



American Concrete Institute

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Meeting Minutes
ACI Committee 370, Blast and Impact Load Effects
Quebec City, Canada
April 24, 2019

Mission: *Develop and report information on the design of concrete structures subjected to blast, impact, and other short-duration dynamic loads.*

Committee Members (Voting)

Adeola Adediran*
Bill Bounds (secretary)
Kennan Crane *
Ahmed Elremaily**
Bradley Foust**
Tarek Kewaisy**
Alan Lloyd**
Kevin Mueller
Clay Naito*
Barendra Talukdar
Mark Weaver
Bill Zehrt

10/23

Ossama Ali*
Mi-Geum Chorzepa*
Khaled El-Domiaty
Jason Florek*
Eric Jaques*
Ted Krauthammer
Thomas Mander*
Eric Musselman*
Lauren Stewart
Ganesh Thiagarajan (chair) *
Eric Williamson

Committee Members (Associate)

Theresa Ahlborn
Serdar Astarlioglu
Chris Barrar
Bal Charwoo
Ian Doiron
Juan Esquivel
Matthew Gombeda
Thomas Kang
Sidney Mindess
Ahmed Mostafa
Tom Panayotidi
James Schroder*
Yijian Shi
Andrew Sorensen
David Yankelevsky
Curtis Yokoyama

2/32

Madasamy Arockiasamy
Darrell Barker
Abass Braimah
Avraham Dancygier
Alvin Ericson
Kazunori Fujikake
Andrew Groeneveld*
Justin Kordas
Paul Mlakar
Daniel Mullins
Robert Pekelnicky
Haijian Shi
Danny Smyl
Joseph Tedesco
Yiming Yao
Lihe Zhang

Committee Members (Consulting)

Quentin Baker
David Kerins
Jaap Weerheijm

Eve Hinman
Sam Kiger

* indicates meeting attendance

** indicates excused absence

Attending Guests

Khaled Nahlawi*
Bowen Woodson*
Jared Brown*
Victor Mechtcherine*
Serhan Guner*
Kevin Kirkley*

1. Administrative**1.1 Introductions**

The meeting was called to order by the committee chair, Ganesh Thiagarajan.

1.2 Minutes from the Las Vegas Meeting

The committee approved the minutes.

1.3 Membership Status Update

Four new voting members were introduced: Bradley Foust, Ossama Ali, Eric Jaques, and Kevin Mueller.

There are 9 new members in the past year.

The list of members will be parsed down to those who are still active in the committee.

Voting members are required to attend meetings frequently, as well as participating in our letter ballots, but we realize that occasionally scheduling conflicts occur. Please notify the committee chair & secretary if you cannot attend the meeting. Please change your membership status if you are inactive.

2. Strategic Planning and Discussion**2.1 Committee Report on FRP Retrofitting of Blast-Loaded Structures, in collaboration with ACI 440 – Jason Florek.**

Jason discussed the overview of the document as currently drafted.

- Uses SBEDS methodology to be more consistent with what ACI has been doing.
- Updated previous methodologies using data available to validate shock tube testing as well as open air testing.

Need to develop a strategy for getting the document through the balloting process.

- Path 1: Address and move forward on each comment
- Path 2: Re-ballot each individual chapter as individual ballot items

There was a discussion on if changes occurred to the document outside the scope of previous ballot comments, then the entire document must be re-balloted.

Advantages of balloting just the ballot-related comments are that the committee doesn't have to re-ballot entire document. If there have been any other changes, then the document must be re-balloted from the beginning.

Kennan: If you have a comment, affirmative or negative, it must be presented in a formal comment following the ACI matrix. The document must stop changing before it can be balloted.

Ganesh: The preferred path forward is to ballot it as an entirely new document.

Ganesh: Many members are well-known in the field, but not active. We do not want a negative ballot from a person who does not show up.

Bill Gold: ACI 440 will have to give their blessing on the document as most chapters have already been balloted.

The following path forwarded was agreed upon by the committee:

- Ballot chapters 1-5 now. Address comments received for these chapters during the Fall 2019 Cincinnati, OH meeting.
- Finalize remaining chapters to be balloting in the fall, and address comments in Chicago, IL. (spring 2020).

Need a quorum in Cincinnati, OH to address the comments (40% of the voting members must be present).

