ACI Committee 548 - Polymers in Concrete Committee Minutes

Calvert B, Baltimore Hilton and Towers

Tuesday, November 2, 1999

Baltimore, MD

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1 ACI 548 MAIN COMMITTEE MINUTES

1.1 Call to Order
Al Kaeding call the meeting to order at about 8:30 am and circulated the committee membership roster, asking everyone to ensure the details were correct, to add E-mail addresses, and to indicate which format they would like to receive E-mail attachments.

1.2 Minutes
The minutes of the Chicago meeting were approved without formal reading.

1.3 Introductions
Everyone present introduced themselves and the organizations that they represented. The following members and guests signed the registration form.

1.3.1 Members

<table>
<thead>
<tr>
<th>Al Kaeding – Chairman</th>
<th>Milton Anderson</th>
<th>Hiram Ball</th>
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<tbody>
<tr>
<td>Paul Carter</td>
<td>James Dikeou</td>
<td>Floyd Dimmick</td>
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<tr>
<td>David Fowler</td>
<td>Bob Gaul</td>
<td>Hank Marsh</td>
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<td>Bob Milliron</td>
<td>Shree Nabar</td>
<td>Yoshihiko Ohama</td>
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<tr>
<td>Richard Prusinski</td>
<td>Bob Rowan</td>
<td>Don Schmidt</td>
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<tr>
<td>Michael Sprinkel</td>
<td>Gerry Walters</td>
<td>Wafeek Whaby</td>
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<td>David Whitney</td>
<td>Dan Edwards</td>
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3.2 Guests

<table>
<thead>
<tr>
<th>Darryl Anderson</th>
<th>Constantin Bodea</th>
<th>Thomas Clapp</th>
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<tr>
<td>Albert Greenberg</td>
<td>Sandra Sprouts</td>
<td>Mike Stenko</td>
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<td>Danold Tragianese</td>
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1.4 Ballot Results for ACI 548.3R
State-of-the-Art Report on Polymer-Modified Cementitious Mixtures was submitted to the committee for approval on July 16, 1999 and the committee was canvassed on August 16, 1999.

Of 52 voting members, 29 voted affirmative, two abstained, and 21 didn't vote. Seven associate members voted, six affirmative and one abstention. Don Schmidt reviewed comments that had been received and most of the editorial would be accepted, but two from Paul Carter would require substantive change and would require re-balloting. After discussion with Paul, one was withdrawn, but the other was valid and will be re-balloted.
1.5 Specifications for Polymer-Concrete Overlays

Al Kaeding circulated four draft specifications. There was considerable discussion on the titles of these documents. After a motion by Michael Sprinkel, seconded by Bob Milliron, and unanimous approval by the members present, it was decided to use a two-letter acronym for each that described the polymer first and the method of application second. So the specifications became:

- Multiple Layer Epoxy Polymer Concrete Overlay – EM
- Slurry/Broadcast Multiple Layer Unsaturated Polyester Polymer Concrete Overlay – PS
- Epoxy Polymer Concrete Premixed with Broadcast Overlay – EP
- Premixed Methyl Methacrylate Based Polymer Concrete Overlay – MP.

The specifications were then discussed. Comments on all the specifications are requested by December 1, 1999 so that they can be balloted for possible submission to TAC for consideration at the spring convention in 2000.

1.5.1 Polymer Concrete Overlay EM

It was pointed out that the test described in ACI 503R could not be used, as this was not a standardized document. It could be added as a note until a standardized test was available. It was suggested that ACI 503 draft a test that ACI could standardize until ASTM developed such a method. There was also discussion on the values listed, Michael Sprinkel is to compare with the AASHTO specification.

1.5.2 Polymer Concrete Overlay EP

There was discussion on the modulus described in this specification. Mike Stenko is to draft a low modulus version. There was considerable discussion on the aggregate gradations and the mixture proportioning.

1.5.3 Polymer Concrete Overlay PS

There was discussion on the level of styrene in the unsaturated polyester.

1.6 State-of-the-Art Report - Precast Sulfur Concrete

There was no committee action on this document.

