WC20:  
A New Standard for Custom Seating Product Design

By: Custom Seating Design Team

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Revision 3
Introduction

This paper will explain the ANSI RESNA WC20 Standard: *Seating Devices for Use in Motor Vehicles*, and introduce the Sunrise Medical product solution that meets the requirements of this new standard.

Problem Statement

While there has been progress in the development of transit standards for mobility devices used as a seat in a motor vehicle, the correct application of these standards is still mired in confusion.

For most patients and their families, the primary question is: how safe, to both the wheelchair user and other vehicle occupants, is this product when transported with the user in the chair? Providing a clear answer to this question can be difficult. This stems partially from the WC19 standard itself (*Wheelchairs for Use in Motor Vehicles*), and partially from the limitations of what can be tested with that standard. For a segment of the patient population, many have had to choose between the right seating system, and options or a WC19 transit approved wheelchair.

This paper introduces a new option for Sunrise Medical Custom Seating, which complies with a recently developed transit standard for seating devices. Through this discussion, it will be explained why this option improves safety to the consumer and continues to demonstrate Sunrise Medical’s leadership in the area of transit ready product design.
A WC19-compliant wheelchair has features that make it easier to secure with 4-point strap-type tie downs. A WC19 wheelchair is designed so that the person securing the straps can do so easily and with one hand. The wheelchair has also passed a standardized crash or sled test, and has survived with little or no structural damage. Wheelchairs that have passed standardized tests have proven their ability to withstand the forces of a 30-mph/20-g change in velocity—the same crash pulse that all automotive equipment must survive.

Part of the requirement of the WC19 standard is labeling the wheelchair and the 4 securement points so that it can be clearly recognized as ready for use as a seat in transportation vehicles.

Choosing a WC19 compliant wheelchair will reduce a wheelchair user’s risk of injury in the event of a crash. However, it is important to bear in mind that replacing or modifying any component of a transit wheelchair may invalidate the wheelchair’s status.

While the WC19 standard seems clear, confusion occurs when a consumer requires a custom-designed seating device for their mobility base. Given the number of seating devices and wheelchairs, however, it becomes prohibitive to test for every permutation. Many, therefore have been forced to settle for a WC19 frame with the clinically required custom seating device, even though the combination lacked clear performance requirements. Some seating (including Sunrise seating) was tested to the WC19 standard in the absence of any specific standard for seating. This was done to promote the safest possible system, but in the end, created more confusion as to the scope and reach of the WC19 standard. While seating tested to WC19 was preferable, and represented the best effort to promote safety, clear methodologies were needed to provide a “worst case” loading scenario to adequately test and evaluate the performance of a seating device while in transit.

The WC20 Standard is an ANSI/RESNA standard to establish design and performance requirements for seating devices (attached to a wheelchair) for use in motor vehicles. The following is excerpted from the WC20 Standard as a means of explaining its intent.

Transportation safety research has verified that the design and crashworthiness performance of the vehicle seat play important roles in protecting the occupant in a crash, in conjunction with the vehicle restraint systems and vehicle interior. People with disabilities are often not able to transfer to a motor vehicle seat and instead travel seated in their wheelchairs. Since most wheelchairs were not intended to serve as a motor vehicle seat, wheelchair-seated travelers are generally at increased risk of injury in a crash.

Section 19 of ANSI/RESNA WC/volume 4 Wheelchairs for Use in Motor Vehicles provides requirements and test methods for the design and performance of complete wheelchairs with regard to their use as seats in motor vehicles. It is common, however, for the complete wheelchair to be comprised of a seating system from one manufacturer and a wheelchair frame from another manufacturer. Therefore there is a need to be able to evaluate the design and performance of wheelchair seating systems independent of a specific wheelchair frame. This is the purpose of Section 20 of ANSI/RESNA WC/Vol 4

Currently this standard provides design and performance requirements with regard to evaluating complete wheelchair seating systems, including primary seating surfaces and structure, as well as attachment hardware. Future versions of this standard may address testing of the individual components of seating systems, such as attachment hardware. Although this Standard does not address the design of secondary and postural supports for use in motor vehicles, testing of these devices is permitted and encouraged by this standard. Requirements for postural supports will be addressed in greater detail in a future version of this standard.
As with Section 19, the dynamic strength requirements are currently limited to frontal-impact testing of forward-facing wheelchairs. It is anticipated that future standards will address seating system performance for other impact directions, including rear impacts and side impacts. This standard requires frontal impact sled testing using a surrogate wheelchair base that represents crashworthy wheelchair bases that has been successfully tested to Section 19. The surrogate wheelchair base is a repeatable and reusable wheelchair frame to which seating systems can be attached, and has been validated to demonstrate that it produces worst-case seating system loading conditions and failure modes for a range of commercial wheelchair bases and securement point locations.

This standard should not be used to deny access to public transportation. Instead, it is the intent to encourage the design and use of seating systems that will provide for safer transportation for people who use wheelchairs as motor vehicle seats, by defining minimal transportation-related design and performance requirements for such wheelchair seating systems.

