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*Ron Sparks, VP/SM, Columbia Precast Products*

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# CHAIRMAN'S INSIGHTS

## A Message from NPCA Chairman Ron Sparks



### Change is the Only Constant

Well, I'm glad that's over! With 2020 now in our rearview mirror, I am very optimistic about what the coming years have in store for our industry. I also am looking forward to reconnecting with old friends and meeting new ones at this year's Precast Show being held May 20-22 in New Orleans.

This past year, we all learned how to be more agile and adapt to daily disruptions that require on-the-go problem-solving. Our association made adjustments on the fly to provide the best continuity possible, such as creating virtual plant audits and shifting our Annual Convention to a virtual format. While those may be top of mind, there are a few other recent changes that I think set up our industry well for the future.

The pressure from alternative materials continues to grow and impact more product lines. With that in mind, my two predecessors, Mike Hoffman and Jon Ohmes, implemented key initiatives. Mike got the ball rolling on what has now become the Research and Development Advisory Council (RDAC), which gives us a streamlined format to vet and undertake necessary research projects. Jon moved our association's marketing efforts forward and there is more to come on that front.

Another vitally important component that ensures our members are prepared to battle alternative products is training. Many of our competitors are well-funded, have a national presence, are mobilized with technical data and robust sales forces and in some cases have distribution networks. Battles are won or lost at the sales level, and that should be our focus.

Plans currently are being made to develop a robust sales training program on par with our LNPCA and Master Precaster programs. These efforts lay the fundamental groundwork and will be the foundation of our efforts well into the future.

It truly is my honor to serve as Chairman of the NPCA Board of Directors. I look forward to what we will accomplish in 2021 and to working with Chair-Elect Mark Weiser and Secretary/Treasurer Joel Sheets to keep this momentum going well into the future.

# Questions from the Field

Questions from the Field is a selection of questions NPCA Technical Services engineers received from calls, emails and comments on blog posts or magazine articles posted on [precast.org](http://precast.org).

If you have a technical question, contact us by calling (800) 366-7731 or visit [precast.org/technical-services](http://precast.org/technical-services).

Dan writes:

**If we ensure the concrete reaches the required compressive strength at 28 days – let's say 5,000 psi – why are M10, M15, M20 and M25 specified? Why are different proportions specified as long as the concrete reaches the necessary strength?**

NPCA Technical Services engineers answered:

M10, M15, M20 and M25 refer to different mix design proportions. Various mix designs can achieve a 5,000-psi compressive strength using entirely different proportions of raw materials. It's important to not only ensure the concrete mix design will provide the necessary compressive strength, but also that the raw materials and the proportions in which they are batched into the mix provide the desired fresh and hardened concrete properties. The economy of the mix is another important consideration in proportioning.

Confirming that concrete reaches the minimum required compressive strength is not enough to ensure it will perform as

required for its entire service life. A concrete mix could achieve a 5,000-psi compressive strength but may not perform well in service because of the type, quantity or proportions in which the other raw materials are used. For example, a mix could reach the required compressive strength while having a water-to-cement ratio that's too high. This could make the concrete susceptible to watertightness and durability



NPCA file photo

issues. A mix can reach the required compressive strength while using inappropriately sized aggregates, which could increase paste demand and the cost of the concrete while also potentially creating shrinkage-related issues. Mix proportions affect all fresh and hardened concrete properties, and compressive strength is only one of many important factors to consider. This necessitates defining specific mix proportions.

Sandy writes:

**We manufacture retaining wall blocks indoors in a cold climate. Sometimes, we notice small bugholes on the top surface of some of the blocks. In service, those small bugholes could fill with water and then freeze, potentially causing the concrete around the bughole to spall. The specification calls for 4,000-psi concrete with an air-entraining admixture. Our overnight breaks are over 3,000 psi and 28-day breaks are over 8,000 psi. Do we have any reason to worry about the small bugholes or the durability of the concrete?**

NPCA Technical Services engineers answered:

This is unlikely to be a cause for concern. However, you should first revisit your concrete placement and consolidation practices to minimize the frequency and size of any bugholes. NPCA has resources on both topics available on our website at [precast.org](http://precast.org). In some cases, performing a minor repair on the bugholes may be advantageous. In other scenarios, leaving them alone is best. Consult the project specification for guidance regarding bughole acceptance and minor repairs.

