Designation: ~~F3105 – 14~~ F3105 – 20

~~An American National Standard~~

Standard Specification for Externally Loaded Strength Training Equipment, Strength Training Benches and External Weight Storage Equipment[1]

This standard is issued under the fixed designation F3105; 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 this specification is to promote proper design and manufacturing practices for externally loaded strength training equipment, strength training benches and external weight storage equipment. Through these specifications, this specification aims to assist designers and manufactures 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 externally loaded strength training equipment, strength training benches and external weight storage 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 properly and without increasing the risk of serious injury.

1. Scope

1.1 This specification establishes parameters for the design and manufacture of externally loaded strength training equipment, strength training benches and external weight storage 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 an individual age 13 and older.

1.4 This standard is to be used in conjunction with Specification F2276, Test Methods F2571, and Test Methods F3104.

1.5 This standard takes precedence over Specification F2276 and Test Methods F2571 in areas that are specific to Externally Loaded Strength Training Equipment, Strength Training Benches and External Weight Storage Equipment.

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

1.7 *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] 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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1.8 *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:*[2]

F1749 Specification for Fitness Equipment and Fitness Facility Safety Signage and Labels
F2216 Specification for Selectorized Strength Equipment
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
F3104 Test Methods for Evaluating Design and Performance Characteristics of Externally Loaded Strength Training Equipment, Strength Training Benches and External Weight Storage Equipment

2.2 *Federal Standard:*[3]

Department of Justice (DOJ) 2010 Standard for Accessible Design, United States Department of Justice, Title II (28 CFR 35) and Title III (28 CFR 36)

3. Terminology

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

3.1.1 *barbell, n*—a long bar shaped device, usually made of steel or aluminum used for holding weight discs to perform certain exercises. Used in conjunction with certain benches and racks.

3.1.2 *break, v*—shall not separate from the structure or fail to support the load for the intended function.

3.1.3 *catch, n*—rest or holder for an barbell, Smith press, or sled leg press carriage from which the user begins the exercise lift and returns the bar or sled to at the completion of the exercise.

3.1.4 *dumbbell, n*—a device of fixed mass designed to be gripped with one hand. Selectively variable dumbbells where the amount of resistance is selected by the user are included in this definition.

3.1.5 *externally loaded strength training equipment, n*—strength training equipment that relies on user applied weight discs on the movement arm for as primary means of resistance.

3.1.6 *external weight storage equipment, n*—any piece of equipment whose sole function is to store external weights such as weight discs or dumbbells while not in use on externally loaded strength equipment or other means of strength training.

3.1.7 *maximum storage load, n*—maximum load that can be applied to weight post and/or external weight storage equipment as set forth by the manufacturer.

3.1.8 *maximum specified training load, n*—maximum working load as set forth by the manufacture. This load does not include the user weight.

3.1.9 *movement arm, n*—a component of certain strength training devices that allows for a controlled and directed motion of a resistance means for a specific exercise.

3.1.10 *olympic, adj*—a system of external training resistance that allows higher levels of resistance than standard weight discs and describing barbell combinations. One feature is the use of a large bore diameter [approximately 50 mm (1.98 in.)] for the interface between weight discs and barbells.

[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 U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

3.1.11 *rack, n*—a structure often described as a cage or squat rack that will support an Olympic bar on catch assemblies or hooks allowing the user to perform multiple freestyle exercises such as Olympic lifts, squats and similar exercises. The catch assemblies or structures may be vertical or positioned along an upward sloping frame structure typically 45° or greater.

3.1.12 *Smith press, n*—a substantially vertical frame structure with a constrained bar for loading Olympic weight plates onto that travels along linear shafts with indexing engagement means that allow the bar to be started and stopped at multiple positions along the range of travel.

3.1.13 *strength training benches, n*—a piece of equipment used to support the body of a user and/or the training load during certain strength training exercises. A strength training bench does not have integral features to increase training resistance but may have integral features for external weight storage.

3.1.14 *training load, n*—the amount of weight plates added to the machine or bar to provide training resistance to the user.

3.1.15 *training resistance, n*—the force exerted by the user to move lifting arm which may or may not be the same as the training load.

3.1.16 *weight disc, n*—a means for a given mass, usually of steel or iron, for externally loaded equipment. Contains a bore in the center of the disc for attachment to weight post.

