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NPCA is a trade association representing the manufacturers of plant-produced concrete products and the suppliers to the industry around the world.

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Building a Legacy

Piedmont Precast's **forward-thinking** mindset and **ambitious outlook** creates a recipe for success.



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Learn about **Darryl Cloud's cycling journey across the U.S.**

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On the Cover:

Featuring over 336 total Gravix units, this 29-foot-tall precast wall in Atlanta will help ease the traffic congestion resulting from the new Atlanta Braves stadium.

Photo credit Thomas Rainey, P.E., Earth Wall Products



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Uncovering Talent

LORETTA BODI

Master Precaster Loretta Bodi's strong mathematics background is a **valuable asset** for Gainey's Concrete Products.

By Sara Geer



Loretta Bodi learned how to repair a catch basin in PQS II - Production.

"It took this girl right here to stand up and volunteer. And, I must say, it was one beautiful repair!"

– Loretta Bodi

While everyone in Production and Quality School Level II - Technical was groaning and gritting their teeth through the mathematic equations, Loretta Bodi, projects development manager at Gainey's Concrete Products in Holden, La., was grinning from ear-to-ear.

Math has always been Loretta's favorite subject. Fresh out of college with a bachelor's degree in math from Southeastern Louisiana University in Hammond, La., she knew she wanted to do something other than teach. In the midst of job hunting, she came across an opening at Gainey's Concrete Products

that introduced her to a career in precast concrete.

"When I landed a job interview with Lisa and Greg Roache (chief operating officer and president, respectively), they thought I was overqualified for the job and knew I was still searching for other career opportunities," she said. "They hired me for a two-week temporary position to work on a few projects. Two weeks came and went, and here we are 11 years later."

Loretta worked in several different departments before taking her first PQS course in Austin, Texas. She asked to take the course soon after the quality control manager at Gainey's left. No one else in the company had taken PQS Level I or ACI Concrete Field Testing – Grade I to fill the position.

In addition to "being in heaven" in PQS II - Technical, she also enjoyed PQS II - Production. Barry Fleck, CEO of A.L. Patterson, taught the course on patching and repair and Loretta had a proud moment when Fleck asked for a volunteer to do a real repair on a catch basin.

"None of the men volunteered in the class," she said. "It took this girl right here to stand up and volunteer. And, I must say, it was one beautiful repair!"

Loretta's husband, Jarrett, who joined the company in 2009, chose to take the courses as well. His favorite class was PQS II - Quality Control. It helped him understand the science behind why each test and check needs to be done.

He is now working in the quality control department at Gainey's.

They often refer back to their course notes while working on difficult calculations or projects and refresh their knowledge by watching relevant webinars. Loretta said she also calls on past instructors and other precasters and suppliers she has met during her coursework.

"Just a couple weeks ago, I was working on center of gravity calculations," she said. "After about two hours of pulling my hair out, I pulled out my PQS II - Technical binder and found the way to proceed."

Both are thankful for the financial and moral support of Gainey's management in backing their decision to complete the Master Precaster program. She said for precasters on the fence about taking courses, it should be an easy decision to want to continue bettering yourself and learning more.

"If you have an employer that supports you, it's a no-brainer," she said. "Jarrett and I are thankful that Lisa and Greg believed in us and provided this support."

For more information on Precast University and the Master Precaster program, visit precast.org/precastuniversity. **PI**

Sara Geer is NPCA's internal communication and web manager, and is managing editor of Precast Inc.

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Questions from the Field

Questions from the Field is a selection of questions the **NPCA Technical Services Department** receives from calls, emails and comments on blogs or magazine articles on precast.org. *If you have a technical question that needs an answer, contact us by calling (800) 366-7731 or visit precast.org/technical-services.*

Ann writes:

We had a sanitary manhole that was installed and backfilled, and the engineer on site performed a vacuum test and subsequently failed the manhole based on the results. The engineer stopped the timer as soon as the pressure dropped. Could you please explain the acceptance procedure for ASTM C1244?

NPCA Technical Services Department answers:

As the title suggests, ASTM C1244, "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill" would not apply in this situation. If in fact the engineer was trying to use this method, not only is it not applicable, but he was performing it incorrectly. ASTM C1244 does allow for a drop in pressure from 10 to 9 inches of mercury, which is the determining factor in passing or failing the structure. For example, if your manhole has a 4-foot diameter and is 12 feet deep, ASTM C1244 allows 30 seconds for that pressure drop.

Regardless, ASTM C1244 is not applicable when the manhole is backfilled. See two clear references within the title and scope on the standard's first page.

If the authority having jurisdiction wants to perform a test after backfill, there are precautions and adjustments to be taken. Also, I would urge you to contact your precast manhole supplier for additional support and advice.

David writes:

Can the neutralite solution for cement burns be applied after the damage has been done?

Technical Services Department answers:

Neutralite is formulated to control both chronic and allergic dermatitis by acting as a topical skin buffer and neutralizer. Test results

show that it neutralizes the skin's alkalinity after contact with wet concrete and reduces hexavalent chromium to undetectable limits. The user fills up the bottle with tap water, shakes it to dissolve the crystals and sprays the resulting solution onto the affected skin immediately after contact with wet concrete. The solution should be applied until all visible cement is removed from the skin. Then, the affected area should be rinsed with clean water. The manufacturer states that the product serves only as a topical buffer and neutralizer and won't prevent acute irritant contact dermatitis caused by long-term skin exposure to wet concrete.

Zoel writes:

How does air velocity, humidity and temperature affect bleeding of concrete?

Technical Services Department answers:

While bleeding is primarily attributable to water content and poorly graded aggregates, air velocity, temperature and moisture can have an effect. This effect varies based on what kind of concrete structure you are pouring. Air movement and humidity will influence bleed water rates to a higher degree on a large slab than it would with a deep structure with a smaller exposed area. Bleed rates will be dictated, among other things, by setting time. Cold temperatures will slow setting and as a result can extend the bleeding period. High humidity and lack of air circulation can also contribute to prolonged

bleeding. The longer ambient conditions allow bleed water to remain on the concrete surface and not evaporate, the longer the bleeding period may extend.

ACI 302.1R-04, "Guide for Concrete Floor and Slab Construction" recommends using "concrete approaching the highest as-placed temperature permitted by the contract documents."

It is important to note that while this may reduce bleeding, it may lead to other issues, such as reduced long-term strengths. There are also recommendations to use heaters or fans to move the air and evaporate excess surface moisture while concrete is in its plastic stage. This must also be done cautiously as accelerated evaporation may also lead to plastic shrinkage cracking. If using heaters, avoid using non-vented heaters as they may accelerate carbonation, which can create a soft, dusty, chalky surface.

Jeffery writes:

What is the standard for achieving SSD aggregates?

Technical Services Department answers:

Achieving saturated-surface-dry aggregates can be done using methods described in ASTM C127, "Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate" and ASTM C128, "Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate."

Usually, SSD weights are given in the aggregate mill certificates through the absorption capacity. Take the alternating current and multiply it by the oven-dry weight and you get your SSD weight. **PI**



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PROTECTIVE Coatings

for
Precast Concrete Structures

Understand the **basics** of surface preparation, environmental conditions and coating resources for **protecting** precast concrete.

By Angus W. Stocking

Editor's Note:

This article is intended to be a reference guide for entry-level production employees.

Concrete is one of the most versatile materials used in construction today, but that versatility comes at a cost. Concrete's various uses also mean it's exposed to many different factors that could cause damage over time. As a precaster, you must be aware of these factors and resourceful to properly protect and maintain your product.

MAKING A SELECTION

Selecting and applying the proper protective treatment for precast concrete structures can be daunting. There are numerous options and each coating has different strengths, weaknesses and appropriate uses. There are also times when a coating may not be needed at all. But how are you to know when or when not to use a coating?



The first step is to recognize that a coating's success relies heavily on two factors: the environment in which the concrete will be used and the application procedure. You must understand both to ensure proper protection and to maximize the concrete's service life.

ENVIRONMENT

Degradation of concrete includes the following common mechanisms: acidic reactions, alkaline reactions, chloride-induced deterioration and sulfate deterioration. Each is produced by different environmental conditions. Concrete is also highly alkaline and contains moisture, which can prevent a coating from adhering to the surface, curing properly or performing as needed. For these reasons, a precast manufacturer may choose a coating from dozens of coating classes, including acrylics, polyureas, epoxies and urethanes. Each of these has subsets and, except for polyureas, come in solvent and water-based formulas that are alkaline resistant.

Scott Morris, vice president of Coopers Creek Chemical Corp., cited two environments in which it can be difficult to choose coatings that must be chemical, physical and thermal resistant: manufacturing plants and agricultural facilities.

"Manufacturing plants of all kinds produce aggressive discharge streams," Morris explained. "The streams are often highly variable – coated precast structures might be contending with different chemical attacks from day to day. The concentrations of chemicals can vary too, from 10% acid to 30%. It's a hard problem."

In agricultural uses, the problem is the effluent, not variability. Morris feels that the challenges here are sometimes underestimated.

"Agricultural environments can be surprisingly aggressive," he said. "The runoff from corn fields, for example, is very hard on coatings. The biological activity and the fertilizers used can create environments that can defeat many commonly used coatings."

So what's a precast manufacturer to do when producing a new structure for an unfamiliar environment? The first step is to find out why the coating is needed by requesting details about the environment before making a selection. Next, precasters

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can take advantage of resources from the National Precast Concrete Association and coating providers for additional insight and assistance.

PROPER APPLICATION

Morris said another important factor is concrete needs to be properly prepared before applying a coating. More specifically, he sees laitance as a common surface condition affecting coating adhesion.

“What happens is, after forms are pulled away from newly poured structures, the structure continues to cure and laitance forms,” he said. “That’s basically powdery limestone on the surface of the structure.”

In addition to laitance, factors that affect coating adherence include:

- **“Eggshell,”** a concrete imperfection related to laitance, can cause coatings to eventually pull away.
- **Rods or snap ties** removed during stripping can cause holes or protruding wire. These must be cut back and/or filled prior to coating application.
- **Release agents** can affect bonding and must be removed prior to coating.
- **Curing agents’** effects are variable; some are compatible and some are not. Check with manufacturers and other users for more information.
- **Glossy, hardened concrete** cannot be coated successfully unless special methods are used.