While there is little consensus throughout the industry regarding acceptable criteria for bugholes, AASHTO R73, "Standard Practice for Evaluation of Precast Concrete Drainage Products," evaluates bugholes for certain products and is used as a guide by some agencies – even for products outside the scope of R73.

Additionally, the Portland Cement Association states, "These surface voids are primarily an aesthetic problem for exposed structural concrete. However, problems do arise if the concrete surface is to be painted or if the voids reach a larger diameter (typically greater than 1 inch)."<sup>1</sup>

Because these small bugholes are on the top exposed surface of the precast product, water may collect there and freeze in your cold climate. However, the water would not be trapped in the bugholes. If the water does freeze, it will have space outside of the precast block into which it can expand as it freezes.

Additionally, the air-entraining admixture used in the concrete mix design will help protect the blocks against freeze/thaw damage. In short, any water collected within small bugholes like the ones you're referencing is unlikely to be confined during freezing and expanding, and consequently is unlikely to cause spalling. **PI**

REFERENCES:

1 <https://www.cement.org/learn/concrete-technology/concrete-construction/bugholes>



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# A Closer Look:

## ACCELERATED CURING

By Kayla Hanson, P.E.

Accelerated curing methods offer many benefits beyond early-age strength development. Understanding how they work and when to use them is key to implementing them successfully.

We live in an age of instant gratification. We can have groceries delivered to our doorsteps within hours, communicate with people across the globe within seconds and watch most any movie instantly with the click of a button. So why do we wait days for concrete to cure?

While the raw materials, mix designs, and controlled manufacturing and curing conditions used in precast concrete manufacturing enable products to reach design strength in a few days or less, traditional curing methods aren't always fast enough.

### WHAT IS ACCELERATED CURING?

Accelerated curing uses heat, or a combination of heat and moisture, in the early stages of the curing process to increase the rate of cement

hydration. This expedites concrete's early-age strength development. Accelerated curing is used for many reasons, such as counteracting slow strength gain during cold-weather concreting, providing an optimum curing environment for dry-cast concrete or helping ensure precast products reach a desired stripping strength quickly.

### KEYSTONES OF CURING

#### Cement hydration and pozzolanic reactions

When portland cement comes into contact with water, cement hydration reactions begin almost instantly. The reactions, along with those of supplementary cementitious materials, initiate the process by which the paste gains strength, stiffens and ultimately creates a resilient matrix, giving way to concrete as we know it.

### Three keys to curing: Time, temperature and moisture

The conditions fresh concrete is exposed to throughout the curing process directly impact its hardened properties. Ensuring concrete is allowed sufficient time to cure in an appropriately warm and humid environment will help optimize the concrete's properties and ensure the product is as strong and durable as possible, given the mix design and structural design.

The impact of maintaining a moist curing environment on concrete compressive strength development is depicted in Figure 1. The figure reveals that curing concrete in a moist environment compared with curing concrete in air without moisture could almost double compressive strength in one year if all other factors are constant.

Heat causes cement hydration reactions to occur at an expedited rate, which causes concrete to develop strength at a faster rate. Conversely, reactions occur at a slower rate when the fresh concrete or the surrounding environment is cooler. The impact of casting and curing temperatures is shown in Figure 2. Note that concrete cast and cured at warmer temperatures shows higher early-age compressive strengths, but long-term strengths may be slightly compromised.

### HOW ACCELERATED CURING WORKS

Accelerated curing methods alter one or two of the key curing influencers – temperature and/or moisture – to shorten curing time. Curing concrete at high temperatures in low humidity can cause cracks and may reduce long-term strength gain, therefore accelerated curing tends to employ both increased temperature and moisture throughout the process, typically using steam.

Because of heat's impact on cement hydration reaction rates and concrete strength gain, most accelerated curing methods are heavily dependent upon it.

