

**Minutes**  
**ACI Committee 355**  
**Anchorage to Concrete**  
**March 25, 2001**  
**Philadelphia, PA**

**1. Call to Order:** Chairman Ron Cook called the meeting to order at 10:00 AM. All members and guests were self-introduced. The Chairman requested that all members sign the attendance sheet and check the roster for correctness. Future correspondence will be sent by email.

**2. Membership Changes:** Ron Cook announced membership changes as follows. Voting members Bill Alderman and Francis Oluokun were removed from the committee for nonattendance and no longer working in the anchoring field and Andrew Rossi was reclassified as associate member. Branko Galunic was added as a voting member. Ron Miranda, John Stiles, Sherry Yin Xiachen, and Konstantinos Zavliaris were removed as associate members for nonattendance. Gerald Hasselwander was removed as a consulting member and Benjamin Lavon was reclassified from consulting member to associate member.

**3. Minutes:** Motion by Meinheit, second by Makitka, to approve the Toronto minutes as written was unanimously approved.

**4. Agenda:** The agenda was reviewed. Discussion by Pete Carrato of the India earthquake was added to Anchorage Programs of Interest. The April 10, 2001 ICBO ES public hearing was added to New Business.

**5. Status of ACI 318 Appendix D (CB30):** TAC reviewed the design provisions of ACI 318 Appendix D last summer. ACI 318 approved the response to TAC comments at the Fall meeting in Toronto. Appendix D will be published with the rest of ACI 318 proposed changes for a 90-day public comment period. Expect publication in June issue of *ACI Concrete International*. Ron Cook will send out a copy of draft Appendix D as .pdf files.

**6. Report from ACI 349 Subcommittee 3:** New ACI 349 Appendix B is being prepared for publication and will be designated as –2001. Response to public comments will be published in the April 2001 *Concrete International*. Branko Galunic will become the new chairman of ACI 349 Subcommittee 3.

**7. Status of ACI 355.2 Provisional Standard:** Ron Cook reviewed the committee responsibilities under the *ACI Technical Committee Manual*. ACI 355.3-00 has been published as an ACI Provisional Standard and is good for 5 years. The standard continues processing under normal ACI processing to a full standard. The 90-day public comment period runs from February 1 to May 1, 2001. The standard was published in the February 2001 issue of *Concrete International*.

**8. Task Group for Preparing Closure Statement to Public Comments:** Dan Falconer, ACI Managing Director of Engineering, suggested that if the committee expects negatives on the closure statement, it should ballot the closure statement. And then resolve the negatives

All comments will be received by May 1. It is expected that all comments will be available to the committee electronically as early as May 2. Copies will be forwarded to all committee members as soon as they are received. Chairman Ron Cook proposed a Task Group to assist in the preparation of the closure statement. The TG will consist of R. Cook, R. Wollmershauser, R.

Klingner, D. Meinheit, P. Carrato, L. Mattis, and R. Ernst. Possible meeting dates were proposed as May 7/8 or May 10/11. Don Meinheit volunteered the Wiss, Janney, Elstner offices in Northbrook, IL. If the committee members have any editorial comments, please send to Ron Cook for consideration at the end of the public comment period.

**9. Outstanding Revisions to ACI 355.2:** Dick Wollmershauser listed the items that were deferred during the latest balloting period to be taken up as new business. These included 1) adding back into 355.2 of the torque tests that were removed in the balloting process (Eligehausen and Fuchs), 2) the handling of anchors that did not meet the requirement of  $c_{cr} \leq h_{ef}$  (Ernst), and 3) making the seismic tests mandatory rather than optional (Orr). If committee members have other items for consideration, please send to Ron Cook and Dick Wollmershauser to be included on the fall agenda for Dallas. These could also be submitted as comments under the public comment period.

**10. Joint ACI 318, 349, 355 Design Guide:** Ron Cook proposed that a subcommittee be assembled to prepare the design guide. Volunteers included: R. Cook, J. Silva, W. Fuchs, R. Orr, P. Carrato, D. Meinheit, B. Galunic, R. Bandyopadhyah, H. Wiewel, R. Klingner, and M. Miltenberger. Ron suggested a separate meeting in Dallas, or an extended meeting. Dick pointed out that the committee had approved using the same outline as the CEB Design Guide.

