MINUTES – FALL 2006 MEETING
ACI 408 - BOND AND DEVELOPMENT OF REINFORCEMENT
Sunday, November 5, 2006
1:00-3:30 p.m.
Directors J Room
Adam’s Mark Hotel, Denver

Attendance - Members
Adolfo Matamoros, Chair  Leroy Lutz  Matthew Hoehler
Tess Ahlborn  Carl A. Peterson  Ken Leland
Robert Barnes  Max Porter  Frank Nadeau
JoAnn Browning  John Silva  Conrad Paulson
Shih-Ho Simon Chow  M. Keith Thompson  Sami Rizkalla
Doug Cleary  A. Koray Tureyen  Tom Weil
Dave Darwin
Raafat El-Hacha  Attendance – Visitors  TAC Contact/Member
Rolf Eligehausen  Lou Colarusso  David Johnston
Robert Frosch  Lisa Feldman

1. Welcome
Meeting called to order at 1:15 pm by Chair Adolfo Matamoros.

2. Introductions

3. Approval of Agenda
The agenda was approved for this November 5, 2006 meeting.

4. Approval of the minutes from the Kansas City meeting
No corrections to the March 26, 2006 minutes were noted. Motion to approve the minutes by Tess Ahlborn, seconded by Robert Frosch, motion passed.

5. Membership changes
Tess Ahlborn from Michigan Tech will be made interim secretary of ACI 408. While the membership is stable, the committee needs to recruit new voting members. TAC has expressed concern regarding over-representation from one organization and efforts should be made to avoid this as new members are recruited.

21 of 23 voting members have approved the ballot to become a joint committee with ASCE. Adolfo took the request to ACI TAC. TAC has no procedures currently in place to handle such a request. TAC asked for the request to be deferred until they draft and finalize a procedure in place for approving the request.

7. Reorganization ACI Committee 439.

ACI Com. 439 (Steel Reinforcement) has presented a request to TAC to reorganize because they have topics on their agenda which are not part of the original mission of the committee. TAC has asked for the move to be deferred. TAC believes that existing committees may be able to deal with these issues (mechanical development and splices). It seems that the reorganization may not take place. 315 and 408 may pick up these issues.

Thompson suggested that the issues involved may not relate to the mission of 408 in that development length models or equations are not the primary need. Rather acceptance criteria, classification of devices by type, performance requirements for head - bar connections, etc. However, there still are issues of performance criteria (strength and ductility) which relate structural behavior and may best be handled by 408.

Background discussion between Darwin, Colaruso, and Thompson on the specifications of ASTM A970 and how they affect acceptance of various devices. Does 408 wish to delve into the issue of acceptance criteria for the head – bar connection? Recent ICC meeting developments were discussed. Darwin recommended attendance at the ASTM meeting in Atlanta next week.

Some members felt that mechanical splices do not involve bond, so why should this topic be included for discussion by 408. The performance characteristics seem to fall under several modes dealt with by various committees of ACI. Where exactly do splices and mechanical anchors belong? There was much discussion of how much bond occurs. Barnes suggested that headed bars are reinforcement and they do develop in some fashion, therefore they belong in 408.

Conrad Paulson joined the meeting and gave his views and background. 439 took mechanical splices when they emerged. However 439 felt that headed bars belonged in 408. TAC is reluctant to create another committee specifically for mechanical devices. A formal proposal may be made for the Atlanta meeting of TAC. 315 could possibly pick up product availability, while research review and models of behavior could go to 408.

Thompson suggested that whoever deals with head – bar connections should deal with splices. Connection details may require strength and ductility restrictions which do involve structural performance decisions.
David Johnston provided comments and concerns from TAC about bringing splices and headed bars into 408. How will producers be represented in 408? If producers are included, it may cause problems in voting for non-headed bar/splice topics since they will not have the requisite expertise or interest.

Comm. 408 agreed to take on the mechanical splices in terms of bond and development length and it was suggested that Comm. 315 take on the detailing aspects.

8. Update of “Splice and Development Length of High Relative Rib Area Reinforcing Bars in Tension (ACI 408.3-01) and Commentary (408.3R-01),”
LeRoy Lutz

Ballot results were presented for 33 members (7 yes, 5 yes with comment, 3 negative, 2 abstain) 3 negative responders: Robert Barnes, Robert Frosh, and John Silva.

