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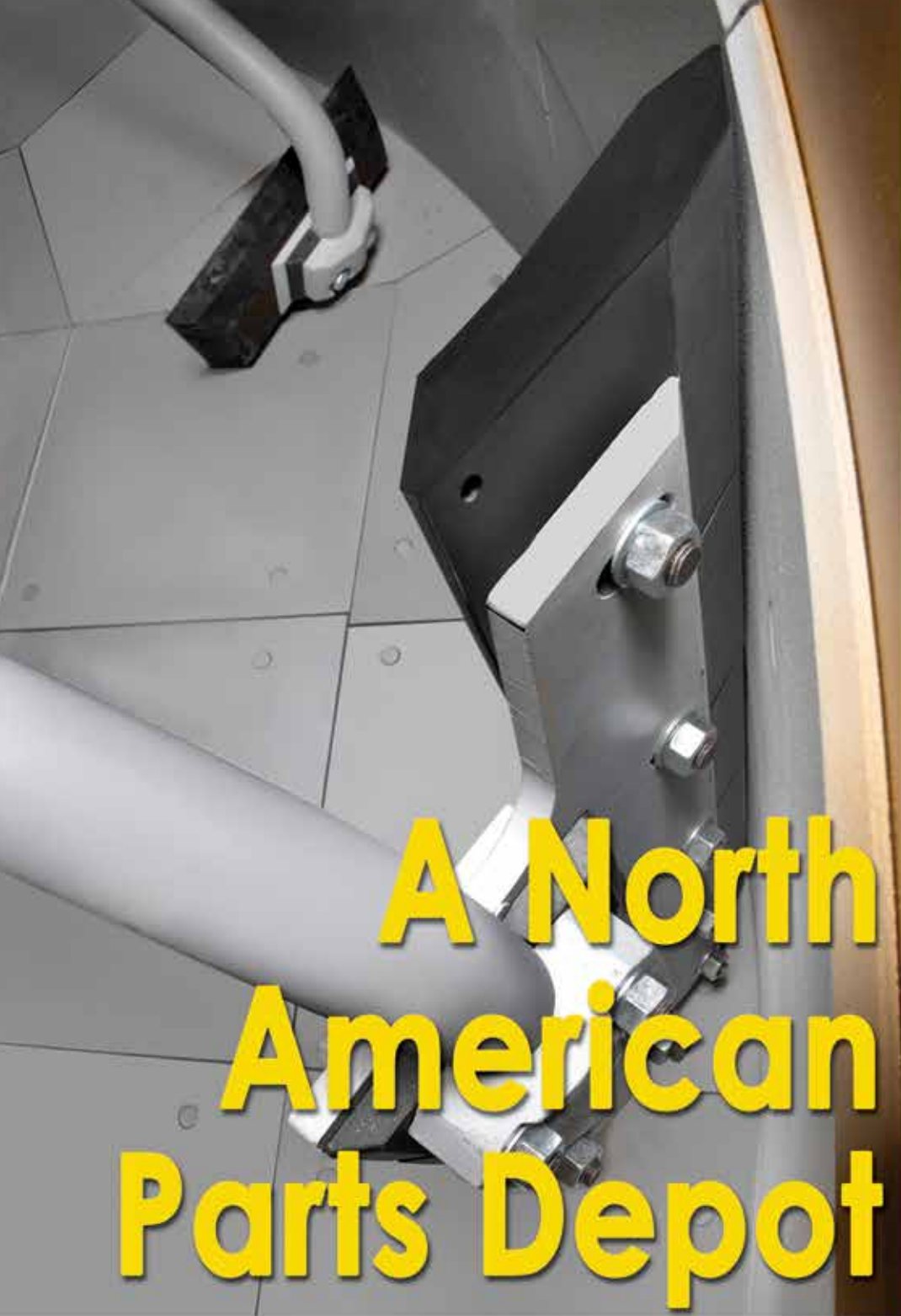


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Precast Inc. (ISSN 1940-9184 print, ISSN 1940-9192 online) is published bimonthly by NPCA.

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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.*

# 28 Cape Fear Precast

## ALL IN

The owners of Cape Fear Precast placed a **BIG BET** starting their own company, but the **gamble paid off**.



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**Get tips for hiring your company's first CFO**

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**On the Cover:**  
*Cape Fear Precast employee Omar Mendoza prepares a form for pouring.*



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# Precast PIONEERS

## E.C. Babbert, NPCA President, 1976



*E.C. Babbert speaks at the NPCA 8<sup>th</sup> Annual Convention in 1973 in Pittsburgh. He served as chairman of the Board in 1976 and won the Robert E. Yoakum Award in 1977.*



*E.C. Babbert, as seen on the cover of MC Magazine in a 2004 profile of his company.*

### 1.) Why did you get involved with NPCA and decide to become chairman?

When we first became aware of the association, it was a burial vault group and they met over in Dayton. Mr. Yoakum had died the day before. After that, they hired Bob Walton to manage the association and I think his first Convention was Denver where I joined. That's where I got

involved with the association. I think that was 1966. To get anything from an association, you need to get involved.

### 2.) When you first got involved with NPCA, did you envision it becoming what it is today?

I did not envision NPCA becoming what it is today. Bob Walton got the association on the right track. At the present, Ty Gable is continuing the success of NPCA.

### 3.) What was the best thing you accomplished as chairman?

One thing we started that I'm really proud of is ASTM C-27. Frank Brooks, Frank

Moeller, Bob Walton, myself and a couple others got this thing going. We had four or five trips to Philadelphia to get that thing through but it worked.

### 4.) How has your company and precast as a product changed over the years?

Regulations have changed over the years. Also, I started in septic tanks and then we just multiplied out of that – they wanted this and they wanted that and that's how we went. We're making big stuff now at our Lancaster plant. It's good once in a while to get a change of pace. If you get set in your ways, you don't advance. You're locked in that same old static position. You've got to change once in a while. That's what makes life interesting.

personal lives with the meeting of many wonderful people. We had very close relations – the Wiesers, the Barbours, the Lendrums, Frank Brooks, Frank Moeller – we all became very close. We got to know one another and their families and it worked out great.

At meetings, we partied whether there was a party going on or not – we were that close to one another and enjoyed each other. Joe Wieser was a very good friend and he always brought his motorhome. He had a 16-gallon keg of beer in the motorhome and cheese curds. We'd get in that motorhome and let the meeting go on inside and we'd go out there and eat cheese curds and drink beer.

It's been a very good experience, belonging to the association. If you wanted to start a new product line or something, you just found somebody that was doing it and was willing to give you information to help you get started. It's just been enjoyable. People who don't join NPCA are missing the boat because there's always something different and something you can learn from other precasters. If you're not too proud to listen, you can get a lot of information.

It's been a great adventure for me. ■

### 5.) What's your favorite NPCA memory?

The year I was president of NPCA, Convention was held in San Francisco. The trade show was run by Jack Doris and that was the year I received the Yoakum Award. I was surprised when I got the Yoakum Award. I had seen others get it but I wasn't thinking about that. I had both my boys, my mother and my wife with me. It was a little bit of shock.

### 6.) How did the friendships formed via NPCA impact your business and life?

Our involvement with NPCA has impacted our business very much and also our

#### EDITOR'S NOTE:

NPCA will celebrate 50 years at its Annual Convention in Minnesota this October.

This year-long series honors past chairmen who helped establish the association as a leading voice for the precast concrete industry.



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**PROGRESS THROUGH SERVICE SINCE 1906**

# Just the Cure for You

A discussion on **accelerated curing** for precast concrete.

By Eric Carleton, P.E.



Curing tarps are used to maintain temperature and moisture.

**F**or efficient precast concrete plant production, cycling product forms as quickly as possible is imperative.

For wet-cast operations, product is typically poured one day and stripped the next so the form is ready to accept another pour. For dry-cast operations, forms are stripped immediately for reuse after casting and consolidation, and products achieve handling strength the next day. To accomplish either, precasters must employ techniques to accelerate curing and consequential early strength gain.

As a result, accelerated curing has become very popular in precast plants. This type of curing is advantageous when early strength gain is important or when additional

heat is required to accomplish hydration. Accelerated curing saves time to better meet precast concrete production demands while maintaining a quality product and reducing costs.

## MIXING IT UP

Accelerated curing is accomplished in one of two ways. The first is through the use of accelerating admixtures, including calcium chloride. Calcium chloride has an excellent 100-year history. It is the most widely used admixture to effectively accelerate strength gain in concrete mixes. Unfortunately, it has some problematic characteristics noted in the sidebar “Calcium Chloride Recommendations” and Federal Highway Administration Materials

Group document, “Accelerating.”<sup>1</sup> The main concern is that calcium chloride is corrosive to steel since most precast concrete products use steel reinforcement for handling and installed loadings. As a result, calcium chloride is not widely used within the precast concrete industry and there are other accelerating admixtures that do not contain chlorides.

## HEATING IT UP

Precast companies have learned the best way to implement accelerated curing is by adding heat to the precast component while reducing process water evaporation through the use of low pressure steam, mist and product tarps. Research has shown this heat- and moisture-induced accelerated curing may lead to slight 28-day compressive strength losses versus following American Concrete Institute’s “308 Guide to Concrete Curing” criteria.<sup>2</sup> However, the benefits of achieving high early strength far outweigh making mix design modifications to produce hardened concrete design strength requirements. If a production method includes heat-induced accelerated curing, it’s good practice for the manufacturer to perform a certain frequency of 28-day cylinder breaks to determine if the specific curing process exhibits this minor strength loss for record keeping.

## BEST PRACTICES

The National Precast Concrete Association has published two articles describing the basic processes of precast concrete curing: “To Cure or Not to Cure” in the May-June, 2011,



issue of *Precast Inc.* and the Tech Note, “Curing Wet-Cast Precast Concrete.” These documents use Figure 1, which shows the atmospheric steam-curing cycle. This important graphic interpretation of the accelerated curing process must be clearly understood by precast quality control and quality assurance personnel and the production team.

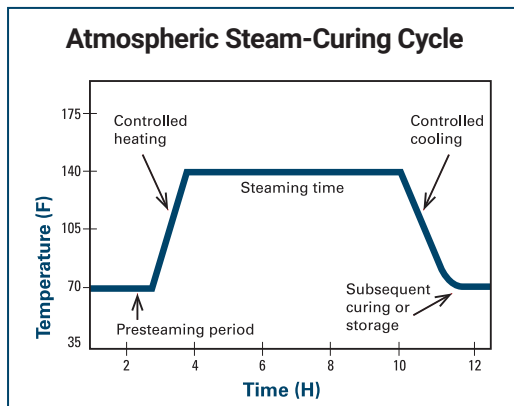


Figure 1. Typical sequences for low-pressure steam curing: Temperature vs. Time.

The process is divided into four primary sections based on temperature and time. Figure 1’s vertical axis shows the temperature of the atmosphere surrounding the precast unit. It is important to also note what temperature the concrete product is at the beginning, during the curing process and at the end prior to storage. This provides a better understanding of mix characteristics and offers another data point if any unexplained quality issues occur.

