

American National Standard

for Wheelchairs –
**Volume 3:
Wheelchair Seating**



RESNA

Rehabilitation Engineering and Assistive Technology Society of North America

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American National Standard
for Wheelchairs –

Volume 3: Wheelchair Seating

Secretary

**Rehabilitation Engineering and Assistive
Technology Society of North America**

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Foreword

This standard covers wheelchair seating devices with associated attachment hardware that are intended to provide postural support and/or tissue integrity management. In all cases, the information that is disclosed with regard to the testing should be considered with respect to the following note: the results obtained are based on testing one or more devices of a specific model and type. The performance a specific individual gets from his/her own wheelchair seating product will depend upon his/her own personal wheelchair set-up and may not represent the results obtained using the standardized RESNA test procedures.

ANSI/RESNA WC Volumes 3 consist of the following sections under the general title Wheelchairs:

Volume 3: Wheelchair Seating

- Section 1: **Vocabulary, reference axis convention and measures for body posture and postural support surfaces**
- Section 2: **Determination of physical and mechanical characteristics of devices intended to manage tissue integrity – Seat cushions**
- Section 3: **Postural support devices – Test methods for static, impact and repeated load strength**

The following ANSI/RESNA WC Volumes are also available:

Volume 1: Requirements and Test Methods for Wheelchairs (including Scooters)

Volume 2: Additional Requirements for Wheelchairs (including Scooters) with Electrical Systems

Volume 4: Wheelchairs and Transportation

These standards had their inception in 1993 when the RESNA Standards Committee on Wheelchair and Related Seating began creating standards in the United States as a result of awareness of International Organization for Standardization (ISO) activities related to wheelchair seating. Three standards were developed by the committee, which was composed of a variety of people including rehabilitation engineers, wheelchair seating manufacturers, governmental representatives, and wheelchair users and prescribers.

The standards are test procedures designed to produce objective information about wheelchair seating products. Some of the test methods establish minimum performance criteria for durability and safety reasons.

The American National Standards Institute (ANSI) originally sanctioned the ANSI/RESNA Standards on Wheelchairs in 1982. RESNA is now accredited as a standards organization and the Assistive Technology Standards Board oversees the work of the RESNA standards committees. RESNA is an interdisciplinary organization that promotes assistive technology for people with disabilities. The committee has also worked concurrently with other countries as an ANSI member body to the International Organization for Standardization (ISO) to create international standards pertaining to wheelchairs and seating.

Suggestions for the improvement of this standard are welcome. They should be sent to the following address:

RESNA Assistive Technology Standards Board
1700 North Moore Street, Suite 1540
Arlington, VA 22209

This standard was approved by the RESNA Standards Committee on Wheelchair and Related Seating and the RESNA Assistive Technology Standards Board for submittal to ANSI. Committee approval of the standard does not necessarily imply that all the committee members voted for its approval or the approval of every test method or requirement in the standard. Contributing members of the RESNA Standards Committee on Wheelchair and Related Seating consisted of the following members:

<i>Organization Represented</i>	<i>Name of Representative</i>
University of Hartford	Chair, Barbara Crane
EC Service, Inc.	Vice-Chair, Evan Call
University of Pittsburgh	Secretary, Patricia Karg
ATECH Services	Kim Davis
BodyPoint, Inc.	David Hintzman, Matthew Kosh
CarePartners Rehabilitation Hospital	Barbara Levy
Convaid, Inc.	Don Griggs, Ermin Nazareno, Sue Johnson
EC Service, Inc.	Justin Pedersen
Georgia Institute of Technology	Stephen Sprigle, Maureen Linden, Tobias Meyer
Invacare Corporation	David Mahilo, Howard Loewenthal
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Otto Bock HealthCare	Bob Clarke
Pride Mobility Products Corp. ..	David Leverett, Jill Kolczynski, Michael Zablocky, Doug Manternach
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Supracor	Brad Stern, Susan Wilson
Tempur Pedic Medical, Inc.	Rick Fontaine
The ROHO Group, Inc.	Kara Kopplin, Dave McCausland
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Vista Medical.....	Geoff Taylor
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Weyl Consulting LLC	Chris Weyl
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Scope of Volume 3

Volume 3: Wheelchair Seating

Section 1 applies to seating intended to provide postural support within a wheelchair. It specifies:

- a) a global coordinate system that permits the determination and recording of a person's posture while seated in a wheelchair;
- b) the standard terms and definitions for use in describing both the posture and the anthropometrics of a person seated in a wheelchair;
- c) the terms and definitions for describing the dimensions, location and orientation of seating support surfaces, which together comprise the body support system.

Section 1 does not specify any methods for use in measuring a person's seated posture, nor does it define terms for dynamic physiological movements (such as flexion or extension).

