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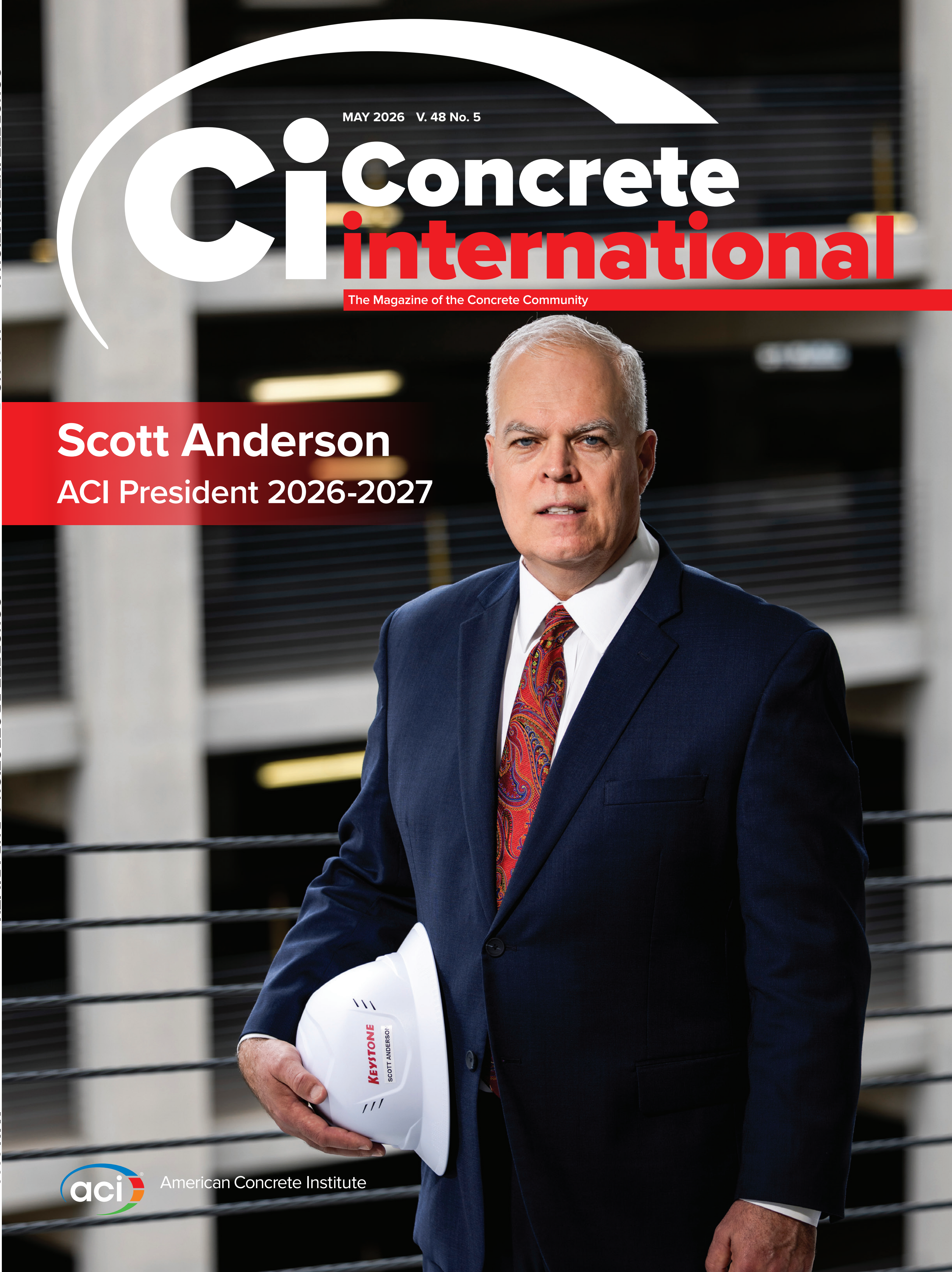

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Not All Concrete is the Same

Why on-site measurements and mindsets matter in the pursuit of durability and sustainability

by Kari Yuers

For most of the past century, concrete placement has operated on a stable foundation of predictable chemistry and familiar field practices. Crews learned from experience: watch the slump, gauge the set by feel, finish when the surface "looks ready."

