ACI 362 - PARKING STRUCTURES
Minutes of Meeting

Pittsburgh

October 25, 2010

LIST OF ATTENDEES

MEMBERS	ASSOCIATE MEMBERS	VISITORS
Erich Martz	**Paul Tourney**	**Neal Berke**
Jim Donnelly	**Tony Kojundic**	**Randy Carwile**
Kurt Wagner	**Terry McDonald**	**Roger Alama**
Ned Cleland	**Prakash Surali**	**Don Vaughn**
Carl Walker	**Amy Trygestad**	**Neal Khosa**
Tom Nehil	**Jack Gibbons**	**Larbi Sennour**
Marty Mikula	**Don Kline**	**Paul Noyce**
Mo Iqbal	**Zuming Xia**	**Larry Krauser**
Boris Dragunsky	**Paul Brienen**	**Greg Zeisler**
	Miroslav Vejvoda	
	Rashid Ahmed	
	Mark Luther	

CALL TO ORDER / ATTENDANCE / APPROVAL OF MINUTES

Chairman Martz called the meeting to order at 1:00 p.m. Meeting attendees briefly introduced themselves.

A motion was made and seconded to approve the Chicago, IL meeting minutes as proposed by Marty Mikula

GUIDE SUBCOMMITTE REPORT AND COMMITTEE ACTIONS

Erich Martz reviewed the status of the revised guide document. All but 2 of the primary comments generated by TAC during the review of the Guide document had been resolved at the Spring meeting. Since that time, the editorial comments have been incorporated into the document.

On the morning of this meeting, the guide subcommittee met and reviewed the remaining comments in order to resolve these comments and to provide recommendations to the main committee on how best to handle the outstanding comments. Therefore, the goal of the main committee meeting would be to review the recommendations for resolving the remaining outstanding TAC comments.

A significant portion of this discussion centered on resolving the negatives associated with the two items balloted by the committee in September. The first balloted item involved Section 4.2.2 regarding pozzolans in concrete, where text had been revised to respond to TAC Primary Committee No. 122. Two negatives were received, one from Cleland regarding the over-reliance on coulomb ratings, and one from Iqbal regarding format. After some discussion, the committee decided to remove the last sentence of the section, which was approved Yes - 8, No - 0, A - 0. See attached ballot summary for Section 4.2.2. The approved text includes a listing of possible appropriate test methods for evaluating the benefits of pozzolans in the concrete. Tony Kojundic agreed to provide a listing of appropriate testing methods to be included in the approved text.

The other item balloted by the committee prior to this meeting, which involved Section 4.6.3 regarding membrane systems and was intended as a response to TAC Primary Comment No. 192, was also discussed in detail. As shown in the attached ballot summary for Section 4.6.3, three "affirmatives with comments" and two "negatives" were received. All five of these ballots were discussed, and the resulting revisions to the test balloted by the committee members present. For the balloting of several items, only 7 voting members were present. The section has been revised per the balloted and accepted text, but requires reballoting.

The remainder of this discussion involved other outstanding comments where further input of the committee was required in order to finalize the responses to the TAC comments and to make the appropriate revisions to the documents. A total of 13 such items were balloted, including 5 primary comments where additional information or direction was required, 6 editorial comments involving definitions or references, 4 secondary comments, and one uncategorized comment. All items balloted during this meeting and the voting results are provided in the attached listing of additional items balloted at Fall 2010 meeting.

NEW BUSINESS:

Mo Iqbal suggested that subcommittees could be formed to look further into a few topics that the revised guide touches on. These suggestions included a durability subcommittee to look into defining a durable structure, a materials subcommittee to review the effects of the use of pozzolans on the properties of hardened concrete, and a subcommittee to review the use of membranes. In general, the committee seemed to agree that this was a good idea, but subcommittee membership was not identified, although there were a few volunteers.

NEXT MEETING: Tampa - Monday, April 4, 2011 – 1:00 to 5:00 pm

ADJOURN: A motion to adjourn was made, seconded and approved. Meeting adjourned at 4:30 p.m.