Several methods of surface preparation are commonly used. The most common is dry abrasive blasting. Wet blasting scarifying and high-pressure

“In the last 5-to-10 years a lot of coatings have been reformulated to contain less solvent.”

– Tim Frazier, *Concrete Sealants*

water jetting also work in most cases. But grease, oil and other penetrating materials can be complicated. They cannot be removed with blasting and must be stripped before other preparation takes place.

The plant’s interior environment and safety also need to be considered when applying coatings. Tim Frazier, technical director for Concrete Sealants, said low temperatures dramatically affect the performance of water-based coatings. And where temperatures are warm, very high humidity can affect bonding. Morris said regulations in some states can also affect a precaster’s coating selection decision.

“Regulations are relatively tight in some states, California for example,” he said. “In the last 5-to-10 years a lot of coatings have been reformulated to contain less solvent. That means they’re safer, but thicker, but that’s not really a problem for precast manufacturers.”

Still, even in the absence of regulation, precasters should be careful and know their materials well.

“Lower percentages of volatile organic compounds is a trend,” Frazier said. “You have to know what’s being applied and have good practices.”

KNOW YOUR VARIABLES

A great variety of concrete coatings are available, but identifying the right coating for a situation requires detailed knowledge of the environmental conditions your structure will face and the chemical expertise that is available. Applying coatings so that they adhere well is better understood, but still requires careful and thorough surface preparation that may vary according to regional conditions. Knowledge, experience and help from coating experts, as well as employee training, all play a critical role in ensuring the success of protective coating for precast concrete structures. **PI**

Angus W. Stocking, is a licensed land surveyor who has been writing about infrastructure since 2002.



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Making the CONNECTION

By Mike Miller

Gasketing pipe is relatively straightforward, but one area that is difficult to seal well is the intersection of the horizontal pipe and vertical manhole. The historical method of sealing the joint used to be a rigid mortar ring around the pipe to fill the void. This method offered a familiar joint, but became the Achilles heel of the system.

FLEXIBILITY BY DESIGN

Rigid mortar has a long history of use for sealing concrete products. It is almost always around the job site, can fill any size or shape opening and doesn't require precision. But what cannot be controlled or changed is the rigidity of the connection. The ideal field connection has the adaptability of a mortar joint and the permanent flexibility of a conventional connector. Although it sounds simple, achieving this has been difficult.

Pipe-to-manhole connections offer some of the most challenging sealing problems in underground construction. Unlike pipe joints, differences in material properties frequently leads to pipe complications. Consolidating backfill soil creates differential vertical loads and shear forces at the joint interface, which increases with bury depth. Without some connector flexibility, the shear load is transferred directly to the pipe, which may not be able to withstand the additional loading. Angular deflection is limited by the requirements of the connector geometry. Design changes can be problematic.

ADAPTATION OVER TIME

An additional factor that has changed for manhole connectors is the implementation of a vacuum test prior to being accepted. When manhole vacuum testing was

Selecting and installing a quality pipe-to-manhole connection requires a team effort between the precaster and connector manufacturer.



NECA file photo

introduced in the 1990s, component failures were not uncommon. Precasters and suppliers responded with better products and improved processes. Contractors also improved installation practices. While it created short-term challenges for the industry, manhole vacuum testing is credited with improving manhole construction quality.

Connector manufacturers have come forth with a wide variety of products to respond to these requirements. From simple, resilient rubber compression seals to multi-adjuster stainless steel boots, each one has its proponents, and almost every connector manufacturer offers its own version of each to accommodate the precaster's preference.

CONSULT WITH THE MANUFACTURER

The variety of sizes, styles and applications of manhole connectors requires the precaster to work closely with the connector manufacturer. Connector specification may change when manhole diameters change. Different products accommodate different pipe types. Some connectors are more tolerant of variation in pipe surface finish or diametric variation. In any event, the precaster and its connector manufacturer(s) must function as a team to provide the best success for the installing contractor. When precasters and contractors work together, the outcome is always favorable.

THE FUTURE OF PIPE CONNECTORS

Flexible connectors are being applied in areas of underground construction other than sanitary applications.

Septic systems

During the early 2000s, septic systems underwent a dramatic change in cost, complexity and functionality. Many government health agencies continue to follow customarily accepted on-site treatment methods. However, concerns with enhanced effluent quality or unacceptable drain field soil characteristics have led some agencies to incorporate on-site sanitary sewage treatment systems traditionally associated with larger municipal treatment plants. Depending on design, these systems can use many advanced treatments, including aeration, pumping, filtration, UV treatment and other techniques that rely on complex components. The system also needs to strictly control infiltration of groundwater and exfiltration of effluent at entry and exit points throughout so that proper treatment can be performed.

Stormwater systems

The movement by municipal owners toward sealing stormwater collection systems is growing. This closely follows the expansion and adoption of stormwater treatment products and techniques. These vary dramatically from landscaping and vegetation plans to separation and settlement products and high-volume filtration systems. Like sanitary sewage treatment, controlling the entry and exit points into these systems is critical for them to work as designed.

Another reason for sealing stormwater systems is to improve the life span of pavement. Since the majority of stormwater systems are constructed in association with street and highway projects, the performance of each is closely linked. By maintaining this soil support, especially at pavement penetrations such as inlets and manholes, the roadway maintains its surface integrity. Perhaps the most progressive proponent of sealing stormwater systems is the Florida Department of Transportation. With the state's high groundwater and erodible fine grain sandy soils, potential mitigation of backfill is a critical design issue to be addressed. While it's still in development, with many more challenges to be met, FDOT's standards provide invaluable real-world experience with stormwater management.

FEELING SECURE

By securing a quality pipe-to-manhole connection, you protect communities from contamination and costly damage. It is a crucial preventative step. For more resources about pipe-to-manhole connectors, visit precast.org/precast-products/manholes. ■

Mike Miller is the owner of Large Caliber Design, LLC, and remains active in sealing product design and development, as well as standards work with ASTM.

IMPORTANT CONSIDERATIONS *for* PRECAST CONCRETE COMPANIES

1. **Connectors are a team effort.** The precaster must select the proper connector for the project application and the installing contractor must ensure proper assembly.
2. **Carefully inspect the mandrel, hole-former or corebit** before using. Excessive wear or damage can impair connector performance.
3. **Always inspect installed connectors** to ensure accurate sizing, placement and condition. Ensure the connector is clean and clear of any concrete or debris.
4. Remember that contractor customers will hold you responsible for products associated with your precast components.
5. Periodically review standard connector applications with your representative. Minor changes can create unintended effects. Learn about new products that could be helpful.
6. Have the connector representative review the complete precast fabrication and contractor installation process. Some connector manufacturers have installation training programs that you should participate in. If not, request that one be established.
7. Ask to be informed of any technical changes made to your familiar products. Check existing inventory against changed product to make sure there are no functional differences.
8. When you make significant changes to your production materials or processes – such as adding coring capabilities – review them with your representative to assess any effect on the connector system.
9. Discuss the connector system and its similarities and differences with new contractor customers.
10. Make sure newly employed changes are discussed with previous contractor customers.
11. Changes need to be checked out before assumptions are made. Contractors make mistakes too. Good suppliers work to help prevent them.
12. Call your connector representative and have them review all pertinent parts of the design before a critical job. Consult with the connector company engineers and have them meet with the installing contractor, if advisable. The bottom of an open trench is a bad place to find a problem that could have been avoided.



Sunny Side UP

Custom precast concrete pads are the **perfect solution** for solar power inverter stations.

By Kirk Stelsel

A precast concrete company with an experienced staff, an in-house design team, metal fabricators and a history of creating custom products is perfectly suited for unique projects. That's certainly the case at Lindsay Precast's plant in Canal Fulton, Ohio, as well as those in Florida, Colorado, and North and South Carolina.

Lindsay Precast employees have designed, manufactured and delivered products like wine vaults, luxury vehicle storage units and even the vault that holds the Charters of Freedom at the National Archives. Now, Lindsay Precast counts solar power companies among its customers.

Lifting the solar pads requires four cast-in lifting anchors per side.

“Since the **most efficient** way to make this was **pouring upside down**, the first challenge was determining the **best way to flip** the full mold ... without stressing it and causing cracking.”

– Mike Hoffman, *Lindsay Precast*

A BRIGHT IDEA

The idea to create a precast concrete pad for solar power inverter stations was a joint concept between Lindsay Precast and the customer. The precast pads are more durable and cost effective than steel and eliminate the need for cast-in-place foundations on some sites. But this product is no ordinary piece of precast concrete. The project required quite a bit of custom design work and precise engineering due to the complexity of the equipment it supports.

Solar power collected by the field array is linked to a photovoltaic inverter station. That’s where the precast pads come into play. Each pad is 31 feet 3 inches long, 10 feet 6 inches wide and 10 inches thick. Features cast into the product include conduit for 120/240 volt and data connections, a 4/0 copper ground loop with stainless steel landing plates for field grounding connections and stainless weld plates. The weld plates anchor the control station and the power panel components as well as a site-installed canopy. The slab also has cast-in cable tray grooves for running the large alternating current, or AC, power cables with inserts for attaching and sealing the aluminum cable tray covers.

Lindsay Fabrication, Lindsay Precast’s in-house steel fabrication division, designed the mold with the intent to pour, flip, strip and stage product every day. To get everything right, the company enlisted the assistance of Concrete Engineering Solutions for structural design and A.L. Patterson for lifting design.

“Since the most efficient way to make this was pouring upside down, the first challenge was determining the best way to flip the full mold the next day for stripping the product without stressing it and causing cracking,” said Mike Hoffman, vice president at Lindsay Precast. “Another challenge was building the tapered cable grooves since they were cast in and running many different directions to properly connect the components. The tolerances were critical so the finished product would strip free without chipping or spalling.”

Each pour is 8 1/2 yards of 6,500-psi concrete. Employees flip the product by rolling the mold over with a spreader beam and crane. It’s important to avoid torsional stress during this process. Once it’s stripped, the pad is set on level blocking prior to integrating the inverters and other components. The finished product is then moved using four cast-in lifting anchors per side and roller blocks to avoid overloading any one anchor.

