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.

Designation: F3021 – 23

Standard Specification for Universal Design of Fitness Equipment for Inclusive Use by Persons with Functional Limitations and Impairments[1]

This standard is issued under the fixed designation F3021; 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 fitness equipment intended for use by persons with functional limitations and impairments. 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 the 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 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[2] 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.

1.2 The intent of this specification is to ensure that the fitness product being designed for inclusive use by individuals with and without functional limitations or impairments remains functional and safe when the equipment is operated according to the manufacturer's operational instructions.

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

1.4 Products designed to meet this specification must not be automatically classified as fit for medical or rehabilitation fitness purposes. Products intended for medical use should comply with any applicable international or national standards.

1.5 Where users are exercising from a wheelchair, it is the intent of this specification to specify products for use by individuals using manual or powered wheelchairs (including scooters) (A1.4.5).

1.6 This standard does not purport to address the needs of every possible user and recognizes that access will not be possible for all individuals or all types of assistive technologies.

1.7 This specification is to be used in conjunction with Test Method F3022 and other ASTM fitness equipment standards and their accompanying test methods as noted.

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

1.9 *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.*

NOTE 1—Additional specifications applicable to specific pieces of equipment, such as treadmills, bicycles, ellipticals, and strength equipment have been published in the equipment-specific standards.

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

[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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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

F2115 Specification for Motorized Treadmills

F2276 Specification for Fitness Equipment

F3022 Test Method for Evaluating the Universal Design of Fitness Equipment for Inclusive Use by Persons with Functional Limitations and Impairments

2.2 *ADAAG:*[4]

Americans with Disabilities Act Accessibility Guidelines (ADAAG)

2.3 *Federal Standard:*

AMS-STD-595 Colors Used in Government Procurement

2.4 *ISO Standards:*[5]

ISO 845 Cellular plastics and rubbers -- Determination of apparent density

ISO 2439 Flexible cellular polymeric materials -- Determination of hardness (indentation technique)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *access, v*—getting at or on fitness equipment or at fitness equipment controls or adjustments.

3.1.2 *assistive technologies, n*—adaptive or rehabilitative devices, or both, for people with disabilities that promote greater independence by enabling people to perform tasks that they were formerly unable to accomplish, or had great difficulty accomplishing.

3.1.2.1 *Discussion*—Assistive technologies include, but are not limited to, wheelchairs, walkers, canes, crutches, prosthetics, alternative communication devices, cell phones, etc.

3.1.3 *audible feedback or instruction, n*—audio voice/speech output.

3.1.4 *color value contrast, n*—the difference in luminance between two or more surfaces seen simultaneously or successively.

3.1.4.1 *Discussion*—In this standard, significant color value contrast is defined as 70 % or more, which is the current best practice.

3.1.4.2 *Discussion*—In this standard, contrast is measured by measuring the luminance (L) of color, as opposed to color hue or saturation.

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

3.1.6 *core branding and logo artwork/graphics, n*—equipment supplier logo, artwork, or graphics, or combinations thereof, that promote and market their brand.

3.1.6.1 *Discussion*—Core branding is not to be used within the body of instructional text.

3.1.7 *free weight style exercise bench, n*—an adjustable or fixed seat device that is intended to provide stability during exercise with free weights, generally consisting of a supported, padded area to sit, lean, or recline.

3.1.8 *gripping surface, n*—the area of the hand grips or hand grip bars/rails intended to be grasped by the hands for balance or stability during access, egress, or exercise, or combinations thereof.

3.1.9 *hand grips, fixed, n*—non-movable piece designed to be grasped by the hand(s) for support during access, egress, or exercise, or combinations thereof.

3.1.9.1 *Discussion*—This includes both applied and integral hand grips as defined in Specification F2276.

3.1.10 *hand grips, movable*—movable piece designed to be grasped by the hand(s) for support and use during exercise.

3.1.10.1 *Discussion*—This includes both applied and integral hand grips as defined in Specification F2276.

3.1.11 *iconography, n*—graphic or pictorial symbols used on consoles or other parts of the equipment to display information.

3.1.12 *impairment, n*—any deficit in psychological, physiological, or anatomical structure or function that has an adverse effect on a person's ability to carry out day to day activities, including health and leisure activities.

3.1.12.1 *Discussion*—An impairment is not a disability if it does not interfere with task performance.

