

Minutes

ACI Sub-Committee 440F
FRP Strengthening/Repair

ACI Spring 2010 Convention - Chicago, IL
March 22, 2010
3:05 p.m. to 5:15 p.m.
Michigan Room A & B - Sheraton Hotel

440-F Members (34):

Lee, Michael (Chair)	Fallis, Garth	Porter, Max
Shield, Carol (Vice-Chair)	Fam, Amir	Rasheed, Hayder
Green, Mark (Co-Chair)	Fyfe, Ed	Rizkalla, Sami
Bakis, Charles	Galati, Nestore	Sen, Rajan
Benmokrane, Brahim	Gremel, Doug	Seracino, Rudi
Bisby, Luke	Harries, Kent	Silva, Pedro
Blaszak, Gregg	Horeczko, Nick	Soudki, Khaled
Bouadi, Hakim	Kleinhans, Danielle	Vatovec, Milan
Brown, Gordon	Mahgoub, Mohamed	Watson, Ron
Brown, Vicki	McClaskey, Charlie	Witt, Sarah
Busel, John	Myers, John	
Ekenel, Mahmut	Nanni, Tony	

440-Main Members* and Visitors (32):

Bae, Sang-Wook*	El-Domiaty, Khaled*	Matta, Fabio*
Bond, Gregory*	Elgawady, Mohamed	Rosenboom, Owen*
Brown, Jeff	Erdil, Boris	Sim, Jongsung*
Carloni, Christian*	Ericson, Alvin	Smith, Zach
Chen, Chien-Chung	Garner, André*	Steere, Sam*
Constain, Laural	Gibson, Robert	Stratman, Brian*
Curran, Elizabeth	Harik, Issam*	Wan, Baolin*
Deschamps, Dominique	Kanitkar, Ravi*	Weservich, Jim*
Di-Judovico, Harco	Kim, Jimmy*	Zatar, Wael*
Dills, Jeff	Lee, Byoungsun	Zehrt, William
Douglas, Elliot	Masmoudi, Radhouane*	

Administrative

1. Co-chair Mark Green called the meeting to order at 3:05 p.m. Attendees made self-introductions.
2. Agenda: Sami Rizkalla moved to approve the Agenda. Garth Fallis seconded the motion. The motion passed by voice vote.
3. Minutes: Sami Rizkalla moved to approve the Minutes from the Fall 2009 Meeting in New Orleans. John Busel seconded the motion. The motion passed by voice vote.
4. Meeting Announcements: Carol Shield announced that the FRPRCS-10 symposium, hosted by ACI 440, will be held in conjunction with the Spring 2011 ACI Convention in Tampa, FL. Papers are due

June 2010. Volunteers will be needed to assist with reviewing manuscripts. Brahim Benmokrane announced the 4th International Conference on Durability and Sustainability of FRP Composites for Construction and Rehabilitation, July 20-22, 2011, Quebec City, Canada.

Old Business

5. Task Group Reports

a) Glass Transition Temperature: Sarah Witt provided an overview of topics to be addressed by the TG. The first step will be to determine if T_g is an appropriate measure, and if so, the next step is to define T_g (e.g., identify measurement technique, standardize test data, and specify curing method and moisture condition of the test specimen). The goal of the TG is to have answers to items raised in these two steps before the Fall 2010 meeting in Pittsburgh. The TG is to convene immediately after the 440F meeting is adjourned. Individuals showing an interest in the work of the TG include Sarah Witt, Chuck Bakis, Tarek Alkhrdaji, Jay Thomas, Elliot Douglas, Mark Green, and Nick Horeczko. It was noted that Mr. Douglas has expertise in chemistry of polymers.

b) Repair Committee 562: Tarek Alkhrdaji announced that balloting is under way on many chapters of the Repair Code. In order to accommodate TAC's anticipated work load associated with reviewing reorganization of ACI 318, the work of Committee 562 has been accelerated. The current schedule calls for a draft of the Repair Code to be submitted to TAC by Spring 2011. It is expected that the Repair Code will be published no later than 2014 so that it can be adopted in the 2015 edition of the International Existing Building Code.

