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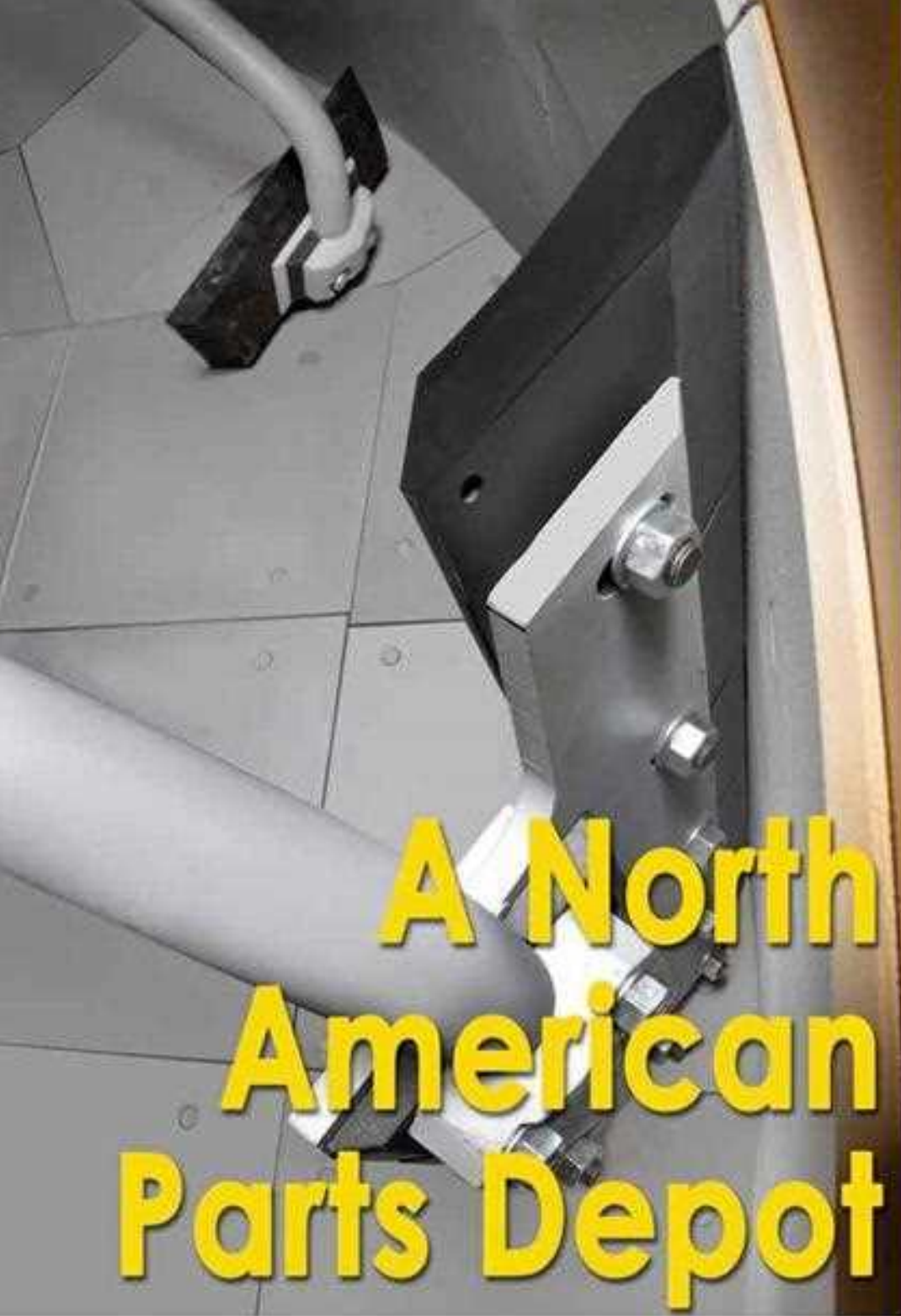
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The Debate over Silica Exposure Limits

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Precast Forecast 2014



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The Economy of Excellence

BY BRENT DEZEMMER | *Chairman, National Precast Concrete Association*

There will be no sub-quality producers in the business a generation from now. They will have been passed over by customers, litigated to death or fined out of business.

There has been much talk in the last few years about the post-recession construction economy and quite a bit of crystal ball gazing from economists and other analysts who are looking for trends and new paradigms in the industry.

Those of us who make our living supplying precast concrete products to the construction industry have been waiting for our sector to rebound. Well, if the Precast Forecast is correct (see page 24), the rebound is happening right now. So instead of wondering what the new post-recession construction economy will look like, let's assume that we are now in the midst of it.

The precast business is for the most part local and regional, so it is natural that most precasters are deeply embedded in their own companies and their own communities. As the chairman of the Board of a national association for the last few months, I've had the opportunity to look at the industry from the 30,000 foot level, and there are a few things that are increasingly obvious as we look to the future.

- **Quality product is now simply expected by your customers.** It is the difference between being in business in a few years and going out of business.
- **Technology drives change.** The construction industry is undergoing a technological revolution. The blueprints of yesteryear are the 3-D BIM modeling images of today, and it is changing the way we work. Eventually, technology will separate the "haves" from the "have nots" in our industry, as it is already doing in other sectors of the construction industry.
- **Marketing sophistication is a prerequisite for doing business.** A website is just one component. Every company needs a big bag of tools that includes all the components of a strong marketing campaign. The new NPCA marketing campaign urges DOTs, specifiers and regulatory

agencies to "Take a New Look at Precast," and your company should do the same. See precast.org/newlook for an example of where the industry is headed. The Marketing Toolkit of resources and training on how to use the toolkit is a free member benefit available to every NPCA member at precast.org/education.

- **LEED v4** is driving material selection, job-site economies, lifecycle costing, wise use of water resources and lean practices throughout the supply chain. The LEED v4 philosophy interlocks with precast concrete construction in many instances and will offer new opportunities to savvy precasters.
- **Excellence is the desired outcome** for companies that want to fully participate in the new construction economy. Business may be increasing, but that doesn't mean it's time to take shortcuts. The economy of excellence means supplying your customers with what they want and being fanatical about customer service.

The reality is that we have to do all of these things in the face of an increasing regulatory environment, uncertainties regarding health care, a possibility of increasing minimum wages and a shortage of skilled labor. Nobody said it would be easy, right? But one thing I do know in taking a 30,000 foot view of the industry: There will be no sub-quality producers in the business a generation from now. They will have been passed over by customers, litigated to death or fined out of business. It's not a pretty picture, but the flip side is that for those who commit to the economy of excellence, there are boundless opportunities in the future.

The start of a new year is a great time to pull your team together and imagine the future. The possibilities are exciting. Are you ready? Let's build the future! ■



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PROFILE

Ready and Willing

Architectural precast columns and caps highlighting the Corinthian Lodge in Nashville only hint at the diverse product line of Reading Rock Inc. in Cincinnati. Built on a solid foundation of core values, Reading Rock's willingness to tackle any project – coupled with an unwavering pursuit of perfection – sets it apart from the ordinary.

Story by Mason Nichols, photo courtesy of Reading Rock Inc.

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How to Diversify

PART 2

Once you've decided to invest in new equipment for your company, look to other small- to medium-sized producers that have made plant investments and hear their advice.

BY SUE McCRAVEN

What equipment do I need to grow my precast concrete company?

Now that you've assessed your current plant based on "Diversify – Part 1" and have done your due diligence with regard to capital investments, it's time to learn from other producers who have modernized their production facilities. If "Hindsight is always 20-20," then these six testimonies should prove to be eye-openers for your business strategy.

Focus on your rate of return

"In 2004, we had a shop with no room for growth and no room in the yard for an addition," said Steve Olson, owner of Huffcutt Concrete Inc. in Chippewa Falls, Wis.

Editor's Note: This is the second of a three-part series on product diversification and modernizing precast concrete plants. Part 1, in the November-December 2013 issue of *Precast Inc.*, offers professional advice for assessing your business and planning for future growth. Here in Part 2, you'll learn about the experiences of plant owners who branched out by investing in new plants and equipment. *Diversify – Part 3*, in the next issue of *Precast Inc.*, will present marketing and sales strategies.

"We were supplementing our concrete with ready-mix, because we couldn't produce it fast enough to fill our orders for septic tanks, precast modular buildings and farm products."

Olson made a large investment to expand his business, the inspiration coming from an NPCA-sponsored lecture. "I listened to an executive strategy presentation by Joan Blecha where she asked, 'Where do you want to be 10 years from now?'" he said. "We felt confident at the time because of the consistent growth we had experienced through the 1990s and 2000s, and we expected future growth." This confidence led to the purchase of land and a new plant that gave the company more interior production space. The price of Huffcutt Concrete's investment? "It was huge – it had lots of zeros," he said.

But then the economy took a dive. "In 2008, we took a big hit – about a 42% drop in business – like everyone else," said Olson. "There was doubt at times in '08 and '09 if we had made a sound decision, but in hindsight, even double hindsight, I'm grateful for deciding to invest in 2004, because we have a more efficient plant. We expanded our existing product line, can produce concrete much faster and are able to control production costs much better."

Even with an uncertain economy, Olson is confident about his business strategy, and in fact offers some advice for other precasters. "If you want to expand, you need to gather as much information as possible and know why you are buying," he said. "Talk to financial people and accountants to understand the risks and the return on the investment."

Don't underestimate the SCC learning curve

"We wanted to solidify our current market," said Derrick Eggleston, president of Valley Precast Inc. in Buena Vista, Colo., as the reason behind purchasing a new plant and equipment in 2009. "Regulations had been changing for wastewater products for three to four years, and we needed more indoor space to get out of the winter weather and to diversify with custom boxes and manholes."

The planning began in 2008, and the decision to invest came in 2009. "Yes, the economy was terrible, but interest rates were down and we were able to save 30% on equipment costs," explained Eggleston. Valley Precast purchased three weigh hoppers, a three-aggregate hopper including belt, a 1-yd Wiggert mixer and a control system from ACT, which provided the technical support to get the production crew up and running with SCC.

"We went from pouring from a truck to immersing ourselves in SCC technology," said Eggleston. "We were nervous about a new process. Everything's different with SCC – there's a steep learning curve. It's probably taken us one year to learn the system, especially moisture control, and we're still growing in our understanding." On the plus side, Valley Precast found huge labor savings, increased safety, and better production efficiency and product quality. (An article on SCC begins on page 14.)

"We went from 4,000 psi to 6,000 psi, and we've saved on our labor costs and steel," said Eggleston. "We're able to better serve our existing customers."



NEW CONTROL ROOM AT WESTERN PRECAST.

Eggleston's advice: "Find a niche market and take care of your existing customers with the best-quality product you can produce."

Small plant gets big results

"When you're a small company like ours, the decision to invest in capital improvements can be particularly tough," said David Daigle, president of Elm Street Vault Inc. in Biddeford, Maine. In 2011, the company saw an upturn in the local economy. "We clearly felt the impact of the recession, but not as strongly as some did. Because we are a small business and have always maintained low overhead and little debt, we were able to weather the storm more easily than others."

After decades of using ready-mixed concrete, Daigle began looking at ways the company could improve production efficiencies and quality for its customers. He considered proposals from three different batch plant suppliers. "ACT did a great job minimizing the footprint of the new mixer and in dealing with the height constraints we had," said Daigle. "We reused our cement silo, aggregate bins, conveyor – pretty much everything. That really helped keep the costs within our budget,

yet provide the critical new equipment we needed to improve our operations." A local fabricator made a custom mixer platform to suit space constraints.

The biggest impact of the equipment investment for Elm Street Vault was the speed with which production achieved specified strengths. Where specifications have allowed, the company has replaced wire mesh reinforcing with steel fibers in its vaults and manholes. "With our new system, we are planning to use SCC to increase our quality and market opportunities," said Daigle.

Elm Street Vault also saves money in labor, set-up and materials. Where specifications have allowed, the company has replaced wire mesh reinforcing with steel fibers in its vaults and manholes. "With our new system, we are planning to use SCC to increase our quality and market opportunities," said Daigle.

A case of want versus need

"Roman Stone needed to invest in flat tables and stackable magnet rails," said Thomas Montalbine, president of Roman Stone Construction Co. in Bay Shore, N.Y. "In order to get the precision required for making precast concrete paving slabs with tight specified tolerances, we needed to invest in new formwork to make this a viable product."

Montalbine makes a clear distinction between wishes and needs in business investing. "We already had a job in-house that paid for the forms, but we did not make any money on that job due to the initial cost of the formwork," he said. "However, our subsequent jobs and the ability to use these forms for other products have made them a winning investment. It always pays to invest when you can cover the equipment cost with the initial job."

Montalbine has no doubt that the Spillman magnetic rails and tilt and flat tables increased Roman Stone's production efficiencies. "We also use the flat tables to expand our product line and are now making pre-engineered Easi-Set all-precast modular buildings," he said.

"I think the best advice about investing in any economy came

from another precaster I met through my affiliation with the NPCA," recalled Montalbine. His advice was not to go into debt to finance your jobs. "Because Roman Stone did not have a large debt load, our company was able to ride out the economic downturn."

"These past few years have been rough for most precasters, and we've seen several companies with leveraged debt go out of business," said Montalbine. "Don't get in over your head. Having some debt is good, but once your current asset-to-liabilities ratio gets down below 2, you need to question, 'Do I really need that new equipment?' It becomes a case of want versus need – just because you want it does not mean that you need it."

Due diligence

In 2006, "Competitors were attacking, and our building site was too small to expand," said Clay Prewitt, general manager of H2 Pre-Cast in East Wenatchee, Wash. "We had no room for product inventory, particularly new products, and we wanted to diversify – to begin producing 3- and 4-sided box culverts, 3-sided bridges and larger-diameter manholes." But there was good news for H2: Interest rates were low in 2006 and 2007. "We took advantage of the low rates, borrowed money and built a new plant," he said.

H2's investment took them from a cramped, 5-acre site to 15 acres; from a 10,000-sq-ft facility to an H-shaped 50,000-sq-ft plant footprint; from one overhead crane to five; from a smaller wet/dry operation to a larger one; to adding new forms from Marks Metal and Helser Industries; and from an outdated mixer to two new Wiggert mixers with controlled custom batching for producing SCC.