3.1.17 *weight post, n*—a structure protruding from the frame of externally loaded strength equipment for the purpose of holding weight discs either for a resistance means or for storage.

4. Equipment Types

4.1 *Externally Loaded Strength Training Equipment, work arm actuated (Type 1)*—The external load is attached directly or indirectly to a movement arm that is displaced intentionally by the user, as shown in Fig. 1.

4.2 *Externally Loaded Strength Training Equipment, linear slide actuated (Type 2)*—The external load is placed on a weight post affixed to a carriage that's motion is limited via a linear slide.

4.2.1 *Type 2a*—A machine that has an angle, from horizontal, greater than 45°. This type includes the Smith Machine as shown in Fig. 2.

4.2.2 *Type 2b*—A machine that has an angle, from horizontal, of 45° or less. This type includes the sled style leg press as shown in Fig. 3.

4.3 *Strength Training Benches, designed for use with a barbell (Type 3)*—Any bench that has integral hooks or catches for a standard or Olympic style barbell. This classification also encompasses stand alone barbell supports. See Fig. 4.

4.4 *Strength Training Benches, designed for independent use or for use with optional equipment (Type 4)*—Any bench that is not included in the definition of a Type 3. Benches that are movable, for use in Smith or rack style devices are included in this type. This type also contains specialty equipment such as body weight style equipment. See Fig. 5.

4.5 *External Weight Storage Equipment, any device with the sole purpose to store external weights (Type 5)*—These devices only store weight, and are not used directly for fitness exercises. This type includes weight trees and dumbbell racks. See Fig. 6.

4.6 *Multi Function Systems, a machine whose function incorporates more than one station or operation intended for separate exercises (Type 6)*—This equipment may contain functionality of equipment Types 1-4. Each station or function shall meet the requirements for the equipment type as listed in 4.1 – 4.4. If the equipment also contains a selectorized station, then the requirements of Specification F2216 and Test Methods F2277 are applicable to that station or function. See Fig. 7.

4.7 *Rack Stations (Type 7)*—Apparatus or structures designed to support an Olympic bar in multiple positions that allow freestyle or unguided exercise with the Olympic bar. See Fig. 8.

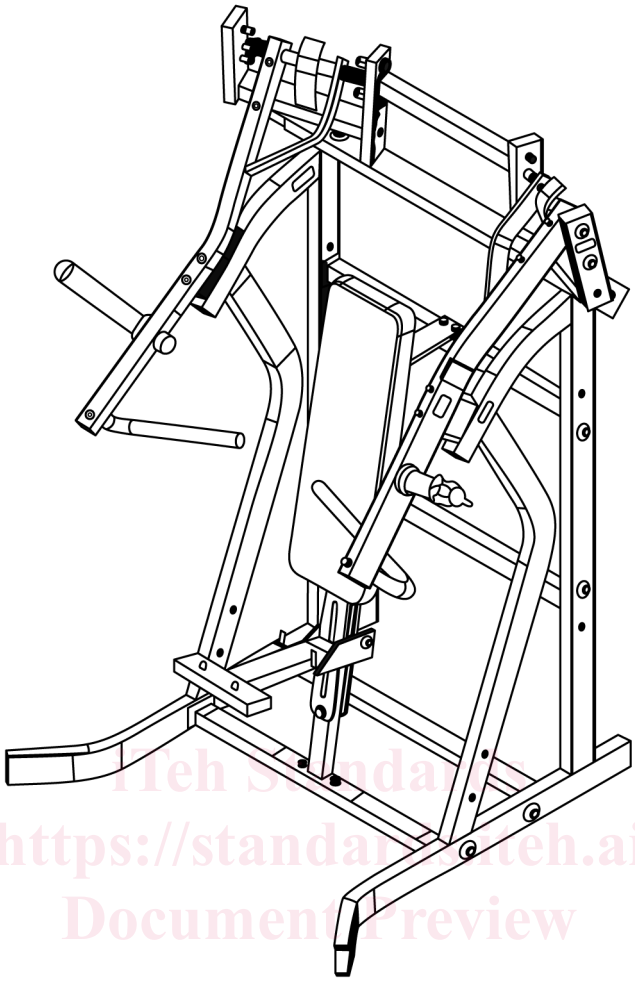

FIG. 1 Type 1 Work Arm Actuated

5. Design and Construction Requirements

5.1 *Weight Discs—Discussion*—There is great variability in the dimensions of available weights discs. The dimensions of the weight discs are instrumental for requirements in this standard and its test method. To this extent it is necessary to define key dimensions for use with this standard. If the design restricts the dimensional limits for weight discs and/or the capacities of each weight post, it will supersede the dimensions that follow.