Ballot for Section 4.2.2 Revised Text: September 2010
Document Title: "Guide for the Design and Construction of Durable Concrete Parking Structures" (362.1R)

Name	Pg #	Line #	Vote	Comment	Resolution
Total	0	0	-	Ballot Summary – 18 voting members 12 - Affirmative 1 - Affirmative with comment 2 - Negative 1 - Abstain 2 - Not returned	D'Arcy comment is for Section 4.6.3 ballot
Cleland	1	All	Negative	Coulomb rating is skewed toward use of silica fume. Dense concrete with low water/cement ratios may be completely suitable for durability requirements, but not meet the Coulomb rating test. This should not be stated as the only measure of impermeability.	Do not add text. Delete last sentence of section, and replace with the following: Appropriate testing methods to evaluate the enhanced corrosion protection of concrete containing pozzolans include ASTM C1202, ASTM C1556, …. (ref. Hooten document, new ACI document), and can be used to assess whether the concrete will meet service life goals. Ballot: Yes – 8, No – 0, A - 0 ~~To achieve the desired level of corrosion protection, concrete containing any of the mentioned pozzolans for Exposure Zones II/CC-I and III/CC-II (as defined in Chapter 6, Section 6.1.1) should produce a concrete with a coulomb (charge passed) rating of 1000 or less at 28 days as measured by ASTM C1202.~~
Iqbal	1	All	Negative	The format is not conducive to making any comments. The draft needs to have line numbers so that proper reference can be made to submitting any comments. I wrote to the secretary about it soon after the ballot was opened, but so far the format has not changed. I believe that the section be reballoted with proper format.	See reponse to Cleland comment. Negative withdrawn.

Ballot for Section 4.6.3 Revised Text: September 2010
Document Title: "Guide for the Design and Construction of Durable Concrete Parking Structures" (362.1R)

Name	Pg #	Line #	Vote	Comment	Resolution
Total	0	0	-	Ballot Summary – 18 voting members 10 - Affirmative 3 - Affirmative with comment* 2 - Negative 1 - Abstain 2 - Not returned * D'arcy comment listed on 4.2.2 ballot	
Jacobson	1	22	Affirmative with Comment	Thick systems typically provide greater wear resistance and resistance to damage from snowplows than thin systems. ~~Asphaltic wear courses may have greater resistance to snowplow damage.~~	These ~~Thick~~ systems typically provide greater ~~wear~~ resistance to wear and damage from snowplows than traffic bearing membrane~~thin~~ systems.
	2	6		Add the word "membrane" after the word "subsurface"	Ballot: Yes – 7, No – 0, A - 0 Agree. Text revised accordingly
Nehil	1	All	Affirmative with Comment	Changes made over time in this section require that a few additional adjustments be made for it to make sense. In particular, the sentence "Thick systems provide greater wear resistance than thin systems" needs to be rewritten since we haven't defined thick and thin systems. For that sentence and the following two I suggest: "Asphaltic overlay membrane systems provide greater wear resistance than deck coatings and can have greater resistance to snowplow damage. The disadvantages of these systems include their greater weight and thickness, and their susceptibility to ultraviolet degradation of the overlay at areas exposed to sunlight."	See revised text above.
	1	22			The disadvantages of these systems include their greater weight and thickness, their susceptibility to ultraviolet degradation of the overlay at areas exposed to sunlight, their susceptibility to rutting under wheel loads, and~~as well as~~ the higher expense of initial installation compared to traffic bearing membrane systems. Ballot: Yes – 7, No – 0, A - 0 Text revised accordingly
	2	10		Also, the last sentence of the paragraph on plaza systems should be rewritten as "… identifying the	Unbonded membranes in plaza applications are not recommended due to the difficulty and expense of

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				source of leaks when they develop."	locating~~identifying~~ the source of leaks when~~if~~ they develop. Ballot: Yes – 7, No – 0, A - 0 Text revised accordingly
Donnelly	1	4	Negative	~~The life of parking structures is highly dependent on M~~maintaining membrane integrity throughout the life of the structure can significantly prolong the service life of a parking structure.	Agree. Ballot: Yes – 7, No – 0, A - 0 Text revised accordingly
	2	5		Most plaza subsurface systems incorporate a subsurface drainage layer and~~,~~ multilevel drains~~, and protection board~~ to collect water at both the wearing surface and at the membrane level, and a protection layer to minimize damage to the membrane during construction.	Agree. Ballot: Yes – 7, No – 0, A - 0 Text revised accordingly
Iqbal	1	All	Negative	The difference between the cost and expected life of the membrane system are critical factors in selection process. I disagree that "identifying" the cracks is difficult. Rather, it is consequence of roof leaking which is critical in selecting the type of membrane and the paying for its associated cost. I need an editable copy of the proposed language with line numbers to provide redlines. (In addition, I suggest a subcommittee publish a separate report.)	Withdrawn. Replaced by subsequent detailed comments below.
Iqbal	1	1	Negative	Define the purpose by inserting the following at the beginning of the paragraph: Membrane systems are used to waterproof the parking floor surfaces in order to extend the service life and maintain operations of the parking facility. [Source: Book by Chrest, Smith, Bhuyan, Monahan and Iqbal]. The waterproofing membrane can be either exposed to traffic or it could be protected from traffic. As such, membrane . . . ."	Agree with 1st sentence, with minor revision. Second sentence duplicates subsequent text. Ballot: Yes – 8, No – 0, A - 0 Add this sentence at beginning of section: Membrane systems are used to provide waterproofing of the floor and roof structural systems~~the parking floor surfaces~~ in order to extend the service life and maintain operations of the parking facility. [Source: Book by