The use of the surrogate wheelchair for testing is the key to establishing worst case loading of a seating device. The surrogate was developed from empirical data as collected during the subsequent testing of wheelchairs for compliance with WC19. The energy absorbing characteristics of these wheelchairs provided a baseline from which to develop the characteristics of the surrogate.

WC20 contains the key requirement; that when a seating device meets the performance criteria of WC20, it is then intended to be used on a base meeting the requirements of WC19. This base, in turn, must be secured with an SAE J2249 approved Wheelchair Tie-down and Occupant Restraint System (WTORS).

Sunrise WC20 Custom Seating Solution

In the summer of 2009, ANSI/RESNA is expected to release the new WC20 standard. WC20 is focused on providing a testing methodology for the evaluation of a seating device. This will then mean that a WC20 approved seating device can be used on any WC19 approved frame to provide the best solution for transportation, when standard wheelchair provided seating is not clinically sufficient.

Sunrise has recognized the importance of the WC20 Standard, and has acted; to the benefit of the safety of our users. Those benefits are:

Benefit 1: Sunrise Jay ConfigureFit product line has been tested to the WC20 standard and meet the requirements

Prior even to the release of this standard, the custom seating design team went forward with hardware, and testing plans, to verify that Jay ConfigureFit would meet WC20 when the appropriate hardware mounting solutions were specified.

Testing utilized the versatile universal (knob style) hardware that fits tubing diameters of 3/4”, 7/8”, and 1”. This solution removes any compromise between choosing the right seating solution and achieving safety during transit.
New mounting brackets have been developed that utilize a pin and lanyard assembly to secure the seat to the hardware in a transit situation, and are compatible with the Sunrise line of transit bases.

Transit Bases from Sunrise (for which WC20 Seating is compatible) are listed below and to the right.

**Benefit 2: Continued commitment to interoperability with other mobility bases**

Patient positioning often requires selection of products from multiple manufacturers that must work in concert to meet clinical goals. A subsequent benefit of the WC20 testing standard is that a rehab technology supplier (RTS) can combine a Jay Configurefit WC20 seating device with a WC19 tested base.

This is possible because the standard requires testing on the surrogate base. Installation on a WC19 base is the intention and indeed requirement of WC20.
Sunrise will continue to offer seating installed on both Sunrise Mobility bases, and those WC19 tested bases drop shipped from other manufacturers.

**Benefit 3: Clear labeling to assist in user compliance**

As noted in the opening problem statement, there is considerable confusion regarding transit standards amongst users and transit operators. Users may see and understand the securement points on the mobility base, but may not be sure what, if anything, they must do with the seating device.

The inclusion of labeling on the locking pins is both an indication of a product that meets requirements, and a direction of action to take. This should facilitate a greater degree of confidence by users; reducing questions about a product’s transit status. Additionally, the labels should improve compliance on the part of users who must insert the locking pin prior to transport.

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**Technical Information**

The Sunrise Jay ConfigureFit WC20 seating solution is offered in both Regular and Li’l Kiddos versions.

There are distinct weight ranges for these products that must be observed. (see the grid below)

<table>
<thead>
<tr>
<th>Type of System</th>
<th>Min User Weight¹</th>
<th>Max User Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular ConfigureFit System*</td>
<td>48 lbs 22 kg</td>
<td>200 lbs 90 kg</td>
</tr>
<tr>
<td>Lil Kiddos System**</td>
<td>48 lbs 22 kg</td>
<td>65 lbs 29 kg</td>
</tr>
</tbody>
</table>

¹ Minimum Weight for Transit only

To identify which type of system is in use, locate the yellow tag attached to the seating system. If tag states 65 lbs (29 kg), the system is a Li’l Kiddos System. If the tag states 200 lbs (90 kg) the system is a Regular System.

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*Regular ConfigureFit configured seating system - This seating system was tested with an anatomic test dummy weighing 170 lbs / 77 kgs

** Li’l Kiddos configured seating system - This seating system was tested with an anatomic test dummy weighing 51 lbs / 23 kgs
Positioning of the occupant restraint belts (WTORS) on the user is critical. Observe the below.

- The pelvic restraint belt should be worn low across the front of the pelvis, so that the angle of the pelvis belt is within the preferred zone of 45-75 degrees to the horizontal, or the optional zone of 30 to 45 degrees to the horizontal as shown in figure A/1.

- Occupant restrains should not be held away from the body by wheelchair and seating components or parts, such as the wheelchair armrests or wheels.

- Vehicle mounted upper torso belts should fit over the shoulders.
- Occupant restrains should be adjusted as firmly as possible, consistent with user comfort.
- Belts should not be worn twisted.

Mounting hardware must be located according to the diagrams below.

**Summary**

The need to clearly communicate transit information, to families and patient's, lies with all parties involved in the process of equipment selection. It is imperative that clinicians, RTS', and manufacturers, present the facts about transit standards, and safety compliance to ensure a balanced solution for the patient. Sunrise Medical will continue to take every opportunity to educate our customers, as well as the public, about the WC20 standard, and the Sunrise products that meet those standards. We feel this new product breaks the tough choice between choosing the right seating solution and ensuring optimal transportation safety.