THE DEVIL IS IN THE DETAILS

In the field, the pads help facilitate a complex process that converts the sun’s rays into usable energy for the power grid. Broken down simply, wires combine the direct current, or DC, electricity from the solar panels and send it to the hardware fixed to the precast pad. They convert it to AC electricity. The AC electricity runs through nine, 1 1/4-inch diameter cables connected to the low voltage side of the transformer using the grooves in the pad.

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Once assembled, the pads are the base for equipment that prepares solar power for the grid.



Photo provided by Lindsay Precast

“We love the challenge and are always up for creating potential new product lines.”

– Mike Hoffman, *Lindsay Precast*

Lastly, the medium voltage side of the transformer transfers the electricity to the grid for use.

The complexity of the process translated into plenty of intricate details for Lindsay Precast. But Hoffman and the rest of the team thrive on complexity and look forward to these types of projects.

“Custom work continues to grow, and has always been one of our specialties at Lindsay Precast,” Hoffman said. “With our own structural steel/fabrication division, we can offer better design solutions and can get projects done with much shorter lead times. We love the challenge and are always up for creating potential new product lines.”

Lindsay Precast shipped the first pads in late 2015, which are now being used successfully in the field. With the production process in place, the team can now efficiently manufacture the pads as needed while the engineering and fabrication teams move on to determine the company’s next product. **PI**

Kirk Stelsel is NPCA's director of Communication and Marketing.

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G&K SERVICES

CEMENT

Hydration Kinetics

By Kayla Hanson

When you see the word **HYDRATION** you might think of **water**, a sports drink commercial, or maybe you think of a **hot, sunny summer day**.

Perhaps you even think of **cement**.

HYDRATION

When it comes to concrete, hydration is just as critical as it is for humans. It is a series of chemical reactions that occurs when water and hydraulic cement come in contact. When water and cement are combined into cement paste, most of the cement grains immediately begin to dissolve, which initiates the hydration process. The reactions produce numerous new compounds, and as more cement hydrates, more water and cement is consumed and more compounds are produced. The compounds developing in the paste grow, spread and also begin to accumulate and interconnect. Eventually, the buildup of compounds results in stiffening, hardening and strength development, transforming plastic concrete into the strong, durable product we depend on every day. And it's all thanks to hydration.

But hydration isn't just about combining

cement and water. Successful hydration, and the rate at which cement hydrates, depends on a variety of factors.

UNDERSTANDING PORTLAND CEMENT'S FOUR MAIN PHASES AND THE IMPORTANCE OF SULFATES

The four main mineral components formed during Portland cement clinker production are referred to as phases. They are similar to traditional compounds but contain traces of other elements and oxides. The four primary mineral phases in cement are tricalcium silicate, dicalcium silicate, tricalcium aluminate, and tetracalcium aluminoferrite, which are often abbreviated as C_3S , C_2S , C_3A , and C_4AF respectively.

In addition to the four phases, calcium sulfate dihydrate, or gypsum, is also a crucial component in any cement. Gypsum is blended with clinker



during grinding to help regulate cement's setting time. Without gypsum, plastic concrete would flash-set. Other calcium sulfates can also be used as regulators.

Other materials, often in the form of industrial byproducts, are added during clinker production to supplement the actions of the sulfates and the four main mineral phases. Adding these raw materials provides additional sources of calcium, iron, silica, alumina and sulfate to create a variety of cement types.

CEMENT TYPES AND THEIR BEHAVIORS

Each cement type has a different chemical makeup that enables it to produce specific desired results when used correctly. The amounts and compositions of sulfates, main mineral phases and other materials used in manufacturing cement dictate cement's type and properties, and determine its behavior.

Cements with relatively low to very low C_3A contents offer the most resistance to sulfates. Cements with low C_3A contents, low C_3S contents and higher C_2S contents offer lower heat of hydration. Cements with high to very high C_3S contents are capable of developing early strength at faster rates.

CEMENT HYDRATION PRODUCTS

The main products of cement hydration reactions are calcium silicate hydrate (CSH), calcium hydroxide (CH), and the AFt and AFm phases. The AFt and AFm phases found in



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hydrated cement are compounds of C_3A , anhydrite and water. The most common AFt phase is ettringite and the most prevalent AFm phase is monosulfate.

Hydrated Portland cement paste usually consists of about 50% CSH and about 15-to-25% CH by mass. The majority of the strength exhibited by hydrated cement paste – specifically strength – can be attributed to CSH.

C_3A is the most reactive of the four main cement mineral phases, but it only contributes slightly to early strength gain. C_3A readily reacts with water in the cement paste to produce a gel rich with aluminate, a process that releases significant amounts of heat. The heat generated reduces quickly, typically only lasting a few minutes. The resulting gel, however, reacts with the various sulfates in cement, including gypsum, anhydrite, and hemihydrate, and produces ettringite. Ettringite development in early hydration stages helps control stiffening in plastic concrete. Days into hydration, ettringite is gradually consumed through reactions with C_3A and is replaced with monosulfate.

C_3S and water react to produce CSH and CH. C_3S , also called alite, hydrates, reacts and hardens quickly, and is the largest contributor to concrete's initial set and early strength development.

C_2S also reacts with water to create CSH and CH. However, C_2S , or belite, reacts slowly relative to alite, and in turn is a large contributor to concrete strength gain beyond one week of age.

C_4AF is the least prevalent of the main four mineral phases and contributes little to strength development.

MIX DESIGNS' ROLES IN CEMENT HYDRATION KINETICS

Set-accelerating admixtures offer options for increasing hydration rates, increasing early strength gain and decreasing the length of time to initial set and final set, often without affecting durability. Accelerators work by weakening the barrier around cement particles to allow mix water easier access to C_3S and C_2S phases, in turn increasing the minerals' hydration rates. Accelerators are often used to offset the retarding effects of cold weather.

Conversely, set-retarding admixtures decrease hydration rates, decrease early strength gain and increase the length of time to initial and final set. Retarders slow hydration by inhibiting the formation and growth of certain hydration products. Retarders are often used to counteract the expedited curing rate caused by hot weather or to delay set to allow for special finishing techniques or difficult placing situations.

Set-accelerating admixtures and set-retarding admixtures both come in a variety of forms, but most often appear as liquid chemical additives. How these admixtures function depends on the composition, dose, time and sequence of their addition to the mix as well as ambient temperature and concrete temperature.

Concrete's water-cementitious material ratio affects nearly every property of both plastic and cured concrete. For complete cement hydration, typically a 0.40 w/cm is required. The degree to which constituent materials hydrate depends on a variety of factors; however, if the w/cm is too high, excess water will remain in the concrete matrix. The additional water will remain until it evaporates, leaving void spaces that don't contribute to compressive strength and greatly increase concrete's susceptibility to a myriad of issues. Conversely, if the w/cm is too low, the mix water will be consumed or evaporated while unhydrated cement remains in the matrix. This offers no benefits to the concrete's strength or durability, and adds cost to the precaster.

Supplementary cementitious materials (SCMs) are often added as a substitute for a portion of Portland cement in a concrete mix. SCMs exhibit behaviors similar to traditional cement. However, different types of SCMs enhance or inhibit certain hydration actions. Commonly used SCMs include fly ash, silica fume and ground granulated blast-furnace slag. SCMs like Class F fly ash and slag cement decrease concrete's heat of hydration and increase setting time, while some natural pozzolans like calcined shale or clay and metakaolin decrease concrete's heat of hydration but have no impact on setting time.

TEMPERATURE'S ROLE IN CEMENT HYDRATION KINETICS

Ambient temperature during mixing, placing and curing plays a role in cement hydration kinetics. Although not all cements react the same way, typically as temperature increases, setting time decreases. In general, a fluctuation of 10 degrees Fahrenheit could change setting time by about 33%. Ideal curing temperatures typically range from 50-to-70 degrees. Temperatures below 50 degrees cause hydration to progress at a much slower rate. When temperatures fall below 40 degrees, early strength development is significantly hindered. However, when ambient temperatures exceed 70 degrees, hydration accelerates beyond a favorable rate and can lead to detrimental outcomes, including plastic shrinkage cracking, lower 28-day strengths and decreased durability.

Mix water temperature also plays a role in hydration, as it alters

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the temperature of the concrete. Mix water temperature can be adjusted, often through heating the water or adding ice to the mix water.

CURING TECHNIQUES' ROLES IN CEMENT HYDRATION KINETICS

Supplemental moisture added during curing replaces water lost through hydration and evaporation. Hydration rates remain largely unaffected when supplemental moisture is added. However, it does help ensure adequate moisture is available throughout hydration and curing. Inadequate moisture could result in cement remaining unhydrated, providing no beneficial properties to the concrete or concrete prematurely drying leading to small surface cracks. Additional moisture can be applied through spraying, saturated burlap or other coverings, fogging or immersion.

Moisture retention procedures rely on sheeting, coverings or membrane-forming compounds applied to products' outer surfaces to trap moisture. Similar to supplemental moisture application, moisture retention has little impact on hydration rates. Instead, retention procedures help improve the curing environment by ensuring adequate moisture is available to sufficiently hydrate the cement.

Accelerated curing through heat and steam application increases hydration rates and strength development rates. Accelerated curing is especially beneficial in attaining early strength gain. These procedures are often used in cold weather concreting to create a more suitable environment for cement hydration.

In conjunction with external curing methods, internal curing involves the

use of fully saturated lightweight aggregate, creating an internal water supply to help maintain sufficient moisture throughout hydration and curing. Internal curing has little impact on hydration rates. Rather, it helps ensure a favorable environment for optimum hydration to occur. Internal moist curing is often used with concretes containing high levels of cementitious materials.

TAKE CARE

As with any concrete mix design component, care needs to be taken to address the impacts different cement types, admixtures, SCMs, w/cm, curing techniques, and any other design and curing factors have on both concrete's plastic characteristics and cured properties. **PI**

Kayla Hanson is a technical services engineer with NPCA.

RESOURCES:

Portland Cement Association, *Design and Control Mixes, 15th Edition*
Understanding Cement, Nicholas B. Winter

REFERENCES:

1. The abbreviations are not the substances' true chemical formulas: tricalcium silicate (C₃S) = 3CaO · SiO₂; dicalcium silicate (C₂S) = 2CaO · SiO₂; tricalcium aluminate (C₃AF) = 3CaO · Al₂O₃; tetracalcium aluminoferrite (C₄A) = 4CaO · Al₂O₃ · Fe₂O₃
2. Visit the online version of this story for a list of cement types.

