

Proper Use of WTORS

Motor vehicle transportation,

whether in public or private vehicles, is so vital to employment, access to quality healthcare, and community interaction that transportation safety for people who are not able to transfer out of their wheelchairs is often a secondary consideration. This doesn't need to be the case.

Although motor-vehicle crashes are a leading cause of death in the U.S., readily available technologies will

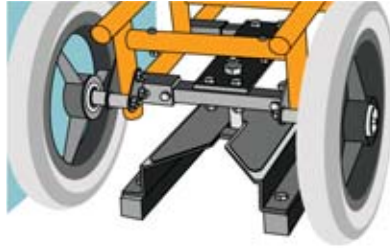
significantly enhance transportation safety for wheelchair-seated travelers.

The safest choice for wheelchair users is to transfer to the vehicle seat whenever possible and practical, so the seatbelt system provided by the vehicle manufacturer can be properly used. The unoccupied wheelchair should then be secured or stored in a cargo area.

For wheelchair users who cannot feasibly transfer, safe transportation requires using after-market equipment to (1) secure the occupied wheelchair facing forward in the vehicle, and (2) provide an effective crashworthy seatbelt for the person in the wheelchair. Commercial products that accomplish both goals are called Wheelchair Tiedowns and

Occupant Restraint Systems, often referred to as WTORS. Those that comply with SAE J2249 Wheelchair Tiedown and Occupant Restraint Systems for Use in Motor Vehicles¹, which involves passing a relatively

A typical docking-type wheelchair securement



severe frontal crash test, should always be used.

The Best Way

The most common type of WTORS uses a four-point strap system to secure the wheelchair. These tie-downs are very effective and can secure a wide range of wheelchair types, but they require that another person attach and tighten the straps. For these systems to work properly, all four straps must be used as instructed by the manufacturer.

Using four-point strap tie-downs is much easier if the wheelchair occupant has a crash-tested wheelchair that complies with ANSI/RESNA WC19, Wheelchair for Use as Seats in Motor Vehicles.² This voluntary standard requires wheelchair frames to include four easily accessible brackets for attaching the tie-down straps. If the wheelchair does not comply with WC19, four structural points on the wheelchair base or seat frame must be

identified and used to secure the wheelchair.

Wheelchairs can also be secured to the vehicle using docking-type devices that allow wheelchair users to secure their own wheelchair. These devices are commonly used by people who drive from their wheelchairs and require the addition of adaptive hardware to the wheelchair for engaging with the docking device mounted to the vehicle floor.

Essential Equipment

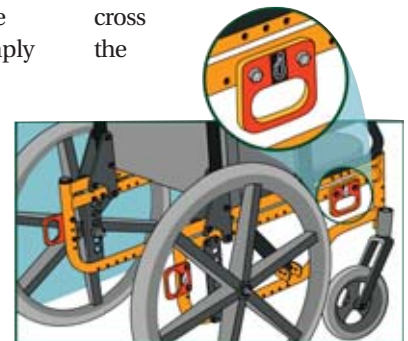
No matter how the wheelchair is secured to the vehicle, a properly used and positioned crashworthy seatbelt, consisting of pelvic and upper-torso belts, is absolutely essential. Seatbelts are by far the most effective occupant restraint system for protecting occupants in crashes and reduce the risk of fatal injuries by more than 50%. They prevent occupants' ejection from and minimize injurious contact within the vehicle.

To be most effective, the lap belt must be placed low on the pelvis near the top of the thighs, and the shoulder belt should cross the



This wheelchair is secured by a four-point tie-down with occupant using a three-point belt restraint.

This WC19 wheelchair has dedicated securement brackets.



Proper seatbelt routing and placement is vital for safety.

middle of one shoulder and the breastbone and connect to the lap belt near the occupant's hip.

While wheelchair securement and occupant restraint are important, a growing body of evidence suggests a large proportion of serious injuries to wheelchair-seated travelers is due to a lack of proper seatbelt use and/or improper positioning of the seatbelt. In many cases, wheelchair features such as armrests and wheels can interfere with proper seatbelt routing and placement, and care must be taken to ensure that seatbelts are properly used and positioned. This may require placing the lap belt between the back of the armrest and the seatback post, or threading the lap belt's ends through openings below the armrest before attaching the belt to the vehicle's anchor points. It is also important to place the seatbelt buckle in direct contact with the occupant and not where it may contact rigid wheelchair components during a crash. *Never* route seatbelts outside the large wheels or over armrests.

Many people mistake postural belts attached to their wheelchair for belt restraints that will protect them in a crash. These are not strong enough to withstand the restraint forces developed in many crashes and are often



not properly positioned over the bony parts of the body. Some WC19-compliant wheelchairs offer a crashworthy wheelchair-anchored lap belt to which a vehicle-mounted shoulder belt can be connected. These would be clearly labeled as complying with ANSI/RESNA WC19.

For more information on wheelchair transportation safety, check out the RideSafe brochure available at www.travelsafer.org or by calling 734-764-2171, and the RERC on Wheelchair Transportation Safety Web site, www.rercwts.org. Both are sponsored by the National Institute on Disability and Rehabilitation Research (NIDRR).

References 1, 2: The corresponding International Standards for WTORS and wheelchairs are ISO 10542 and ISO 7176-19, respectively.

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Seatbelt Add-on

Introduced in 2004, the CG-Lock was originally developed for the performance-driving market as an after-market product to make factory-installed seatbelts racing-harness tight. Users can adjust their lapbelt's rightness while leaving the shoulder belt unrestrained for freedom of upper-body movement. Eliminating the need to brace themselves or hold on reduces drivers' fatigue and reportedly increases comfort and control.

CG-Lock was an Adaptive Driving Alliance (ADA) New Technology Award finalist for 2008. The benefits of CG-Lock are available to drivers with mobility impairments for improved stability, greater comfort, and enhanced safety. Using the device is said to restore a sense of security to those who must operate vehicles via hand controls and can't use their legs to brace themselves. At \$41.98 (MSRP), the CG-Lock may be a relatively inexpensive and effective solution.

Contact: www.cg-lock.com.

On Two Wheels Again

"I was involved in a motorcycle accident April 15, 1998," says Steve Bucaro. "In

the ten years since then, I've built a number of different vehicles—trucks ranging from shaved door handles with airbags, to a lifted Jeep with manual transmission. All of them have been a blast and great experiences."

But the one project that is dearest to Bucaro's heart is his bike.

"People think I'm crazy for wanting to ride a motorcycle again," Bucaro says. "Not at all! The passion to ride again is just huge!"

Bucaro's bike is a 1992 Kawasaki ZX-7, the same year and model he was riding when he was injured. A six-inch linear actuator mounted on the rear is welded to the landing gear.

"This allows me to get on, strap my legs/feet, and then take off!" Bucaro explains. "As I feel comfortable, I hit the button and they go up—and I'm riding two wheels again!"

An electric shifter allows Bucaro to go through the gears. The landing gear and shifter make the bike accessible. Everything else on it is factory. All the work has been done by Eddy McCoy of Eye Candy Cycles in San Clemente, Calif., and Bucaro.

"Lee Beaver created the whole landing-gear product years ago," Bucaro says, "so this made it easy to just get those parts from him. There was no need to reinvent something that is already available and has been proven."