### PRE-STEAMING

The first phase of curing is a very significant time during the early life of new concrete. This period goes by a number of names such as initial delay, preset, pre-steaming, holding or setting. This is when the cement paste begins to become rigid due to cement and water hydration. The clock starts when water is added to the concrete mix, and ends when the temperature of the concrete noticeably increases and the volume of the concrete slightly increases. The concrete mixture is in a vulnerable state during this period. If the atmospheric temperature is very cold, the mix can freeze, destroying the concrete matrix. Just as important, should the mix be subjected to high temperatures, the heat can prematurely accelerate hydration products and cause internal stresses and long-term strength loss. Both temperature extremes create poor hardened concrete with unacceptable strength and durability properties. ASTM C403 has become the standard to determine the mix setting and consequently the setting time. It is developed for mixtures with a slump greater than zero and is based on using a standard Proctor soil probe pushed into the mix to a

depth of 1 inch. The mix has set when it stiffens to develop a 500-psi penetration resistance. The actual length of time from when water was first introduced into the mix to this set point is the pre-steaming time or initial delay time.

Most mix designs used for precast concrete products set between 45 minutes and two hours. ACI 517.2R standard states, “... The drier earth-moist mixes used in machine pipe and dry-cast process are able to withstand relatively short preset periods without damage because of their lower water content. At a total moisture content of 5% some mixes have shown no significant decrease in compressive strength with a preset period as short as 1 hour.”<sup>4</sup>

Experts generally agree that during this period the only heat needed is to ensure the ambient temperature and corresponding concrete is above freezing with an optimum temperature above 50 F. The setting time will decrease with moderate increases in temperature, but a temperature above 85 F will cause a detrimental effect.

### CONTROLLED HEATING, SOAKING AND COOLING

The next important phase in accelerated curing is controlled heating. This is where the precaster can begin to add heat. For stripped products, heat can be added via hot air and mist water or hot steam. For products still in their form jackets, electric heating blankets or heated forms can be used. However, the term controlled heating is there for a purpose, as applied heat needs to increase at a uniform rate between 40 F to 20 F per hour.

Previously, experts believed concrete could safely be brought up to enclosure temperatures approaching 180 F. However, research has shown these high curing temperatures can lead to delayed ettringite formation or visible displacement and cracking.<sup>5</sup> Consequently, current practice dictates preventing the curing enclosure temperature from exceeding 160 F.

During the controlled heating phase and into the next constant temperature or soaking time phase, the exposed concrete surfaces of dry-cast or wet-cast products still in their forms must be kept moist for proper curing. Additionally,

wood formwork without an impervious barrier coating may work like a sponge to draw out water from the precast product. If a wood form must stay in place, be sure to keep it wet and saturated when possible. If a steel form is used, ensure it hasn’t moved or expanded enough to pull away from the precast product. This will cause an air void and shrinkage cracking to occur on the concrete surface. It is also important for precasters to carefully check the blankets or steam enclosure curtains being used to ensure there are no major tears or leaks leading to moisture loss, temperature variations and problematic air drafts.

When steam is introduced to the curing space via a hose, it is imperative the exiting steam is dispersed uniformly. Steam hoses discharging directly onto a curing precast product can elevate the temperatures of the curing concrete section to adverse levels. However, ambient temperature data would show the product was cured within the prescribed plant procedures.

After the concrete temperature has caught up with the ambient temperature through hydration, external heat sources may be turned off or reduced. The time in this phase will vary depending on the soundness of the product’s enclosure and the temperature used for curing.

The final phase is controlled cooling. Similar to controlled heating, the expectation is to conduct a gradual, uniform reduction of curing temperatures. The suggested reduction in temperature is between 40 F to 20 F per hour.

### SPECIAL MIX CONSIDERATIONS

Modern precast concrete mix designs rarely include only cement, water, and fine and coarse aggregate. The concrete mix will typically include admixtures and/or secondary cementitious materials such as fly ash, slag or silica fume. It is important for quality control personnel to understand how admixtures and SCMs affect accelerated curing. For example, as stated previously, accelerated curing processes led to slightly decreased long-term compressive strength. Testing has also shown that some fly ash mixes may mitigate that effect. However, it is well known that most fly ash slows the set time for concrete mixes and increases

## Calcium Chloride Recommendations

1. **Verification tests should be performed** on liquid admixtures to confirm the material is the same as approved. The identifying tests include chloride and solids content, pH and infrared spectrometry.
2. **Calcium chloride should not be used** where reinforcing steel is present.
3. **Calcium chloride should not be used** in hot weather conditions, prestressed concrete or steam-cured concrete.
4. In applications using calcium chloride, the **dosage rate should be limited** to 2% by weight of cement.
5. **Select non-calcium chloride accelerators with caution** since some may be soluble salts, which can create corrosion.

the required curing time for safe form removal, handling and storage.

Another important consideration is viscosity-modifying admixtures used to produce self-consolidating concrete. Though research has been submitted detailing accelerated curing of SCC using steam<sup>6</sup>, no compelling studies detail any detrimental effects when using traditional accelerated curing processes with these mixes.

### DOCUMENT YOUR FINDINGS

It is important for the plant QA/QC personnel to note and document specific temperatures and curing times within the curing cycle that works for their plant, products, process and climate. Quoting ACI, "There is no one curing cycle that is best for all plants. Each plant is unique and the curing cycle that is optimum for one plant may not be effective in another. Many factors act and interact in the curing cycle, and they influence the strength and other properties of the product ..."<sup>7</sup>

Employees knowledgeable about your plant's accelerated curing process will manufacture provide the highest quality-finished product

and be able to remedy any curing issues. A well-documented accelerated curing procedure and corresponding positive testing results for your plant's unique conditions may save you time and trouble if an inspector visits your plant. It will also help you revise your production protocol based on an understanding of precast concrete manufacturing standards. **PI**

*Eric Carleton, P.E., is NPCA's vice president of Technical Services.*

### RESOURCES:

1. Federal Highway Administration Guidance Document, Infrastructure Materials Group "Accelerating"
2. Construction of Prestressed Concrete Structures, Second Edition Ben c. Gerwick Jr. Pages 19-23, 91-94
3. Portland Cement Association, Design and Control of Concrete Mixes, 15th Edition, Figure 15-9
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7. ACI 517.2R-7 Effect of Variations in the Curing Cycle on Compressive Strength and Other Properties



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DETAIL A  
SCALE 1 : 20

# OSHA REDEFINES RULES

## Update on reporting severe injuries.

By Evan Gurley

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### HOW TO REPORT INCIDENTS

OSHA's website lists three different methods that can be used to report an incident:

**1**

Call 1-800-321-OSHA (6742)

**2**

Locate your nearest OSHA area office:  
[www.osha.gov/html/RAmap.html](http://www.osha.gov/html/RAmap.html)

**3**

Submit an electronic form:  
[www.osha.gov/report\\_online](http://www.osha.gov/report_online)

For guidance completing the forms, visit: [www.osha.gov/recordkeeping](http://www.osha.gov/recordkeeping)

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Safety and injuries are never fun topics to talk about, but they're important to discuss, especially when procedural changes are made. The Occupational Safety and Health Administration revised two key elements in its recordkeeping rule that went into effect Jan. 1, 2015. The two revisions will affect how precasters record and report injuries.

The rule updates the list of industries that are exempt from the requirement to routinely keep OSHA injury and illness records due to relatively low occupational injury and illness rates. The previous list was based on the old Standards Industrial

Classification system and outdated injury and illness data from the Bureau of Labor Statistics. The new list is based on the North American Industry Classification System and injury and illness data from the Bureau of Labor Statistics from 2007, 2008 and 2009. The new rule retains the exemption for any employer with 10 or fewer employees, regardless of industry classification.

The rule also expands the list of severe, work-related injuries that all employers must report to OSHA. The revised rule still requires employers to report all work-related fatalities within eight hours and

*Employers are required to prepare and maintain records of serious injuries and illnesses using OSHA 300 logs.*



adds that the loss of an eye, work-related inpatient hospitalizations and amputations must be reported within 24 hours. Inpatient hospitalizations are only reportable if they occur within 24 hours of the work-related incident. The hospital or clinic determines whether the worker was formally admitted as an inpatient.

Establishments located in states under federal OSHA jurisdiction must now comply with the new requirements. Establishments located in states that operate non-federal safety and health programs should check with their state plan for the implementation date of the new requirements.

The final rule allows OSHA to focus its efforts more effectively to prevent fatalities and serious work-related injuries and illnesses. It also allows more access to information about workplace safety for employers, employees, researchers, and the public, which increases their ability to identify and abate serious hazards.

According to Dr. David Michaels, assistant secretary of labor for OSHA, "OSHA will now receive crucial reports of fatalities and severe work-related injuries and illness that will significantly enhance the agency's ability to target our resources to save lives and prevent further injury and illness. This new data will enable

## OSHA FAQs

### What if the fatality, inpatient hospitalization, amputation or loss of an eye does not occur during or right after the work-related event?

If the fatality occurs more than 30 days after the work-related incident or if the inpatient hospitalization, amputation or loss of an eye occurs after more than 24 hours after the work-related incident, you do not have to report the event to OSHA. However, if you are required to keep OSHA injury and illness records, you must record the event.

### I don't have to keep OSHA records because my company has fewer than 10 employees. Do I still have to report these events?

Yes, all employers under OSHA jurisdiction must report fatalities, inpatient hospitalizations, amputations and losses of an eye to OSHA, even if they are exempt from routinely keeping OSHA records.

### What information do I have to give to OSHA when I report the fatality, inpatient hospitalization, amputation or loss of an eye?

- The establishment name
- The location of the work-related incident
- The time of the work-related incident
- The type of reportable event
- The number of employees who suffered a fatality, inpatient hospitalization, amputation or loss of an eye
- The names of the employees who suffered a fatality, inpatient hospitalization, amputation or loss of an eye
- Your contact person and his or her phone number
- A brief description of the work-related incident

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The advertisement features a dark blue background with white and yellow text. At the top, the words 'CURING' and 'PRECAST' are written in large, white, sans-serif font. Below this, there are images of yellow Besser machinery, including a large curing chamber and a precast concrete form. A yellow starburst graphic contains the text 'Call us for a quote on your next form.' In the middle section, the text 'COMPLETE SYSTEMS, PARTS AND SERVICE for Producing High Quality Concrete Products' is displayed in white. Below this is the Besser logo, which consists of the word 'BESSER' in a bold, blue, sans-serif font with a globe icon to the left, and the tagline 'Trusted Since 1904' in a smaller font below it. The website 'besser.com' is written in white. At the bottom, the word 'PIPE' is written in large, white, sans-serif font, and the contact information '+1.989.354.1000 or 800.530.9991 • sales@besser.com' is provided in white.

“OSHA will now receive crucial reports of **fatalities** and **severe work-related injuries** and illness that will **significantly enhance** the agency’s ability to target our resources to **save lives** and prevent further injury and illness.”

– Dr. David Michaels, *assistant secretary of labor for OSHA*

the agency to identify the workplaces where workers are at the greatest risk and target our compliance assistance and enforcement resources accordingly.”

#### THOUGHTS ON THE RULE CHANGE

Speaking on the new OSHA rule change, Don Graham, director of safety for Jensen Precast, said, “For us it meant a lot more communication, especially for our plants in California. California already has the same reporting requirements as OSHA, so when I communicated these proposed changes to our other locations I had to leave out the California plants. This would have confused our California locations.”

When addressing challenges of the OSHA rule change, Graham said it’s hard to determine when to contact OSHA. For example, if there’s an injury and the employee is taken to the hospital, information on the condition of the employee is restricted due to Health Insurance Portability

and Accountability Act laws. However, if OSHA is contacted after determining the employee’s condition, 72 hours or more may go by and it could result in receiving a fine of up to \$5,000.