5.1.1 The maximum diameter for a weight disc considered for use with externally loaded strength training equipment shall be ~~460~~457 mm (18 in.) unless specified by the manufacturer.

5.1.2 The minimum thickness for a weight disc considered for use with externally loaded strength training equipment shall be 37 mm ~~(1.45~~(1.46 in.) unless specified by the manufacturer.

5.1.3 The maximum size weight disc ~~(diameter~~ (diameter and thickness) considered for use with externally loaded strength training equipment shall be either 45 lb (standard Olympic weight) or 25 kg (metric Olympic weight) unless specified by the manufacturer.

5.2 In addition to the requirements of Specification F2276, the following requirements are applicable.

5.2.1 *Adjustable Stops*—All Type 2 equipment shall be provided with adjustable stops to limit the travel of the training load. Appropriate warnings and instructions on the use of the stops shall be provided—refer to Sections 6 and 7 of this document.

5.2.1.1 *Smith Machines, Squat Racks and Lifting Cages*—These apparatus shall be equipped with an adjustable stop on each side

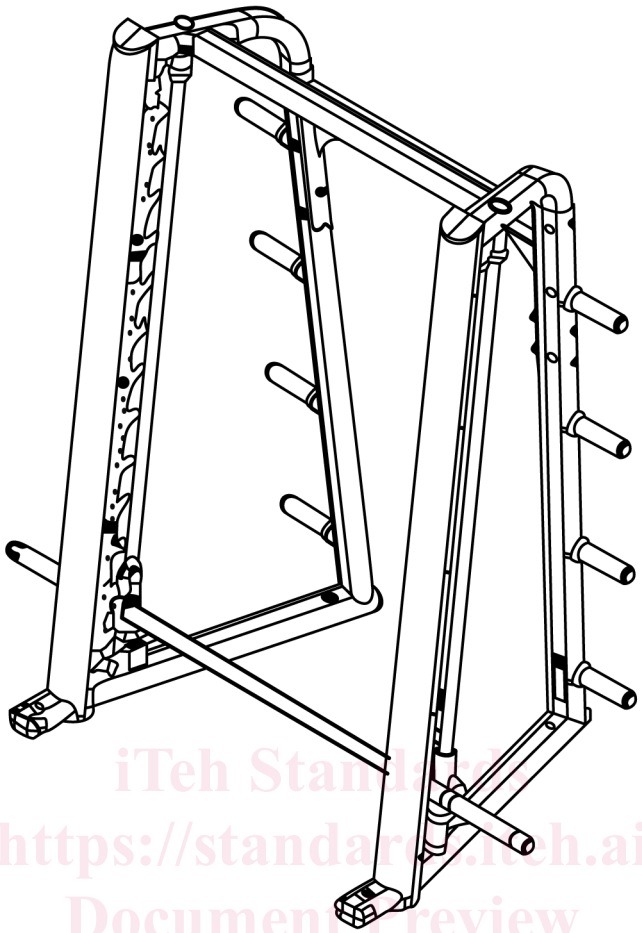

FIG. 2 Type 2a Linear Slide Greater Than 45°

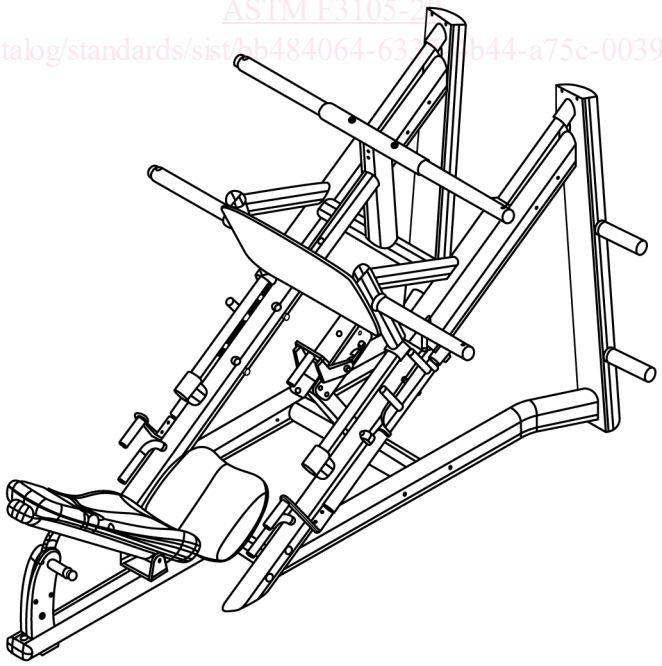

FIG. 3 Type 2b Linear Slide 45° or Less

that shall limit the downward travel of the lifting bar. One set of stop position shall stop the bar 711 mm (28 in.) or higher from

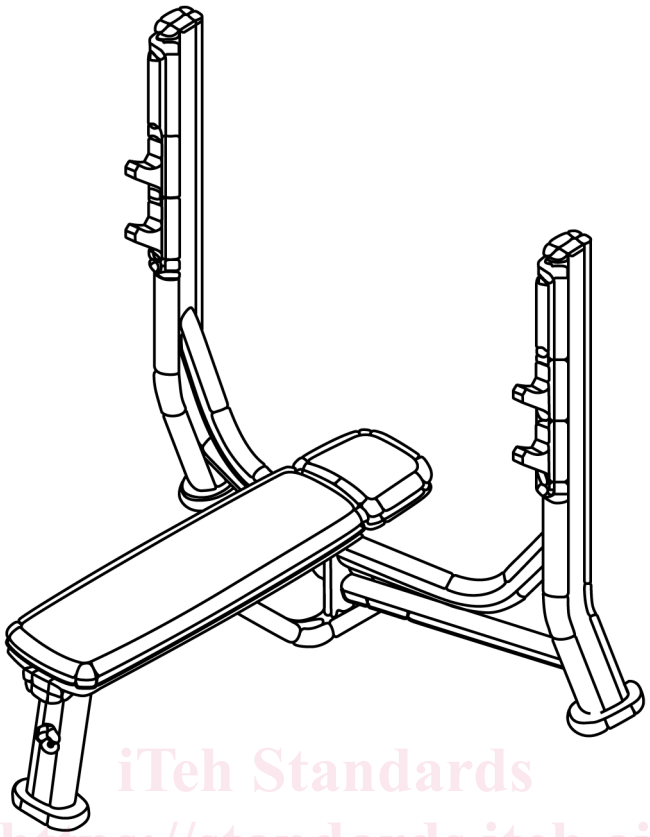

FIG. 4 Type 3 Strength Training Bench With Barbell Support

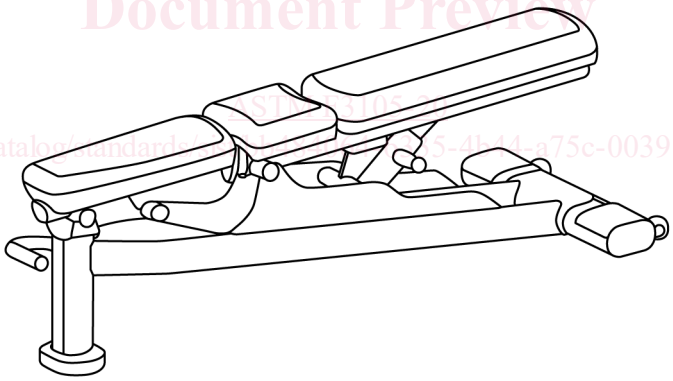

FIG. 5 Type 4 Independent Use Strength Training Bench

the floor (measured to the underside of the bar). This position shall be identified with a site specific label indicating that for squat exercises the stops shall not be placed below this level.

5.2.1.2 *Sled Leg Press Machines (Type 2b)* shall be outfitted with permanent dead stops that stop the downward travel of the lifting sled. These dead stops shall stop the sled so that there is at least 266 mm (10.5 in.) of space between the lowest most portion of the foot platform and the front edge of the seat assembly.

