



## Standard Specification for Elliptical Trainers<sup>1</sup>

This standard is issued under the fixed designation F2810; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### INTRODUCTION

The goal of this specification is to promote proper design and manufacturing practices for elliptical training equipment. Through these specifications this standard 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 fitness 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 or instruction from the fitness facility, or both, prior to using this equipment. Certain physical conditions or limitations may preclude some persons from using this equipment properly and without increasing the risk of serious injury.

### 1. Scope

1.1 This specification establishes parameters for the design and manufacture of elliptical training equipment as defined in 3.1 for use in an indoor environment or setting.

1.2 It is the intent of this standard to specify fitness products for use only by an individual age 13 or older.

1.3 This standard is to be used in conjunction with Specification F2276 and Test Methods F2811F2811. All specifications in this standard supersede those of Specification F2276 where applicable.

1.4 This specification<sup>2</sup> established additional requirements not set forth in the referenced ASTM standards for the design of commercial fitness equipment to increase access and user independence by people with functional limitations or impairments.

1.5 The values stated in SI units are to be regarded as standard. The values 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.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>3</sup>

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

F2276 Specification for Fitness Equipment

~~F2571~~F2811 Test Methods for Evaluating Design and Performance Characteristics of Fitness Equipment

~~F2811~~F3021 Test Methods Specification for Evaluating Design and Performance Characteristics of Elliptical Trainers

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

<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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<sup>3</sup> 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. Terminology

3.1 *Definitions*—The terms listed below are unique to this specification. For terms not defined below, refer to Specification- Specifications F2276 and F3021.

3.1.1 *adjustable guide system, n*—components that allow the user to vary the angle or position of a guide surface.

3.1.2 *control panel, n*—equipment/user interface device for controlling the operation of, or displaying information about the operational state of the equipment.

3.1.3 *elliptical trainer, n*—training equipment that can produce a continuous, predominately elliptical motion path. Elliptical training functions as a continuous non-circular closed loop cycle.

3.1.4 *fixed handlebar, n*—handlebars that are stationary.

3.1.5 *foot support, n*—a device designed to support the foot while the user is correctly performing the exercise as intended by the manufacturer, or while the user mounts or dismounts the equipment. Illustrated in Fig. 1.

3.1.6 *handlebar, n*—the means that are provided to a user to enhance balance and stability. Handlebars shall be defined by the manufacturer as the intended grippable zone.

3.1.7 *movable handlebar, n*—the moving means that are provided for a user to engage the upper body during the exercise.

### 4. Equipment Types

4.1 *Elliptical Trainer Withwith Fixed Handlebars (Type 1)*—Handlebars are in a fixed position and are not intended to provide guided or un-guided motion of the user’s upper body, as shown in Fig. 2.

4.2 *Elliptical Trainer Withwith Moveable Handlebars (Type 2)*—Handlebars are configured to provide for guided or un-guided motion of the user’s upper body, as shown in Fig. 3.

4.3 *Elliptical Trainer Withwith Moveable and Fixed Handlebars (Type 3)*—Exercise equipment that contains both fixed and moveable handlebars as described in 4.1 and 4.2, as shown in Fig. 4.

4.4 *Seated Elliptical Trainer (Type 4)*—Exercise equipment that allows exercise from the seated position, as shown in Fig. 5.

### 5. Design and Construction Requirements

NOTE 1—In addition to the requirements of Specification F2276, the following requirements are applicable.

5.1 *Foot Support*—Equipment shall be equipped with adequate foot support and constructed to reduce foot slippage. The foot supports shall have a slip resistant surface of at least 300 mm long by 100 mm wide (11.8 in. by 3.9 in.) as well as have a guard with at least 30 mm (1.2 in.) in height along the entire front and 1230 mm (0.50(1.2 in.) along the inside edge-tall along 80 % of the length along the inside edge of the foot support. If there are pinch or shear points then an additional 30 mm (1.2 in.) tall guard shall be added to the outside of the foot support.

5.1.1 *Foot Support Loading*—The loading requirements of Specification F2276 shall be applicable.

5.2 *Handlebars*—Equipment shall be equipped with at least one handlebar.

5.2.1 The ends of movable handlebars shall be designed to avoid eye socket penetration. Acceptable provisions may include, but are not limited to, a 50 mm (1.97 in.) diameter end portion of the handlebar grip; bending of the handlebar to achieve an end portion greater than 50 mm (1.97 in.) in diameter, angling of the end portion of the movable handlebar away from the user so that the end portion remains angled forward of a vertical reference plane through the user throughout the handle’s entire range of travel.

