ISWP Standards Working Group
December 12, 2018 Meeting Recap

The ISWP Standards Working Group met by conference call on Wednesday, September 12, 2018 from 12:00 p.m. to 1:30 p.m. U.S. Eastern Time. This document provides a recap. Link to call recording: **https://iswp.adobeconnect.com/pm79b3o9c5zz/**.

Next call: Wednesday, March 13, 2019, 12:00 p.m. U.S. Eastern Time/16:00 UTC.

Discussion:

1. **Funding**: ISWP is negotiating a new award from USAID to include activities related to products standards:
    a. Developing a consensus set of target product profiles (TPPs) – product specifications and standards used for large-scale purchases of manual wheelchairs for adults and children (e.g., by governments). The TPPs would be based on WHO or UNICEF format and build on current work of UCP.

    b. Supporting product testing and testing labs worldwide.

    c. Continuing to publish design drawings and technical support for product testing equipment.

    d. Developing a guide to perform ISO tests (e.g., manual with steps, photos, videos) and host online.

    e. With additional funding, providing funds and technical support to groups to develop test labs or add equipment to existing labs. The goal is to have a regional presence; e.g., Northern Africa. Jon mentioned discussing a Kenyan test lab at an ISO meeting in early 2018. organizations, also submitted a proposal.

2. **Free Wheelchair Mission (FWM) Update:** The FWM team is in Baja collecting stress, strain and acceleration data among wheelchair users so it can be correlated with the whole chair system. The whole chair test system is fully functional and, while not running 24/7, is being used about 80% of the time during a week. FWM also has tested other manufacturers' chairs and reported results.

    FWM has been examining where maximum stress occurs on wheelchairs using strain gauges; it appears maximum stress is at the caster where it is welded to the frame. FWM also is continuing to test bushings; testing to date is promising. The bushing would take the place of the bearing in three locations: Rear wheel, caster stem and rear axle. FWM is interested in

collaborating with Pitt to test corrosion on bushings.

3. **LeTourneau Update:** Norm Reese summarized LeTourneau team's work last year, including adding a brake to the drum to improve zeroing of the load cell and changing the mounting of the load cell. The changes resulted in some repeatable results to be able to validate the load cell for large wheels. The team presented a poster at RENSA 2018 based on cart pulling. Norm returns to LeTourneau in January. A senior design team starts in fall 2019, which would be the next opportunity to continue the work.

4. **ISWP Update:**
   a. *Cushion testing*: Matt McCambridge put the Pitt team in touch with an MIT student team which is designing a cushion that relies on air tubes from bike tires. The student team will visit Pitt in January to test the cushions using Pitt equipment. Matt commented that developing the cushion technology which is based on a replaceable consumable like a bike inner tube and which could have with a longer field life would have good potential. Chris Rushman commented that intermediate level of service requires postural support in addition to pressure relief. Perhaps there are ways to deliver postural support design features, as well.

   b. *Caster testing*: Anand Mhatre presented the caster standard at the ISO London meeting in October 2018 and online meeting in December 2018. He received good feedback on revisions. Norm Reese also provided some feedback, which Anand will incorporate. Anand then will submit a new work item proposal for caster standard development work to the ISO committee.

      As part of a senior design project, Pitt engineering school students did a simulation on caster failure with Whirlwind caster, including fork hardness testing and tensile strength. The tests showed that fracture failure would happen in the fork where it intersects with the bolt. Neither Eric Wunderlich nor Matt McCambridge recalled seeing that specific failure. Matt commented that poor quality wheels or other quality problems could be masking other issues in the field. The students found a suitable correlation in the cycles to failure between field and FEA analysis. Anand would like to extend the project to other casters in the next class which begins in January 2019.

      Through a Year of Pitt Global project, Anand received funds to develop a mobile application to characterize wheelchair use and exposure outdoors by measuring reliability through user exposure. Data will be captured by accelerometer and gyroscope.

      The Pitt team will be testing bushings and bearings (with and without corrosion) soon and hopes to report at the March 2019 Standards Working Group meeting.

   b. *Rolling Resistance Equipment*: Joe Ott presented results of rolling resistance testing completed at Pitt. This included initial testing showing a linear proportional trend in load and an inverse trend for tire pressure. Toe was found to be more complex but showed

similar results to Norm. The Pitt team is developing a testing protocol for the machine and has a list of wheel, tire, and tube combinations to be run under several conditions: Air pressure, load, toe in, camber (more machining to be done), surface characteristics (commercial grade and high-pile carpet) and all combinations. Wear and influence of push rims also will be considered. With some adjustments or add-on hardware, all of the caster bearing blocks Anand developed for the caster testing can be used on the rolling resistance equipment.

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

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