AGENDA

Responsibility in Concrete Construction Committee

Marriott New Orleans
New Orleans, Louisiana

Sunday, November 8, 2009
2:00 P.M. – 5:00 P.M.
Balcony K

MEMBERS

Jeffrey W. Coleman, Chair
Mark A. Campo, Staff Liaison

Dennis C. Ahal    Mohammad Iqbal    Matthew A. Offenberg
Kenneth B. Bondy William M. Klorman    Joseph C. Sanders
Ronald Burg    Jim E. Kretz    Michael J. Schneider
Boyd A. Clark    Colin Lobo    Ava Shypula
Peter Emmons    Kevin A. MacDonald    Eldon Tipping
Beverly A. Garnant    Thomas Malerk    Christopher Paul Mosley
Geoffrey Hichborn

1.0 CALL TO ORDER AND CHAIR’S OPENING REMARKS

2.0 APPROVAL OF MINUTES – Sunday, March 15, 2009, San Antonio, Texas

3.0 MEMBERSHIP

Chair Coleman will announce four new members to the RCC Committee, whose memberships became active at the conclusion of the Spring 2009 Convention: Dennis Ahal, Kevin MacDonald, Joseph Sanders, and Michael Schneider. All members of the Committee are asked to verify that their information on the roster (Exhibit A) is correct.

4.0 COMMITTEE ACTIVITIES
4.1 RCC Committee Activity Report to the Board of Direction (Exhibit B)

4.2 Committee Assistance with TAC Review Process

Two mandatory-language documents were up for review during the Fall 2009 TAC Document Review cycle: Specifications for Concrete Environmental Containment Structures (ACI 350.X), and Code Requirements for Evaluation, Repair, and Rehabilitation of Existing Concrete Buildings (Chapter 4) (ACI 562). Reviewers for these documents will discuss any responsibility issues that they commented on during the reviews.

4.3 Responsibility in Concrete Construction Document

4.3.1 Document Status

A draft of the document, as reviewed at the Spring 2009 Convention in San Antonio, is attached (Exhibit C). Additional input has been provided by Ava Shypula regarding testing/inspection agencies (Exhibit D) and from Kevin MacDonald regarding prescriptive vs. performance specifications (Exhibit E). An edit of the document from Geoffrey Hichborn to conform to the ACI Style Manual was not received.

4.3.2 Board Approval Process

Once consensus on the document is achieved, an item on the Board Agenda will be requested, and the document will be included as an Exhibit. The final version of the document must be completed in time to be included on the Board Agenda (late January) for the Spring 2009 Convention in Chicago. At the Board meeting, the Committee Chair or a designate will present a brief discussion of the document and request that the Board make a motion to endorse the document. If this motion is made and seconded by a Board member, the Board will vote on endorsing the document. Based on previous documents submitted by RCCC to the Board for endorsement, the document should not have to go through the TAC review process.

5.0 NEW BUSINESS

6.0 ADJOURNMENT

ATTACHMENTS:

Exhibit A – RCC Committee roster
Exhibit B – RCCC Activity Report to the Board of Direction
Exhibit C – Draft responsibility document
Exhibit D – Draft of Section 9 content from Ava Shypula
Exhibit E – Draft of Appendix A content from Kevin MacDonald
MEMBERSHIP ROSTER

Responsibility in Concrete Construction Committee

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<tbody>
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Exhibit B-1

Board Committee: Responsibility in Concrete Construction

Chair: Jeff Coleman

Staff Liaison: Mark Campo

Date: 9/15/09

BOARD COMMITTEE ACTIVITY REPORTS
(Including Advisory Committees and Task Groups)

In an effort to get Board committees to think strategically, the Board of Direction has requested that Board committee Chairs/Staff Liaisons provide a summary report on the five items listed below, including expected dates for completion, as appropriate.

1. **Committee’s Major Goals / Objectives for Next 12 Months** – (up to five)
   (with expected target dates for completion)
   - Finalize the new responsibility document, “Responsibility in Concrete Design and Construction,” at or soon after the meeting in New Orleans.
   - Submit the new responsibility document to the Board of Direction for approval at the Spring 2010 convention in Chicago, IL.
   - Review ACI mandatory language documents and identify issues related to assignment of responsibility (as needed).

