JULY 2022 VOLUME 13, ISSUE 7

MYCONCRETE

The Bulletin of the American Concrete Institute - Malaysia Chapter (e-Bulletin)

TABLE OF CONTENTS

American Concrete Institute Malaysia Chapter
70-1, Jalan PJS 5/30,
Petaling Jaya Commercial City (PJCC), 46150
Petaling Jaya, Malaysia.

Email: admin@acimalaysia.org
Tel: +60 (3) 7782 2996
Fax: +60 (3) 7782 1196
H/P: +60 (14) 220 7138

MyConcrete:
The Bulletin of the American Concrete Institute – Malaysia Chapter

Editor:
Ms. Serina Ho Chia Yu
Hume Cement Sdn. Bhd.

70-1, Jalan PJS 5/30, Petaling Jaya Commercial City (PJCC),
46150 Petaling Jaya,
MALAYSIA

🌎 http://www.acimalaysia.org
☎ +6014 220 7138
🖂 admin@acimalaysia.org

Published in Malaysia by
American Concrete Institute - Malaysia Chapter
70-1, Jalan PJS 5/30, Petaling Jaya Commercial City (PJCC),
46150 Petaling Jaya, Malaysia.

Table of Content

Thank You Sponsors!

We take this opportunity to thank our sponsors for their contribution and support for this month's edition of MyConcrete e-Bulletin.

Premium Sponsor	**SINCT-LAB SDN BHD**
Loyal Sponsor	**IMPIANTI SDN BHD**
	ADEPT TECHNICAL SERVICES SDN BHD

INTRODUCTION TO ACI MALAYSIA CHAPTER

American Concrete Institute - Malaysia Chapter (ACI-Malaysia) is a non-profit technical and educational society representing ACI Global in Malaysia, which is one of the world's leading authorities on concrete technology. Our members are not confined to just engineers; in fact, our invitation is extended to educators, architects, consultants, corporate, contractors, suppliers, and leading experts in concrete related field. The purpose of this Chapter is to further the chartered objectives for which the ACI was organized; to further education and technical practice, scientific investigation, and research by organizing the efforts of its members for a non-profit, public service in gathering, correlating, and disseminating information for the improvement of the design, construction, manufacture, use and maintenance of concrete products and structures. This Chapter is accordingly organized and shall be operated exclusively for educational and scientific purposes.

Objectives of ACI-Malaysia are:

- ACI is a non-profitable technical and educational society formed with the primary intention of providing more in-depth knowledge and information pertaining to the best possible usage of concrete.

- To be a leader and to be recognized as one of Malaysia's top societies specializing in the field of concrete technology by maintaining a high standard of professional and technical ability supported by committee members comprising of educators, professionals and experts.

- Willingness of each individual member/organization to continually share, train and impart his or her experience and knowledge acquired to the benefit of the public at large.

Past Presidents

1997 - 1998
Ir. Tae Ah Heng
(Protem)

1998 - 2000
Ir. Dr. Kribanan G. Naidu

2000 - 2002
The Late Ir. Dr. Norzan

2002 - 2004
Ir. Soo Thong Phor

2004 - 2006
Mr. Seow Aik Guan

2006 - 2008
Ir. Boone Lim

2008 - 2010
Ir. Parnam Singh

2010 - 2012
Ir. Ng Kok Seng

2012 - 2014
Dr. Zack Lim

2014 - 2016
Dr. Zack Lim

2016 - 2018
Ms. Serina Ho

2018 - 2020
Prof. Dr. Sudharshan N. Raman

2020 - 2022
Mr. Martin David

2022 - Present
Mr. Martin David

Management for 2022-2024

Board of Directions (BOD) 2022-2024

President:
Mr. Martin Gerald Joachim David

Director 1:
Mr. Mike Lim Wey Peow

Director 2:
Prof. Dr. Hamidah Bt Mohd Saman

Secretary:
Mr. Oscar Teng Ri Hao

Treasurer:
Mr. Chris Yong Hoe Chern

Immidiate Past-President:
Assoc. Prof. Dr. Sudarshan N. Raman

Internal Auditor
Dr. Zack Lim Eng Hock

Biodata of the Media and Event Committee

Mr. James Lim - Head of Media and Event Committee

James Lim completed his degree in Civil Engineering from the University of Auckland in 1996. He started his career as a structural engineer with a consultancy firm and subsequently developed his interests in concrete repair and waterproofing. He then went on to work for companies such as Hilti, MC Bauchemie and Fosroc in product sales and specification work. In 2002, he obtained his Executive MBA from the University of Bath UK. In 2005, he ventured out from the corporate world to start his own specialist contracting company specializing in concrete repair and waterproofing servicing the construction industry in Malaysia.

He specializes in the repair of cracks in concrete elements by method of injection. He has helped many contractors resolve their troubled leaks with specialized application. In addition, he also has vast interests in basement and roof slab waterproofing system especially in the spray polyurea lining system. His recent experiences include KVMRT Line 1 and KVMRT Line 2 underground station waterproofing work.

Ms. Melissa Lim - Secretary 1

Melissa Lim had accumulated more than 15 years of experience in marketing and project operation, particularly in the construction industry.

Some of her greater achievements including to be certified as one of the first females as 'ACI Concrete Flatwork Technician' in Malaysia by ACI USA.