Since Graham has been dealing with these regulations in California for some time now, his advice is to call OSHA and let them know you have had an injury that may lead to hospitalization. Inform them that you will call back with more information. You have now reported within the timeframe OSHA states and will not suffer any penalties. He said an employer should still be prepared to receive a visit from OSHA even after the call is made. **PI**

*Evan Gurley is a technical services engineer with NPCA.*


#### REFERENCES:

[www.osha.gov](http://www.osha.gov)

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# HIRING Your First CFO

By Bridget McCrea

Important tips and strategies to use when hiring your precast manufacturing firm's first chief financial officer.



**T**here comes a time for every precast manufacturing firm when leaders sit down and ask if they need a chief financial officer.

Until that day, company finances are typically managed internally by one or more owners or managers and then handed off to an outside accountant at tax time. Whatever previous financial management approach was used, it's now time to hire a full-blown CFO to take over the duties.

This is a big decision for any small-to-midsize organization. And if the firm's upper management and ownership ranks were intentionally kept thin, the move to hire a CFO could inflict a mix of cultural and organizational challenges.

"All manufacturing firms have a lifecycle that starts off with just the owner and his or her family members, progresses to a small pool of trusted employees, and then expands from there as the company grows," said Jean Cook, a business coach with the Corporate Performance Group in Tulsa, Okla. In the early stages, founders are typically involved in all aspects of the business and know every financial detail related to that entity. When that responsibility becomes overwhelming, when the numbers grow to unmanageable levels or when things start to slip through the cracks, it's time to consider hiring a CFO.

Another good indication is when just knowing the numbers isn't good enough to propel the company to the next level. Remember that good financial management goes beyond just examining profit and loss statements, Cook cautions. In today's data-rich business world, being able to interpret those numbers and use them to make actionable, forward-looking decisions is a vital skill.

"When you get to the point where your company can no longer effectively recognize and capitalize on opportunities, it's time to go beyond the outsourced accountant and bring in someone who can bridge that gap," Cook said.

## WHAT'S A CFO?

Titles can sometimes cause confusion as to who's doing what within a firm. According to the website Investopedia, a CFO typically handles a few core duties, including:

- **CONTROLLERSHIP DUTIES:**

These responsibilities make up the backward-looking part of a CFO's job. Controllership duties hold the CFO responsible for presenting and reporting the accurate and timely historical financial information of the company he or she works for. Every stakeholder in the company – including shareholders, analysts, creditors, employees and other members of management – relies on the accuracy and timeliness of this information. It is imperative that the information reported by the CFO is accurate because many decisions are based on it.

- **TREASURY DUTIES:** The CFO must also decide how to invest the company's money, taking into consideration risk and liquidity. In addition, the CFO oversees the capital structure of the company, determining the best mix of debt, equity and internal financing. Addressing the issues surrounding capital structure is one of the most important duties of a CFO.

- **ECONOMIC STRATEGY AND FORECASTING:**

A CFO must be able to identify and report what areas of a company are most efficient and how the organization can capitalize on this information. For example, the CFO of an auto manufacturer must be able to pinpoint which models are making the most money and how this information can best be used to improve the company. This aspect of a CFO's duties also includes economic forecasting and modeling – or, in other words, trying to predict the best way to ensure the company's success in the future.

of his time at work managing the budget. Once a precaster hits a certain threshold in sales, he said the related tax obligations really should be addressed and managed by someone other than the company's owner(s).

"This isn't something you can manage as a hobby," he said. "You really have to be on it on a full-time basis."

In addition to taxes, Feuerstein is also charged with making sure all of the firm's accounts receivable are up to date. This is a particularly important task in today's business world where, "if you don't collect your money in a timely manner, then you can't pay your bills in a timely manner," Feuerstein said.

"These and other money-related responsibilities fall under the auspices of a CFO, and will come to his or her table when there's a problem."

A good CFO will also help a precast company better manage its own savings and resources – a particularly important point for a growing enterprise. The company that has managed to accumulate \$1 million in financial assets, for example, should be maintaining multiple bank accounts, namely because the Federal Deposit Insurance Corp. only insures accounts up to \$250,000. These and other financial considerations can easily slip through the cracks when CFOs wear many different hats and juggle various responsibilities outside of just finance.

Specific to precast manufacturing, a good CFO can provide valuable, money-saving guidance on how to invest in assets like equipment, vehicles, land and even people. The precaster operating a 20-year-old batch plant that has to be shut down four times a year for sizable repairs should consider a new batch plant in order to

**"When you get to the point where your company can no longer effectively recognize and capitalize on opportunities, it's time to go beyond the outsourced accountant and bring in someone who can bridge that gap."**

– Jean Cook, *Corporate Performance Group*

At Western Precast Concrete Inc. in El Paso, Texas, Leo Feuerstein handles the duties outlined above and more. As operations manager and secretary-treasurer, Feuerstein spends about 90%

gain efficiencies, improve productivity and take advantage of the IRS's accelerated depreciation allowance. This allows companies to write off up to 50% of their total investment during the equipment's

# 5 QUALIFICATIONS to Look for in Your New CFO

Inc.com's "How to Hire a Chief Financial Officer," highlights the qualifications that companies should be seeking in a CFO. They are:

- 1. LEADERSHIP SKILLS.** At the CFO level, these skills are paramount.
- 2. EXPERIENCE IN A SPECIFIC INDUSTRY.** You may want to broaden these criteria to include hiring someone in a similar industry.
- 3. ACCOUNTING SKILLS.** More and more CFOs are certified public accountants. One reason this qualification may be helpful to your business is due to the changing regulatory environment, both in the U.S. and globally.
- 4. COMMUNICATION AND PRESENTATION SKILLS.** A CFO must have the skills to deal with a board of directors or outside investors to present complex information in a way that can be understood.
- 5. INVOLVEMENT IN INDUSTRY ORGANIZATIONS.** This is an important way for a CFO to benchmark your business against best practices in the industry.

first year in operation.

"This is just one example of how a CFO can provide value beyond just controlling your payables/receivables and P&L statement," Feuerstein said. "It's definitely something for growing precasters to consider."

## FINDING THE BEST CANDIDATES FOR THE JOB

To find a good CFO, Cook suggests networking with other companies, participating in local chamber of commerce meetings and events or hiring a recruiter to sift through potential CFOs. Online social networking sites like LinkedIn, which is geared to professionals, is another potential source of candidates.

David Lewis, president and CEO of OperationsInc, an HR outsourcing and consulting firm in Norwalk, Conn., said precasters would do well finding a CFO who is already familiar with their industry.

"One of the biggest learning curves that companies complain about is the fact that they hired plain-vanilla finance experts who don't actually understand their businesses," Lewis said.

In some cases, the person who already understands your company and its customers may be easier to train than the one who has only financial knowledge.

Lewis also cautions precasters against hiring "yes men"

who don't argue with upper-level directives or suggestions.

"That defeats the purpose of having someone in the CFO position who has your back and is there to take objective looks at your business from time to time," Lewis said. "Sometimes, the CFO has to deliver news that ownership doesn't want to hear. Hire someone who just sits there and nods his or her head and takes direction and the objectivity will be lost."

## ROUNDING OUT YOUR TEAM

In finding a good CFO for your company, the best approach is to look for someone who is more than just an accountant.

"In a CFO, this means that the individual must be an all-around businessperson," Cook said. "He or she must understand what the company does and be able to equate those activities into the financial analysis and decision-making support that the executive team needs to run the company."

How do you find out if a person has these abilities? Cook said precasters should start by asking good questions during the recruiting and interviewing process. For example, ask about key business decisions that the person was involved with in the past. You can also give an example of a business issue or opportunity relating to your company and get their take on it. Then ask human resources, information technology, operations and sales questions to learn about their cross-functional expertise.

It's also important that the new CFO fits well with the rest of the executive team. To get the best fit possible, Cook said precasters should include other executive team members in the interview process. But remember, Cook said, that you're not looking for cookie cutter team members.

"The executive ranks of your company should comprise individuals who have different views and opinions, yet who can work collaboratively in the company's best interest," she said.

Finally, be sure to share information about your company's culture and have numerous in-depth discussions with the candidates.

"Seek out the candidate's thoughts on your company's values and how these values do or don't fit him or her," Cook said. "This applies to recruiting for all positions at your company. If a candidate doesn't fit the company values, they are simply not a fit, no matter how good their other credentials are."

**"The trick is being able to clearly identify what you need and the individual who will best meet those requirements."**

– Jo Clarkson, *The Alternative Board*

## IT'S NOT A ONE-SIZE-FITS-ALL EXERCISE

Jo Clarkson, U.K. operations director for business and coaching advisory firm The Alternative Board, said it's important to remember that taking a one-size-fits-all mindset to the task will probably not yield satisfactory results.

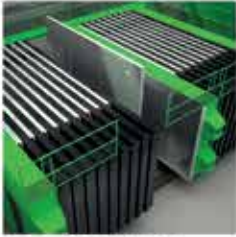
"CFOs come in all different shapes and sizes, and the trick is being able to clearly identify what you need and the individual who will best meet those requirements," Clarkson said. "By developing a clear picture of this person before you start searching, your chances of finding the right candidate will be much better."

Finally, Clarkson said precasters should also consider the cost involved. A better compensation package will generally yield a better candidate. **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.*