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					Chrest, Smith, Bhuyan, Monahan and Iqbal].
Iqbal	1	15	Negative	After full stop, insert: The service life of membrane varies depending on its location on a parking floor. For example, it may last up to 10 years under a car stall, but may last no more than a year with snow plow in drive lane or at turns. This is the least expensive type of membrane available.	Agree, but with modifications. Ballot: Yes – 7, No – 0, A - 0 In lieu of third sentence, Add: ", lower initial cost," at end of line 13. Add: on Line 15 after period: The service life of this type of membrane varies depending on its location on a parking floor. For example, it may last up to 10 years or more in low traffic areas such as parking spaces, but may require annual maintenance in areas of high traffic wear such as turns or entrances, or where exposed to snow plows.
Iqbal	1	23	Negative	Before "The", insert this sentence: The expected service life of the asphaltic overlay membrane is between 15 to 20 year, and with periodic repairs, it may last up to 30 years.	Agree, but with modifications. Ballot: Yes – 8, No – 0, A - 0 Add at end of paragraph: The expected service life of the asphaltic overlay membrane may be between 15 to 20 years, or longer with maintenance and periodic repairs. Also add rutting per response to Nehil comment on pg. 1, line 22.
Iqbal	2	10	Negative	After full stop, insert: This is the most expensive type of membrane and its expected life is more than 30 years.	Agree, but with modifications. Ballot: Yes – 8, No – 0, A - 0 Add this sentence on pg. 2 line 10 after "wear surface.": "This system has the highest initial cost of the membrane systems, but may require less repairs

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					and maintenance, and may have a service life of 30 years or more."
Iqbal	2	11	Negative	I am concerned about the use of word "identifying". The author should clarify it.	Addressed in above response to Nehil comment on Page 2, line 10. Negative withdrawn.
D'Arcy				I recommend changing membrane thickness to 50-70 mils.	Ballot: Yes – 8, No – 0, A - 0 Agree. Replace traffic-bearing membrane thickness "1/8 in. (12mm) or less" on Line 9 with "50 to 70 mils (5 to7 mm)".

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TAC Review: Spring 2010 – Chicago, Illinois
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No.	Pg #	Line #	G/E/P/S	TAC Comment	Committee Response
47	7	9	P	Consider elaborating on intended use. What other uses beyond parking passenger vehicles are there? Does this guide cover them all?	Ballot: Yes – 8, No – 0, A - 0 Agree. Proposed change: Delete "intended use"
122	18	5	P	C1202 may be a poor choice for some projects. Consider removing the 1000 coulomb restriction and placing the qualitative report result ("Very low") from C1202 into the document. Also consider putting some of the caveats from the C1202 into the document – certain admixtures and pozzolans are known to cause issues with the test. Consider referencing some of the other tests for permeability – C1543 (does not have precision and bias), AASHTO T259, etc.	September 2010 Ballot Summary (18 voting members) 13 - affirmative 2 - negative (Cleland, Iqbal) 1 - abstain 2 - not returned Cleland Negative: Coulomb rating is skewed toward use of silica fume. Dense concrete with low water/cement ratios may be completely suitable for durability requirements, but not meet the Coulomb rating test. This should not be stated as the only measure of impermeability. Committee Recommendation: Do not add text. Delete last sentence of section, and replace with the following: Appropriate testing methods to evaluate the enhanced corrosion protection of concrete containing pozzolans include ASTM C1202, ASTM C1556, …. (ref. Hooten document, new ACI document), and can be used to assess whether the concrete will meet service life goals. ~~To achieve the desired level of corrosion protection, concrete for Exposure Zones II/CC-I and III/CC-II should have a coulomb (charge~~