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From left: Glen Bowen, president; Coll Bowen, chairman of the board; Frank Bowen, plant manager.



PIEDMONT PRECAST

BUILDING A LEGACY

Piedmont Precast's forward-thinking mindset and ambitious outlook create a recipe for success.

Story and Photos by Mason Nichols

Running a successful precast concrete plant requires mixing a few key ingredients: a line of exceptional products, superb customer service and a commitment to quality. Most companies are happy with this standard formula. It's a battle-tested approach that has proven lucrative through the years. But as the landscape of the construction industry evolves, companies seeking future business will need to pepper a little something extra into the mix.

The owners at Piedmont Precast of Atlanta, Ga., know this all too well, which is why their forward-thinking mindset functions as the driving force behind business operations.

"Ten years from now, there are going to be products that we will be saying we don't know how we ever lived without," said Frank Bowen, plant manager. "We just want to be there when they are discovered."

Piedmont Precast's new facility features 700 linear feet of construction space across two production bays. Inside, the company manufactures burial vaults, its core product line.





With a strong core product line in place and an eye on continued diversification, Piedmont Precast possesses all the ingredients needed to build on a legacy that began nearly a century ago.

THE FOUNDATION

Construction plays an important role in the Bowen family. For Frank and his brother Glen, president of Piedmont Precast, it's the reason the company is in business today.

In the 1920s, Frank and Glen's great-great-grandfather, Caleb, worked as a general contractor in Atlanta. Caleb worked on many projects, but his involvement in the construction of the H.M. Patterson & Son Spring Hill funeral home changed the lives of the Bowen family forever.

After the funeral home was completed in 1928, Caleb's health began to decline. To make matters worse, the Great Depression was about to send millions of Americans scrambling for work. Recognizing an imminent slowdown in the construction industry, Caleb advised his eldest son, Frank Bowen, Sr., to stray from pursuing a career in construction and take a pending offer for employment at H.M. Patterson & Son.

Shortly before Caleb passed away in 1930, Frank Sr. secured a funeral director position at H.M. Patterson & Son. There, he discovered his new line of work was resistant to the severe economic downturn brought about by the depression. Also during this time, many cemeteries across the U.S. began requiring the use of outer-burial containers to prevent "sunken graves." After discovering a waterproof precast concrete vault developed by Wilbert Hasse, Frank Sr. applied his background in construction and concrete to start the Wilbert Burial Vault Co. of Atlanta, Ga., in 1937.

For more than three decades, Wilbert Burial Vault Co. – through a licensee relationship with Wilbert W. Haase Co. – manufactured concrete outer-burial receptacles from the company's original location on Mecaslin Street in Atlanta. In 1972, the company moved operations to a new location outside of downtown Atlanta. That facility is still in operation today.

NEW BLOOD

Through the years, Wilbert Burial Vault Co. witnessed many crucial events in U.S. history, including World War II, the civil rights movement, the Vietnam War and many others. No matter what was happening at the time, customers remained in need of interment services and products. This allowed the company to operate regardless of the events of the day.

Still, ownership knew they could expand their business beyond the death care industry. And when

Glen joined the company in 2003, the outlook shifted from focusing solely on funeral products and services to seeking new product lines.

"With regard to business development, Glen has always had a clear understanding of the importance of diversification," Frank said. "He recognized the need to expand very early and said, 'We need to try some new things. We need to find what's out there.'"

At the same time, a new precast retaining wall system developed in northern Michigan by the Manthei family was just beginning to penetrate the market. The system – known as Redi-Rock – sought licensing partners with the capacity to expand into producing and marketing precast modular block. As such, the Manthei family included burial vault manufacturers like the Bowens in their list of target companies. This led to the decision for Wilbert Burial Vault Co. to expand their product offerings and diversify their customer base.

The following year, Wilbert Burial Vault Co. secured a subcontract with Suhor Industries of Overland Park, Kan., to supply precast lawn crypts to the new Georgia National Cemetery in Canton, Ga. At the time, the project – which required roughly 18,000 double-depth lawn crypts – was the largest ever undertaken by the National Cemetery Administration. To meet the needs of the project, Wilbert Burial Vault Co. required a large plant expansion. After nearly a year of work, the company's new manufacturing halls, warehouse and batching facilities added the necessary capacity for the national cemetery project and long-term growth projections.

Owners rebranded the company as Piedmont Precast in 2005. Glen also sought the aid of his brother, Frank, to help get the new Redi-Rock line off the ground. Frank agreed to assist, and though he didn't plan it at the time, the two have worked side-by-side growing Piedmont Precast ever since.

THE OLD STANDBY

Convincing local specifiers to embrace the Redi-Rock system as an optimal solution took time. However, through a concentrated effort which included many presentations and outreach endeavors, contractors, specifiers and project owners began to see the benefits. But just as the new line started to gain traction, the Great Recession slowed everything down.

Thankfully, the Bowen family had seen this before. And though the economic effects of the Great Recession didn't reach the lows of the Great Depression, the company once again turned to its core product – burial vaults – to help carry it through tough times.



FAMILY MATTERS

Like many brothers, Glen and Frank clashed at times growing up. But the synergy the two have is pushing Piedmont Precast forward. According to Frank, one of the major benefits of working with Glen is the openness the two have with one another.

“When I give Glen honest and direct feedback, he respects it,” Frank said. “I know that he’s going to ensure that all of us together excel. Everybody moves forward.”

Though Glen noted that having a family-owned business presents some challenges, being closely knit is critical to Piedmont Precast’s success.

“One key advantage afforded to us is the simplified corporate structure and streamlined communications between management and the board of directors,” he said. “In our scenario, dialogue is not limited to formal meetings. This creates a great level of flexibility with our decision-making process.”

Beyond the ability to be candid and quickly tackle issues as they arise, working with family provides more benefits. Frank explained that one of the driving factors in his decision to change career paths and work for Piedmont Precast was the opportunity to spend more time with Glen and his father Coll, who serves as chairman of the board of directors.

Glen added that the company has helped bring the family even closer together.

“Sometimes our spouses complain that the business dominates conversations around the dinner table, but the luxury of working with family is something that should not be taken for granted,” he said.

“During the recession, our cement salesman came to me and said, ‘Look, you guys have always joked about how small you are, but I can’t tell you how important accounts like yours are right now,’” Frank said. “There was nothing special to what we were doing. Funeral products and services just happen to be more resistant than most other precast products in an economic downturn.”

After the worst effects of the recession began to fade in 2009, Piedmont Precast continued to grow its Redi-Rock line. Today, it represents more than 20% of total business. A variety of the company’s Redi-Rock projects can be seen around town, including in high-profile movies filmed in Atlanta.

EIGHT MONTHS TO 45 SECONDS

As part of Piedmont Precast’s work with the Redi-Rock line, Glen and Frank had collaborated with Thomas Rainey, P.E., of Earth Wall Products. The brothers were both pleased with the design work Rainey and his crew had done to help make Piedmont’s Redi-Rock projects a success.

While Rainey was assisting Piedmont, he was simultaneously developing a new retaining wall system. The new solution, which contractors can install to specification using on-site soil as backfill, is named Gravix. To take the system through a trial run, Rainey built a wooden form in his garage and sent it to Piedmont Precast. From that first form, the company manufactured more than 100 units for a medical facility project.

Glen and Frank grew increasingly excited about adding another product line. As a result, Piedmont Precast purchased a set of forms which would allow them to manufacture all of the Gravix product types: standard, top, leveling and traffic barrier.

The traffic barrier unit was of particular importance, as Piedmont Precast and Gravix sought to achieve a MASH TL-4 crash rating in 2013 from the Federal Highway Administration. Testing required 19 traffic barrier units to be shipped to a facility at the Texas A&M Transportation Institute in Bryan, Texas.

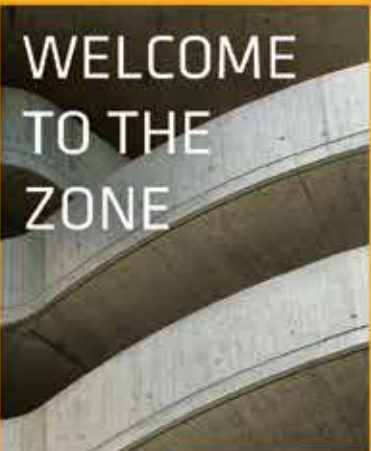
The test entailed crashing a 26,000-pound truck traveling nearly 60 mph into a series of Gravix units. To pass the test, the units had to prevent the truck from jumping over the barrier, which would equate to protecting the passenger, if one were inside. Jason Sailors, business development manager with Piedmont Precast, summed up the gravity of the situation with a simple statement.

“What took eight months of preparation, manufacturing and logistics came down to 45 seconds of pass or fail,” he said.

To the delight of Rainey and everyone at Piedmont Precast, the Gravix barriers passed the test. As a result, Gravix became the first precast unit to achieve the MASH TL-4 rating and can now be specified for transportation projects in every state.

“After the successful crash test, our entire team beamed with a proud sense of achievement,”





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(Above): Redi-Rock products account for more than 20% of total business at Piedmont Precast. (Left): With an approved MASH TL-4 rating, Piedmont Precast's Gravix line can be specified for transportation projects in every state.



Watch a video of the Gravix crash test at [precast.org/piedmont](https://www.precast.org/piedmont)

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BUILDING TRUST





Plant Manager Frank Bowen and Business Development Manager Jason Sailors ensure aesthetic expectations are met during a weekly meeting.

Frank said. “We were thrilled, to say the least, about the performance of this product. We saw the potential in the system and realized – especially after our history working in geotechnics – all the places where Gravix would be applicable.”

GROW OR DIE

With burial vaults continuing to perform well and new product lines being added, Piedmont Precast was beginning to develop the kind of diversification Glen and Frank had first envisioned nearly a decade earlier. Now, the company faced a new problem: they were running out of production space.

Although the facility they had moved to in 1972 had performed well for 40 years, as Frank explained, it no longer offered the capacity needed for Piedmont’s growth. As management explored expansion options, they did everything they could to optimize workflows in the limited space.

