

60

Reasons to Celebrate Concrete

« BY BILL PALMER »

In the 60 years since CONCRETE CONSTRUCTION was first published, the concrete industry has made great strides in materials, equipment, construction techniques, and applications. And I would wager that the best is yet to come. For many applications, there is really no substitute for concrete.

To celebrate CC's 60th anniversary, we asked prominent industry members to tell us why they are proud to be a part of this dynamic industry and what we have accomplished and why they are optimistic about the future of concrete (you can see a complete list of those people on CC's website). Some of the responses were obvious; others will surprise you. We couldn't fit them all in the magazine but you can find all of the responses at go.hw.net/cc60. Feel free to add your own reasons to be proud!

1

Sustainability: "Our industry has recognized that cement production significantly contributes to ozone depletion and CO₂ generation. Many facets of our business have made 'impossible' commitments in the area of sustainability, then gone on to achieve those commitments," says Jay Shilstone, Command Alkon. BASF's Jennifer Hamilton agrees, "We should be proud of environmental product declarations (EPD), eco-efficiency analysis (EEA), and environmentally-preferable concrete mixtures (Green Sense) that can be quantified."

2

Advancements in fiber reinforcement: "Ancient fibers of straw and animal hair have come a long way over the past 60 years. New high-strength fibers of steel and synthetics have taken reinforcement options to new, creative, and cost-effective levels." — *Dan Biddle, Forta Corp.*

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Excitement. "You interact with different people every day and concrete being environmentally sensitive just adds to the excitement! And working with cool tools and equipment. Who wouldn't want to use power tools, set-up lasers, and GPS, and run a laser screed, drive a skid loader, operate finishing equipment...the list goes on." — *Jereme Montgomery, Nebraska C&AA.*

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Fly ash, slag cement, and silica fume are all industrial byproducts that are being incorporated to improve concrete performance and eliminate the need for disposal. Despite recent regional fly ash shortages, the American Coal Ash Association insists that it "will continue to be produced and continue to be available for beneficial uses" well into the future. Today, ash is being removed from landfills and reconditioned for beneficial uses (like concrete).

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Specialty Admixtures: Shrinkage-reducing, hydration-stabilizing, slump retention, corrosion-reducing, anti-washout, viscosity-modifying—the innovation continues!

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Certification: From testing technicians to precast plants to flatwork finishers, industry members are obtaining credentials certifying their knowledge.

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Seismic concrete design: Despite what you see in the news from places like Haiti, modern concrete structures have easily withstood major earthquakes.

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Lightweight concrete: Not only is it lighter and more fire-resistant, lightweight can provide internal curing water and actually dries nearly as fast as normal-weight concrete.

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Locally produced: Concrete is the only construction material that is always locally produced, primarily with local materials by professional producers.

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Photocatalytic concrete: Italcementi's TX Active cement reacts with air pollutants and also keeps white cement structures their whitest.

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Essential: "There is no suitable or viable replacement for concrete," says Rich Szecsy, TACA. "In other words, what would our life be like without concrete?"

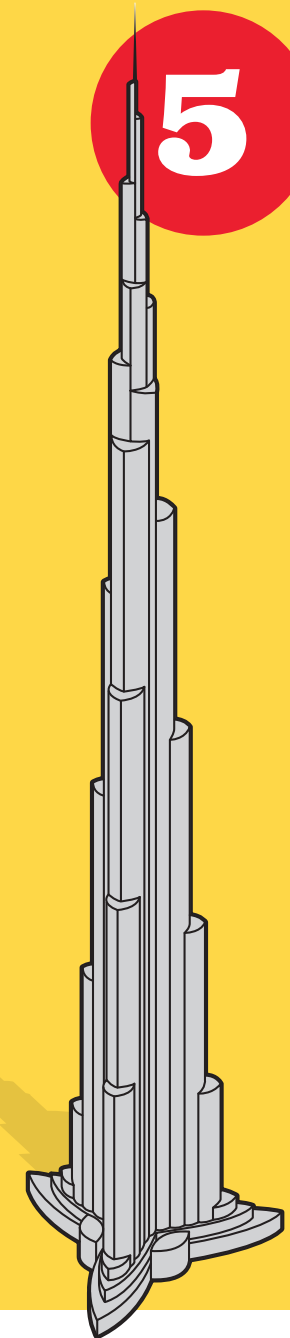
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Concrete Cares: Mike Murray's pink concrete campaign is only one of the many community-building efforts made by companies in the concrete industry in their local communities.