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					~~passed) rating of 1000 or less at 28 days, or at an alternate age if specified, as measured by ASTM C 1202 (6.1.1).~~ Ballot: Yes - 8, No - 0, A - 0. Iqbal negative: Withdrawn
192	26	8	P	Are the various membrane category names given in this document listed officially in any other publication either ACI or elsewhere? The category names are poor and vague, especially the "under or plaza" category. Suggest to use: Elastomeric Membranes for "thin", Composite Asphalt Overlay Membranes for "thick", and Concealed Membranes for "under or plaza"	Spring 2010 Ballot: Yes – 11, No – 0, A – 0 Agree. The names of the systems will be revised. Thin will become "Traffic Bearing Membrane" .typically, between 040 to .125 inches Thick will become "Asphaltic Overlay Membrane" A ¾ inch minimum thickness asphalt wear surface. Under or plaza system will become "Buried Membrane" Section rewritten with revised names, and revised text reballoted to committee 9/10. Fall 2010 Ballot: Yes - 11 Yes with comment - 2 Negative - 2 Abstain - 1 Not returned -2 Negatives resolved with some further text revisions and comments incorporated

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					unanimously at Fall 2010 meeting, but only 7 full committee members present for portions of the balloting. Final revised text: **4.6.3** *Waterproofing membranes*—*Membrane systems are used to provide waterproofing of the floor and roof structural systems in order to extend the service live and maintain operations of the parking facility (Chrest, et al 2001).* Membrane systems for parking applications usually fall into one of three basic system categories: traffic bearing membranes, asphaltic overlay membranes and plaza subsurface membranes. ~~The life of parking structures is highly dependent on M~~maintaining membrane integrity throughout the life of the structure can significantly prolong the service life of a parking structure. Traffic bearing membranes are elastomeric waterproofing membranes bonded to the concrete surface and built up in multiple coats to incorporate a base membrane and an integral wearing surface with skid-resistant properties. The total thickness of the traffic bearing membrane systems is generally 50 to 70 mils (1/3 to 1.8 mm)~~1/8 in. (3 mm) or less~~. Typically, these systems use urethane or neoprene base membranes with urethane or epoxy

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					topcoats incorporating sand or other grit to improve wear and skid resistance. Traffic bearing membranes, sometimes called deck coatings, are the most commonly used membrane systems in the United States and Canada for parking structure applications because of their light weight, lower initial cost, and a thin profile that does not reduce headroom within the structure. Traffic bearing membrane systems should be periodically inspected and repaired (ACI 362.2R). The service life of this type of membrane varies depending on its location on a parking floor. For example, it may last up to 10 years or more in low traffic areas such as parking spaces, but may require annual maintenance in areas of high traffic wear such as turns or entrances, or where exposed to snowplows. Further information regarding traffic bearing membrane systems can be found in ACI 515 documentation. Asphaltic overlay membrane systems usually incorporate a hot applied asphaltic membrane, often 0.060 to 0.120 in. (1.5 to 3.0 mm) thick, bonded to the concrete surface and overlaid with a bonded asphaltic overlay. The asphaltic overlays are often latex-modified to reduce weight and provide wearing course thicknesses of approximately 1-1/4 to 1-1/2 in. (30 to 40

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					mm). These ~~Thick~~ systems typically provide greater ~~wear~~ resistance to wear and damage from snowplows than traffic-bearing membrane ~~thin~~ systems. ~~Asphaltic wear courses may have greater resistance to snowplow damage~~. The disadvantages of these systems include their greater weight and thickness, their susceptibility to ultraviolet degradation of the overlay at areas exposed to sunlight, their susceptibility to rutting under wheel loads, and ~~as well as~~ the higher expense of initial installation compared to traffic bearing membrane systems. The expected service life of the asphaltic overlay membrane may be between 15 and 20 years, or longer with maintenance and periodic repairs. Plaza subsurface membrane systems involve membranes, either bonded or unbonded, protected by wearing course systems that usually are not bonded or integral to the membrane, such as concrete slabs or various types of paver systems. Most plaza subsurface membrane systems incorporate a subsurface drainage layer and~~,~~ multilevel drains~~, and protection board~~ to collect water both at the wearing surface and at the membrane level, and a protection layer to minimize damage during construction. Plaza subsurface membrane systems over air conditioned (heated or

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					cooled) occupied spaces may also include rigid closed-cell thermal insulation in addition to the membrane, drainage layer, and wear surface. This system has the highest initial cost of the membrane systems, but may require less repairs and maintenance, and may have a service life of 30 years or more. Unbonded membranes in plaza applications are not recommended due to the difficulty and expense of locating~~identifying~~ the source of leaks when~~if~~ they develop. For a more complete discussion of membrane systems, refer to ACI 515.1R, "A Guide to the Use of Waterproofing, Damproofing, Protective, and Decorative Barrier Systems."
342	50	2	P	Provide a reference for the statement "cracks are wider and more widely spaced with epoxy-coated bars than with uncoated bars."	Ballot: Yes - 8, No - 0, A - 0 Agree - Reference to ACI SP 225 added.
398	70	5	P	ACI 504 documents should not be referenced in any new ACI document. ACI 504 has been discharged and their documents are no longer maintained. They are being kept for historical purposes and you may still purchase them in electronic format, but they should not be referenced any longer. Consider a new reference or delete this reference.	Agree. Delete reference. Committee question: is there another reference we should be making? ASTM C1193 - Standard Guide for Use of Joint Sealants. Ballot: Yes - 8, No - 0, Abstain - 0
37	6	19	E	Definition submitted: **pretopped**—plant-manufactured, precast prestressed concrete member, most commonly a double-tee that has an increased flange thickness in lieu of a field-placed concrete topping.	Ballot: Yes - 8, No - 0, Abstain - 0 Agree. ITG definition preferred, but with minor modifications.