“We were standing on top of ourselves,” Frank said. “We climbed up the walls and had more organized work stations that you would typically find in large-volume production facilities that are more autonomous.”

Even with the accommodations made, Glen knew operations were reaching a breaking point.

“Plain and simple, we were out of space and constraints at our primary manufacturing facility were inhibiting our growth,” he said. “Grow or die.”

Many considerations factored into the decision of whether to expand the facility, construct a new one or

purchase an existing building. Ownership considered crane heights, the production equipment, yard space and more as they mulled over their decision. Eventually, a 102,000-square-foot facility that met the criteria became available just around the corner. Piedmont Precast had found its answer.

“Over the next few months, there were a lot of late nights,” Frank said. “I would get calls from Glen in the middle of the night and he would say, ‘You know what we can do?’ We’d meet the next morning, review the plan and then try and explore the problems in it.”

Eventually, Glen, Frank and the rest of management decided on a plant layout that maximized production and allowed future expansion. Today, the new facility is set up with more than 700 linear feet of construction space across two production bays. Piedmont Precast transferred burial vault production to the new facility. This allowed workers at the other building to focus on the company’s construction products, including Redi-Rock, Gravix, Sub-Mar and custom solutions. According to Glen, the move expanded production by more than 50%.

BREAKING OUT

The Bowen family is always thinking about what’s next. It’s not just about, “How did we perform today?” but also “What can we do to perform even better tomorrow?” That’s why the company keeps track of numerous statistics like the number of zero-defect products manufactured per

man per day – a metric that has improved since moving burial vault production to the new facility.

It’s also why the company is considering establishing satellite locations as business continues to increase. Frank said he feels confident this type of expansion can succeed with the correct approach.

“As long as the communication is solid and the management structure is in place, you can reduce potential hiccups when establishing satellite locations,” he said. “But you must be goal-oriented and stick to your business plan.”

The company is also looking to manufacture more product lines and is excited to take on custom projects. As Frank explained, no project is out of the question.

“When a customer presents challenges, it teaches you about future opportunities and your own ability to produce something new,” he said. “I like taking on that challenge and working with it to satisfy the customer.”

ALWAYS ADVANCING

Glen and Frank dream big, and the two have developed a chemistry that provides the extra surge needed to help Piedmont Precast reach the next level. Sailors explained this insatiable desire to advance is felt throughout the management team and reverberates throughout the company.

“There’s a hunger here,” he said. “We’re all at a point in our careers where it’s time to dig in. Everyone is excited.”

Frank agreed, noting with the right planning and processes in place, anything is possible.

“Precast is about finding solutions for construction economy,” he said. “It’s about having a creative idea that is always in consideration of throughput. If we keep looking for new ways to develop construction sites, we will continue manufacturing precast products that go viral.”

Mason Nichols is the managing editor of Precast Solutions magazine and is NPCA’s external communication and marketing manager.



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The EPD Force Awakens

ENVIRONMENTAL PRODUCT DECLARATIONS ARE NOW AVAILABLE FOR UNDERGROUND, STRUCTURAL AND ARCHITECTURAL PRECAST CONCRETE PRODUCTS.

By Claude Goguen, P.E., LEED AP

If you're a Star Wars fan and a precaster, it's been an incredible few months. First the release of "The Force Awakens," and now the release of precast concrete Environmental Product Declarations. The former may have satisfied your inner geek, but the latter will benefit you and your business for years to come.

SO WHAT IS AN EPD?

An EPD is an independently verified and registered document that communicates transparent and comparable information about the life cycle environmental impact of building products. Put simply, it verifies the sustainable attributes of your product. For example, say you're a designer tasked with selecting materials for a project based on economic, structural and environmental criteria. It's easy to compare pricing and you can find information on how how materials perform in service. But how do you compare them in terms of environmental

impact? Until recently, you had to rely on inconsistent, incomplete or even inaccurate data from suppliers. This created a demand to develop EPDs in the green building and infrastructure industry. Through the International Organization for Standardization 14025, EPDs are third-party verified and now give designers the ability to compare apples to apples.

JOINT COALITION

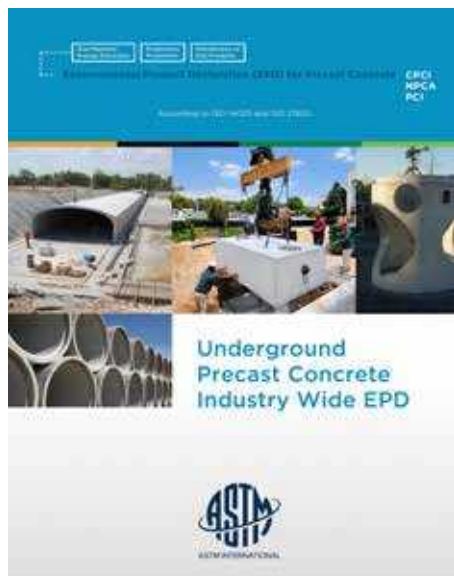
EPDs are created based on a Product Category Rule and a Life Cycle Analysis. Creating an EPD alone would be complicated and time consuming. The good news is NPCA worked with the Precast/Prestressed Concrete Institute and the Canadian Precast Prestressed Concrete Institute to create the PCR, LCA and EPDs for the North American precast concrete industry.

The industry-wide EPDs are now available for architectural and insulated wall panels, structural precast concrete products and underground

An **EPD** is an independently verified and registered document that communicates transparent and comparable information about the **life cycle environmental impact** of building products.



View and download the EPDs on NPCA's website, precast.org/epds



precast concrete products. The structural EPD covers bridge products, building products, retaining walls and sound walls. Structural precast products can be conventionally reinforced or prestressed. The underground products EPD covers pipe, culvert products, manholes, wastewater and stormwater tanks, chambers and related products such as electrical utility products. The wall panel EPD addresses conventional and sandwich wall panels and architectural trim products.

WHAT CAN I DO NOW?

Learn:

Take time to educate yourself about ecolabels and sustainability. The NPCA Sustainability Committee is working hard to prepare members by offering educational courses and forums. NPCA offered the first Precast University elective course on sustainability earlier this year, which is available on precast.org. NPCA offers courses through webinars and at our live events as well. You can also visit the sustainability page at precast.org/sustainability to get more information and read past Precast Inc. sustainability articles.

Adopt and Comply:

Having access to an EPD alone doesn't make you sustainable. Consider adopting sustainable practices at your plant to not only benefit the environment and society, but your bottom line as well. Many sustainable practices result in saving money for your operation. Also, make sure you comply with all applicable environmental regulations for your area.

Brag:

Don't be afraid to boast about the sustainable attributes of your plant and products. Make it a point of emphasis on your website and in your advertising campaign. You may be surprised how much attention it receives and the business it brings.

The EPDs contain information on potential production impacts such as:

- Global warming
- Acidification
- Eutrophication
- Smog creation
- Ozone depletion
- Primary energy consumption
- Material resources consumption
- Waste generated

Many NPCA Producer Members contributed data for the development of these EPDs. They are listed in Appendix A of each EPD.

The EPDs were independently prepared by Athena Sustainable Materials Institute in accordance with ISOs 14025 and 21930, PCRs and ASTM International's EPD program operator rules. They were also independently verified in accordance with ISO 14025 by ASTM International and Industrial Ecology Consultants. The EPDs are valid until 2020.

WHAT DOES THIS MEAN TO ME?

There's absolutely no doubt the green building industry is growing. If you think you are immune due to your geographical location and products, think again. For example, a customer asked a member in Georgia for an EPD on a grease interceptor. You don't want to be left out when that moment comes.

Materials that compete with precast concrete, such as ready-mixed concrete, masonry block, plastic, fiberglass, wood and steel have already developed or are in the process of developing their own EPDs, which are being requested with bid documents in ever-increasing numbers. If you do not have an EPD available when asked, it will be too late.

LEED v4, Architecture 2030 Challenge for Products and the International Green Construction Code request or reward building product manufacturers for submitting EPDs. LEED v4, which replaces the older version of LEED this October, provides two points for a project with 20 products with EPDs and 50% demonstrating lower impacts than industry baselines through EPDs. LEED v4 values different types of EPDs as follows:

- Self-declared EPDs are worth 1/4 value
(not third-party verified)
- Industry-average EPDs are worth 1/2 value
(third-party verified)
- Product-specific EPDs are worth full value
(third-party verified)

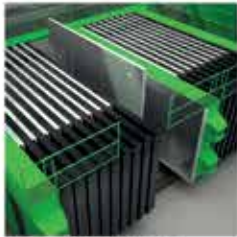
READY TO HELP

The NPCA Sustainability Committee and staff are ready to help you whether you're just starting your sustainability journey or are already well on your way. These EPDs are another tool in your toolbox to use when requested. View and download the EPDs on our website at precast.org/epds.

For any additional questions or comments, please contact Claude Goguen, director of sustainability and technical education, at cgoguen@precast.org or at (317) 571-9500. **PI**

Claude Goguen, P.E., LEED AP, is NPCA's director of sustainability and technical education.