1.7 Guide for Structural Design of Polymer Concrete

A draft had been circulated in the subcommittee and comments to David Whitney were requested by December 15.
1.8  Subcommitte Reports

1.8.1  548A - Polymer-Modified Concrete
Don Schmidt reported that subcommittee meeting on Monday dealt with the comments received on the balloting of 548.3R (see section 4 of these minutes). At the next meeting, the future of 548A is to be discussed.

1.8.2  548B - Polymer Concrete Overlays
Floyd Dimmick reported subcommittee meeting on Monday dealt with the Polymer Concrete Overlay Specifications. He also reported that one more paper was desired for the technical session to be held in San Diego in the spring of 2000.

1.8.3  548D - Sulfur Concrete
Al Kaeding reported that the chairman Chris Vroom had left the industry and either Garth Fallis or Dave Whitmore would possibly replace Chris as chairman of the subcommittee.

1.8.4  548E - Structural & Design Analysis of Polymer Concrete
David Whitney reported that the subcommittee meeting discussed the Guide (see section 7 of these minutes). He said that the subcommittee needed more members. Dr. Wahby is editing the papers presented in Chicago for possible publication in Concrete International.

1.9  Liaison Reports

1.9.1  ASTM
Gerry Walters reported that C 09 had passed the specification and test methods for polymer modifiers and polymer-modified cementitious mixtures; the numbers were C 1438 and 1439 respectively. The tensile-bond test method had passed at a previous meeting and was numbered C 1404.

1.9.2  ICRI
It was reported that three documents are to be published shortly, (1) on methods of measurements to be used on contracts, (2) hydro-demolition of concrete, and (3) a pull-off test like that in ACI 503R.

1.9.3  ICPIC
Jim Dikeou reported that the next conference is scheduled for May 24, 2001 in Hawaii. There is a call for papers, abstract due to David Fowler by December 1, 1999. ACI is managing the conference. ICPIC is looking for sponsorship from industry organization and financial sponsorship and exhibit booths form the industry.

1.9.4  Other
Dr. Ohama reported on an East Asia Workshop to be held in Shanghai, China November 20, 2000.
Floyd Dimmick reported that a one-day technical session jointly sponsored by ICPIC and CFI was held in Chicago on October 26, 1999.

1.9.5 TRB
Michael Sprinkel reported that two technical sessions are to be held in January 2000, covering PC in the past and PC in the future respectively. There is also a session on sealers. He is looking for persons to give presentations to at the committee meeting.

1.10 Technical Session - New Materials for Polymer Concrete
The committee was reminded on this session that is moderated by David Fowler and is to be held in that afternoon.

1.11 Technical Session - Industrial Flooring
This session is scheduled for the spring convention in 2000 in San Diego. Floyd Dimmick, the moderator for this session, is looking for one more paper. It was noted that this session is being held on Sunday.

1.12 Technical Session - The First 30 Years
This session is scheduled for the Spring Convention in 2001 in Philadelphia. Richard Prusinski, the moderator is looking for presenters.

1.13 The Status of Subcommittee 548A
Discussion was tabled until the next meeting.

1.14 Old Business
There was no old business.

1.15 New Business

1.15.1 It was announced that Deon Kruger is holding a two-day seminar on polymers in repair in June 2000 on South Africa.

1.15.2 Al Kaeding requested the committee to suggest subcommittee tasks.

1.15.3 Al Kaeding announced that Phil Andreas was stepping down as chair of the 548 editorial subcommittee and that Dan Edwards was his replacement.

1.16 Next Meeting
Al Kaeding announced that he had requested that same time for subcommittee and committee meetings for the next convention as those at this convention.
1.17 Adjournment
The meeting adjourned at 11:30 am.