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				CT definition: This term is not currently defined in the CT. Other ACI definitions: 362.1R-97(02): **Pretopped**—A term for describing the increased flange thickness of a manufactured precast concrete member (most commonly a double-tee beam) provided in the place of a field-placed concrete topping. (Definition by ACI 362.) ITG-7-09: **pretopped**—a manufactured precast concrete member that does not require a field-placed concrete topping. Definition in Process: 550.XR: **pretopped system—**a precast flooring system that employs a thickened top flange and eliminates the requirement for field-placed topping. Discussion: The ITG-7-09 definition is the most general and the most accurate for all pieces of precast concrete. However, it does not discuss pieces like double tee wall panels – whether they are cast with a flange that is as thick as a pretopped double tee or not, they are never "pretopped". Document Recommendation: Suggest using a slight modification to the ITG-7-09 definition: **pretopped**—plant-manufactured, precast, prestressed, near-horizontal concrete member that does not require a field-placed concrete topping. ACI Concrete Terminology Recommendation: No change – do not add to the ACI CT.	**pretopped** - plant-manufactured, precast, ~~prestressed~~ concrete floor or roof member that does not require a field-placed concrete topping.
39	6	21	E	Definition submitted: **tooled joint**—a groove tooled into fresh concrete using a concrete jointer tool to control the location of shrinkage cracks.	Disagree. Definition explains method of joint preparation, not type of joint (i.e., contraction). Tooled joints often serve as either contraction

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				CT definition: This term is not currently defined in the CT. Other ACI definitions: 362.1R-97(02): **Tooled joint**—A groove tooled into fresh concrete with a concrete jointer tool to control the location of shrinkage cracks. See contraction joint. Discussion: Consider editing the document to use "tooled contraction joint" where "tooled joint" is used. This is a better solution than defining tooled joint. Document Recommendation: **joint, contraction** — formed, sawed, or tooled groove in a concrete structure to create a weakened plane to regulate the location of cracking resulting from the dimensional change of different parts of the structure. ACI Concrete Terminology Recommendation: No change. CT has the above definition for a contraction joint.	or construction joints. Proposed text: **tooled joint** - a groove placed into fresh concrete using a concrete jointer tool and often installed to form a contraction joint or prepare a construction joint ~~weakened plane intended to control the location of cracks~~. Ballot: Yes - 8, No - 0, Abstain - 0
172	23	11	E	Please provide more recent references if available.	Disagree. Reference is still relevant. Iqbal to provide newer references.
187	25	7	E	Please provide more recent references if they are available.	Disagree. Reference is still relevant. Iqbal to provide newer references.
204	28	11	E	Is Santoprene used as a generic term or as a proper noun? If this is a proper noun, the TM symbol should be used.	Agree. Will be added.
368	64	5	E	Section 7.3.1 – Consider referencing ITG 7-09 for precast tolerances.	Agree. Need title.
123	18	2	S	I would disagree that the use of pozzolans can enhance the "finishing" of concrete.	Agree. Delete "finishing". Ballot: Yes - 8, No - 0, Abstain - 0
137	19	12	S	…only after verifying that the chemical content complies with specifications.	Agree. Add: "of the concrete mix" after "content". Ballot: Yes - 8, No - 0, Abstain - 0

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169	22	12	S	Reword as follows: "…placing, finishing, curing process, and hardened properties of concrete should be…"	Agree. Ballot: Yes - 8, No - 0, Abstain - 0
243	32	9	S	Add sentence: interaction between the separated parts during seismic events must be evaluated to avoid slapping effects.	Agree. Propose adding the following sentence to the end of Line 4: The gap width of an expansion joint separating adjacent segments should consider the effects of volume change and seismic pounding. Ballot: Yes - 8, No - 0, Abstain - 0
372	65	11		and line 12 Rephrase sentence.	Disagree. Sentence seems clear. Move last sentence to beginning of paragraph to help clarify.

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