World's tallest buildings

The tallest buildings could not be built without the strength and stiffness of high-performance concrete. The Burj Khalifa, the world's tallest, used nearly 60,000 cubic yards of concrete just in the foundation and a total of more than 250,000 cubic yards.

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All illustrations by Chris Philipot

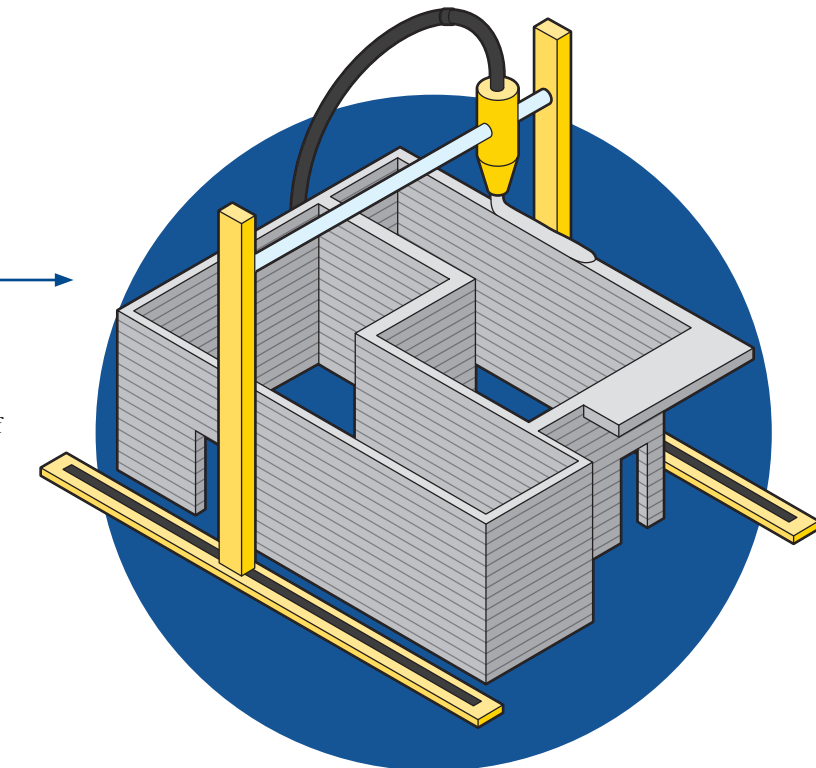
Self-Consolidating Concrete

Contractors find placing concrete in heavily reinforced columns and beams, especially for high-rise construction or in high-seismic zones, to be ever more difficult. Factor in the labor costs for two or more workers to operate a vibrator and wrangle its hoses on the jobsite. Then consider the risks of “white finger” injuries that vibrator operators face, and the liability those risks impose on contractors. Self-consolidating concrete (SCC) is a product that addresses all these concerns. By eliminating the need to vibrate concrete placed in crowded forms, SCC saves time, reduces labor costs, and helps preserve worker health and safety. No wonder Bill Phelan of Euclid Chemical compares it to an automatic transmission, and notes how few people use a stick shift these days.

