

**ISO/TC173/SC 1/WG 6  
Wheelchair Tie-down and Occupant Restraints/Transportable W/Cs**

**DRAFT MEETING MINUTES**

**Nov. 18-20 1999, Valencia, Spain**  
Convenor: Douglas Hobson, Canada

**November 18<sup>th</sup>: optional tours**

The Working Group was given an exceptional opportunity to visit the ADIADA crash test facility, located south of Barcelona. The participants witnessed a barrier crash involving a minivan-sized vehicle carrying two ATD-occupied W/cs. The manual W/c was secured with a clamp-type securement device. The powered W/c was secured by a docking device, using a U-shaped interface to the rear of the W/c. The powered W/c appeared to survive the crash event very well, whereas the manual W/c demonstrated some damage to the clamping device. A special thanks to Juan Dols and his staff for creating this informative opportunity to learn more about the work and test facilities in Spain.

**November 19<sup>th</sup>: 9:00 AM**

**1. Opening and Organization**

1.1 Introductions/arrangements

Juan Dols welcomed the WG to Valencia and provided an overview of the local arrangements for the meeting.

1.2 A Roll call was circulated and is attached as Appendix A to these minutes. Meeting minutes (WG6-291) from Vienna May, 1999 were accepted as distributed. The draft agenda (WG6-292) was accepted as the work plan for this meeting.

1.3 Identification of Documents:

WG-6-291: WG6 Meeting minutes; May 3/4, 1999; Vienna, Austria

WG6-292: Meeting Agenda; Valencia, Spain, Nov 19&20, 1999

WG6-293: ISO DIS 10542-1 8/11/99-

WG6-294: ISO DIS 10542-2 8/11/99

WG6-295: ISO 10542-1 Voting Comments – 9/13/99

WG6-296: ISO 10542-2 Voting Comments – 9/13/99

WG6-297: 10542-3 Draft Docking Tiedown Systems 11/12/99

WG6-298: 10542-5 Draft Systems for Specific Systems 7/05/99

WG6-299: T2 Development of Wheelchair Securement Interface Concepts – University of Pittsburgh

WG6-300: Seating and Back Surfaces and Attachment Hardware Testing – University of Pittsburgh

WG6-301: TNO Testing Equipment for Special Transport of Wheelchair Users (TEST), 26 Feb 1999

WG6-302: Comparison of FMVSS 209 and ECE 16 Requirements

WG6-303: Design Requirements in Clamping Tiedown Systems – University of Valencia

**2. Background:** The convenor briefly reviewed the background of the interim WG activities and presented the goals for this meeting.

### **3. Ongoing matters arising from previous business**

#### **3.1 Liaison with TC22/WG4**

Juan Dols provided a report on TC 22/WG4. The next meeting of the TC 22 group will occur next week. ISO 12339 (buses for more than 8 passengers) comments will be discussed at the meeting. An EU Directive document is also being developed for large buses and may eliminate the need for the ISO 12339 document. Discussions in the EU bus directives, among other issues, does include wheelchair accessibility issues. The next meeting on the EU bus directives is also scheduled for next week in Brussels . When finalized, 15 EU countries will be required to eventually comply with these EU directives. Donald MacDonald attends the EU meetings

**Action:** Donald MacDonald was asked to keep the WG updated on this development. No other action by the WG was deemed necessary at this time

#### **3.2 Collaboration with CEN**

June '99 CEN group meeting: – Allen is officially appointed as the liaison person between ISO and CEN. No intention exists to establish separate W/c transport standards, but rather to adopt the ISO versions when completed. The group will be closely observing the efforts of ISO-WG 6. The TNO test report has generated interest within the CEN. Aleid H. will provide an overview of this report at this meeting.

#### **3.3 Status of 10542**

Voting comments on 10542-1&2 have been received and will be reviewed at this meeting. According to ISO protocol, the convenor and Secretariat can proceed independently with addressing voting comments when a document has reached the DIS level. However, both the Secretariat and the convenor felt it best to give the WG participants an opportunity to address the technical comments as a group. Editorial comments have already been incorporated into the latest document, and will not be discussed. All other comments, especially those of a technical nature that the WG has not previously debated and decided upon, will be addressed by the WG at this meeting.

