her actions while using the machine and can prevent the inadvertent contact with machine components within the user's field of view by the user or a third party by stopping the exercise or movement of the machine. For this reason, the discussion of entrapment points is broken down into "within" and "outside" the field of view of the user. Wherever possible, the design of movable components shall avoid catch, shear, or pull-in points.

4.2.1.1 In general, the fingers are the body components most likely to be injured. The primary exception to this is weight stacks, or other frame components, where feet or hands, or both, could also be injured. Weight stacks shall be spaced less than 9.5 mm (0.375 in.) or greater than 25 mm (0.98 in.) from any fixed frame member. This spacing shall remain constant through the travel range of the weight stack. Weight stack to frame spacing greater than 60 mm (2.36 in.) is exempt from this requirement. Weight stacks shall be spaced at least 60 mm (2.36 in.) from the base frame of the machine. Strength equipment that includes weight stack enclosures designed in accordance with 4.3 as a permanent feature of the machine are