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An American National Standard

Standard Specification for Motorized Treadmills[1]

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INTRODUCTION

The goal of this specification is to promote proper mechanical design and manufacturing practices for motorized treadmills. Through these practices, this specification aims to assist designers and manufacturers in producing functional, safe machines under proper operational conditions. The equipment user must recognize, however, that a standard alone will not necessarily prevent injuries. Like other physical activities, exercise involving treadmills involves the risk of injury, particularly if the equipment is used improperly. The designers and manufacturers of treadmills should also consider other standards including, but not limited to, those listed below. This specification does not apply to treadmills designed for underwater use.

1. Scope

1.1 This specification covers the establishment of parameters for the design and manufacture of motorized treadmills.

2. Referenced Documents

2.1 *ASTM Standards:*

F 1749 Specification for Fitness Equipment and Facility Safety Signage and Labels[2]

F 2106 Test Method for Evaluating Design and Performance Characteristics of Motorized Treadmills[2]

2.2 *UL Standards:*[3]

UL 1647 Motor Operated Massage and Exercise Machines

UL 961 Electric Hobby and Sports Equipment

UL 1439 Test for Sharpness of Edges on Equipment

UL 2111 Thermal Protectors for Motors

2.3 *European Standards:*[4]

EN 957-1 Stationary Training Equipment—Part 1: General Safety Requirements and Test Methods

pr EN 957-6 Stationary Training Equipment—Part 6: Treadmills, Additional Specific Safety Requirements and Test Methods

3. Terminology

3.1 *Definitions:*

3.1.1 For treadmill terminology, see Fig. 1.

3.1.2 *accessible areas*, *n*—area accessible to the user or third party when the equipment is in normal use, during setting up, grasping, or correcting pieces of equipment or position of the body. This does not include areas that are accessible during the initial assembly.

3.1.3 *adjustable incline system*, *n*—components that allow the user to vary the angle of the moving surface relative to the floor.

3.1.4 *catch point*, *n*—location at which edges, protrusions, or surfaces allow a body part to become injured or clothing to be damaged.

3.1.5 *consumer treadmill*, *n*—treadmill intended exclusively for use by one person or a family unit in a home environment.

3.1.6 *folding treadmill*, *n*—a treadmill that is designed with some components that can be moved to allow a more compact, nonusable storage position.

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

3.1.8 *intended use*, *n*—operation in a manner consistent with use described in the owner's manual.

3.1.9 *owner's/user's manual*, *n*—documentation supplied and intended by the manufacturer to convey information to the owner/user about the treadmill.

3.1.10 *pinch point*, *n*—location between two moving components or the location between a moving and fixed component that, when entered, causes a portion of the body to become entrapped.

3.1.11 *pull in point*, *n*—the location between two moving components or the location between a moving and fixed component that, when entered, causes a portion of the body to be pulled into and trapped between the components.

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[2] *Annual Book of ASTM Standards*, Vol 15.07.

[3] Available from Underwriters Laboratories Inc., 333 Pfingsten Rd., Northbrook, IL 60062–2096.

[4] Available from CEN Management Centre, 36 rue de Stassart, B-1050, Brussels, Belgium.