Building a larger, more modern plant was a great business strategy, but not because Prewitt was following the lean-manufacturing admonition to limit inventory. "It didn't take us long to figure out that lean on-site storage was not the way to go for us," he said. "We needed product inventory, because competition was fierce. More contractors were bidding on less



NEW FORM WORK AT ROMAN STONE CONSTRUCTION CO.



H2 PRE-CAST'S NEW PLANT

work, and they wanted to get stuff in the ground as fast as possible." The new plant means that H2 can get more work, because it can supply its custom and standard products much faster than its competitors.

"Is there any good time to invest?" queries Prewitt. "Only if you have done your due diligence - we spent two years assessing our options - then you will have confidence in your plans to upgrade and branch out."

OK, let's talk dollars

"It was an easy decision," said Leo Feuerstein, Western Precast Concrete Inc. in El Paso, Texas, of his company's upgrade. "Our batch plant was outdated, and over the years, wear had taken its toll - it was becoming increasingly more difficult to accurately calibrate the use of all raw materials."

If you're thinking about investing half of a million dollars in a batch plant upgrade, also consider your cost for ready-mixed concrete, advised Feuerstein. When Western Precast began to batch its own concrete, it experienced a \$20 to \$30 savings per cubic yard. "That was an \$800 to \$1,000 savings per day, or a quarter of a million dollars in annual cost reductions," he said.

But beyond cost considerations is product quality. "With our new mixer and batching system, we can strictly monitor the quality control of every batch we produce," added Feuerstein. Western Precast maintains its high product quality standards and still gains greater efficiencies, output and cost savings because of its investment. "It was invaluable to have controls that do the checks and balances to make sure the amount of raw materials we are purchasing nets the tonnage of finished concrete anticipated."

How would Feuerstein advise other producers? "That's a tricky one!" he said. "Your first inclination in a down economy is to pull back and make do with what you have. This may well be the only option available, but if you have properly managed your profits from the boom years, you should have liquid capital."

You also have to decide if you are going to be in it for the long haul or if you are looking for a way out. "After 67 years in this business and a successful second-generation transition, we see no choice but to continually invest back into our company for the future," said Feuerstein.

"We are currently investing an average of \$1 million a year back into our business in the form of capital improvements, forms, trucks, batch plants, technology, facilities and employee resources," added Feuerstein. "It may be hard to see, but when times are slow, it is the best time to invest in your plant. This will place you in a position to be competitive and innovative when demand picks up. It may be a timing game, but you have to be ready to handle demand without hesitation, or the contractor will find someone who can."

With a laugh, Feuerstein offered one final piece of advice about investing: "I would rather see my money in a new batch plant or crane truck than sitting in a CD at 0.5%." ■

Sue McCraven, NPCA technical consultant and Precast Inc. technical editor, is a civil and environmental engineer.

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**WHAT
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OSHA's Proposed Amendments to Respirable Silica Standards

A call to action concerning the debate surrounding permissible exposure limits.

BY EVAN GURLEY

Winds of change have been blowing in from the U.S. Occupational Safety and Health Administration (OSHA) recently, and one of the more significant changes affecting the precast industry is a proposal to tighten existing standards for exposure to respirable crystalline silica.

OSHA (osha.gov) has asked for a public comment period addressing proposed amendments to its current standards for occupational exposure to respirable crystalline silica. This is a proposal and not a final rule, so OSHA encourages the public to participate in development of the rule by submitting comments and participating in public hearings. But you'd better hurry: Comments are due Jan. 27, 2014, and the public hearing will start March 18, 2014. Details on how to participate can be found at the end of this article.

What is OSHA's thinking?

It helps to start with a definition of the subject. OSHA describes respirable crystalline silica as particles at least 100 times smaller than ordinary sand you may encounter on beaches and playgrounds. It is created during work operations involving stone, rock, concrete, brick, block, mortar and industrial sand. Exposures to respirable crystalline silica can occur when cutting, sawing, grinding, drilling and crushing these materials. These exposures are common in brick, concrete, pottery manufacturing and operations using industrial sand products.

The proposal was issued by the Assistant Secretary of Labor for Occupational Safety and Health, who wanted to determine whether employees who are exposed at the current permissible

exposure limits (PELs) face a significant risk to their health and whether the proposed tougher standards will substantially reduce that risk.

OSHA currently enforces PELs for respirable crystalline silica in three sectors: general industry, construction and shipyards. These PELs were adopted in 1971 shortly after the agency was created and have not been updated since. The PEL for quartz (the most common form of crystalline silica) in general industry is 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air as an eight-hour, time-weighted average. The current PEL for construction is 250 $\mu\text{g}/\text{m}^3$ and 50 $\mu\text{g}/\text{m}^3$ for the two other forms of crystalline silica (cristobalite and tridymite).

OSHA is proposing a new PEL for respirable crystalline silica (quartz, cristobalite and tridymite) of 50 $\mu\text{g}/\text{m}^3$ in all industry sectors covered by the rule. OSHA is also proposing other elements of a comprehensive health standard, including requirements for exposure assessment, preferred methods for controlling exposure, respiratory protection, medical surveillance, hazard communication and recordkeeping.

The new standard would also set an action level of 25 $\mu\text{g}/\text{m}^3$, meaning that employers would be required to conduct periodic exposure monitoring for employees. The rule also includes:

- Provisions for measuring how much silica exposure workers face
- Limits on workers' access to areas where exposures are high
- Medical exams for workers with high silica exposures
- Training for workers about silica-related hazards and how to limit exposure

The standard would make controlling silica dust the primary method for reducing employee exposure. Rules about personal protective equipment (PPE) are included, but PPE would be a last resort to reduce exposure after first taking measures to control dust, such as:

- Wetting work areas to keep the dust from getting into the air
- Enclosing a work area (process isolation)
- Using a vacuum to collect dust at the point it's created before workers can inhale it

OSHA estimates the rule will cost the average facility \$1,242 per year, and the cost for small facilities with fewer than 20 employees would be about \$550. Other industry estimates have been much higher.

What do others think?

The Crystalline Silica Panel of the American Chemistry Council (ACC) argues that the current PELs are sufficient. "The best available science, to our understanding, shows that the current OSHA PEL for quartz of 0.1 mg/m^3 is appropriate to protect against silica-related disease, provided it is adhered to strictly," said the ACC in a recent news release. "Accordingly, achieving full compliance with, and enforcement of, the current PEL is the best way to protect silica-exposed workers."

The ACC (americanchemistry.com) added that the data from the U.S. Centers for Disease Control (CDC) show a greater than

90% reduction in the silicosis mortality rate from 1968 to 2010, demonstrating the effectiveness of the current PEL since its adoption in 1971 as well as improvements in industrial hygiene practices. "While cases of silicosis still exist, the panel believes that the current PEL is both appropriate to protect workers and is an enforceable limit, and that the cases of silicosis that still occur result from noncompliance with the current PEL," it said. "Accordingly, the panel does not believe there is a need for a new crystalline silica standard with a reduced PEL."

The National Association of Manufacturers (NAM) has pointed out that compliance with the new proposed levels would lay more responsibility on employers in several areas:

- Medical surveillance – Must be available to each employee exposed above the PEL for at least 30 days at no cost to the employee with periodic exams, including physicals, chest X-rays, pulmonary tests, latent TB tests and any other test deemed appropriate by the health care provider.
- Communication – Must include inventory, labels, perpetual training, etc., for hazards including cancer, lung effects, immune system effects and kidney effects in the hazard communication program. The employer must also ensure that the employee can demonstrate knowledge of these elements.
- Recordkeeping – Must keep records of air monitoring test procedures and results and identify the lab performing the analysis and its process, the identity of all employees monitored, the data and medical monitoring.
- Compliance schedule – Must comply within 180 days for everything except engineering controls and lab requirements, which are within one and two years, respectively.

The ACC said that while compliance with the current PEL is required and necessary to continue the reduction in silicosis, reducing the PEL is not. "OSHA compliance sampling over several recent decades show a noncompliance rate with the current ... PEL in excess of 30%," it said. "Moreover, attempting to comply with the sharply reduced PEL presents



enormous feasibility challenges for the many job-producing sectors where silica exposures may occur. Furthermore, it is unclear how the proposed PEL could be enforced given that serious questions remain about the ability of laboratories to measure silica exposures accurately and reliably at such low concentrations."

The National Precast Concrete Association opposes the OSHA proposed rule and has submitted public comments in support of retaining the current PEL of 100. NPCA supports adherence to existing standards and more OSHA education about best practices for controlling exposure and encouraging respirator usage. In addition, NPCA and a coalition of concrete-related trade associations have joined the American Chemistry Council's Crystalline Silica Panel in support of the ACC's scientific argument that the current PEL is sufficient.

What do you think?

To make their voices heard, precasters and those in other industries are encouraged to submit their comments. Written comments are due Jan. 27, 2014. The deadline for submitting a notice of intent to testify at the hearing was Dec. 12, 2013; the public hearing will be held March 18, 2014, in the auditorium of

the U.S. Department of Labor, 200 Constitution Avenue NW, Washington, D.C.

All submissions must include the agency name and the docket number for this rulemaking (Docket No. OSHA-2010-0034). All comments, including any personal information you provide, are placed in the public docket without change and may be made available online at regulations.gov. Therefore, OSHA cautions you about submitting personal information such as social security numbers and birthdates.

- *Electronically:* You may submit comments and attachments electronically at regulations.gov.
- *Fax:* If your submissions, including attachments, are not longer than 10 pages, you may fax them to the OSHA Docket Office at (202) 693-1648.
- *Mail, hand delivery, express mail, messenger or courier service:* You must submit your comments to the OSHA Docket Office, Docket No. OSHA-2010-0034, U.S. Department of Labor, Room N-2625, 200 Constitution Avenue NW, Washington, DC 20210. ■

Evan Gurley is a technical services engineer with NPCA.

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RETAINING WALLS ALONG US 31 IN CARMEL, IND., WERE MANUFACTURED WITH SCC BY SANDERS PRE-CAST CONCRETE SYSTEMS INC., WHITESTOWN, IND.
NPCA File Photo

Implementing SCC **PART 1**

Expert advice for precast concrete producers.

BY SUE McCRAVEN

Editor's Note: This condensed, two-part overview of self-consolidating concrete (SCC) is based on a recent NPCA White Paper. Part 1 explains SCC characteristics, aggregates and equipment, plus a cost/benefit analysis of SCC compared with conventional concrete. Part 2, to be published in the March-April issue of *Precast Inc.*, will guide the precaster in SCC test methods and troubleshooting. Parts 1 and 2 are designed to highlight the critical advice of industry experts to assist precast concrete producers who are using SCC for the first time.

If you've been following the three-part series in *Precast Inc.* about diversifying and growing your company (Part 2 begins on page 6 in this issue), you may be planning to modernize your plant for the greater production efficiencies of self-consolidating concrete (SCC).

If so, this article provides the answers you need to the following questions:

1. What makes SCC a "different animal" compared with conventional concrete?
2. Can I produce SCC with my existing mixer and forms?
3. If I do need to purchase more equipment to use SCC, which already costs more than conventional concrete, how can it possibly save me money?
4. What do industry experts say about SCC?

What is SCC, and what can it offer me?

SCC was first developed by Japanese precasters more than 30 years ago as a means to produce concrete with less labor due to a serious shortage of qualified workers. Therefore, SCC's primary benefit is the significantly reduced need for labor. Unlike conventional concrete, SCC does not require vibration. SCC flows like lava to fill forms on its own, even for structures with a lot of reinforcing steel and intricate forming. During pouring, SCC's large aggregates remain uniformly distributed (no settling).

The three material attributes of SCC are:

1. Flowability: Fills form spaces with no external assistance
2. Passing ability: Flows through rebar and around obstructions
3. Stability: Large aggregates stay evenly mixed throughout production

The production advantages of SCC are:

- Less labor: Vibration and the noise it creates are eliminated, along with the cost of vibration equipment
- Increased safety: no walking on forms and reinforcement steel with hand-held vibrators)
- Decreased form maintenance
- Improved product finish and less rework
- Reduced electrical bills

The way to find out if SCC is viable in your plant – and the only way – is to give it a try. Run some trial batches of SCC with your crew and products and see what happens. There's a pretty steep learning curve for SCC, so be prepared to give your staff enough time to experiment and get a good feel for using the material. Do trials with flat slabs and structures with complex reinforcement.

While the crew sizes up this new experience, do a cost/benefit analysis of SCC versus conventional concrete. Be forewarned, SCC mixes can be temperamental – even delivery methods (ready-mix truck or bucket) must be addressed in mix design.

SCC experts recommend a plant-wide meeting to present your SCC initiative and the particular vagaries of SCC production. Host lunch-and-learn presentations for your crew with your admixture supplier or industry experts on what to expect with SCC.