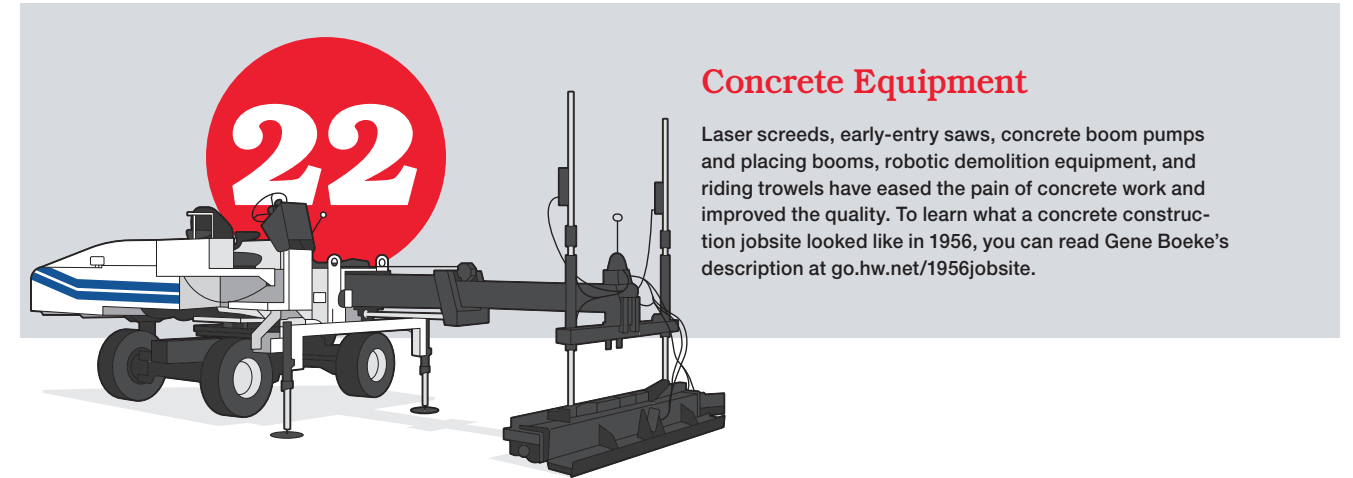
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21 3D Printing of Concrete:

An interesting worldwide trend worth keeping an eye on. “3D concrete printing, when combined with a type of mobile prefabrication center, has the potential to reduce the time needed to create complex elements of buildings from weeks to hours. We expect to achieve a level of quality and efficiency which has never been seen before in construction,” says Skanska’s director of innovation Rob Francis.



- 15 **“We should be proud** of the MIT Concrete Sustainability Hub’s focus on a life-cycle approach with research and tools to support competition and longer term decisionmaking, which is changing the rules of the game.” — *Julie Garbini, RMC Foundation.*
- 16 **Codes and standards:** “Sure we complain about them—how they are hide-bound and slow to change. But people who participate in the process are steadfast in their dedication to ensuring life-safety while still accommodating innovation.” — *Jay Shilstone.*
- 17 **Robotic stations and laser scanners for site layout:** Site layout used to be done with optical transits, levels, and 100-foot tapes. Today’s total stations have the entire layout entered as a CAD file and use laser point clouds to verify as-built conditions.
- 18 **Lean construction management techniques and integrated project delivery (IPD):** It’s really just a matter of working together and constant improvement.
- 19 **Concrete 2029:** Most organizations and companies within the concrete industry have some sort of strategic plan but never before has the entire community come together to create a plan to improve the industry, said Peter Emmons to open the initial Concrete 2029 planning session in May. The objective is no less than to save the concrete industry for future generations.
- 20 **Onboard measurement of slump, water-cement ratio, and air content:** New technology allows concrete workability and air to be tested during transit and to have continuous water additions.



