

MEETING MINUTES
ACI 445C – Punching Shear
Sunday, April 17, 2016 1:00 PM
Hyatt Regency & Wisconsin Center
Milwaukee, WI

Present:

Gaur Johnson
Trevor Hrynyk
Neil Hammill
Johannes Furche (V)
Antoni Cladera
Larry Nowak

Remy Lequesne
Katerina Genikomsou (V)
Qiang Yu (V)
Zdenek Bažant
Carlos Ospina

Note: (V): Visitor

Regrets:

Walter Dilger

1. Welcome, Introductions

Ospina welcomed all to the meeting. Attendees introduced themselves.

2. Announcements

Presentation by Johnson to be added to the agenda.

3. Approval of Milwaukee Agenda

Novak moved for approval. Seconded by Johnson. Milwaukee meeting agenda was approved.

4. Approval of Denver (Fall 2015) Minutes

Nowak moved for approval of Denver Fall 2015 meeting minutes. Seconded by Hrynyk. Minutes approved.

5. Presentations and Discussions

- a. ACI 318E Punching Shear Code Change Proposal (Ballot CE 020) (Ospina and Hawkins)

Ospina reported on CE 020 proposal status. Number of negatives from ACI 318E dropped to 4 only. Balloting met the $\frac{1}{2}$ and $\frac{2}{3}$ passing rules. In its latest form, based on input from ACI 318E, as noted by Nowak, the proposal defined a minimum amount of slab flexural reinforcement (expressed in terms of ρf_y) within lines 1.5h on either side of the column to ensure a punching load of $4 \sqrt{f'c} b_o$ (USCS units). For lower reinforcement ratios, the punching failure would be expected to be driven by flexure, and occur at a load below $4 \sqrt{f'c} b_o$. Setting a minimum ρf_y value was considered more practical than calculating the punching capacity of a lightly reinforced slab using yield line theory. The proposed minimum ρf_y value of 600 (psi) applies to interior, edge and corner columns. It translates into a minimum reinforcement ratio of 1% for slabs

with 60 ksi yield steel reinforcement. For existing slabs with low reinforcement ratios, the punching capacity can be estimated as $0.2\alpha_s m$.

Acknowledging situations where slab-column connections are not stressed to their maximum allowable shear strength, it was proposed that the ρf_y requirements be not needed until v_u exceeds $3 \sqrt{f'_c}$. As noted by Nowak, this may be the case of thicker slabs, where the response may not be ductile at all. Hrynyk noted the language in the proposal could be improved.

The revised version of the proposal kept $3/\sqrt{d}$ as the slab depth effect factor for slab depths greater than 9 inches. Nowak agreed with the trigger. The proposal also included the recent work by Dönmez and Bažant in support of the proposed slab depth effect. Tureyen noted that the test data used in the figure showing the slab depth effect correspond to test slabs with some variation in the slab reinforcement ratio. As a result, the figure did not quite isolate the slab depth effect. Hrynyk noted that a double correction may be required. Ospina noted that the proposed depth effect factor was a lower bound and that it reasonably captured the depth effect even for slabs with low reinforcement ratios. Bazant also noted that the smooth formula is probably better than the $3/\sqrt{d}$ factor but expressed no major concerns about using the latter.

b. Joint ACI / *fib* Punching Shear International Symposium (Ospina)

Ospina reported that ACI approved the joint ACI/*fib* international symposium on punching shear in Philadelphia. Three sessions were approved. Session dates/times to be confirmed. The symposium will be held in honor of Neil Hawkins for contributions to punching shear knowledge. ACI Special Publication and possibly a *fib* Bulletin will be produced out of this effort.

c. Status of ACI 445/*fib* WP 2.2.3 Collaborative Punching Shear Test Databank Development Effort (Ospina)

Ospina reported on joint ACI 445C - *fib* WP 2.2.3 activities regarding development of the following punching shear databanks:

Databank A1 (Joint ACI/*fib* Concentric punching shear databank (slabs without shear reinforcement)): Ospina working with Walkner (*fib*). Walkner is using ACI 445 databank as a starting point.

Databank B1 (Eccentric punching at interior columns, monotonic static loading). Ospina assisting Ramos and Sagaseta (*fib*).

Databank B3 (Eccentric punching at interior columns, cyclic loading). Ospina to provide references to Ramos (*fib*).

d. Presentation on Code Requirements for Evaluation/ Repair/Rehabilitation of Concrete Buildings (Johnson)

Johnson presented conditions for safety and assessment of performance and safety in existing slabs. Johnson will be liaison for ACI 562 in ACI 445.

6. Next Meeting

Sunday, October 23, 2016, Philadelphia. Joint meeting expected to take place with that of *fib* WP 2.2.3.

7. Adjournment

Meeting was adjourned at 3 pm.