



ISWP Standards Working Group September 12, 2018 Meeting Recap

The ISWP Standards Working Group met by conference call on Wednesday, September 12, 2018 from 12:00 p.m. to 1:15 p.m. U.S. Eastern Time. This document provides a recap. Link to call recording: <https://iswp.adobeconnect.com/pqet9xa7kfk/>.

Next call: Wednesday, December 12, 2018, 12:00 p.m. U.S. Eastern Time/17:00 UTC.

Action Items:

1. Don Schoendorfer to suggest design changes for dummies used in whole chair test track.
2. Matt McCambridge to follow up with MIT regarding results of testing Free Wheelchair Mission chairs in Indonesia.
3. Working Group members to submit testimonials regarding the impact of ISWP's products and services on their organizations and on the wheelchair sector.

Discussion:

1. **ISWP Funding:** Pitt received a separate five-year grant which is supporting ISWP team members who are working on product standards. ISWP's current USAID grant ends on October 31, 2018. Regardless of ISWP funding, product standard testing will continue. ISWP submitted a response to a USAID request for information to establish an evidence-based resource center to support international wheelchair initiatives. Many of the activities align with ISWP and would provide additional resources such as building worldwide capacity for wheelchair testing (e.g., drawings repository, establishments of test labs). ISPO, in conjunction with other organizations, also submitted a proposal.
2. **Whole chair testing update:** Free Wheelchair Mission (FWM) named the test track Lotus, after a client who was able to walk after receiving a FWM wheelchair. A paper comparing test track data to ISWP double drum results was accepted for ISS 2019. The test track has been running for 600 hours; FWM is noticing that the steel dummies are showing signs of wear. On the threaded rod which connects knees to thighs, the thighs are moving up and down against the rod which is wearing out the thread. Also, the span between the knees can't be adjusted, and there appears to be a crack in rectangular steel block which holds the rod. There seems to be a lot of shock to the knees. FWM will be recommending design changes for the dummy to minimize wear.

Fractures were occurring at 21 hours, but that has improved to 110 hours recently. FWM is seeing every type of failure which has been reported from the field except for failures related to UV exposure or corrosion, which can't be test with the track. FWM found a crack in the frame behind the barrel that holds the caster stem – at the weld. Weld experts said it can be

welded differently. There also appears to be a problem where maximum stress is experienced on the crossbars.

FWM sent questionnaires to partners asking whether they are seeing similar failures. However, Don cautioned that field volunteers are not trained in looking for failures. Also, distributions take place in remote areas where the partner goes home after the chair is distributed, so FWM only learn about a problem if the user requests support, which does not happen often.

FWM adjusted one of the dummies to be Don's weight and compared Don with the chair, along with measuring vibration by accelerometers in the chair with Don in it. The accelerometer is located just behind the caster barrel. They are seeing 40% of the acceleration with Don versus the dummy -- likely the absorption of forces from the human body which need to be taken into account. Bonnie collected data in Kenya, which will be included in the paper (middle school wheelchair users who were using their chairs in aggressive ways). FWM also plans to collect data from adult wheelchair users in Baja. Anand suggested having wheelchair users experience a series of bumps first before testing the wheelchair to calibrate.

Don is starting to experiment with bushings instead of bearings and is seeing over 130 hours of use without a failure; he is encouraged with these preliminary results. FWM has not introduced debris or infiltration to the testing yet. IGUS has been making the bushings for 50 years and indicated they have tested bushings with contaminants. Jon said ISWP is interested in collaborating to test using the salt fog chamber -- running comparisons between bearings versus bushings with and without corrosion. Then introduce debris to determine any weak links. This could be done faster than adapting the caster testing equipment to introduce debris when casters are tested and allows time to develop a more detailed protocol.

Due to high temperatures in California, FWM has had trouble stabilizing the 24-foot long belt. The group that built the test track researched and recommended changing the profile on the drum by about 1/2." It will be installed next week, which will result in using the test track 24/7 versus 10 hours/day currently.

FWM provided MIT with wheelchairs to test in Indonesia, but results have not been shared. Anand was added to the MIT IRB and also is awaiting information. Matt will follow up with MIT.

3. **LeTourneau Update:** No report as Norm Reese is on sabbatical.

4. **Caster Testing update:** Anand presented caster testing results. The test involved putting a load cell directly on top of the caster and measuring stress over a number of cycles – for stem bolts and caster materials. Small casters – UCP Expressions, Whirlwind and Shonaquip – were used. The standard shock exposure on the test can do 5% of damage over 2 years, but low-quality materials do break on the test equipment i.e. experience 100% damage. Some materials are not up to spec, especially materials on stem bolts and forks; additional investigation is under way.

Stress exposure on casters – bearings capacity is between 50-130MPa. Equipment can identify low-quality bearings. Also identifies tire delamination. Next step is to do materials testing to determine material quality.

Jon commented that there is a lot of variation among materials produced in other countries; it appears that quality of materials is much lower than they are telling ISWP. Matt said counterfeit bolts are a common problem in manufacturing in Asia. Quality and design of casters are different from the quality and design in the field. Even before testing, Anand has an idea of how the casters likely will fail.

5. **Rolling Resistance Equipment:** Testing results will be available in December 2018, including data from different tires and camber, toe in and toe out. We believe that challenges with friction which Norm Reese and the LeTourneau team experienced have been eliminated in this equipment because of the use of air bearings and a timing belt to keep the drum in place.
6. **Request for Testimonials:** ISWP invites sector stakeholders to provide testimonials about the impact of ISWP's programs and services on your organizations and the wheelchair sector in general. Please submit your testimonial using this Google form ([link](#)).

Participants

- Bonnie Gonzalez, Free Wheelchair Mission
- Dave Mahilo
- Daniel Martin, Shonaquip
- ✓ Matt McCambridge
- Mark Sullivan, Convaid
- Norman Reese, LeTourneau University
- Chris Rushman, Motivation
- ✓ Don Schoendorfer, Free Wheelchair Mission
- Scott Walters, Mobility Worldwide
- Karl-Erik Westman, Humanity & Inclusion
- ✓ Eric Wunderlich, LDS Charities
- Ben Gebrosky, University of Pittsburgh
- ✓ Mendel Marcus, University of Pittsburgh
- ✓ Anand Mhatre, University of Pittsburgh

- ✓ Joe Ott, University of Pittsburgh
- ✓ Jonathan Pearlman, University of Pittsburgh
- ✓ Nancy Augustine, University of Pittsburgh

Prepared by: Nancy Augustine, Anand Mhatre and Joe Ott, University of Pittsburgh