

Safety Tips for Vehicle Modifiers and Equipment Installers who prepare personal vehicles for use by drivers seated in wheelchairs secured by docking securement device

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

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

- Always check with the manufacturers of the wheelchair to make sure that the client’s specific wheelchair model has been successfully crash tested with the docking securement device. Also check that any necessary add-on docking securement hardware is available for the client’s specific wheelchair model.

- A WC19 wheelchair is rated for how well they accommodate the proper use and positioning (on the driver) of vehicle-anchored lap/shoulder belts. **The client should purchase a wheelchair with a “good” to “excellent” rating.**
- Follow the securement-system manufacturer’s instructions when attaching any add-on securement hardware to the wheelchair, using all fasteners, backing plates, etc. as specified and/or supplied by the manufacturer.
- Add-on wheelchair docking securement hardware must be attached to solid frame members and not to movable or detachable wheelchair components.

SELECTING AND USING A DOCKING SECUREMENT SYSTEM

- 3) Select a docking securement 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 securement equipment that is labeled with words to indicate that it complies with the Society of Automotive Engineers (SAE) Recommended Practice J2249.

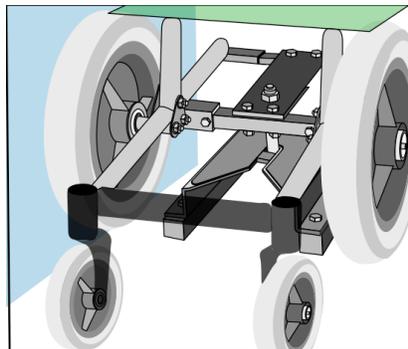
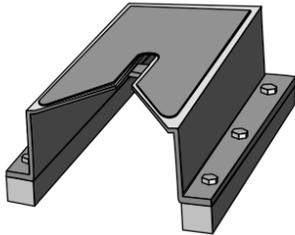


Illustration of a wheelchair secured by a docking securement system

- 4) Locate and fasten the docking-securement device on the driver area of the vehicle floor so that the driver will be positioned to safely and effectively operate the vehicle hand controls but as far rearward from the steering wheel as possible **and do not deactivate the steering-wheel-mounted airbag.**
 - Ensure that all audible and visual devices provided by the manufacturer of the securement system, as required by SAE J2249 and WC18, are installed and functioning properly so that the driver knows when their wheelchair is fully and properly locked in the securement device.
 - For securement systems that connect a single point or structure on the wheelchair to the securement device on the floor of the vehicle, such as a vertically hanging bolt under the wheelchair, a front stabilizing bracket and

associated wheelchair connecting hardware should be installed and used to prevent wheelchair rotation to the left and right during travel.

- It is best to locate the primary securement structural member (i.e. securement bolt) toward the back of the wheelchair frame rather than near the center. This, along with the front stabilizing bracket, will help to reduce downward rotation of the front of the wheelchair and seating system in a frontal crash, which can lead to an increased risk of abdomen injury from the lap belt riding up onto the abdomen (also known as lap-belt submarining).

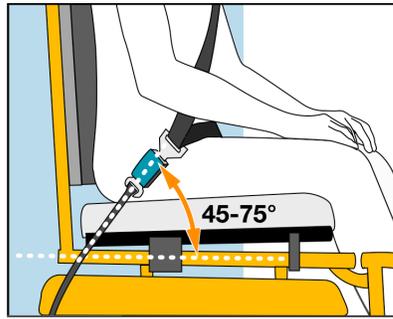


- When possible, raise the docking-securement device so that it is 2 or more inches above the vehicle floor so that the lowest point of the docking-securement hardware on the wheelchair will not get caught on door thresholds and other raised ground and vehicle-floor surfaces.

- After installing the docking securement components in the vehicle and on the wheelchair, the wheelchair should be secured and checked to ensure that it is properly positioned for the driver to use the hand controls.

SEAT BELTS FOR DRIVERS SEATED 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 driver seated in their wheelchair.
- 6) Whenever possible, locate the docking device on the vehicle floor so that the driver seated in a wheelchair will be positioned with the diagonal shoulder belt crossing over the middle of the driver'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 the driver 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 complete 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 to make it easy to reach



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 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 drivers 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 drivers 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.