Robert Barnes’ Comments:
1. Definition of \( c_{bb} \)? The committee decided that it is clear cover to the tension face. Barnes: Withdrawn as negative, changed to editorial.
2. Definition of \( c_{si} \) is inconsistent. Defined as clear spacing between bars. Barnes: Withdrawn as negative, changed to editorial.
3. Definition of \( c_{si} \). The statement “\( c_{si} \) may be used in lieu of \( c_{si} + 0.25 \) in to compute \( c_s \)” was moved to the definition for \( c_s \). Barnes: Withdrawn as negative, changed to editorial.
4-8. Editorial comments
9-10. The nomenclature for “tension ties” as used in the document is not the same as the term used in ACI Appendix A. The committee discussed whether to change the term to “tie element” to coincide with Chapter 21. The committee eventually decided to use “tension tie member” as used in Chapter 12 and to cite R12.15.5 of ACI 318 for clarity. Editorial.

Robert Frosh’s Comments: (negative comments only)
1. P2, L7, Addressed through comments by Barnes. Frosh: Withdrawn as negative, changed to editorial.
2. P6, L5-6 negative comment regarding the classes of lap splices in Section 5.1: The meaning of \( \omega = 1.0 \) for Class B and Class C needed clarity. The overall section seemed to need clearer text. David Darwin suggested that the structure of the sections mirrors ACI 318 and should not be changed. Rolf Eligehausen suggested that the previous paragraph be amended to stipulate the value of \( \omega = 1 \)
for class B and C prior to the Class B and C definitions. The committee decided to include additional text for Class B and Class C splices:

Class B splice …………………1.0l_d where l_d is calculated with ω = 1.0

Class C splice …………………1.25l_d where l_d is calculated with ω = 1.0

Frosch: Withdrawn as negative, changed to editorial.

Other: Rolf Eligehausen requested that the first sentence of 5.1 be made to read “Class A, B, or C splices”. The omission of Class C was an editorial oversight. The sentence was corrected.

3. P9, L18-19: In the commentary for Section 5.1 the phrase “which occur at lengths corresponding to Eq. (4.1) with the confinement parameter at a value of 4.” was deleted. The committee agreed it was an editorial change. Frosch: Withdrawn as negative, changed to editorial.

4. P11, L1: In R5.2, the phrase “is less than 1.0 and more than half of the reinforcement is spliced at one location.” The “and” does belong in the phrase because the phrase refers to Class B requirements. The wording needs editorial cleaning, but is technically correct. Frosch withdrew negative.

Other: Figures R4.2.1 and R4.2.2 needed to be updated to reflect revised analysis.

*John Silva's Negative Comments:*

1. P4, L10-11: In section 4.2, the wording was changed as suggested by Silva in comments to clarify the permutations under which maximum f'_c values of 16000 psi or 10000 psi should be used.

2. P 6, L10-11: In section 5.2, the wording was changed to make the section easier to read. John Silva withdrew his negative on the understanding that the problem was primarily editorial and optimal wording would be found later. Further editorial changes will be made to the sections for clarity.

3. P6, L21-22: In section 5.3, the last bullet item, confining transverse reinforcement needed to be clarified. The wording “confining” refers to bars that encircle or surround the bar. A figure will be added to the commentary to clarify the statement.

4. P11, L7-10: In section R5.3, the first sentence was rewritten to be more specific about when lap splices are used in practice with tension members.

John Silva withdrew all of his negatives.

Joanne’s update was moved ahead of item 7. Chap. 2 has been updated. Chap 3-6 have literature reviews completed. Drafts of chapters should be completed before Atlanta.

10. Recommendations for changes in Chapter 12 of ACI 318

Current ACI 318-B work items:

a. CB055 Selection of design values for $f_y$ for steels with nominal yield strengths greater than 80 ksi
b. CB005 Adoption of ACI 408 design procedures for tension and development length
c. CB006 Modification of ACI 318 procedures to regain level of bond reliability on ACI 312-02
d. CB010 and CB010a design of headed bars
e. CB012 Limitation of wire size to D 31.
f. CB018 Evaluation of Development Length at Reactions and Ties of Strut-and-tie Models

David Darwin provided an update from 318-B discussions on the proposed changes to Chapter 12:
Negatives regarding $K_{tr}$ were addressed by clarifying appropriate $f_y$ values.
There were some negatives regarding integrity steel which must still be addressed.
In removing the bar size factor, some negatives arose which must still be addressed.


Adolfo passed out a draft outline for the report and asked the committee to review it. Please provide feedback to Adolfo.

12. Bond of FRP Reinforcement – State-of-the-Art report

No discussion.

13. Research presentations

Shih-Ho Chow gave a presentation on bond performance of reinforcement in fiber reinforced concrete.
14. Other business
No discussion.

15. Next meeting
The next meeting will be held at the ACI Convention, Hilton Atlanta Hotel, Atlanta, GA on Sunday 4/22/07 from 8:30-11:30 am in the Douglas Room.

Adjournment
The committee ran short of time and adjourned at 3:30 pm.