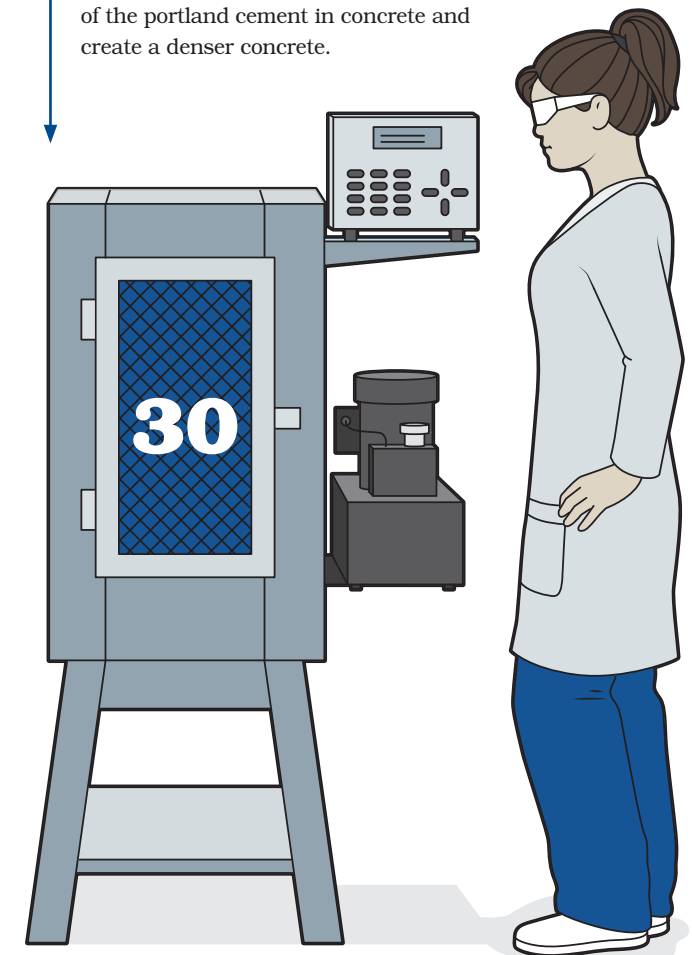
Concrete Equipment

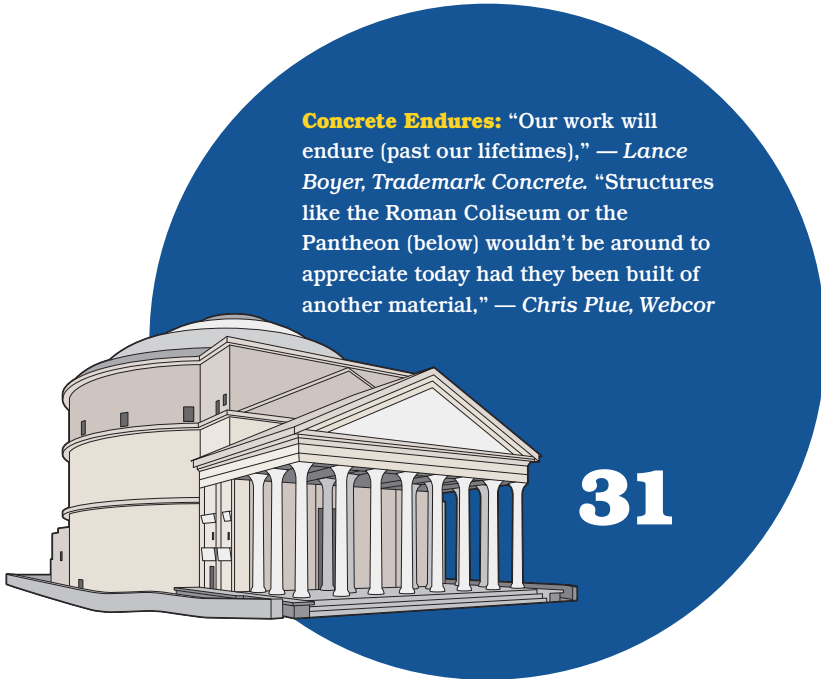
Laser screeds, early-entry saws, concrete boom pumps and placing booms, robotic demolition equipment, and riding trowels have eased the pain of concrete work and improved the quality. To learn what a concrete construction jobsite looked like in 1956, you can read Gene Boeke’s description at go.hw.net/1956jobsite.