c) Deflection: Hayder Rasheed presented a table that depicted predictions of FRP-strengthened beams using three methods, including the Bischoff method recently balloted. Results shown in the table were based on service loads. Dr. Rasheed noted that the Bischoff method does not appear to account for deflection caused by bond slip and adhesive shear deformations, both of which appear to be present even at service loads. Questions were asked about whether bond slip would occur when beams are strengthened in-situ since the stress in the FRP would only be due to post-strengthened superimposed loads. The TG will investigate this further and also be expanding the database of tests results so a more comprehensive comparative study can be performed. The aim is to include beams strengthened using NSM, end anchors, and other FRP systems or features. A call was made for test results. Owen Rosenboom volunteered to provide results from beam tests.

d) Blast Upgrade: A presentation was given by Khaled El-Domiaty regarding development of the Blast Design Guidelines document. A working copy of the document will be posted to the 440F website following today's meeting for information purposes only. Review comments will be solicited at a later date. The document is envisioned to be a stand-alone document (i.e., not inserted into 440.2R). The scope of the document includes concrete and masonry walls, and reinforced concrete slabs. Discussion followed regarding: 1) the need for input from ACI Committee 370 (dynamics and vibratory effects) and, 2) identifying the proper ACI committee for this document to reside in. Tony Nanni noted that he is serving as TAC liaison for Committees 440 and 370 so communication and cooperation between the committees is expected to be good. The efforts of the TG were applauded because when completed the document will fill a void that exists in the blast design industry.

e) Mechanically Fastened FRP: On behalf of co-leader Larry Bank, Vicki Brown reported that a working copy of the TG document will be main available for posting on the 440F website after it undergoes an additional internal review. The document is fairly extensive (approximately 50 pages). The TG is not certain if the document will result in a stand-alone report or if it will serve as

background information for design guidelines to be inserted into 440.2R. Dr. Brown commented that the best utilization of the document should become more apparent as its development progresses.

f) Seismic Design Guidelines: Pedro Silva reported that all ballots comments received in October 2009 have been addressed. Some of the main technical items addressed involved the effect of cyclic loading on FRP bond, a 0.006 FRP strain limit, moment curvature equations, design criteria for shear wall strengthening, and FRP anchorage at base of shear walls. Dr. Silva acknowledged contributions from Kent Harries in addressing the effect of cyclic loading of FRP bond. A comment was made concerning the possible negative effect of very cold temperatures on the stiffness of the FRP system. Going forward, work will focus on developing several additional examples to illustrate application of the design guidelines. It is expected that an internal review of a modified document will be completed by Summer 2010 and that a ballot will be issued at the subcommittee level prior to the Fall 2010 meeting in Pittsburgh.

New Business

6. Garth Fallis made a presentation titled "*XMesh Gold Cementitious Mortar Strengthening System.*" This system consists of a FRP grid that is applied to the surface of concrete structures using a mortar. Reported beneficial features relative to FPR applications using resins include better performance at slightly elevated temperatures, and non-combustable and non-toxic qualities under exposure to fire. Technical test data for the system was not presented for review. Discussion followed regarding the proper ACI Committee for this system as Committee 440's scope is limited to polymer and polymer-based systems. Sami Rizkalla and others voiced concerns regarding the proprietary nature of the XMesh product and cautioned that the work of ACI should not be limited to a product produced by a single company. Gordon Brown noted that if load transfer occurs between fiber and mortar using a chemical mechanism, then it may be appropriate for this system to fall within the scope of Committee 440. Garth Fallis moved that Committee 440F initiate a TG to study a fiber-reinforced cementitious matrix (FRCM) system using continuous fibers for strengthening concrete structures with the first task being to determine if this matter belongs within the scope of Committee 440. The motion included friendly amendments from Vicki Brown and Gordon Brown. Kent Harries seconded the motion. Nick Horeczko suggested that the new TG review AC218 for a similar product. The motion carried by recorded vote of 27 in favor, 2 opposed, and 4 abstained.

Adjournment

7. A motion to adjourn was made by Sarah Witt. The meeting was adjourned at 5:15 p.m.

End of Minutes