ISWP Standards Working Group

September 09th, 2020 Meeting Recap

The ISWP Standards Working Group met by conference call on Wednesday, September 09th, 2020 from 12:00 p.m. to 1:30 p.m. U.S. Eastern Time. This document provides a recap.

Next call: Wednesday, December 09th, 2020, 12:00 p.m. U.S. Eastern Time/16:00 UTC

Discussion:

1. **ISWP Update:** After 5 years being part of the University of Pittsburgh, ISWP will become a separate entity. To do this, ISWP is working with AMCES, a consulting firm, and Forming Committee that consists of ten sector stakeholders. To date, the Forming Committee approved the new organization structure, governance and Board composition, membership categories and voting rights; the committee also reviewed funding strategies. Next steps include: Establishing a Founding Board and a Change Management Team which will take the organization through the implementation phase; finalizing the headquarters location; and filing the required legal documents. It is anticipated the transition will take place in early 2021.

2. **GRIT Presentation** Ben Judge from GRIT presented several designs of the Freedom Chair For Review (BMX wheelchair). Ben presented the two steel forks available: Upgraded Tubular Fork and Basic Sheet Metal Fork. Ben described failures on the designs and iterations.

    - Fork Features: Bicycle headset with angular contact bearings, 9” casters and front hub spacing with 100 over lock dimension with is similar to the one used in bicycles.

    - Base Sheet Metal Fork: It is a hybrid sheet/tubular weldment manufactured in US and it has passed the ISO 7176, including double drum and curb drop test.

        - Failures: bending when running into a curb and fatigue.

        - The base fork failure happening on the welding point is critical since it can cause harm to the user. The welding process was then corrected based on the failure observations.

- Upgraded Tubular Fork: This tubular fork was tested and it was shown that it was stronger than the sheet metal fork. Fatigue crack happened after 100,000 cycles. A test different from that on ISO 7176 helped identify other design improvements as well.

    - Finishing: Sheet metal: ASTM B633 Type II, SCI (Zinc chromate). Tubular: Electrophoretic Deposition (ED) coating, which is less expensive than that of the sheet metal and is common in the bicycle industry. Better resistance and bending.

- The fatigue cracking on the weld, was this on the field or after hitting a curb? The fatigue only happened when the sheet metal was changed. Otherwise, the failure on the fork was almost exclusively bending.
- Anand mentioned that when forks are bent, it is more common to see failures regarding corrosion and cracks can happen earlier. Anand to provide information.
- Only for the US market.
- There has not big an issue with the current wheels but it uses a pneumatic front wheel.
- Anand asked if they have found corrosion on the bearings? Yes, there has been corrosion, so they replace the entire wheel.

3. **Group Updates:**
    a. FREE WHEELCHAIR MISSION- Don and Bonnie. The Test track is being used to test the FWM wheelchairs Gen 2 with a fixed frame, and the Gen 3 with a folding frame. There are some changes that have are in process, specially changing the caster to improve the durability of the frame as it was presenting some cracking. Other changes include the brake and seating design to make it easier to assemble. Besides, FWM is approaching another manufacturer from India and the test track will be very useful to use.
        - Anand asked about the caster stem weld improvement. FWM mentioned that once the caster was replaced, other failures went way and concluded that the caster design is really important and can affect other failures.
        - Jon Pearlman mentioned that wheelchairs are more susceptible to failures with smaller casters. Casters have a huge impact on the wheelchair as they absorb the impacts into the frame.

- Don offered LOTUS for other people to test their wheelchairs. As LOTUS work 24/7 and there are cameras, they can still work remotely and see when and where the failures happen.
- Chris mentioned that there is a limit on the durability on the casters after 70 0000 cycles. In order to go higher than those cycles, the rubber would need to be stronger and be re-rubbered.
- Don would be happy to evaluate what ISWP's testing of bushings on casters (axle and stem bearings). Results to date show that bushings are very cost effective and as durable as high-quality bearings.