Learn from the pros

Consider the following advice from industry experts in the areas of aggregates, cement, admixtures, equipment, QC and mix trials:

Aggregate sources and grading: critical to SCC performance

- Coarse aggregates retained on a 200 sieve/pan may be advantageous
- Light aggregates can be challenging; closely monitor air content
- Grading of fine aggregate may deviate from the norm
- Coarse aggregate volumes may need to be altered due to SCC's increased paste requirements
- A higher percentage of fines retained on a 200 sieve/pan may be advantageous
- When using >50% fines (by aggregate volume), hardened shrinkage testing may be required
- Software programs are available for optimum aggregate grading
- Choosing the cheapest source of aggregates is a common mistake
- Trial batching is the only way to find optimum aggregate grading
- Follow ASTM except for fines gradation¹
- Ensure that there is no crossover contamination between aggregate storage bins
- When in doubt, consult with an SCC software/mix-control expert

Cement & supplementary cementitious materials (SCMs)

- Follow ASTM standards, DOT specs (some states require AASHTO M35) for all SCMs
- Paste volume and cementitious particle size may affect SCC
- Re-qualify mix if cement source or cement characteristics change
- Blended cements and variable SCM particle sizes and shapes aid SCC mix stability
- Choose low-carbon fly ash to avoid bleeding and air-content fluctuation
- Grade 120 slag is preferred by producers due to its high reactivity
- Silica fume can contribute significant paste and mix stability
- When in doubt, call in an a professional concrete mix specialist

Admixtures

- Due to the viscosity of the paste, SCC is particularly vulnerable to small changes in the amount and character of SCM
- High Range Water Reducers (HRWR) are essential to SCC's flowability and consolidation; polycarboxylates are highly recommended
- Potent HRWR are part of mix water (w/c) and require accurate metering; overdosing may cause surface bubbles ("champagne effect") and aggregate segregation
- Air-entraining admixtures improve workability, flowability and reduce bleeding
- Calcium chloride accelerators are not recommended as they can degrade reinforcing and promote drying shrinkage
- Corrosion inhibitors can delay accelerate set time and cause rapid loss of spread
- HRWR plus corrosion inhibitors can cause water reduction in the mix
- Viscosity Modifying Admixtures (VMA) bind water into the concrete matrix; VMA overdosing can cause incomplete self-compaction, sticky finishing and bug holes
- Intricate formwork and heavy reinforcing requires a less viscous mix to ensure complete coverage and consolidation
- When in doubt, call your admixture supplier for technical advice

SCC equipment and placement

- Mixers used for conventional concrete can usually handle SCC
- Forms may need alteration because for lower viscosity mixes — formwork gaps may leak paste (blowouts), resulting in honeycombing and air pockets
- Hydrostatic (outward) pressure may be higher than that of conventional concrete and additional bracing for wooden and semi-rigid forms may be required
- Pouring too rapidly may cause entrapped air and bug holes; pouring too slowly (especially for more viscous mixes) may lead to insufficient head pressure, decreasing SCC's ability to fully compact in the form
- Proper timing of pour is important to ensure that HRWR effects are not diminished
- Concrete conveyors and chutes must have tight dispensing

NEW TOOLS FOR SCC CONSISTENCY - A CASE STUDY

BY WAYNE FAULKNER AND ROB PIOSIK

Self-consolidating concrete (SCC) provides the concrete producer with improved product quality at reduced costs. Like most production enhancements, however, improvements do not occur without some investment. Many concrete producers have already discovered that producing SCC is not a walk in the park. Factors related to mix design proportions, aggregate gradations and moisture control require tight product specifications if consistent SCC quality is to be achieved from batch to batch.

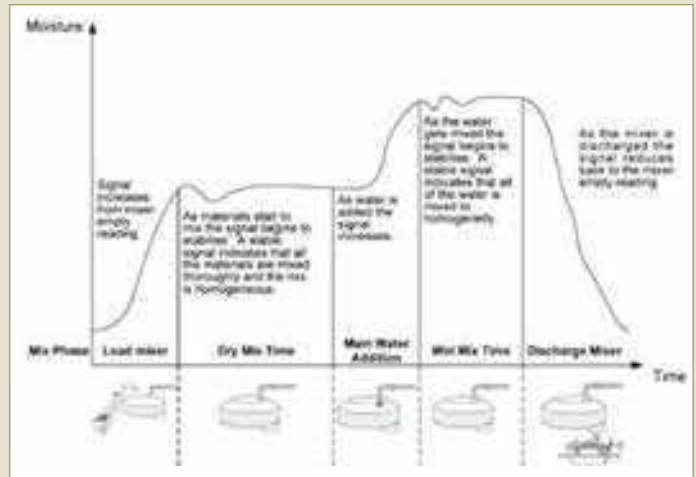
SCC success depends on controlled aggregate moisture content. New moisture probe technology allows the precaster to control total water in the mix.

The first requirement for consistent SCC is a consistent yield of the raw materials. Your goal should be to achieve consistent aggregate material yields by measuring the moisture as the material flows across the probe during weigh up and then correcting the required weight target in real time. This comprehensive process delivers the exact material amount as specified in the mix design.

In addition, your process can be set to measure all of the sources of moisture content in the mixer before intake of cement, including a final measurement of blended aggregate, silica, admixtures and color. Total measurement of moisture content of all the “dry” aggregate moisture includes any rinse water left from the last batch or other foreign sources of water.

Foreign water sources could be rainwater on a material transfer belt during mixer charging or unmelted ice in the material. Often small amounts of ice will melt during the aggressive dry-mixing time. Armed with accurate data on total water, producers are able – for the first time – to produce consistent SCC spreads.

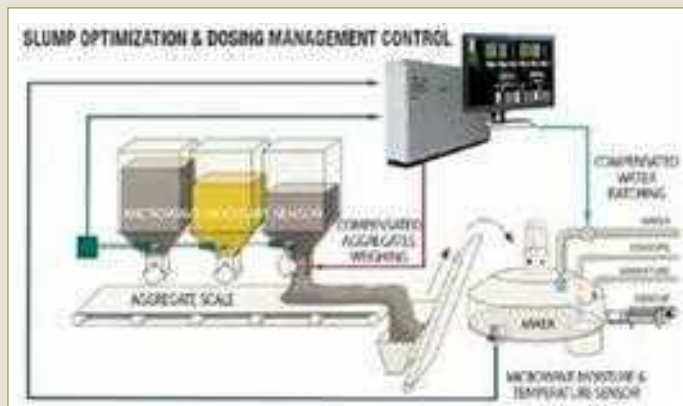
This same technology accommodates high-absorption aggregates. Prior to SCC innovations, the producer’s only option was to constantly sprinkle the aggregate with water, hoping that doing so would produce an aggregate at Saturated Surface Dry (SSD)



conditions. However, there was no way to ensure SSD conditions as material moved through the plant, was stored overnight in bins, or exposed to hot or windy conditions. The solution is to introduce a small amount of water during the dry-aggregate mixing cycle to ensure the aggregate reaches at least the SSD state.

Another important improvement in the new SCC toolset further reduces errors in moisture measurement. Using sensor physics, the precaster can specify a mix calibration based on dry-aggregate volume (cubic yards) in the mixer. Additional tools for SCC include the ability to graph and store the mix moisture information with the batch weights. The graph produced during batching has proven to be an invaluable tool for QC analysis of the concrete quality. These tools allow producers to monitor moisture, temperature, air content, wattage draw and other relevant sensors, and plot this data in real time with the final batch report for storage.

These technological improvements in SCC production control systems give precasters the advantage of being able to request SCC concrete at the touch of a button.



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Rob Piosik is the global CP delivery manager for Command Alkon and began his career in concrete plant automation 24 years ago as a support engineer. He may be reached at rpiosik@commandalkon.com.

- gates, both out of concern for safety as well as loss of paste
- If your concrete delivery bucket traverses rough ground, post-transport testing is required to ensure proper elastic properties (not required of ready-mix truck transport)
- Typical vibration and finishing equipment is not needed for most SCC mixes
- Over-vibration causes: course aggregates to sink (segregate), loss of entrained air, and paste and bleed water to rise to the surface
- Finishing may be delayed by small entrapped air bubbles; likewise, screeding may be delayed (or eliminated entirely)
- Just like conventional concrete, SCC's surface will crust if exposed to outside wind and heat, leading to finishing problems; use an evaporation retardant where needed
- Note that any delays in placement, as with conventional concrete, can have a profound effect on SCC
- When in doubt, call your equipment suppliers for expert advice and assistance

QC: increased testing, calibration and monitoring

- Carefully review and record technical data in mill test reports; record fineness (Blaine) when qualifying mixes
- Establish SCC mix design parameters for slump flow and air content
- Set minimum frequency for calibration of scales, meters, admixture dispensers and probes
- Increase minimum testing frequency for aggregates, gradation, and moisture content
- Increase minimum testing frequency of fresh and hardened concrete
- Designate the person who will decide if and when inadequate SCC mixes should be discarded; ideally, the responsible person has experience with SCC, or – at a minimum – a good understanding of SCC characteristics, how numerous factors affect SCC quality and troubleshooting knowledge
- It is critical that the designated control person be present during all stages of SCC production, and this person must have total control over batching operations (good communication and mutual SCC understanding with mix-control and aggregate-storage personnel)
- Establish post-casting inspections for paste leakage, dimensional integrity, static-mix segregation, air content, foaming and surface bleeding
- It is important to note: SCC is generally more sensitive to water variations. For this reason alone, automated moisture controls are strongly recommended.

For specific information on moisture control systems for SCC production, see the sidebar “New Tools for SCC Consistency – A Case Study.”

The SCC linchpin: mix trials

- Mix trials should be performed with multiple sources of raw materials
- The cheapest materials can be the most costly in the long run

- Always use actual plant mixer and equipment in mix trials
- Trials may reveal any reaction between SCC head pressure and form release agents
- Early trial batches in the lab may minimize material waste and labor

Perform a cost/benefit analysis of conventional concrete versus SCC

Precasters know that the No. 1 and most costly resource in the production of precast concrete is labor. The process efficiency of workers and staff is just as critical for small- to medium-sized producers as it is for the largest precast concrete conglomerates.

Perform a time study at your plant to determine the amount of time spent placing, consolidating, floating and patching a conventional-mix product. Record the time (minutes per cubic yard). Then, using a matrix similar to Table 1, calculate your labor cost per cubic yard. The labor rate is an average of the hourly rate (including overtime) plus the cost of health benefits, profit sharing and pension plans. Any step in the production process that does not add value to the product must be identified and eliminated.

The second direct manufacturing cost is materials. Tables 2 and 4 illustrate a theoretical cost/benefit evaluation of material costs of conventional concrete versus SCC.

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Increased costs of using each type of concrete are highlighted in red, while cost savings are highlighted in green.

Table 1 – Approximate Labor Cost/cu yd for Conventional Concrete (theoretical)				
Labor (standard mix)	Time/cy (min.)	No. of workers	Hourly rate	Extended cost
Placement	5	5	\$15	\$6.25
Vibrating	3	4	\$15	\$3.00
Floating	2	2	\$15	\$1.00
Patching	10	1	\$15	\$2.50
Total/cy				\$12.75

Table 2 – Material Cost/cu yd for Conventional Concrete (theoretical)	
Material (standard mix)	Extended cost
Cement	\$27.60
SCM (fly ash, slag, pozzolans)	\$2.70
Coarse aggregate	\$9.00
Fine aggregate	\$6.50
Air-entraining admixture	\$0.22
Water-reducing admixture	\$4.69
Total cost/cy	\$50.71

The total cost (labor + materials) of producing conventional precast concrete in the theoretical examples shown in Tables 1 and 2 is \$63.46 per cubic yard.

Once you know the costs associated with the production of conventional concrete, use the same procedure to determine the cost for producing SCC. A trial SCC production run is necessary to obtain actual time-study data. Time estimates from another precast plant will not accurately reflect the efficiencies – or lack thereof – of your crew and equipment.

Table 3 – Approximate Labor Cost/cy for SCC (theoretical)				
Labor (SCC mix)	Time/cy (min.)	No. of workers	Hourly rate	Extended cost
Placement	3	2	\$15	\$1.50
Vibrating	0	0	\$15	\$0.00
Floating	0	0	\$15	\$0.50
Patching	0	0	\$15	\$0.00
Total cost/cy				\$2.00

Table 4 – Material Cost/cu yd for SCC (theoretical)			
Materials (SCC mix)	Cost/unit	Quantity	Extended cost
Cement			\$32.43
SCM (fly ash, slag, pozzolans)			\$3.17
Coarse aggregate			\$7.50
Fine aggregates			\$7.50
Air-entraining admixture			\$0.22
HRWR admixture			\$5.47
Total cost/cy			\$56.29

The total cost (labor + materials) of SCC in the theoretical examples shown in Tables 3 and 4 is \$58.29/cy, resulting in a theoretical savings (\$63.46/cu yd – \$58.29/cu yd) of \$5.17/cu yd.

Remember that the costs and savings realized in this example are based on hypothetical data and actual savings are specific to each plant. A savings of more than \$5/cu yd is a substantial sum for a plant producing 50, 75 or 100 cu yds of concrete per day, and savings can be realized even for a smaller operation with an output of 10 cu yd per day or less.

Adjustments in workforce staffing hours probably will need to be addressed in order for any savings to be realized. A complete overhaul of post-cast handling may be needed. If patching is no longer a standard practice with SCC, staging areas and secondary handling may be eliminated. These changes can have huge implications on the bottom line, but only if staff adjustments are recognized and acted upon. Sales staff, particularly, must be cognizant of lower SCC production costs for success in bidding and winning new work.

Additional SCC savings

Reduced labor and material costs are not the only financial savings offered by SCC. Other savings include reduced cost for:

- Electric power for consolidation
- Purchase and maintenance of vibratory equipment
- Concrete waste due to overfilling of forms (SCC is self-leveling)
- Housekeeping (plant cleanliness) due to spilled concrete
- Form repair needed for damage during demolding
- Health issues and injuries (including lost time and replacement training) related to climbing on forms and reinforcing to haul and operate vibrators, and tripping over electrical cords and air hoses
- Health issues relating to hearing loss from high-decibel vibratory noise

As you can see, there are a great many advantages of using SCC, and a lot of precautions that go along with them. Is SCC right for you? There is only one way to find out, and that's to try it. Arm yourself with information, and expect some failures along the way, but you may find, as other precasters have, that little failures can lead to big successes. ■

Sue McCraven, NPCA technical consultant and Precast Inc. technical editor, is a civil and environmental engineer.

Watch for Part 2 of Implementing SCC in the March-April issue of Precast Inc. to learn about SCC testing protocol and troubleshooting.

Endnotes

ⁱ Fine aggregate for use in SCC should conform to ASTM C33 with the exception of gradation requirements. Grading may deviate to achieve a more ideal grading curve when blending with other aggregates to develop a robust SCC design. Variations in the fineness modulus (FM) should not deviate from the qualification design by more than +/- 0.20



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Visitor Safety 101

How to keep vendors and contractors safe while they are on site and on the road.

BY BRIDGET McCREA



It was a normal workday in October at what would soon be the new San Francisco 49ers football stadium. Workers moved busily around the site doing their jobs, supervisors called out orders, and drivers unloaded the heavy, bulky materials used to construct the new \$1.2 billion structure. In a split second, tragedy hit when a 60-year-old truck driver was crushed to death by the steel rebar he was unloading from his truck.

The accident – the second construction worker-related death within four months at the stadium – was still under investigation when this article went to press, and is certain to impact both the general contractor and the worker’s employer. But the human impact on the worker’s family, friends and co-workers was immediate and devastating.

Reminders of the dangers lurking on construction sites, on the road and at manufacturing facilities are plentiful. While full-time employees may understand and compensate for the dangers that stand before them, the typical “visitor” may not readily recognize those threats.

Unthinkable?