3.1.13 *inclusive, adj*—including people with and without disabilities or impairments, or both.

3.1.14 *incremental weights, n*—additional fractional weights that can be applied in between the main weight plate selections.

3.1.15 *instructions for use, n*—user-facing instructions that are affixed to the equipment relating to the use of a piece of equipment, not including core branding or logo artwork, manufacturer's labels, model number labels, or standards or certification marks, or owner's/training manual(s).

3.1.15.1 *Discussion*—For example: Placard, decal panel, or other means.

3.1.16 *labels, n*—information directed at the user to support the use of a specific element of a piece of equipment, not including core branding or logo artwork, manufacturer's labels, model number labels or standards, or certification marks.

3.1.17 *luminance (L), n*—value or lightness on a scale ranging from black to white of light reflected off a surface measured in candela per meter squared (cd/m^2).

3.1.18 *main controls, n*—quick start, start, stop, enter, clear, numeric digits 0 to 9, increase resistance/level, decrease resistance/level, increase speed, decrease speed, increase

[3] 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.

[4] Available from the US Access Board, www.access-board.gov, or contact the US Access Board Customer Service at ta@access-board.gov.

[5] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, http://www.iso.org.

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gradient/incline, decrease gradient/incline, audio on/off, and any other functions, for example, emergency or safety stops, considered essential for the use of the equipment.

3.1.18.1 *Discussion*—See Appendix X1 for suggested universal design symbols for main control functions.

3.1.19 *mobility aids, n*—any device used to assist in balance, transfer, or locomotion.

3.1.20 *movable seat, n*—a seat which can be moved away from the primary exercise position where the entire seat structure remains attached to the main structure of the equipment.

3.1.21 *postural supports, n*—integral element to the equipment which assists in holding the user in position during exercise.

3.1.22 *quick start, n*—one-push mechanism that starts the equipment in manual mode at the minimal speed or resistance that is specified in the standard for the specific piece of equipment.

3.1.23 *removable seat, n*—a seat that can be moved away from the primary exercise position where the entire seat structure can be removed or separated from the remaining structure of the equipment.

3.1.24 *sans serif, n*—without any short lines stemming from or at an angle to the upper and lower ends of the strokes of a letter.

3.1.24.1 *Discussion*—For example: Times New Roman is a serif font where as Arial, Helvetica, and Calibri are sans serif fonts.

3.1.25 *seated cardio equipment, n*—recumbent cardio fitness equipment performed from the seated position, such as recumbent ellipticals, recumbent steppers, recumbent cycles, and total (upper and lower extremities) body and upper body ergometers.

3.1.25.1 *Discussion*—An upright cycle is not seated recumbent cardio equipment.

3.1.26 *skids, n*—a mechanism for moving equipment by sliding across the floor without wheels.

3.1.27 *swivel seat, n*—a seat that rotates horizontally about a vertical axis as if on a pivot.

3.1.28 *tactile, adj*—of, or relating to, or proceeding from, the sense of touch.

3.1.29 *transfer, v*—the action of getting onto (access) or off of (egress) a piece of fitness equipment, particularly from a wheelchair or other mobility aid.

3.1.30 *transfer surface, n*—area of the static or moving surface, or both, that is clear of any obstruction that would impede normal foot placements or motion, or both, and therefore is accessible for normal use.

3.1.31 *wheelchair, n*—device to provide wheeled mobility with seating support system for a person with mobility impairment, including manual wheelchairs which are powered by the user and electrically powered wheelchairs which are powered by a motor.

3.1.31.1 *Discussion*—A walking aid with wheels is not a wheelchair.

3.1.31.2 *Discussion*—A scooter is an electrically powered wheelchair.

4. Color Value Contrast

4.1 *Color Value Contrast Criteria Background:*

4.1.1 For the purpose of this standard, significant color value contrast is defined to be a value greater than or equal to 70 %.