"It's advantageous," said Mark Kraft, regional director – North America of Kraft Curing Systems, Inc. "You're creating a 100% saturated environment at an elevated temperature. Steam is also the most efficient heat-transfer method available."

The specific approach for each situation depends on factors such as the shape and size of the concrete product, allowable accelerated curing time, finish requirements and cost.

### Other methods to achieve higher early-age strengths

Other methods to expedite early-age concrete compressive strength development include using heating coils under formwork, heating forms prior to casting, incorporating accelerating admixtures, using warm mix water or incorporating Type III cement in the concrete mix design.

Accelerated curing processes and methods to increase the rate of early-age strength gain are not universal. Each mix design, product, manufacturing facility and curing environment is different, so the methods should be carefully considered before selecting the best option.

"You have to look at the cost of your mix design versus steam curing," Kraft said. "That will play a role. The chemicals, the cement, and the accelerated curing have an expense."

### ACCELERATED CURING USING STEAM

Steam curing is a popular accelerated curing method for precast products and can be conducted using live steam at atmospheric pressure or a high-pressure autoclave. The autoclave, which is similar to a pressurized oven, is best suited for curing small products or masonry units. Due to their size, most precast products are steam cured at

atmospheric pressure within an enclosure. Steam curing precast products requires careful attention to time and temperature, as well as to the curing enclosure.

### Steam-curing enclosures

Steam-curing enclosures function like kilns and are typically made of tarps, polyethylene sheeting or similar materials capable of retaining both heat and moisture. Some precasters use a separate room for steam curing instead of creating a temporary enclosure.

"You really want to make sure your kiln is well-sealed," said Marcus Barnett, Hamilton Kent territory manager and 37-year-veteran of the precast industry. "You can lose a lot of heat through fluing."

No matter their design, ensure curing chambers are properly sealed and free of gaps or openings so the enclosure retains steam, prevents drafts and maintains the anticipated curing conditions.

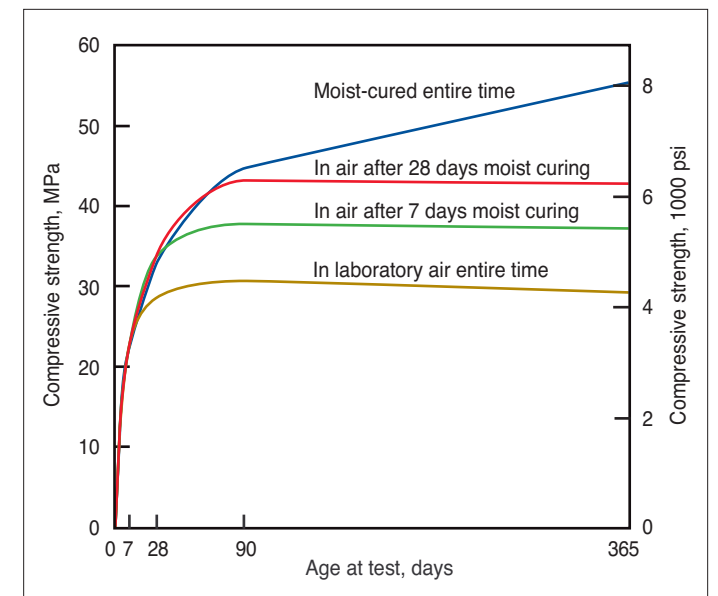


Figure 1: Effect of moist curing on strength gain of concrete (Gonnerman and Shuman 1928).<sup>1</sup>