2 Subcommittee 548-A Minutes
Monday, November 1, 1999, 3:30 – 5:00 pm, Boardroom, Hilton Hotel, Baltimore, MD

2.1 Call to order
Don Schmidt called the meeting to order.

2.2 Membership and attendance

2.2.1 Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
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<tbody>
<tr>
<td>Hiram Ball</td>
<td>Ball Consulting Ltd.</td>
</tr>
<tr>
<td>Al Kaeding</td>
<td>CDR Systems Corporation</td>
</tr>
<tr>
<td>Shree Nabar</td>
<td>DAP Inc.</td>
</tr>
<tr>
<td>Yoshihiko Ohama</td>
<td>Nihon University</td>
</tr>
<tr>
<td>Bob Rowan</td>
<td>Robert L. Rowan and Associates</td>
</tr>
<tr>
<td>Don Schmidt</td>
<td>Rohm and Haas Company</td>
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<tr>
<td>Wafeek Wahby</td>
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<tr>
<td>Gerry Walters</td>
<td>Consultant</td>
</tr>
<tr>
<td>David Whitney</td>
<td>University of Texas</td>
</tr>
</tbody>
</table>

2.2.2 Visitors

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stephen W. Hart</td>
<td>EPS Corporation</td>
</tr>
<tr>
<td>Sandra Sprouts</td>
<td>Master Builders Technology</td>
</tr>
<tr>
<td>Donald Tragianese</td>
<td>EPS Corporation</td>
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</tbody>
</table>

2.3 Minutes of Meeting, March 1999.
The minutes of the meeting of Subcommittee 548A of March 1999 in Chicago, IL were approved without formal reading.

2.4 Status of State of the Art Report on Polymer Modified Concrete (PMC), ACI 548.3R-95.
A summary of the balloting for this document was presented by Al Kaeding, which was as follows:

Voting members of Subcommittee 548A

31 members voted
29 members voted to accept the document (some with comments)
2 members abstained from voting
No members voted to reject the document

Associate and consulting members of Subcommittee 548A
7 associate and consulting members voted
6 associate and consulting members voted to accept the document
1 associate or consulting member abstained from voting
No associate or consulting members voted to reject the document

All of the qualifying comments submitted by voting members were editorial in nature except for one comment submitted by Paul Carter Reid, Crowther, and Partners, Ltd., Edmonton, Alberta, Canada) which is quoted as follows:

“p.38 line 15, Limitations: Nothing is said about placing LMC on slopes where the highly workable material may flow and create undulations in the surface. Perhaps the reader should know the way to deal with this potential problem on bridge decks.”

Gerry Walters volunteered to draft a statement to address this point. The section of the document containing this point will then be resubmitted to the committee for voting. This revision must be mailed to the committee members for voting by December 15, 1999 in order for the document to be reviewed by TAC during the Spring 2000 meeting. That timing is a necessity in light of the age of the original document and ACI time requirements for updating documents.

2.5 Old business

There was no old business.

2.6 New business

With the completion of Document 548.3R, there are no immediate needs for other document updates by Subcommittee 548A. The subcommittee will determine whether there are other documents that should be created by ACI in the area of polymer modified concrete. By copy of these minutes, Don Schmidt solicits input from other members of Subcommittee 548A and Committee 548 for recommendations of document that should be written by the subcommittee which would add value to the application area. Please direct input to:

Donald A. Schmidt
Rohm and Haas Company
727 Norristown Road
Spring House, PA  19477
Phone: 215-641-7775
Fax: 215-619-1623
E-mail: Donald_A_Schmidt@rohmhaas.com

3 Subcommittee 548-B Minutes

Monday, November 1, 1999, 8:30 – 10:00 am, Lafayette, Hilton Hotel, Baltimore, MD
3.1 Call to Order
The meeting was called to order by Chairman Dimmick at 8:30 a.m. Members and guests then introduced themselves.

3.2 Membership and Attendance
The following attendees signed the meeting registration form:

MEMBERS (12)
Floyd Dimmick, Chairman  Al Kaeding
H. Dan Edwards, Secretary  John R. Milliron
Milton D. Anderson  Michael M. Sprinkel
Paul Carter  Michael Stenko
David W. Fowler  Wafeek Wahby
Bob Gaul  David P. Whitney

VISITORS (4)
Darryl Anderson  Tom McCall
Ron Heffron  Ray Schutz

3.3 Review of the Minutes from the Spring Meeting
Chairman Dimmick circulated the attendance registration and the 548B roster, asking members to make any necessary corrections to that information. The updated roster is attached to these minutes. The minutes from the Spring meeting in Chicago, IL on March 15, 1999 were then distributed and approved as written following the motion of Milt Anderson and second of David Whitney. The Chairman announced his new affiliation and expressed his commitment to making progress on the work of the subcommittee.

