

**ANSI/RESNA**  
**Committee on Wheelchairs and Transportation**  
**Unconfirmed Minutes**  
Hanover B, Hyatt Regency  
Atlanta, Georgia  
June 22/23 2003

**1:00 – 5:00 Sunday June 22<sup>nd</sup>**

**1) Opening of Meeting**

1.2 Welcome and Introductions

Chair Larry Schneider opened the meeting and welcomed all in attendance. Attendees then introduced themselves and their affiliation. Attendees included Trish Karg (UPitt), Dong Ran Ha (UPitt), Bill Ammer (UPitt), Lee Sheffield (Invacare), Greg Shaw (UVA), Michael Bird (Convaid), Gina Bertocci (UPitt), Miriam Manary (UMTRI), Larry Schneider (UMTRI), Linda van Roosmalen (UPitt), Amor Taylor (California independent living), Doug Sten (Pride Mobility), Guy ?? (MARTA), Jack Carey (Accufast), Jean Marc Girardin (Q'Straint), Carmen DiGiovine (Uchicago), Cindy Johns (Center for Successful Society), Doug Cross (ACTransit), John Phillips (Ottobock). Hale Zukas (consumer) joined the group a few minutes later by speaker phone.

1.2 Meeting objectives

Larry reviewed the primary goal for the meeting, which was primarily to make progress on the various documents and related tasks of the different Working Groups. In particular, he indicated that the Chairs of the Working Groups need to leave the meeting with sufficient feedback from other members of their Working Groups Committee participants to be able to move the documents forward to at least a pre-ballot stage.

**2) Administrative matters**

2.1 Review and acceptance of meeting agenda

Larry reviewed the agenda for the meeting and indicated that this first portion of the meeting (Sunday afternoon) would be primarily spent on Committee administrative matters, reports on related standards activities, and reports on progress/problems by consumers and manufacturers relative to implementing existing standards. Monday morning would be a time for Working Groups to meet separately, and Monday afternoon would be a time for Working Group chairs to report progress to, and obtain additional input from, the full Committee.

2.2 Approval of Minneapolis meeting minutes

Larry asked for any comments or corrections to the unconfirmed minutes of the Minneapolis meeting. There were no changes and the minutes were accepted as written.

2.3 Distribution and numbering of new documents

New documents available at the meeting were numbered as follows:

TW-135 Agenda for June 22/23, 2003 meeting

TW-136 Minutes from July 1, 2002 Minneapolis meeting

- TW-137 List of Committee Working Groups and participants
- TW-138 Current list of Committee voting members
- TW-139 Revised title page and initial contents for RESNA WC/Volume 4 Wheelchairs and Transportation
- TW-140 Latest version of ISO 10542-3 Docking systems
- TW-141 Latest version of ISO 16840-4 Seating Systems

#### 2.4 Mail list and list serve updates

Larry circulated a Committee roster/ mailing list and the list of email addresses on the Committee listserv maintained at the University of Pittsburgh. He also circulated the list of voting Committee members for whom the listserv is maintained by the RESNA Technical Board at Beneficial Design, Inc. Larry requested that those in attendance make changes and additions as appropriate.

#### 2.5 Committee membership

Larry described the Committee membership process and the need for the Committee to strive to maintain a balanced constituency. Applications for membership were made available. Current membership distribution includes 8 researchers, 10 manufacturers, 2 clinicians, 6 consumers, and 1 government representative, for a total of 27 voting members. To maintain voting membership, members must maintain an “active” status by attending at least one meeting within two years or by having communication with the Committee chair regarding standards development. Membership on the RESNA Technical Standards Board (TSB) is also available to members and other participants in the various wheelchair standards committees. Committee and Working Group chairs are strongly encouraged to participate in TSB meetings as members of TSB.

#### 2.6 Update on ANSI audit of Volume 1

Larry reminded attendees that ANSI has been conducting an audit of the revised Wheelchair Standards Volume 1 *Wheelchairs Used as Seats in Motor Vehicles*, for which the only revision was the addition of WC/19 in 2000. The process has gone well and is nearly complete since excellent records were maintained during the development of WC/19. It has been important to be able to show documented evidence that the standards development was an open process with opportunity for public comment throughout development of the standard. This is a reminder to Working Group and Committee Chairs and Secretariats of the importance of maintaining accurate and complete records of all correspondence, including emails, as we move forward with future standards development.