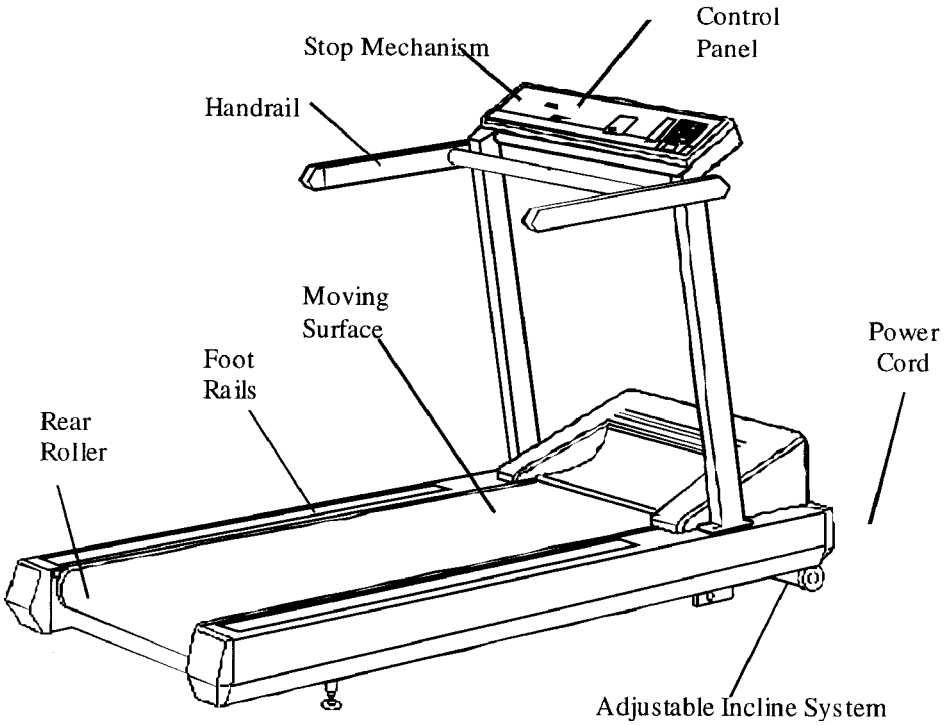

FIG. 1 Treadmill Terminology

3.1.12 *shear point*, *n*—location at which parts move past one another, a fixed point, or belt/pulley interfaces, so as to cause a body part to become caught in a scissors action.

3.1.13 *stop mechanism*, *n*—the device on the treadmill that, when actuated, removes power from the system that drives the moving surface or initiates a controlled stop.

3.1.14 *user support means*, *n*—see *hand rails*.

3.2 *Definitions of Terms Specific to This Standard:*

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

3.2.2 *corner*, *n*—the intersection of three planes or surfaces on a single component.

3.2.3 *cycle*, *n*—refers to one application of load to specifications required in the standard followed by removal of that load.

3.2.4 *deck*, *n*—component that supports the moving surface.

3.2.5 *edge*, *n*—the intersection of two planes or surfaces on a single component.

3.2.6 *foot rail*, *n*—the area beside the moving surface intended for the user to stand on when mounting or dismounting or during a pause.

3.2.7 *handrail*, *n*—the means that are provided for a user to enhance balance and stability by partially or totally supporting the user's weight with the user's arms.

3.2.8 *motorized drive*, *n*— a system that causes motion in the moving surface—utilizing a power source other than the user.

3.2.9 *moving surface*, *n*—component(s) on which the user walks or runs.

3.2.10 *roller*, *n*—the cylindrical component of the treadmill used to tension or support the moving surface.

3.2.11 *steady state unloaded condition*, *n*—the operational state of the treadmill in which no user or other externally applied load has been applied to the treadmill and the moving surface speed has been allowed to stabilize as commanded by the user interface.

3.2.12 *treadmill*, *n*—a motorized stationary exercise device that allows the user to walk, jog, or run by means of traversing a continuous moving surface.

3.2.13 *usable moving surface*, *n*—the area of the moving surface that is clear of any obstructions that would impede normal foot motion including the portion of the stride prior to initial foot fall and therefore accessible for normal use. Where no obstructions exist, the tangency point of the roller and the belt is considered the end of the usable surface.

3.2.14 *user weight (maximum)*, *n*—the mass of the exerciser that the treadmill was designed to safely accommodate. The manufacturer defines this value.

4. Design Requirements

4.1 Tests for conformance to design and loading requirements shall be performed in accordance with Test Method F 2106.

4.2 *Stability*:

4.2.1 The treadmill shall be stable during intended use.

4.3 *Exterior Design*:

4.3.1 *Edges*—All edges in accessible areas shall be free of burrs and sharp edges.

4.3.2 *Corners*—All corners in accessible areas shall be radiused or chamfered.

4.3.3 *Tube Ends*—Tube ends in the exposed accessible areas shall be closed off either by other components or plugs, caps, or covers.

4.3.4 The design of rotating parts shall avoid shear, pinch, or catch points by guarding, shielding, spacing, or other appropriate means.

4.3.5 The rear roller of the treadmill shall be designed or guarded to reduce the risk of finger entrapment. The guard or design shall function through the full range of inclination possible and through the full range of belt tension adjustment. The guard configurations shown in Fig. 2 are suggestions that may reduce the risks associated with this area. Fig. 2 assumes that the treadmill is maintained and adjusted per manufacturer's recommendations.

4.3.5.1 *Discussion*—The intention of Fig. 2 is to show some possible alternatives that have been used previously on treadmills to guard the rear roller area. This figure is not intended to limit alternatives that may more effectively address the hazard that is present at the rear roller. The function of the guard is to minimize the possibility of finger entrapment between the roller and the moving surface and between the frame and the end of the roller without introducing an undo tripping hazard to the user of the treadmill.

