

UNIVERSAL DESIGN OF FITNESS EQUIPMENT CRITERIA TO MEET THE NEW DEPARTMENT OF JUSTICE ACCESSIBILITY REQUIREMENTS

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INTRODUCTION

The Americans with Disabilities Act (ADA) ensures that equal opportunities are provided to people with disabilities. Public fitness facilities and gyms must provide a percentage of accessible parking spaces and restrooms; and the built environment, i.e., doors, corridors, stairways, elevators, ramps, etc., must comply with accessibility criteria. However, little has been done to ensure that the fitness equipment and programs within the building are usable by those with disabilities. The Department of Justice (DOJ) is now mandating (effective March 2012) that accessible fitness equipment must be provided to meet the needs of people with disabilities in public fitness facilities.

The Rehabilitation Engineering Research Center (RERC) on RecTech standards development project has developed a set of specifications for aerobic and strength equipment that will allow manufacturers to design fitness equipment that will meet the new DOJ requirements. Existing fitness equipment design criteria and standards were evaluated, including relevant national and international standards as well as the ADA Guidelines. Extensive harmonization was done between the US criteria and the existing Inclusive Fitness Initiative (IFI) Stage II Standard that is currently in effect in the UK. One uniform, international draft standard was produced. Feedback from stakeholders, including manufacturers and users, was sought throughout this process. This work was adopted by ASTM in 2008, which houses over 12,000 voluntary consensus standards. The draft ASTM F08.30 Fitness Products Standard Specification for Universal Design of Fitness Equipment (UDFE) for Inclusive Use by Persons with Functional Limitations and Impairments was circulated for ballot in the fall of 2011 and is

currently being revised per the comments received during the voting process.

METHODS

The ADA Guidelines and existing ASTM, European (EN), and International Standards Organizations (ISO) fitness equipment standards were reviewed for all specifications that would be applicable to accessibility. Mainstream cardio and strength fitness equipment was evaluated for usability by people across a range of abilities. A list of design criteria were drafted and input from stakeholders including manufacturers, exercise professionals, disability experts, facility operators, researchers, and people with a range of abilities was sought. The design criteria were then systematically compared and harmonized with the existing IFI Stage II Standard (Hurley & Axelson, 2009). Undefined design variables that needed further research were identified through this process in order to develop objective specifications. Research projects were developed as needed with sub-groups of experts.

The RecTech standards development team has actively participated in eight F08.30 Fitness Products Technical Advisory Group meetings since May 2008 in order to further develop and promote the draft ASTM UDFE Standard. Manufacturer review and feedback was solicited during these meetings. The draft ASTM UDFE Standard was revised after each meeting per committee member feedback, research, and testing results.

The RecTech standards development team responded to DOJ's call for comments on their proposed ruling for fitness equipment criteria. Minimum scoping requirements and general specifications were submitted based on the work done for the draft ASTM UDFE Standard.

RESULTS

This project resulted in one, uniform international set of draft criteria for both cardio and strength mainstream fitness equipment. This work was adopted by ASTM, as ASTM Work Item 34535: Standard Specification for Universal Design of Fitness Equipment for Inclusive Use by Persons with Functional Limitations and Impairments (Table 1).

Table 1: Draft ASTM UDFE Standard Contents

Section #	Section Title
1.	Scope
2.	Referenced Documents
3.	Terminology
4.	Color Contrast Background/Criteria
5.	Design and Construction Requirements
5.1	General Requirements
	Access and Setup
	Seat Surfaces and Back Supports
	Adjustment Mechanisms/Hand grips
	Instructions for Use/Labeling Requirements
5.2	Control Panels/Consoles
	General Positioning
	Button/Labeling Requirements
	Color/Tactile Requirements
	Visual/Audio Feedback Requirements
5.3	Selectorized Strength Equipment
5.4	Treadmills (Motorized)
5.5	Exercise Bicycles/Ergometers
5.6	Ellipticals

Specific mainstream fitness equipment design criteria were drafted to address the needs of people with mobility impairments (assistive device users, balance issues, etc.), sensory impairments (visual and/or hearing), and/or cognitive impairments. An iterative process took place between the project team and stakeholders, including manufacturers and users, to develop a set of objective universal design criteria (see Table 2).

Table 2: Excerpts of Draft ASTM UDFE Criteria

Clause #	Criteria
5.1.1.3	Max step-on height onto a transfer surface should be no higher than 170 mm (6.7 in.)
5.1.2.1	Sitting surface width and depth shall be a min of 380 mm (15.0 in.) X 255 mm (10.0 in.)
5.1.2.1	Seats used in conjunction with a back support shall have a min of 5 degrees "dump"
5.1.2.5	Seated upper body equipment shall have a removable/movable seat
5.1.3.3	Adjustment mechanisms shall not require the simultaneous use of two hands
5.1.3.11	Adjustment markings shall be tactile
5.1.4.5	Movable gripping surfaces shall have a different color than static gripping surfaces
5.1.5.2	Instructions shall be available for users in an accessible electronic format
5.1.6.3	Sentence case, sans serif, and non-italic fonts shall be used for instruction panel text
5.2.1.3	Console controls shall have grouping/pairing of similar main operational controls
5.2.5.2	All main controls shall have simple and easily differentiated raised iconography
5.2.6.5	Visual and non-visual feedback shall be provided prior to the start/stop of a moving surface
5.3.6.1	Start/incremental resistance shall meet the min resistance requirements
5.4.2.1	A marking in a contrasting color is required on the running surface, i.e., treadmill belt
5.5.4.2	Foot pedals shall have adjustable toe straps

The following research tasks were identified during the development process: 1) develop a method to measure color contrast, 2) disclose the risks of overloading a wheelchair while using fitness equipment, 3) educate wheelchair users and trainers on stability issues while using fitness equipment, 4) develop objective criteria that addresses the needs of people with vision impairments, and 5) develop an international anthropometric data set which includes people with a range of abilities.