She leads few teams of engineers and supervisors to manage few projects on hand for ZACKLIM company to construct flat floors for several prestigious projects in Malaysia where she focuses mainly on IKEA & IKANO projects where she is committed to deliver her best effort to meet client’s requirement and achieve the project target deadlines by exerting her strengths on planning and management skills.

Mr. Smith Yong - Secretary 2

Smith completed his BSc of Civil Engineering from University of Portsmouth, UK in the year of 2011 and MSc of Structural Engineering from Newcastle University, UK in the year of 2013. He worked with Arup Malaysia as Structural Engineer for 5 years. He involved in the design of complicated basement structures, high rise buildings as well as convention centre design such as Setia SPICE Convention Centre Penang. Smith is currently working for one of the well-known construction product supplier company as sales engineer which specialist in concrete repair or strengthening works.

Membership Subscription 2022

Gentle reminder that 2021 subscription is due.

Kindly note that payment can be made as follows:

Bank : **Hong Leong Bank Berhad**
Account Number : **291 0002 0936**
Account Name : **American Concrete Institute – Malaysia Chapter**

Once payment has been made, it is important to send
Remittance Slip */* ***Deposit Advice*** */* ***Bank Transfer Receipt***
to our ***Administrative Office*** *for confirmation, via these channels:*
WhatsApp: **+60 (14) 2207 138** or
E-mail: **admin@acimalaysia.org.my**

Digital Membership Certificate 2022

Members who have paid their subscription will receive their digital membership certificate. See sample below.

Internship Programme For ACI Student Members

(Subject to Terms & Conditions Apply by Companies)

Company Name	Company Address	Person To Contact	Business Involved
PLYTEC FORMWORK SYSTEM INDUSTRIES SDN BHD	No. 19, Jalan Meranti Permai 3, Meranti Permai Industrial Park, Batu 15, Jalan Puchong, 47100 Puchong, Selangor.	012 - 691 2883 (Mr.Louis Tay)	BIM Engineering Specialist, CME Project Delivery, IBS & Prefabrication Construction.
CRT SPECIALIST (M) SDN BHD	E5-5-25, IOI Boulevard, Jalan Kenari 5, Bandar Puchong Jaya, 47170 Puchong, Selangor.	012 - 313 5991 (Mr.James Lim)	Waterproofing Work, Concrete Repair & Strengthening, Injection & Grouting.
REAL POINT SDN BHD	No. 2, Jalan Intan, Phase NU3A1, Nilai Utama Enterprise Park, 71800 Nilai, Negeri Sembilan.	016 - 227 6226 (Mr.Chris Yong)	Concrete Admixture Production.
JKS REPAIRS SDN BHD	Star Avenue Commercial Center, B-18-02, Jalan Zuhal U5/178, Seksyen U5, 40150 Shah Alam.	017 - 234 7070 (Mr.Kathiravan)	Structural Repair Works, Structural Strengthening, Waterproofing System, Injection & Sealing, Concrete Demolition Works, Protective Coating For Concrete And Steel.
ZACKLIM FLAT FLOOR SPECIALIST SDN BHD	70, Jalan PJS 5/30, Petaling Jaya Commercial City (PJCC), 46150 Petaling Jaya, Selangor.	603 - 7782 2996 (Mr.Zack Lim)	Concrete Flatfloors.
UFT STRUCTURE RE-ENGINEERING SDN BHD	No 46, Jalan Impian Emas 7, Taman Impian Emas, 81300 Skudai Johor.	012 - 780 1500 (Mr.Lee)	Structural Repair, Construction Chemical, Carbon Fibre Strengthening, Protective Coating, Industrial Flooring, Soil Settlement Solution, Civil & Structure Consultancy Services, Civil Testing & Site Investigation.
SINCT-LAB SDN BHD	No 46, Jalan Impian Emas 7, Taman Impian Emas, 81300 Skudai Johor.	012 - 780 1500 (Mr.Lee)	Structural Repairing, CFRP Strengthening, Site Investigation, Civil Testing, Soil Settlement Solution, Civil And Structural Design And Submission.
STRUCTURAL REPAIRS (M) SDN BHD	No. 1&3, Jalan 3/118 C, Desa Tun Razak, 56000 Wilayah Persekutuan, Kuala Lumpur	012 - 383 6516 (Mr.Robert Yong)	Carbon Fiber Reinforced Polymer System, Sealing Cracks With Resin Injection, Re-Structure Repairs and Upgrade, Diamond Wire & Diamond Blade Sawing System, Diamond Core Drilling, Non-Explosive Demolition Agent.

Important Notes:

i) ACI Malaysia is only a platform for our members to advertise for interns.

ii) All application to be made direct to companies and would be subject to their terms and conditions.

Upcoming Events

Upcoming Events

FB Live Tech Talk

American Concrete Institute
Malaysia Chapter

BUILDING DEFECTS, REPAIR AND MAINTENANCE: FLOOR TRAP

MS. LOH POH YEE (SPEAKER)
Epsilon Enterprise

PohYee graduated with a Bachelor's degree in Electronics Engineering from Multimedia University and is currently a PhD student in Material Engineering from the Universiti Malaya. She is active in a multidiscipline career related to building such as building inspection and repair related to water leakage issues especially for residential units. She investigates water leakages from different sources inside the building and its facades.
Floor trap is one of the major components in floor design for wet areas. In this session, she will share her knowledge about the floor traps, problems related to and proper maintenance.