4.3.6 Electrical elements shall be guarded so as to meet or exceed UL 1647.

4.3.7 All treadmills shall be equipped with foot rails to facilitate user mounting and dismounting.

4.3.7.1 Foot rails shall be constructed to minimize foot slippage. A coefficient of friction of at least 0.5 must exist between the foot rail and a standard rubber test surface.

4.3.7.2 Foot rails shall be a minimum of 610 mm (24 in.) long and adjacent to the moving surface. They shall cover, as a minimum, from within 460 mm (18 in.) of the forward edge of the usable moving surface and at least 150 mm (6 in.) beyond the center of the usable moving surface. See Fig. 3.

4.3.7.3 For foot rail lateral spacing of 950 mm (37.5 in.) or less, the minimum foot rail surface width dimension shall be 75 mm (3 in.). For foot rails spaced greater than 950 mm (37.5 in.), the minimum foot rail surface width dimension shall be 150 mm (6 in.). See Fig. 3.

4.3.8 *Moving Surface*:

4.3.8.1 The moving surface shall be constructed to minimize foot slippage. A coefficient of friction of at least 0.5 must exist between the side of the moving surface presented to the user and a standard rubber test surface.

4.3.8.2 The minimum dimensions of the usable moving surface shall meet the following requirements (maximum speed determined from test method for 4.8.3):

For Institutional Treadmills:

Maximum Speed	Minimum Width	Minimum Length
0 to 9.7 kph (0 to 6 mph)	400 mm (15.75 in.)	815 mm (32 in.)
>9.7 to 13 kph (>6 to 8 mph)	400 mm (15.75 in.)	965 mm (38 in.)
>13 to 16 kph (>8 to 10 mph)	400 mm (15.75 in.)	1090 mm (43 in.)
>16 kph (>10 mph)	400 mm (15.75 in.)	1270 mm (50 in.)

For Consumer Treadmills:

Maximum Speed	Minimum Width	Minimum Length
0 to 9.7 kph (0 to 6 mph)	325 mm (12.75 in.)	815 mm (32 in.)
>9.7 to 13 kph (>6 to 8 mph)	350 mm (13.75 in.)	965 mm (38 in.)
>13 to 16 kph (>8 to 10 mph)	350 mm (13.75 in.)	1090 mm (43 in.)
>16 kph (>10 mph)	400 mm (15.75 in.)	1270 mm (50 in.)

4.3.9 All treadmills shall be equipped with a handrail for user support during use and to assist in dismount. The handrail shall have a total grip length of at least 405 mm (16 in.), and at least one segment shall be a minimum of 200 mm (8 in.) long.

4.3.9.1 If the treadmill is not equipped with a front handrail, side handrails shall be included on both sides and have a maximum width of 965 mm (38 in.) measured centerline to centerline.

