

Safety Tips for Vehicle Modifiers and Equipment Installers who prepare personal vehicles for use by passengers seated in wheelchairs secured by four-point, strap-type tiedown systems

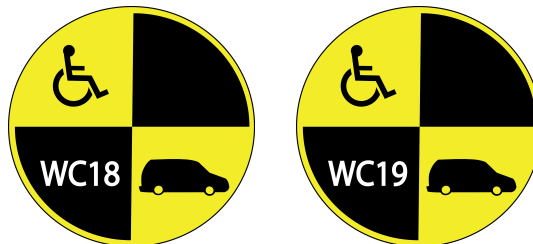
GENERAL GUIDELINES

1) Always:

- follow the National Mobility Equipment Dealers Association (NMEDA) guidelines to ensure that vehicle modifications are completed and adaptive equipment is installed in accordance with the highest industry standards and best practices,
- follow the instructions provided by the tiedown/restraint manufacturer when installing anchorages on the vehicle floor and sidewall, using all fasteners and backing plates provided or specified by the manufacturer, and
- install anchorages so that the passenger seated in a wheelchair is facing the front of the vehicle.

2) Whenever there is an opportunity, encourage clients to purchase a crash-tested wheelchair that has been designed for use as a seat in motor vehicles. These wheelchairs will comply with the industry safety standard for “Wheelchairs used as seats in motor vehicles,” and are usually referred to as **WC19 wheelchairs**.

- WC19 wheelchairs will be permanently labeled with the circular symbol below, or words on permanent label stating that the wheelchair complies with WC19.



Symbols indicating compliance
with industry wheelchair
transportation safety standards

- A WC19 wheelchair will have four easily accessible, crash-tested “securement-point” brackets to which hooks and straps of tiedown assemblies can be easily and effectively attached. These locations will be identified by a hook symbol on or near the tiedown securement-point bracket.

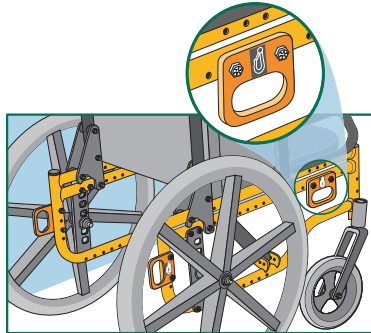


Illustration of securement-point brackets on a WC19-wheelchair designated by hook symbols

- A WC19 wheelchair provides the option of using a crash-tested wheelchair-anchored lap belt to which the lower end of a diagonal shoulder belt provided by the tiedown manufacturer can be connected to complete a three-point belt lap/shoulder-belt restraint system.
- A WC19 wheelchair is rated for how well they accommodate the proper use and positioning (on the passenger) of vehicle-anchored lap/shoulder belts. **The client should purchase a wheelchair with a “good” to “excellent” rating.**

SELECTING AND USING WHEELCHAIR TIEDOWN STRAPS AND VEHICLE ANCHOR POINTS

- 3) Select a four-point, strap-type wheelchair tiedown system that complies with current industry wheelchair transportation safety (WTS) standards and that is labeled with the same circular symbol shown on the previous page for WC19 wheelchairs, indicating that it complies with Section 18 of Volume 4 of RESNA wheelchair standards, which is known as a WC18 tiedown system.

NOTE: It is also acceptable to use wheelchair tiedown equipment that is labeled with words to indicate that it complies with the Society of Automotive Engineers (SAE) Recommended Practice J2249.

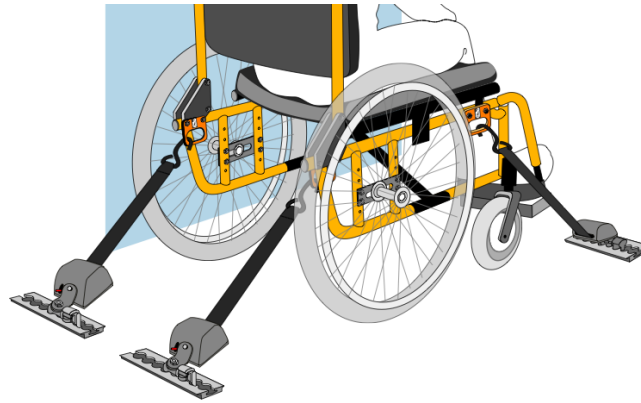
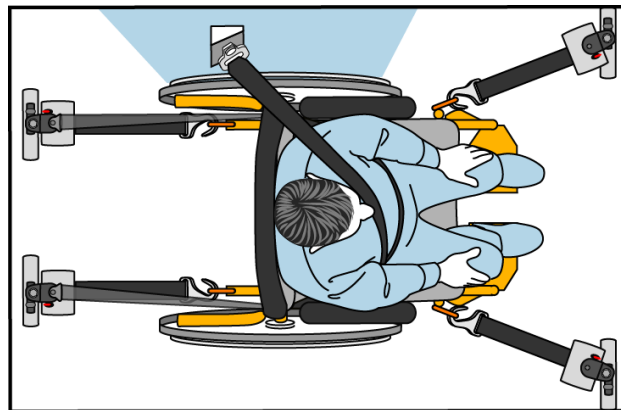


Illustration of a wheelchair secured by a four-point, strap-type tiedown

- 4) Select anchor points on the vehicle floor for the tiedown straps and seat belts that will provide effective wheelchair securement and occupant restraint in crash situations and during emergency vehicle maneuvers, such as sudden braking to avoid a collision.
- The distance between the front and back tiedown anchor points should be at least 48 inches, or as far apart as possible when space limitations prevent at least 48 inches.
 - Locate the anchor points for the rear tiedown straps so they will be positioned directly behind where the tiedown straps are attached to the client's wheelchair (about 12 to 16 inches apart).
 - Try to locate the anchor points for the front tiedown straps wider than the lateral distance between the wheelchair front securement points to increase lateral stability during travel (about 12 to 30 inches apart).



