Tuesday, October 17, 2017

2:30 pm – 6:10 pm

10th Anniversary ACI Concrete Sustainability Forum—D-Magic Kingdom Ballroom 4

Sponsored by ACI Committees 130, 201, 236, and 349

Moderated by Koji Sakai, Japan Sustainability Institute; and Julie Buffenbarger, Consultant

Topic: Concrete Sustainability: Where We Are Now and Where Are We Going?

ACI Concrete Sustainability Forum series originated as a workshop in St. Louis, MO, in 2008, when ACI Committee 130, Sustainability of Concrete, was formed. For the last decade since that action, there has been great advancements in concrete sustainability technologies and systems. To celebrate the 10th Anniversary ACI Concrete Sustainability Forum, the presidents of ACI and fib will provide some insight for the future. In addition, the chairs of ACI 130 Committee on Sustainability of Concrete, fib Commission 7 on Sustainability and ISO/TC71/SC8 on Environmental Management for Concrete and Concrete Structures will show the essence accomplishments over the last decade, allowing participants to understand what's going on in concrete sustainability. The latest technological "challenges" and the future of concrete sustainability for the next decade and beyond will be discussed. A variety of significant topics will be condensed to provide participants a look into the past and future, a most fitting event for the 10th anniversary.

2:30 pm: Introduction

Koji Sakai, Japan Sustainability Institute

2:35 pm: Part 1 - ACI and fib Presidents' Leadership on Sustainability

ACI President Khaled Awad, Advanced Construction Technology Services

fib President Hugo Corres Peiretti, FHECOR Ingenieros Consultores

3:15 pm: Part 2 - What's Going on at ACI, fib and ISO on Sustainability?

3:15 pm: ACI 130 Sustainability of Concrete (Guidelines) Julie Buffenbarger, Consultant

3:30 pm: fib Commission 7 (Sustainability) Petr Hajek, Czech Technical University in Prague

4:45 pm: ISO/TC71/SC8 (ISO Environmental Standards for Concrete Sector) Koji Sakai, Japan Sustainability Institute

5:00 pm: Part 3 - What's New in Technologies on Sustainability?

5:00 pm: "Revolutionary" Systems for the Construction of Long-Life Infrastructures, Akira Hosoda, Yokohama National University

Quality and cracking of concrete are always of the biggest concern for concrete engineers,

and various efforts have been made in this regard, but none can be deemed to have been entirely successful. Recently, a revolutionary approach called “Construction Conditions Tracking Check Sheet” has been developed in Japan. This check sheet is used to control cracking and improve “covercrete” quality of concrete structures. The check sheet clearly lists essential measures for appropriate concrete work to achieve high quality.

Furthermore, a crack control design system not requiring expensive numerical simulation of thermal stress was established based on a database of construction records of existing structures. In actual use, this system has been found to dramatically reduce harmful cracking and improve “covercrete” quality.

After the Great East Japan Earthquake in March 2011, construction of a highway network totaling 584 km called the “Revival Road” was launched in the disaster area. This highway network includes some 200 new bridges and some 100 new tunnels. The check sheet mentioned above is being used to prevent initial defects in the Revival Road, which is being built in a very short time with limited human and material resources. To achieve 100-year durability under very severe environmental conditions including the spraying of huge amounts of de-icing agent, advanced durability design exceeding the design codes of Japan was realized based on life-cycle sustainability evaluation. The achievement of truly long-life infrastructures requires a “revolution” in the form of the implementation of quality attainment systems for concrete in construction and sustainability design. Judging from the results already being achieved, such approach shows great promise.

5:15 pm: Does Fiber Reinforcement Enhance Concrete sustainability? Nemkumar Banthia, University of British Columbia

Fiber reinforced concrete (FRC) was developed over half a century ago with the purpose of enhancing the crack growth resistance of concrete. These attributes of fibers, on the one hand, enhance the durability of concrete, and on the other hand, improve strain capability, toughness and energy absorption ability of concrete. While fibers circumvent brittle failures in concrete, and their uses have increased enormously over the years, questions remain, including: ‘Is fiber reinforced concrete a sustainable material?” and, “Does fiber reinforcement enhance concrete sustainability?” This presentation will grapple with these queries and present a logical approach to answer these questions through a quantitative evaluation of the life-cycle carbon foot-print of concrete with and without fiber using social, economic, and environmental yardsticks.

5:30 pm: Global CO_2 Sink by Concrete Carbonation, Fengming Xi, Chinese Academy of Sciences and Steven J. Davis, Construction and Engineering Services

Calcination of carbonate rocks during the manufacture of cement produced 5% of global CO_2 emissions from all industrial process and fossil-fuel combustion in 2013.

Considerable attention has been paid to quantifying these industrial process emissions from cement production, but the natural reversal of the process—carbonation—has received little attention in carbon cycle studies.

Using new and existing data on cement materials during cement service life, demolition, and secondary use of concrete waste to estimate regional and global CO_2 uptake between 1930 and 2013 using an analytical model describing carbonation chemistry, it was found that carbonation of concrete over their life cycle represents a large and growing net sink of CO_2, increasing from 0.10 gigatons of carbon (GtC) per year in 1998 to 0.25 GtC per year in 2013. It was estimated that a cumulative amount of 4.5 GtC has been sequestered in carbonating concrete from 1930 to 2013, offsetting 43% of the CO_2 emissions from production of cement over the same period, not including emissions associated with fossil use during cement production. We conclude that carbonation of cement products represents a substantial carbon sink that is not currently considered in emissions inventories.

5:45 pm: Part 4 - Discussion - What Actions Should We Take Towards the Next Decade?

Moderators: Koji Sakai, Japan Sustainability Institute and Julie Buffenbarger, Consultant

6:05 pm: Closing Remarks

Julie Buffenbarger, Consultant