4.1.2 The following applies to these sections within the document:

4.1.2.1 Integral surfaces and separate steps/frame (see 5.1.1.7).

4.1.2.2 Element of the equipment where the user is required to step over/adjacent surface (see 5.1.1.21).

4.1.2.3 Seats/primary adjacent surface (see 5.1.2.12).

4.1.2.4 Adjustment mechanisms/adjacent surface (see 5.1.3.8).

4.1.2.5 Markings/adjacent surface (see 5.1.3.12).

4.1.2.6 Intended gripping surfaces of all hand grips/adjacent surface (see 5.1.4.4).

4.1.2.7 Test, iconography, and a minimum of the border of the main instruction panel/adjacent surface (see 5.1.6.7).

4.1.2.8 Inclusive fitness symbol/adjacent surface (see 5.1.6.8).

4.1.2.9 Text, iconography, and a minimum of the border of the main control buttons/adjacent surface (see 5.2.4.3).

4.1.2.10 Numeric readouts relating to the main controls/adjacent surface (see 5.2.6.2).

4.1.2.11 Audio headphone jack (socket) symbol/adjacent surface (see 5.2.7.8).

4.1.2.12 Information button symbol/adjacent surface (see 5.2.7.13).

4.1.3 The US Access Board's technical assistance guide to the ADA Standards states regarding accessible signage: "The higher the contrast, the better for legibility, particularly for people with low vision" (A1.4.7) and the 1991 ADA Accessibility standards addressed the finish and contrast requirements in an appendix note, stating, signage is "more legible for persons with low vision when characters contrast with their background by at least 70 percent" (A1.4.1). The calculation of contrast is determined by:

$$\text{Color Value Contrast} = [(L1 - L2)/L1] \times 100 \quad (1)$$

where

L1 = luminance (L) of the lighter area
L2 = luminance (L) of the darker area

NOTE 2—It is a best practice to choose color pairs that have a color value contrast of greater than 80 % due to the approximately 10-point reproducibility limit for color pairings close to 70 % color value contrast found in the ASTM interlaboratory study. See Test Method F3022 for more information on the test method and interlaboratory study results.

4.2 *Color Definitions:*

4.2.1 There are three basic properties of color: Hue (the color), Saturation (or intensity), and Lightness (or value). See Fig. 1.

4.2.1.1 *Hue* refers to what is commonly called color, for example, red, green, blue-green, orange, etc.

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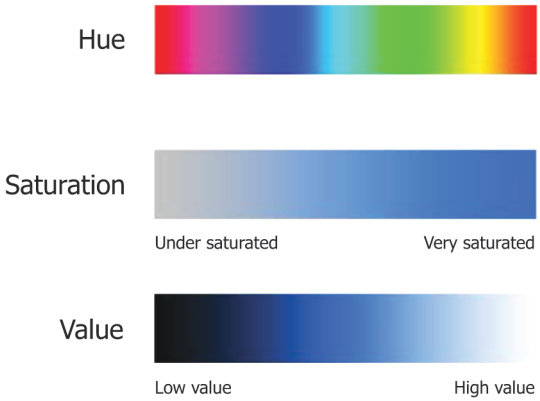

FIG. 1 Hue, Saturation, Value

4.2.1.2 *Saturation* refers to the richness of a hue as compared to a gray of the same lightness or value; in some color notation systems, saturation is also known as chroma.

4.2.1.3 *Lightness (or Value),* of a light source or the lightness of an opaque object is measured on a scale ranging from dim to bright for a light source or from black to white for an opaque object (or from black to colorless for a transparent object). In some systems, lightness is called value.

4.2.2 Color value contrast in this standard is defined as the light to dark (or value) contrast since this is the characteristic that can be seen by most of the population, including people who are completely color blind.

4.2.2.1 *Luminance*—The measurement of reflected light is called luminance. Luminance is "the amount of visible light leaving a point on a surface in a given direction...due to reflection," or the perceived or apparent brightness of a surface (A1.4.2). The standard unit of luminance is candela per square meter (cd/m^2), also called nits. Luminance is measured using a reflective light meter, a technology that measures light within the visible spectrum.

4.2.2.2 *Illuminance*—The measurement of incident light is called illuminance. Illuminance is the total luminous flux incident on a surface, or the "quantity of light...falling on a unit area of a surface" (A1.4.3). The standard unit of luminance is lux (lx). Illuminance is measured using an incident light meter—a technology that measures light within the visible spectrum.