#### 2.7 Update on ANSI/RESNA procedures/process

Larry reviewed the RESNA organization relative to the standards development process. Our group is a RESNA standards Committee, which does the final balloting of draft standards developed by Working Groups. Tricia indicated that other RESNA Committees may also be involved in the official voting on documents developed by our Working Groups and Committee. The Secretariat of the RESNA TSB distributes draft standards for pre-balloting and balloting. Distribution for pre-balloting is widespread, but final balloting is only done by Committee members, although the wider group can comment on the document during balloting.

Currently, five RESNA Committees report to the TSB and there are four volumes of wheelchair standards. Standards related to wheelchair transportation will be contained in Volume 4, while Volume 1 and Volume 2 contain wheelchair standards and Volume 3 will contain other non-transit wheelchair seating standards that address body and seat measures, postural support devices, and tissue integrity management devices.

In general, Committee Working Groups are formed to work on developing standards for new work items (NWIs) that the Committee identifies. We currently have five Working Groups (a 6<sup>th</sup> WG was formed later in the meeting). Each Working Group Chair is the primary facilitator/author of the respective draft standard.

Pre-balloting usually occurs at both the Working Group and Committee level and is not confined to voting members of the Committee. Pre ballots offer an opportunity to gain widespread input to the draft standard prior to official balloting. One or more pre-ballots may be conducted, depending on the extent of comments and number of negative votes received. For each pre-ballot, comments and negative votes are summarized and reported to the parent Committee and the TSB.

When it is time to conduct the final balloting on a new draft standard or a revision of an existing standard, a Project Initiation Notification (PIN) must be submitted to ANSI. This is done at the volume level for wheelchair standards. Thus, a PIN will be submitted when the initial version of Volume 4 is ready for balloting. This initial version may contain more than one draft standard or related document. For example, the initial version of Volume 4 will probably contain an updated and revised version of WC/19, the updated versions of SAE J2249, and related documents for specifications of surrogate wheelchairs, etc. When Volume 4 is subsequently modified by the addition of a new section, such as dynamic testing of seating systems, and/or the revision of an existing part, a new PIN will be submitted to ANSI to ballot the whole of Volume 4. Acceptance of a new standard requires that two-thirds of those voting cast positive votes, but all voting comments must be addressed by the Committee even if the document passes. Members with negative votes are given opportunity to revise their vote if changes are made based on balloting comments. Those with any remaining negative votes are notified of their right to appeal.

Larry asked each Working Group Chair to clearly define the purpose and scope of his/her Working Group. He also indicated that he hopes that the Working Groups of the Committee will have several documents ready for pre-balloting within six to eight months. In pre-balloting, individual documents are generally balloted separately.

## 2.8 Update on HIPPA/wheelchair terminology

Tom Whelan was not in attendance and so there was no update on wheelchair terminology and related transit wheelchair activity in the FDA.

## 3) Reports on Related Activities

### 3.1 ISO TC173/SC1 WG6

Larry reported on ISO WG6 activities. The last meeting was held in Zug, Switzerland. A number of documents are out for CD vote within ISO. 10542: Part 3 (docking) is out for DIS vote, Part 5 of 10542 (WTORS for specific and limited applications) is about ready for FDIS vote. ISO 16840-4 Seating Systems was discussed at the Zug ISO meeting and is now out for a 3<sup>rd</sup> CD vote. Part 6 of ISO 10542 was also added as a NWI for rear-facing

occupied wheelchairs in frontal impacts. A TRL report involving sled impact tests of forward- and rearward-facing wheelchairs conducted was distributed. Donald McDonald, who sponsored the testing, made a brief presentation on the study which shows the problem of a gap between wheelchair occupants and the padded stanchion for rear-facing wheelchair occupants in frontal crashes.