2. **Summary of Activities of Importance at Spring 2009 – San Antonio**
   (highlight major items from last meeting minutes & action taken. Example: Examine viability of maintaining two ACI Journals—No consensus was reached, this item will be placed on the agenda for the next meeting)
   - Reviewed progress and discussed additions/changes to new responsibility document.
   - Discussed and concluded that the issue of concrete performance specification approval by a licensed design professional should be addressed in the new document.

3. **Intervening Actions Since Spring 2009 Convention— San Antonio**
   - Reviewed ACI 301, “Specifications for Structural Concrete,” and ACI 332, “Code Requirements for Residential Concrete and Commentary,” during special off-cycle review.
   - Continued developing draft of new responsibility document.

4. **Summary of Anticipated Activities at Fall 2009 Convention — New Orleans**
   (i.e. highlight major items on current meeting agenda)
Finalize the text for the new responsibility document in time to include the document as an exhibit in the Spring 2010 Board of Direction meeting agenda.

5. **Status of Outstanding Board Assignments**

- The committee is proceeding with review of mandatory language documents for assignments of responsibility.
Responsibility in Concrete Construction
A Report by the ACI Responsibility in Concrete Construction Committee

1. INTRODUCTION

This document is intended as a guide for defining responsibilities of the various parties involved in concrete construction. The responsibilities of each party in a concrete construction project should be adequately described in the contracts between the parties. It is important that the party controlling that process (usually the Owner or an Owner’s representative) make certain that the responsibilities of the parties are clear, coordinated and consistent. Clarity and consistency in the responsibilities defined in the contracts will reduce disputes over responsibility. This document is not intended to supersede the contracts between the parties, if there are inconsistencies between the parties’ contracts and responsibilities defined in this document, then the contracts between the parties govern the relationships and responsibilities.

The user of this document is encouraged to also review this committee’s report published in September 1995 in Concrete International. In particular the Committee continues to endorse the concept that responsibility should only be assigned where authority is also assigned and that each party should take responsibility for its own work.

Question: Should we add a section that acknowledges C94 and PCI Design Handbook? Example:

Other industry documents define responsibilities in Concrete Construction. ASTM C94 contains Section 6, “Ordering Information” that applies “In the absence of designated applicable general specifications” and must be complied with if specified in the Contract Documents. Notably C94 contains “Options” A, B and C that define the information that must be supplied depending on who will be responsible for the mix design. The PCI Design Handbook contains Section 10.4 “Recommendations on Responsibility for Design and Construction of Precast Concrete Structures” that provides guidance in the area of precast construction particularly regarding the
interaction and responsibilities of the Engineer of Record and the Specialty Structural Engineer who often works for the precast concrete subcontractor.

2. Responsibilities of the Owner.

2.1 Ultimate Responsibility for the Entire Project.

As the final decision making authority, the Owner has ultimate responsibility for the entire construction project. Directly or indirectly all parties in the process report to the owner.

2.2 Define the Project

The Owner is responsible for project definition, which includes establishing the scope and objectives of the project, the overall budget and project schedule. Further, the Owner is responsible for clearly communicating project requirements to the Design Professional developing the plans and specifications for the project. Should the project requirements be changed, the Owner must be prepared to accept the costs and/or schedule consequences of the changes.

2.3 Provide Funding for the Project

Before entering into any stage of the project, the Owner must ensure that required funding, including a reasonable contingency reserve, is available.

2.4 Provide needed real estate, rights of way, permits, and insurance.

The Owner will provide the building site, all rights of way and easements for site access and utilities, all required construction related permits and insurance, unless otherwise delegated in the contract documents.

2.5 Beyond legally established codes and regulations, the Owner establishes quality and performance standards for the project.

The scope and objectives of the project, set forth by the Owner in contract documents, shall establish the quality level expected of the construction and any performance standards required by the Owner.

2.6 Establishes system for overall project management.

It is the Owner’s responsibility to establish the overall project management structure and clearly enunciate management and decision-making authority.
2.7 Selects key designers, managers, and contractors.

The Owner should establish and follow a fair and ethical procedure for selection of key members of the design and construction team.

2.8 Establishes quality assurance program

2.9 Provides overall site safety and security.

2.10 Makes agreed upon payments as project goals are met.

2.11 Accepts the completed project.

3. **Responsibilities of the Design Professional**

3.1 Perform all contractually required professional services including designing the work in accordance with the standard of care.