Suppose a delivery person is hurt while unloading materials at your plant? Or, perhaps a subcontracted transport company drops your product on the highway? Even worse, what if that

product topples onto another car? It has happened before.

These are all questions that companies like Jensen Precast of Sparks, Nev., ask themselves and address on a regular basis. To reduce such risks, the company has developed a workplace safety program that includes specific policies and directives around vendors and contractors. As part of the program, for example, a crane operator who is coming on site to conduct equipment maintenance must provide a certificate of insurance and complete an orientation program. Through the latter, Jensen Precast can determine whether the individual has the proper safety credentials to perform the work, inform that person about its lockout procedures, and ask that he or she sign an acknowledgement.

“We also use a prequalification process with vendors that spells out our requirements, and requests specific pieces of safety information before they can even do business with us,” says Donald Graham, director of safety. The program was implemented several years ago after a safety-related incident pushed Jensen Precast to more carefully examine its procedures. And while deliveries of office supplies are handled more informally (since they take place in the precaster’s “common areas”), those that are directed at the plant or yard fall under more scrutiny.

Graham says the program was modeled after several Jensen

Precast customers who send out “prequalification managers” for all new jobs. As part of those pre-bid qualifications, Graham says the precaster is asked for its OSHA history, insurance experience modification factor, and copies of other safety-related documents. “We’ve basically borrowed a page from their book,” says Graham, who adds that all vendors who come on site need to comply with and follow the same procedures.

“We put all visitors, customers and vendors through an orientation program that tells about the hazards of the plant, ensures that the individual has a PPE, hardhat and safety glasses, and sets him or her up with an escort,” says Graham, adding that Jensen Precast’s workplace safety program has “gone pretty smoothly” since inception – with the exception of the errant vendor who refuses to attend the orientation and/or fill out the acknowledgements.

“When they refuse, we tell them that we’ll just contact another vendor,” Graham says. In regions where alternate vendors are not available, he says Jensen Precast works out negotiated arrangements with the suppliers in question. The program has received positive reviews from visitors, customers, vendors and even OSHA. “When you can create a positive experience with a regulator, it’s never bad,” says Graham. “The best news is that we’ve had no accidents or fines involving vendors, contractors or visitors since implementing the program.”

Litigious matters

In our increasingly litigious society, preventing accidents, mishaps and deaths on your premises, at job sites and even on the road should be a top-of-mind issue. Take premises liability, for example. In “Premises Liability: Who is Responsible?” by FindLaw, a leading provider of free legal information (findlaw.com), in most cases the property owner is responsible for maintaining a “relatively safe” environment. This is known as “premises liability.” A courier delivering a package may sue you for injuries if he or she slips and falls on an oil slick in the driveway, for example, but if the same courier happened to be intoxicated or otherwise acted in an unsafe way, then he or she may not have a valid claim.

According to FindLaw, the legal theory of premises liability holds property owners liable for accidents and injuries that occur on that property. The kinds of incidents that may result in premises liability claims can range from a slip and fall on a public sidewalk to an injury suffered on an amusement park ride. Liability is determined by the laws and procedures of the state in which the injury occurred. In some states, the court will focus on the status of the injured visitor in determining liability. In other states, the focus will be on the condition of the property and the activities of both the owner and visitor.

For precasters and other manufacturers, the issue of visitor and delivery safety arises in relation to loading and unloading products. In the recent North American Transportation Association (NATA) article “Loading and Unloading, Who is Responsible?” the author points out that the person who loads a cargo-carrying vehicle can make the difference in establishing

liability for loss or damage to the cargo; for injuries that occur during transport; and for problems that surface during delivery.

According to the U.S. Department of Transportation regulations, the trucking company and the driver bear the ultimate responsibility for the safe operations of the trucks, but those regulations generally do not apply to people who ship or receive freight on trucks (consignors and consignees). OSHA standards state, “OSHA regulations govern the safety and health of the workers and the responsibilities of employers to ensure their safety at the warehouse, dock, construction sites, and other places truckers go to deliver and pick up loads throughout the country. While OSHA does not regulate self-employed truckers, it does regulate workplaces to which the truckers deliver goods and the workers which receive those goods.”

But what happens when someone gets injured due to the shifting and/or falling of a large precast piece while the cargo is in transit – or while it’s being unloaded? According to the NATA, if the shipper loaded the freight and secured the cargo, the trucking company generally is not liable for injuries caused by shifting or falling freight.

However, if a trucking company driver witnesses and/or participates in the loading process, secures the freight for transport and could have made changes to the load to make it safe for movement, then the trucking company and driver could be liable for any shifting or falling freight damages. “If the shipper assumes responsibility for the loading process without

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the driver or an agent of the carrier observing the process, or if they could have offered input on how to properly load the cargo vehicle, then they may be liable for any shifting or falling freight damages.”

Visitors welcome

In most cases, the truck drivers, vendors, delivery personnel and clients who visit your premises will not understand the exposures and dangers associated with your facility like you do. One of the best ways to offset this lack of knowledge, says Gary Murrall, construction consulting director at CNA Risk Control in Chicago, is by controlling physical access when such individuals are on site. If you have the space, for example, consider separate “visitor” driveways, parking areas and common areas where you can feasibly keep exposure to a minimum.

“The idea is to keep them away from production and heavy-traffic areas,” says Murrall. “Steer them out of having to make these decisions for themselves. Make it clear this is their entrance and that they need to report to the office.” Signs that emphasize messages like “Unescorted visitors must report to the office” can also help keep visitors safe and accounted for, says Murrall.

The same care should be used at gates and entrances

designed for truck ingress and egress. Clearly mark entrances and exits with signage, Murrall advises, and use a similar tactic to remind drivers to “stay in their vehicles unless otherwise directed.” And, if you do decide to allow them to exit their vehicles, be sure to designate and communicate where they can and cannot go once they are on foot (for example, use signs that state “Non-employees are not allowed beyond this point”).

Murrall says precasters can take their commitment to on-site safety a step further by requiring drivers to wear visibility vests once they exit their trucks. “Even if they aren’t walking around in an area of exposure, you want to make sure they’re seen by all,” says Murrall, who notes that all of these steps are designed to create a controlled environment – even outside in a large yard area where dozens of workers are going about their daily tasks. “The key is to communicate your message and enforce it.”

Empowering employees

As a precaster, your own employees are one of your best lines of defense against a visitor injury, accident or even death. Break-ins, thefts and other threats can also be thwarted by attentive employees who understand the rules and know what to look for.

“Empower your workers to be your eyes and ears and to be on the lookout for potentially problematic people and/

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or situations," says Murrall. "When your workers exhibit this behavior and thwart problems, be sure to give them an 'Atta Boy!' This will help change behaviors and make sure that everyone is on the same page when it comes to site and individual safety."

Changing the rules

Precast manufacturers looking to roll out improved visitor and driver safety policies should expect some pushback, says Murrall. After all, it's just human nature to be resistant to change, he says. Much like Jensen Precast ran into issues with a small handful of vendors who didn't want to comply with its workplace safety program, your company will likely face some resistance when asking, say, a longtime vendor to suddenly wear a reflective vest and not visit his longtime friend over on the shop floor without an escort.

"Vendors and drivers that have been visiting your site for 10 years may assume that they know what's right and wrong," says Murrall, who advises precasters to emphasize the safety aspect of their programs and campaigns when dealing with pushback. "Tell them that you're trying to ensure that you have the safest environment possible through posted signs, communicated safety rules and related policies. If they can't

follow those, then you'll have to work with someone who can. Period."

On a final note, Murrall advises precasters not to miss the trees for the forest when developing site and on-the-road safety procedures. Much like the longtime vendor who feels he knows the ins and outs of your premises, you too may be blind to the possible threats that are lurking around the next corner. "You may be so familiar with your property that you've become immune to the hazards and exposures," Murrall warns.

One effective method of overcoming this "halo effect" is by walking through your plant and around your premises with an imaginary 10-year-old child by your side. Not only are people more protective of children as a whole, but children also tend to be more curious and mischievous than the average adult. "This exercise will raise your awareness, because people know that children lack knowledge and experience," says Murrall. "Look at the hazards and exposures that exist from that perspective, and you may be surprised to find out that what you think you have covered is not very well covered at all." ■

Bridget McCrea is a freelance writer who covers manufacturing, industry and technology. She is a winner of the Florida Magazine Association's Gold Award for best trade-technical feature statewide.



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PRECAST FORECAST 2014

Precast sector expected to add 6%.

BY THE NATIONAL PRECAST CONCRETE ASSOCIATION

It used to be said that the precast concrete industry was recession-resistant because of the wide range of products that cross over into nearly all construction sectors. That was the good old days, when the construction industry was basking in an unprecedented 20-year growth cycle. Then the bottom fell out – all construction sectors tanked – and even the most diverse precast companies felt the steep contraction. Many precasters either slimmed down their operations or went out of business when the recovery proved too small and too slow. Dozens of supplier companies merged operations, and now the industry at the beginning of 2014 looks different from the peak years of the mid-2000s.

While the precast concrete industry was stalled at the bottom from 2009 through 2011, two years of slow growth followed. The NPCA Benchmarking Report, which tracks the industry through an annual survey sent to precast

concrete producers in North America, shows the industry at its lowest level in 2011, down nearly 45% from the peak in 2007. While the construction industry as a whole was coming back on the strength of an improved housing market in 2012, precasters recorded a modest 2.5% increase, followed by an estimated 3% increase in 2013. The slow recovery trend should accelerate in 2014, with the precast sector adding another 6% in sales, to \$16.31 billion in total sales, based on the data from the NPCA Benchmarking Report and a variety of construction industry forecasts.

Because so much of the precast industry is concentrated in public works projects that take longer to revive after a recession, the precast sector tends to lag about a year behind the overall construction industry, according to Ty Gable, NPCA president. “Many of these big public works projects are bid and funded years in advance,” Gable said.

“The result is that the precast industry stayed fairly strong for about a year after much of the rest of construction went into recession. And now it’s taking us longer to come out of it while we’re waiting for public works projects to come off the shelf.”

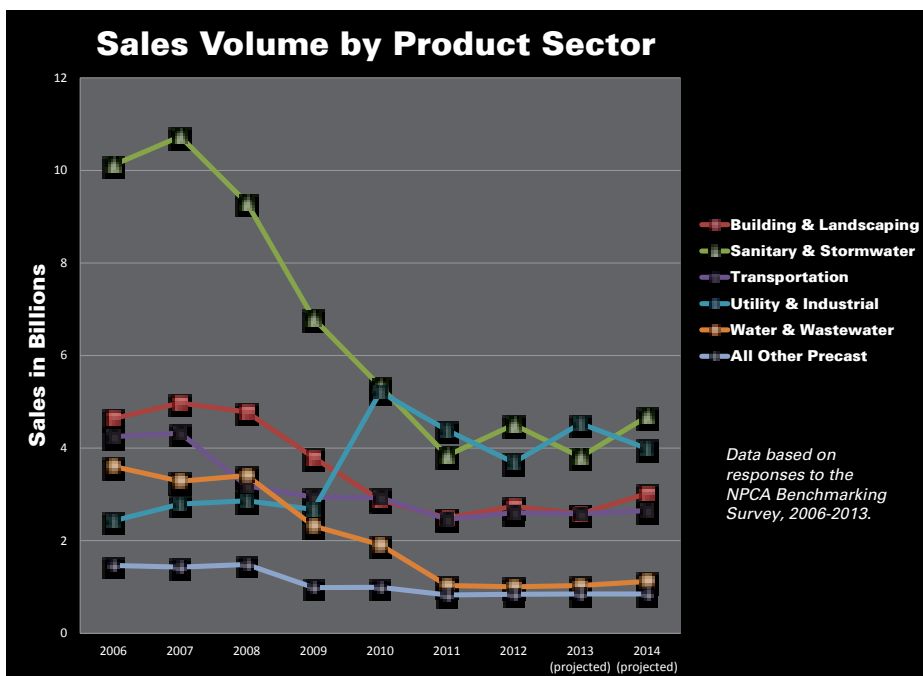
Transportation and infrastructure look flat

Transportation projects funded through the federal bill Moving Ahead for Progress in the 21st Century (MAP-21) are stable through Sept. 30, 2014, although the highway trust fund that supplies revenue for MAP-21 is likely to become insolvent in mid-2014, and will require an infusion of cash from Congress to make it to the end of the fiscal year.

On the positive side, states and local governments are finding ways around federal government gridlock and creating their own funding for transportation and infrastructure through higher gasoline taxes, new tolls, public/private partnerships and bond initiatives, Gable said. “In states where the economy has improved and tax receipts have grown, we’re seeing new initiatives to replace aging infrastructure and improve transportation systems,” he added. “These local efforts have helped to replace some of the work lost as a result of federal inaction.”

Data from the 2014 Dodge Construction Outlook, FMI’s Construction Outlook and market research firm IBISWorld confirm that the construction sectors where precast products are prevalent, such as transportation and water-related public works, will likely remain flat through 2014.

The buzz is still in the housing sector, and both single-family housing and



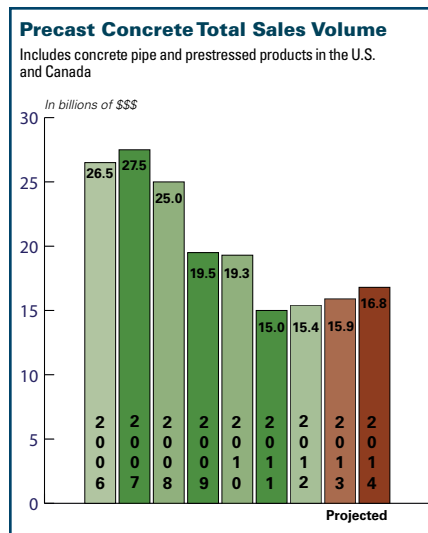
multifamily dwellings are expected to continue their revival in 2014 with a third straight year of double-digit increases. Single-family housing starts should rise another 26% in 2014, according to the Dodge Construction Outlook, while IBISWorld predicts the value of new residential construction to increase by 21.4% to more than 800,000 new starts. That should mean continued good news for precast companies that supply septic tanks and other products to the residential housing market.