### 3.2 CSA

Larry reported that CSA has recently published the revised versions of Z605 and Z604. These documents are now mostly consistent with WC/19 and SAE J2249 and ISO standards. The main difference is that CSA standard for transit wheelchairs (Z604) contains some non-crash related characteristics of wheelchairs, such as handle requirements on manual wheelchairs, a ramp-stability requirement for transit wheelchairs, and defining SgRP location relative to the wheelchair footprint. As with the U.S. standards, CSA standards address products for children and adults with a mass greater than 22 kg, about 6 years and older.

### 3.3 RERC on WTS report

Gina reported on the RERC on Wheelchairs and Transportation which is being conducted by the University of Pittsburgh and UMTRI. She indicated that it is a five-year center funded by NIDRR that has numerous R&D tasks in five main priority areas plus development of standards, information dissemination, training and technology transfer. Gina indicated that she and Larry had recently participated in the Formative Review process at NIDRR which takes place after the first year of the project. The five R&D priorities include:

#### SP-1 WC Crashes

- WC User Survey – goal of 300 respondents/180 to-date, incidence of injuries, crashes, adverse events
- In-depth Investigations – establishing network to report accidents
- Crashes on Transit Buses – reviewing transit databases, in-depth accident investigation

#### SP-2 Rear and Side Impact protection

#### SP-3 Docking

- UDIG – Sled testing of UDIG, Development of Surrogate Docking system
- Low G Docking
- High G Docking in personal vehicles

#### SP-4 Seating and postural support device (PSD) Crashworthiness

- Development and validation of a surrogate wheelchair base (SWCB) for crash testing of wheelchair seating systems per ISO std 16840-4 and the corresponding RESNA standard

#### SP-5 Wheelchair Integrated Restraints

- Establish user requirements, usability testing
- Develop WIRS for children and adults

The sixth priority is SP6 and is concerned with the development, updating, and implementation of standards. Information dissemination includes the RERC on WTS website, Answers to Frequently Asked Questions, and a new easy-to-read Ride Safe brochure.

### 3.4 Transit and APTA activities

Doug Cross reported on activities in public transit and particularly on the panel session held at the APTA annual conference in Milwaukee during the first week in May. The panel addressed the question: What is the appropriate level of protection that is needed for fixed-route transit vehicles? Knowing that this level is below 30 mph/20 g, then additional options are available for wheelchair securement. Larry suggested that the Committee might want to form a new Working Group to address wheelchair securement issues in low-g vehicles. Doug noted that Brenden Hemily, who was on the APTA panel, is developing a report on rear-facing in large transit buses from the Canadian and European experience. The UK has also addressed rear facing of wheelchair occupants in a recent TRL report that was distributed at the recent ISO meeting. There have been very few large transit bus crash tests to define an appropriate crash pulse for greater than 1-g events.

### 3.5 Reports from manufacturers/researchers

Jean Marc raised a concern that the market for after-market three-point belts sold with WTORS is moving away from using the standard interface clip that connects to a pin-bushing connector on the lap belt. Recent designs are moving toward using a combined lap and shoulder belt mounted in the vehicle and 80% of Q'Straint's market utilizes the combined lap/shoulder belt. This creates a potential problem for having shoulder belts in vehicles that will connect to crash-tested lap belts provided on WC/19.

Michael Bird asked about self-certification and guidelines for such a program. Larry indicated that compliance with the ANSI/RESNA standards is not policed and that it is up to each manufacturer to have documentation that supports their claims of compliance with the standards.

Carmen DiGiovine asked why all wheelchair manufacturers have not moved more aggressively to provide WC/19 compliant products given the adoption of the standard. Lee Sheffield indicated that Invacare, Inc. is holding back and waiting to see what happens in the 1<sup>st</sup> lawsuit involving a wheelchair in transport. They are concerned about the risk of providing transit-options wheelchairs. Gina stated that wheelchair manufacturers are less liable in litigation if their products comply with the latest voluntary standards. Jean Marc mentioned that lawsuits happen all the time, so why is this different? Larry indicated that we are establishing a list of J2249 and WC19 compliant products to aid in consumer product selection. Larry also indicated that Carmen has raised a good and important question and that it is time that all wheelchair manufacturers recognized that their products are used as seats in motor vehicles and make full use of WC/19. He also reemphasized that manufacturers would be less liable in lawsuits if they do something rather than nothing to address this foreseeable use of their products, and that WC/19 was developed, in large part, to provide a reasonable target for manufacturers to design and test to relative to the motor-vehicle-seating application of their products.