Engrained across generations, this tacit knowledge served the industry well when mixture designs were comparatively simple. But while best practices for placing concrete have remained the same, the materials used in concrete have changed drastically.

Type IL cement or portland-limestone cement (PLC) has become a cornerstone of the concrete industry's decarbonization strategy. Type IL cement replaces some high-carbon ingredients with low-carbon limestone. The overall formulation is ground more finely than ordinary portland cement (OPC).

Risks of Improper Installation

From a lab and specification standpoint, Type IL cement performs as it is intended. On the jobsite, however, the material's fineness changes how the cement behaves in fresh concrete.

Today's concrete, including emerging solutions recommended by ACI, can be difficult to assess with the naked eye—or thumb, which is often the case on many jobsites. The mixture reacts with water over a specific—yet always changing, depending on the environment—amount of time.

The push toward sustainable performance, reduced cement content, and enhanced workability has produced mixtures that behave less like traditional concrete and more like dynamic chemical systems.

Field teams who assume a standard bleed rate or a predictable finishing window risk misjudging set times by many minutes or even hours. That margin of error can be the difference between a flawless surface and a compromised slab.

"Change has happened so slowly over the past 100 years, and now it is happening at the fastest pace ever," said Ben Wiese, President of New Green Umbrella, Inc. "It has snuck up on a lot of concrete contractors, and the old ways of doing things just do not work anymore."

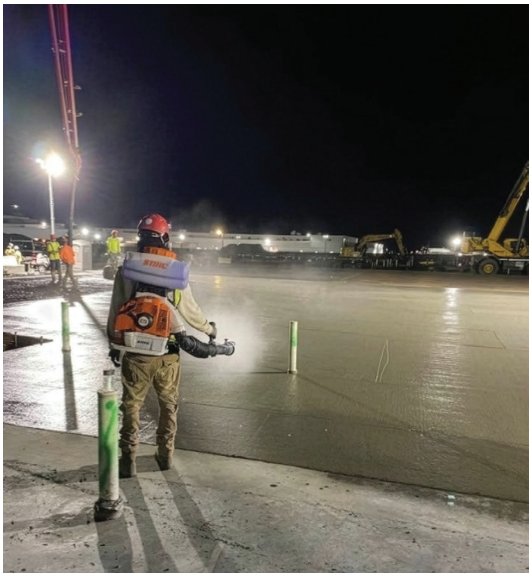


Fig. 1: Early fogging is necessary to maintain the reflective appearance of the damp concrete. With the changing nature of Type IL cement, contractors need to consider environmental factors and keep concrete surfaces continuously damp, without allowing water to accumulate *(photo courtesy of Ben Wiese)*

The gap between laboratory formulation and jobsite execution is widening, not because crews lack skill, but because the materials themselves have evolved faster than many field protocols. The result is a growing operational risk: high-performance mixtures placed using legacy practices can lead to compromised finishes, increased cracking, reduced durability, and shortened service life. Finishing is where the stakes of modern concrete behavior are most visible. The application of troweling, texturing, fogging, or hardening processes must align precisely with the slab's chemical evolution (Fig. 1).

Early finishing is especially problematic in mixtures with reduced bleed water, where evaporative loss outpaces visible surface cues.

Finishing too late can be equally damaging. When evaporation exceeds hydration-driven moisture retention—especially in windy or low-humidity conditions—the surface can:

- Lose critical moisture needed for chemical finishing reactions;
- Begin forming shrinkage microcracks;
- Become difficult or impossible to consolidate effectively; and
- Require aggressive finishing that can damage the surface layer.

In modern mixtures containing Type IL cement along with supplementary cementitious materials (SCMs), these effects can be amplified.

How to Mitigate It on the Jobsite

Today's concrete mixtures must be precisely monitored upon arrival at the jobsite. Testing and measurements need to be taken early and often in the process, so crews can time everything accurately based on chemical reactions within the material.

To avoid problems with hydration, workability, setting time, shrinkage, and surface finish, concrete contractors need real-time information about the material as they are placing it. This, combined with environmental conditions, such as temperature, humidity, and wind, will allow them to adjust their finishing schedule accurately.

"You are not allowed to start finishing it until it has reached initial set," said Craig Appelman, Materials Engineer, Appelman Materials Engineering Ltd.