b. University of Pittsburgh. Caster Testing. Anand.
   i. Caster Testing is submitted to ISO Committee draft ballot for the standard. It is close to become a standard as the next stage is disclosure.
   ii. Publications.
      1. APMR: Submitted
      2. RESNA papers on bushings and bearings have been accepted for publication.
   iii. Bushings: Good results to date. Planning to 3D print bushings. Received some from a manufacturer. 3D printing bushing is also a consideration for the future and it is not being recommended at the moment.
   iv. Testing: Procuring casters based on outdoor failures. Dust testing will be done bushings versus bearings. Results will be shared when ready.
   v. Fact Sheet: Prepared a sheet to inform suppliers on caster selection based on field observation and test results. SWG members invited to provide feedback on the document available here. https://pitt.app.box.com/s/xjysduwhio8j30b4qjskgbcuxgijrois. This will also be available on ISWP's website

c. University of Pittsburgh. Rolling Resistance- Holly Jene-Wilson
   i. Late July-Early August testing was resumed for LDS charity's wheels and casters. Some of this testing has been completed and there is also some work in progress.
   ii. Testing additional casters and wheels with biomechanical data sets.
   iii. Holly presented results for 4" and 5" casters looking for the relationship between the RR force and the load applied to the casters.
   iv. Holly will be presenting a poster at RESNA and is working with Anand on a caster cross-over paper.
   v. Publications:

1. Joe Ott's papers have been submitted for publication and there is also a paper from Holly that will be presented as a poster at RESNA.

vi. Knowledge Transfer: Online Tool: It is in progress and working to make it available for suppliers and clinicians. The proof of concept of equivalent weight calculator was presented in which the input factors as well as the caster selection is entered. This calculator will provide information about how high/low the RR is, the weight added to the user depending on the configuration selected previously. Further work includes publications, additional testing, contact parch and surface hardness measurements and the development of this online tool.

d. Group Updates:

i. Motivation. Chris would like to present next meeting about their 3-wheeler which can be re-sized. This can fit in space between deep rural, rough terrain and the uneven urban area, as well as deals with smaller spaces (more compact) and helps with public transportation. Can be resized easily into one of fourth widths quickly to provide more stock flexibility.

ii. Latter-day Saint Charities. Eric provided updates to their current projects and mentioned they have done a survey to users in the field in terms of wear. Corrosion has been one of the main issues they have found on their results.

1. Jon Pearlman asked about the location of the corroded parts. Eric mentioned that corrosion was present in casters, and wheel locks, but he would check to provide further details.

iii. Participant Assistive Products. Keoke mentioned that due to the pandemic their production has stopped with no big updates on product development. As China has restricted travel from people from the US, this has caused a delay on their progress, but they hope the next shipping coming in November.

iv. BambooAbility. Yetsa mentioned that students are involved into adding bamboo in their wheelchair and a group of students have carried this project as their thesis project. Took Don's advice and engaged students/engineers at university of Delaware to mold bamboo as it grows to build a more complete bamboo wheelchair in settings like west Africa. Hope to have update at end of the semester on how to use bamboo more comprehensively at the component level. Marjella was introduced to the group, she is her coworker and also joined the meeting from Amsterdam. She holds bachelors in Biomedical Engineering and is

working on the bamboo wheelchair for past 2 years. Lived in Ghana for a year. Working on master's at the medical school and continues to work with BambooAbility.

v. Mobility Worldwide: Prototypes in Kenya. Completing survey on how cart is performing in the field, along with user issues and how to improve the product. Planning organization's conference, to be held virtually.

4. **Standards Wiki**: Presented the wiki during a June 30 webinar, with 63 participants from 21 countries. Currently, it is available in English. Added FWM test track tests to the wiki. Encourage SWG members to contribute content, as well. Stephanie can help. Current content is being translated into Spanish, and a webinar will take place in Spanish soon. Working with developer on enhancements to enable authors more independence in posting. Also invite group members to provide ratings, feedback in the wiki.

5. **Open Discussion**: Following the meeting, will send a survey to SWG about converting from WG style meeting to a Community of Practice.

Participants:

✓	Bonnie Gonzalez, Free Wheelchair Mission	✓	Andy Maynard, Mobility Worldwide
✓	Ben Judge, GRIT		Chris Rushman, Motivation
✓	Keoke King, Participant Assistive Products		Yetsa Tuakli, BambooAbility
	Daniel Martin, Shonaquip	✓	Marjelle Scheffers, BambooAbility
	Matt McCambrisge	✓	Anand Mhatre
	Mark Sullivan, Convaid	✓	Jon Pearlman
	Norman Reese, LeTourneau University	✓	Maria Luisa Toro
✓	Chris Rushman, Motivation	✓	Nancy Augustine
✓	Don Schoendorfer, Free Wheelchair Mission	✓	Holly Wilson-Jene
✓	Scott Walters, Mobility Worldwide	✓	Stephanie Vasquez
✓	Eric Wunderlich, Latter-day Saint Charities		

Prepared by: ISWP Pitt Team