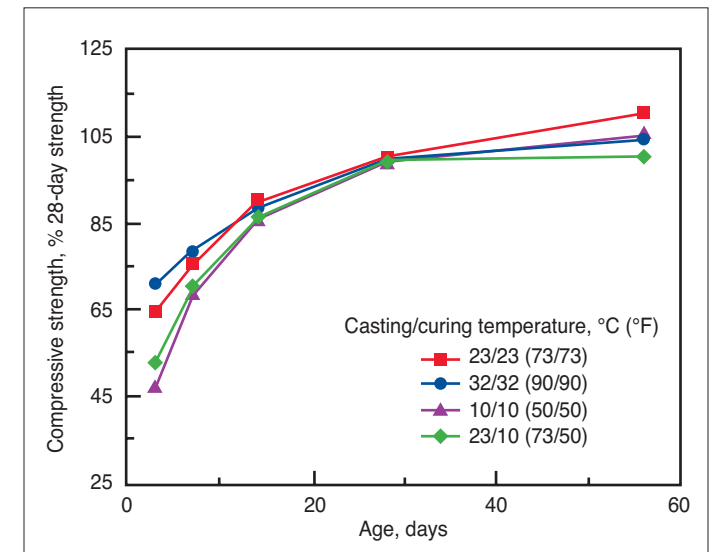


Figure 2: Effect of curing temperature on strength gain relative to 28-day strength (Burg 1996).<sup>1</sup>

## Delayed Ettringite Formation

Ettringite, or calcium sulfoaluminate, is a naturally occurring mineral in portland cement concrete. Gypsum and other sulfate compounds react with calcium aluminate to form ettringite in the early stages of the hydration process. When the concrete is exposed to elevated temperatures at early ages, some of the existing ettringite can deteriorate. Then, in the presence of moisture, it can reform much later once the concrete has cured. The reformed ettringite, or delayed ettringite formation (DEF), can cause internal expansive pressures that can lead to hardened concrete cracking. Therefore, the recommended maximum concrete curing temperature should be limited to 158 degrees.<sup>1</sup>

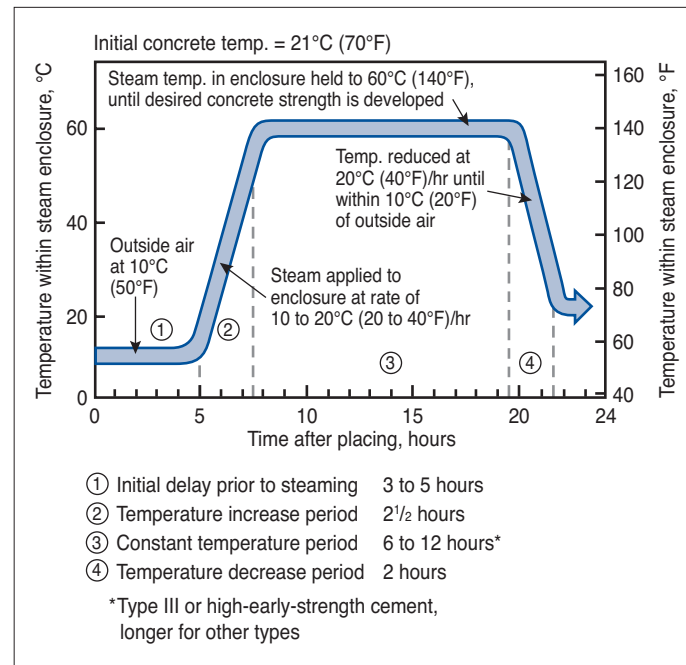
### Steam curing cycles

Plants must establish a curing cycle that outlines durations and curing temperatures specific to each application.

“The mix design is going to determine the curing specifications,” Kraft said. “Steam curing can affect the aesthetics of architectural and colored products. You could get staining, change of color or efflorescence if it’s not carefully controlled.”

Product dimensions are also a factor in tailoring each accelerated curing cycle.

“Thin-walled sections are going to go faster than a thick product,” Kraft said. “Thin sections will reach their curing temperature quicker



and need less accelerated curing time than a large product.”

A general steam-curing cycle is shown in Figure 3. The curing cycle, durations and temperatures

**Figure 3:** A typical atmospheric steam curing cycle (Portland Cement Association).<sup>1</sup>

will vary depending on each scenario and must be monitored and documented throughout the accelerated curing process.

### Cycle monitoring

Sensor technology advancements have streamlined steam curing for precasters. Many sensors on the market today allow precasters to upload the data directly to a computer for easier monitoring and correlation between sensor data and other recorded concrete data.