4.3.9.2 All handrails shall be a minimum of 800 mm (31.5

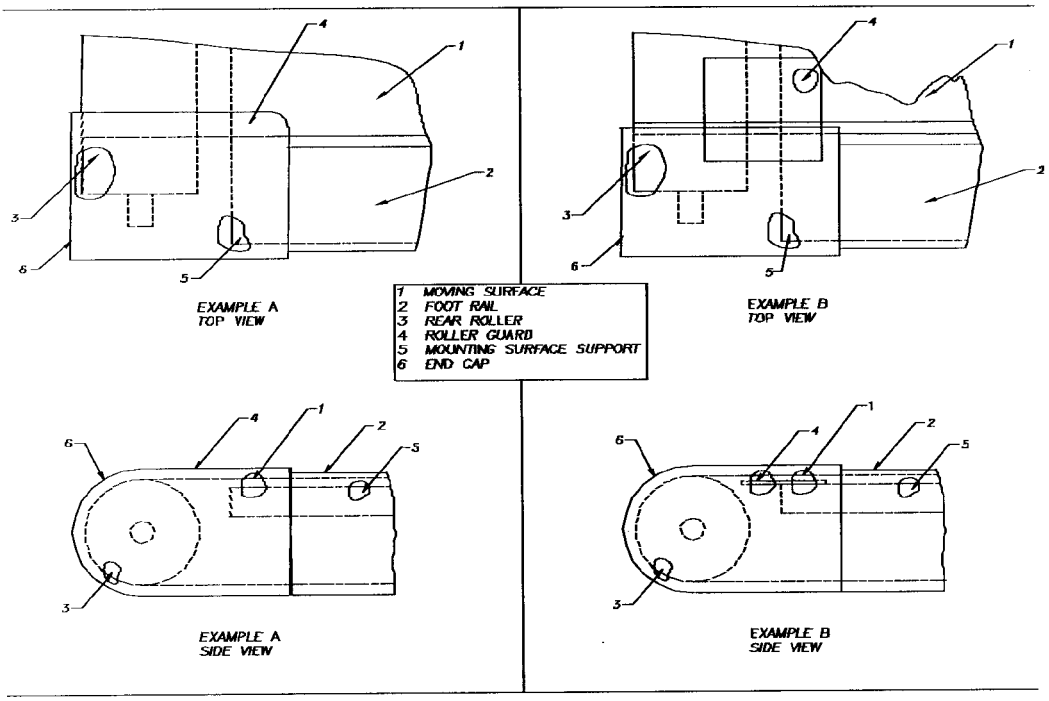

FIG. 2 Examples of Rear Roller Guarding

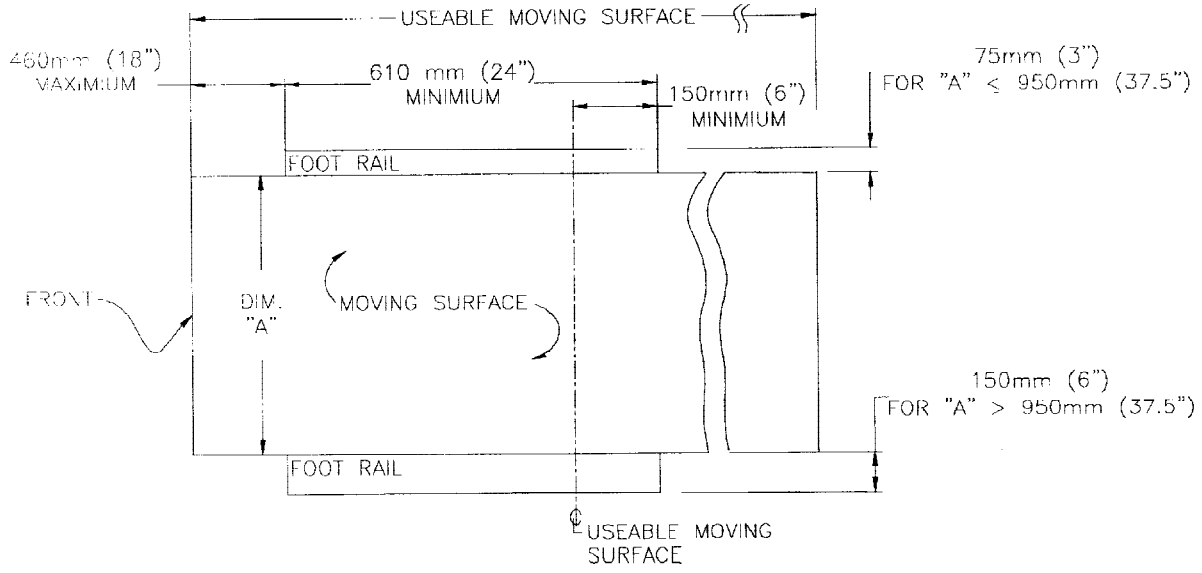

FIG. 3 Top View of Required Foot Rail Dimensions

in.) and a maximum of 1170 mm (46 in.) above the moving surface.

4.4 *Endurance*:

4.4.1 Treadmills shall function per manufacturer's specifications after enduring a minimum of 375 000 cycles (= 2 cycles/s × 3600 s/h × 1 h usage/week × 52 weeks) at a load equal to 1.5 times maximum specified user weight for consumer treadmills or 2 620 000 cycles (= 2 cycles/s × 3600 s/h × 7 h/week usage × 52 weeks) at a load equal to 1.5 times maximum specified user weight for institutional treadmills applied to the stationary moving surface.

4.4.2 Switches and switch actuation mechanisms for controlling the stop, pause, or end functions shall function properly as follows:

4.4.2.1 *Consumer Treadmills*—3 times/h × 5 h/week × 52 weeks/year × a safety factor of 2 = 1560 actuations.

4.4.2.2 *Institutional Treadmills*—3 times/h × 50 h/week × 52 weeks/year × 3 years × a safety factor of 2 = 46 800 actuations.

4.5 *Static Loading*:

4.5.1 The moving surface and deck (if present) shall withstand a load equal to 4 times maximum specified user weight for institutional treadmills and 3 times maximum specified user weight for consumer treadmills without breakage. The foot rails shall withstand a load equal to the maximum specified user weight × 3 for institutional treadmills and × 2 for consumer treadmills without breakage.