BEST BUILDINGS WITH ELEMATIC TECHNOLOGY



Battery mold



Acotec



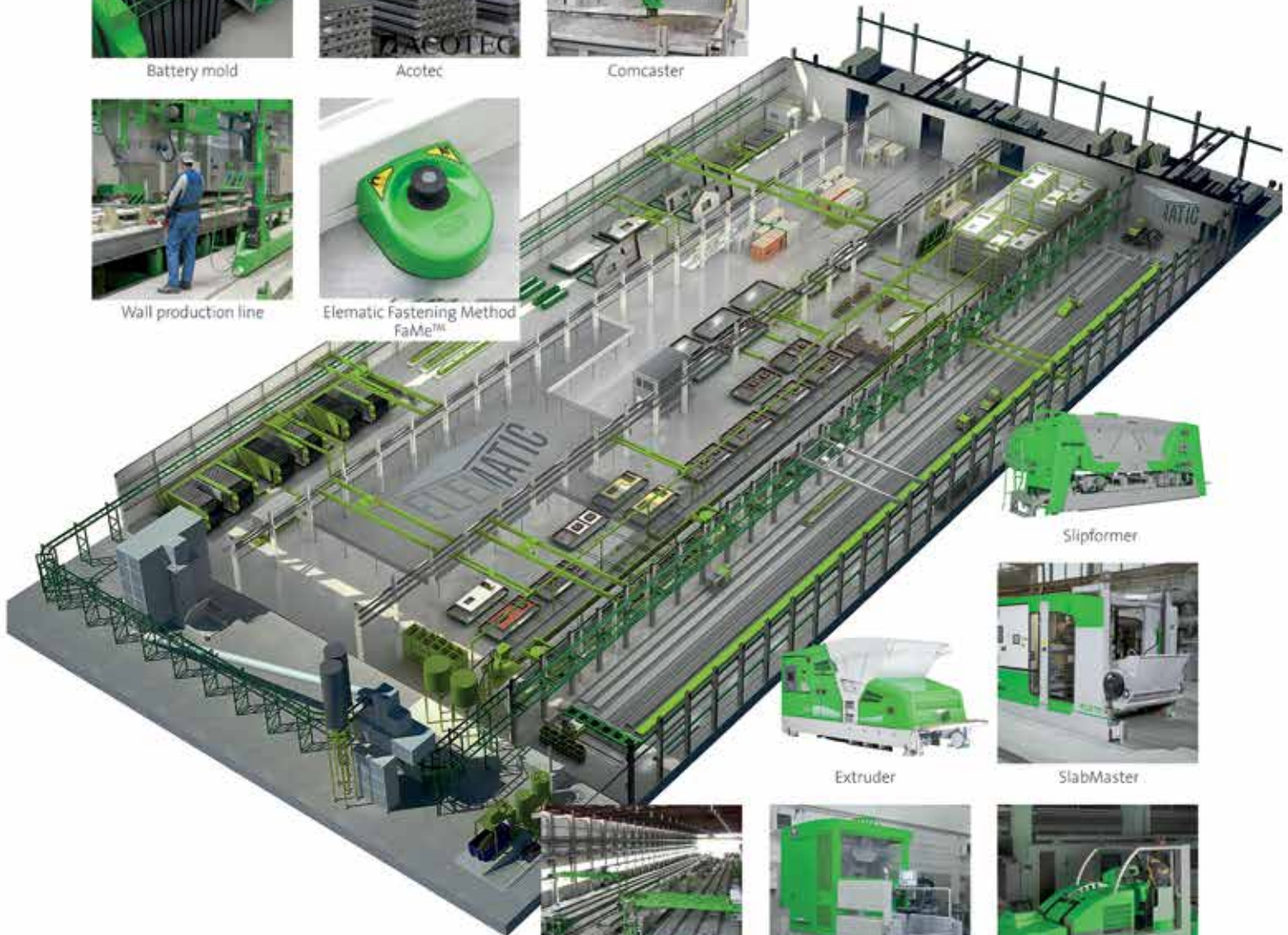
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Giving Back **Darryl Cloud's Odyssey**

Marine's coast-to-coast bicycle ride supports wounded veterans and their families.

By Bob Whitmore

Editor's Note:

"Giving Back" is a year-long series about NPCA members who are doing extraordinary things in their local communities, across North America and throughout the world. If you would like to nominate an NPCA member for a future article, please contact Sara Geer (sgeer@precast.org).

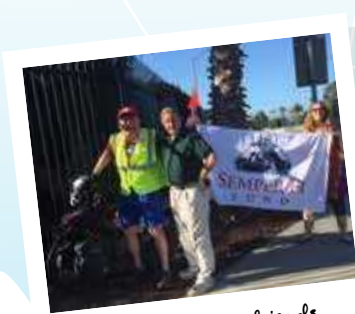
It's a common thread that runs through the precast concrete industry: precasters know how to get things done. Companies that are able to navigate through recessions and thrive in the competitive construction environment usually have another thing in common – an entrepreneurial risk-taker at the helm of the company. And when a successful precaster gets involved in a volunteer project outside the confines of the plant, good things can happen.

The true cost of war is not measured in dollars and cents but in the lives lost and forever changed by catastrophic injuries to the body and mind. While wounded veterans who returned home from Vietnam

were often met with a shrug of the shoulders, those returning from recent conflicts have found a generally supportive public. But there is often a gap between what the Department of Veterans Affairs provides and what wounded soldiers require to deal with life-changing injuries.

Darryl Cloud is helping to bridge that gap through his efforts for the Semper Fi Fund, a nonprofit organization that helps wounded veterans cope with life after severe battlefield injuries. His commitment is so deep that at a time in life when most 66-year-olds are making retirement plans, he completed an arduous coast-to-coast bicycle odyssey – 2,668 miles over 77 days – to raise money for track-driven, all-terrain "wheelchairs" and to bring awareness to the plight of wounded veterans and their families.

Cloud, the national sales manager for Concrete Sealants Inc. in Tipp City, Ohio, has often raised money for nonprofits after he started running in 2001. But it was in 2006 or 2007 that he found his

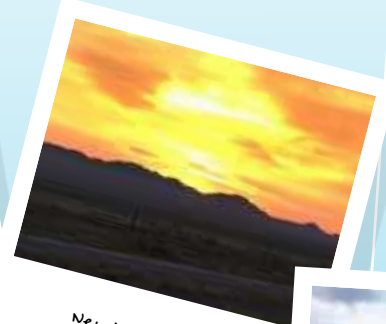


At the start, with friends Margaret Scott and Maj. John Trotti

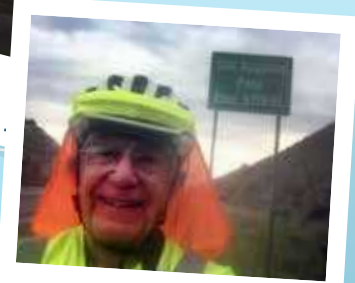
SAN DIEGO, CA



Looking back at California from the Arizona border.



New Mexico sunrise



Near Las Cruces, NM



To visit Darryl Cloud's Semper Fi Fund page, go to precast.org/cloud

"We've got Marine Corps posts on either coast, and I thought from Marine Corps Recruit Depot San Diego to MCRD-Parris Island (S.C.) is almost a straight shot across the U.S. And the seed was planted."

– Darryl Cloud

true calling when he learned about the Semper Fi Fund at the Cincinnati Flying Pig Marathon. He visited the Semper Fi Fund exhibit at the marathon and ended up joining the Community Athlete Program, which includes about 300 diehards who are committed to long-term fundraising to help severely injured Marines put their lives back together. Formed in 2003 as a grassroots effort of five wives of active duty Marines, the Semper Fi Fund has grown exponentially to meet the ongoing needs of military families. It has served more than 15,000 wounded veterans and families in its short history and has raised \$120 million to provide supportive equipment, home and vehicle adaptations, and services.

A former Marine Corps sergeant and Vietnam veteran, Cloud experienced war firsthand and knows intimately how devastating it can be. He and a high school buddy enlisted after graduation in 1967 during the height of the Vietnam War and in 1968 found themselves in the middle of the conflict.

"I was in a hostile fire situation for 15 months of my life," Cloud said. "People were intent on killing us."

His classmate and several other friends lost their lives during the siege of Khe Sanh, which was the longest single battle of the Vietnam War, lasting 77 days. But Cloud made it home.

"I never forget for one moment how lucky and fortunate I am," he said. "I'm fine. I'm OK. I look back and realize I've lived three times longer than some of those guys lived."

So it was natural that Cloud would merge his passion for running and other athletic endeavors with his passion for helping people – especially veterans. But in 2015, he took it to a whole new level.

He had run three Marine Corps Marathons on behalf of the Semper Fi Fund and started cross-training by entering sprint triathlons. Those endeavors would be more than enough for most middle-aged athletes, but it wasn't enough for Cloud.

"I'm just cranking out the miles, and kept thinking, I want to do something really different. Really big," he said.

Then one day about two years ago he was at the office when the wife of Concrete Sealants' president Howard Wingert was visiting.

"Cindy Wingert was sharing a story about a friend whose husband had ridden his bicycle coast-to-coast. And that's when the light bulb went off," Cloud said. "I thought, that's pretty cool. That's big."

"And that's when it hit me. We've got Marine Corps posts on either coast, and I thought from Marine Corps Recruit Depot San Diego to MCRD-Parris Island (S.C.) is almost a straight shot across the U.S. And the seed was planted."

Cloud's big idea was to ride from boot camp to boot camp to raise money and awareness for the Semper Fi Fund. He started doing the research and realized it was not beyond his capabilities – although it would require extensive planning and a lengthy leave of absence from work.

"I talked to Howard and right from the start he was 100% behind me," Cloud said.

A year of logistical planning, a special-order bicycle, gear, camping classes and training rides led to the start of the ride last August. His wife Julia learned how to read an elevation map and served as the navigator from their home in Sidney, Ohio. During their evening calls she would provide him with weather updates and a preview of the terrain he would be covering the next day.

He started at the main gate at MCRD-San Diego. He dedicated the ride to Maj. Larry Helber, an Ohio Marine aviator missing in action in Vietnam. Cloud first learned of the officer through a missing in action bracelet his brother gave him as a gift. But Cloud wanted a human connection to Maj. Helber, so he reached out months earlier to the family and had become close friends with three of Helber's children and his brother. Helber's daughter, Margaret Scott, traveled to San Diego to watch him start the journey.



"It was physically challenging. It was emotionally challenging. I went six weeks without seeing anybody I even knew – and I'm a social guy."

– Darryl Cloud



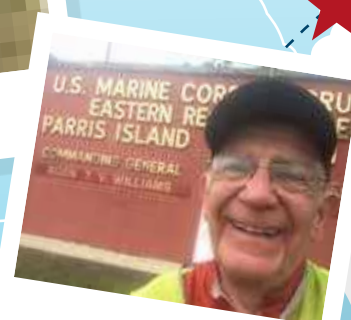
Texas hill country



Near Gulfport, MS



Bluffton, SC



Main Gate, Parris Island



PARRIS ISLAND, SC

"She said, 'It's like my dad was forgotten until you came along. You brought his memory back,'" Cloud said.