---

25 AUGUST 2022 (THURSDAY)
8.30 PM - 9.30 PM

www.facebook.com/acimalaysia.org

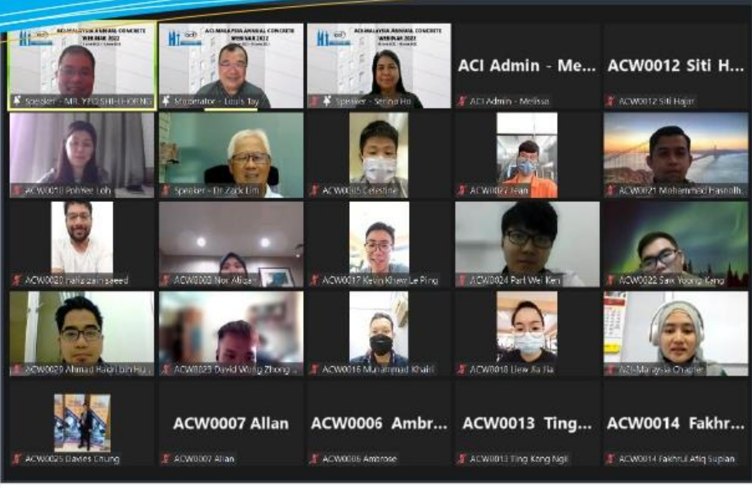
Disclaimer: The opinions expossed in the talk are of the individual, speaker's and not necessarily those of the American Concrete Institute - Malaysia Chapter.

Upcoming Events

Annual Concrete Seminar 2022

PAST EVENT

15 & 16 June 2022



2 Morning Sessions

8 Hours

1 Moderator

2 Keynote Speakers

7 Expert Speakers

28 Participants

Moderator

Mr. Louis Tay

Opening Keynote Speaker

Mr. Martin David Gerard

Speakers

Ms. Serina Ho - Important aspects of Cement (MSEN 197-1)

Assoc Prof Ir Dr Cheah Chee Ban - Ground Granulated Blastfurnace Slag for Structural Concrete Production (MS EN15167)

Mr. Yeo Shih Horng - Cost-saving concrete mix design according to the latest (EN 206)

Dr. Sudharshan N. Raman - Concrete Testings for Fresh and Hardened Concrete, including Self-Compacting Concrete (EN 12350 & EN 12390)

Ts. Go Chee Siang - Non destructive test (EN 12504)

Mr. Lee Yean Fu & Dr. Zack Lim - Concrete repair (EN 1504) & maintenance; Abrasion Resistance

Closing Keynote Speaker

Ts. Ir. Choo Kok Beng

Understanding construction methods according to standard codes.

The construction industry has been facing challenges of lack of skilled knowledge and labour, declining productivity, high and unnecessary repair costs, etc. This two-morning days shared the fundalmental understanding of construction methods according to standard codes is hence key to tackling these challenges.

In this Annual Concrete Seminar 2022 which was held via Zoom, a panel of seven expert speakers shared their knowledge and discussed interesting current issues faced in the construction industry along with the participants.

The enthusiastic participants attended were engineers, consultants, contractors, academicians & students, materials suppliers and others.

During the seminar, interesting questions raised by our participants; for high grade concrete G80 and above, what is the percentage of silica fume should be added in the concrete design mix?

Our experienced speaker has shared that for concrete above C50/60, inclusion 5 to 10% of silica fume in binder content is sufficient to achieve the required strength. For high performance concrete (compressive strength > 120 MPa) the dosage of silica fume ranges from 15 to 35%.

Other questions raised including the application of limestone aggregate in concrete. Unlike the predecessor of EN 206 which is BS 5328, the latest EN 206 has no limitation on carbonated aggregate to be used in concrete. Based on the speaker's experience in Sarawak, Mr Yeo Shih Horng explained that concrete made from limestone aggregate is able to achieve more than 60 MPa.

For closing keynote speech, it was a great honour that Ts. Ir. Choo Kok Beng who has been in the construction industry for many decades, shared valuable insights of adopting current state-of-art technologies to eliminate human errors while adopting available standard codes as guideline to practise best methods of construction.

Participants attended this seminar were able to claim CCD & CPD professional points and every one was awarded with certificate of attendance presented by our ACI Malaysia Chapter President, Mr. Martin David Gerard.

For more information regarding ACI upcoming seminars, please visit www.acimalaysia.org .

Organising Committee & Admins

Ms. Melissa Lim

Ms. Lina

Mr. Mervin Gerard

Ms. Girly Ong

aci American Concrete Institute Malaysia Chapter

Reprint from CI Magazine, Volume 42, No 4, Page 47-49

Taking Concrete Sustainability into the Elementary Classroom

Hands-on experimentation introduces students to science, technology, and engineering

by Ara A. Jeknavorian

In the growing movement of advancing science, technology, engineering, arts, and math (STEAM) education in school curriculums, can introducing concrete sustainability to the elementary school classroom be a meaningful and enriching experience? An opportunity to address this question was made possible thanks to the annual Baker Elementary School (Moorestown, NJ) Science Day program.

The process began with the school's Science Day coordinators reaching out to science-oriented parent volunteers who would be willing to make a 10- to 15-minute presentation on a technology and then engage elementary school students with a related hands-on science activity lasting approximately 30 minutes.

Two of my granddaughters attend the school, so my daughter introduced me to the Science Day program to gauge my interest in possibly participating with a chemistry-related project. With a strong interest in introducing young students to scientific concepts, I took on the challenge with enthusiasm. Having spent 34 years conducting research and development on chemical admixtures for concrete, a concrete-related project was my natural first choice. After all, the students should be aware of the properties of concrete, the most manufactured material in the world. Their prior exposure to it made the project something students could readily grasp.