Design Professionals have the responsibility to perform their services in accordance with the “Standard of Care.” The Standard of Care is generally determined on a case-by-case basis; however, it can be defined in the contract between the parties. If not defined in the contract between parties, it is generally defined as the “the exercise of the skill and judgment which can be reasonably expected from similarly situated professionals” and “to exercise such care, skill, and diligence as men in that profession ordinarily exercise under like circumstances.” Add Case Cite Thus, the Standard of Care creates a responsibility on the part of the Design Professional to perform their services in the same manner that a prudent designer would perform their services in a similar geographic area and in a similar time frame.

3.2 Code Compliance with Applicable Codes.

Design Professionals have a responsibility to design the project in accordance with applicable codes. However, there may be instances where the building code represents a minimum design standard. In those cases, the applicable Standard of Care may require that the Design Professional exceed minimum code requirements.

3.3 Coordinate with Other Design Professionals.

A lead Design Professional has a responsibility to coordinate its work with other subconsultant Design Professionals. However, if the Owner has retained other Design Professionals under direct contract with the Owner, then the Owner has a responsibility to designate which of the multiple prime Design Professional
has the responsibility to coordinate with the work of the various multiple prime Design Professionals.

3.4 Prepare Analytical and Design Justification (calculations) used for the preparation of Design Documents.

The Design Professional has a responsibility to prepare design calculations as appropriate and consistent with the Standard of Care. The Design Professional does not have a responsibility to issue or publish those calculations unless required by the contract documents, applicable codes, regulations or laws.

3.5 Provide Design documents for Construction, which should, at a minimum, include but not limited to; drawings and specifications.

The design documents are not expected to be perfect; however, the design documents should be adequate to describe the intended final outcome of the project and the final performance criteria of the components of the project and the over completed project.

3.6 Issue Material Specifications and Installation Specifications Considering Local Practice.

The Design Professional has a responsibility to specify the types of materials required for the project. The Design Professional should specify installation procedures that are necessary for the proper completion of the project. However, the Design Professional is not responsible for specifying the Contractor’s means, methods, techniques, sequences, or procedures, as those are the responsibility of the Contractor. There are however, instances where Design Professional musts specify means, methods, techniques, sequence and procedures so that the Contractor understands not only the materials to be provided for the project, but how these materials are to be installed so as to meet the Owner’s final criteria. The Concrete mix, placement and curing shall be specified by the Design Professional in a prescriptive method detailing all requirements that are necessary for the intended strength and durability. Alternatively the Design Professional may specify the Concrete mix, placement and curing using performance based criteria. The Design Professional may, where necessary, specify a combination of prescriptive and performance based criteria. The responsibility of the Design Professional in a combined performance and prescriptive specification is to specify criteria that are consistent, compatible and possible to perform. (See Appendix A for Prescriptive vs. Performance specifications) [Where is Appendix A???---needs discussion/development---Use Canadian Chart???)
3.7 Provide field Observation if required in the Owner’s Contract and/or Applicable Codes, Regulations, or Local Laws.

The Owner is responsible for determining the amount of field observation that the Design Professional will provide, and the Owner is responsible for paying an adequate fee to allow such field observations.

3.8 Perform all Inspections, Observations, and Reviews of Construction On-Site if required by the Contract or Applicable Codes, Regulations, or Laws.

3.9 Perform Shop Drawing Review in Accordance with the Terms and Conditions of the Contract Between the Design Professional and the Owner.

3.10 Understand and convey the Owner’s requirements in the Plans and Specifications.

The Design Professional should endeavor to fully understand the Owner’s requirements; however, the Owner has a responsibility to communicate those requirements and also has the responsibility to accept the cost and/or schedule consequences of changes in those requirements.

3.11 Review submittals for general contract compliance if required by the contract between the owner and the design professional.

3.12 Either perform or designate who will perform special inspections required by building codes, if applicable.

4. RESPONSIBILITIES OF GENERAL CONTRACTOR

Definition: A general contractor is a contractor whose scope of work includes the construction of all or a portion of the work. This work is described in the “general contract documents”.

4.1 Construct the building in accordance with the contract documents and with the appropriate standard of care for general contractors in the geographical area of the work.

4.1.1 Contractors have no direct responsibility to engineering design requirements found in building codes.

4.1.2 Contractors conform to code design requirements by building in accordance with the contract documents.

4.1.3 Contractors have a right to assume that contract documents contain all applicable code and other requirements.
4.2 Call attention to any obvious errors or discrepancies in the contract documents.