#### 11. Anchorage Programs of Interest:

- a) Don Meinheit reported on a series of WJE/PCI group shear tests on 1/2 and 5/8 inch welded studs in a single row perpendicular to the edge. The applied shear force was in-line with the orientation of the stud line. The purpose of this test series is to develop design recommendations for headed stud groups loaded toward a free edge. The testing work is aimed specifically at developing design criteria for headed studs for PCI. The first part of the research results were published in the Sept/Oct issue of the PCI Journal and included only steel failures under shear loading. This current series being reported included the effects of the front (de3) edge effects of concrete breakout. 136 tests were performed in this series. It was determined that:

$$V_c = 22\sqrt{f'_c}(BED)^{4/3}(\zeta)$$

where: BED = back edge distance or the distance from the free edge to back row of studs.

$\zeta$  = coefficient to account for the spacing of studs perpendicular to the shear force

The finding was that the front rows of studs can be ignored. They do not contribute to the strength of the connection for a concrete breakout failure and no cracking occurs at the front rows of studs.

Additional tests were performed on groups with multiple rows.

There was no effect of diameter of the stud (data in the range of 1/2 to 3/4 inch diameter studs was analyzed) and there is no influence of embedment depth.

- b) Rolf Eligehausen reported:
- i. Finished tests and numerical simulation study on bonded anchors. Will propose a modified CCD method. One only needs bond strength of the adhesive material.
  - ii. Studies of long channel bars with large height to embedment have been made.
  - iii. Headed studs with blowout near edges was looked at. CCD equation for single anchors toward the edge is OK. Parallel to the edge is conservative.

- iv. They will study shear fastenings parallel to and away from the edge.
- c) Pete Carrato reported on Bechtel reporting of possible anchor damage from the India earthquake. Only two cases of very limited damage were determined. The damage appeared to be due to shear spall of a thick grout pad. Photos are attached.
- d) Ron Cook reported about tests on anchors grouted in for repairs to a bridge in Florida.

**12. Unfinished Business:** There was no unfinished business.

**13. New Business:**

- a) Based on the wishes of a majority of members present, the Dallas meeting will be requested for Sunday October 28, 2001, 10:00 AM to 6:00 PM. Primary subjects will be Design Guide, Proposal for Design of Bonded Anchors, and items remaining as new business from ACI 355.2.
- b) Rich Ernst discussed the proposed use by ICBO ES of the ACI 355.2 seismic tests in cracks, with modifications from the 355.2 document and applied also to bonded anchors.
- c) Rolf Eligehausen provided an update on European Commission actions and their effect (little to none) on the status of EOTA anchor technical approvals that contradict the statements on a website supported by a group of anchor manufacturers in the US. There are no planned revisions to ETAG 001. Part 5, Bonded Anchors, is completed by the working group and is in review before the EOTA hierarchy. Approval as written is expected in September. Part 6 for structurally indeterminate attachments is to be developed. They are discussing criteria for stiffness requirements for fastened elements.

Meeting was adjourned at 1:15 PM.

Respectfully submitted  
Richard E. Wollmershauser  
Secretary

Members in attendance: J. Ardahl, R. Bandyopadhyah, P. Carrato, R. Cook, R. Eligehausen, R. Ernst, S. Eskildsen, W. Fuchs, B. Galunic, H. Graves, C. Heinz, R. Klingner, A. Makitka, R. McGlohn, D. Meinheit, M. Miltenberger, D. Niday, R. Orr, J. Pearson, J. Silva, R. Smith, P. Sullivan, H. Wiewel, R. Wollmershauser

ACI Staff: D. Falconer

Guests: E. Barrbeiro, J. Hammell, G. Harstead, D. Istvan, Y-T Ju, J. Kkrohn, S. Kurtz, S-J Kwon, K. Laternser, C. La Vine, R. Malleé, R. McGrath, J. Nasvik, B. Turley, A. Wong