4.3 *Spot Luminance Meter Technology*—The US Access Board's technical guide on accessible signage does not specify the technology or methodology to measure the luminance values in Eq 1. At the time this standard was written, at least one simple, low-cost technology solution had been identified: a spot meter designed for the photography and cinematography industries. An alternate technology, a spectrophotometer was investigated; however, its cost and complexity made it an unrealistic option. Spot meter technology measures color value, not hue, by measuring luminance, measures small areas, is economically priced, is portable, and uses light within the existing environment. The Sekonic L-758CINE meter was used at the time this document was written because it functions not only as a spot luminance meter, but also as an incident light meter that measures illuminance (in lux or footcandles) using a retractable lumisphere.[6] Any spot luminance meter or incident light meter, or both, combinations that meet the following specifications may be used:

4.3.1 Digital exposure meter with 1° spot viewfinder for ambient light readings of reflected light; the same meter or a separate meter can be used to measure incident light. Repeatability accuracy shall be ±0.1 EV or less. Informative range and units for measurements are:

4.3.1.1 *Measured with Spot Meter*—Brightness: 0.25 to 190 000 cd/m^2 (to two significant digits).

NOTE 3—A small range will limit the lighting conditions that can be measured in the field.

NOTE 4—Limited research has been done using meters other than the Sekonic L-758CINE. Future research should include other meters.

4.3.1.2 *Measured with Incident Light Meter*—Illumination: 0.63 to 190 000 lux (to two significant digits).

NOTE 5—Further information on the specifications for spot luminance meters can be found in the test method that accompanies this standard, Test Method F3022.

5. Design and Construction Requirements

5.1 *General Requirements:*

5.1.1 *Access and Setup:*

5.1.1.1 Easy access, egress, and transfer to get into and out of the correct start position shall not be impeded by the frame or other structural parts of the equipment, or both. This includes equipment with removable/movable seats, where the seat has been removed/moved.

NOTE 6—This specification refers to the equipment design only. It does not refer to equipment placement within the facility, which is beyond manufacturer's control (see the US Access Board Accessible Sports Facilities Guidelines for best practice of fitness facility equipment layout and RESNA IF-1, American National Standard for Inclusive Fitness – Volume 1: Inclusive Fitness Environments) (see A1.4.4 and A1.4.6).

5.1.1.2 Access and egress should be possible from the maximum number of approach positions (for example, front, rear, or side), avoiding left/right bias where practicable.

NOTE 7—Some pieces of fitness equipment, such as the leg press, will have points of entry that are not possible due to the weight stack placement. Control panels/consoles where necessary for exercise or for use, such as on a treadmill, will also prohibit access from all paths of entry.

5.1.1.3 The maximum step-on height onto a transfer surface should be no higher than 170 mm (6.7 in.) from the ground, measured with the equipment in the neutral position with 0 % grade/zero incline.

5.1.1.4 Where the user is required to step over supporting framework to access equipment, the maximum step-over height should be no higher than 400 mm (15.7 in.) measured from the ground to the highest point of the framework for a minimum width of 300 mm (11.8 in.) in the primary step-over position.

5.1.1.5 Where maximum step-on or step-over heights are exceeded, an integral surface or separate step shall be provided to reduce these heights to a maximum of 170 mm (6.7 in.) or 400 mm (15.7 in.), respectively.

[6] At the time of the 2023 revision, the Sekonic L758CINE was no longer being manufactured, but might still be available to rent from photographic equipment rental houses.

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NOTE 8—Only one transfer step is allowed per piece of equipment.

5.1.1.6 Integral surfaces and separate steps shall have a minimum length of 500 mm (19.7 in.), a minimum width of 300 mm (11.8 in.), and a maximum height of 170 mm (6.7 in.).

5.1.1.7 Integral surfaces and separate steps shall have a significant color value contrast from the adjacent surface of the equipment that they are primarily seen against (as defined in 4.1).

NOTE 9—Consideration should be given to both light and dark colors for contrast with different floor surfaces.

5.1.1.8 Separate steps shall have a means of preventing unintentional movement during use and appropriate mechanisms, for example, wheels/skids and hand grips/gripping surface, to enable the step to move easily over different floor surfaces. Movement or removal shall not require the user to lift the step fully unless it weighs less than 7.5 kg (16.5 lb).

5.1.1.9 Seated cardio equipment shall have integral back support.

NOTE 10—Tabletop ergometers are exempt from this criteria.

5.1.1.10 Seated cardio equipment with back support must be walk through in design with the walk-through structure no higher than 125 mm (4.9 in.).

NOTE 11—Walk through is an integral part of the design that allows the user to step through the structure of the equipment to access the exercise position as opposed to having to step over a centerpiece.