Barnett advised precasters to pay close attention to the sensor location within the curing enclosure. Placing a sensor on the ground or near the top of the enclosure may not provide an accurate representation of conditions throughout the chamber. Placing sensors in the same position each day is also important to maintain consistency in data collection.

## STEAM CURING PROCESS

### Phase 1 – Initial Delay

For wet-cast concrete, Phase 1 could last up to 6 hours from the time of casting. This duration is shorter for dry-cast concrete products. During this period, the products cure in the enclosure without using heat or moisture.

If heat is applied too soon, the concrete could experience permanent damage, delayed ettringite formation (DEF) or compromised long-term strength development. This initial delay also ensures any moisture on the concrete surface is allowed to naturally evaporate instead of drying prematurely as a result of heat being applied too soon.

Therefore, the initial delay is critical to allow the cement paste to reach initial set – at least 500 psi – prior to applying accelerating curing practices. Initial set is typically tested in accordance with ASTM C403, “Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance,” and can occur 2-to-6 hours after batching.

“When the concrete gets to initial set, that’s when you’re going to get the most from accelerated curing,” Barnett said.

Conversely, it’s also important not to wait too long to begin accelerated curing practices. Steam curing is less effective when applied after concrete reaches final set. When producing numerous pieces over the course of an entire shift, consider creating an adjacent curing enclosure so the steam curing process can run in waves.

“Sometimes, it could be 8-or-10 hours before you can start the steam,” Barnett noted. “If you can, it’s best to start the steam as you go.”

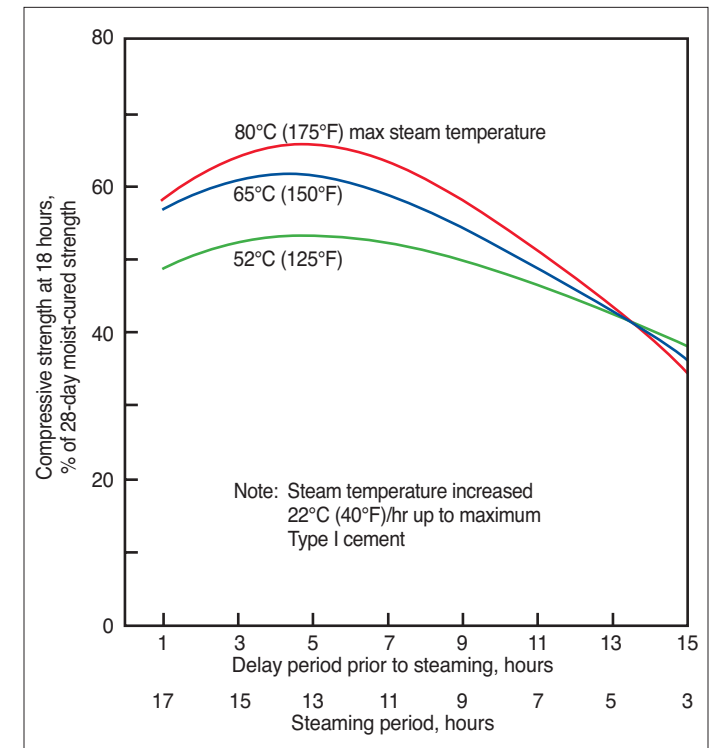
Figure 4 shows the relationship between concrete compressive strength at 18 hours and the initial delay period prior to employing accelerated curing practices. Regardless of the steam temperature in each scenario, the 18-hour compressive strength was optimized when a 5-hour initial delay was used.

Figure 5 shows the rate at which concrete mixes at different temperatures can reach initial set. Similar to Figure 2, Figure 5 depicts how increased temperatures significantly impact the rate of initial set.