2.2 Committee Sponsored Technical Sessions (Mi-Geum Chorzepa & Eric Jaques)

ACI 370 is sponsoring a special publication (SP) and technical session on state-of-the-art research on concrete subjected to high strain rate impacts, including ballistic, vehicle collision, falling loads and debris set in motion by explosions or tsunamis. The objective is to highlight current and developing methodologies in impact-resistant concrete manufacturing, testing, and analysis, and present knowledge to ACI audiences on the use of these emerging technologies to improve penetration and impact resistance of concrete structures.

The SP has preliminary approval, with the session request for Spring 2020 Chicago, IL, awaiting approval.

A mix of authors from around the world have submitted abstracts

- USA (5), Canada (2), Germany (1), Italy (1), Czech Republic (1), China (1)
- The session organizers are still searching for contributors

Contact Eric Jacques (ejacques@vt.edu) and Mi-Geum Chorzepa (chorzepa@uga.edu) if you are interested in participating.

The committee is looking for volunteers to lead new sessions ideas

2.3 Committee involvement with other groups

There was a discussion at the last meeting on collaboration with 349/359.

- Adeola had a discussion on 349/359 to obtain consistency and alignment between the two codes and with 370 documents.
- 349/359 updating references to reflect the state-of-the-art.
- ACI 370 will be presented with the opportunity to comment/review their document for our information (“Report on the Design for Impactive and Impulsive Loads for Nuclear Safety Related Structures”).
- There is a concern that there is significant overlap between 370 and 349/359 given shock and impact loading.

A 370 sub-committee will be created to provide commentary on the document that’s being prepared by 349/359 for an “administrative” ballot.

3. Old Business

Update on Concrete Research Council (CRC) Proposals

- FRP design project in support of the current FRP document: Jason is leading and received good feedback but was declined for funding this cycle.

- High strength steel project: down selected to the round of 12 for final voting

Members wishing to advance CRC proposals are asked to prepare a 10-minute project briefing for the committee at the Cincinnati, OH meeting.

4. New Business

4.1 RE-authorization of ACI 370 R-14, Report on the Design of Concrete Structures for Blast Effects.

Needs to be reauthorized every 8 years.

A sub-committee of 12 members will be formed with each member responsible for a specific chapter (“chapter leads”).

Start with editorial review, before we go down the road of technical changes.

Technical changes involve much more work.

- Chapter 1 (Introduction) – later
- Chapter 2 (Notation and Definitions) – later
- Chapter 3 (Design Philosophy) – Ossama Ali
- Chapter 4 (General Planning and Design Methodology) – Kevin Mueller
- Chapter 5 (Blast Load Predictions) – Ganesh Thiagarajan
- Chapter 6 (Types of Structures) – Thomas Mander
- Chapter 7 (Material Characteristics)– Kennan Crane
- Chapter 8 (Structural Analysis) – Eric Musselman
- Chapter 9 (Design of Reinforced Concrete Components) – Clay Naito
- Chapter 10 (Blast Hardening Retrofit Concepts for Existing Buildings) – Jason Florek
- Chapter 11 (Design of Blast-Resistant Ancillary Openings) – later
- Chapter 12 (References) – later

We still want a stand-alone document, so it must be comprehensive.

Need to enhance concrete material subsequent to the current published report.

For Cincinnati, chapter leads are to provide a report on what types of changes they feel are necessary for their assigned chapter.

4.2 Blast Certification Program

An update was provided by Mark Weaver. This was just a discussion, there is no action.

4.3 Confab Presentation Discussion (Ganesh)

This conference is focused fire and blast, and will be held in September 2019.

Ganesh is providing a state-of-the-art keynote in blast research in the USA. Topics include structural behavior of concrete under blast loading, dynamic bond strength, bond-slip modelling under blast loads, and FRP retrofit considerations. Several members of 370 have volunteered to contribute material.

4.4 Member Presentations

Member presentations (10 to 15 minutes) are encouraged during the committee meetings.

Inform Ganesh know if you plan on presenting.

4.5 New Initiatives

4.5.1 Non-session Initiatives

There was no discussion.

4.5.2 Code & Criteria Initiatives

There will be a discussion on this topic at the next meeting in Cincinnati, OH because the 370 committee is not proactive. The committee should discuss getting protective about adding blast design provisions into 318 building code.

- High strain rates, response limits, etc.
- ACI 349/359 is trying to bring items into the 318 code
- There is an opportunity to collaborate on a united front to push for these additions

5. Adjournment

The next committee meeting will be 20-23 October in Cincinnati, Ohio.