Linda van Roosmalen indicated that she has received input that there is confusion between postural belts and crash-safe occupant restraints in the field. Some postural belts look similar to occupant restraints in that they are 2" wide belts made from standard seatbelt webbing. Miriam suggested that an easy-to-identify logo be required on crash-tested occupant restraints and wheelchairs to identify them as such. There was a discussion about proper labeling/identification of belts. Larry suggested that we consider this issue in the revisions to WC/19 and perhaps also in the seating standard.

### 3.6 Reports from consumers/transit providers

Hale Zukas (participating by speaker phone) indicated that he is glad that people think that keeping wheelchairs stationary during travel is the main goal, but he also thinks that securing wheelchairs at the 1-g level is not good enough. Larry explained that wheelchairs can be used in all types and sizes of vehicles and therefore they need to be crash tested for the worst-case motor-vehicle environment, whereas wheelchair tiedowns can be vehicle specific and can be designed and tested to low-g crash environments if clear labeling helps to prevent their inappropriate installation in smaller vehicles. It may be that the universal docking interface geometry (UDIG) method of wheelchair securement is best suited to larger, vehicles with potentially low-g crash environments.

Hale also mentioned that 90% of wheelchairs are paid for by 3<sup>rd</sup> parties, and asked for the details of these data - specifically how are wheelchair costs split between Medicare, Medicaid, VA, and private insurance? No one at the meeting had that information. Hale feels that it will be a great accomplishment to get Medicaid and Medicare to reimburse for docking interface, and ideally require it. Doug Cross mentioned that the education Working Group will look into this further for all securement modes. Hale reminded us that Medicaid is not one program, but it is fifty different state-run programs. Larry reminded the group that he provided input to one situation in Washington that helped reverse a Medicaid refusal to pay for transit option. Hale used to think that 4-point securement on fixed route is more trouble than it is worth, but now he understands the advantage of the 4-point in certain situations where the rear of the wheelchair cannot be tightly secured.

Doug Cross reviewed his APTA presentation describing the tether strap program. He also mentioned the Cleveland Clinic/Sure-Lok prototype WTORS demonstration project, and that Oakland County will be receiving 200 European buses with rear-facing wheelchair compartments for use in fixed-route transit.

## 4) Organizational Matters

### 4.1 Review of Working Groups and Work Items

Larry reviewed the current Committee Working Groups and suggested that we might want to form a new Working Group to address the low-g transit environment concerns. These Working Groups and current Working Group Chairs are as follows:

Working Group # and Name	Chair
1) Implementation and Education	Schneider
2) Child Restraints and Updates to WC/19	Manary
3) Universal Docking Securement	Hobson
4) Wheelchair Seating Systems	Bertocci
5) WTORS	Schneider
6) Low-g Securement – to be proposed	TBD

### 4.2 Update on plans for Volume 4 - WCT

Larry reviewed the Table of Contents of WCT/Volume 4, referring to document TW139, and the proposed document titles and section numbers. Bill Ammer and Lee Sheffield questioned whether we wanted to use the same document numbers in different volumes of wheelchair

standards. They noted that document numbers have traditionally not been duplicated in the various RESNA volumes. Larry said that he will discuss the numbering issue with Peter Axelson. (Note: Larry discussed this with Peter Axelson following the meeting and was told that there is no reason not to use document numbers in Volume 4 that are also used in other RESNA wheelchair standard volumes)

Larry adjourned the meeting until 9:00 AM on Monday morning, and indicated that the full Committee would meet prior to the Working Groups meeting separately.