After reviewing possible topics related to concrete and chemical admixtures and considering the opportunity to introduce the very relevant issue of sustainability in concrete construction, I decided students could readily appreciate a project dealing with leftover concrete.

Topics presented by other participants included:

- Computer forensics;
- Dentistry;
- Elevator engineering;
- Orthodontics;
- Cognitive science;
- Instructional app design;
- Diabetes research;
- Astronomy;
- The human heart;
- Architecture; and
- Pharmacology.

Presentation

My picture-laden PowerPoint presentation introduced students to basic concrete technology. The specific discussion topics focused on:

- What a chemist does;
- The composition of concrete;
- The difference between cement and concrete;
- Concrete as a global building material;
- The basic function of chemical admixtures;
- The reasons a construction project can have leftover concrete and the value of recycling concrete;
- Details of the experiment; and
- Ensuring the safety of the students while conducting the various procedures.

The students learned that if the concrete could be kept in a workable condition for some period, under certain circumstances, it could eventually be blended with fresh concrete and used for certain allowed applications such as walls and blocks. This would avoid the cost and effort of disposing of the concrete or of mechanically separating the concrete and reclaiming the sand and stone for use as a partial replacement of fresh sand and stone.

With respect to enabling the use of leftover concrete, I developed the idea for an interesting project whereby students would learn how a common sweetener, sugar (sucrose), can keep mortar from hardening for an extended period. Having the Science Day on a Friday created a special challenge requiring that the mortar samples prepared with the sucrose solution be kept from hardening over the weekend.

In designing the hands-on experiment, a set of objectives was developed to:

- Help students understand the mixing process to make mortar;

- Introduce the concept of how certain chemicals can alter the hardening rate of cementitious mixtures;
- Explain how to set up a control experiment and follow a set procedure; and
- Demonstrate how the hardening of mortar can be significantly delayed.

While the presentation was in progress, sealed samples of cement clinker, cement, sand, and a small toy concrete mixer truck along with a small piece of polished concrete were passed around the classroom to help the students visualize the difference between cement and concrete—two terms very commonly confused by the general public.

Summary of Hands-on Science Experiment

Each student prepared a mortar mixture using a preweighed mixture of cement and sand contained in a plastic vial. Half of the students used water, while the other half used a sucrose solution as the mixing water. After the mortar samples were prepared, an “anchor” was immersed in the mortar and the vials were covered. After 72 hours, the students pulled on the anchors and recorded their observations.

Equipment and materials

Each student was given a test kit with the following items contained in a sealed ziplock plastic bag (Fig. 1):

Fig. 1: Each student was provided a science kit in a ziplock plastic bag

Fig. 2: A 25 mL vial with a cement and sand mixture. The vial cover was fitted with a paper clip affixed to a small clothespin

- A pair of small rubber gloves;
- Plastic safety glasses appropriate for young students;
- A 25 mL clear, numbered plastic vial with a snap cover containing a mixture of 2 g of portland cement and 3 g of concrete sand conforming to ASTM C33/C33M, “Standard Specification for Concrete Aggregates.” A small hole was made in the vial cover through which a paper clip was inserted. A 10 mm long clothespin was attached to one end of the paper clip, while the other end of the paper clip was bent to form a loop (Fig. 2);
- A 12 mL plastic vial with a snap cover containing either 4 mL of water or a 10% sucrose solution (students were informed whether they received water or the sucrose solution). I had previously prepared the sucrose solution to provide 10% sucrose by weight of cement when 2 mL of the solution was mixed with the cement-sand mixture. The smaller vial had the same number as the 25 mL vial;
- A small flat wooden stirrer (110 x 10 mm craft sticks);
- A 2 mL plastic pipette with a mark corresponding to 1 mL; and
- Several paper towels.

Procedure

The students were cautioned to follow my instructions, step-by-step, to ensure their safety as well as to minimize the variability in how the mortar mixtures were prepared. After they opened their plastic bags, the students put on their safety glasses and gloves, and they placed their paper towels on their desks. Then they were directed to take the following steps:

- Open the vials with the cement-sand mixture and water (or sucrose solution);
- Using the pipette, add 2 mL of the mixing water (or 2 mL of the sucrose solution) to the vial containing the cement-sand mixture;
- Carefully mix the mortar with the wooden stirrer for 30 seconds by gently moving the stirrer deeper into the mortar;
- Examine the bottom of the vial to check for any dry material;
- After mixing, carefully insert the clothespin attached to the paper clip into the mortar using a twisting motion to fully submerge the clothespin in the mortar; and
- Firmly secure the snap cover on the vial.

Twelve mortar mixtures were prepared with water (control mixtures), and 12 mixtures were prepared with the sucrose solution (retarded mixtures). I kept a log of the students’ first names and their respective sample numbers. We then placed the samples in a container, and we left the container in the classroom over the weekend. On Monday, the students examined their vials. First, they were directed to lift the cover and report what they saw. Then they were directed to pull on the paper clip embedded in the mortar and report what happened (Fig. 3).

Results

The students found that the control mortar mixtures (mixed using water) were solid and firmly held the clothespins. They also

Fig. 3: Three-day-old mortar samples prepared with: (a) water; and (b) sucrose solution

found that all but one of the retarded mortars (mixed using a sucrose solution) were still soft. The students could easily pull the clothespins from the retarded mortars. We couldn't determine why one sample of sucrose-treated mortar was able to harden over the weekend. This possibly resulted from mislabelling the solution in the test kit.