Appelman recommends conducting trial placements on site using 20 x 30 in. (508 x 762 mm) pads and taking regular measurements to determine the rate at which water is being absorbed within the mixture.

"Do not just think that whatever mixture you have used before will perform the same way as a new mixture," Appelman said.

It is also important to note that the instructions might not be accurate on the jobsite. They are based on laboratory settings, which are controlled environments and often very different from the environments where concrete is placed.

Even small deviations in wind speed or ambient humidity can materially alter hydration kinetics, evaporation rates, and surface readiness for finishing. Key factors to consider on a jobsite include:

- Wind accelerates surface drying, increasing the likelihood of plastic shrinkage cracking, particularly in mixtures with reduced bleeding capacity or low water content;
- Humidity affects both evaporation rate and bleed water behavior. High-humidity environments may expand finishing windows, while low-humidity conditions can shorten them dramatically; and

Fig. 2: Based on real-time measurements, concrete contractors should adjust their setting procedures. Here, a worker entraps bleed water on the concrete surface under a uniform film of a liquid applied evaporation retardant. It is critical to apply the evaporation retardant after strikeoff and between the different floating operations *(photo courtesy of Ben Wiese)*

- Temperature impacts the setting of cement. In hot conditions, crews often experience rapid slump loss, shortened finishing windows, and an increased risk of plastic shrinkage as the cement reacts more quickly and consumes available water faster. In cold weather, the same fine system can appear sluggish.

This variability requires multiple live measurements to gauge how the concrete is performing, so crews can plan their finishing schedules in harmony with the materials and conditions (Fig. 2).

Changing Mindsets to Keep Up with Innovation

Proactive contractors and quality control teams use instruments and processes that provide real-time environmental and material data, including:

- Portable concrete thermocouples;
- A pocket penetrometer for estimating initial setting time;
- Relative humidity and wind sensors;
- Maturity meters for early-age strength prediction;
- Evaporation rate calculators dynamically tied to mixture design; and
- Surface moisture meters for evaluation of finishing compatibility.

The challenges surrounding modern concrete are not merely technical—they are also cultural. Crews must understand not just the "how" of concrete placement but the "why" behind modern mixture behavior.

This requires:

- Updated training protocols aligned with current admixture technologies;
- Increased collaboration between materials engineers and

field supervisors;

- Jobsite documentation that tracks environmental conditions and mixture responses; and
- A shift toward proactive adjustments rather than reactive corrections.

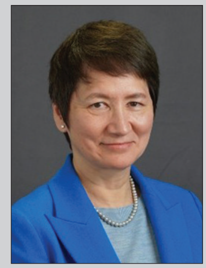
The objective is to recalibrate traditional skills to the demands of today's high-performance materials. Successful outcomes now depend on a disciplined approach to on-site measurement, vigilant monitoring of environmental variables, and informed decision-making about finishing timing.

Using chemical admixtures can also play an important role. Our industry is rising to the challenges and moving fast to innovate, optimize, and provide guidance to ensure that we support the properties needed to combat these environmental factors and achieve performance goals.

Contractors who regularly update field protocols and adopt data-driven, chemistry-informed workflows will deliver better performance, more durable surfaces, fewer callbacks, and protection from liability in the event of concrete failure or possibly even tragedy.

Those who continue to rely solely on intuition will find that modern concrete, for all its engineered benefits, can underperform when misunderstood.

Selected for reader interest by the editors.



Kari Yuers, FACI, is the President and CEO of Kryton International Inc., a global leader in specialized concrete admixtures for durability, waterproofing, and abrasion resistance. With over 30 years of industry leadership, she transformed Kryton into an international manufacturing and distribution network spanning 50 countries. She is immediate past Chair of ACI Committee 212, Chemical Admixtures, and the document chair for ACI E4-22, "Chemical Admixtures for Concrete," in ACI Committee E701, Materials for Concrete Construction. An ACI Fellow, she received the inaugural 2025 ACI Michel Bakhoum International Collaboration Award for her leadership, guidance, and support of ACI's international initiatives and collaborating globally in technology transfer activities aimed at improving the durability and sustainability of concrete. Yuers is an EY Entrepreneur of the Year and holds a 2022 Global ESG designation.