- 23 **World of Concrete:** WOC is now more than 50 years old and drew more than 60,000 visitors and 1500 exhibitors in February 2016. WOC remains the essential show for concrete construction, although CONEXPO-CON/AGG (coming in March 2017) is bigger every three years.
- 24 **Flat floors and extended joint spacing:** The greatest problem in heavy warehouse floors is joint deterioration—get rid of the joints and that problem goes away. Extended joint spacing is being achieved with fiber reinforcement (steel and macrosynthetics), post-tensioning, and shrinkage-compensating concrete.
- 25 **Skilled labor:** The industry has a huge group of skilled craftsmen. There are thousands of ACI-certified concrete flatwork finishers in the U.S. and many more skilled craftsmen across the industry.
- 26 **Polished concrete:** The nearly maintenance-free polished concrete floor is replacing vinyl, wood, and tile in many applications. It’s a great way to revive and old floor.
- 27 **Insulating concrete forms:** ICFs are a simple way to build an energy-efficient concrete building.
- 28 **Concrete is evolving,** versatile, challenging, exceeding expectations, character-building, inspirational, strong, trend-setting, overcoming obstacles, meeting demand, gratifying, limitless, bountiful, beautiful, and sustainable. — *Scott Tarr*
- 29 **American Society of Concrete Contractors:** In 1994, ASCC had a staff of one and the World of Concrete opening party drew about 25 people. Today, ASCC’s staff includes the executive director (Bev Garnant), a membership director (Todd Scharich), a technical director (Bruce Suprenant), and one full-time and five part-time staff members. The WOC Kick-Off Bash drew almost 500 people this year and more than 250 will attend September’s Annual Conference. ASCC has become the nation’s leading advocate for concrete contractors.

Alternative cementitious materials:

New binders such as geopolymers, activated slags, metakaolin, activated glass, magnesium silicates, and CO₂-cured concrete can replace some or all of the portland cement in concrete and create a denser concrete.





Concrete Endures: “Our work will endure (past our lifetimes),” — *Lance Boyer, Trademark Concrete*. “Structures like the Roman Coliseum or the Pantheon (below) wouldn’t be around to appreciate today had they been built of another material,” — *Chris Plue, Webcor*

32 Concrete toppings: Overlays have improved dramatically. Unbonded concrete over asphalt for pavements and parking lots is showing great success. ASCC is about to publish a new guide for design and construction of overlays. “Polymer-modified toppings continue to evolve, allowing for less removal and replacement of concrete,” — *Byron Klemaske, T.B. Penick*

33 Portland limestone cement: Adding this basically inert material reduces cement consumption while having little effect on strength or workability.

34 Maturity methods: Despite some reservations (see article on page 55), maturity methods increase safety by allowing accurate knowledge of in-place strength for earlier post-tensioning, formwork/shoring removal, and return to service.

35 Concrete countertops and furniture: Lots of creative uses for concrete, even concrete jewelry, a concrete watch, and, of course, concrete canoes.

36 “Concrete is tried and true but there is still much room for innovation (self-healing concrete, pollution-resistant concrete, ‘smart’ concrete, lightweight concrete, etc.),” — *Shelby Mitchell*

37 Concrete people: “Not only do people in our industry care about concrete, many of them are passionate about it,” says Jay Shilstone. “Concrete people are willing to help and bring along even the smallest contractor,” says Rocky Geans. “Size doesn’t matter, we help each other!”

Concrete Industry Management Program

In the 20 years since the first two students were enrolled, the CIM Program has grown into a vital source of well-trained, highly motivated graduates ready to take on leadership roles in the concrete industry. More than 1000 students have completed the four-year B.S. program, which combines technical courses with business management. The program has expanded from Middle Tennessee State University to California State-Chico, Texas State University, and the New Jersey Institute of Technology. In 2013, an MBA in the CIM program was added at MTSU. What makes the CIM program unique is the strong support of the concrete industry, from industry associations and corporations to the World of Concrete auction which has generated \$4 million for the program over the last 10 years.

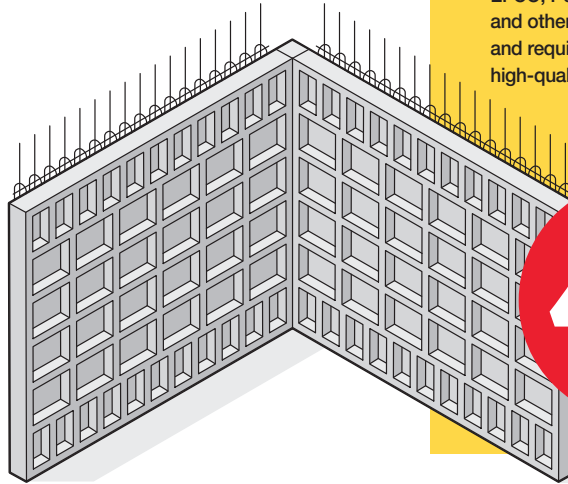


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ASTM C94, Specification for Ready-Mixed Concrete: The standard specification that governs the production and delivery of concrete has recently dropped the maximum of 300 truck drum revolutions requirement that got many loads rejected. The committee also suggests that producers and contractors confer when compressive strength results don't meet the spec and has allowed water addition in transit for trucks equipped with automated systems like Verifi.