In Conclusion

All the students were able to safely prepare their mortar samples. Pulling on the paper clip affixed to the clothespin proved to give the students an effective visual and physical interaction with the hardened and soft mortars. (Optionally, the clothespin could have been omitted, and the students could have probed their mortar with a toothpick.)

A sampling of the comments from thank you letters sent by the students helped underscore the value of the experiment:

- "It was fun to learn about concrete and how you can keep it soft for many days."
- "I loved wearing the safety goggles and gloves. Made me feel like a scientist."
- "It was interesting to see how the sucrose kept the concrete squishy."
- "I appreciate how you let us do the experiment, and not just showing us."
- "Now I know that concrete is made from cement, sand, rocks, water, and different chemicals."
- "I tried to pull the clothespin out of my mortar, but it would not come out!"

Note: Additional information on the ASTM standard discussed in this article can be found at www.astm.org.

Selected for reader interest by the editors.

Ara A. Jeknavorian, FACI, serves the concrete construction industry as an independent consultant on the development and application of chemical admixtures. Prior to starting Jeknavorian Consulting Services, he completed a 34-year career as a Research Fellow with the Construction Products Division of W.R. Grace, Cambridge, MA. He holds 19 patents for concrete and masonry admixtures and was responsible for polycarboxylate product development with W.R. Grace. Jeknavorian is a member of the American Chemical Society and a Fellow of ASTM International, where he chaired the subcommittee on chemical admixtures and served on ASTM Committee C09, Concrete and Concrete Aggregates. He has authored 51 publications related to chemical admixtures for concrete, and he has received several industry awards for his contribution to standards and technology development for concrete admixtures. Jeknavorian received his PhD in analytical chemistry from the University of Massachusetts.

TECHNICAL REPORT

Reprint from CI Magazine, Volume 42, No 8, Page 43-47

Proposed Data Sheet for Alternative Cementitious Materials

New materials that differ from ASTM standards will need more testing

by Terence C. Holland and Kenneth C. Hover

An ever-increasing number of materials are being proposed for use as alternative cements or alternative supplementary cementitious materials (SCMs). Journals and conference proceedings routinely include papers discussing the basic properties of new materials that, in most cases, are proposed to reduce the carbon footprint (or global warming potential, GWP) from cement and concrete production. However, few if any of these papers provide sufficient data to verify that the materials can be used reliably in a concrete structure designed in accordance with the ACI 318 Building Code (the Code).

Such basic research is the easy part of product development. Bringing new materials to market is the more difficult, time-consuming, and expensive part. To assist in those efforts, the product data sheet proposed in this article will guide potential suppliers through the testing and documentation that will be required to market their products.

Alternatives

ACI 318-19, the most recently published version of "Building Code Requirements for Structural Concrete and Commentary,"1 has opened the door to the use of alternative cements. It includes the following definition, originally published in ITG-102:

Alternative cement—an inorganic cement that can be used as a complete replacement for portland cement or blended cement, and that is not covered by applicable specifications for portland or blended cements.

ASTM C1709-18, the most recently published version of "Standard Guide for Evaluation of Alternative Supplementary Cementitious Materials (ASCM) for Use in Concrete,"3 provides the following definition for alternative SCMs:

Alternative supplementary cementitious materials—inorganic materials that react pozzolanically or hydraulically, and beneficially contribute to the strength, durability, workability, or other characteristics of concrete, and does [sic] not meet Specifications C618, C989/C989M, and C1240.

The ASTM C1709 definition limits alternative SCMs to reacting with currently used cementitious materials and reacting only pozzolanically or hydraulically. For the purpose of this article, we are proposing a broader definition without these limits. We are also proposing to combine alternative cements and alternative SCMs into a single definition as shown herein. As of this writing, the final definition is being vetted within ACI. Whatever the outcome, the requirements in the proposed data sheet will still apply.

Alternative cementitious material—an inorganic material that can be used as a complete or partial replacement of the cementitious material that includes portland cement or blended cement, that is not an inert filler, and that is not covered by specifications referenced in this code.

ACI 318-19 is silent on alternative SCMs. However, it is expected that these materials will be addressed in the next version of the Code.

While some alternative SCMs, such as bottom ash, natural pozzolans, or off-spec fly ash, may be familiar to concrete industry professionals, others may be relatively new and thus unknown. The more a new material differs from materials currently specified per ASTM standards, the more testing and documentation will be necessary. There are also several new alternative materials that have received or are in the process of obtaining an ASTM designation. Just because an alternative material has received an ASTM designation does not automatically allow its use under the Code. These materials can also benefit from developing the data requested by the proposed data sheet.

Guidance

Even for materials that successfully meet the recommendations in ASTM C1709, it will be very difficult for a licensed design professional (LDP) to evaluate an alternative cementitious material for use on a project. Some characteristics, such as those affecting construction efficiency and aesthetics, cannot be evaluated using laboratory testing, so the LDP will still need to make an informed decision. The data sheet proposed herein is intended to help in that effort and to complement ASTM C1709. If a potential supplier cannot provide the requested data, the supplier should consider it questionable that the material will be approved.

