TECHNICAL REPORT

ISO/TR 13570-1

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2005-04-15

Wheelchairs —

Part 1: Guidelines for the application of the ISO 7176 series on wheelchairs

Fauteuils roulants —

Partie 1: Lignes directrices pour l'application de la série ISO 7176 aux fauteuils roulants

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 13570-1 was prepared by Technical Committee ISO/TC 173, *Assistive products for persons with disability*, Subcommittee SC 1, *Wheelchairs*.

This first edition cancels and replaces the first edition of ISO/TR 13570:2001, of which it constitutes a minor revision. This part of ISO/TR 13570 is based on the book, *A Guide to Wheelchair Selection: How to Use the ANSI/RESNA Wheelchair Standards to Buy a Wheelchair,* written by Peter Axelson, Jean Minkel and Denise Chesney, published in 1994 by the Paralyzed Veterans of America, Washington, DC, USA.

ISO/TR 13570 consists of the following parts, under the general title *Wheelchairs*:

— *Part 1: Guidelines for the application of the ISO 7176 series on wheelchairs*

The following part is under preparation:

— *Part 2: Typical values and recommended limits or dimensions, mass and manoeuvring space as determined in ISO 7176-5*

Wheelchairs —

Part 1: Guidelines for the application of the ISO 7176 series on wheelchairs

1 Scope

The purpose of this part of ISO/TR 13570 is to explain how you can use the International Standards on wheelchairs to select your next wheelchair. The actual standards are very technical and, at first glance, you may not understand how this information will help you select a wheelchair or scooter. This part of ISO/TR 13570 is meant to help you understand the purpose for and content of International Standards on wheelchairs.

This part of ISO/TR 13570 is divided into six clauses.

a) How to use this Technical Report.

b) Standardized testing and information disclosure: Provides background information on standardized testing of wheelchairs. Discusses how chairs are tested and how information is disclosed.

c) General considerations: Discusses general considerations related to choosing a powered or manual wheelchair.

d) Incorporating personal body characteristics: Relates your physical characteristics to the fit of a chair, either manual or powered.

e) Manual wheelchairs: Discusses manual wheelchair test procedures.

f) Powered wheelchairs: Discusses powered wheelchair test procedures; focuses on three- and four-wheeled scooters as well as full-sized powered wheelchairs.

In the manual and powered wheelchair sections, the test procedures are grouped into three categories:

— performance,

— safety, and

— dimensions.

For each test procedure, this part of ISO/TR 13570 includes

— reasons why you might need this information,

— a brief description of the standardized test procedure,

— how the results of the test will be disclosed in the manufacturer's technical product literature, and

— how to interpret the results of the test for your own situation.

2 How to use this Technical Report

If you are an experienced rider, you may know which elements of performance, safety and dimension are important to you. If not, or if you are a novice, we highly recommend that you involve other knowledgeable people in selecting your wheelchair. Many rehabilitation specialists have the expertise and training in using these standards and can help you select an appropriate wheelchair.

An excellent approach to the wheelchair selection process is to set priorities based on your mobility and seating needs. Setting priorities will help you identify the features that are most important to you and those on which you are willing to compromise. For example, if you live in a small apartment and need to fit your wheelchair into the boot (trunk) of your car, you will probably want to look specifically at the overall dimensions, foldability, and weight of the wheelchair. On the other hand, if you use a van and have an accessible apartment or home, you may not need a folding wheelchair. This part of ISO/TR 13570 will help you understand the test results that pertain to the factors most important to you. Armed with this information, you will be able to accurately compare products and make an informed purchasing decision.

3 Standardized testing and information disclosure

3.1 General

Purchasing a wheelchair can be a harrowing experience and finding the right chair among so many choices might seem impossible. Comparing wheelchair characteristics and performance has been difficult in the past because manufacturers used different standards and procedures to measure and test their chairs. For example, one manufacturer measured seat width from the outside of the seat rails, another measured from inside the rails, and a third measured the distance between the armrest panels. Thus, if you requested a chair with a seat width of 18 inches, the actual distance from the outside of the seat rails could be anywhere from 17 inches to 19 inches. This inconsistency, as well as a general concern for user safety, led to the development of standardized wheelchair measurements and test procedures. The results of these procedures will provide you with the information you need for true comparison shopping.

3.2 Background on tests and standards

The ISO Technical Committee on wheelchairs has been working to provide consumers with objective information about the characteristics and performance of wheelchairs. The committee includes rehabilitation engineers, wheelchair manufacturers, agency representatives, wheelchair users, and wheelchair prescribers.

The standards developed by the committee consist of a number of test procedures that apply to all wheelchairs and some that apply only to powered wheelchairs, including scooters. The test procedures are detailed instructions on how to perform the tests or measurements on wheelchairs. Some of the test procedures suggest minimum performance criteria for durability and safety, while others disclose the results of the tests for comparison purposes. The information obtained from the tests is designed to help you make better-educated selections. See Figure 1. The standardized test procedures also allow you to compare the test results of wheelchairs from different manufacturers. Since many of the test procedures set minimum performance levels, they also help manufacturers produce better products.

