



Photo: PCI

Stay Vigilant and Innovate

William N. Nickas, *Editor-in-Chief*

I just returned from a fantastic session of the Concrete Materials for Bridge Training Program, presented by Dr. Kevin Folliard and Dr. Thanos Drimalas at the Concrete Bridge Engineering Institute (CBEI) in Austin, Texas (see Concrete Materials Course on pg. 40). During the course, I scribbled down several key points, but two really struck a chord. First, I was reminded of the importance of staying engaged with suppliers. This is certainly not a new concept, but it is one that we need to dust off and make a greater priority in our industry.

Second, the CBEI course drove home the point that we need to remain vigilant about the quality of concrete materials. The constituent materials that we use in our concrete mixtures can sometimes lead to “bad” concrete—concrete that may be prone to alkali-silica reaction, delayed ettringite formation, corrosion damage in marine environments or from deicing agents, and other types of damage. We can mitigate this risk by understanding the effects of cement type and supplementary cementitious materials (SCMs) on concrete quality, and avoiding the use of reactive aggregates and excessive admixtures.

While the CBEI training and course materials were up to date and absolutely relevant to today’s industry, the topics we covered took me back some, nearly 40 years, to the start of my career. At that time, fly ash seemed to be the be-all and end-all with regard to the densification of


high performance concrete. We were developing new concrete mixture designs that had fewer channels for moisture to penetrate and reach the reinforcement. “Holy sustainability, Batman!” We thought we had found the holy grail—with fly ash, we were recycling a product that otherwise would have ended up in a landfill (a fabulous new concept). The concrete industry also came to embrace other industrial byproducts and SCMs such as silica fume, slag, and metakaolin as options for densifying concrete. This had been cutting edge stuff for 40 years, and to say our industry was excited by the possibilities these SCMs offered is an understatement.

Fly ash did not turn out to be the be-all and end-all for the concrete industry. Coal-fired plants are

going offline, which affects the supply of fly ash as an industrial byproduct, and we are also in search of sustainable, environmentally friendly, reliable alternatives to traditional SCMs. Chemists continue to play a critical role in developing ingredients for high-performing, durable concrete mixture designs.

We often talk about innovation and pushing new concepts—and I’m all in. The October-December 2024 issue of the Transportation Research Board’s *TR News* is on the theme of transportation innovation and implementation, and several of the articles point out that we need to thoroughly test possible solutions and quantify the costs and benefits of their implementation. I think these lessons are critical in this new era of emerging blended cement technologies. Suppliers, designers, owners, and manufacturers alike need to be careful about how they implement new options. We need to fully understand the risks for long-term structural deterioration associated with those options so that we do not build bridges that are vulnerable to adverse mechanisms such as alkali-carbonate reaction. As we move back into the fundamentals of cement and concrete science, we cannot ignore the carbonization hazard. We need to deal with it. During my time at CBEI, I was heartened to learn that although we face a range of durability issues, there are sufficient guidance documents, test methods, and specifications available to ensure that we can deliver durable concrete bridges.

Collaboration strengthens our profession and community as a whole. We in the concrete industry are successful in exchanging information, engaging our peers, and sharing our research and innovative ideas with our colleagues. However, as we seek to understand our challenges and implement innovative solutions, we may need to look beyond the boundaries of our traditional community and its resources. Is there an idea, approach, or methodology outside of our industry that can help with the challenge of densifying concrete? Can we borrow it, perhaps for just a few years, while we rejigger our supply lines for silica fume and metakaolin?

It’s important to admit that we don’t know what we don’t know. Nonetheless, we must keep focused on our quest to achieve long-lasting concrete bridge solutions. Simply put, that’s our job. 

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Cover

On the Sound Transit’s Federal Way Link Extension project in Washington state, a cast-in-place concrete segmental structure is constructed from above using the balanced-cantilever method allowing for the long spans needed to avoid problematic soil conditions. Photo: Kiewit.

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