NOTE 12—Refer to ASTM Standards for specific walk-through dimensions that may deviate from this criteria, such as Ellipticals.

NOTE 13—Rowing machines are exempt from this walk-through criteria.

5.1.1.11 Walk-through equipment shall have a minimum transition area box from the seat when adjusted in mid-position to the framework directly in front of the seat of 300 mm (11.8 in.) wide by 635 mm (25.0 in.) high across the entire step-through structure.

5.1.1.12 Seated cardio equipment seat position shall be adjustable forwards and backwards through a range of at least 300 mm (11.8 in.).

NOTE 14—Tabletop ergometers are exempt from this criteria.

5.1.1.13 Seated total body cardio equipment which enables upper limb function/movement to aid lower limb function/movement shall have a swivel seat.

NOTE 15—Recumbent cycles and rowing machines are exempt from this requirement.

(1) Swivel seats shall automatically lock in the center position (primary exercise position). Swivel seats shall rotate and lock into position at a minimum of 45° and 90° to the right of center (primary exercise position) and 45° and 90° to the left of center.

NOTE 16—It is recommended to have as many rotating and locking positions as possible to increase access.

5.1.1.14 When adjusted in its most forward (lowest/shortest) position, seated cardio equipment seat height shall be a maximum height of 640 mm (25.2 in.) when measured from the ground to the top of the seat surface.

NOTE 17—Tabletop ergometers are exempt from this criteria.

5.1.1.15 Cardio equipment that can be operated by both the upper and lower body shall have an adjustment mechanism that locks the foot and hand supports in place in order to facilitate placement of the feet/hands in position during mounting/dismounting.

5.1.1.16 For seated cardio equipment, fixed hand grips shall be provided (see 3.1.9).

NOTE 18—Tabletop ergometers are exempt from this criteria.

5.1.1.17 Foot platforms/pedals shall have adjustable toe retention, for example, straps, through a range of shoe sizes. Toe straps may be permanently fixed or detachable.

NOTE 19—Consideration should be given to user foot sizes from 5 % female to 95 % male.

NOTE 20—Detachable straps shall comply with 5.1.3.7.

5.1.1.18 Foot supports shall have a minimum length of 300 mm (11.8 in.) and width of 150 mm (5.9 in.).

5.1.1.19 For seated cardio equipment, foot supports shall have foot retention, for example, raised guard, with a minimum height of 30 mm (1.2 in.) for a minimum of 80 % along the inside edge and 12 mm (0.5 in.) along a minimum of 80 % of the outside edge.

NOTE 21—This clause does not apply to pedals. Pedals are not considered foot supports.

5.1.1.20 For seated cardio equipment, foot supports shall have a mechanism for heel retention, for example, rear raised guard or strap, with a minimum height of 30 mm (1.2 in.).

5.1.1.21 To highlight potential trip hazards, an element of each part of the equipment where the user is required to step over or around shall have significant color value contrast from the adjacent surface of the equipment that they are primarily seen against (as defined in 4.1).

NOTE 22—Trip hazards include step-over structures on walk-through equipment and structure that protrudes outside the footprint of the main body of the equipment.

5.1.1.22 Foot support/pedal heel and toe retentions shall have significant color value contrast from the adjacent surface of the equipment that they are primarily seen against (as defined in 4.1).

5.1.2 *Seats, Sitting Surfaces, and Back Supports:*

5.1.2.1 Seats/sitting surfaces shall have minimum dimensions of 380 mm (15.0 in.) width at the widest point and 255 mm (10.0 in.) depth at the centerline of the seat. For seats used in conjunction with a back support, the seat angle shall be a minimum of 5°, with the front edge of the seat higher than the rear.

5.1.2.2 Fixed seats shall have a maximum height of 450 mm (17.7 in.) from the ground to the highest point of the seat. Where the maximum fixed seat height is exceeded, an integral surface or separate step that complies with the requirements described in 5.1.1.6 – 5.1.1.8 shall be provided to reduce the height to a maximum of 450 mm (17.7 in.).

5.1.2.3 For lower or upper body equipment that has adjustable seat heights, the adjustable height shall include a fixed seat height option in the range from 430 to 485 mm (16.9 to 19.1 in.).

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5.1.2.4 Seated upper body equipment shall have an adjustable height seat.

NOTE 23—Upper body torso and back extension types of equipment are exempt from these criteria.