4.3 Make agreed upon payments to subcontractors and material suppliers as project goals are met.

4.4 Enter into contracts with sub-contractors that are consistent with the contract document requirements between the General Contractor and the Owner. Develop, maintain and manage the overall project schedule and coordinate the work of subcontractors and material suppliers.

4.5 If a Prescriptive Specification is used, make sure that all requirements are passed on to the appropriate sub-contractor and/or material suppliers. If a Performance Based specification is used, determine who will be responsible for developing mix designs or other criteria that will achieve the specified performance criteria. If a combination of prescriptive and performance criteria are specified the Design Professional is ultimately responsible for the specification however the General Contractor should communicate with the Owner and Design Professional in writing if it becomes known to the Contractor that the combined prescriptive and performance criteria are inconsistent, incompatible or impossible to perform.

4.10 Develop, maintain and administer a site safety program for the work

5. Responsibilities of the Design-Build Contractor

5.1 A Design/Builder is an entity who undertakes a combination of both design and construction for either an entire project or a significant portion of one.

5.2 Responsibilities include all those associated with the design as well as with the execution of the work. This relationship also includes the coordination of the design with the construction to eliminate the risk to the owner for gaps, errors or conflicts.

5.3 The entity that undertakes a contract under this form may be a Constructor, a Designer (Architect or Engineer), a Developer or some other organization.

5.4 All design work must be done by properly licensed professionals authorized to work in the location of the project. This is true whether design is done “in house” or contracted to third parties by the Design/Builder.

5.5 Inspection and Testing for Quality Assurance and for conformance to the completed plans and specs should be within the Owner’s scope of responsibility to eliminate any appearance of conflict of interest.
6. Responsibilities of the Subcontractor
One whose scope of work includes construction of a limited portion of the project.

4.1 Construct the building in accordance with the contract documents and with the appropriate standard of care for subcontractors in the geographical area of the work.

4.1.1 Subcontractors have no direct responsibility for engineering design requirements found in building codes.

4.1.2 Conform to code design requirements by building in accordance with the contract documents.

4.1.3 Subcontractors have a right to assume that contract documents contain all applicable code and other requirements.

4.2 Call attention to any obvious errors or discrepancies in the contract documents.

4.3 Make agreed upon payments to sub-subcontractors and material suppliers as project goals are met.

4.4 Enter into contracts with sub-subcontractors or material suppliers that are consistent with the contract document requirements between the General Contractor and the Subcontractor.

4.5 If a Prescriptive Specification is used, provide concrete and construction in compliance with the contract documents and make sure that all requirements are passed on to the appropriate sub-subcontractor and/or material suppliers. If a Performance Based specification is used, provide concrete and/or construction to achieve the specified performance criteria including all necessary design if required. If a combination of prescriptive and performance criteria are specified the Design Professional is ultimately responsible for the specification however the Subcontractor should communicate with the General Contractor in writing if it becomes known to the Subcontractor that the combined prescriptive and performance criteria are inconsistent, incompatible or impossible to perform.

4.10 Comply with the General Contractor’s safety program and if required, develop, maintain and administer a site safety program for the subcontractor’s work that is consistent and coordinated with the General Contractor’s safety program.

7. Responsibilities of Specialty Subcontractors
Definition: A specialty subcontractor is one whose scope of work includes the construction and the design of a portion of the completed work. The specialty
subcontractor retains a licensed design professional to execute the delegated design work. Examples would include the design and construction of precast concrete elements or the design of and construction of all or part of cast-in-place post-tensioned floor systems.

7.1 Retain the services of a design professional (specialty engineer) with demonstrated expertise and/or experience in the type of work to be designed. Responsibilities of the specialty engineer include:

   o Design the work in accordance with the standard of care for the design of similar works in the same geographic area.
   o Prepare plans and specifications for the work that incorporate all applicable building code requirements, laws, and ordinances.
   o Perform all contractually required inspections, observations, and reviews of placing and/or shop drawings.

7.2 Review the design for obvious errors or differences from generally accepted standard practices.

7.3 Construct the work in accordance with the plans and specifications prepared by the specialty engineer.

7.4 Construct the work in accordance with the standard of care for the work involved and in accordance with standard practices of similar subcontractors in the same geographic area.