#### **3.4 Status of 7176/19**

7176/19 is out for voting and therefore will not be discussed at this meeting. Final national voting on 7176/19 is due January 2000. The WG will address the voting comments at its May 2000 meeting.

#### **3.5 Status report on developments in participating countries**

##### **TNO Test Report-Netherlands:**

Aleid Hekstra provided an overview of the TNO Test Report “Testing Equipment for special transport of W/c user (TEST) – test methods and test results for WTORS and WUSMV”. The document was distributed to the WG and numbered WG6-301.

Approximately 20 W/cs and 20 WTORS were obtained for evaluation. These products were subjected to ISO 10542 and 7176/19 testing criteria. 24 total sled tests were conducted of commercial W/c and WTORS products. ISO labeling requirements were lacking in many products. Four sled tests were conducted to evaluate WTORS products. The poor results led TNO to first evaluate these products using static testing as a revised first step. A surrogate tiedown was used to evaluate wheelchairs. The surrogate construction consisted of a rigid

metal tiedown which was stiffer than commercial tiedowns. Ten dynamic tests were conducted of WTORS (6 at 20g/4 at 10g). Eight four point strap type tiedowns were evaluated. Many of the clamp systems use only lap belts and were tested accordingly. Nine commercial wheelchairs using a surrogate tiedown were tested. Most of the manual W/cs performed successfully. However, the rebound phase created ATD kinematics which allowed the ATD to slide up the backrest and often hit its head on the shoulder belt anchorage. One combination W/c-docking system was tested. Two commercial W/cs (manual) with commercial tiedowns – in both cases the WTORS failed. A review of applicable standards is included in Annex D of WG-301. One WTORS system failed in the acceleration phase (approx. 2 g) of the test. WTORS utilizing out-dated auto industry components (adjusters, buckles, clips, etc) were seen to often fail. TNO has constructed a surrogate W/c that attempted to reflect the latest modifications in the surrogate specifications. TNO recommends the use of a surrogate WTORS to evaluate W/cs so that all wheelchairs are subjected to the same loading conditions.

**UK Update:-Allan Lynch**

Wheelchair manufacturers have been testing extensively. The focus has been primarily on the dynamic testing aspects of the standard. Difficulties observed: 1) lack of manufacturer participation in standards efforts. They seem to be taking the position that they will accept and implement whatever the standards mandate. 2) UK wheelchair industry has stagnated in terms of wheelchair procurement procedures.

Allan introduced Bob Appleyard. Bob has joined the UK standards development efforts and will likely become the WG member replacing Peter Roy. Bob is from Millbrook, a UK test facility. Millbrook has a CVC impact sled and high speed film capability that is being used in wheelchair testing. Two impact tests can be done simultaneously on the Millbrook sled which is especially useful for comparative testing. Wheelchair seating manufacturers have also begun to subject their products to sled testing. Failures have been seen in the seating attachment hardware. Several concepts in hardware design have been tested successfully.

**USA Update: Larry Schneider**

ANSI/RESNA WC-19 was sent out for pre-balloting and subsequently to the parent committee for voting. Voting is now complete – no negative votes were received, minor comments are currently being addressed. It appears as though WC-19 will be an approved document by the year's end. W/c manufacturers have been testing extensively in the US. Wheelchairs are being re-designed to include securement points, etc. to comply with WC-19. Larry indicated that seating and wheelchair manufacturers are collaborating to evaluate a matrix of seating-wheelchair combinations. The next meeting of SOWHAT committee is scheduled for Vancouver, BC at the end of Feb. 2000, in conjunction with the International Seating Symposium. As of last August, Larry is the Chair of the SOWHAT committee, replacing Doug who has stepped down.

**Spain Update: Juan Dols**

Juan reported that a standard based upon Parts 1&2 is being developed to particularly address clamping systems which are prevalent in the country. A Spanish draft standard will be targeted for next year. Plans for harmonization with ISO exist. Sled testing is beginning in Spain to evaluate securement systems.