5.1.2.5 Seated upper body equipment shall have a removable/movable seat which, when removed/moved, creates an accessible clear space of a minimum of 1300 mm (51.2 in.) length by 750 mm (29.5 in.) width by 975 mm (38.4 in.) height which is also free of physical obstructions above the height of 15 mm (0.6 in.) in the remaining floor area to prevent trip hazards.

NOTE 24—Removable seats should have storage positions to safely keep them out of the clear space.

NOTE 25—Upper body torso and back extension types of equipment are exempt from these criteria.

5.1.2.6 When the seat is in the removed/moved position on upper body pressing equipment with an integral back support, for example, chest and shoulder press, there shall be a minimum distance of 300 mm (11.8 in.) between at least one of the start positions of the hand grips designed for wheelchair use and the back support of the specific fitness equipment.

NOTE 26—This is to allow for the design of wheelchairs which have a brace behind the back support of the wheelchair to adopt a non-stressed start position.

NOTE 27—A broader range of start positions is desirable to accommodate a larger range of wheelchair users and users with limited shoulder mobility.

NOTE 28—This space shall also be clear of any horizontal protrusions above floor height that may pose a danger for persons with impairment due to sharp edges that may impede access for wheelchair users trying to achieve a correct exercise start position.

5.1.2.7 Removable/movable seats shall have appropriate mechanisms, for example, wheels or skids and hand grips or gripping surfaces, to enable the seat to move easily over different floor surfaces and a means of preventing unintentional movement during use (see Fig. 2). Seats which retain no permanent fixing to the equipment once removed shall have a hand grip(s) in an appropriate position to assist with moving them to/from the main structure of the equipment. Any movement or removal shall not require the user to lift the seat fully unless the force required to move it weighs less than 7.5 kg (16.5 lb).

FIG. 2 Example of a Movable Seat

5.1.2.8 For removable/movable seats on products intended to have a specific exercise position, a physical locating or locking mechanism or a visual reference shall be provided to indicate the correct seat alignment (see Fig. 3).

NOTE 29—In the left photo of Fig. 3, the grey upholstery stripes provide a visual reference for the correct seat and back support alignment and in the right photo the head support provides a physical locating mechanism for the correct back and head support alignment (since the back support cannot be physically moved back any further).

5.1.2.9 Where a free weight style exercise bench is provided with equipment and where the movement path is primarily defined by the user, for example, adjustable or high/low pulley equipment, it shall be a minimum width of 380 mm (15.0 in.) at the hip/pelvic support area and a minimum length of 450 mm (17.7 in.) for seated benches and 1200 mm (47.2 in.) for prone/supine benches.

NOTE 30—Prone is the exercise position of lying face down while supine is face up.

NOTE 31—These benches are exempt from Specification F3021 adjustable height requirement.

5.1.2.10 Integral back supports shall have a minimum width of 180 mm (7.0 in.) for a continuous minimum height of 500 mm (19.7 in.).

5.1.2.11 All postural supports/surfaces shall be cleanable and padded to a minimum depth of 12.7 mm (0.5 in.) of foam. The manufacturer shall disclose the thickness of the padding, the density of the padding per ISO 845 with a minimum of 75 kg/m^3, and the hardness per ISO 2439 with a minimum of 315 N (70.81 lbf).

5.1.2.12 Seats shall have significant color value contrast from the adjacent surface of the equipment that they are primarily seen against (as defined in 4.1).

NOTE 32—Consideration should be given to both light and dark colors for contrast with different floor surfaces.

5.1.3 *Adjustment Mechanisms:*

5.1.3.1 Adjustment mechanisms required for set up shall be visible in a clear line of sight to the user when approaching the equipment or from the primary exercise position, or both, as seen from a 5 % female to 95 % male sitting height (refer to Table 1 "Dimensions of US Civilian Male and Females" in Test Method F3022).

5.1.3.2 Left/right hand bias of adjustment mechanisms required for set up shall be avoided.

NOTE 33—Weight stack(s)/resistance selection is excluded from the requirement for left/right hand bias, provided the resistance can be selected with either hand before mount or from the primary exercise position, or both.

5.1.3.3 Adjustment mechanisms required for set up shall not require the simultaneous use of two hands.

NOTE 34—Users with use of one hand may use body weight or other body parts (for example, shoulder) to facilitate adjustment.

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