Cloud traveled alone, climbing the mountains east of San Diego and dropping down to the desert floor. He biked through 120 degree temperatures in the Sonoran desert, battled relentless headwinds across the endless roller-coaster hills of Texas and braved the long, narrow bridges over the bayous of Louisiana. He passed close to New Orleans and kept rolling through Mississippi, Alabama and Florida, then up the coast through Georgia and on to Hilton Head, S.C., where he stopped 23 miles from Parris Island. He completed the ride Oct. 28, racing a storm and fighting intense winds on the last 20-mile leg to the Parris Island guard station. He arrived at the gate 15 minutes before the storm broke loose after probably the toughest 20 miles he'd ridden up to that point.

"It was physically challenging," Cloud said. "It was emotionally challenging. I went six weeks without seeing anybody I even knew – and I'm a social guy."

He was riding solo, but in addition to his wife's and bosses' support he had several classes of elementary students from around the country following his progress. He also had hundreds of fans following his regular posts on Facebook and a team of nine Semper Fi Fund Community Athlete Program volunteers who helped coordinate logistics with his wife.

"It worried us all," said Laura Castellvi, senior manager of community outreach and events for the Semper Fi Fund. "Our biggest concern was that he was on his own, but he had it all figured out."

About one-third of the time he would camp, laying back at night in the desert to watch the stars through the netting on his tent. His thoughts would turn to the friends he lost in Vietnam and to the wounded veterans he had met at Semper Fi Fund events. He did media stops along the way to talk about the Semper Fi Fund.

"He is able to share our mission so beautifully and so purely," Castellvi said. "He's not trying to call attention to himself," she added. "He's just trying to explain the effort."

"He embodies everything we believe in. He speaks so comfortably and eloquently and his passion just shines through."

Cloud's Boot Camp-2-Boot Camp tour has raised more than \$70,000 to date for the Semper Fi Fund, a figure that leaves Cloud "tickled to death" and inspires awe from his Semper Fi outreach volunteers. But the ride will not be measured in money raised so much as in lives changed. The Action Trackchair vehicles the money will be used for move on a track (like a tank) and can go where wheelchairs can't. The chairs are custom-fitted to the service member, who likely lost one or both legs and has severe mobility issues.



Welcome banner signed by NPCA friends and presented by Nagelle Smitherman of the Semper Fi Fund.



With Tom Helber, brother of MIA Maj. Larry Helber.

he could sit, but not really play with the children. "Now they can be down there on the beach and he can be there with the children," Castellvi said.

Cloud's efforts will purchase at least four Action Trackchairs that will change the lives of the service members and the families who receive them.

"Kids are getting their daddy back," Cloud said. "I was watching a video of a guy in New England. He had four or five sleds attached to his Track. He had the whole neighborhood in tow."

"The kids were just going nuts. He was flying down the road with these kids in tow. It was so cool."

Cloud credits his supporters for the success of his Boot Camp-2-Boot Camp tour and other Semper Fi Fund activities. He said there are many people backing him up, including many of his longtime friends from the National Precast Concrete Association. Mike Vaughn, general manager of Vaughn Concrete Products in Henderson, Colo., gave an impassioned speech at NPCA's annual meeting to make a final fundraising push just a few days before Cloud finished his ride.

"I really cannot express my gratitude to the association for the support I've gotten," Cloud said. "There's Mike and there are dozens of other people who have just stepped up to the plate and supported me and I am grateful beyond words."

And so is the Semper Fi Fund. Cloud has raised more than \$100,000 and counting through his efforts over the years, Castellvi said.

"We can never thank him enough and we are so grateful that he's part of our team. We're very appreciative of him and all those who support him. He always says that it's not just him but all of the people behind him, so he carries all of you with him when he's out on the road." ■

Bob Whitmore is NPCA's vice president of communication and public affairs.

Castellvi remembers the presentation of an Action Trackchair to a service member in California.

"The first thing his wife said is, 'Isn't that wonderful? Now we can all go down to the beach together,'" Castellvi said.

Before they received the Trackchair, the wife would have to place her husband on a boogie board and drag him down to the beach, where

"We can never thank him enough and we are so grateful that he's part of our team. We're very appreciative of him and all those who support him."

– Laura Castellvi,
Semper Fi Fund

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Coming Up Next

THE VALUE of NPCA for YOUNG MEMBERS



If you are interested in becoming an NPCA member, visit precast.org/membership

By Bridget McCrea

For young precast professionals, NPCA offers a wide range of services and support designed to not only assist their transition into the industry, but also nurture them throughout their careers.

Standing at 80-plus million strong, born between 1980 and 2000, and currently aged 16-to-36, the millennial generation is the largest in history. As it continues to make its way into the workforce, this generation has very different traits and characteristics than its predecessors. For example, as the first generation that's never known life without the Internet, millennials tend to rely heavily on social networking in both their personal and work lives. And while they're known to show loyalty to a cause, millennials aren't necessarily joiners by nature.

"In many organizations, membership has

dropped, prompting some to suggest that this generation simply aren't joiners," wrote Steven Worth in "Membership and the Millennial Generation: A Whole New World." "While they will not show loyalty to an organization like previous generations did, [millennials] will show loyalty to a cause. Membership organizations must therefore articulate a clear and compelling cause, mission and purpose."

COURTING EMERGING LEADERS

The fact that millennials might be tougher, or maybe just different, to crack than older generations



Jesse Wingert

NPCA/Allegretto

comes as no surprise to organizations that watched membership numbers fluctuate over the last few decades. Where the 78 million baby boomers may have grown up in an era where joining was both necessary and desirable, their children have been exposed to different options that don't necessarily align with traditional membership in industry and trade organizations.

For young precast professionals, NPCA offers a wide range of services and support designed to not only assist their transition into the industry, but also nurture them throughout their careers. From continuing education and widely attended national conferences to one-on-one networking opportunities, the organization has been connecting both present and future leaders in the precast concrete industry since 1965.

Andy Hayward got involved as soon as he joined his family's business, Panhandle Concrete Products in Scottsbluff, Neb.

"We started going to NPCA shows and events when we were kids," said Hayward, quality control and production manager for Panhandle. "Even today, there's still a large family presence within the NPCA at those events. The older generations are retiring or moving on, and we're starting to see a lot of new faces and future leaders emerge."



Andy Hayward

Five years ago, Hayward started joining NPCA committees as a way to get more involved in the organization. In 2014, Hayward joined the NPCA Foundation Board of Directors. Since 1989, the NPCAF has provided scholarships to more than 100 students enrolled in civil engineering, architectural and construction-related curricula. NPCAF's philosophy is to introduce the features and benefits of precast concrete products to help create a more educated specifying community.

While Hayward said baby boomers and Generation X continue to dominate most of the groups and foundations he's joined, he has seen more millennials taking the step and getting involved. Keeping that joining momentum up over the next few years will be important as a way to help others understand the value of membership and participation.

"We need to step up as a generation and get involved with the groups that support our companies and our industry as a whole," said Hayward, who sees the precast concrete industry as a friendly, helpful place where people aren't afraid to share ideas with one another. "While many of us are out there competing against one another on a daily basis, we're all pretty open to sharing information and brainstorming together."

START WITH SMALL STEPS

Hayward said a good first step is to simply visit precast.org to check out the plant resources, certification, education, meetings and publications offered to members and the general public.

"There's a wealth of information right there online," Hayward said. "You can learn about the educational offerings, see what committees are available and read the group's magazines."

Hayward also relies on NPCA's website to look up technical information and research, find other producers in his region and then connect with them to discuss relevant topics and trends. Other valuable online resources include lunch and learn templates to help members engage with local specifiers, web-based courses and webinars.

"It's amazing what you can learn about your organization by just spending a few minutes on NPCA's website," Hayward added. "New offerings are being added all the time, so the odds that you'll discover something that you weren't even aware of are pretty high."

The next logical progression is to attend The Precast Show and/or the annual convention.¹ Hayward said young members attending their first NPCA show will probably be surprised at the level of camaraderie among members, industry leaders, associate members and suppliers.



What Young Members Like (and Dislike) About Organizations

They may be well-connected digitally, but millennial workers typically need an extra "push" before they'll join and get involved with a professional organization. To get inside their heads and figure out what they really want and expect from membership, Buzz Marketing Group conducted Professional Organizations Study 2015. When asked how they are interacting with professional organizations, millennials said:

92% of respondents under the age of 40 believe membership in today's professional organizations provides strong opportunities for networking and social capital.

52% of those under 40 are more likely to join invitation-only organizations (rather than "open" opportunities).

77% of those who aren't currently a member of an organization plan to join one in the future.

74% believe professional organizations and communities are useful.

50% believe that such groups are "innovative" and 40% of respondents under 40 see these groups as technologically savvy.

67% believe that professional organizations have benefits that are relevant to them.

When asked why they choose **TO LEAVE** professional organizations and communities:

45% did so because membership was too expensive

35% didn't feel there was a community of peers

31% didn't see the organization as technologically savvy

“The **big rewards** [of membership] come in the form of networking, knowledge and education, all of which are **critical to success** in today’s changing business environment.”

– Andy Hayward, *Panhandle Concrete Products*

“The social aspect of our industry is one of the best, particularly when it comes to meeting different suppliers and producers under one roof and over a couple of days,” Hayward said.

In return for the time spent attending events, Hayward said he gains knowledge and insights that would be difficult to accumulate and digest in any other setting.

“The big rewards come in the form of networking, knowledge and education, all of which are critical to success in today’s changing business environment,” Hayward said. “There’s always some newfound knowledge to be gained, some problem to figure out or some application to learn about. The experience is invaluable.”

SUPPORTING COMPANIES, FAMILIES AND INDIVIDUALS

For Jesse Wingert, business manager at Concrete Sealants Inc. in Tipp City, Ohio, associate membership in NPCA dates back three family generations.

“We’ve put a lot into the NPCA both as a company and as a family,” Wingert said. “In return, the organization has given a lot back to us, including valuable mentoring experiences and a solid knowledge base that’s helped us move forward as an organization.”

As he surveys the three generations that are currently leading or working in the precast industry – and those industries that support it – Wingert sees more to be done. He said the fact that 83 million millennials are either in or entering the workforce while 75 million baby boomers are exiting it creates both challenges and opportunities for the industry.

Add rapid technological advancements to the mix and you wind up with a business landscape that requires different and innovative approaches. For example, customers no longer rely heavily on phone calls, faxes or in-person visits from precasters. Instead, they want to be able to use their smartphones and tablets to place orders directly from the job site and with very little human contact.