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ACI 562 Repair Code: The new repair code is performance-based, and with release of the "Guide to the Code Requirements," repair contractors know exactly who's responsible for what. Very soon, the International Concrete Repair Institute will release a structural concrete repair technician certification that will be referenced in ACI 562—a surface repair technician certification is available now.



Modular Formwork

Building formwork used to require skilled carpenters, but today's easy-to-assemble forms from EFCO, Peri, Doka, Ulma, Atlas, and others speed construction and require less skill to achieve high-quality finishes.

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Ultra-High Performance Concrete (UHPC, like Lafarge's Ductal) was developed in Europe in the 1980s and has found some applications in structures like bridges that can take advantage of its very high tensile strength and impermeability.

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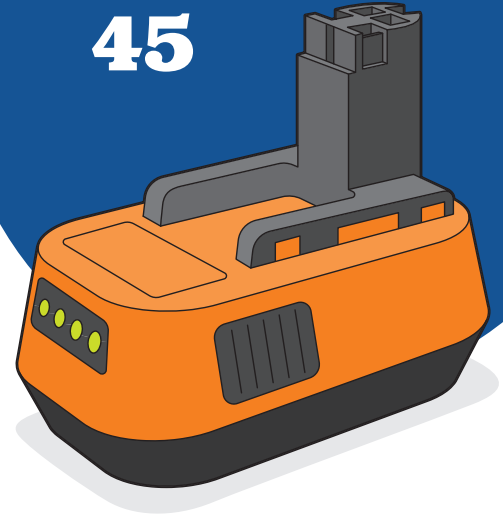
Industry associations: There are a lot of associations in the concrete business, starting with the American Concrete Institute and the American Society of Concrete Contractors. Then there is NRMCA (see Reasons #47, 54, and 57) plus smaller groups like the American Concrete Pumping Association, the Tilt-Up Concrete Association, and the Concrete Sawing & Drilling Association. These groups advocate for their members, provide education and certification, and disseminate knowledge. A promising recent development is funding the development of information (rather than relying on volunteers), which allows documents to go public much more quickly than in the past. "I'm proud of ALL the concrete-related associations that make our industry stronger/safer/more professional," says ACPA's Christy Collins.

44

"We beautify cities. Concrete buildings are safer for employees, good for the environment, save taxpayers money through longevity, stay up longer, and stay cooler. And concrete always uses local materials." —*Big Bob Weatherton*

Cordless tools make jobsites safer and work simpler. Batteries have improved and even better batteries are on the horizon, including those with inductive charging.

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Extreme Tilt-Up: Tilt-up has gone through an innovative period when it is being used almost exclusively in some markets for mid-rise office buildings. Records for heaviest panel and tallest panel are broken regularly. See page 45 for the new tallest panel at 111 feet, 9 inches tall, breaking the previous record by 15 feet.

NRMCA Parking Lot Design Assistant Program

NRMCA's Design Assistant Program (DAP) was rolled out in 2012 to help everyone in the industry get the correct concrete design for a specific parking lot application. By accessing this free service, designers and contractors can get recommendations for concrete thickness and compressive strength, cross section details showing base support information, joint spacing, and other typical details. The DAP has proved effective in promoting the use of concrete in parking lots. NRMCA reports that more than 60% of all parking lot DAP projects went concrete. The DAP is on target to do 220 parking lot projects in 2016, with a goal of doing 1000 projects annually by 2020. And now, NRMCA has rolled out a DAP for concrete buildings to convert them from wood frame or steel to concrete. The results so far have been extremely positive, with four DAPs completed and many more getting under way, reports NRMCA Senior Director, Building Innovations, Gregg Lewis.