5.2.2 *Handlebar Loading*—Handlebars shall endure a static load of 1.0 times the maximum specified user weight or 100 kg (220 lb), whichever is greater, applied in the vertical direction without breakage. Handlebars shall endure a static load of 0.5 times the maximum specified user weight or 50 kg (110 lb), whichever is greater, applied in the most onerous horizontal direction without breakage.

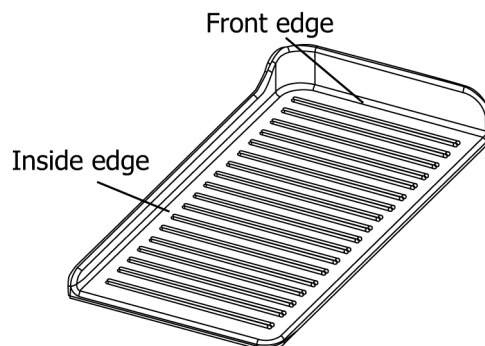


FIG. 1 An Example of a Foot Support

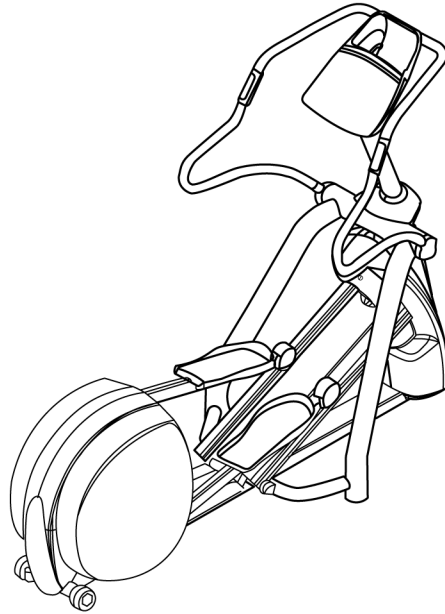


FIG. 2 An Example of a Type 1 Elliptical Trainer With Fixed Handlebars

5.3 *Endurance:*

5.3.1 *Discussion*—Load input to the elliptical trainer can be accomplished by securing weight to the foot pedals and lifting the weight using pneumatic cylinders, or by pushing down with pneumatic cylinders (with or without weight). It has been found that the user does not completely remove all load from one pedal as he cycles over to drive the opposite pedal. Measurements of the forces experienced by the foot supports of elliptical trainers have found loads ranging from 20 % of the user weight on the trailing side to loads of approximately 120 % of the user weight on the pedal side being “driven” by the user. These loads can vary depending on the design of the elliptical being tested. Regardless of how the load is input to the elliptical trainer under test, careful consideration shall be given by the testing facility as to how the test apparatus is constructed. The testing facility shall communicate with the manufacturer prior to commencing the test and verify that the apparatus functions and loads the elliptical trainer in a manner similar to how a user would actually use and interface with the elliptical trainer.

5.3.2 Consumer equipment shall function per manufacturer’s specifications after enduring a minimum of 375 000 cycles. Institutional equipment shall function per manufacturer’s specifications after enduring a minimum of 2 000 000 cycles.

5.3.3 The loading applied to moving handlebars in the forward and reverse directions shall be 5 % of the maximum specified user weight.

5.3.4 The force applied to the foot supports shall be equivalent to the load produced by a user of 135 kg (300 lb) or the load produced by a user of the maximum specified user weight, whichever is greater. This load shall follow the guidelines discussed above and be alternately applied to each of the pedals in accordance with the test method.

5.4 *Adjustable Guide Systems*—The operation of the adjustable guide system, if equipped, may create entrapment points. Therefore, the movement of this system shall not exceed 25 mm/s (1 in./s) as measured at the entrapment points.

**6. Additional Universal Design Requirements to Specification F3021**

6.1 This set of accessibility criteria shall be used in conjunction with Specification F3021. This set of criteria pertains only to equipment designed to be accessible to people with disabilities in addition to those without disability.

6.2 If a conflict exists with the requirements listed in Specification F3021, then the specific requirements listed in Section 6 take precedence over the requirements listed in Specification F3021.

NOTE 2—Standing ellipticals are exempt from Specification F3021 foot strap requirements.

6.3 *Handlebars:*

6.3.1 For standing ellipticals, fixed handlebars shall be provided within the range of 1000 to 1400 mm (39.4 to 55.1 in.).

6.3.2 For standing ellipticals, fixed handlebars shall have a mechanism to prevent the hand from slipping off the end of the hand grip, for example, a lip or curvature or taper.

6.3.2.1 Handlebars shall comply with Specification F3021, subsection 5.1.4.3 non-slip material.

6.3.2.2 Handlebars shall comply with Specification F3021, subsection 5.1.4.5 for color contrast.