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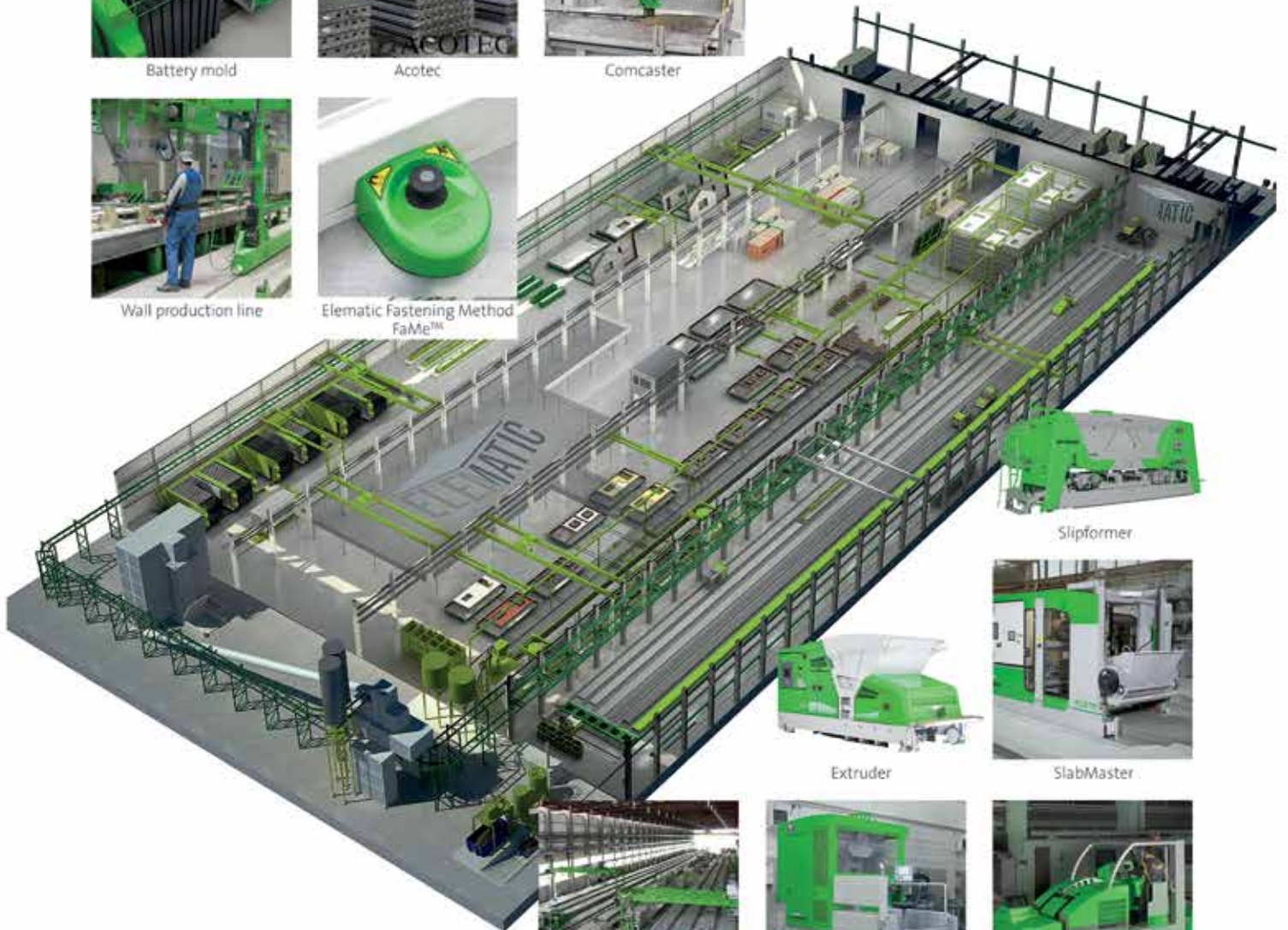
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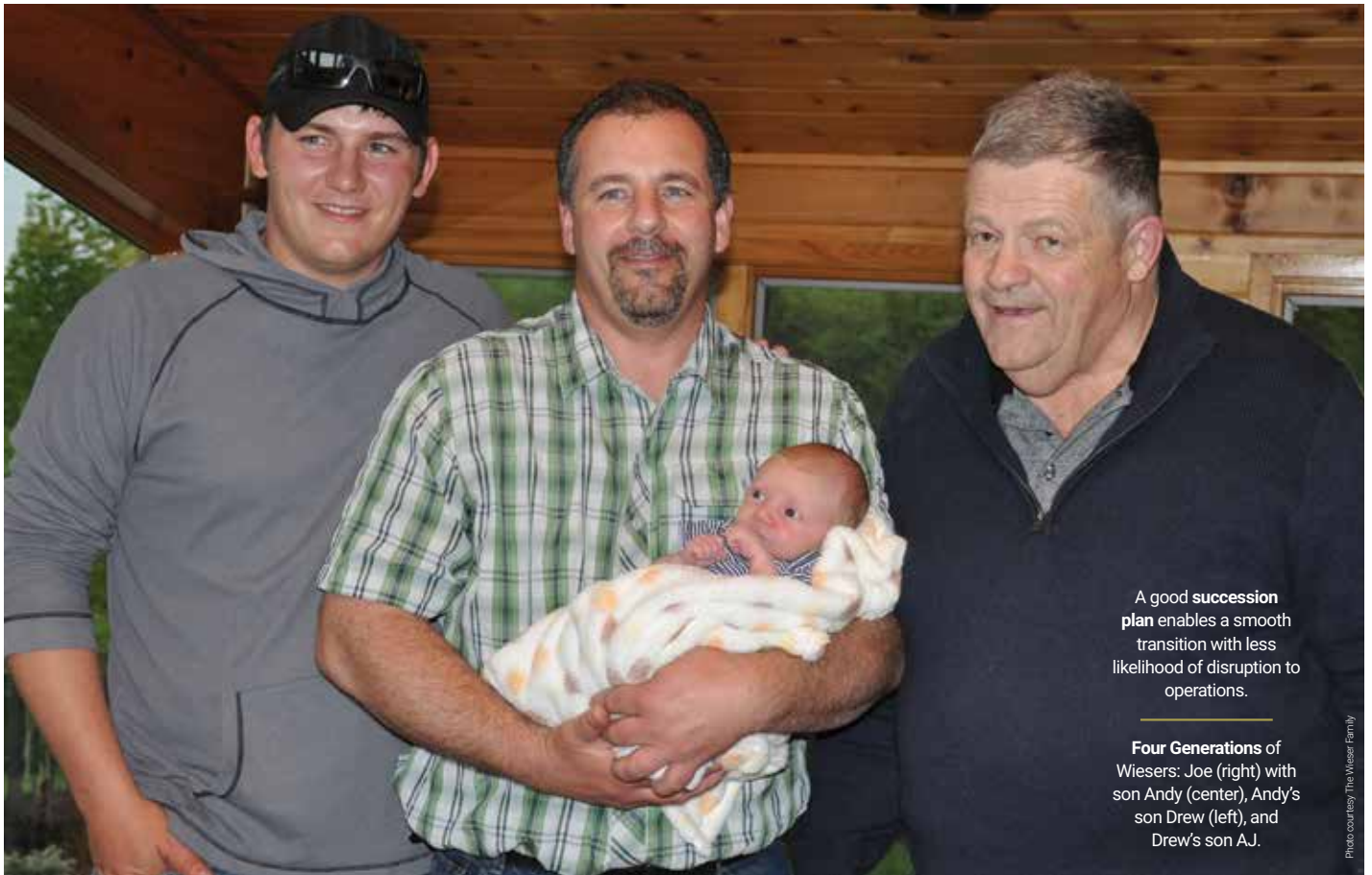
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A good **succession plan** enables a smooth transition with less likelihood of disruption to operations.

**Four Generations of Wiesers:** Joe (right) with son Andy (center), Andy's son Drew (left), and Drew's son AJ.

Photo courtesy The Wieser Family

# SUCCESSION PLANNING

## Easy to Avoid, Essential for Success

By Mark Crawford

Coming out of a recession, precasters are working harder than ever – and often still doing more with less – in an increasingly competitive environment. Many business owners don't feel they have time for things like succession planning. Yet the recession is a powerful reminder that proper leadership and planning is critical for surviving tough economic times.

Even so, succession planning is easy to put off. It takes you away from your

business, it's expensive, it involves legal counsel and it can stir up emotional family issues. However, when done correctly, succession planning creates a stronger company by identifying leadership that can reach and exceed its future goals as well as assure stability and success for the next generation.

### GO FOR IT

Howard Wingert, president of Concrete Sealants in Tipp City, Ohio, and his wife, are second-generation owners. Their son,

Jesse, has worked with Concrete Sealants since 2010 and is the next generation of ownership. In 2014, Wingert launched a 10-year plan for transitioning to third-generation ownership. One of the first steps was establishing a timeline, which gives everyone a reasonable expectation for when the transition will occur.

Choosing a reasonable timeline is important since there should be enough time to communicate key details, but not so much time that stakeholders lose interest and older leadership hangs on.



Wingert picked a 10-year plan for several reasons.

“Being 58 years old, it seemed like a good plan to be ‘out of the way’ when I reach 68,” he said. “We also have several projects for growing the business which should reach maturity over the next 10 years. That gives me time to be a mentor to Jesse so that he continues to learn the details of running the business. It also establishes a level of certainty for all employees to feel comfortable as to where the company is headed.”

Mark Wieser, vice president of Wieser Concrete Products in Portage, Wis., has also been on both sides of the succession planning spectrum. His father founded the company in 1965 and started transitioning ownership in 1996. That process was finalized in 2008. In 2013, Wieser initiated the second round of succession planning, which is still in development.

**“Don’t delay the conversation. Life can be short. If something happens and you are not prepared, the future of the company – and everything you have worked for – could be at risk.”**

– Aaron J. Ausen, *Dalmaray Concrete Products*

“We teamed with our accountant and a very good trust lawyer who helped a lot with the process,” Wieser said. “For example, I learned there are tax implications if succession planning is not done properly and at the right time. We decided to transfer some of the ownership to an irrevocable trust.

“One of the issues small business owners face is paying capital gains taxes on the increased value of a company. Our approach is an example of how proper planning can alleviate some of those taxes.”

### DEALING WITH FAMILY

Managing taxes and accounting issues can seem easy compared with discussing the future of the company with family members. Depending on family dynamics, it can be an emotional roller coaster. Considerable time is often required to work through existing personal and family concerns to arrive at a consensus regarding the future of the company.

“It isn’t a straightforward procedure,” said Aaron Ausen, vice president of Dalmaray Concrete Products in Janesville,

Wis. “If there was a dummy’s guide to it, trust me, I’d buy it.”

Ausen is about halfway through developing a succession plan for three generations – his 90-year-old grandfather who still comes to work every day, his father, and Ausen and his two brothers.

“Human emotions are at play,” he said. “For example, how do you develop a safe exit strategy for your elders without making them feel like you are pushing them out the door? Negotiations are needed to determine when they will retire and how they will be taken care of without hurting the company.

“This can be tough. You are talking to the owners of the company, who are also your parents and grandparents, but you really must make your opinions heard to stay in control of your future.”

Wingert agrees. He said reading books, talking with experts and attending

seminars is not the same as going through the process in person. Succession planning is a personal task. Knowing when your successor is ready to take on additional responsibilities is sometimes difficult to realize and even more difficult to acknowledge.

“I sometimes need to be prodded by other employees and my wife to turn over some of my responsibilities to Jesse,” Wingert admitted. “Listening to and following up on comments such as, ‘He already knows how to do it’ or ‘How do you expect him to learn it if you don’t let him do it?’ is important. Letting go of control is not easy.”

### MOVING FORWARD

Succession planning can be complicated and expensive. If the succession plan involves selling the business to the next generation, fair value of the company and terms of purchase must be determined.

“My experience purchasing Concrete Sealants taught me that calling upon the advice of people who are familiar with the business is better than hiring outside

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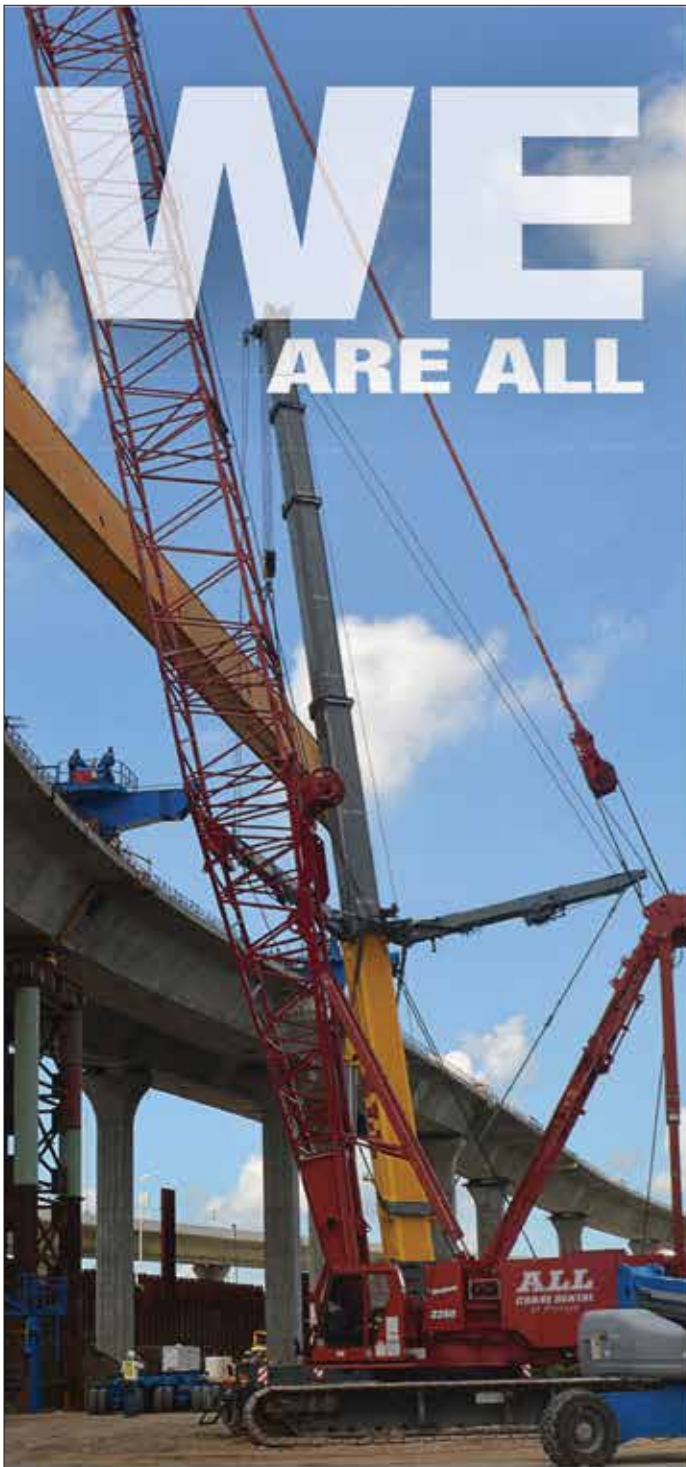
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**Father and sons:** (from left) Andy, Joe, Dan and Mark Wieser.

consultants,” Wingert said. “Seek the advice of people who know you and know your business, such as your banker, an outside certified public accountant or your attorney, who can help establish a fair value for your business.”

