

# Minutes

## ACI 440-J Stay-In-Place Formwork

Sunday, November 8, 2015

1:00 pm - 3:00 pm

Sheraton Hotel Downtown, Denver, CO - PLAZA BALLROOM E

Chair: Amir Fam

### ATTENDENCE

#### Officers

Amir Fam, Chair

John Busel, Co-Chair

Will Gold, Committee 440 Chair

#### Subcommittee members:

Ayman Okeil

Felipe Acosta

Max Porter

Greg Bond

#### Guests:

Dawn Cheng

Scott Smith

Doug Tomlinson

### 1. Welcome and Introductions

- Amir Fam called the meeting to order at 1:20 pm.
- The attendees made self-introductions.

### 2. Approval of the agenda and minutes

- Amir Fam added a new item under new business. Greg Bond moved to accept the agenda as revised. Seconded by Ayman Okeil. Motion passed.
- Amir Fam summarized the key items that occurred at the last meeting. First, there were many editorials that were discussed and revisions to the document that focused and refined the scope of the document. The group also discussed the phi factor and its impact to the equations. John Busel moved to accept the minutes as written. Seconded by Greg Bond. Motion passed.

### 3. Review of the 2<sup>nd</sup> draft Design Guide

- Amir Fam reported on the newest version of the document. Amir Fam acknowledged the work of Pedram to bring this document to where it is today.
- Doug Tomlinson reviewed the changes made since the last meeting. The document is focused on circular CFFT's. The title and scope was changed accordingly. The definitions were revised to match ACI Concrete Terminology.

- Amir Fam explained that unlike any other 440 document, this document will need to refer to classical lamination theory. The group discussed the use of classical lamination theory and data provided by producers.
- Amir Fam discussed the need to use classical lamination theory in the equations of the document. Doug Tomlinson suggested to add classical lamination theory to the definitions. The group agreed to specify the type of information that manufacturers provide all tensile and compressive mechanical properties. Doug Tomlinson noted that aramid was removed from Table 1 because this is not a product that is commercially available. The subject was raised as to whether a double skin would be considered in this document. It was pointed out that the interior is fully concrete and that there is no other tube.
- The group pointed out that some equations from 440.2 were revised and need to be reflected in this document. All changes were based on feedback received from the committee since the last meeting.

#### 4. **Review of database used for verification**

- Amir Fam reported that a database was compiled from test data reported from the references to generate the factors and equations used in the document. He pointed out the correlation of the data with the equations was very good and he felt that the approach used in the document was on track and can be verified. Amir Fam pointed out that the laminate structure for typical FRP pipe is +/- 55 degrees. These were the products used in the many tests. When these pipes were tested and compared in the database, the data did not correlate very well and was on the very conservative side. He noted that you cannot use coupon data to establish the equations. More investigation is needed.

#### 5. **Calibration of Phi factor using database**

- Ayman Okeil presented to the group his investigation and findings for determining the Phi factor. He noted that the resistance model had to be verified. He presented a methodology that was used to generate the factors. He summarized the reliability work he performed on the data. Ayman Okeil stated that more analysis is needed to complete the analysis. He asked for assistance in defining the typical configurations that could be used in design to validate the design data.

#### 6. **Additional gaps in document and assignments**

- Amir Fam reviewed gaps in the document. He stated that large angle tubes, database collection for axial, axial flexure, shear, seismic, fatigue, and internal, moderate steel reinforcement. Amir Fam expanded on the inclusion of steel reinforcement that it has benefits to the document where users might feel more relaxed with specifying steel. He asked the committee for comment. Fire was pointed out as a consideration and the motivation of why FRP would be used. Amir Fam stated that there are many other applications other than buildings where CFFTs would be used.

7. **New Business**

- Amir Fam reported he attended ACI 355 meeting. There is a possibility of joining with ACI 355 in a combined session for the Fall 2016 convention in Philadelphia on the subject of hybrid structures and CFFTs.

8. **Adjourn**

- Amir Fam adjourned the meeting at 2:45 pm.

Respectfully submitted,

John Busel