3.4 Status of Publications from Technical Sessions
Chairman Dimmick explained that the proposed editorial review of papers from the Seattle conference simply did not work out, and so their publication by Concrete International is not currently possible. The Chairman expressed the opinion that some of these should be published and proposed that they be combined with papers from the upcoming Spring Convention in a special publication. With the five papers to be given at San Diego, a total of ten could be offered. Al Kaeding said that ten total papers would be enough for a special ACI publication, but that this would have to go through TAC. Chairman Dimmick said he would follow up on this. He advised that each paper would require a review by two peers. Wafeek Wahby was appointed the editor for this process, and Milt Anderson and Floyd Dimmick agreed to be readers.

3.5 Status Report on the “Guide for Using Polymer Concrete Overlays on Industrial Floors”
The Chairman discussed the status of the “Guide for Using Polymer Concrete Overlays on Industrial Floors”. He distributed the completed portion of Chapter 5 (Surface Preparation) and thanked Joe Solomon and John Trout (non-member) for their work on this section. The Chairman will mail the full chapter as soon as it is available. He requested members to read this and return their comments to him by December 28. He will consolidate the comments and send the finished chapter to 548
Chairman Al Kaeding by January 15 for subcommittee ballot on February 21 with ballot return due on March 15.

The Chairman reported that Chapter 1 (Industrial Polymer Concrete Overlays) was not yet completed, but would be soon. He will mail the completed chapter to the membership by the end of November. The same schedule for return of comments and balloting will be used as for Chapter 5.

Chapter 4 (Concrete Defects and Repair) has been authored by David Fowler and Bob Gaul. Dr. Fowler distributed his section and commented that he needed photos to illustrate the defects. Chairman Dimmick agreed to obtain these from John Trout. Wafeek Wahby provided a copy of Bob Gaul’s section to Al Kaeding for copying and distribution at the main committee meeting. Chairman Dimmick said we would follow the same schedule for return of comments and balloting as for Chapters 1 and 5 except that comments on Chapter 4 will be sent to David Fowler by December 28.

The Chairman reported that Chapter 3 (Materials) still needed a section to be written on bisphenol-A epoxies. Bob Gaul agreed to ask Wolfgang Eisenhet to do this. The Chairman asked David Whitney to send him a floppy disk with the completed section on aggregates. Other authors are Jim Maass (methylmethacrylate), Richard Martens (unsaturated polyesters), Shree Nabar (polyureas) and a newly appointed author, John Chec.

The Chairman reported that he had been unable to contact Joe McElroy, the author of Chapter 2 (Evaluation of Concrete). Milt Anderson agreed to try to contact Joe.

Chairman Dimmick distributed a white paper on Fire Retardant Polymer Concrete Systems authored by Bobby Picker, Jr. He said that editing needed to be done by spring. Milt Anderson, David Fowler and Michael Stenko agreed to do this by February 15.

3.6 Status Report on Spring 2000 Technical Session in San Diego
The Chairman reported that five papers have been contributed for the Technical Session on Polymer Concrete Overlays at the Spring 2000 convention. The authors are Richard Prusinski, Floyd Dimmick, David Fowler, Ron Pritt and Stephan. Chairman Dimmick said it would be good to have one more author. Michael Stenko said he would ask Wilfried Riesterer to author a paper.

3.7 Status Report on “Polymer Concrete Overlay Specifications”
The Chairman expressed thanks to Paul Carter and Al Kaeding for their work formatting and compiling comments on the four Polymer Concrete Overlay Specifications (premixed methyl methacrylate, slurry unsaturated polyester, premixed epoxy, and multiple layer epoxy). He then distributed the four drafts for discussion as time allowed.