Section 1 may be applicable to seating other than that intended for use within a wheelchair.

Section 2 specifies apparatus, test methods and disclosure requirements for wheelchair seat cushions intended to maintain tissue integrity and prevent tissue trauma. It does not include test methods or requirements for determining the fire resistance of cushions.

Section 2 can also be applicable to tissue integrity management devices used as other support systems, as well as to cushions used in situations other than a wheelchair.

Section 3 specifies test methods for the determination of static, impact, and repetitive load strengths as well as disclosure requirements for postural support devices (PSD) with associated attachment hardware intended for use with wheelchairs.

Section 3 does not test the transportability or the use of the PSD in a motor vehicle.

NOTE At the present time there are no minimum or maximum strength requirements specified in the test procedures for testing for PSDs. In the future, minimum or maximum loads for testing might be specified for testing on a pass/fail basis. The maximum displacement, the maximum force achieved before failure, and the type of failure that occurs is disclosed for comparison purposes.

This standard specifies requirements and test methods for determining wheelchair seating performance. It also specifies requirements for the disclosure of the test results.

These test methods may be used to verify manufacturers' claims that a product exceeds the minimum requirements of this standard.

WARNING: This RESNA Standard calls for the use of procedures that may be injurious to the testing technician if adequate precautions are not taken.

Section 1

Vocabulary, Reference Axis Convention and Measures for Body ~~segments~~, Posture and Postural Support Surfaces

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Section 1 Introduction

This section of RESNA WC-3 is based on ISO 16840-1. RESNA has created these amendments to eliminate redundancies and highlight discrepancies between the various parts of the ISO 16840 Wheelchair Seating Standards. These amendments apply to ISO 16840-1, dated March 15, 2006. At the time of publication of this standard, the March 15, 2006 edition of ISO 16840-1 was valid. All standards are subject to revision, and parties to agreements based on this section of RESNA WC Vol. 3 are encouraged to investigate the possibility of applying the most recent edition of the ISO standard. Members of ISO maintain registers of currently valid International Standards. More recent versions of this ISO document may have resolved some of the highlighted discrepancies. If ISO resolves these discrepancies in a different manner than described in the following amendments, the RESNA amendments shall supersede the ISO revision.

In this section, strikethrough text indicates text that has been deleted from the ISO standard, and underlined blue text indicates text that has been added to the ISO standard.

The development of wheelchair seating as a sub-specialty of rehabilitation services has been occurring over the last several decades. This practice involves the selection and provision of wheelchair seating products that provide improved body support, movement control, and injury prevention for the wheelchair user. Inherent in this selection process is the measurement and communication of the anthropometrics and postural measures of the seated person, as well as the orientation, location, and linear measures of the person's seating support surfaces.

However, there has been tremendous variation in the use of the terminology and definitions related to the clinical measures of a seated individual. Standard definitions and terms are lacking for communicating critical postural information and support surface parameters in a way that is uniformly useful to service providers, researchers, manufacturers, wheelchair users and purchasers when selecting and providing wheelchair seating devices.

The purpose of this section of RESNA WC-3 is to specify standardized geometric terms and definitions for describing and quantifying a person's anthropometric measures and seated posture, as well as the spatial orientation and dimensions of a person's seating support surfaces. The body measurements also allow for the systematic monitoring of a person's seated posture change over time.

Section 1: Vocabulary, Reference Axis Convention and Measures for Body segments, Posture and Postural Support Surfaces

1. Scope

This section of RESNA WC-3 applies to seating intended to provide postural support within a wheelchair. It specifies:

- a) a global coordinate system that permits the determination and recording of a person's posture while seated in a wheelchair;
- b) the standard terms and definitions for use in describing both the posture and the anthropometrics of a person seated in a wheelchair;
- c) the terms and definitions for describing the dimensions, location and orientation of seating support surfaces, which together comprise the body support system.

This section of RESNA WC-3 does not specify a method or instrument for measuring a person's seated posture, nor does it define terms for dynamic physiological movements (such as flexion or extension).

This section of RESNA WC-3 might be applicable to seating other than that intended to be used within a wheelchair.

2. Terms and definitions

For the purposes of this section of RESNA WC-3, the terms and definitions given in RESNA WC-1, Sec. 26 and the following apply:

2.1 absolute angle

angle which represents the orientation in space of a body segment or support surface reference plane relative to the gravitational axis system

NOTE See 5.2.

2.2 body centerline

vertical line falling on the midsagittal plane of the body, as viewed in the frontal plane

2.3 body segment line

line defined by two designated body landmarks, either palpated or calculated, used in determining angular positions of body segments

2.4 contact surface

surface of the seating support **intended to be** in contact with the seated person's body