There is no one-size-fits-all solution for strategic planning. Wieser recommends conducting in-depth research on succession planning strategies before getting started. Talk with different people – lawyers, accountants and peers – to see what advice they might have.

“Don’t make commitments to people before you know who is capable, willing, and deserving of running your company,” Wieser cautions. “Maintain that flexibility until you are sure. You need to be fair to family members, but fair doesn’t necessarily mean equal in all aspects.”

**“This is an exceptionally difficult decision when the succession plan involves a family-owned business.”**

– Howard Wingert, *Concrete Sealants*

One of the most difficult aspects of the process is making an honest, unbiased appraisal of the talents of the next generation. Are there one or multiple potential successors?

“This is an exceptionally difficult decision when the succession plan involves a family-owned business,” adds Wingert. “Honestly, evaluating the skills of children can be a challenging process. Seek the advice of knowledgeable people who can assist in making objective evaluations of talent.”

Perhaps one of the greatest benefits of succession planning is the peace of mind felt once finished. Dalmaray Concrete Products is about halfway through its succession planning process. “It is gratifying that we are retaining our family ownership and staying true to our roots,” Ausen said.

Wieser agrees. Although Wieser Concrete’s planning process is in its early stages, Wieser said it is good now that they have started the steps to keep the company moving forward.

Finally, it is never too early to discuss succession planning and possible directions for the future.

“Don’t delay the conversation,” Ausen urged. “Life can be short. If something happens and you are not prepared, the future of the company, and everything you have worked for, could be at risk.” **PI**

*Mark Crawford is a Madison, Wis., based freelance writer who specializes in science, technology and manufacturing.*



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# Fine-Tuning

## CONCRETE'S VOLUME

Understanding some of the most **common** concrete **volume changes**.

By Kayla Hanson



Precast concrete volume changes can occur at various stages of production and must be considered prior to batching.

Since concrete is typically restrained by foundations, reinforcement or connecting elements, volume changes can cause significant stresses. Concrete volume changes begin immediately as cement hydrates and continues throughout the life of the product. Understanding the nature of these changes and the effects of curing, temperature changes, applied loads, and organic and chemical factors helps eliminate detrimental or irreversible volume changes.

### VOLUME REDUCTION

#### Chemical Shrinkage

Chemical shrinkage, a result of cement hydration, is the reduction in absolute volume of cement paste. The total volume of constituent paste materials before mixing and hydration is greater than the volume after hydration. The process begins when cement grains come in contact with water and continues at a decreasing rate beyond initial set. Some forms of shrinkage are evidenced by subsidence and autogenous shrinkage prior to initial set.

The settlement of solids relative to liquids, air voids or water rising to the surface as aggregates settles causes subsidence, or settlement shrinkage. Subsidence is considered minor when concrete is appropriately consolidated and bleeding is kept to a minimum. The use of air





entrainment and appropriate quantities of fine materials, in addition to a low water-cementitious material ratio, can reduce subsidence and resultant cracking.

The severity of autogenous, or internal, shrinkage is related to the presence of external curing water. The additional moisture applied through moist curing methods helps replenish the liquid lost to evaporation and during hydration. When moist curing methods aren't used, hydration reactions are only able to consume pore water. This dehydrates the cement paste and intensifies the severity of volume loss and the extent of autogenous shrinkage.

Air voids are also a result from cement hydration. Voids begin accumulating at the beginning of hydration, progress through initial set and continue beyond final set. The reduction in relative volume, combined with the development of void space, makes up the total change in the concrete's absolute volume caused by chemical shrinkage.

### Plastic Shrinkage

Another form of volume reduction in fresh concrete is plastic shrinkage. This is typically evidenced by rough-edged tears or cracks in the surface of concrete. Plastic shrinkage is caused when surface water evaporates faster than bleed water can travel to exposed surfaces. Like autogenous shrinkage moist curing methods reduce plastic shrinkage.

### Drying Shrinkage

Drying shrinkage, another common cause of concrete cracking, can cause a significant amount of stress within concrete. The stress intensifies as the level of restraint increases. As it cures and loses moisture to hydration and evaporation, concrete transfers stress to reinforcement and embedded objects. Unless special curing procedures are applied, the innermost portion of concrete retains unreacted mix water longer than the surrounding concrete. Interior concrete applies additional stress to the setting, drying concrete, which can result in cracks as it reduces in volume. Monitoring and adjusting curing procedures and moisture levels as needed can help control concrete volume reduction caused by drying. The most significant factor is the amount of water used per unit volume of fresh concrete.

The main cause of concrete surface cracking is plastic shrinkage due to bleed water evaporation.

### VOLUME INCREASE

#### Swelling

Moisture lost through chemical shrinkage can be replenished by external water sources, referred to as swelling. Cement paste and concrete are able to absorb external water in an attempt to equalize concentrations on either side of the concrete surface. In this process, some of the absorbed water is held in capillaries and pores while another portion is consumed through hydration, which

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results in additional crystal growth. Removal of the external water source enables autogenous and drying shrinkage, which reverses swelling and the temporary increase in absolute volume caused by water absorption.

### Creep

Applied loads can also cause an increase in the relative volume of concrete. Although there is an initial, immediate deformation when the load is applied, concrete continues to deform at a decreasing rate for the duration of the loading. This deformation is called creep. The curing method used before application of the load can affect the magnitude of creep. Although steam curing has been shown to reduce concrete creep, this method has a smaller impact on reducing drying shrinkage.

### THERMAL EXPANSION AND CONTRACTION

Some of the most influential factors in thermal expansion and contraction of concrete are aggregate characteristics and gradation, water-cementitious material ratio, relative humidity and fluctuations in temperature.

Cement hydration produces a significant amount of heat, which dissipates throughout thin concrete sections but is retained in larger elements. The increase in internal temperature causes minor, temporary expansion that counteracts chemical shrinkage. Additionally, the ambient temperatures concrete is exposed to play a role in its volume fluctuations.

As temperatures decrease, particularly below freezing, concrete contracts. Low temperatures have less of an impact on dry concrete than moist or wet concrete. The types of aggregate present and the concrete's water-cementitious material ratio has a significant impact on the volume change that occurs at sub-freezing temperatures. Cracking at low temperatures is more likely when high levels of restraint such

as rigid reinforcement, embedded objects and secondary pours exist, or when freezing water expands.

After reaching final set, high temperatures are generally less of a concern than low temperatures. Ambient temperatures exceeding 200 F that last for at least a few hours can cause irreversible damage to the concrete and its constituent materials. High temperatures cause the cement paste to dehydrate and shrink and the aggregate to expand. Due to varying coefficients of thermal expansion, aggregate volume increases tend to exceed the magnitude of paste shrinkage, resulting in an overall expansion.

Concrete is designed with the expectation that it will expand and contract in service due to ambient temperatures. Implementing a low water-cementitious material ratio; use of appropriate placement, consolidation, finishing and curing techniques; and use of aggregates ideal for certain environments can help mitigate the effects of temperature fluctuations.

### CONTROLLING VOLUME CHANGES

Concrete volume changes are inevitable and result from a wide range of factors. Understanding how and why concrete volume changes occur is the first step to ensuring that concrete products do not suffer any detrimental effects. Using this understanding, the next step is to implement proper design, manufacturing and curing techniques to control the level of volume change that occurs. If you have further questions about volume changes, the National Precast Concrete Association technical department can help. Visit [precast.org](http://precast.org) to learn more or to contact NPCA staff. ■

*Kayla Hanson is a technical services engineer with NPCA.*

### RESOURCES:

[Portland Cement Association, Design and Control of Concrete Mixes, 15th Edition](#)

Concrete expands slightly as temperature rises and contracts as temperature falls. Temperature changes may be caused by environmental conditions or by cement hydration.







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# CONCRETE AND RUBBER:

## Distant Cousins with Much in Common

By Mike Miller

**M**ost everyone in the precast concrete industry knows concrete and rubber share a complementary relationship. In very simple terms, concrete structures form our stormwater, wastewater and traffic systems, while rubber products provide the sealing elements between these structures. Concrete brings strength, rigidity and permanence to the equation. Rubber provides the flexibility needed for rigid elements to be sealed at their junctions. Beyond these functional differences, the two materials share far more similarities than are immediately apparent.

MATERIALS	CONCRETE	RUBBER
Basis Materials	Aggregate, Sand (80%)	Polymer, Fillers (70%)
Processing Fluid	Water (5%)	Oils (20%)
Binders	Cementitious Materials (10%)	Cure Agents (5%)
Property/ Processing	Admixtures, etc. (<5%)	Accelerators, Antiozonants (<5%)

Table 1

### A CLOSER LOOK INSIDE

Concrete and rubber are both complex mixtures of a variety of different materials, many of which serve similar structural purposes and are used in somewhat similar ratios. If we compare these, they look something like this (see table 1).

In both, some ingredients serve more than one function. For concrete, water is both a processing fluid and the primary curing additive. For rubber, oils aid processing and also moderate physical properties of the finished product.

### PERMANENCE

Both concrete and rubber are thermoset materials. This means heat is required for them to achieve their final state, which is permanently fixed on a molecular level. Concrete develops its own heat through hydration while rubber must have heat provided. Both materials use a small quantity of binders, distributed completely throughout the mixture, that react to heat and form permanent bonds.

In concrete, the bonds and the final material are rigid. The cementitious material surrounds all elements in the mix, allowing the mixture to become one unit. In rubber, bonds are created only between nodes in the polymer molecules. This permits temporary displacement of these molecules while retaining the connections among them. This difference is what gives concrete and rubber unique and very different characteristics in their final states.



## PROCESSING SIMILARITIES

The similarities between the materials continue with processing. Concrete and rubber require the constituent materials be mixed in a similar manner. Both materials are precisely batched to ensure the required ingredients are incorporated together consistently and at the proper time. There are practical and technical limits to this process in both instances. Concrete mix times are limited to prevent over-mixing, while rubber mixing times are limited to prevent over-heating.