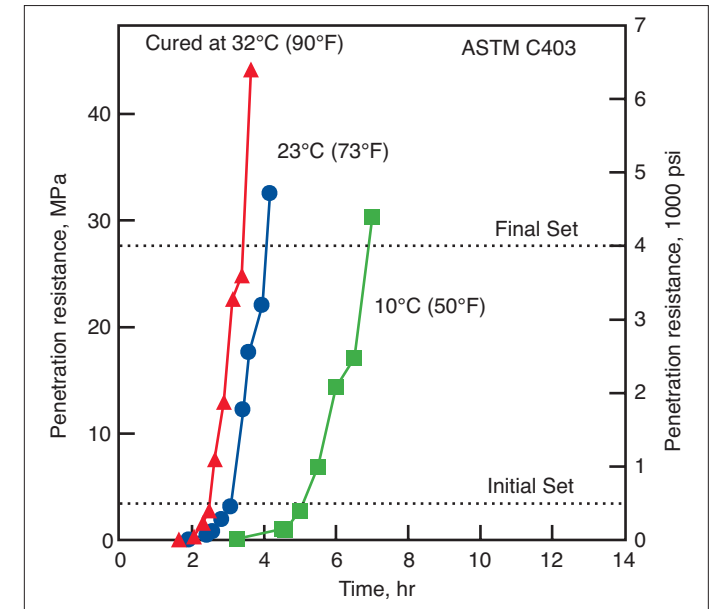
### Phase 2 – Ramping Up

Phase 2 generally lasts 2-to-3 hours. During this “ramping up” period, the enclosure is filled with steam as the temperature steadily increases. The temperature increase within the enclosure must be carefully controlled and limited to a 20-to-40-degree increase per hour – until the enclosure temperature reaches about 140-to-150 degrees. This prevents thermal shock and avoids damaging concrete volume changes.

Steam curing concrete at temperatures greater than 140 degrees is



**Figure 4:** Relationship between strength at 18 hours and delay period prior to steaming. In each case, the delay period plus the steaming period totaled 18 hours (Hanson 1963).<sup>1</sup>



**Figure 5:** Initial and final set times for a concrete mixture at different temperatures (Burg 1996).<sup>1</sup>

not shown to significantly improve compressive strength development.

### Phase 3 – Constant-Temperature Steam Curing

Phase 3 consists of holding the enclosure temperature constant – around 140 degrees – for 6-to-12 hours or until the concrete has reached the desired compressive strength. The duration primarily depends on the mix design and the curing temperature. Mixes made with Type III cement, which provides enhanced early-age strength development,

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may require less time to reach the desired compressive strength, while products made with Type I or other types of cement may require longer curing times. Likewise, steam curing at temperatures toward the high end of the acceptable range – around 140 degrees – will expedite curing and strength gain.

Monitoring both the temperature within the enclosure and the concrete's internal temperature during this period is paramount. Cement hydration reactions are exothermic, meaning they generate heat. Therefore, while the curing environment within the enclosure may be an appropriate temperature, the concrete temperature during steam curing could be significantly higher. In no case shall the concrete temperature exceed 150 degrees, unless the precaster employs measures proven to avoid DEF.

“The cement hydration reactions are going to add a lot of heat, too, so you have to be careful not to overshoot it,” Kraft advised. “On a larger product, for instance, when you see the internal temperature get to 140 degrees, you can cut off the heat source and you’ll see the internal temperature keep rising due to the heat of hydration.”

#### Phase 4 – Ramping Down

Phase 4 typically lasts 2 hours or longer. The steam curing process continues during this period, but the temperature within the enclosure is gradually reduced at a rate of about 20-to-40-degrees per hour until the enclosure temperature is within 20 degrees of the ambient environment. Like the “ramping up” phase, this “ramping down” phase

must be carefully controlled. Excessive temperature drops could shock the concrete or cause abrupt and damaging volume changes.

Once the enclosure temperature is within 20 degrees of the surrounding environment, the enclosure can be opened and the cured products removed and transported to their storage location.

#### MYRIAD BENEFITS AWAIT

Accelerated curing methods can offer benefits beyond expediting early-age strength development. In comparison to curing concrete at 73 degrees, which has been shown to be optimal in terms of long-term strength development potential (Figure 2), curing concrete around 140 degrees can reduce drying shrinkage and creep.<sup>1</sup>

Precasters should consult their suppliers to determine how accelerated curing practices will affect each mix design and specific product, and to determine the ideal accelerated curing cycle for different applications. Depending on the specific scenario, other methods to promote early-age strength gain – such as using accelerating admixtures, Type III cement or warm mix water – may be viable solutions. **PI**

*Kayla Hanson, P.E., is NPCA's director of technical services.*

#### REFERENCES:

<sup>1</sup> Kosmatka, Steven H. and Wilson, Michelle L., *Design and Control of Concrete Mixtures*, EB001, 16th edition, Portland Cement Association, Skokie, Illinois, USA, 2016, 632 pages.