Leaner, greener

While the recovery has been slow to come, it hasn't been all doom and gloom since 2008. While most precast operations were contracting, some companies were able to survive, and even thrive, by aggressively seeking out new opportunities – either through diversifying their product lines or by selling precast concrete as a better solution to project designers who had originally specified a different material. Those companies are setting the tone for the leaner, greener precast industry that is now emerging.

“There will be plenty of opportunity for precast manufacturers that are willing to get out into the marketplace and sell the many advantages of precast over other materials,” Gable said. “The prevailing trends in construction are favorable for precasters. The leading companies in the precast sector understand this new environment and are becoming more outward facing and aggressive in marketing the tangible benefits of precast to specifiers.”

The LEED v4 building standards recently introduced by the U.S. Green Building Council emphasize material selection in relation to lifecycle costs and environmental impact. As a locally sourced material that can be designed to last 100-plus years and stand up to the most destructive weather events, precast concrete is perfectly positioned as the go-to material for LEED-based construction. In addition, the continued incorporation of building information modeling (BIM) into the design process is leading into a new era where the



BIM design team is intent on creating efficient, clean, low-impact construction sites that earn LEED points. These are the same benefits NPCA and many of its members have been trumpeting for many years with regard to precast concrete products.

McGraw-Hill Construction discusses this trend in its recent Smart Market Report, “Prefabrication and Modularization: Increasing Productivity in the Construction Industry.” The report, based on a survey of hundreds of construction professionals, traces the growing impact of BIM. “A key benefit of BIM is enabling the increased use of prefabrication and modularization, which in turn improves worksite productivity and overall project ROI,” the report states. Engineers, architects and contractors are on board with this trend because it often leads to reduced timelines, budget savings and less construction site waste.

Positioning precast

While the transportation and water infrastructure side of the precast industry are stable but not expected to grow in the near term, there appears to be ample opportunity to position precast as a key building material that can enhance the BIM-Prefab-Modular movement.

NPCA's Precast Forecast 2014 is segmented by product line and includes five major sectors of the precast concrete industry and an “other”

category that encompasses a wide variety of products. These figures are based on the annual Precast Industry Benchmarking Report published by NPCA. Compiled by Industry Insights, an independent manufacturing research firm, the NPCA Benchmarking Report is based on a survey of precast concrete manufacturers in North America.

Building and Landscaping Products

\$3.02 billion Includes architectural wall panels, architectural building components, prestressed structural building elements, basement/wall foundation panels, steps and basement entries, burial vaults, and other related landscaping and building products.

Sanitary and Stormwater Products

\$4.68 billion Includes manholes, concrete pipe, stormwater management and retention structures, curb inlets, catch basins and other related products.

Transportation Products \$2.65 billion

Includes box culverts, 3-sided structures, highway and traffic barrier, retaining wall systems, sound wall/barrier, prestressed bridge elements, the emerging category of precast concrete pavement and other related products.

Utility and Industrial Products \$3.99 billion

Includes utility vaults, utility buildings and other related products.

Water and Onsite Wastewater

Products \$1.12 billion Includes septic tanks, grease interceptors and other related products.

All Other Precast Concrete Products \$850 million

Total Precast Sales Volume \$16.31 billion

Total Resale Items \$2.24 billion

Total Volume Including Resale Items \$18.55 billion





READY AND *willing*

BY MASON NICHOLS

Photos by Mason Nichols and Kirk Stessel

WHAT MAKES A SUCCESSFUL BUSINESS? HONESTY, OPENNESS AND RESPONSIBILITY COME TO MIND. FOR **READING ROCK INC.** OF CINCINNATI, ALL OF THESE ELEMENTS – AND ONE SHORT BUT POWERFUL PHRASE –
work together to create a winning formula.

For some businesses, establishing a positive company culture can be a daunting task. While most owners recognize that promoting employee morale, fostering effective communication and efficiently meeting customer needs are all crucial to success, it can be difficult to implement a business plan that addresses these issues while simultaneously moving forward. But for Reading Rock Inc. (pronounced “Redding”), a precast concrete producer based in Cincinnati, a simple phrase serves as the foundation for a continuous dedication to excellence and progression: “Yes, we can!”

ROCKS SOLID

Spending just a few minutes at Reading Rock reveals that the company’s simple promise to meet any need is indeed fitting. Looking around, one quickly notices the wide array of products the company manufactures, including everything from basic 6-in. step units to incredibly ornate architectural column caps.

Gordy Rich, president, explained that Reading Rock’s commitment to never turning down a project is crucial to the company’s success and paramount to making the many skilled teams feel as though they are part of one large family. “Every day when we come to work, we know what we’re doing here,” he said. “We know that if we don’t do our job, we can’t fund the people sitting next to us. They’re part of our family. We have an everyday reminder of why we’re here, and that’s pretty compelling.”

The Reading Rock family is tied

LEFT: BRIAN LEARY, MARK SWORTWOOD AND GORDY RICH ALL EMPHASIZE THE “ROCKS” CORE VALUES AS KEY TO THE COMPANY’S SUCCESS.

BELOW: READING ROCK’S CORPORATE HEADQUARTERS IN CINCINNATI.

together through the constant reinforcement of ROCKS, a set of five core values that the leadership team expects all employees to practice on a daily basis. These values include:

- Responsibility
- Openness and honesty
- Continuous improvement and communication
- Knowing internal and external customers
- Safety as a lifestyle instead of a slogan

At the heart of the ROCKS core values is the International Rett Syndrome Foundation, a nonprofit corporation housed at Reading Rock that aims to fund research and provide support for those afflicted with Rett syndrome¹. Rich’s daughter, Kelly, was diagnosed with the neurological disorder at a young age. Adhering to the values emphasized within the ROCKS core values serves as a constant reminder for Reading Rock’s employees to bring the best mindset and approach to work each day, regardless of the situation.

While these principles and the foundation contribute to the success of the business, Rich recognizes that knowing the customer has enabled Reading Rock to remain committed to client needs while continuing to significantly expand its product line over the years.

“Really, it’s the understanding of the aesthetics,” said Rich. “We sell color and texture, and I think we understand that’s who our customer is. We can do more in color and texture than almost anyone else we run into, because we know that’s what our customer wants. So if it has color and texture, we can make it out of something.”

When Reading Rock was founded in 1947, it was just one of the many block plants that sprung up after





veterans returned home from World War II. Though the company exclusively produced block masonry units when it first opened its doors, through time the product line expanded to many other pieces such as precast concrete lintels and paving stones. Today, Reading Rock's inventory is as diverse as ever, ranging from interlocking concrete pavers and segmental retaining walls to nearly every imaginable component of the building envelope.

Contributing to the company's wide-ranging portfolio is the aforementioned dedication to continuous improvement and communication, something that Mark Swortwood, senior vice president, explained as a constant endeavor. "We have a culture where we're never going to reach perfection, but we want to strive for that," he said. "There's not a lot of celebration – because you're never perfect – but when we do celebrate, we move on and say, 'Okay, what can we do to get better?'"

THE SOLUTIONS PROVIDER

Striving for perfection is one thing, but quickly and efficiently finding solutions to customer requests is

READING ROCK
MANUFACTURES
A WIDE ARRAY
OF MATERIALS,
INCLUDING
ARCHITECTURAL
PRECAST,
PAVERS, SLABS
AND RETAINING
WALLS.

crucial to establishing long-term business success for Reading Rock. Shannon Tokarsky, assistant vice president of specifications and marketing, attributes Reading Rock's ability to consistently meet customer needs to both the company's product line and the passion employees exhibit when working on projects.

"Being a solutions provider is not just something we put on paper," said Tokarsky. "It's something that we really promote. Our product line is so vast that, depending on what your needs and wants are, we have a product that can meet those requirements. And people are truly passionate about what they do here. We work really well as a team, everything from engineering to manufacturing and sales."

Swortwood echoed Tokarsky's sentiments, adding that the manufacturing team's attention to detail results in positive outcomes for the company. "It's not like, 'Well,

“BEING A SOLUTIONS PROVIDER IS NOT JUST SOMETHING WE PUT ON PAPER. IT’S SOMETHING THAT WE REALLY PROMOTE. OUR PRODUCT LINE IS SO VAST THAT, DEPENDING ON WHAT YOUR NEEDS AND WANTS ARE, WE HAVE A PRODUCT THAT CAN MEET THOSE REQUIREMENTS.” – *Shannon Tokarsky*

we’ll just figure it out.’ We’re very methodical in how we approach things, whether it’s setting up the color and using a spectrometer to match something that’s made in one of the other buildings or raw material storage, moisture probes, whatever it is,” he said.

Even when presented with challenging jobs, the “Yes, we can!” attitude pushes the production teams at Reading Rock through unique situations. Swortwood described a large job in Mississippi the company secured, which included three pieces weighing 42,000 lbs. While Reading Rock’s manufacturing facilities aren’t designed to produce and ship materials of that scale, the team came together and discussed whether or not making the product was possible, how the molds were going to be created and the steps necessary to remain committed to staying safe. In the end, the team was able to successfully manufacture the product, load it onto a truck and ship it to the customer, offering up a solution for a scenario in which other companies may have floundered.

Brian Leary, senior vice president, referenced Reading Rock’s willingness to expand as key to the company’s growth, especially as the industry experienced difficulties during the recession.

“The unique thing I found walking in the door was that the precast plant was here and the company was moving toward producing architectural precast,” he said. “The economy was beginning to flatten out in 2008 and 2009, so the question was, ‘We have a plant, what else can we do?’”

To continue to meet customer needs and remain successful, the leadership team placed an emphasis on determining what additional products could be manufactured utilizing the tools and equipment already on hand. This led to Reading Rock entering into the ReCon Retaining Wall business as a licensee, and today, big block is produced side by side with the complex architectural pieces that serve as the signature of the Reading Rock brand.

“We continue to evolve,” Leary said. “Being able to manufacture additional products on the same shop floor with the same safety, quality and focus is what makes us unique.”

Rich agreed with Leary, noting that satisfying customer needs is what drives Reading Rock into new territories. “If it can be made out of concrete, we should be able to manufacture it,” he said. “It doesn’t matter to us if you want to use a segmental retaining wall, a big block wall or whatever. We want to be that solutions provider, and if we can offer a better solution by offering different products, then that’s our responsibility to the end user.”

TEAM PLAYERS

Maintaining an expansive product line and committing to evolution is no simple task and is something that requires buy-in from all employees. In order to help achieve these goals, Reading Rock has taken several steps to ensure that everyone understands the importance of the company’s core values, from general office staff to workers on the production floor.

One initiative the company has recently implemented is the ROCKS core value award, which recognizes employees who have positively contributed to Reading Rock by exhibiting characteristics of ROCKS. Tokarsky explained the award as yet another component of the

READING ROCK’S
DRY-CAST
PRODUCTS ARE
MANUFACTURED
WITH A
HAND-TAMPING
METHOD.



company's willingness to always strive for improvement.

"The idea behind the award is that anyone can nominate anyone," said Tokarsky. "It doesn't have to be a manager down. It can be a manager to a manager or it can be a peer to a peer. We're trying to promote the positivity in the organization and how that ties back to our mission, our purpose and our core values."

Each month, a winner is chosen for the award, but all of the employees who were nominated are also given exposure through the Reading Rock newsletter, via social media and in the company's town hall meetings. The hope is that teamwork is further promoted as employees take pride in the work they perform together.

The ability for any employee to nominate any other employee speaks to the openness of Reading Rock's communication channels, something that Greg McMullin, production manager for the company's RockCast line, views as key to success. "Openness and honesty are probably the biggest things here," he said. "Anyone can walk into Gordy, Mark or Brian's office if they have ideas or want to critique anything. They can go straight to the owner of the company."

THE BEAM,
COLUMNS AND
PAVERS AT THE
ALUMNI &
FRIENDS PARK,
NOE PLAZA AT
CAMPBELLVILLE
UNIVERSITY IN
KENTUCKY STAND
AS A LEGACY TO
READING ROCK'S
PRODUCT LINE.

Reading Rock has also made strides in enhancing teamwork by translating more company communication into Spanish. A significant portion of employees working on the production floor are non-English speakers, and as such, the company wants workers to feel as though they, too, participate in and contribute to the company culture.

Tokarsky added that one of the biggest requests from workers on the production floor is the ability to understand more about the projects they work on, including their locations and purpose. Workers have also taken great interest in photographs of finished projects.

"One of the things we're doing now is reaching out not only to the sales team but across the organization and asking about the projects that have been completed during a given month," said Tokarsky. "Then we will have those who respond send us a picture and give us a few sentences explaining why the project was a success."

In order to achieve maximum visibility, these reports are publicized through posters and the company newsletter. As with other forms of company communication, they are also translated into Spanish so that all employees can appreciate the extent of their work.

Rich explained that a priority for Reading Rock is ensuring that all employees recognize ROCKS. "You could ask anybody, from the person on the floor to the



A FAIR *trade*

BY KIRK STELSEL

Membership in a trade association means something different to each member. For NPCA members, networking, The Precast Show, publications and education consistently rank among the top benefits in satisfaction surveys.

Reading Rock finds all these and more as benefits of its membership. However, Brian Leary, the company's senior vice president, feels as though what you get from your membership is directly proportional to what you give, and in the end everybody comes out ahead. The company is an NPCA Certified Plant, and Leary sits on the NPCA Board of Directors.

"When we get involved we want to contribute," Leary said. "If I don't bring interesting opportunities back and different ways of doing things, then I haven't done my job for the company. If I don't bring our best practices or thoughts or different ways to look at things to board meetings and committee meetings, then I haven't done my job in the other direction. It's a two-way street."

Company president Gordy Rich echoed those thoughts. "Participation on the lowest level probably is not going to get us anything," he said. "The one thing I'm pleased to see is that NPCA is very much aware of the competitive environment and its position and what it needs to do to continue to stay ahead of the curve. It's that understanding of where we are and what opportunities are out there. You only get that from shared learning."

In addition, the company has been an NPCA Certified Plant since 2007, a program that has provided great value for the company. According to Leary, it helps set Reading Rock apart and establishes it as a company that understands how to make the product correctly. NPCA certification is a third-party, accredited program that confirms best practices, consistency, safety and quality not only in the precast industry but in the entire building materials arena.

"By having that certification behind us, we're more knowledgeable and more credible and able to be a better resource to our customers to ultimately have a better product," Leary said. "Being a part of NPCA is critically important. Let's be serious, there are lots of competitive products that could substitute out, and we've watched this happen. The associations play a great role in helping us control building standards and codes that allow the products to continue to grow and for us to move forward."

