

A Rationale and Guideline to Recommended Practice SAE J2249 Wheelchair Tiedown and Occupant Restraint Systems for Use in Motor Vehicles

I. Introduction

We live in a mobile society where access to, and use of, public and private motor vehicle transportation is essential to daily living. We are also in a time when public concern and desire for vehicle crash worthiness and occupant safety is at an all-time high, due largely to government regulation and implementation of airbags, seat-belt laws, and an increase in public education through the media and other materials on the need for effective occupant restraints .

We also live in a time when the number of people with physical disabilities who require the use of a wheelchair for movement and daily functioning is at a new high and increasing. These are people for whom motor-vehicle transportation is also essential. Over the past two decades, federal legislation has been passed and implemented³ to assure that people in wheelchairs are not excluded from public transportation. After-market equipment has been developed to adapt or modify vehicles so that people in wheelchairs can get in and out of, and, in some cases, operate a motor vehicle. While many wheelchair users are able to transfer to the vehicle seat and store the wheelchair during transit, many are not. For the latter group, the legislation that has assured access to motor vehicles for people in wheelchairs, has generally not been followed by legislation that assures a safe ride⁴. Thus, persons seated in wheelchairs while traveling in motor vehicles, including children traveling to school, adults traveling in public transit and paratransit vehicles, elderly traveling to and from nursing homes, and wheelchair-seated drivers and passengers of personally licensed vehicles (usually vans), have generally traveled at significantly higher risk of injury in a vehicle crash than the able-bodied population. This increased risk is not so much a result of a reduced tolerance to injury for this population of people (which may also be the case) as it is due to the absence of suitable seating and effective and appropriate occupant restraint systems, comparable to that available to travelers in vehicle seats that are regulated by federal safety standards.

³ IDEA and ADA

⁴ It should be noted that during the development of SAE J2249, FMVSS 222 for *School Bus Passenger Seating and Crash Protection* was upgraded to include static strength requirements for OEM wheelchair tiedowns and occupant restraints, as well as installation for forward-facing wheelchairs.

Background

SAE Recommended Practice J2249 *Wheelchair Tiedowns and Occupant Restraints for Use in Motor Vehicles* (hereafter referred to as J2249) was developed over a ten year period by the Restraint Systems Task Group of the SAE's Adaptive Devices Subcommittee (ADSC) in recognition of the need to improve after-market equipment used to secure wheelchairs and restrain wheelchair occupants during motor-vehicle transportation. While a primary element of this recommended practice is a dynamic strength test of wheelchair tiedown and occupant restraint equipment conducted on an impact sled in a manner similar to FMVSS 213 for child restraint systems (CRS), the practice includes many other requirements related to basic principles of occupant protection, as well as basic principles of good engineering and design practice.

SAE RP J2249, *Wheelchair Tiedowns and Occupant Restraints for Use in Motor Vehicles*, was first published in October 1996. The goal of this companion document is to provide guidance in the use of J2249, and to provide interpretation, explanation, and rationale for its various provisions and parts. This guideline document is written primarily for manufacturers of Wheelchair Tiedown and Occupant Restraint Systems (WTORS), but will also be useful to consumers and third-party groups who purchase, use, or install WTORS. It provides insight into the requirements set forth in the Recommended Practice, gives the rationale behind the requirements, and clarifies the intentions and limitations of the of the requirements. It also references parallel efforts that have taken place in other countries and indicates where attempts at harmonization have been successful.

Overview and Purpose - i.e., what the recommended practice is and what it isn't.

As stated in the Foreword to the Recommended Practice, the purpose of SAE J2249 is to establish requirements for wheelchair tiedowns and occupant restraint systems (WTORS) sold as after-market equipment for installation and use in motor vehicles. WTORS are not covered by OEM regulatory provisions of safety standards established by the National Highway Traffic Safety Administration (NHTSA) through Federal Motor Vehicle Safety Standards (FMVSS), and likely never will be. For example, seats in motor vehicles must comply with the provisions of FMVSS 210, occupant restraints must comply with FMVSS 209, and the combination of seats and occupant restraints must comply with FMVSS 208, a full-vehicle dynamic impact test. Also, school buses and their interior components, including seats, must comply with FMVSS 222 and child restraint systems (CRSs) must comply with FMVSS 213, a dynamic or sled impact test.

In setting forth the requirements of SAE J2249, it was recognized by the Task Group that human tolerance to injury resulting from impact forces generated under vehicle crash conditions varies widely across the population and that elderly and disabled individuals may be at higher risk

(i.e., have lower injury tolerance) to injury than younger and stronger *non-disabled* individuals. It is important, however, to understand that the goal of the Task Group and J2249 was not to achieve a comparable level of injury risk for people in wheelchairs, but rather to provide them with the opportunity to use occupant restraints that have a comparable level of performance to restraints provided by the vehicle manufacturer that must conform to federal motor vehicle safety standards (FMVSSs).

SAE recommended practices, such as J2249, are not mandatory standards in the same sense as federal motor vehicle standards. However, in the absence of federal standards for after-market vehicle equipment like wheelchair tiedowns, an SAE recommended practice can serve the purpose of a national standard if consumers, third-party payers, state agencies, and transportation groups insist on purchasing, installing, and using equipment that conforms with the recommended practice.