**WC19: Wheelchairs**

**RESNA WC-4:2012, Section 19 - Wheelchairs Used as Seats in Motor Vehicles**

WC19 is a revised and updated version of Section 19 of American National Standards Institute/Rehabilitation Engineering and Assistive Technology Society of North America (ANSI/RESNA) Wheelchair Standards/Volume 1, *Wheelchairs Used as Seats in Motor Vehicles*. The updated standard was published in December 2012 as part of the RESNA Wheelchair Standards/Volume 4: *Wheelchairs and Transportation*. The standard is available for purchase at the [RESNA American National Standards webpage](http://www.resna.org) or by contacting RESNA:

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Wheelchairs that comply with WC19 are labeled with the symbol below.

![Symbol](WTS_Symbol-Vol4.png)

To download a high resolution version of the Volume 4 Wheelchair Transportation Safety symbol click here:

- [WTS Symbol-Vol4.png](WTS_Symbol-Vol4.png)
Rationale for WC19

Providing safer transportation for occupants of motor vehicles is a systems problem in which the vehicle seat plays a key role. A vehicle seat must be effectively secured so that its mass does not add to crash-generated restraint forces on the occupant and so that seat belts will effectively limit occupant movement within the vehicle. The seat must be designed so that it does not interfere with proper placement of belt restraints on the occupant and so that it does not cause failures of belt restraint components during dynamic loading. The seating system must support the occupant throughout the crash event so that properly positioned belt restraints remain on the bony regions of the body, and the seat should be designed so that it is not the source of occupant injuries.

For people with disabilities who are unable to transfer from their wheelchair when traveling in motor vehicles, the wheelchair must serve as the vehicle seating system and perform all the functions of a vehicle seat as described above. The purpose of WC19 is to establish design and performance requirements, and associated test methods, for wheelchairs related to their use as seats in motor vehicles. This standard employs basic principles of occupant protection and accepted procedures for dynamic testing used in federal motor vehicle safety standards (FMVSS). In today’s society where the number of people using wheelchairs is increasing, many wheelchair models will be used as seats in motor vehicles. Thus, wheelchair manufacturers are encouraged to acknowledge this use of wheelchairs and to proactively offer products that are compliant with WC19 whenever possible.

For purposes of WC19, a wheelchair is considered to be a complete personal mobility device comprised of a frame, a seating system, wheels, and casters that provides seated support and mobility for persons with physical disabilities. A wheelchair that complies with all the requirements of this standard is considered to provide a reasonable measure of safe and effective seating during vehicle ingress/egress, during normal transportation, and during a vehicle collision.

In preparing this standard, it was recognized that there are many makes, models, and styles of wheelchairs in use, and that few, if any have been designed to serve as a seat in a motor vehicle. It is the purpose of this standard to encourage the design, testing, and use of wheelchairs that comply with this standard and that will, therefore, enable and enhance effective wheelchair securement and occupant restraint in a frontal collision, offering comparable crash performance...
to that provided by the OEM vehicle seat. While the primary concern is to reduce the potential for injury to wheelchair-seated occupants that may be involved in a frontal vehicle crash, the standard also addresses issues of wheelchair performance related to vehicle access, maneuverability, and stability under normal operating conditions. It is also anticipated that achievement of improved occupant protection through effective wheelchair securement will result in increased comfort and security for wheelchair-seated occupants during normal travel.

The proper use and placement of belt restraints (on the occupant) are essential to effective occupant safety and crash protection. Moreover, since publication of the initial version of Section 19 in ANSI/RESNA WC Volume 1, an increased awareness of the difficulty of achieving proper placement of belt restraints on many wheelchair-seated travelers has developed, and there is now clear evidence of the high risk of serious and fatal injuries to wheelchair occupants that results from the lack of proper seatbelt fit and use (Schneider et al., 2010). As a result, WC19 addresses the key deterrents to proper and effective belt-restraint use, including wheelchair interference with belt-restraint placement on the wheelchair occupant and intrusion into the personal space of the wheelchair user by drivers and caregivers. This is accomplished by:

- Requiring that wheelchairs provide the wheelchair user with the option of using a dynamically tested wheelchair-anchored pelvic belt to which a vehicle-anchored shoulder belt can be readily connected, and
- Requiring that wheelchairs achieve acceptable, good, or excellent ratings for both the ease of properly applying a vehicle-anchored belt restraint on the wheelchair occupant and the degree to which proper belt positioning is possible when the wheelchair is evaluated for its accommodation of vehicle-anchored belt restraints using the methods of Annex E.