For both materials, mixing equipment, mix designs and production processes vary but continue to share many similarities. Rubber and concrete are typically processed in forming equipment, prior to the introduction of heat. Concrete is typically placed in molds before heat, through hydration, occurs. Once this begins, the material hardens to its final state over time. Rubber processing usually starts at room temperature and processing equipment warms it so it's easier to form. Then it is placed into a mold and additional external heat is applied. After a sufficient application of heat, the material, even immediately after being removed from the mold, displays its final characteristics and cannot be changed.

## MATERIAL TESTING

Material properties of both rubber and concrete are interpreted from pre-process testing and confirmed with destructive testing of samples. Since the properties of both materials change during processing, the properties determined from lab tests correlate with

actual outcome. For example, concrete mix design may be tested by slump or spread. Rubber may be tested by measuring its cure on a device that shows the expected cure curve. Both tests imply the suitability of materials and may also provide guidance for processing.

The results of destructive testing are then used to demonstrate the outcome of the materials and processes. Both rubber and concrete are commonly produced to exceed minimum requirements to protect against unexpected variables and provide consistent performance.

## ADVANCEMENTS

Both rubber and concrete have been commonly used materials for many decades, and both have undergone dramatic changes and improvements in that time. It's not always easy to see these improvements on the exterior, but performance is greatly impacted. The age and experience of both industries is an asset. Concrete and rubber have been tested extensively and proven to be trusted materials through decades of performance. Both the precast and rubber industries have bright futures ahead as they continue to advance and work together to create infrastructure we all depend upon. **PI**

*Mike Miller is owner of Large Caliber Design, LLC, and remains active in sealing product design and development, as well as standards work with ASTM. He may be reached at [largecaliberdesign@gmail.com](mailto:largecaliberdesign@gmail.com).*



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Story and photos by  
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**ALL IN**





N

PCA members have all kinds of interesting stories to share about how their businesses started, but Cape Fear Precast in Jacksonville, N.C., is probably the only company

that can trace a part of its history to a poker game.

Jerome Coker and Tom Krakauskas, owners of Cape Fear Precast, worked together previously at a precast plant for many years – Coker in engineering and Krakauskas in sales. During that time, they saw there were only a small number of precast manufacturers on the eastern coast of North Carolina and talked about establishing their own company in that underserved area with a focus on efficiency, quality and customer service. While playing poker one night, a few contractors encouraged them to take the idea seriously. So the two began to plan in earnest. In less than two years, they secured financing, a building and some used equipment and started production in Southport, N.C.

#### **INTO THE DEEP END**

A little good fortune led Coker and Krakauskas to an empty, 20,000-square-foot building with overhead cranes that became Cape Fear Precast's first home. Soon after, they hired their first two employees and were pouring with concrete from ready-mix trucks. The goal was to be a comprehensive underground utility structure provider right out of the gate.

"We knew that if we were going to have presence in the market we needed to be able to produce a complete product line," Coker said. "That was our biggest challenge right off the bat."

"You have to compete," Krakauskas added. "People weren't going to buy a manhole from us and a storm drain from the other guy. We were really hungry getting started – it was either sink or swim."

Coker said competitive pressure pushed them not only into developing a diverse line of products but also into manufacturing large and complex projects early on. In the first year of production, Cape Fear Precast manufactured a 70,000-pound oil-water separator and major structures for Raleigh-Durham International Airport. The work included several storm structures set over 84-inch diameter pipe that was buried 40 feet under a runway extension.

"The contractor still contacts us because we did such a good job on that," Krakauskas said. "If they had realized how young we were [both laugh], I don't know if they would have given us the job but it was a groundbreaker for us."

Jerome Coker (right) owns Cape Fear Precast with Tom Krakauskas.



The Cape Fear Precast team



Employees are cross-trained on all jobs at the plant, including repairing equipment and trucks.

Both Coker and Krakauskas laugh now, but taking on jobs like those – and doing them well – set a very serious tone from the beginning for the company and its capabilities.

### OWNING THE PRODUCT

It doesn't take long to understand how much Coker and Krakauskas care about the business. The two don't just lead the company, they take ownership of every job and every product. Calls go to one of them unless both are already helping customers, in which case Jerome's wife Marie takes the call. "Hang on one second," was a common statement throughout the day as they stepped away to take calls from customers that sounded more like conversations with

old friends than business calls. Relationships with coworkers and customers is almost familial. And for Coker and Marie, as well as Krakauskas and his wife Betsy, it is. Betsy handles all accounting duties other than tax returns. Working with family works out perfectly for the company.

"Our business interests and goals are the same and we are able to share in both the challenges and rewards of running a business," Coker said.

"Family is important to us, and I think having our boys here some days, seeing mom and dad working together and how we interact away from home is an important life lesson," Marie added. "They better enjoy being young while they can because dad would have them pouring concrete today if they could."

Because they care so much, Coker and Krakauskas expect the same from their employees. Both have worked in the plant and Coker is currently plant manager since, as Krakauskas explains, nobody has "taken ownership of it yet."

"We've got great guys, we really do," Coker said. "It's always been important to me to tell them 'I did this before you did it and it means a lot to me to give you this job so I expect you to take care of it.' They know that we're serious about it and they know that we appreciate them.

"I think our commitment to quality shows our employees that we're driving to do things right, that we take it to heart, and when you show that they're going to mimic it."

Almost every employee is cross-trained and the owners look for people with a diverse range of skills. Above all, they look for employees who are trainable and willing to work hard and learn. Employees do everything from manufacturing custom forms and tooling to truck and equipment maintenance. For example, Coker and two employees quickly addressed a batch plant issue. "It was just build up on a sensor," Coker explained after climbing down from the batch plant. A dirty sensor had kept the computer from recognizing the door to the mixer was closed. It's just one example of how the company



“We’ve got great guys, we really do... they know that we appreciate them.”

– Jerome Coker, co-owner



Cape Fear Precast has numerous employees who have been with the company for many years, including Pablo Sanchez-Hermosillo.

Employees weld with multiple kinds of metal, such as this aluminum pond structure top.



handles unexpected problems efficiently. Later in the day, employees also repaired a split coolant hose on a delivery truck and put it back into service less than an hour later.

"You've got to be your own island," Coker said. "We realized early on that if we're going to do this, we're going to have to figure out ways to do everything ourselves."

#### **MAKING THE RIGHT MOVES**

As Cape Fear Precast grew, so did the economy, the housing industry and just about everything else ... until 2008. The ideal situation in Southport deteriorated quickly, but Coker and Krakauskas already anticipated a move. Today, the business is in Jacksonville, N.C., and sits in the middle of a hotbed of military bases with highway access to Virginia, South Carolina and the Raleigh-Durham area.

The company provides products to Fort Bragg, Camp Lejeune, New River Air Station, Marine Corps Air Station Cherry Point and Seymour-Johnson Air Force Base. These bases have been important, especially as they ramped up spending during the recession as other bases were consolidated to the area. Cape Fear Precast has provided everything from standard water and sewer products to custom products for firing ranges and grenade pits.

"It's been fun - we've done a lot of different structures and designs," Krakauskas said.

"It's not steady work, but when they build new ranges it's a large volume," Coker added. "They'll need hundreds of

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Cape Fear Precast manufactured an 84,000 pound junction box that required extensive planning for safety and quality purposes.

“I see our product up and down the roadway and that really makes a guy feel good.”

– Tom Krakauskas, co-owner

different items and they’ll need them all at one time.”

Among the biggest military contracts was a project for Camp Lejeune’s MV-22 Osprey. The job required, among other products, 1,000 linear feet of 8-foot-by-8-foot, aircraft-rated box culvert in 30 days. The company also worked on an MV-22 hangar project that included storm sewer and rainwater harvesting products, pump stations, oil-water separators and underground vaults to store firefighting foam.

One key to landing military projects, as well as other jobs that make up about 30% of all business, has been arrangements made with water supply distributors. Coker and Krakauskas found that general contractors from out of state were not familiar with Cape Fear Precast. By aligning with national water supply distributors, they have a foot in the door.

The physical move to Jacksonville was accompanied by building a new plant, which they describe as the most important business move to date. Although the old building had been a lucky find, it was not hard for them to leave the cramped four acres of land or the aging cranes. They designed the new plant to meet existing needs and accommodate future ones. Walls are moveable, cranes are expandable in three different directions and there’s a pit



Employees take care of all aspects of production, including bending and cutting rebar.

“...to have presence in the market we needed to be able to produce a complete product line.”

– Jerome Coker, co-owner



Above: A project for Camp Lejeune required 1,000 linear feet of aircraft-rated box culvert in 30 days.

Right: The implementation of a paperless QC program, including barcoding, has increased efficiency.



for dry-cast should the market arise. Coker and Krakauskas also purchased a batch plant from ERMC with central aggregate dispensing and two independent mixers.

“The batch plant stores a lot of data for us and helps us with our NPCA Certification,” Coker said. “We can also shut one mixer down and still run the plant or we’ll run both mixers simultaneously if we’ve got a big pour day.”

#### QUALITY BY ASSOCIATION

Manufacturing the highest quality products has always been a priority at Cape Fear Precast.

Over the years, advancements such as perfecting a self-consolidating concrete mix design and finding the right quality control manager have helped. NPCA Plant Certification was not a priority early on, but when the North Carolina Department of Transportation made it a requirement the company joined the association and got certified.

“We weren’t interested in joining the NPCA at all,” Krakauskas said. “In retrospect, we should have done it a long time before. It’s kind of like an OSHA inspection – you never want it to happen but when it does you finally say, ‘Well, you know what, we should have done that a long time ago.’”

In addition, the plant’s QC manager, Matt Hoyman, is taking courses in NPCA’s Precast University and working toward earning the Master Precaster designation.

“He’s taking every opportunity that NPCA provides him to continue his education and he applies that in the plant and does really well with it,” Coker said. “We talk a lot and after webinars he’ll have ideas that we’ll try. I’ve been surprised at the level of education NPCA offers.”

The company’s latest endeavor is a paperless QC system by International Coding Technologies that streamlines product tracking and eliminates paperwork. The company uses tablets and barcodes to track products from manufacturing to delivery. The next step is to tie each delivery to Google Earth and add photos of each stage of production.



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“Panel forms allow us to do so many different diverse products.”

– Jerome Coker, co-owner



QC Manager Matt Hoyman is working on earning his Master Precaster designation through NPCA.

### PRECAST ANYTHING

In recent years, the company has focused on increasing volume for its go-to products. Customized underground utility structures continue to make up the majority of the work.

“Panel forms allow us to do so many different diverse products,” Coker said. “Having this tooling, in conjunction with all of our other molds, allows us to form and build just about anything you can imagine.”

“I think that’s going to be key to our growth, doing more of what we’re good at and trying to capture more of the

market,” Krakauskas added. “I think we’re about halfway to where we need to be.”

The company also continues to push the envelope with large and complex products such as a zigzagging weir structure or a 40-foot-deep pump station next to a river. For the latter, each section weighed more than 40,000 pounds and required beams on the interior due to hydrostatic pressures. The final assembly weighed more than 400,000 pounds. The contractor asked for embedded pipe flanges to bolt the pipes to the structure due to the immense head pressure. The contractor sealed joints with a double-butyl sealant and a liberal application of an external butyl sealant wrap. On another project, an 84,000-pound junction box, the company’s challenges included keeping form panels from blowing out, wood from shifting, pouring 20 yards of concrete while avoiding cold joints and picking such a heavy product.

“We used an 8,000-psi mix design with 850 pounds of cementitious material per yard and a complement of specialized admixtures for that product,” Coker said. “There’s not much we’re scared to take on. We’ll precast just about anything.”