This list is not intended to be all-inclusive. The LDP may have additional project-specific structural, durability, or other requirements for the project, and the material supplier will be One author (Holland) was directly involved with bringing silica fume to the concrete market in the United States. Many of the questions on this proposed data sheet are derived from his experience working with silica fume. Before silica fume was considered a material that was appropriate for use in a wide variety of applications, these questions had been answered largely through field experience. required to meet these needs. It is also recommended that the supplier review issues relevant to the use of alternative cements. The article by Becker, Holland, and Malits provides additional references.4

Although the proposed data sheet is intended for the use of the LDP, the owner and the building official are also potential key users of the information. The owner must be made aware of the use of the proposed material and of the risks and benefits the material presents. The building official must be comfortable that the material will perform as intended and provide the appropriate level of life safety for the project.

We expect a supplier of a new material will be asked for the information in the proposed data sheet. The sooner the questions are addressed, the easier it will be to bring a new material to market. The list incorporates questions based on more than 100 years of experience with concrete materials, including the SCMs that are in common use today. Because such extensive background data are not generally available for even the most promising of newer materials, this generic checklist is applicable to newer materials currently in use as well as those under development.

Beyond its immediate commercial application to enable and encourage appropriate use of innovative materials, this list may provide checkpoints for the development of future products and serve as a starting point for data sheets for other alternative materials such as recycled aggregates.

Data Sheet for Alternative Cementitious Materials

Item	Requirements
	Part A: General
A1	What is the material? • Generic description; • Product (brand) name; • Form (powder or slurry); and Ordering information.
A2	Who is the producer of the material?
A3	Is this material intended to replace all or part of the cementitious material in the mixture? • In terms of percentage of portland cement by mass; or • In terms of percentage of total cementitious materials content by mass.
A4	Does this material have an ASTM designation? If yes, is the ASTM standard referenced by the ACI 318 Building Code?
A5	What is the chemical behavior of this material when used in concrete (for example, carbonation, acid-base, or alkali activation)? List references that describe this behavior.
A6	What is the fineness or particle size distribution of this material?
A7	What are the recommended uses of this material (types of members, exposure, or property enhancement)?
A8	What are the sources of the raw material from which the product is derived? Do properties vary depending on the specific source?
A9	Is there an adequate volume of material available to support the entire construction project?
A10	Are material properties consistent over time? Provide data on variability of key characteristics or properties of the proposed material over a time frame similar to that of the project.
A11	Is a Material Safety Data Sheet (MSDS) available? List quantities of heavy metals or other potentially harmful ingredients and provide test data regarding stability against leaching from hardened concrete.
A12	Have fire ratings been established by testing for concrete made with this material?
A13	Is a warranty or guarantee available for the performance of the material? Does the supplier have sufficient net worth to back up a warranty or guarantee?

Part B: Concrete Production	
B1	How is the material supplied? Bags, big bags, or bulk for dry products; or Drums or totes or tanker for slurry products.
B2	If the material is supplied in bulk, who supplies the necessary silo or tanks for storage?
B3	Are there multiple components that require separate storage?
B4	Will concrete production need to be modified when using this material? Consider: Storing; Batching (mass or volume); Mixing; and Placement (pumping behavior).
B5	Does use of this material change the requirements for quality and composition of the batch water?
B6	Are tests required for evaluation of this material before mixing?
B7	How is concrete to be proportioned using this material? (Mixture proportions must be derived from historical data or laboratory testing. The default values for standard deviations accepted by the ACI 318 Code cannot be used because they are derived from traditional cementitious materials.)
B8	Will use of this material influence limitations on permissible time from batching to placement?
B9	How are fresh properties of concrete impacted by the use of this material? Consider air content and stability of air bubbles, slump, slump-flow, compatibility with chemical admixtures and fibers meeting ASTM standards, workability and loss of workability, sensitivity to temperature, and time of setting. What are the time limits on mixing and delivery?
B10	Can concrete made with this material be retempered with water on site in accordance with ASTM C94/C94M, “Standard Specification for Ready-Mixed Concrete”?
B11	Does the test protocol during concrete production and delivery need to be changed for this material? That is, are new fresh concrete test methods required?
B12	Are there any additional safety considerations for making concrete with this material? For example, are there safety concerns associated with highly corrosive and potentially toxic liquid alkaline activating solutions? Are volatile organic compounds or crystalline silica a concern?
B13	Are there any other issues the concrete producer needs to be aware of when using this material?
Part C: Contractor Considerations	
C1	Are there any special requirements for transporting or placing concrete made with this material?
C2	Does the material impact the cohesiveness or segregation of the concrete and therefore influence methods of placement or consolidation?
C3	Are special form release agents required for concrete produced with the material because mixtures are excessively sticky or resistant to reactive agents?
C4	Is this material compatible with integral waterproofing agents, coloring agents, sealers, or surface hardeners?
C5	Are finishing operations for slabs or other flatwork different for concrete when using this material? Do the bleeding characteristics of this material impact the timing of finishing operations?
C6	Are concrete curing methods affected when using this material? Do the bleeding characteristics of this material impact vulnerability to plastic shrinkage cracking? Is a specific curing procedure preferred?
C7	Does this material influence the ability to achieve desired flatness or levelness?
C8	Does the heat of reaction of the proposed material influence temperature rise, differential temperatures, or thermal cracking of the concrete?
C9	What are the effects of hot and cold weather on concrete made with this material? Are there differences in the rate of strength gain, or early or later age strength, relative to concrete made with conventional cements?
C10	How will use of this material impact form pressure and forming, shoring, and reshoring schedules?
C11	Is it advisable or required to demonstrate the ability to place, consolidate, finish, and cure concrete with a preconstruction mockup in the field?
C12	Is it advisable or required to produce a field mockup to demonstrate the influence of the material on the color, texture, finish, or variability of concrete appearance?
C13	Are there any additional safety considerations for working with concrete made with this material?