8. **RESPONSIBILITIES OF THE CONCRETE MATERIAL SUPPLIER.**

Responsibilities of the concrete material supplier include:

8.1 Use ingredient materials that comply with pertinent specifications.

8.2 Manage materials and production practices that facilitate quality and maintaining batch to batch uniformity.

8.3 Maintain production facilities to include concrete plants and mixer trucks in conformance with pertinent standards (ASTM C 94, AASHTO M157).

8.4 Maintain documentation of ingredient materials certifications and quality tests to be provided to the purchaser on request.
8.5 Conform to industry best practice, as presented in the requirements of ASTM C 94, for production and delivery of concrete when no specification or contract is invoked for the job.

8.6 Supply concrete in accordance with the order made and in conformance to the standard of care for materials suppliers in the geographic area or the work. All requirements in a specific contract override the requirements of reference standards such as ASTM C 94.

8.7 Material suppliers have no direct responsibility for engineering design.

8.8 Materials suppliers have no direct responsibility for compliance with requirements in building codes if these are not addressed in contract documents.

8.9 The material supplier has the responsibility to communicate potential errors, omissions and conflicts in contract documents if they have such knowledge relative to the standard of care in the geographical area of operation, or relative to constructability or service conditions of the structure.

8.10 When the contract or job specification assigns prescriptive provisions to the composition of the concrete mixture, the concrete producer has no responsibility for the resulting performance of the fresh or hardened concrete.

8.11 When the contract or job specification assigns a combination of prescriptive and performance provisions on the concrete mixture, the producer is responsible for furnishing material to the more restrictive criteria but will not be responsible for any performance characteristic that was intended and not defined by the prescriptive limit.

8.12 When the contract or job specification assigns performance criteria to the concrete mixture, these need to be clearly defined and it is the responsibility of the concrete producer to demonstrate compliance in accordance with the criteria set forth in the contract. In such cases the producer has the right to retain confidentiality of the mixture composition especially when there has been a significant cost and/or effort associated with establishing the mixture composition to achieve the required performance.

8.13 The material supplier has the responsibility to report information and furnish documentation that is required in the submittals section of a contract or job specification.
8.14 The concrete producer cannot be responsible for product quality or complying with the order made when additions or modifications are made by the purchaser over and above that permitted by the standards.

8.15 Provide concrete (or other specified materials) that are consistent with the requirements of the Prescriptive Specification. If a Performance Specification is used, develop a concrete mix (or other materials) that will achieve the performance criteria specified and will meet any supplemental requirements of the Concrete Installer (See Appendix A).

9. Responsibilities of the Testing/Inspection Agency

9.1 Gather and comply with applicable code requirements and project specifications for testing and inspection.

9.2 Comply with qualification and licensing requirements.

9.3 Conduct testing and inspection in accordance with applicable standards.

9.4 Report test results as required by the project specifications.

10. Responsibilities of the Forensic Consultant [This is written as if the forensic consultant is only involved in materials investigations. Obviously there are many more things that forensic consultants investigate. This really needs more work] Add qualification re/ only if needed etc.

10.1 A forensic consultant is an entity which investigates failures or alleged deficiencies associated with the design or construction of the work. A forensic consultant may also investigate quality control of construction materials and/or practices.

10.2 The forensic consultant must have specialized expertise and experience in the area of his/her assignment. This could include design, construction, or materials issues.

10.3 The forensic consultant is responsible for assuring that the techniques used during an investigation are reliable and generally accepted by the relevant scientific, engineering, or construction community.

10.4 The forensic consultant must consider all relevant standards and codes during the investigation.

10.5 The forensic consultant must coordinate and communicate closely with the client (or client’s agent). The client may be an attorney, owner, materials supplier,
constructor, architect, engineer or developer. [most forensic consultants are retained by attorneys]

10.6 The forensic consultant must act independently of the client to ensure that the data is not biased. Forensic consultants must not become advocates.

10.7 The forensic consultant must report all of the data and other information collected during the investigation to the client (or client’s agent). This could include site observations, photographs, field notes, calculations, reference documents, and any other materials used in the investigation. A written report should be provided if requested by the client. [Many forensic retainers do not involve written reports]

ADD REFERENCES?? (FOR EXAMPLE, SEE PCI DOCUMENT)

ADD DEFINITIONS??
Testing and Inspection Responsibilities

**Contractor’s Responsibilities.** The Contractor shall be responsible for qualification of personnel, the Contractor’s inspection, and performing work in conformance with the requirements of this code and contract documents.