5.2.2 *Weight Disc Retention*—All weight posts used for application of the training resistance shall contain a retention means. Acceptable means include: Detent pins, clips or angling of the weight post above horizontal. If angling of the weight post is used then the weight post shall be angled 2° or greater with respect to horizontal throughout the entire range of motion.

5.2.2.1 If weight posts are designed for weight plate size less than 45 lb or 25 kg (as defined in 5.1), then the unit shall limit the use of such discs through the use of a site specific label. Institutional Equipment may use mechanical interference to limit the capacity as referenced in ~~5.2.4.2~~5.2.3.2.

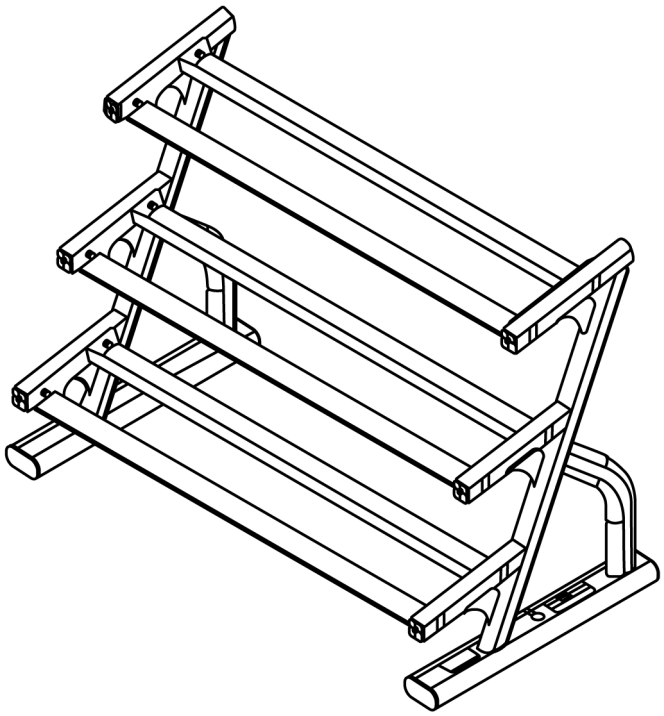

FIG. 6 Type 5 External Weight Storage—Dumbbells

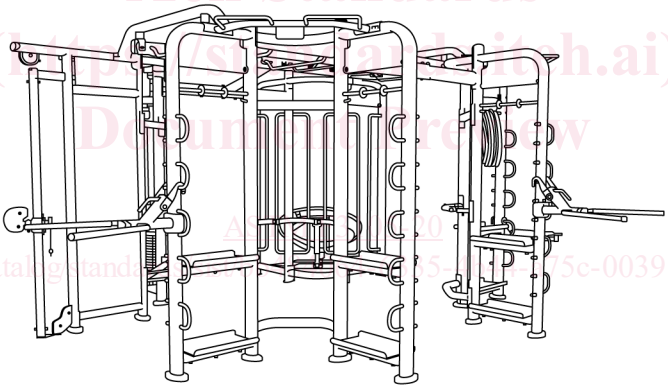

FIG. 7 Type 6 Multi Function Apparatus

~~5.2.3 *Barbell Support Hook Dimensions*—The rear part of the barbell hook shall be at least 80 mm (3.15 in.) higher than the front of the hook. The depth of the hook (front to back) shall be a minimum of 40 mm (1.57 in.). The height of the front of the barbell hook, a, shall be between 20 mm (0.78 in.) and 40 mm (1.57 in.) when measured from the bottom of a 30 mm (1.18 in.) barbell at rest in the hook. See Fig. 9.~~

5.2.3 *Weight Disc Clearance*—The distance between weight discs and other movable or fixed parts shall be greater than 25 mm (0.98 in.).

5.2.3.1 Weight discs on the same weight post are exempt from this requirement.

5.2.3.2 If a mechanical interference device is used to limit the use of certain size weight plates, such as a pin parallel to the weight posts, then it shall be exempt from the clearance requirement between the weight disc and mechanical interference device. A site specific warning shall be present in the immediate area to warn as to the maximum weight plate size. For consumer equipment, weight plate size restriction may be specified in the owner's manual.

5.2.4 *Barbell Support Hook Dimensions*—The rear part of the barbell hook shall be at least 80 mm (3.15 in.) higher than the front