Part D: Structural Considerations	
D1	Does material testing support the use of ACI 318 as a technical design standard for concrete produced with this material? Are there portions of ACI 318 that need to be modified to design with this material to reach an equivalent result?
D2	Are test data available to cover the structural properties of concrete made with this material? Consider splitting-tension strength, modulus of rupture, modulus of elasticity, creep and shrinkage, reinforcement bond strength, reinforcement detailing and behavior of anchorages, shrinkage or expansion, and coefficient of thermal expansion, as a minimum. If yes, provide data on each property with this data sheet.
D3	What is the maximum test age for which mechanical property data are available?
D4	Is there any evidence of strength retrogression at ages later than 28 days?
D5	Are data available to demonstrate the behavior of structural members, including flexure, beam-shear, two-way shear, and beam-column behavior?
D6	Has this material been used in concrete for projects for similar loads and applications and under similar environmental conditions? If yes, provide data with this data sheet.
D7	Are there any changes required for project specifications if this material is used? If yes, provide necessary specification language.
Part E: Durability Considerations	
E1	Does the durability of concrete made with this material depend on water content of the concrete?
E2	Are the maximum water-cementitious materials ratio (*w/cm*) and minimum compressive strength required by the ACI 318 Building Code applicable for this material?
E3	Are test data available to cover the basic durability requirements of the ACI 318 Building Code? Consider deicing salt exposure, freezing and thawing, sulfate attack (including delayed ettringite formation), permeability, and alkali-aggregate reactions. Include data with this data sheet.
E4	Are there specific issues regarding corrosion protection of reinforcement with concrete made with this material?
E5	If this is an alkali-activated cementing material, does it pose any additional considerations for alkali reactivity of aggregates used in the concrete?
E6	Does use of this material influence the rate of carbonation or abrasion resistance of the concrete?
E7	Is concrete made with this material stable under cycles of wetting and drying in warm and cold conditions?
E8	Will concrete made from this material act as a host for the growth of bacteria?
E9	Are there any types of members or exposure conditions for which concrete made with this material should not be used?
Part F: Sustainability Considerations	
F1	If an alternative cementitious materail is proposed to improve the sustainability of the concrete mixture, provide an Environmental Product Declaration (EPD) for this material.
Part G: Considerations for the Architect	
G1	Can this material be used in architectural concrete? Concerns include color, texture, variability, interaction with form liners, and surface defects such as bug holes.
G2	Can surface defects be satisfactorily repaired?
G3	Will the concrete made with this material be compatible with paints, stains, or other surface treatments or wall and floor coverings?
G4	Does this material influence floor moisture and its effect on the performance of floor coverings?
G5	Can concrete made with this material be polished?
G6	Will field mockups be required?
G7	Will the color of concrete made with this material vary over time?
G8	Does use of this material influence efflorescence?

Acknowledgments

The authors acknowledge the significant help received from members of ACI Committee 318: Frank Malits, Colin Lobo, Maria Juenger, and Shana Kelly. Rex Donahey of ACI staff and Larry Sutter, who is involved in ASTM efforts regarding these materials, also provided helpful comments.

References

1. ACI Committee 318, "Building Code Requirements for Structural Concrete (ACI 318-19) and Commentary (ACI 318R-19)," American Concrete Institute, Farmington Hills, MI, 2019, 623 pp.
2. ACI Innovation Task Group 10, "Practitioner's Guide for Alternative Cements (ACI ITG-10R-18)," American Concrete Institute, Farmington Hills, MI, 2018, 14 pp.
3. ASTM C1709-18, "Standard Guide for Evaluation of Alternative Supplementary Cementitious Materials (ASCM) for Use in Concrete," ASTM International, West Conshohocken, PA, 2018, 4 pp.
4. Becker, R.J.; Holland, T.C.; and Malits, F.S., "Structural Concrete Using Alternative Cements," Concrete International, V. 41, No. 6, June 2019, pp. 39-44.

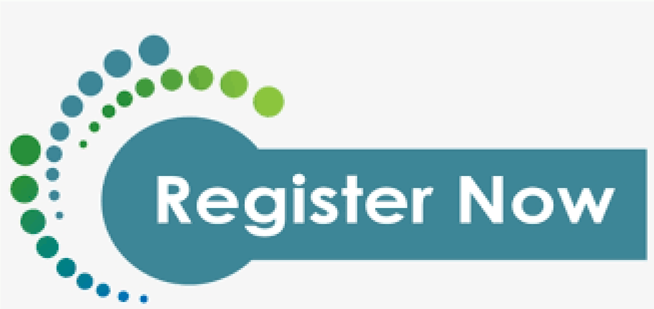
Received and reviewed under Institute publication policies.

ACI Honorary Member Terence C. Holland is a Consulting Engineer with Concrete.Terry.LLC, Auburn Township, OH. He served as ACI President in 2002-2003. He is Chair of ACI Subcommittee 318-A, General, Concrete, and Construction, and a member of ACI Committee 318, Structural Concrete Building Code.