### **General**

The convenor suggested that a need exists for guideline documents that can provide information to all parties interested in the application of wheelchair transportation standards. He urged that each country begin to think about compiling such a document that can be posted to the WG6-website. It was recognized that although parts of any applications document will need to be tailored to meet national needs, there will be parts that can be common and this should be shared. Also, sharing of information on the country-specific information may provide both ideas and stimulus for similar developments in other countries. The UK is working on such a guideline document with a planned completion for March 2000. The US also has a guidelines document in progress that addresses WC19 with a similar target date. A guideline document already exists on the SAE WTORS website that addresses WTORS-J2249.

## **4. DIS 10542: Parts 1&2**

### **Review and decisions on voting comments**

The WG evaluated the voting comments that were provided by the Secretariat and numbered as documents WG-6 295 (part 1) and 296 (part2). The experts present reviewed and reached consensus on a approximately 100 technical comments.

**Action Plan:** The WG decisions associated with each comment were documented in tabular format and will be submitted to the TC 173 Secretariat, and posted to the WG 6 website. Based on these decisions, an editorial committee was formed and assigned the task of finalizing the 10542 Parts 1&2 documents. It was agreed that final drafts of both documents will be posted to the WG-6 website for review by experts present at the Valencia meeting. Comments on the draft documents will be due within 2 weeks. The editorial committee will then finalize the documents and forward them to the Secretariat for FDIS distribution. Editorial committee: Larry S., Allen L., Campbell M., Aleid H. and Doug H.

November 20<sup>th</sup>

## **5. CD 10542, parts 3, 4 and 5**

### **5.1 Review of previous decisions**

The convenor referred to the minutes from the Vienna meeting (WG-6 291) that outlined the decisions, break out group participants and interim action plans for parts 3,4 and 5.

### **5.2 Developments on action plans on 10542, Part 3: Docking-type systems**

Hobson presented a slide overview of the work done at the University of Pittsburgh related to the development of a Universal Interface Device (UID) for latching W/cs to docking g securement devices. This development is detailed in WG-6 99. The latest working draft of Part 3 (WG-6-97) now contains the proposed UID standard as an informative Annex. The intent is that this Annex would be vital information for docking manufacturers (and wheelchair manufacturers) wishing to produce compatible products that would allow universal docking tiedown in vehicles that must transport many different types of W/cs.

**Action plan:** After considerable discussion, and in keeping with the ISO deadline, it was agreed that the working draft should now be placed on the ISO template, in preparation for CD voting, hopefully following the next WG meeting. The break-out group was re-constituted and pledged to conduct review and revision work on the working draft during the interim period.

### **5.3 Developments on action plans on 10542, Part4: Clamping-type systems**

Juan Dols reviewed WG6-303 “Design Requirements for Clamping Tiedown Systems” and a video of clamp-type system frontal 20g impact testing. Across many tests the occupant restraint systems failed at the anchorage to the flooring track. Extreme rearward rotation of the wheelchair along with rearward excursion of the occupant was observed in tests utilizing clamping systems that attach to the rearward portion of the lower frame. A commercial four-point tiedown system test was also conducted with observed failures. All tests were conducted using manual wheelchairs. With power wheelchairs, failures using clamp-type system are even more likely. Juan pointed out that there are a number of deficiencies in current clamp-type tiedown systems. It is reasonable to assume that the clamping systems will not be appropriate for use with power wheelchairs; from both crashworthy and construction aspects. A discussion related to Part 4 test methods occurred. Current commercial clamping systems will not necessarily withstand the forces associated with a Part 1 20g crash pulse using the SWC. The question was raised as to whether a low g crash pulse or manual wheelchair only stipulation should be considered. The consensus of the group was that Part 5 could be used to test a specific clamping system and wheelchair combination; otherwise clamping systems must comply with test methods established by Part 1 (50kph/20 g) and thereby be tested for use with any wheelchair.

