

American National Standard

for Wheelchairs –

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

**Section 11
Test Mannequins**



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Section 11

Test Mannequins

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Section 11 Introduction

This section of RESNA WC-1 is based on ISO 7176-11:2012. RESNA amended ISO 7176-11:2012 to eliminate redundancies and highlight discrepancies between the various sections of the ISO 7176 Wheelchairs standards, and to include editorial and technical revisions.

At the time of publication of this section, ISO 7176-11:2012 was valid. All standards are subject to revision, and parties to agreements based on this section of RESNA WC-1 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 herein, the RESNA amendments shall supersede the ISO revision.

In this section, ~~strikethrough~~ text indicates text that is published in the ISO standard, but was deleted from the RESNA standard. Blue text indicates text that is not published in the ISO standard, but was added to the RESNA standard. Wherever there is blue text there will also be a sidebar to help locate the text.

When testing wheelchairs, it is often necessary to simulate a human occupant. Test mannequins designed for motor vehicle crash testing are used where it is appropriate to do so, but they are expensive. A need exists for an affordable alternative. The first edition of ISO 7176-11, published in 1992, specified a set of test mannequins that would be suitable for most wheelchair tests. The designs were intended to provide an appropriate total load mass, to approximate the mass distribution of a human occupant, to avoid unrepresentative damage to the wheelchair, to be durable and to be inexpensive to manufacture.

Experience of using the first edition of ISO 7176-11 and related test mannequin specifications showed that test mannequins did not always provide repeatable results, particularly for static and dynamic stability tests. Several areas for improvement have been identified: to extend the mass range, to enable a test mannequin of arbitrary mass to be made, to enable verification of the location of the overall center of mass and to enable adjustment of the position of the overall center of mass. This second edition of ISO 7176-11 is intended to provide these improvements.

The ability to measure and adjust the location of the overall center of mass eliminates the need to specify many aspects of test mannequin design. It also allows for the mass of a test mannequin to be altered as needed.

The formula provided in this section of RESNA WC-1 Sec. 11 for the location of the overall center of mass are based on data and research available to date. It is expected that the range of masses and the mass distribution of wheelchair occupants will change over time. Revisions can be made to this section of RESNA WC-1 Sec.1 to reflect such changes as and when data becomes available.

Section 11

Test mannequins

1 Scope

This section of RESNA WC-1 specifies requirements for test mannequins of any mass ~~greater than or equal to 25 kg~~, to be used in the evaluation of wheelchairs. This section of RESNA WC-1 provides formulae that specify the location of the overall center of mass of test mannequins, the masses of the segments that comprise the test mannequins and the locations of pivots that connect the segments. It also specifies the characteristics of loading pads that support the segments.

The specified location for the center of mass is approximately the same as that of a human being of the corresponding mass when seated in a wheelchair, and also, for masses up to 100 kg, when in a standing position in a stand-up wheelchair. This section of RESNA WC-1 does not attempt to represent the mass distribution of a person with limb atrophy or amputation. This section of RESNA WC-1 is intended to enable the construction of test mannequins that will produce comparable results for stability, performance and durability testing of manual wheelchairs and electrically powered wheelchairs, including scooters.

This section of WC-1 also includes informative tables of mass and locations of center of mass, which are derived from the formulae, corresponding to example test mannequin masses up to 300 kg in 25 kg increments.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

RESNA WC-1 Section 22: Set-up procedures

RESNA WC-1, Section 26: Vocabulary

3 Terms and definitions

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

3.1 forward location

distance forward from the back support reference plane, measured perpendicular to it

NOTE For the purposes of this document, the back support reference plane is equivalent to the front surface of the test fixture's back support when the test mannequin is fitted in the test fixture (see 5.1).