Kirk Stelsel is NPCA's director of Communication.



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“WE CONTINUE TO EVOLVE. BEING ABLE TO MANUFACTURE ADDITIONAL PRODUCTS ON THE SAME SHOP FLOOR WITH THE SAME SAFETY, QUALITY AND FOCUS IS WHAT MAKES US UNIQUE.” – *Brian Leary*

truck driver to anyone else, and one of the things we’ve driven home is that all of them should know what ROCKS is,” he said.

THE 50-16 PLAN

Looking ahead, precast concrete is set to play a large role in Reading Rock’s commitment to evolution. Recently, the company initiated its 50-16 plan, which is designed to grow business 50% by the end of 2016. Though the bar has been set high, Rich believes the company can achieve its goal thanks in large part to the versatility of precast concrete products.

“Of all our business segments, we think precast has the highest growth potential because of its flexibility,” said Rich. “We think the opportunity is out there for us to reach our goal, and a large part of that potential for success comes from the precast segment of our business.”

McMullin noted that the company’s precast concrete line takes over when production limitations of its cast stone (dry tamp) product line make it difficult to manufacture a product to exacting specifications. “When you’re working on a fancy capital, you have a 15 to 1 rule in length for dry tamp,” he said. “But in precast, you can do much larger panels as well as reinforce the product with steel.”

Leary added that current trends within specific precast markets have allowed Reading Rock to experiment

with additional product lines. “Precast is definitely growing within the hardscapes market and in the big block market,” he said. “The big block market is now one where engineers and architects are becoming more comfortable, so now they want to do more things with it.”

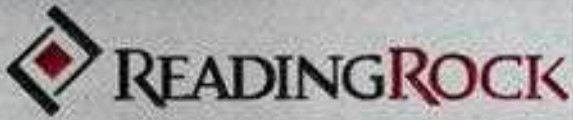
These changes within the industry have resulted in the development of a combination precast and Allan Block system, which is designed with a precast face and interlocking segmental retaining wall backs. Leary believes this new endeavor serves as a prime example of the company’s ability to leverage two core competencies while expanding into another.

The company is also seeking to extend its RockCast line of precast products, with plans to roll out an entire exterior site package. Swortwood explained that while it may be very difficult to create a full catalog, the company is considering putting together a large idea book to get the creative juices flowing. “When customers look at the building and site package, under the RockCast precast realm we can do all of those things,” he said. “There’s definitely a lot of opportunity.”

No matter what the situation, Reading Rock’s goal is to get more “products on projects,” an endeavor that leadership believes will come to fruition through the extraordinary flexibility of precast concrete.

PAVERS (AT LEFT, CURING) AND AN INTERLOCKING SEGMENTAL RETAINING WALL TAKE SHAPE AT READING ROCK’S PRODUCTION FACILITY.





IF YOU CAN DREAM IT...

Reading Rock's "never say never" attitude serves as the core to the company's approach to business, leading employees to take on new and challenging tasks, and for management to open up new opportunities for expansion. Without such an outlook, Tokarsky feels as though the company would become stagnant, failing to attract the kind of employees who help keep Reading Rock ticking.

"When employees get to use their brains and work outside of the box, that's when they really excel," said Tokarsky. "I think the people who work here like that variety and like to be stretched into thinking differently."

Rich echoed Tokarsky. "The people here are what set us apart from everything else," he said. "We've got great people who really drive our culture through. When someone visits here, we've said that our success rate is 100%, because you can't help but want to be a part of the family when you leave."

For more than 65 years, Reading Rock has proven that its willingness to meet any challenge is vital to establishing a thriving business. For Rich, continuing that storied devotion to excellence will mean continuing to rely on "Yes, we can!"

"If you can dream it, we can build it," Rich says. "Just give us a shot." ■

Mason Nichols is NPCA's communication coordinator.

Endnotes

¹ Rett syndrome is a progressive neurological disorder that results in impaired motor functions. Often misdiagnosed as autism, the disorder can result in difficulty with movement, communication and coordination. To learn more about Rett syndrome, visit the IRSF's website at rettsyndrome.org.

² Dry tamping is a casting method utilizing a special zero-slump concrete mix. The mix is poured into a mold and vibrated in layers, each a couple of inches thick. A rake is employed to prevent delamination before the piece is stripped and touched up for any blemishes. Finished pieces are placed into a kiln chamber, where they typically cure for 12 hours at 100 degrees with 100% humidity.

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Disaster Preparedness: Creating an Emergency Response Plan

BY THOMAS A. GRAY

Hurricane Irene caused widespread damage in New England in 2011. In 2012, Superstorm Sandy clobbered the New Jersey and Long Island coastlines, and caused major flooding and widespread disruption in New York City. Sandy resulted in the third largest amount of damage (more than \$18 billion) behind Hurricane Andrew in 1992 and Hurricane Katrina in 2005. More recently there was catastrophic flooding in Colorado and a major wildfire in Northern California.

Disasters, unfortunately, can happen anywhere, and before you can say, "It will never happen here," your company's well-being could be in harm's way. To minimize the risk to employees, assets and operations, precasters must prepare

for these large-scale disasters with an emergency response plan (ERP). The primary goal of an ERP is to help your organization:

- Assess potential risk exposures
- Develop a detailed, practical response plan that reduces uncertainty, clarifies decision-making and prepares your facility for whatever may happen
- Satisfy the life-safety needs of your employees and visitors in emergency situations
- Coordinate your response with public agencies and others in the community
- Determine actions to take in an emergency if external agencies or services are not available, even if just for a few hours or days

Assessing ERPs

A series of questions have been derived from various sources to assist precasters in evaluating their level of disaster readiness, and in developing/enhancing their disaster response plans. You should always consult with legal counsel and/or your insurance agent about contractual liability and insurance coverage issues associated with disaster-related scenarios.

ERPs should emphasize specific risks associated with the geographic area and others that may impact your business from afar. Questions you should be able to answer include:

- Has an emergency coordinator been designated? Is there a backup person assigned? Has a spokesperson in



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charge of communicating with public responders, government agencies and the media been chosen?

- Have an emergency command post and backup location been established? Are both spots equipped with reliable communication equipment and emergency contact information?

COMMUNICATION – In a disaster, communication (not cash) is king.

- Are procedures in place for emergency communications with off-duty employees, families, police and fire departments, suppliers, contractors, utilities, public authorities and others?
- Are there backup communication options in case telephone service is unavailable? Examples may include cellular telephones, electronic mail, social media and faxes?
- Are paper copies of emergency telephone numbers posted at strategic locations throughout the facility?
- Are there battery-powered weather radio(s), and are hazardous weather alerts monitored and conveyed to managers, employees and visitors?

COORDINATION – It won't work unless it all works together.

- Are relocation agreements in place (as necessary) with others?
- Are there written procedures for working with local emergency managers and receiving information from them, including evacuation orders?
- Has the response plan been reviewed and approved by local emergency management agencies and incorporated into the overall community emergency management and disaster plan?
- Are there arrangements made for using emergency shelters as backup evacuation sites for employees and visitors, if normal locations are unavailable?

EVACUATION DETERMINATION – Public authorities may order evacuation.

- Are there written criteria for deciding whether to evacuate or shelter in place

– namely, safely within the building?

- Are both external and internal factors considered – your staff availability, security concerns, power outages, structural soundness of facilities and employee mobility?

TRANSPORTATION – This may be disrupted in area-wide disasters.

- If necessary, have contracts been executed with local services and transportation vendors?
- If a widespread geographic area creates a regional disruption, are there backup plans for outside transportation service providers?
- Do evacuation plans and estimated travel times consider factors such as availability of fuel supplies and the effect of widespread evacuation on traffic density?

STAFFING – Your employees may not be available to you.

- Does the plan address the possibility of employee unavailability and consider other solutions such as hiring temporary staff or borrowing employees from other facilities?
- Is there a provision for employees' families to shelter in the facility during severe emergencies and to evacuate, if necessary?

SUPPLIES – You can't buy them when the disaster occurs.

- Does the plan specify the source and location of emergency supplies? These should include food, potable water and first aid supplies/medicines in case normal supply channels are disrupted.
- Are there paper copies of possible backup supply sources, including government and charitable agencies?

POWER – This is the widespread disaster most likely to happen.

- If applicable, is there adequate backup generator capacity for power to key equipment, emergency lights, computers, security, HVAC and other vital utilities?
- Is there sufficient fuel available for longer term generator use, and have backup fuel sources been identified?

RETURN TO WORK – It won't be as easy as you think.

- Are procedures in place for securing your building during the evacuation, inspecting it for damage, making needed repairs and arranging for the return of employees?
- Is a designated individual authorized to make the decision to return from the evacuation site, based upon written criteria?

EDUCATION/TRAINING – Must do before the disaster.

- Is every employee aware of the ERP and his or her role in the plan? Has it been made available to employees for their review?
- Is emergency planning included in employee orientation and reviewed by them at least annually?
- Are employees "tested" at least annually on their knowledge of the plan, including command center location, contact information and their specific roles in evacuations, searches and other emergency scenarios?

DISASTER DRILLS – These are essential to success during a disaster.

- Are drills performed at least annually, followed by evaluation and modification (if needed) of existing procedures?
- Has the facility participated at least once in a wider area evacuation drill together with local emergency management agencies and first responders?

When disaster strikes, an effective and well-communicated ERP is instrumental in saving lives and property and keeping your company in business. Your plans should be regularly reviewed and updated. Start with the questions included in this article and use them as a basis for self-assessment. ■

Thomas A. Gray, P.E., FSFPE, CIRT (Level 3), CBCP, Six Sigma Green Belt, RRE, NFPA Member for Life, is CNA's consulting director, Property Risk Control.

Somewhere between winning the bid...



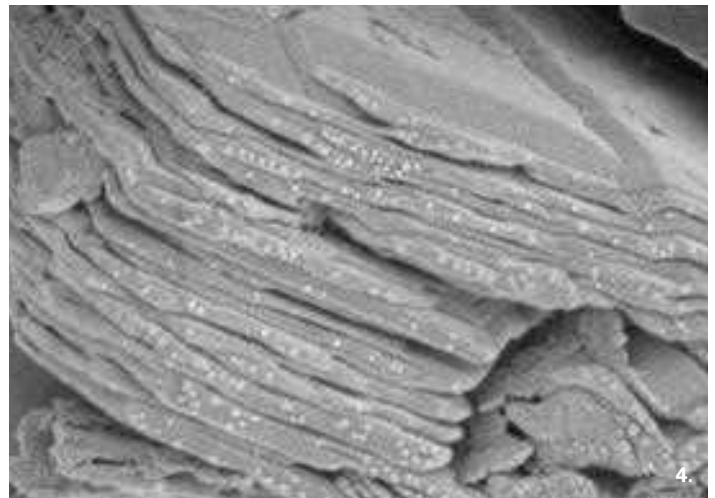
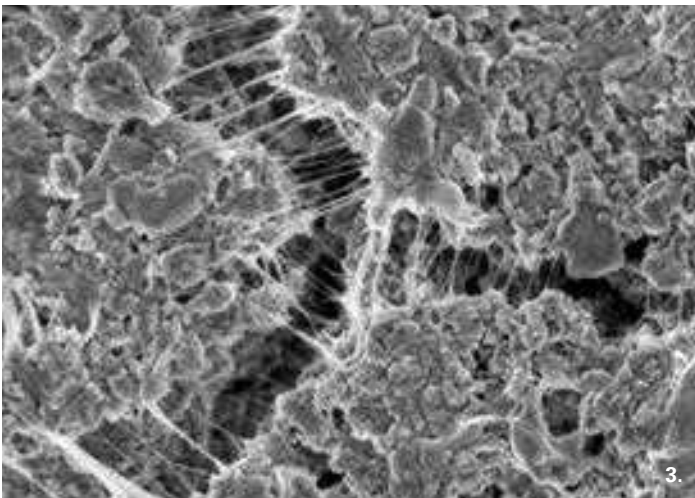
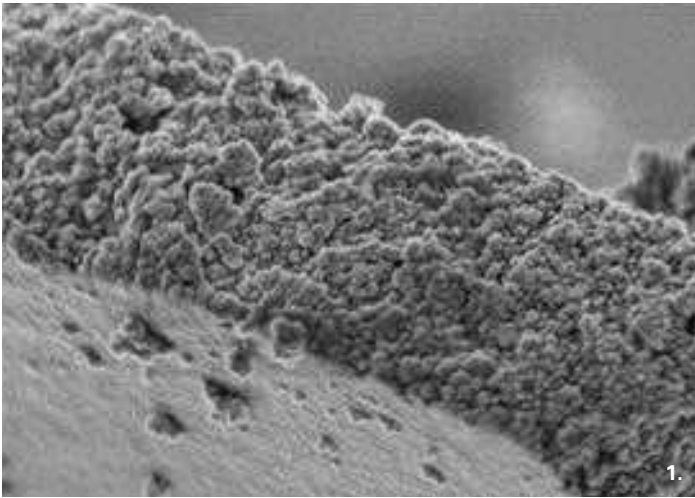
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The Next Big Thing in Concrete is Not Big at All

BY CLAUDE GOGUEN, P.E., LEED AP

In precast concrete, we make big, heavy structures. We tend to think in the macro scale, which is to say we deal in feet and inches or meters and millimeters. But exciting, new technologies are being developed that could affect the performance and durability of your product, and they are based on the study of very small things: nanotechnology.

Nano is a prefix used mainly in the metric system meaning one billionth of a meter. In context, a typical sheet of

paper is 100,000 nanometers thick, and the author of this article is 1,900,000,000 nanometers tall! The point is that nano is very small.

Nanotechnology is the manipulation of matter on an atomic and molecular scale. This discipline deals with the production and application of physical, chemical and biological systems at scales ranging from a few nanometers to submicron dimensions. The technology is used across science fields including chemistry, biology, physics, engineering

and materials science. The latter is what concerns us, but first, more cool stuff about nanotechnology.

While the science related to nanotechnology is new, nanosized matter has existed on earth as long as life itself. It has been proven that the exceptional mechanical performance of biomaterials, such as bones or mollusk shells, is due to the presence of nanocrystals of calcium compounds.