The discussion began with the Premixed MMA specification. Bob Gaul pointed out that tolerances, a range and/or maximum and minimum values are needed for tables such as 2.3.1 on page 8. Michael Sprinkel said this is done in the Task Force 34 document on this subject. Chairman Dimmick suggested using the Task Force 34 document as a template for the four specifications being considered by 548B. Michael Stenko moved and Michael Sprinkel seconded this motion. It passed unanimously. Chairman Dimmick appointed David Fowler, Michael Stenko, Al Kaeding and Paul Carter as an ad hoc editorial committee that would integrate the Task Force 34 tolerance format into these four specifications. Bob Gaul cautioned the committee to be sure that all property relationships are compatible and not mutually exclusive. He suggested using Task Force 34 guidelines for all property tables. Michael Sprinkel agreed to check the tables for conformance. ACI 548 Committee
Chairman Al Kaeding said he wants these four specifications to go to TAC in the Spring and expressed his intention to mail them on December 15 for a full committee ballot.

A general discussion on Specification titles followed. Al Kaeding suggested that the titles be simplified to Type A, Type B, Type C and Type D with the full description of resin and method contained in the body of the specifications. Michael Stenko said this approach should be used in all current and future specifications, and expressed his preference for letters instead of numbers. The resolution of this subject will be taken up in the full committee meeting.

Comments received from John Robinson on the two epoxy specifications (multiple layer and premixed) were discussed as time allowed. In response to his observation that the specifications seem to be written for high modulus epoxy while most overlays are low modulus, the committee discussed what constituted high, medium and low modulus. Michael Sprinkel said that high modulus epoxy was used in the Task Force 34 specification for premixed epoxy, but that the broadcast or multiple layer epoxy was low modulus. In practice, medium modulus epoxy is the usual choice for premixed epoxy overlays. He said that modulus was traditionally defined by tensile elongation as determined by ASTM D638 on the neat or unfilled resin. Below 5% tensile elongation implied a high modulus resin. Tensile elongations of 5% to 29% implied a medium modulus resin, and tensile elongations of 30% to 80% implied a low modulus resin. Milt Anderson moved and Michael Sprinkel seconded that these definitions be accepted for discussions within this subcommittee.

3.8 Liaison Reports
There were no liaison reports.

3.9 Old Business/New Business/Adjournment
There being no other business, the meeting was adjourned at 10:00 A.M. upon the motion of Milt Anderson and second of Michael Stenko.

4 Subcommittee 548-D Minutes
Monday, November 1, 1999, 10:00 – 11:30 am, Boardroom, Hilton Hotel, Baltimore, MD
(Minutes were not available for this meeting.)

5 Subcommittee 548-E Minutes
Monday, November 1, 1999, 2:00 – 3:30 pm, Boardroom, Hilton Hotel, Baltimore, MD

5.1 Call to order
5.1.1 The meeting was called to order at 2:05 p.m. on Monday, November 1, 1999, by David Whitney.

5.2 Membership and attendance
Members introduced themselves (6 members, 0 visitors)
Richard Prusinski     Al Kaeding
5.3 **Minutes of Meeting, March 1999.**

David Fowler motioned that the minutes of the Chicago meeting be accepted as read. Richard Prusinski seconded that motion.

5.4 **Discussion**

5.4.1 Members discussed the latest draft of the Guide for a Structural Design of Polymer Concrete.

a. Richard Prusinski pointed out that the tone of the Guide is too negative to encourage the use of polymer concrete. Dave Whitney will work on refining it to a more positive approach with Larry Rickels.

b. Al Kaeding is reviewing and digesting a long draft of specifications from Dick Prusinski. He will try to break it into smaller parts to be inserted into the document.

c. Wafeek Wahby handed in comments and additions to the text.

d. Constantin Bodega will send in updated specifications for architectural panels next week.

e. David Fowler will try to contact Van Gamert in Belgium and Terry Capuoni.

f. David Whitney asked that all comments be returned to him before December 15, 1999.

g. David Whitney will return corrected draft to subcommittee by the end of January 2000.

h. Next tasks of subcommittee will be to publish PC Structural Specifications.

5.4.2 Wafeek Wahby agreed to edit structural design oriented papers for publication in C.I.

5.5 **Next meeting**

March 27, 2000 in San Diego, CA.

5.6 **Motion for adjournment**

By David Fowler and seconded by Richard Prusinski at 3:30 p.m.