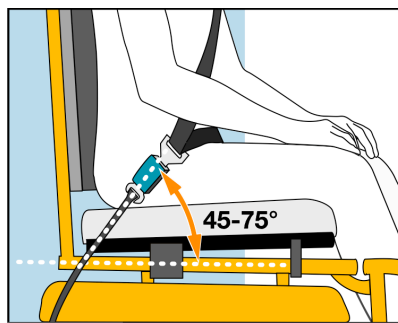
Top view of secured wheelchair showing rear tiedown straps going straight back to vehicle anchor points and front tiedown straps angled outward to wider vehicle anchor points

- For adult passengers seated in wheelchairs in the front row of a vehicle, locate the tiedown-strap anchorages so that no part of the passenger's body will be closer than 12 inches to the dashboard **and do not deactivate the dashboard-mounted airbag.**

Warning: Never attach anchorage hardware to movable or detachable vehicle components.

SEAT BELTS FOR PASSENGERS IN WHEELCHAIRS

- 5) It is very important, especially in privately owned vans and minivans, that a three-point restraint system with both a lap belt and a diagonal shoulder belt is properly installed for use by a passenger seated in their wheelchair.
- 6) Whenever possible, locate the tiedown anchor points so that the passenger seated in a wheelchair will be close to either side of the vehicle so that the diagonal shoulder belt will cross over the middle of the passenger's shoulder closest to the side of the vehicle.
- 7) Three-point lap/shoulder belt restraint systems provided by the vehicle manufacturer may be used as the primary restraint system for passengers seated in wheelchairs **only** if a seat-belt buckle receptacle is installed in the vehicle on the side of the wheelchair that is closer to the center of the vehicle to make the vehicle lap/shoulder belt system.
 - The after-market buckle receptacle installed must be fully compatible with the latch plate or "tongue" of the vehicle seat belt, so that the latch plate will effectively engage with, and lock into, the receptacle.
 - Buckle receptacles are usually attached to a stiff cable stalk anchored to the vehicle floor



Buckle receptacle attached to rigid cable stalk anchored on inboard side of the wheelchair

- When using the vehicle manufacturer's seat belt be sure to locate the anchorages of tiedown straps and the anchorage for the buckle receptacle on the vehicle floor to achieve proper routing and fit of the lap and shoulder belts on the passenger seated in a wheelchair such that:
 - the angle of the lap belt is ideally 45 degrees or greater to the horizontal, as illustrated above, and no less than 30 degrees, and such that
 - the shoulder belt crosses over the middle of the shoulder to an upper anchor point on the vehicle that is behind and above the top of the passenger's shoulder.



Good shoulder belt positioning over the center of the shoulder

8) It is often best for passengers in wheelchairs to use a complete lap and shoulder seat-belt system provided by the manufacturer of the WTORS. These are often referred to as “after-market” seat belts.

- Install an after-market seat belt that complies with the current industry safety standard, RESNA WC18, as indicated by the circular symbol shown previously.

NOTE: It is also acceptable to use aftermarket belt restraints that comply with SAE J2249.

- Locate the upper shoulder-belt anchor point or D-ring guide so that it is behind and above the passenger’s shoulders.
- Seat belts provided by the WTORS manufacturer often have a shoulder belt that manually disconnects from a pin-bushing type anchorage on the buckle latch plate, or that is attached to a metal bracket sewn onto the lap-belt webbing, thereby making it easier to properly position both the lap and shoulder belts on passengers seated in wheelchairs. Manually disconnecting shoulder belts also allow for easily attaching the metal anchorage at the lower end of the shoulder belt to a pin-bushing anchorage on a crashworthy lap belt anchored to a WC19 wheelchair (see 3rd bullet under 2 above), thereby completing a three-point, lap-shoulder belt occupant-restraint system.
- Locate lap-belt anchorages behind the client in his/her secured wheelchair so that the angle of the lap belt is at least 30 degrees to the horizontal, and preferably between 45 and 75 degrees when the lap belt is placed properly over the lower pelvis of the passenger, as in the illustration above.

OTHER FACTORS TO CONSIDER

9) When ready for travel, the lap belt should:

- be as snug as possible consistent with user comfort,
- the junction of the lap belt and shoulder belt should be near the hip of the passenger on the side opposite to where the shoulder belt crosses over the shoulder, and
- the seat-belt buckle should be against the passenger’s body and not be in contact with, or close to, rigid wheelchair components.

- 10) If a rear head restraint is installed in the vehicle, a vehicle-anchored back restraint must also be installed to limit rearward movement of the passenger's upper torso during rear impacts.
- 11) To make it easier to maneuver an occupied wheelchair into the wheelchair-passenger space, cover or fill open pockets in the wheelchair station that were previously used to anchor the vehicle manufacturer's seat to the floor.

For more information on industry safety standards and best practice for providing transportation safety for passengers seated in wheelchairs, refer to the *Ride Safe* brochure and to other educational materials that can be obtained online at wc-transportation-safety.umtri.umich.edu.