“Right now we all need to focus on how the environment is changing and what’s ahead,” said Wingert, who sees NPCA as the perfect platform for collecting, reviewing, and then sharing relevant information and



Jesse Wingert



WHY I’M AN NPCA MEMBER

MICHAEL TIDWELL
Owner
Bartow Precast Inc.
Cartersville, Georgia
www.bartowprecast.com
NPCA Member Since 2002

**“It’s an investment.
We never look at it as
an expense.”**

Michael says...

“Through our committee involvement and all the educational opportunities, we know we’re going to get good information and industry knowledge in exchange for a fairly minor commitment on our end.

I’ve always said it’s a small investment for what we get out of it. Of all our business investments, it’s probably the best return we get dollar for dollar.”

Find out more at:
precast.org/member



data. Armed with a broad spectrum of knowledge that “can’t be found anywhere else,” he said NPCA helps bring together geographically dispersed members in a very social manner that’s well suited to millennials who thrive on such connections and interactions.

“I’ve seen members from the northeastern U.S. interacting with others from the Southwest to figure out problems and come up with better methods for their own customers,” Wingert said. “That’s just one example of how NPCA brings together otherwise unrelated entities to share their experiences in the precast industry and expand their knowledge bases fairly quickly. If you want to become an expert in our industry, you have to be involved with the NPCA.”

ROLLING OUT THE RED CARPET

As a long-time NPCA member, Chris Fitzpatrick understands that not all generations communicate and operate in the same fashion. A member of Oldcastle Precast’s operational excellence team in Denver, Fitzpatrick said getting younger members interested and participating requires an innovative approach that includes tools that older members may not be as inclined to use such as Twitter and Facebook.



Chris Fitzpatrick

“The younger generation of leaders is caught up in social media,” Fitzpatrick said. “They want instant access to everything.”

The good news is the same basic principles that helped earlier generations, such as networking and sharing ideas, work just as well today. For example, a few years ago, Fitzpatrick was attending an NPCA conference when he learned about a new product line to help Oldcastle create a new approach to an existing product.

“We’re using that on a job right now,” Fitzpatrick said. “That really makes me feel good about our association with and involvement with the NPCA.”

Knowing that tomorrow’s industry leaders may need a slight nudge to get involved with NPCA and with the precast industry as a whole, Hayward said potential members need to know that the group is very warm and welcoming. For example, NPCAF is working to get even younger members on board and integrated into the precast industry while they’re still in school.

“Collectively, we’re all working to ensure that precast concrete is the material of choice for engineers, architects and specifiers,” Hayward said. “Ultimately, our goal should be to always make precast concrete the premier construction material out there. We’re already doing a pretty great job of that, but we also need to keep working together – and get the younger generation involved – in order to maintain and surpass that level.” **PI**

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.

REFERENCES:

¹ NPCA’s 51st Annual Convention in Austin, Texas, is Sept. 28 – Oct. 1, 2016. Information on NPCA meetings can be found at precast.org/meetings

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OPCA BRINGS NATIONAL EDUCATION to the Local Level

Ohio Precast Concrete Association hosts PQS Level I for its members.

By Sara Geer



Claude Goguen, P.E., LEED AP, director of sustainability and technical education at NPCA, taught PQS Level I to 40 students at OPCA's regional event.

Ohio precasters didn't need to travel far in January to take Production and Quality School Level I in person. The Ohio Precast Concrete Association hosted the course locally with support from the National Precast Concrete Association.

Forty students attended the course offered in Canton, Ohio, at the Pro Football Hall of Fame. Sam Lines, OPCA's executive director and engineering manager at Concrete Sealants, said the regional course attracted many smaller businesses due to reduced travel costs and less time away from the plant. OPCA also subsidized a portion of the students' tuition for the course.

"This provided only two days physically outside the plant for everybody," he said. "And most people were within a couple hours drive of the Canton area, so it was a good turn-out and a good broad scope."

Lindsay Precast had the largest attendance. Dean Wolosiansky, general manager at Lindsay Precast in Canal Fulton, Ohio, said the company sent a wide range of staff to the course including production employees, computer-aided drafters and project managers. The course offered an opportunity for everyone to be in a classroom setting to discuss daily issues or concerns together.

"When someone comes back from a PQS course, they have a sense of

pride in their industry," Wolosiansky said. "It feels good for them to understand the education behind the daily production processes."

Key benefits from the class were lessons on mix design and reinforcement. Corey Mahaffey, CAD drafter at Lindsay Precast, said knowing the importance of rebar sizing, spacing, cover and type is something he incorporated into his job right away.

"Having a sharper knowledge on the subject will assist in catching more errors in drawings," he said.

Jason Fortune, pump station project manager at Lindsay Precast, also said the course is very helpful for an employee brand new to the precast concrete industry. He said when it comes to concrete, most people know very little.

"Taking this class provides a clear image of the science and practicality that concrete brings to the building industry," Fortune said.

Wolosiansky said the company's goal moving forward will be to get interested and motivated employees to take more courses. As a 2016 Master Precaster graduate himself, he said it's nice to see more people choosing to be invested in the company. Lines said OPCA will likely offer more NPCA education opportunities to its regional members moving forward.

"Oftentimes, NPCA seems very distant to smaller precasters, which makes up about 40-to-50% of our membership," Lines said. "But when we can bring an NPCA event to their hometown it provides them a stronger connection to the larger association."

If you are interested in offering PQS Level I, or any NPCA education, in your region contact Marti Harrell, vice president of education, at (800) 366-7731 or mharrell@precast.org. **PI**

Sara Geer is NPCA's internal communication and web manager, and is managing editor of Precast Inc.

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DETAIL A
SCALE 1 : 20

People & Products

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 sgeer@precast.org.

FORTERRA BUILDING PRODUCTS ACQUIRES SHERMAN-DIXIE CONCRETE INDUSTRIES

Forterra Building Products announced it has acquired Sherman-Dixie Concrete Industries.

This acquisition will leverage Sherman-Dixie's presence in the southeastern United States to expand Forterra's capacity and capabilities. Sherman-Dixie will continue to operate its existing facilities in Tennessee, Alabama, Kentucky and Indiana. Under the new structure, the company will be part of Forterra's Pipe and Precast business and will adopt the Forterra name.

PROALL REVEALS THE COMMANDER

ProAll revealed the Commander, a new control system, at the World of Concrete trade show in February.

With the Commander, automated functions and a digital interface give control, accuracy and consistency. Elements of a mix are measured several times a second and auto-controlled by a cutting edge programmable logic controller hydraulic system.

With the Commander, all functions of a Reimer Mixer are now integrated, including belt speed, water and cement. The digital controls are on one dashboard and mix measurements are displayed together on one screen where production can be tracked and warning messages will appear if mix proportions are incorrect.



The Commander by ProAll

SMITH-MIDLAND WINS AWARD FOR SMITHSONIAN NATIONAL ZOO PROJECT

The Washington Building Congress awarded Smith-Midland the 2016 Precast Concrete Craftmanship Award for its manufacturing of the Smithsonian's National Zoological Park retaining wall in Washington, D.C.

The 850-foot-long-by-30-foot-high simulated stone retaining wall was built to replace existing structures along an extensive drop off on the entrance road above parking lot C.

General Contractor Hensel Phelps worked with



Smithsonian's National Zoological Park Retaining Wall by Smith-Midland

Smith-Midland to design the precast concrete panels and to complete the welding and wall erection. Originally designed to be cast-in-place, Phelps rethought the process and proposed the use of a shotcrete wall and placement of precast concrete panels as a facing.

The panels were formed and hand-stained to mimic the look and color variations of a natural stone wall, matching the stone walls located on the nearby Rock Creek Parkway.

PRESS-SEAL GASKET CORP. ANNOUNCES NAME CHANGE

Press-Seal Gasket Corp. announced it is changing its name to Press-Seal Corp. The name change reflects the company's initiative to better align the company's name with its future strategy and



product roadmap. A recent addition to its core capabilities is the addition of extrusion and molding of thermoplastics.

The new name, Press-Seal Corp., is effective immediately and will be implemented across the company's products and services in 2016.

BESSER COMPANY AND ECONCRETE SOLIDIFY COOPERATIVE ENDEAVOR

Besser Company and ECONcrete Tech Ltd. jointly embarked on a project to develop a high production dry-cast system to use ECONcrete's proprietary additives and designs to produce bio-enhanced concrete products.



Besser's ECONcrete bioactive wall

Extensive research has demonstrated that concrete products containing ECONcrete's proprietary additives and designs are able to reduce the ecological footprint of urban and coastal infrastructure and mitigate the impact of climate change. Besser Company and ECONcrete will market and promote the products jointly.

Besser Company's role is to engineer, test and manufacture molds and concrete products that satisfy the concrete unit specifications defined by ECONcrete. The Binational Industrial Research and Development Foundation funded the joint project in December 2015.

VAUGHN CONCRETE PRODUCTS GENERAL MANAGER RECEIVES AWARD

Mike Vaughn, P.E., president and general manager of Vaughn Concrete Products was awarded the Wyoming Engineering Society President's Outstanding Engineer Award at the WES convention banquet in February.



Mike Vaughn, P.E.

Mike attributes receiving the award to his, and Vaughn Concrete Products', efforts over the past 30 years to help engineers and contractors find effective time- and money-saving innovative precast solutions for their projects. He said it is "a joy to go to work each day and think outside the concrete box."

He is always willing to talk to engineers and customers about their specific projects whether in the design or construction phase to help make their projects cost effective and time efficient.

Mike is a registered professional engineer in Wyoming, Colorado, Texas and 14 other states. He looks forward to many more years of providing "precast solutions" in these states. **PI**

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Sept. 28 - Oct. 1, 2016
NPCA 51ST ANNUAL CONVENTION
 Renaissance Austin Hotel
 Austin, Texas



March 2-4, 2017
THE PRECAST SHOW 2017
 Cleveland Convention Center and
 Hilton Cleveland Downtown
 Cleveland, Ohio



February 22-24, 2018
THE PRECAST SHOW 2018
 Colorado Convention Center and
 Hyatt Regency Denver
 Denver, Colo.



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6

CASE STUDY

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*Brian Malaer
Plant Manager
Valley Prestress Products, Inc.*



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