4.5.2 The handrail shall endure a vertical static load of 1.0 × the maximum specified user weight with permanent deformation of less than 5 % of original dimensions at the furthest point from attachment as measured from the foot rails.

4.5.3 The handrail shall endure a horizontal static load of 0.5 × the maximum specified user weight with permanent deformation of less than 5 % of original dimensions at the furthest point from attachment as measured from the attachment point.

4.5.4 The upright support of folding treadmills shall be sufficiently stable such that it will not fold down with a load of 180 N (40 lbs) applied horizontally to the handlebar support means. The user support means must not reach its balance point, when pulled toward the rear of the treadmill, before rotating at least 30°.

4.6 *Overheating*:

4.6.1 No external surfaces shall achieve a temperature exceeding 85°C (185°F) for nonmetallic surfaces or 60°C (140°F) for metallic surfaces. If the test is conducted at a room temperature of other than 25°C (77°F), the results are to be corrected to that temperature.

4.7 *Adjustable Incline System*:

4.7.1 The adjustable incline system, if the treadmill is so equipped, shall not move in excess of 25 mm/s (1 in./s) measured at any pinch or shear point created by the movement of the incline system.

4.8 *Control Panel*:

4.8.1 The control panel for the operation of the treadmill shall be readily accessible by the user.

4.8.2 The controls for a motorized treadmill shall incorporate a prominently labeled and user accessible stop switch. The stop switch causes the moving surface to decelerate and stop and stops the motion of any power-driven incline system. Stop mechanisms may include a push-button stop switch, a pull cord stop switch, an infrared beam switch, or other suitable means.

4.8.3 If the motorized treadmill is equipped with a speed display, it shall reflect the true moving surface speed to within ±1.6 kph (1.0 mph) while in a steady state unloaded condition.

4.9 *Motorized Drive System*:

4.9.1 The initial starting speed of the moving surface shall not exceed 2.4 kph (1.5 mph). The acceleration of the moving surface, with the treadmill in an unloaded condition, shall not exceed 3.2 kph/s (2.0 mph/s).

4.9.2 The maximum deceleration shall not exceed 9.7 kph/s (6.0 mph/s) with the treadmill stopping with a load equivalent

to a 90-kg (200-lb) or maximum specified user weight, whichever is less. This maximum deceleration rate shall apply on activation of the stop switch or removal of power by any means.

4.9.3 Treadmills shall be equipped with an immobilization method to prevent unauthorized operation by third parties. Examples of acceptable means include, but are not limited to, key, pull-out switch, combination lock, a power cord that is removable from the treadmill, or by software disabling.

5. Warnings/Warning Labels

5.1 Adequate warnings alerting users, third parties, and service personnel to hazards associated with treadmills shall be provided.

5.2 These warnings labels shall be designed in accordance with Specification F 1749.

5.3 *General Warning Label*—The general warning label for treadmills shall be permanently affixed to the machine in an area encountered by the user prior to each use of the machine. The general warning label must meet the requirements of Specification F 1749 as a minimum and include the following additional subjects.

5.3.1 Keep children away.

5.3.2 Since reading and understanding all warnings and instructions contained in the owner's manual is essential to safe operation, consumer treadmills shall be labeled with a statement advising the user to obtain, read, and understand the owner's manual prior to use.

5.4 Site-specific labels shall follow guidelines set forth in Specification F 1749.

5.5 *Facility Safety Signs*—A facility safety sign as specified in Specification F 1749 shall be provided by the manufacturer with each institutional facility equipment order.

6. Documentation

6.1 *Owner's/User's Manuals*—Every treadmill shall be accompanied by an owner's/user's manual.

6.1.1 The first topic in these manuals will be a comprehensive listing of safety precautions. Illustrations shall be incorporated to assist in the user's understanding of any procedures not readily describable with text.

6.1.2 The warnings in the manual shall include as a minimum the following:

6.1.2.1 Obtain a medical exam before beginning any exercise program. If at any time during exercise you feel faint, dizzy, or experience pain, stop and consult your physician.

6.1.2.2 Keep children away.

6.1.2.3 If the treadmill is intended for consumer use only, the manual shall state so.

6.1.2.4 Read, understand, and carefully follow all warnings, instructions, and procedures on the treadmill and in the owners/users manual before using the treadmill.

6.1.2.5 Inspect the treadmill for incorrect, worn, or loose components and then correct, replace, or tighten prior to use.