The use of panel forms allows the company to create custom structures for its customers.

### PRIDE OF OWNERSHIP

The business has been trying, challenging and “a lot of hard work” for Coker and Krakauskas, but what keeps it fun is seeing the growth and the opportunity to do new products and expand their market.

“I’ve really enjoyed this business and it’s something you can be proud of,” Krakauskas said. “I see our product up and down the roadway and that really makes a guy feel good. I got two phone calls one morning and both of them were just to say thank you – talk about making your heart swell.”

“We’ve really built personal relationships with all of our contractors,” Coker added.

Nearly 15 years into their business venture together, Coker and Krakauskas can reflect a little bit on the risks and rewards. They knew a good hand when they saw it and bet big but had to let the chips fall where they may. With hard work and dedication, they fell in the right direction. **PI**

*Kirk Stelsel is NPCA’s director of Communication and Marketing.*





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# Here Comes **THE SUN**

An update on Shea Concrete's solar energy decision.

By Claude Goguen, PE., LEED AP



Courtesy of Shea Concrete Products

**T**wo years ago, Shea Concrete Products decided to make a big investment. It wasn't to buy a new mixer or crane. It was to install more than 1,000 solar panels on the roof of its facility in Amesbury, Mass. In the summer of 2013, the system produced an estimated 421,000 kilowatt-hours per year. In California, Oldcastle's San Diego facility has 50,000

square feet of solar panels on its roof and the result has been exponential savings.

Data from the Solar Energy Industries Association, estimates that installations of photovoltaic systems in 2014 increased 36% over 2013. By fall 2014, a new solar project was installed every three minutes. Installations continue to increase while costs continue to decrease.

Shea Concrete chose solar panels manufactured by SunPower of Milpitas, Calif. The panels are American Recovery and Reinvestment Act compliant.





Solar panels were installed on Shea Concrete's Amesbury facility in 2013.

With changes such as adding solar panels, businesses can be good stewards of the environment by reducing use of fossil fuels while also saving money. In the first nine months after installation, the plant in San Diego saw a 53% decrease in its

electrical bill over the previous year. Shea Concrete's electrical bill for its Amesbury facility was around \$6,000 a month prior to installation. It has now dropped to less than \$500 a month, a nearly 92% decrease.

The initial costs of solar panels are offset by lower utility costs and also by potential incentives. Figure 1 shows states that offer incentives for solar energy projects. In Massachusetts, for example, the Department of Energy and Environmental Affairs has a program called Solar Renewable Energy Certifications. This particular incentive can offer more than 50 cents per kilowatt-hour which can add up quickly. Shea Concrete is estimating its initial \$1.4 million investment in solar energy will be paid off by 2020 through incentives and energy savings.

The amount of power produced by the panels at Shea Concrete's facility will make it a net-zero electrical energy consumer. In other words, the solar panel system will generate enough electricity to fully power the plant without requiring any additional sources of electricity. Greg Stratis, Shea Concrete's general manager, said the plant has been net-zero since April 2014. The extra energy gathered by the solar panels helps run the plant's electrical meter backward in order to make more power than needed. When a winter day comes and the panels cannot produce power, his hope is the reserved energy will get them through to spring.

"The objective for us, when the solar panels were designed, was to produce 5 to 10% more energy than we have in prior years," Stratis said. "I'm hoping now that we have had the panels up for about a year we won't need to purchase more energy during the winter."

The SunPower solar panels, installed by Beaumont Solar Company of New Bedford, Mass., are American Recovery and Reinvestment Act compliant. Stratis is very happy with the company's investment in solar energy. He said maintenance

**"I'm hoping now that we have had the panels up for about a year we won't need to purchase more energy during the winter."**

– Greg Stratis, Shea Concrete Products

has been worry-free since Beaumont periodically sends out technicians to maintain the solar panels.

"The Shea family did it primarily to help the environment," Stratis said. "We do other things like recycle our process water and we plan on adding a new office that will be LEED certified."

The benefits of using alternative forms of energy don't stop there. As developers continue to push for more sustainable construction, they are seeking suppliers that have the same mindset. A product that requires less fossil fuel to manufacture is important to a decision maker looking for a sustainable building material.

Precast plants all over North America are implementing creative and efficient ways to be more environmentally friendly and also save money. Harnessing power from the sun is certainly a good way to do that.

"If the small town electrical companies where my other three plants are located allowed us to store power on the grid like in Amesbury, I would definitely consider placing solar panels on all of them," Stratis said. "The whole project has been a huge success." **PI**

*Claude Goguen, P.E., LEED AP, is NPCA's director of Sustainability and Technical Education.*

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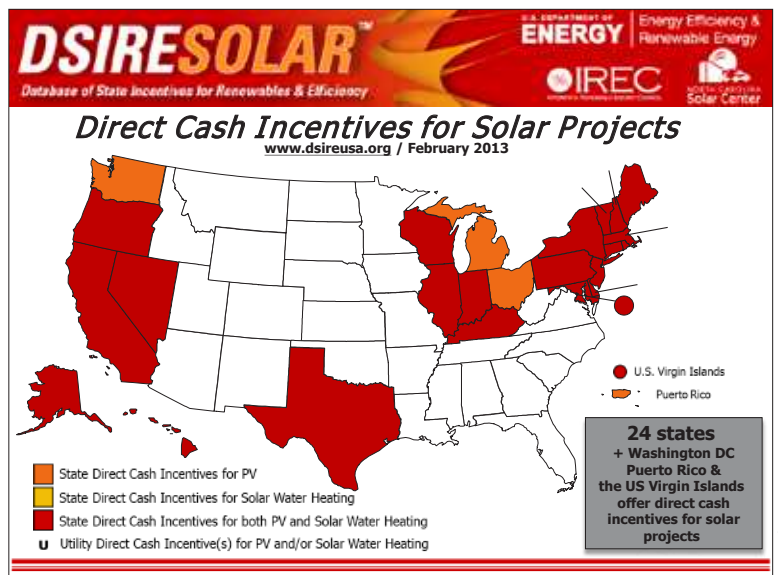


Figure 1

# Determination

## DAVID AMORIM

NPCAF scholarship recipient's **dedication** and **drive** play a significant role in the pursuit of a master's degree in **civil engineering**.

By Mason Nichols



Courtesy of David Amorim

**G**rowing up, NPCA Foundation scholarship recipient David Amorim spent plenty of time on construction sites. As the son of a general contractor, the gigantic machinery fascinated him. From excavators to cranes, Amorim was hooked, but his parents weren't so sure about their son's budding interest.

"My parents were always like, 'No, you have to do better. You can't become a construction worker,'" Amorim said.

What did Amorim do to allay his parents' fears? Naturally, he allowed his fascination to grow even stronger. When he was 10, Amorim enrolled in a program called Career Trek at his school. Over the course of roughly a year, participating students boarded a school bus each Saturday and visited a local university to learn about a wide variety of professions. One particular lesson on civil engineering stood out to him and planted the seed for what would ultimately grow into his career path.

Today, Amorim is a graduate student in civil engineering at the University of Manitoba where he is researching precast concrete bridge deck panels and ultra high performance concrete joints. Thanks to NPCAF support, he has been able to focus nearly all of his efforts on working in the lab.

"I haven't had to work part-time through the entirety of my master's program," Amorim said. "Every dollar I've been able to get from scholarships here and there has definitely helped allow me to stay focused on my schooling."

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NPCAF scholarship recipient David Amorim researches precast concrete bridge deck panels and ultra high performance concrete joints at the University of Manitoba.

This is important to Amorim. The large-scale, experimental nature of his research means plenty of time working in the lab, where he has already built two sizeable bridge decks. Despite sticking with a career in construction, he has followed one part of his parents' advice – consistently pushing to do better.

Amorim participated in the school's co-op program as an undergrad, allowing him to gain industry experience over the course of three summers. Working for Dillon Consulting in Winnipeg, Manitoba, Amorim contributed to



the expansion of a major floodway, the modification of a city tunnel and the design of several precast bridge structures throughout the province. He now works at the company part-time.

In the final year of his undergraduate studies, Amorim expanded his growing knowledge of precast further by participating in the Precast/Prestressed Concrete Institute's Big Beam Contest. Amorim and his team members partnered with Lafarge to fabricate an approximately 20-foot-long prestressed beam, which was tested for predictable structural behavior. Through the contest, Amorim met Lafarge's Ifan Lim, who would eventually become Amorim's sponsor for the NPCAF scholarship.

But obtaining industry experience and becoming more accustomed to working with precast concrete wasn't enough. After attending several local American Concrete Institute presentations, Amorim learned about the institute's graduate fellowship and decided to apply. He became a finalist and eventually flew to ACI's annual convention for an interview. In the end, he was not awarded the fellowship.

Seeking an opportunity to win the next year, Amorim did more digging and discovered other students had established local ACI chapters at their

schools. Amorim found the activities students participated in while joining university chapters to be intriguing, so he put in the work to establish one at his own school. Today, the University of Manitoba ACI chapter has more than 70 members.

"It's been pretty successful so far," Amorim said. "We have monthly dinner presentations on a variety of topics and last year we did a tour of a precasting plant. We've had a lot of support from the industry and were able to fundraise over \$10,000 to do all of these activities."

Even with all of the success he has experienced, Amorim continues looking ahead. After earning his master's, he hopes to spend some time working in the industry before potentially returning to school to pursue a Ph.D.

"I'm really interested in long-span, cable-type structures," Amorim said. "I'd like to be a design engineer on major, iconic bridge structures."

If doing better was the goal, Amorim has already proven he is more than capable of exceeding expectations. With the support of the



**"I'm really interested in long-span, cable-type structures. I'd like to be a design engineer on MAJOR, ICONIC bridge structures."**

– David Amorim

NPCAF and a seemingly endless drive to advance, Amorim is primed for success no matter what the future may hold. ■

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

Amorim's thesis focuses on accelerated bridge construction techniques and the potential for implementing them in Manitoba.

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## People and 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](mailto:sgeer@precast.org).

### NEW HAMPTON METAL FAB LAUNCHES NEW WEBSITE

New Hampton Metal Fab is inviting visitors to explore its new website.

The new website has been designed to provide a user-friendly experience with improved navigation and functionality, allowing customers to access detailed product information. The website also has a responsive design optimized for smart phone, tablet and desktop use.

For more information, visit [www.newhamptonmetalfab.com](http://www.newhamptonmetalfab.com).



### BESSER ANNOUNCES TWO NEW HIRES

Besser has announced two key hires, one to expand the sales team and the other to serve as a sales application engineer.



Jeff Lindberg



Chandramouli Nagarajan

**Jeff Lindberg** joined the company as a sales and service representative for the Northeast United States. He is promoting machine and mold parts, capital equipment, paid service, and training for the entire product line. He joins Terry McNamee and Randy VanSickle in supporting plants throughout the region.

**Chandramouli (Chandra) Nagarajan**, the new sales application engineer, is responsible for coordinating the planning, design, and installation of masonry, hardscape,

pipe and precast equipment, curing systems and complete production facilities.

### DAYTON SUPERIOR ANNOUNCES LATEST PRODUCT LAUNCH

Dayton Superior Corp. adds new product to their accessories product portfolio.

The Bar Lock D252L End Anchor offers Type 2 splicing capabilities and is used to provide embedment anchorage while offering additional flexibility. The anchor can be moved to an out-of-the-way position on rebar when needed, then slipped back into the final installation position. Installation of the Bar Lock D252L can also be done on the job site without special preparation requirements, saving time and labor costs.