3.3 Standards increase your buying power

The standards are voluntary: manufacturers are not required by law to use the test procedures. However, if consumers start using the results as a basis for wheelchair selection, the manufacturers who do not use the standards may lose sales. The US Department of Veterans Affairs (VA), the single largest purchaser of wheelchairs in the United States, is adopting the standards for future wheelchair purchasing. Marketplace pressure will most likely encourage overall compliance with the standards.

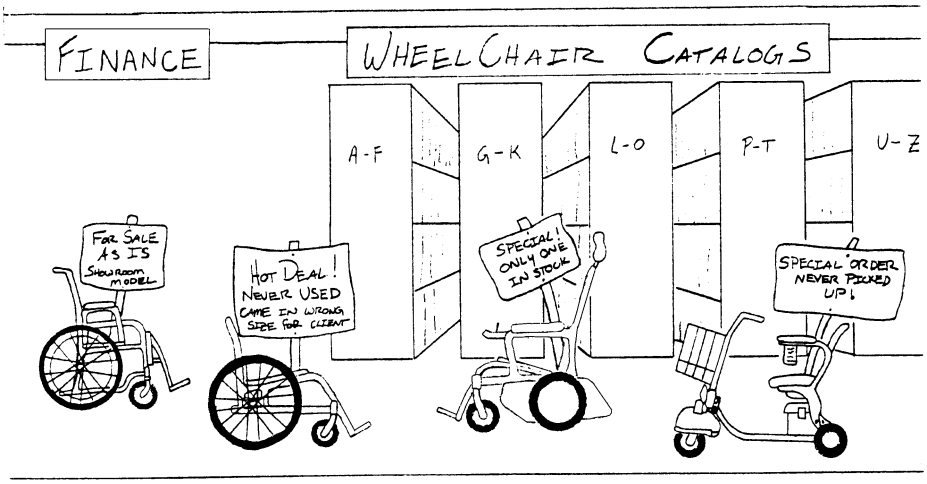

Figure 1 — Finding the right chair among so many choices might seem impossible

3.4 More about International Standards

To gain the maximum benefit from the standardized testing, both consumers and professionals must understand how to use the information.

The following is a list of the test standards, listed by their ISO number designation, that apply to all wheelchairs, with a brief description of the test procedure.

ISO 6440:1985, *Wheelchairs — Nomenclature, terms and definitions*. This International Standard establishes the terms and definitions used in the test procedures.

ISO 7193:1985, *Wheelchairs — Maximum overall dimensions*. This International Standard establishes suggested maximum dimensions of a chair for other organizations to use as guidelines for architectural accessibility.

ISO 7176-1:1999, *Wheelchairs — Part 1: Determination of static stability*. This test determines how stable the wheelchair is when it is resting on a sloped surface.

ISO 7176-3:2003, *Wheelchairs — Part 3: Determination of efficiency of brakes*. This test determines how well the wheel locks (parking brakes) prevent the wheelchair from rolling on a sloped surface. This test also determines the minimum stopping distance of a powered wheelchair at its maximum speed.

ISO 7176-5:1986, *Wheelchairs — Part 5: Determination of overall dimensions, mass and turning space*. This part addresses the overall length, width, height, folded width, mass and turnaround space of the chair.

ISO 7176-7:1998, *Wheelchairs — Part 7: Measurement of seating and wheel dimensions*. This part addresses the dimensional information needed to fit a chair to a rider. Standard methods of measurement eliminate the problems that result from variations in measurement methods.

ISO 7176-8:1998, *Wheelchairs — Part 8: Requirements and test methods for static, impact and fatigue strengths*. This part addresses the strength and durability of a wheelchair.

ISO 7176-11:1992, *Wheelchairs — Part 11: Test dummies*. This part addresses the dimensional and mass (weight) specifications of the dummies to be used when conducting the tests.

ISO 7176-13:1989, *Wheelchairs — Part 13: Determination of coefficient of friction of test surfaces*. This test describes the roughness or slipperiness of the surface to be used for testing.

ISO 7176-15:1996, *Wheelchairs — Part 15: Requirements for information disclosure, documentation and labelling*. This part tells what information manufacturers are required to disclose and how it should be disclosed in their product literature, if they choose to comply with the standards.

ISO 7176-16:1997, *Wheelchairs — Part 16: Resistance to ignition of upholstered parts — Requirements and test methods*. This test addresses the extent to which upholstery will burn and how fire retardant the upholstery is.

ISO 7176-19:2001, *Wheelchairs — Part 19: Wheeled mobility devices for use in motor vehicles*. This part sets out the design and performance requirements, and associated test methods, for wheelchairs that are intended for use as a seat in a motor vehicle.

ISO 7176-22:2000, *Wheelchairs — Part 22: Set-up procedures*. This part specifies the procedures for configuring and adjusting a wheelchair prior to testing.