\*\*\*\* Monday June 23<sup>rd</sup> \*\*\*\*

## **5) and 6) Working Group Activities and Progress on Draft Documents**

When the Committee convened on Monday morning, Larry suggested that, given the relatively large number of Working Groups compared to the number of attendees, it might be best if the Working Groups did not meet separately. Rather, each Working Group Chair would review the status of their activities and/or standard development with the goal of obtaining sufficient Committee discussion and input to allow the WG Chair to move forward with completion of a pre-ballot document or other activities, as appropriate to the Working Group's agenda. Attendees agreed and the Committee proceeded to address the progress and issues of each Working Group. The following summarize these discussions that followed, but not necessarily in chronological order.

### **6.1 WG1 Implementation and Education**

Mary Ellen Buning from the Univ. of Pittsburgh joined the meeting for this portion of the discussion and agreed to take over as the new Chair of this Working Group since it matches her responsibilities in the RERC WTS. Mary Ellen led a discussion on the following:

- The Ride Safe brochure, Answers to FAQ's, and the RERC WTS website have been the initial steps toward implementation and education. NMEDA and ADED are critical organizations to educate since consumers contact them for guidance on transport.
- Target groups include consumers, clinicians, transport providers, wheelchair manufacturers, WTORS manufacturers, NMEDA, APTA, CTAA (Community Transit Association of America), TSB (Transportation Safety Board), the NHTSA, vehicle manufacturers, ADED, NAPTA, NADPTS, third party payers (HHS, CMS, VA).
- Reimbursement and funding for wheelchairs with the transit option is extremely important.
- Important info to convey in education and issues that need addressed include:
  - WC/19 wheelchairs are available and should be used.
  - WC/19 wheelchairs include securement points that interface with four-point tiedowns.
  - Wheelchair users are at increased risk in motor vehicles if they do not use a WC/19 wheelchair
  - Examples of crash tests and tipping of wheelchairs during normal maneuvers when wheelchairs are not properly secured.
  - How to recognize WC/19 wheelchairs.
  - It is important for clinicians to specify WC/19 wheelchairs.
  - How do we get the transit option paid for by third-party payers.

- How do we create social change to increase demand for WC19 wheelchairs
- The importance of using all 4 tiedown straps
- The importance of using lap and shoulder belts in addition to securing the wheelchair.

Carmen DiGovine and Michael Bird were added to the Working Group. The Working Group will solicit input from manufacturers and clinicians to better understand the issue of third party payment and reimbursement.

## 6.2 WG2 Child Restraints and Updates to WC/19

Miriam distributed a document entitled “Extending WC19 to Include Smaller Wheelchair Users” – see document number from last meeting. She provided an overview of the differences between FMVSS 213 Child Restraint Systems and WC/19. Miriam indicated that there is a gap between FMVSS 213 and WC/19 related to children and described five recommendations to enhance WC/19 for the pediatric population: 1) expand dummy family to include 3-year-old ATD, 2) require integrated 5-point harnesses for children under 40 lb, 3) add harness adjustment criteria to assure snug fit, 4) require minimum/maximum buckle release forces, and 5) require head support for children under 50 lb.

Other updates to WC/19 include:

- The requirement for ATD knee excursion to exceed wheelchair excursion by 10% is not appropriate when using a wheelchair-integrated lap belt and should be deleted for this test condition.
- Use and adjustment of supplemental occupant support components are currently vague but can affect test results. Should manufacturers specify tightening forces and torques and should there be a special “transit setting” on adjustable components?
- The ABCD belt-fit rating system has some inconsistencies – e.g., a wheelchair can perform very poorly in a critical area but still pass the test. Also, a sharp edge near the tiedown is a fail, but a sharp edge near the occupant restraint is not. The rating procedure should be revised.
- In the tiedown clear-path test, the methods need to be modified to check for a worst-case scenario for strap proximity to sharp edges.
- ATD rebound is currently unrealistic due to lack of anything to block upward movement of the ATD’s legs. Larry reviewed results of a series of eight sled tests to evaluate the effect of the foot strap for limiting upward movement of the ATDs’ feet/ankles on forward and rearward ATD kinematics. The foot strap does not have a significant effect on forward point-P, head, and knee excursions, and has results in a small reduction in seatback normal force and rearward ATD head excursion. Most importantly, the foot strap reduces variability in these rebound variables. Thus, the new version of WC19 will include a foot strap in the methods for frontal-impact testing.