For more information, visit [www.daytonsuperior.com](http://www.daytonsuperior.com).

### SMITH-MIDLAND CORPORATION APPOINTS NEW ACCOUNTING MANAGER

Smith-Midland has hired **AJ Krick** as an accounting manager. Krick brings a decade of experience as a licensed Certified Public Accountant and controller, guiding organizations through fiscal growth and regulation. Krick has improved financial reporting, processes and internal controls to help organizations reach optimal efficiency.



AJ Krick

Krick previously worked at Marshall Consulting Group as a manager. He was in charge of controller services such as monthly financial statements, budgeting, tax returns and forecasting.

### NEW INDUSTRIAL ENGINES FEATURE HYSTER® VARIABLE POWER TECHNOLOGY™

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Hyster® Variable Power Technology™ engine

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To learn more, visit [www.hyster.com](http://www.hyster.com).

## SHUTTLELIFT ANNOUNCES NEW SB 120 SINGLE-BEAM MOBILE GANTRY CRANE

Shuttlelift has added a new model to its product lineup. The SB 120 single-beam, single-hook, rubber-tired mobile gantry crane is the manufacturer's largest SB Series crane to date.

The SB 120 has a single traversing beam and a single-point hook. Other features include a

standard wireless remote control to improve operational safety and ensure maximum maneuverability.

For more information about Shuttlelift products, visit [www.shuttlelift.com](http://www.shuttlelift.com). ■



Shuttlelift's new SB 120 single-beam, single-hook, rubber-tired mobile gantry crane

# 2014 Safety Award Winners

(Watch for additional award winners from **The Precast Show** in the May-June issue of *Precast Inc.*)

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 Oldcastle Precast-Middle Island, Middle Island, NY  
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 Sherman Dixie Concrete Ind.-Cullman, Cullman, AL  
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 Sherman Dixie Concrete Ind.-Louisville, Louisville, KY  
 Spoerr Precast Concrete Inc., Sandusky, OH  
 Wieser Precast Inc., Williamsburg, IA

### Gold Award

Wieser Concrete Products Inc., Portage, WI

### Silver Award

Hanson Building Products, La Place, LA

### Bronze Award

Hanson Building Products, Como, MS

### Most Improved Award

Oldcastle Precast-Idaho Falls, Idaho Falls, ID

## CATEGORY II (60,001 – 120,000 HOURS)

### Platinum Award

CP&P, Salem Precast, Salem, VA  
 Hanson Building Products, Deland, FL  
 JJ's Concrete Construction LLC, Montgomery, AL  
 Lee's Precast Concrete Inc., Aberdeen, MS  
 Oldcastle Precast-Fredericksburg, Fredericksburg, VA  
 Oldcastle Precast-Houston, Houston, TX  
 Oldcastle Precast-Lebanon, Lebanon, TN  
 Oldcastle Precast-MaderaMF, Madera, CA  
 Oldcastle Precast-Newnan, Newnan, GA  
 Oldcastle Precast-San Antonio, San Antonio, TX  
 Oldcastle Precast-Topeka, Topeka, KS  
 Wieser Concrete Products Inc., Maiden Rock, WI

### Gold Award

Jensen Precast Phoenix, Phoenix, AZ

### Silver Award

Oldcastle Precast-San Diego USC, San Diego, CA

### Bronze Award

Champion Precast Inc., Troy, MO

### Most Improved Award

Oldcastle Precast-Lebanon, Lebanon, TN

## CATEGORY III (120,001+ HOURS)

### Platinum Award

Hanson Building Products, Lorena, TX  
 Oldcastle Precast-Mansfield, Mansfield, TX  
 Oldcastle Precast-Telford, Telford, PA  
 Norwalk Concrete Industries Inc., Norwalk, OH  
 Tindall Corporation-Utilities Division, Spartanburg, SC

### Gold Award

Oldcastle Precast-Auburn, Auburn, WA

### Silver Award

Oldcastle Precast-Chandler, Chandler, AZ

### Bronze Award

Hanson Building Products, Houston, TX

### Most Improved Award

Norwalk Concrete Industries Inc., Norwalk, OH

# THE PRECAST SHOW: Education Wrap-Up

NPCA Staff Report

There are plenty of reasons to love The Precast Show: networking opportunities, plant tours, hands-on demonstrations ... the list goes on and on. For attendees of this year's show in Orlando, Fla., the educational offerings, including everything from lessons in leadership principles to advanced admixture technology, provided significant added value and once again set the standard for top-notch training in the industry.

**Matt Weber**, president of ROAR! Internet Marketing, presented a course entitled "10 Minutes to a More Profitable Website." The class included nine easy-to-implement tips with the potential to significantly impact a website's profitability. They included finding the one thing you must have on every page of your website to creating a strategy for determining if your website is helping your company or not.



Matt Weber

The class was not technical. In fact, Weber ensured that no jargon was used during discussion. "Some of the attendees may never use the word 'website' again," he said.

Students attending "Principles in Leadership," led by Concrete Sealants Inc.'s **Sam Lines**, learned how to become effective leaders through charting a new course for their lives and developing a personal mission statement. Lines stressed leadership does not come from fear, but instead from



Sam Lines

focusing on methods to maximize your strengths.

"In this course, I teach you about you," he said. "In examining your strengths and talents, your lesser strengths are also identified so that they can be properly managed."

Attendees also learned that calendars can tell them a lot about what they value. Lines covered the importance of schedule prioritization,

noting that what goes into your agenda ultimately influences where you will end up.

On the business management side, **Frank Bowen** of Piedmont Precast taught "Operations Management Strategy."

Bowen focused on the many simple techniques and procedures precast professionals can implement to increase profit that may otherwise be lost. Students learned the benefits of Six Sigma tools and the scientific method, discovering how both can easily be applied to business strategy.



Frank Bowen

"Students who participated in this class were able to take away many best business practices they previously had little or no exposure to," Bowen said. "From this training session, participants can go back to their facilities with techniques for organizing and consolidating their operations in a manner that will allow them to achieve cost reductions and improve production efficiency."

**Ara Jeknavorian, Ph.D.**, of Jeknavorian Consulting Services led a course titled "Chemical Admixture Technology: The Pathway to More Durable Concrete." Jeknavorian covered



Ara Jeknavorian, Ph.D.

a wide range of topics, including the chemical makeup of admixtures, how admixtures can improve precast concrete products and different applications in which admixtures can be used.

"Attendees leave my course having a better understanding of what chemical admixtures can and cannot do," Jeknavorian said. "This will help production staff optimize correct use,

minimize or eliminate possible abuse and ensure a more consistent batch-to-batch quality."

Additional speakers at The Precast Show 2015 included Greg Chase of Chase Consulting, Stephen Szoke of the Portland Cement Association and Albert Robert Rubin of North Carolina State University, among many others.

To take advantage of NPCA's educational offerings, visit [precast.org/education](http://precast.org/education). There, you will find online courses, webinars and information about upcoming live classes. ■





# Meet the NEW Precast.org

## The new website is designed to better meet the needs of members and specifiers.

NPCA Staff Report

At the end of 2013, we excitedly reported that precast.org had exceeded 500,000 page views for the first time. Expectations for 2014 were high, but we could not have predicted what occurred. Last year, website traffic skyrocketed and page views ended up just shy of 750,000.

The 50% increase in traffic reinforces a decision the NPCA Board of Directors made earlier in 2014 to invest in the future of the NPCA website with a complete redesign. The goals of the redesign include bringing the most important programs of the association to the forefront, providing easier navigation and better access to members, updating the look and feel, placing more emphasis on imagery and, perhaps most importantly, making the site more mobile friendly.

The time was right and the new precast.org is a modern, informative and useful website that will serve member needs and educate the general public about the benefits of precast concrete.

### WHY IS PRECAST.ORG SO IMPORTANT?

NPCA was founded to represent members and their precast concrete products. The website has become an increasingly important part of that effort as the site ranks high in search results for a wide range of topics relating to the precast industry. Once visitors arrive at the website, it must keep their attention, provide them with the right information and also lead them to find NPCA members. If not, a major opportunity is lost.

### WHAT MAKES THIS SITE BETTER THAN THE LAST ONE?

The last version of precast.org was launched more than four years ago and a lot has changed since then. More than ever, people today prefer succinct copy and large images. Additionally, design preferences have shifted and developers have new tools to enhance the user experience.

The first thing you'll notice on the new precast.org is a home page that emphasizes the most important aspects of NPCA. Front and center, you'll find precast products, resources for members, plant certification, education, meetings and publications. Visitors can find NPCA members in the main menu, which remains at the top of the page even after scrolling down.

We have also reworked internal pages to communicate the most important facts while placing emphasis on images to help tell the story. The product pages provide visitors with additional related content and links to key documents such as technical papers or specifications which are presented in a more visual way.

All of this and much more provides a seamless experience on the site and ensures we get the right message across.

### MOBILE

In addition to the visual and organizational changes, the site provides an entirely new experience for mobile visitors. The number of mobile visitors per year has nearly quadrupled since 2012.

Precast.org is now built on a



responsive framework so the site adapts to the size of the display screen the visitor is using. On tablets, the site remains largely the same with subtle changes to optimize the experience. On a phone, the site transforms drastically to ensure visitors can quickly scroll and find what they are looking for.

### LET US KNOW WHAT YOU THINK

Precast.org is a major voice for the precast industry. It is important to have a strong online presence that effectively reaches visitors on any device. The site must accomplish the goals of NPCA members to succeed. If you see ways to improve the site, please don't hesitate to let NPCA staff know. **PI**

# CALENDAR OF Events



**October 21-24, 2015**  
**NPCA 50TH ANNUAL CONVENTION**  
 Minneapolis Marriott City Center  
 Minneapolis, Minn.



**March 3-5, 2016**  
**THE PRECAST SHOW 2016**  
 Gaylord Opryland Hotel  
 Nashville, Tenn.



**THE PRECAST SHOW 2017**  
 To be determined



**February 22-24, 2018**  
**THE PRECAST SHOW 2018**  
 Hyatt Regency Denver  
 Denver, Colo.



For the most up-to-date information about NPCA events, visit  
[precast.org/meetings](http://precast.org/meetings)

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**21****HAMILTON FORM CREATES FUNCTION****CASE STUDY****ARCHED SOFFIT  
FOR CURVED BRIDGE BEAM**

"The curved beams for this project were critical. Hamilton Form delivered a soffit for the beams that made the casting simple – we supplied the drawings, they did the rest. I'd count on them for any project when the dimensional accuracy and quality of the product are essential."

*Dennis Fink, General Manager, Plant Operations  
Northeast Prestressed Products, LLC*

**The Project:**

The original Frederick Avenue Bridge in Baltimore was a two-span concrete arch design built in 1930. In keeping with the historical character of the area, the replacement bridge is a two-span prestressed concrete structure designed to imitate the original bridge.

**The Challenge:**

Northeast Prestressed Products, LLC in Cressona Pennsylvania is supplying the precast elements for the project, including 12 arched sections assembled to create 2 arches on each side of bridge replicating the look of the original double arches.

**The Solution:**

To cast the beams, Hamilton Form fabricated a soffit that is 44' long and curves to a 52'6" radius. To form the radius, the understructure material was cut with a high-definition plasma cutter to hold tight dimensional tolerances.

**The Results:**

Just like the quality of the precast product is dependent on the form it's cast in, the quality of a curved soffit depends on the understructure. The accuracy of the understructure allowed the skin to be easily welded in place. The resulting product is stunning.



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