The provisions of this standard should not be used to discourage people with disabilities from using motor vehicle transportation, or to limit access to, and availability of, motor vehicle transportation to wheelchair user.

**Scope of WC19**

This RESNA standard specifies general design requirements, test procedures, and performance requirements for complete wheelchairs that can be considered to offer suitable and safe forward-facing seating for passengers traveling in transit, paratransit, school bus, over-the-road coaches, and personally licensed vehicles. The standard applies to the securement of wheelchairs by four-point strap-type tiedown systems that are occupied by child- and adult-sized passengers restrained by belt-type occupant restraints. The standard applies to a wide range of wheelchair types and styles, including manual wheelchairs, powerbase wheelchairs, three-wheeled scooters, tilt-in-space wheelchairs, and specialized mobile seating bases with removable seating inserts. It applies primarily to wheelchairs as purchased from the OEM manufacturer, but also has application to wheelchairs that are retrofitted for use as a motor-vehicle seat by the addition of after-market add-on components.

The standard places particular emphasis on design requirements, test procedures, and performance criteria related to frontal impact performance. However, it also includes design and performance requirements for wheelchairs with regard to accessibility to motor-vehicles and
stability during normal vehicle travel. The standard specifies strength and geometric requirements for wheelchair securement points and occupant restraint anchorage points on the wheelchair. It also provides requirements and information for wheelchair accessory components, seat inserts, and postural support devices with regard to their design and use in motor vehicles.

In addition to the general requirements indicated above, several additional key features required for a wheelchair that complies with the standards are that it shall:

- Have at least four permanently labeled securement points that can withstand the forces of a 30 mph, 20 g impact,
- Have specific securement point geometry that can receive a securement end fitting hook of a specified maximum dimension,
- Be equipped with anchor points for a wheelchair-anchored pelvic belt and recommendations for purchasing a belt if not provided, such that the wheelchair and pelvic belt will withstand a 30 mph, 20 g impact, and
- Provide a standard interface on the pelvic belt to connect to a vehicle-anchored shoulder belt.

With the Volume 4 publication, the scope of WC19 has been expanded to include wheelchairs designed for smaller children who weigh between 25-50 lb. Wheelchairs designed for smaller children must provide protection similar to that of a forward facing child restraint equipped with a harness including:

- a sufficiently high back support/headrest
- a crashworthy wheelchair-integrated five-point harness

This website has an up-to-date listing of crash-tested wheelchairs, which includes and denotes those wheelchairs that have been successfully crash tested with a wheelchair-integrated five-point harness for children less than 50 lb.

Current and Future Efforts

This version of the WC19 standard does not address all the issues and concerns. For example, it does not address rear or side vehicle impacts or rollover situations. Securement methods and devices other than strap-type securement devices are only partially addressed. These discrepancies will need to be addressed by future additions to the standards. Most standard developments efforts are incremental and the work is rarely completely done in the initial standard. Field experience with the standard invariably reveals shortcomings or limitations, and thereby clarifies the focus for revision or expansion. Research and standards development are currently focusing on docking technologies, seating devices for use in motor vehicles, and non-frontal impact conditions.
Implementation of WC19

It is vital to follow up the completion of standards with activities that will ensure the effective implementation of the provisions and requirements of the standard. This includes developing educational materials, such as guidance documents, presentations, news releases, and articles in consumer journals and magazines, and training videos, which explain the contents in lay language. It also involves working with manufacturers who need to understand the scope of the standards, and who may need assistance getting their products and literature to conform with the requirements of the standard. Finally, it also means providing one-on-one technical assistance to various user groups, transportation providers, and manufacturers to clarify misinformation and unfounded concerns that arise whenever a new standard is established.

The pages below contain many resources that are intended to accomplish these goals. Click on the link that best describes your information needs:

- **Consumers**: individuals or family of individuals who use wheelchairs.
- **Prescribers**: clinicians, rehabilitation therapists, Certified Rehabilitation Technology Suppliers and Rehabilitation Engineers.
- **Manufacturers**: companies that manufacture manual and power wheelchairs, seating products and wheelchair tiedowns and occupant restraint systems.
- **Transporters**: public, private and paratransit transportation agencies and school districts.