ACI Honorary Member Kenneth C. Hover is Professor and Weiss Presidential Fellow at Cornell University, Ithaca, NY. He served as ACI President in 2010-2011. He is a member of ACI Committees 301, Specifications for Structural Concrete; 305, Hot Weather Concreting; and 306, Cold Weather Concreting; and ACI Subcommittee 318-A, General, Concrete, and Construction. Hover was an Army Combat Engineer Officer, Project Engineer and Project Manager for Dugan & Meyers Construction, and a Partner and Manager for THP structural engineers before coming to Cornell.

MEMBERSHIP


WE ARE A
CARING
ASSOCIATION
Benefits of Joining Us?
Benefit #1
Access to the ACI
Membership Directory
Benefit #2
Digital subscription to
Concrete International Magazine
Benefit #3
Three ACI University
tokens
Benefit #4
Printable ACI
Membership Certificate
We believe a
long lasting business
relationship is built
on friendship.
About Us
America Concrete Institute-Malaysia Chapter (ACI-Malaysia) is a non-profit technical and educational society representing ACI Global in Malaysia, which is one of the world's leading authority in concrete technology.
Our membership is not only limited to engineers, in fact it includes educators, architects, consultants, corporate bodies, contractors, suppliers and experts in cement and concrete related fields.
Contact Us
www.acimalaysia.org
70-1, Jalan PJS 5/30,
Petaling Jaya Commercial City (PJCC)
46150 Selangor, Malaysia.
+60 (3) 7782 2996 (Admin-1)
+60 (14) 2207 138 (Admin-2)
Email: info@acimalaysia.org



We look forward to your kind support and, more importantly, to your participation and registration as a member of ACI-Malaysia Chapter. It is our firm belief your involvement and together with your commitments will go a long way in our quest to uphold all our objectives to mutually benefits for all members.

American Concrete Institute - Malaysia Chapter
70-1, Jalan PJS 5/30,
Petaling Jaya Commercial City (PJCC),
46150 Petaling Jaya,
Malaysia.

Website: http://www.acimalaysia.org
Phone: +6014 220 7138
Email: admin@acimalaysia.org

American Concrete Institute – Malaysia Chapter
70-1, Jalan PJS 5/30, Petaling Jaya Commercial City (PJCC),
46150 Petaling Jaya, Selangor. Malaysia.
Tel.: **+60 (3) 7782 2996** Fax.: **+60 (3) 7782 1196**
Website: **www.acimalaysia.org** eMail: **info@acimalaysia.org**

Membership Application Form

Type of Membership (please tick "☑" one option only)

	Joining Fees (Total)(RM)	(Entrance Fee +	Subscription Fee per annum)
❒ Organizational Member:	A Firm, Corporation, Society, Government Agency or other organizations.		
	RM800.00	(RM500.00 +	RM300.00)
❒ Associate Member:	An individual who is not a member of **ACI International** but American Concrete Institute – Malaysia Chapter only.		
	RM200.00	(RM100.00 +	RM100.00)
❒ Student Member:	**RM30.00**	(RM30.00 +	RM0.00)

To be admitted as a **Chapter Member**(*), return this form together with **Crossed-cheque** (any outstation cheque to include Bank Commission)/ **Online Bank Transfer**/ **Cash Deposit** made payable to:

Account Holder Name: **American Concrete Institute – Malaysia Chapter**
Bank: **Hong Leong Bank Berhad (HLB)**
Account Number: **291.0002.0936**

*Once payment has been made, it is important to send **Remittance Slip/ Deposit Advice/ Bank Transfer Receipt** to our Administrative Office for confirmation, via these channels:*

WhatsApp: **+60 (14) 2207.138** (*ACI.my Administrative-2*); or
eMail: **admin@acimalaysia.org**

(*) Benefits provided by **ACI International** for Chapter Members:
1. Digital subscription to Concrete International magazine;
2. Access to the ACI Membership Directory; and
3. 3-Tokens to ACI University Courses;
4. Printable ACI Membership Certificate

Important Notes:
- Benefits will be accessible via Temporary Password sent to your email account either in the month of **June** or **December**, depend on time slot of **Chapter Member List** update to **ACI International**;
- All benefits are subject to change without prior notice.

Personal Particulars:

Are you a Member of **American Concrete Institute International** (ACI International)?
❒ No.
❒ Yes. (Please provide your ACI Int'l Membership Number: ________ Since (Year): ________)

Name: ________ (First) ________ (Last)
Salutation / Title: ________ (Mr./ Ms./ Mdm./ Ir./ Ar./ Dr./ Prof./) Other: ________
NRIC/ Passport No: ________ Nationality: ________
Mobile Number: +60 (1) - ________ Email: ________
Company / Organization: ________ Designation: ________
Postal Address: ________
____
Postal code: ________ State: ________
Tel.: ________ Fax: ________ Email: ________
I am introduced to ACI-Malaysia Chapter by: ________

________ Applicant Signature ________ Date

For Office Use Only

Membership No: [| - | | | |] Receipt No.: ________ Date: ________
Verified by: ________ (Name: ________) Date: ________

❒ NF/ RF ❒ PoP ❒ DB ❒ MRR ❒ GglC ❒ RvnT ❒ InvT ❒ I&R ❒ MF/PoP/I&R-F

PREMIUM SPONSORSHIP

LOYAL SPONSORSHIP

American Concrete Institute - Malaysia Chapter
70-1, Jalan PJS 5/30, Petaling Jaya Commercial City (PJCC),
46150 Petaling Jaya, Malaysia.