The framework of nanotechnology was first introduced in 1959 by Nobel Laureate

LEFT: 1. SYNTHESIZED CEMENTITIOUS NANOPARTICLES; 2. AND 3. CARBON NANOTUBES BRIDGING CRACKS IN A CEMENT COMPOSITE; 4. NANOLAYERED CALCIUM ALUMINATE PARTICLES. *Courtesy National Research Council Canada*

Richard P. Feynman. Tokyo University of Science Professor Norio Taniguchi first coined the term nanotechnology in the early 1970s. It wasn't until 1981, however, with the development of the Nobel Prize-winning scanning tunneling microscope that could "see" individual atoms, that modern nanotechnology began.

Then in 1989, the first atomic force microscope (AFM) was introduced and is still one of the tools used today for imaging, measuring and manipulating matter at the nano scale.

Further work and research in nanotechnology brought about breakthroughs in areas such as materials and manufacturing, nanoelectronics, medicine and health care, energy, biotechnology, information technology and national security. Construction – and especially the construction materials field – has benefitted and will continue to do so with further developments in nanotechnology.

Nanotechnology and concrete

Researchers are obtaining a better understanding of the complex structure of cement-based materials at nano levels. This may result in a new generation of stronger and more durable concrete with desired behaviors and properties.

Hydration of cement produces a rigid, heterogeneous microstructure. As water is introduced to cement to make a paste, which hardens over time, the main microstructural phases in the hydrated cement paste are:

1. Calcium silicate hydrate gel (C-S-H);
2. Calcium hydroxide (CH);
3. Ettringite (a sulfoaluminate hydrate);
4. Monosulfate;
5. Unhydrated cement particles; and
6. Air voids.

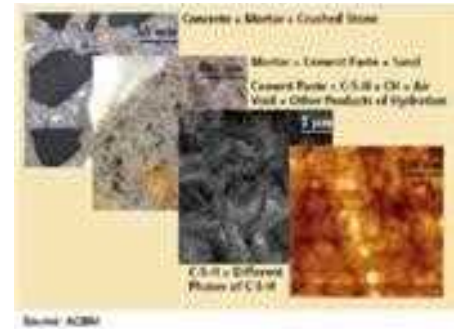
These microstructural phases govern the macroscopic properties of cementitious materials such as strength,

ductility, flow and durability. Controlling the macroscopic properties demands a detailed knowledge of the structure of these phases at the smallest size level. Among the various phases, the first one, C-S-H, is the most important product of hydration and accounts for 50 to 70% of the total paste volume. This main binding phase governs the macroscopic properties of the cement paste, but the micro- and nanoscale structure of C-S-H is still not well established. However, University of Leeds professor Ian Richardson discovered from an investigation of the "amorphous" C-S-H gel that at the nanoscale it has a highly ordered structure.

We know that pozzolanic supplementary cementitious materials such as fly ash and silica fume react with the CH in the presence of moisture to form more C-S-H. Researchers have taken this to the nano scale by using a colloidal silica in the concrete matrix to more effectively achieve the same properties. Colloidal silica is also being used to control concrete cracking due to alkali silica reactivity (ASR), a chemical reaction between reactive silica in aggregates and alkalis in cement.

Jon Belkowitz, president of Intelligent Concrete LLC and doctoral student of Stevens Institute of Technology, studies chemical reactions within concrete at the nanoscale. His research into the optimal use of colloidal silica is expected to create a new concrete mixture that will result in longer-lasting buildings, roadways, sidewalks, stairs, sewers and dams. "With the advent of nanotechnology, the material properties of concrete, including ASR mitigation, gives engineers and architects the ability to use concrete in applications that were once impossible," he says.

Belkowitz's research took a three-tiered approach. "I'm using this new nanotechnology to not only stop ASR from being produced, but I'm also using nano silica to strengthen the hydrated cement matrix of concrete to resist the expansive nature of the ASR gel," he explains. "I'm also trying to change the properties of the excess water within the concrete so that it can't react with soluble



THESE FOUR PHOTOS SHOW CONCRETE AT VARIOUS LENGTH SCALES: 10MM (0.3937 IN.); 500 MICROMETERS, OR μm (0.01969 IN.); 2 μm (0.00007874 IN.); AND 500 NANOMETERS, OR NM (0.00001969 IN.). NOTE: C-S-H = CALCIUM SILICATE HYDRATE; CH = CALCIUM HYDROXIDE.

alkalines in silica to cause ASR gel."

Nanotechnology has made possible many benefits for precast concrete including:

- Reducing concrete shrinkage
- Reducing permeability
- Increasing durability to physical and chemical attack
- Achieving the same strength with less induced heat
- Higher cement efficiency
- Higher early strength
- Higher tensile strength, ductility and toughness
- Self healing of micro cracks
- Degradation of pollutants and self-cleaning concrete

Nanotechnology is an exciting field of study that has incredible potential for many fields, and precast concrete will undoubtedly continue to benefit from this technology. It will be interesting to see how colossal changes in the concrete industry will take shape at the submicroscopic level. ■

For more information on this topic, please contact Claude Goguen, NPCA's director of Sustainability and Technical Education, at (800) 366-7731 or cgoguen@precast.org.

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LEED v4 is Here

BY CLAUDE GOGUEN, P.E., LEED AP

Chances are if you haven't worked on a LEED project recently, you will. Since its unveiling in 2000, Leadership in Energy and Environmental Design (LEED) has become a part of building construction vernacular in North America and around the world.

From its humble beginnings, LEED has grown to the point that it is now certifying 1.5 million sq ft of building space each day in 135 countries. Today, more than 54,000 projects are currently participating in the current version, LEED 2009, comprising more than 10.1 billion sq ft of construction space. Some owners and specifiers have embraced it while others find flaws in this rating system, but love or hate it, it continues to grow.

As a part of that growth, the U.S. Green Building Council (USGBC) is currently launching LEED v4. After a couple of years of deadline extensions and six public comment periods, 86% of USGBC members voted to approve this latest version.

The USGBC is taking a phased approach to LEED v4. This means that rather than requiring all projects to use it right away, it is giving the marketplace time to become familiar with the concepts and theories that it's based on. Project teams can register their projects under LEED 2009 until June 1, 2015.

What's changed?

Practitioners familiar with previous versions of LEED will recognize the same fundamental structure. There are still prerequisites and credits, 100 base points, regional priority credits and pilot credits. v4 has more emphasis on USGBC's goal of reducing carbon emissions, and this means increased energy efficiencies across the board. Consequently, v4 had adopted ASHRAE standards.

LEED v4 is technically more rigorous than its predecessor. This version also expands the market sectors (21) able to use LEED including data centers, warehouses and distribution centers, hospitality, existing schools, existing retail, and LEED for Homes Mid-Rise.

Credit weightings have also been revised. Point distribution will more closely tie the rating system requirements to the

SAN FRANCISCO'S ICONIC TRANSAMERICA PYRAMID, A 40-YEAR-OLD STRUCTURE FEATURING WHITE PRECAST-QUARTZ AGGREGATE PANELS, IS ONE OF THE MOST FAMOUS LEED PLATINUM BUILDINGS IN THE UNITED STATES. ITS ENERGY STAR SCORE OF 98 MEANS IT IS AMONG THE TOP 2% OF HIGH-PERFORMING ENERGY-SAVING STRUCTURES IN THE COUNTRY. (*Dreamstime.com*)



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THE U.S. LEGAL SERVICES AGENCY ADMINISTRATION BRAC 132 BUILDING IN FT. BELVOIR, VA., WITH ITS BRICK-CLAD PRECAST CONCRETE WALL PANELS, IS A CERTIFIED LEED GOLD PROJECT. Photo courtesy of Smith-Midland Corp. (smithmidland.com)

priorities articulated by the USGBC community.

There are new prerequisites and credits across the LEED credit categories and rating systems. Point values have also changed. Each rating system has gone through a weighting process and has LEED points associated with each credit and option of the rating system.

How does LEED v4 affect the use of precast concrete?

Some of the changes affecting the use of precast concrete include:

- **Site Development – Protect or Restore Habitat. (Formerly SS 5.1)**
The requirement is to preserve and protect from all development and construction activity 40% of the greenfield area on the site (if such areas exist). Precast will still contribute in this category, because it's made to order, reduces storage space on site and minimizes site disturbance.
- **Rainwater Management.**
(Combined former 6.1, "Stormwater Design – Quality Control," and 6.2, "Stormwater Design – Quantity Control") Precast will still contribute through the use of stormwater products.
- **Heat Island Reduction.** Precast concrete has a higher solar reflectance than many other materials,

which is beneficial in reducing the heat island effect.

- **Building Product Disclosure and Optimization – Environmental Product Declarations.**

Option 2. Multi-Attribute Optimization (1 point)

This credit rewards the use of products that comply with one of a few criteria including products sourced (extracted, manufactured, purchased) within 100 miles of the project site. Precast concrete manufacturers are often located within short distances from the project.

- **Building Product Disclosure and Optimization – Sourcing of Raw Materials.**

Option 2. Leadership Extraction Practices

This credit awards points based on the use of products that meet at least one of six responsible extraction criteria for at least 25%, by cost, of the total value of permanently installed building products in the project including recycled content. Precast concrete includes pre and postconsumer recycled content mostly through the use of supplementary cementitious materials and reinforcing.

- **Construction and Demolition Waste Management.**

Option 2. Reduction of Total Waste Material

Do not generate more than 2.5 lbs of construction waste per square foot of the building's floor area. The use of precast concrete significantly reduces construction waste, because it arrives on site ready to be installed.

- **Thermal Comfort.** (Renamed from "Controllability of Systems – Thermal Comfort," combined with "Thermal Comfort – Design Requirements for Achievement") Design of heating, ventilation and air conditioning (HVAC) systems and the building envelope will need to meet the requirements of American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 55-2010, "Thermal Comfort Conditions for Human Occupancy." Precast

enclosures will contribute due to concrete's thermal mass properties.

Environmental Product Declarations

LEED v4 also awards credits for the use of Environmental Product Declarations (EPDs) for products and Life Cycle Assessments (LCAs) for whole buildings as a way to demonstrate transparency and superior environmental performance. Similar to a food nutrition label, an EPD reports environmental impacts such as carbon footprint, acidification or ozone depletion potential. EPDs list quantified life-cycle product data and are owned by the product or brand producer. In essence, they are eco-labels, and many believe they will be required for all building products in the future.

Product Category Rules (PCRs) govern how LCAs and EPDs are written. The PCR is developed for a broad product type such as vinyl siding, asphalt roof shingles and

precast concrete. NPCA is working with other industry partners to create a North American PCR for precast concrete.

LEED could be an opportunity

The green building industry is continuing to grow, and LEED has been a big part of that growth. Expand your market by educating yourself on the LEED program. Request information from your suppliers in regard to recycled content and any other documentation that may assist your customers in pursuing LEED credits under the 2009 version or the new v4 version.

For more help with understanding LEED and what you need to supply to your customers, visit NPCA's website at precast.org/sustainability. ■

For questions about this article, please contact Claude Goguen, NPCA's director of Sustainability and Technical Education, at (317) 571-9500 or cgoguen@precast.org.

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Source: Ken Parula, a professor of IT management at the University of Mass.

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Family Ties: Nicole Behnke

NPCAEF Scholarship recipient's family ties pave the path to civil engineering career.

BY MASON NICHOLS



NICOLE BEHNKE

Growing up in River Falls, Wis., as the daughter of a bridge contractor, Nicole Behnke quickly developed a strong connection to the construction and precast concrete industries. Thanks to her strong familial bonds and the scholarship funds provided by the NPCA Educational Foundation, she continues to pursue her career aspirations with fervor today.

Behnke cites her father as highly influential in generating her intrigue concerning all things infrastructure. When Behnke was a child, her father would consistently ask her who she believed built the various bridges dotting the landscape as the two drove around town. "Guess who built that bridge? Guess who built that bridge?"

But Behnke's ties run even deeper. Joe Wieser, a pioneer in the precast concrete industry and the founder of Wieser Concrete Products Inc. in Maiden Rock, Wis., is Behnke's grandfather.

Both of these connections – and many others – played an important role in spurring Behnke to major in civil engineering at Iowa State University with an emphasis in transportation.

Now in her senior year, Behnke has benefitted from several internship opportunities that have helped prepare her for life as an engineer. She notes, however, that the aid of the NPCA Educational Foundation has helped make it possible.

"Being an NPCAEF Scholarship recipient has allowed me to gain some really, really great internship experiences," Behnke said. "The Foundation has been integral in making my continuing education possible."

Behnke's first internship was in Foley, Minn., where she worked as a field engineer. The project involved turning a two-lane highway into a four-lane divided highway. Because of her connections to the precast concrete industry, Behnke was able to easily identify the various precast components being used on the project, including a small bridge and box culverts. She was also quick to emphasize the advantages of specifying precast.

"Precast is less time-consuming, which is a big advantage for any project, because using it will decrease construction time," Behnke said. "It also aids in minimizing disruption for the public."

Another one of Behnke's major internship opportunities allowed her to work as a transportation engineer for the St. Croix River Crossing Project in Minnesota. The \$600 million endeavor, which aims to replace an outdated lift bridge with a new extradosed bridge connecting expressways on both sides of the St. Croix River, is expected to significantly mitigate traffic flow in the area.

Responsibilities for Behnke were design-related, including developing the curves, alignments, profiles and cross-sections of the roadway approaches. Much of her work was performed using high-end software programs.

Behnke was also involved in discussions between the Minnesota Department of Transportation and the local community pertaining to roadway design.

"We talked about roadway design, because it's a really commercialized area," Behnke said. "There were a lot of local businesses that were worried about keeping their access open throughout construction as well as ensuring that their driveways were going to be repaired afterward."

Being given a crucial role in the project was of great importance to Behnke, who said she appreciated not being "just the intern."

"It was really nice, because they treated me as a full-time employee. I walked in the first day and just jumped right into it. I was like, 'Are you guys sure that you want me doing all this?' But they had a lot of trust in me."

As Behnke works toward earning her degree in the spring of 2014, she continues to recognize the importance of using precast concrete for a variety of transportation projects, likely because of her roots in the precast industry.

"Precast concrete is always in the back of my mind, so whenever I'm on a project, I keep my eyes open and see where it's used and how it's used effectively," she said.