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Reorganized ACI 318 Building Code Requirements:

Substantial changes in the document's organization included the new Chapter 26, Construction Documents and Inspection, which contains all the details that the designer must communicate to the contractor in the project specifications. This change helps reduce confusion and potential oversights.

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Moisture in concrete slabs: Moisture coming from concrete has destroyed flooring all over the world. Now we better understand the problem, know how to measure the moisture more accurately (with ICRI-certified technicians), and have excellent under-slab vapor retarders and mitigation materials.

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Economic Impact: BASF scientist Fred Goodwin says, "Concrete is an important worldwide economic factor, yet low-cost when compared to other materials, which explains its popularity." He points to a study by the European Cement Association focused on the multiplier effect of the cement and concrete industry that concluded "for every euro generated in this sector, €2.8 are generated elsewhere in the economy."

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Concrete paving: Improved initial construction methods (such as stringless paving) and repair methods (like dowel-bar retrofit and diamond grinding) are making concrete pavements very competitive, especially on a life-cycle cost basis.

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Pervious Concrete: Pervious has helped concrete capture a larger share of the parking lot market through its ability to reduce stormwater runoff. It can also result in snow- and ice-free surfaces. NRMCA's marketing and installer certification programs and ACI's 522 Specification have moved this material forward.

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Technology Tools, including Building Information Modeling (BIM), virtual reality, and 3D laser scans of buildings and floors. "4D and 5D modeling link BIM to schedule and costs." — *Mike Hernandez, Baker Concrete.*



Performance-Based Concrete Specifications

Recognizing that prescriptive specifications tend to constrain innovation in concrete design and production, NRMCA established its P2P (Prescription-to-Performance) Initiative in 2002. The goal has been to promote performance-based specifications as a superior alternative to prescriptive mix design specs, and thus benefit the industry in several ways. Performance-based specifications allow ready-mix producers and contractors to develop and place economical, workable concrete mixes, while assuring designers that critical performance requirements are being met. Though it will still take time before performance specs become the general rule, the P2P Initiative has raised industry awareness and prompted many steps in the right direction. New simple and quick test methods for placeability, finishability, and durability have eliminated some contractor objections to P2P. "We're moving closer to performance-based specifications which will help drive increased sustainability and innovation, as well as cost-effectiveness," says Julie Garbini, RMC Foundation.

54

Front discharge mixers: Although more expensive, these mixers allow the driver to avoid backing onto muddy, uneven jobsites where they must depend on direction from an unknown spotter.

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56 Challenging: “Concrete is the only construction material that arrives onsite perishable,” says Chris Plue, Webcor. “Unlike pipe, lumber, or wiring, those that work with concrete have a limited amount of time to deal with the material. Every workday is like gameday.”

57 Build with Strength: Faced with mid-rise buildings being converted to wood-frame structures, NRMCA has launched the Build with Strength program to show owners and designers why concrete should be the preferred alternative. And PCA is developing an industrywide marketing plan for concrete.

58 Worker shortage: There are some in the industry who are working to attract new workers. Chicago’s Ozinga Brothers put out the Born to Build campaign and Jereme Montgomery produced a video called Tough as Concrete. Meanwhile Tanya Komar’s Concrete Preservation Institute is attracting new military veterans.

59 Decorative concrete: The decorative industry has matured with some of the original players disappearing or being bought by larger companies (think Scofield, Increte, Bomanite). “I am enthused by the growth in communications among decorative concrete professionals,” says ASCC’s Todd Scharich.

Safety

ASCC’s newest strategic plan includes a goal to feature safety at every meeting—and most ASCC meetings these days start with a “safety moment.” Contractors are getting much more serious about safety at the very highest level. During this summer’s Concrete Executive Leadership Forum, Bill Gilbane, president of the Gilbane Companies, one of the nation’s largest construction companies, said, “Safety is everyone’s responsibility. Safety and productivity are one and the same. We just completed a 17 million man-hour job without a single lost-time accident—that’s what we were most proud of on that project.” **CC**