**Action Plan:** Juan proposed working with a breakout group (Aleid H, Campbell M., Juan D) to develop the remaining technical requirements for Part 4. The resulting working draft will then be placed on the ISO template in preparation for WG review at its next meeting. The convenor will forward the current electronic file of the Part 4 working draft to Juan Dols as prepared by John Fuland .

### **5.4 Development on action plans on 10542, Part 5: Systems for Specific Types of W/Cs-**

WG6-298: Allan L. reviewed the latest draft document – group discussion is reflected below. Specific draft document comments:

- Change definition of ATD in Part 1 to be more general so as to allow for various occupant sizes. With that modification the ATD definition can then be deleted from Part 5.
- Change definition of “end fitting” in Part 1 to reflect that indicated in Part 5 “...or that attaches an occupant restraint to a tiedown system.” – make the Part 1 definition more general - then delete Part 5 “end fitting” definition.
- Delete “2 point restraint” definition in Part 5.
- Delete 4.2.1 a.
- 4.2.1 - Pelvic belt alone, or both, pelvic and shoulder belts, can be anchored to the wheelchair. (a shoulder belt alone should not be permitted).
- In Part 5 we “allow” restraints to transfer load to the wheelchair. Therefore 4.2.1 should be modified to read “occupant restraints may be designed to function independently of the wheelchair OR be designed to transmit loads to the wheelchair”.
- Add labeling and identification requirements for the wheelchair as a new item 5.2. (must add this information since Part 5 evaluates the assembly which includes the wheelchair).
- Part 6 – Performance Requirements: must add appropriate 7176/19 test criteria
- Add 5.3.1.d – battery requirements.
- Additional WC-related test criteria as described in 7176/19 section 5.3.2 a-h.
- If an integrated pelvic belt is used then the impingement criteria evaluating knee/wheelchair is no longer required.
- Excursion limits for various ATDs must also be added
- Annex A – add a Principle statement.

**Action Plan:** Allan L. will revise the document based upon the WG decisions (target date end of December) and send a file to the convenor for posting on the WG6 website. Notification will be issued to the WG members in order to solicit final input. It was requested that experts from test facilities review/comment on Annex A revisions, specifically.

Target date for CD issue: Jan, 2000. This means that voting comments should be available for review at the next WG6 meeting.

#### **5.5 AWI 16480-4: Seating devices for use in motor vehicles: Developments on action plan**

Gina Bertocci presented the background and current status of the breakout group's efforts. After considerable discussion the WG formulated the following guidelines for the group:

- dynamic testing be incorporated as the ultimate validation of compliance,
- static tests should be made available to manufacturers in an informative annex, which may become normative if research proves equivalence,
- the scope for first CD draft should be as approved by SC-1, but with the specific exclusion of custom seating,
- consider the feasibility of a complete system test using a surrogate wheeled base
- include rebound, if possible,
- develop and distribute a questionnaire to solicit seating manufacturer's views on the structure and scope of the draft standard.

**Action Plan:** prepare a draft standard based on the above and previous work for CD voting distribution by the Spring deadline.

#### **6. Electronic communications and interim activities (convenor's note)**

ISO-CS has begun to enforce a very rigorous voting timetable for standards development. Failure to meet established deadlines can result in termination of work items by the ISO-CS. It is virtually impossible to meet these deadlines if progress is limited to the semi annual meetings of the WG. For this reason, break-out groups have been established with assigned leaders, action items have been defined, electronic communications (list serve and www posting support) have been established, all with the expectation that the work of the WG will progress between meetings. This places an onus on those that have agreed to participate in break-out groups to actively work on the action plan when called upon by the group leader. It seems clear that it will be small working groups using electronic communications that will essentially craft the standards of the future.

The URL for WG 6 www-site is: <http://www.erc.upmc.edu/STDsDev/ISO/ISOindex.html>

#### **7. Next meeting plans**

The next meeting of WG-6 is scheduled for May 7 & 8<sup>th</sup> – Stockholm, Sweden

#### **8. Adjournment**

The convenor thanked the participants present, and especially Juan Dols and his staff, for a most productive and pleasant venue in Valencia. Given that all items on the agenda had been addressed, the convenor adjourned the meeting at 5:30 PM.