ISO 7176-23:2002, *Wheelchairs — Part 23: Requirements and test methods for attendant-operated stair-climbing devices*. This part determines the performance of stair-climbing devices that are operated by an attendant.

ISO 7176-24:2004, *Wheelchairs — Part 24: Requirements and test methods for user-operated stair-climbing devices*. This part determines the performance of stair-climbing devices that are operated by the occupant.

The following is a list of test procedures that apply to powered wheelchairs only:

ISO 7176-2:2001, *Wheelchairs — Part 2: Determination of dynamic stability of electric wheelchairs.* This part addresses how stable a powered wheelchair is in the rearward, forward and lateral directions when it is driven.

ISO 7176-4:1997, *Wheelchairs — Part 4: Energy consumption of electric wheelchairs and scooters for determination of theoretical distance range*. This test addresses the energy consumption of a powered wheelchair on a standardized track.

ISO 7176-6:2001, *Wheelchairs — Part 6: Determination of maximum speed, acceleration and deceleration of electric wheelchairs*. This part addresses the maximum speed in forward and reverse. It also determines the minimum time from stationary to maximum speed (acceleration) and from maximum speed to a complete stop (retardation).

ISO 7176-9:2001, *Wheelchairs — Part 9: Climatic tests for electric wheelchairs*. This part addresses the effects of rain and temperature changes on the functioning of a powered wheelchair.

ISO 7176-10:1988, *Wheelchairs — Part 10: Determination of obstacle-climbing ability of electric wheelchairs*. This test determines how high an obstacle a powered wheelchair can climb over.

ISO 7176-14:1997, *Wheelchairs — Part 14: Power and control systems for electric wheelchairs — Requirements and test methods*. This test addresses safety, how well the fail-safe braking mechanism works, the force required to actuate the controls, and other issues related specifically to powered wheelchairs.

ISO 7176-21:2003, *Wheelchairs — Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and motorized scooters*. This part addresses the electromagnetic emissions and electromagnetic immunity of powered wheelchairs, including scooters.

3.5 How chairs are tested

The International Standards on wheelchairs are specific instructions on how to perform the test procedures. Some of the test procedures have minimum performance requirements, including flammability and climatic tests, static and impact strength tests, and power and control systems tests for powered wheelchairs. The results of the minimum performance tests are either pass or fail. These tests ensure minimum performance and safety of the product. See Figure 2.

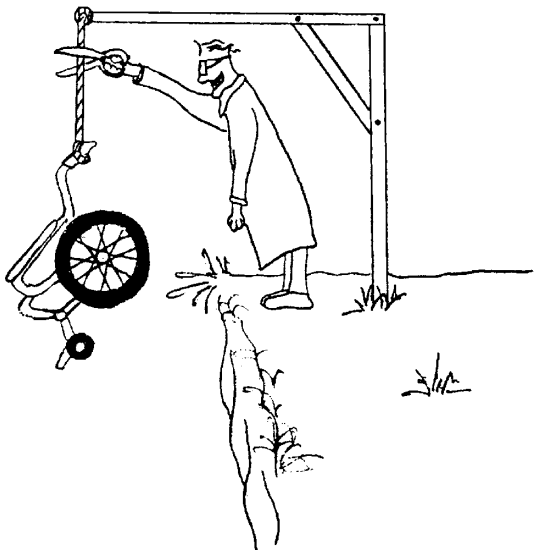

Figure 2 — Testing of wheelchairs has become more sophisticated over the years

Most of the test procedures are performance tests that produce quantified information about a chair. The results give information for comparison purposes only; there is no pass or fail determination. These comparisons are meaningful because, for the first time, each manufacturer uses the same tests. Until now, different manufacturers described their wheelchairs using different terms. By comparing test results of different chairs, you can begin comparative wheelchair shopping.

Most of the tests are conducted with a test dummy in the chair to represent the weight of a person. The results for chairs tested in this “loaded” condition more closely approximate the fit and performance of a chair when it is actually occupied. Your own body size, body proportions riding style may affect the actual fit and performance of a chair.

For wheelchair components that are adjustable, the manufacturer adjusts the wheelchair configuration and controls to obtain the extreme range of outcomes for a specific test procedure. For example, rear axle position and other adjustable features affect the stability of a chair. In this case, the manufacturer tests the wheelchair with its rear wheels and other adjustable features in both the least and most stable configurations. These results give a range of tipping angles that reflects the least stable and most stable configurations that can be obtained by adjusting the rear wheels and other features of the wheelchair. On a powered wheelchair with an adjustable controller, the manufacturer will disclose a range of stopping distances to reflect the adjustability of speed and retardation (deceleration).

3.6 How information is disclosed

Manufacturers that wish to comply with the International Standards on wheelchairs must comply with ISO 7176-15, *Wheelchairs — Part 15: Requirements for information disclosure, documentation and labelling*, which specifies which test results must be contained in the pre-sale technical product literature. A list of the additional tests that the manufacturer is required to perform is contained in Annex A. The manufacturer is not required to disclose the results of these additional tests in the technical product literature, but the consumer can request this information. See Figure 3.