6.1.2.6 Do not wear loose or dangling clothing while using the treadmill.

6.1.2.7 Care should be used when mounting or dismounting the treadmill.

6.1.2.8 Disconnect all power before servicing the treadmill.

6.1.2.9 Read, understand, and test the emergency stop procedures before use.

6.1.2.10 Do not operate electrically powered treadmills in damp or wet locations.

6.1.2.11 The recommended minimum clearance required around each treadmill for access to, passage around, and emergency dismount shall be stated. The minimum dimensions are to be: 0.5 m (19.7 in.) on each side of the treadmill and 1 m (39 in.) behind the machine.

6.1.2.12 A review of all warning labels and how to obtain replacements shall be explained.

6.1.2.13 Requirements to keep the top side of the moving surface clean and dry.

6.1.2.14 Do not exceed maximum specified user weight. Manufacturer to state value of maximum user weight in this warning.

6.1.3 A parts list and descriptions or, if illustrated, a parts list with key numbers, shall be provided to assist in part identification.

6.2 *Assembly Instructions*—If the treadmill requires assembly, the assembly instructions or owner's/user's manual or both shall provide the following information.

6.2.1 The first section in the assembly instructions shall be a listing of all warnings related to correct and safe assembly of the treadmill.

6.2.2 A review of all warning labels that relate to correct and safe assembly and how to obtain replacements shall be provided.

6.2.3 The information shall include clear, detailed assembly instructions.

6.2.4 A list of tools required for assembly of the treadmill, even if the manufacturer supplies the tools.

6.2.5 The requirement that a complete visual inspection, and test of the features and functions of the assembled treadmill be made prior to use.

6.3 *Maintenance Instructions*—If the treadmill requires user maintenance, the maintenance instructions or owner's/user's manual or both shall provide clear, detailed instructions and shall include the following.

6.3.1 The first section of the maintenance instructions shall be a listing of all warnings related to correct and safe performance of the maintenance procedures.

6.3.2 A review of all warning labels that relate to correct and safe maintenance of the treadmill and how to obtain replacements.

6.3.3 The safety and integrity designed into the machine can only be maintained when the treadmill is regularly examined for damage and repaired. It is the sole responsibility of the user/owner or facility operator to ensure that regular maintenance is performed. Worn or damaged components shall be replaced immediately or the treadmill removed from service until the repair is made. Only manufacturer-supplied or -approved components shall be used to maintain and repair the treadmill. The maintenance instructions shall call the reader's attention to these facts.

6.4 *Operational Instructions*—Each function of the machine shall be explained in the operation instructions or owner's/user's manual or both including the following topics.

6.4.1 Maximum user weight.

6.4.2 The function of the immobilization method.

6.4.3 Function of the emergency stop method.

6.4.4 Operation of all controls on the control panel.

6.5 *Installation Instructions*—If the treadmill requires installation instructions, the installation instructions or owner's/user's manual or both shall include the following:

6.5.1 The first section in the installation instructions shall be a listing of all warnings related to correct and safe installation of the treadmill.

6.5.2 A review of all warning labels that relate to the correct and safe installation and how to obtain replacements shall be made.

6.5.3 Installation of power supply shall comply with local building codes.

6.5.4 Procedures for proper storage, movement, and placement shall be indicated.

6.5.5 Set up and operate the treadmill on a solid level surface.

6.5.6 The recommended minimum clearance required around each treadmill for access to, passage around, and emergency dismount shall be stated. The minimum dimensions are to be: 0.5 m (19.7 in.) on each side of the treadmill and
1 m (39 in.) behind the machine.

6.6 *Marking*—Treadmills shall have identification affixed to the machine indicating the following.

6.6.1 The name, address, and telephone numbers of the manufacturer or distributor or both.

6.6.2 Serial and model numbers.

6.6.3 Date of manufacture or code number that indicates the approximate date of manufacture.

6.6.4 A notification if the treadmill is for consumer use only.

6.6.5 On institutional treadmills, a visual movement indicator shall be provided on the moving surface. This indicator shall be permanently affixed to, or part of, the moving surface. The indicator must be designed to last for the useful life of the moving surface as set forth in the maintenance instructions provided by manufacturer.

6.6.6 On institutional treadmills designed for a maximum user weight of less than 135 kg (300 lb), the maximum user weight shall be affixed to the machine in a location where the user can easily read the statement prior to use.

7. Keywords

7.1 acceleration; handrails; moving surface; safe zone; treadmill