## 6.3 WG4 - Wheelchair Seating Systems

Gina reviewed the design and performance goals and features of the surrogate wheelchair base (SWCB) what will be used as the platform for sled testing of wheelchair seating systems in the new seating standard. Carmen asked if seating systems would need to be tested with all possible cushions and all possible coverings. Gina clarified that it is the structural and attachment components of the seating system that are evaluated in the frontal-impact test. Gina went through the draft standard (TW141) and highlighted areas that had drawn discussion in previous meetings. Doug Sten noted that the strikethrough on the ghostbusters red circle with a slash the slash should go through the other way (i.e., 11 to 5

rather than 1 to 7). Gina asked for donations of hardware for validation testing. Invacare and Ottobock volunteered to provide seating products for testing. Gina indicated that the use of two rear securement points will be explored during validation testing to see if different failure modes result.

#### 6.4 WG3 - Universal Docking Securement

Doug Hobson was not in attendance so Linda VanR described the recent development efforts and the latest version of the universal docking interface geometry (UDIG). This was followed by discussion on whether the UDIG information should be covered in a separate informative document or as separate appendices in the revised/updated versions of WC/19 and J2249. Since it will be necessary to obtain comments on an informative separate document, it was decided that Larry will check to see if it is possible to apply the voting and commenting process to an informative document. (Note: Subsequent to the meeting it was decided to follow the approach of ISO WG6 and include the UDIG specifications in informative annexes of the revised WC/19 and J2249 standards, and not to include them in a separate information document).

#### 6.5 WG5 - WTORS

There wasn't time to review the changes and upgrades to SAE J2249 (WTORS standard) that is being transferred from SAE to ANSI/RESNA Volume 4. However, Larry pointed out one design requirement that will probably change. In 4.4 Occupant Restraints, the initial WTORS standard does not allow a WTORS to be designed to anchor to the wheelchair, but requires that pelvic belts anchor directly to the vehicle, to components of the wheelchair tiedown, or to the wheelchair frame. With the increase in transit wheelchairs that allow for anchorage of crash-tested pelvic belts, this requirement will need to be changed.

#### 6.6 WG6 – Low-G Securement

Greg Shaw talked about his continuing investigation within the RERC on WTS on injury rates and crash severities for large fixed-route transit buses. Greg suggested that 1-g securement is probably appropriate for large fixed-route transit buses but he is troubled by the realization that there is documented evidence of crash events that significantly exceed 1 g. Greg believes that additional information is needed to effect changes in ADA regulations, for which the requirements are based on an 8-10-g crash environment. Greg noted that Hemily is conducting a study on rear-facing wheelchair riders in Canadian and European transit buses. Doug Cross indicated that AC Transit has ordered 200 buses with rear-facing wheelchair stations as part of a demonstration study. This will include both 40- and 60-ft buses. Greg indicated that the Committee could monitor this demonstration project. He also mentioned the possibility of studying buses with EDR (event data recorders). In Las Vegas, buses are equipped with such devices. The Committee agreed that a new Working Group is needed to address this issue. Greg Shaw was suggested for the Chair of this Working Group, although he had left the meeting to catch his flight. (Note: Greg subsequently declined to serve as Chair of this new Working Group).

### 7) Other Business

Larry reviewed and summarized the additions and changes of Committee and Working Group members. He noted that these changes will be made to the appropriate list which will be distributed at the next Committee meeting.

**8) Next meeting dates/locations**

It was suggested that the Committee should meet again in about six months, and possibly in Oakland, Calif. The other option is at the International Seating Symposium in Vancouver. (Note: Subsequent to the meeting, it was decided by a consensus of Working Group Chairs that the next meeting will be held in conjunction with 2004 RESNA and that rather than meeting as a Committee, the effort should be placed by Working Group Chairs on completing draft documents for Volume 4 pre-ballot.

**9) Adjournment**

Larry adjourned the meeting at about 5:00 PM.