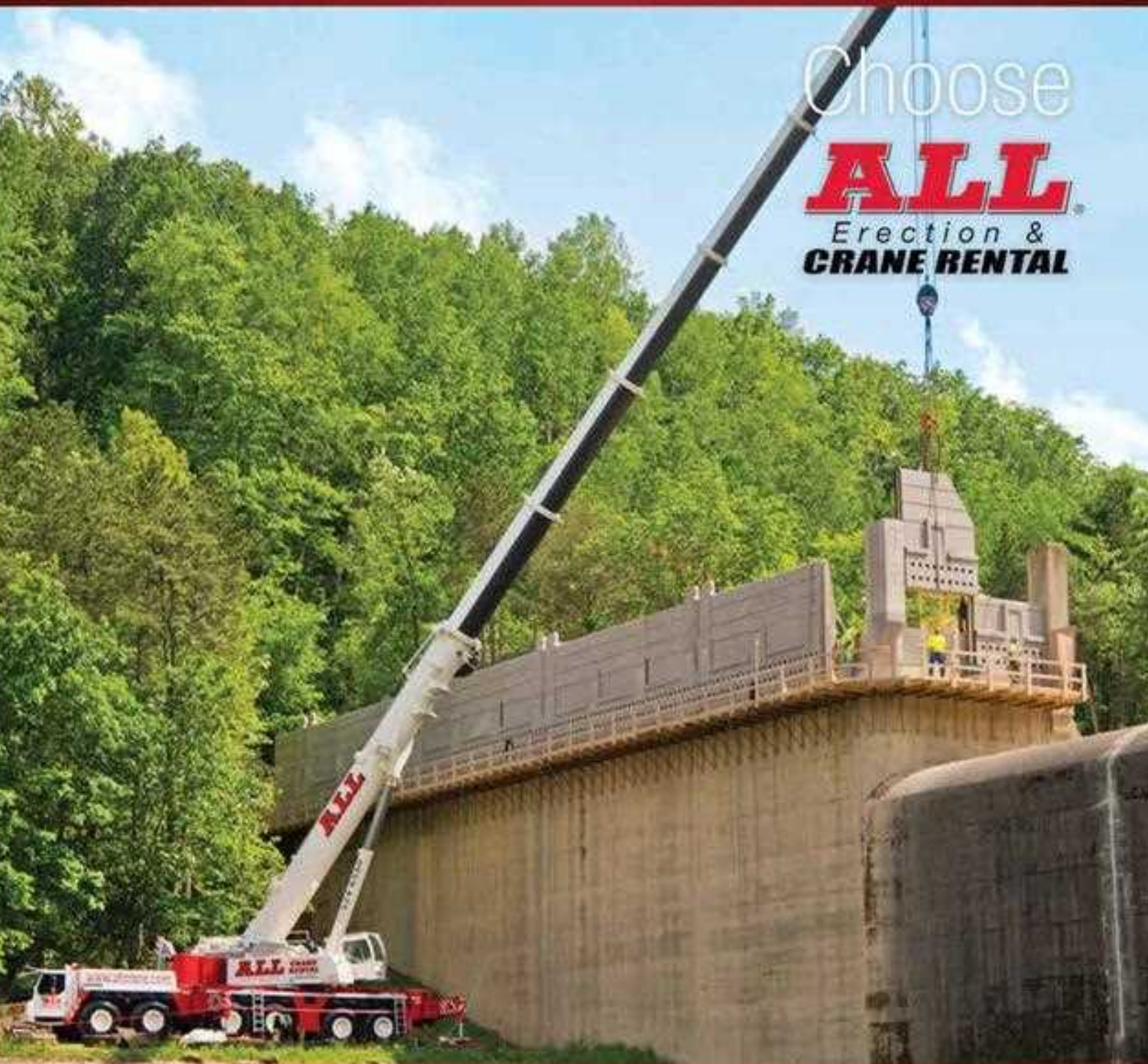
Beyond precast, Behnke's passion for learning, coupled with the school funding provided by her NPCAEF Scholarship, will likely lead her to ask her father a very important question in the not too distant future: "Guess who built that bridge?"

Mason Nichols is NPCA's communication coordinator.

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One of the largest precast concrete culvert installations in Ontario will allow both man and beast to benefit as automotive traffic travels overhead while safely avoiding the wildlife traffic passing underneath.

Anchor Concrete Products Ltd., Kingston, Ontario, provided its first contribution to the Highway 407 Express Toll Route (407 ETR) extension, which involved the supply and delivery of supersized precast culverts in Whitby, Ontario. The installation included 44 sections of precast box culvert with a combined weight of more than 2,640 metric tons placed in just four days.

Culvert infrastructure has a variety of uses, including short-span bridges, underpasses, and stormwater and stream water conveyance. Anchor's 407 ETR culverts fulfill all three of these uses. The Anchor team worked with the 407 ETR group to design a product that would meet their challenging schedule while providing a

ANCHOR CONCRETE PRODUCTS PRODUCED SUPERSIZED CLAMSHELL BOX CULVERTS FOR A SUPERSIZED HIGHWAY PROJECT. *Photo courtesy of Anchor Concrete Products Ltd.*



high-quality structure. The solution was an innovative, two-piece "clamshell" culvert that incorporated a cantilever joint. This allowed the contractor to place the culvert pieces using only a crane, eliminating the normal task of pulling the pieces together. This innovative design




produced a very tight fit between the culvert sections and allowed a quick, user-friendly placement of the structure.

The culvert's spacious interior, with a 2.1-meter interior height and 8-meter interior span, will allow wildlife to pass under it, a design that is popular in Alberta and British Columbia due to their large wildlife populations. These underpasses give animals a safe passageway to cross the freeway to help protect Canadian wildlife and motorists alike from potentially fatal collisions.

Contractors were able to install up to six pieces per hour, meaning that in just 10 minutes, roughly 35 metric tons of concrete were safely lifted and placed.

"This is quite an achievement for Anchor, showing that excellence in design, tight tolerances, quality control in manufacturing and shipping allowed us to place more than 1,000 (metric) tons of precast," said Jeff Bradfield, Anchor Concrete's president and CEO.

This culvert section is the first of three and runs 76.6 meters long and 3.5 meters high at its tallest point, making it one of the largest concrete culvert installations in Ontario, and the next culvert installation will be even bigger. 



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People & Products is a forum where NPCA members and nonprofit organizations can share information on new products, personnel promotions/acquisitions or service announcements concerning the precast concrete industry. Items are printed on a space-available basis. For possible inclusion, send your press releases and photos to NPCA, Attn: Precast Inc. magazine, 1320 City Center Drive Suite #200, Carmel, IN 46032 or email them to rhyink@precast.org.

Shuttlelift unveils its largest gantry crane to date

Shuttlelift, a rubber-tired gantry crane manufacturer based in Sturgeon Bay, Wis., has unveiled the largest rubber-tired, double-beam, fully traversable gantry crane it has ever built: the Shuttlelift DB 200.



THE SHUTTLELIFT DB 200

More than 54 ft tall, more than 68 ft wide and just under 44 ft long, the new DB 200 is by all accounts a gargantuan machine, and it can handle loads up to 400,000 lbs. But what makes it really unique, says the company, is that a full-capacity 200-ton load can move from one side of the crane to the other, not just on its centerline.

The DB 200 comes with an array of important features. One is all-wheel electronic steering; since all four wheels at all four corners of the crane are able to turn, the operator can employ several different modes of steering. Another feature is wireless remote control, an option that improves visibility of the load by allowing the operator to be anywhere around the load or work being performed. The crane also has an electronic load readout of the load weight being lifted.

A special addition to the DB 200 is the custom operator's cab, which is elevated so the operator's eye level, in a seated position, is 35½ ft from the ground for optimal viewing of the load. And, instead

of the standard ladder, a series of stairs and platforms offer easy access to the cab.

For more information, visit shuttlelift.com.

Hyster launches comprehensive mobile lift truck app

Hyster Co., a worldwide lift truck designer and manufacturer based in Greenville, N.C., has launched a new mobile lift truck app featuring a lift truck product selector tool, detailed information on Hyster lift truck models and a Hyster dealer locator function.

The app can inform the customer about which applications certain products are best suited for, while also delivering a wealth of information



on each product – from the company's motorized pallet jacks to its shipping container handlers.

The app is available for Apple iOS and Android devices through iTunes and the Android Google Play Store. Along with a product selector, the app includes detailed information, technical guides, images and brochures on each Hyster lift truck model, as well as videos and brochures on the Hyster product line categories, components and other equipment features.

For more information about the new app, visit hyster.com and search for "comprehensive mobile app" then follow the link. There you will find links to download the iTunes and Android apps. Users must be on a mobile device to download the app.



Meadow Burke appoints marketing and new products manager

Meadow Burke, a manufacturer and distributor for the concrete construction industry, has

DENISE SENIOR

announced that Denise Senior joined the organization to further develop its sales and marketing capabilities via new product innovation and development.

Senior comes with a wealth of experience outside of the industry, having spent the last eight years within a global contract services company where she was instrumental in new business sales and marketing strategies as well as brand and product extension introductions and launches, says the company.

For more information about Meadow Burke, visit meadowburke.com.

ConShield Technologies announces exclusive distribution agreement for Australia and New Zealand

ConShield Technologies Inc., a producer of antimicrobial additives for



CONSHIELD TECHNOLOGIES PRESIDENT BILL SHOOK, LEFT, CONGRATULATES ITW PRESIDENT BOB CONNELL AND ITW BUSINESS DEVELOPMENT MANAGER CLAU ROTSTEIN.

concrete based in Atlanta, has announced the appointment of ITW Construction Systems as an exclusive distributor of ConShield products throughout Australia and New Zealand. Agreements were signed during a brief ceremony held Sept. 6 at ITW's Australian headquarters in Melbourne.

ITW Construction Systems is a supplier of specialty concrete products for the construction industry. Spearheading the program for this operation is Claus Rotstein, ITW business development manager.

"The ConShield additive has clearly demonstrated the benefit of internal corrosion protection in North America since 1996 and we are pleased that cities and precast producers globally see the benefits of its long-term protection and cost effectiveness," says William Shook, ConShield Technologies president.

For more information, visit conshield.com.

Hamilton Form announces Saf-T-Mate safety railing

Hamilton Form Co., based in Fort Worth, Texas, has announced its new Saf-T-Mate work platform and safety railing. The Saf-T-Mate attaches to a side form with a hinged connection to provide safe, convenient access to the top of the form.

The platform has a grip strut walking surface and a receiver to attach and lock the railing into place. These simple connections make it easy to use the platform and railing on multiple forms within a precast plant. The hinged connection allows Saf-T-Mate to drop out of the way to provide clearance to move



HAMILTON FORM'S SAF-T-MATE

the side forms back to strip product from the form.

A convenient, practical alternative to traditional catwalks and scaffolding systems, Saf-T-Mate is available in 10-ft sections, making it easy to install along the entire length of the bed. For more information, contact Hamilton Form Co. at (817) 590-2111 or sales@hamiltonform.com.

Cresset introduces 2 new eco-friendly products

Cresset Chemical Co. of Weston, Ohio, has introduced two new products for the concrete construction industry: Spatter-Cote Armor-Xtra Spatter Protection, and Crete-Lease 880-VOC-Xtra Release Agent.

In response to excessive spatter buildup on construction equipment, Cresset has introduced its new Spatter-Cote Armor-Xtra Spatter Protection formulation. The eco-friendly product is a proprietary mixture of corrosion inhibitors and non-stick polymers that are applied to equipment surfaces exposed to concrete spatter. Regular use of Spatter-Cote Armor-Xtra keeps equipment clean and free from buildup, says the company. This prevents rework while retaining the surface quality, thus protecting the equipment – ultimately saving cleaning time, extending product service life and preventing potential malfunctions. The product's predominantly water-based, virgin material is ideal for a myriad of applications such as ready-mix trucks, highway concrete paving equipment, portable batch plants, concrete tools and accessories, hard surface furnishings during construction (windows, stairwells), screeds, back sides of forms and dry-mix mixers.

Since the EPA defined the allowable amounts of VOCs (volatile organic compounds) for concrete release agents that may be released into the atmosphere, Cresset has introduced its Crete-Lease 880-VOC-Xtra Release Agent, an environmentally friendly version of its original Crete-Lease 880. The proprietary blend is comprised of neutralized vegetable oils in mineral oil

that contains no waxes, silicones or carcinogens, and it is also solventless and nontoxic. Crete-Lease 880-VOC-Xtra provides easy and stain-free clean stripping of forms and form liners from concrete. The end result mimics the surface of molds and site amenities with a superior finish without bug holes. When applied properly, it eliminates concrete buildup, cutting labor costs of form cleaning time up to 70%, says the company.

For more information, visit cresset.com.



PETER VIENS

Dayton Superior names senior vice president of operations

Dayton Superior Corp., a North American provider of engineered product solutions for the nonresidential concrete construction market, has announced that Peter Viens joined the company as senior vice president, Operations. Viens will be responsible for Dayton Superior's extensive manufacturing and distribution operations.

Prior to joining Dayton Superior, Viens served as president/general manager for Morgan Advanced Materials/Molten Metal Systems, where he led the global companies' manufacturing of engineered consumables and advanced materials/ceramics. Preceding his executive role at Morgan, he held several key operational leadership roles, including 13 years with Emerson Electric.

Viens holds a bachelor's degree in Technology from Thomas Edison State College in New Jersey and a master's in Marketing from Rutgers. He served as a noncommissioned officer in the U.S. Marine Corp. He also holds a Lean Manufacturing Certification, is a Six Sigma Black Belt and a LEED AP.

For more information about Dayton Superior Corp., visit daytonsuperior.com.



Meeting	Location	Date
The Precast Show 2014	George R. Brown Convention Center – <i>Houston</i>	Feb. 13-15, 2014
NPCA 49th Annual Convention	Le Centre Sheraton Montreal – <i>Montreal, Quebec</i>	Oct. 22-25, 2014
The Precast Show 2015	Orange County Convention Center – <i>Orlando, Fla.</i>	March 5-7, 2015
The Precast Show 2016	Nashville Convention Center – <i>Nashville, Tenn.</i>	Jan. 21-23, 2016
The Precast Show 2017	Colorado Convention Center – <i>Denver</i>	Feb. 9-11, 2017

For the most up-to-date information about NPCA events, visit precast.org.

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