The Engineering Society For Advancing Mobility Land Sea Air and Space®
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SURFACE VEHICLE RECOMMENDED PRACTICE

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Wheelchair Tiedown and Occupant Restraint Systems for Use in Motor Vehicles

Foreword—For people with disabilities who are unable to transfer from their wheelchairs when traveling in motor vehicles, the wheelchair must serve as the vehicle seat. This usually means that the occupant restraint system installed by the vehicle manufacturer cannot be used to provide protection in a crash. In addition, the wheelchair must be secured to the vehicle so that it does not impose forces on its occupant and/or become a hazard to other vehicle occupants in a collision or sudden vehicle maneuver. Providing occupant protection for the wheelchair-seated occupant, therefore, requires that aftermarket equipment be installed to secure the wheelchair and restrain the wheelchair user.

This SAE Recommended Practice applies to the design and performance of motor-vehicle adaptive equipment referred to as wheelchair tiedown and occupant restraint systems or WTORS. It is the purpose of this document to encourage the design, testing, installation, and use of WTORS equipment that will provide effective wheelchair securement and occupant restraint in a frontal collision, and that will be comparable in crash performance to seat securement and occupant restraint systems provided by the vehicle manufacturer. While the primary concern is to reduce the potential for injury to wheelchair-seated occupants involved in a frontal vehicle crash, it is anticipated that achievement of improved occupant protection will also result in increased driver and passenger safety and comfort during normal travel. The provisions of this document 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 users.

Sincemanufacturers of WTORS are generally not able to control or specify the end use of their products, the 48-km/h, 20-g sled impact test specified in Appendix A is intended to qualify WTORS for use in vehicles with a gross vehicle weight of less than 7000 kg. In larger vehicles, it may be possible to provide safe transportation using WTORS that do not comply with the level of crash severity used in this document.

As with any vehicle seat, the wheelchair is an important component of the occupant protection system, and also contributes significantly to the stability and comfort of the wheelchair-seated occupant during normal travel. Design and performance of wheelchairs used as seats in motor vehicles is addressed in a separate, but related, ANSI/RESNA Standard now under development.

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1. Scope—This SAE Recommended Practice applies to WTORS comprised of a system or device for wheelchair tiedown and a system or device for restraining the wheelchair-seated occupant. It specifies design requirements, test methods, and performance requirements for WTORS, requirements for manufacturer's instructions to installers and users, and requirements for product marking and labeling. This document places particular emphasis on design requirements, test procedures, and performance requirements for the dynamic performance of WTORS in a 48-km/h, 20-g frontal impact. It also specifies test procedures and performance requirements for webbing slippage at adjustment devices of strap-type wheelchair tiedowns, and for partial but ineffective engagement of wheelchair tiedowns, and tiedown components that could be perceived to be effectively engaged. Appendix F includes additional recommendations for WTORS that will enhance the design, performance, installation, and use of WTORS, but which are not, at this time, required for compliance with this document.

The contents of this document apply to WTORS used with forward-facing wheelchair-seated children and adults, and apply to passengers and drivers of personally licensed motor vehicles as well as to passengers of motor vehicles used in public and school transportation. While much of the focus of this document is on WTORS that use four-point wheelchair tiedown systems, unless otherwise specified, the provisions of this document are applicable to all types of WTORS, including those that use docking-type wheelchair tiedowns.

While the primary focus of this document is a WTORS that is packaged by the manufacturer as a complete system or kit, it is recognized that a significant portion of the WTORS market consists of separate WTORS components and subassemblies, such as anchorage track that is sold to the bus manufacturer, or securement and restraint assemblies that are sold to the transit provider. Manufacturers of such WTORS components and subassemblies may certify their equipment as being in compliance with this document provided that:

a. The subassemblies and components intended to be used together to create a WTORS meet all the appropriate requirements of this document, and
b. The separately sold components and subassemblies are provided with instructions in accordance with 5.5, where the word "compatible" means tested together to comply with this document.

2. References

2.1 Applicable Publications—This document contains provisions which reference the following documents. At the time of publication, the indicated editions of these references were valid. Since all publications are subject to revision or deletion, users of this document are encouraged to refer to the most recent published editions of these referenced documents.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J211-2—Instrumentation for Impact Test
SAE J850—Fixed Rigid Barrier Collision Tests
SAE J1834—Seat Belt Comfort, Fit, and Convenience