Color Contrast Method

Color contrast was identified as an important design criterion for accessible fitness equipment in order to distinguish between key

parts of the equipment, such as static gripping points, adjustment mechanisms, moving/non-moving parts, and text and pictograms. Although ADA recommends color contrast to increase accessibility, it does not provide a method to objectively measure color contrast. A method to measure luminance contrast using spot meter technology that is commonly used in the photography industry was developed and tested. Preliminary data suggests that the calculated color contrast values are repeatable (Hilderbrand, Hurley, & Axelson, 2010).

Wheelchair Load Tolerance

Testing was completed to define the load tolerances and static and dynamic stability of a wheelchair while using fitness equipment (Gmuender, Hurley, & Axelson, 2010).

In order to address manufacturer concerns of excess load applied to a wheelchair while using fitness equipment, such as an overhead shoulder press, wheelchair durability testing was completed. In order to address wheelchair stability risks while using fitness equipment, such as the chest, overhead, or vertical press or tricep extension, wheelchair stability testing was completed. Wheelchair characteristics, such as axle position, and user characteristics, such as weight and height, were investigated. A warning poster and guidebook have been developed in order to educate wheelchair users on safe practices while using fitness equipment while seated on a wheelchair.

Wheelchair Users and Fitness Equipment

In response to manufacturer and user concerns, a guide is being developed through the National Center on Physical Activity and Disability (NCPAD) to educate people on static and dynamic stability while using fitness equipment from a wheelchair. This guide includes an overview of:

- Exercise benefits/precautions
- Wheelchair positioning and securement
- Removing/moving seats
- Increasing wheelchair stability
- Wheelchair loads while using equipment
- Transferring on/off equipment
- Use of adaptive equipment and trainers

In addition, a quick facts warning label was developed for fitness facilities and gyms to post safety information on wheelchair stability and loading restraints during exercise using fitness equipment.

Criteria for People with Vision Impairments

A break out group including people with vision impairments was formed to address the audio needs for fitness equipment accessibility. Criteria were drafted to address headphone jack size, location, tactile feel, color contrast, and symbol design; audio format for instruction panels, function buttons, and performance feedback; and beeps/clicks for button activation.

Stakeholder Review

The ASTM F08.30 Fitness Product Committee is comprised of producers, users, consumers, and general interest members. The fitness equipment manufacturers include representatives from Nautilus, Icon, Precore, Paramount, Johnson Matrix, and Life Fitness.

The ASTM F08.30 Committee was presented with a revised draft of the standard at each bi-annual ASTM meeting. Criteria were revised based on stakeholder feedback and research results, and then presented to the committee members for further review and comment.

Department of Justice (DOJ) Input

Minimum scoping requirements for accessible fitness equipment in public fitness facilities and gyms were provided to DOJ. A recommendation was made to include a minimum of 10% of each type of equipment (amounting to at least one of each):

- Bicycle (recumbent or upright)
- Elliptical
- Treadmill
- Upper body ergometer
- Upper body strength equipment
- Lower body strength equipment
- Torso strength equipment

In addition, a list of general criteria defining an accessible piece of equipment based on Table 1 was provided, which included:

- Alternative start positions/adjustments
- Adequate support mechanisms
- Hand rails/supports
- Low start/incremental resistance/speed
- Walk through designs
- Tactile or kinesthetic feedback
- Quick start buttons
- Color contrast of key components

DISCUSSION

The intent of the ADA was to facilitate access for people with disabilities to public facilities, including participation in activities within the building structure. The new DOJ guidelines recently confirmed this intent by requiring public fitness facilities to provide accessible fitness equipment. The importance of providing accessible fitness equipment in public fitness facilities and gyms is accentuated by the fact that fitness equipment is typically large, heavy, and difficult to move. It is also a significant expenditure item for replacement.

Exercise is important and provides many of the same benefits for people with and without disabilities. Increase in activity level decreases secondary conditions and health costs often associated with disability. Affording people with disabilities the opportunity to exercise in public facilities, rather than specialized medical therapy settings, increases the social opportunity to interact with family members and friends.

This draft ASTM UDFE Standard gives manufacturers, health club managers, fitness trainers, and people with and without impairments the tools they need to choose fitness equipment that will meet their needs. Fitness facilities can also expect to benefit from an increase in membership.

The success of this draft ASTM UDFE Standard emphasizes the importance of involving manufacturers and people with disabilities throughout the process of inclusion policy development. This process ensures that

the criteria are both feasible for manufacturers and usable by people with disabilities.

Further research will include user evaluations on fitness equipment that meets the standard, outreach to promote fitness to teens with functional impairments, addressing accessible facility layout, and developing an international anthropometric data set which includes people with a range of functional abilities. Many of the criteria, i.e., color contrast methodology, developed by this project can be generalized to increase access to other environments, such as public transportation, medical equipment and facilities, and amusement parks.

REFERENCES

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