1) Inspection

**Inspection and Contract Stipulations.** For the purpose of this document, contractor’s inspection and testing, and verification (by the owner) inspection and testing shall be separate functions.

2) Quality Assurance

**General** – Concrete materials and operations may be tested and inspected by Owner as work progresses. Failure to detect defective work or material by the Owner’s agency will not prevent rejection if a defect is discovered later nor shall it obligate Architect/Engineer for final acceptance.

3) **Testing responsibilities of Contractor**

The use of Owner’s testing services will not relieve Contractor of the responsibility to furnish materials and construction in compliance with Contract Documents.

**Duties and responsibilities.** Unless otherwise specified in Contract Documents, Contractor shall assume the duties and responsibilities given below.

- Qualify proposed materials and establish mixture proportions.
- Allow access to the project site or to the source of materials and assist Owner’s testing agency in obtaining and handling samples at the project site or at the source of materials.
- Advise Owner’s testing agency at least 24 hours in advance of operations to allow for completion of quality tests and for assignment of personnel.
- Provide and maintain adequate facilities on the project site for safe storage and initial curing of concrete test specimens as required by ASTM C31/C31M for the sole use of testing agency.
- The Contractor shall be responsible for qualification of personnel, the Contractor’s inspection, and performing work in conformance with the requirements of this code and contract documents.

**Contractor’s Inspector.** This inspector is the duly designated person who acts for, and in behalf of, the Contractor on all inspection and quality matters within the scope of the contract documents.

**Contractor’s Inspection.** This type of inspections and tests shall be performed as necessary prior to concrete operations and during and after concrete operations to ensure that materials and workmanship meet the requirements of the contract documents. These inspections and testings shall be the responsibilities of the Contractor unless otherwise provided in the contract documents.

4) **Testing agencies.**

Agencies that test concrete materials shall meet the requirements of ASTM C 1077. Testing agencies that test reinforcing steel shall meet the requirements of ASTM E329. Testing agencies shall be accepted by Architect/Engineer before performing any work. Field tests of concrete shall be made by an ACI Concrete Field Testing Technician Grade 1 certified in accordance with ACI CPI or equivalent. Equivalent certification programs shall include requirements for written and performance examinations as stipulated in ACI and CPI.
Verification Inspector (Owner’s inspector). This inspector is the duly designated person who acts for, and in behalf of, the Owner or Engineer on all inspection and quality matters within the scope of the contract documents.

Items to be Furnished to the Inspector. The Inspector shall be furnished complete detailed drawings and specifications.

Inspector Notification. The inspector shall be notified in advance of the start of operations subject to inspection and verification.

Inspector Requests. The Contractor shall comply with all requests of the Inspector(s) to correct deficiencies in materials and workmanship as provided in the contract documents.
<table>
<thead>
<tr>
<th>Specification Method</th>
<th>Designer Responsibility</th>
<th>Installer Responsibility</th>
<th>Supplier Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescription</td>
<td>The designer shall designate the cement content and composition, the water:cement ratio, the aggregate properties and any other requirements</td>
<td>Comply with the specifications as to installation, and to review the proposed mixtures and ensure that they are compatible with the proposed methods of construction. Where an incompatibility is identified bring it to the attention of the designer for resolution.</td>
<td>The supplier is to provide concrete in compliance with the specification. There is no supplier responsibility for the properties of the concrete.</td>
</tr>
<tr>
<td>Performance Based Specification</td>
<td>The designer is to designate an exposure condition, as defined in ACI318 -08, for each portion of the structure, and any other performance criteria which is required for performance.</td>
<td>Comply with the specifications as to installation, and to review the proposed mixtures and ensure that they are compatible with the proposed methods of construction. Where an incompatibility is identified bring it to the attention of the designer for resolution.</td>
<td>The supplier proportions the mixture to meet the designers performance criteria in the hardened state, as well as to the installers requirements for plastic concrete to meet the proposed construction methods, including pumping and placing</td>
</tr>
<tr>
<td>Mixed Method</td>
<td>This option should not be considered as it does not clearly define the responsibility of either party.</td>
<td></td>
<td></td>
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</tbody>
</table>