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Watertightness is a critical characteristic of wastewater tanks.

# Watertightness Testing: SEPTIC TANKS & GREASE INTERCEPTORS

By Kayla Hanson, P.E.

Precast concrete septic tanks and grease interceptors are designed and manufactured to be strong, durable, resilient and watertight. Watertightness is a critical characteristic of precast tanks not only to ensure they function properly and provide the necessary treatment, but also to protect the surrounding soil and groundwater. A thorough quality control/quality assurance program provides the foundation for manufacturing quality precast concrete products. Conducting routine watertightness testing is a best management practice for plants that manufacture septic tanks and grease interceptors.

**Vacuum tests should not be performed on-site after backfilling.**

## STANDARD SPECIFICATIONS

ASTM C1227, “Standard Specification for Precast Concrete Septic Tanks,” and ASTM C1613, “Standard Specification for Precast Concrete Grease Interceptor Tanks,” discuss design requirements, manufacturing practices, materials, testing and performance requirements for both monolithic and sectional precast concrete septic tanks and grease interceptors prior to installation or backfill. IAPMO Z1000, “Prefabricated Septic Tanks,” and IAPMO Z1001, “Prefabricated

Gravity Grease Interceptors,” discuss requirements for design, materials, performance, testing and markings for septic tanks and grease interceptors. ASTM C1719, “Standard Test Method for Installed Precast Concrete Tanks and Accessories by the Negative Air Pressure (Vacuum) Test Prior to Backfill,” is also a valid test. Tank watertightness tests shall be performed in accordance with the applicable sections of these standards or the requirements set forth by the authority having jurisdiction, whichever is more stringent.

## FIRST THINGS FIRST

Before getting started, it’s important to note vacuum tests should not be performed on-site after backfilling, as no industry standard exists for this situation. Other loads, such as soil and groundwater, affect the results of backfilled vacuum test and have the potential to cause a system failure if those loads are not considered. If a vacuum test is performed on a backfilled septic tank or grease interceptor and an issue arises, it would be difficult to identify the cause and locate and repair the affected area.

Appropriate personal protective equipment must be worn during a vacuum test. Care must also be taken to keep testing personnel a safe distance away from any pressurized tank. In the rare case that a tank experiences sudden structural failure during a vacuum test, fragments of the tank could be propelled into the air, creating a dangerous situation for those in the vicinity. Vacuum testing should be performed

on a tank surrounded by other precast concrete tanks.

Before beginning a vacuum test, ensure the tank has reached sufficient strength to undergo the test. It is imperative that the concrete has developed enough tensile and compressive load capacity prior to inducing loads by vacuum.

## TANK VACUUM TESTING

The tank must be assembled with joint sealants prior to the vacuum test. In addition, the top slab or top half of the tank must be securely in place. Once the empty tank is assembled, determine which tank opening will be used for the vacuum device. All other access points, including inlet and outlet openings, must be temporarily – yet thoroughly – sealed. Prior to beginning a watertightness test, perform a visual inspection of the tank to locate and resolve any potential issues that could cause problems during the test.

Once the tank has been thoroughly sealed and inspected, attach the vacuum device to the unsealed access point. Because the device will draw air from the tank and measure the resultant negative pressure, the vacuum device must be capable of drawing a minimum vacuum pressure of 7 inches of mercury (Hg) and must employ a calibrated gauge, mercury manometer or water manometer accurate to within 0.2 inches Hg. However, if a vacuum gauge is used, its range may not exceed 0-to-10 inches Hg. When possible, two gauges should be used to ensure one is not malfunctioning.

To prepare the vacuum test, slowly and steadily begin introducing

negative pressure into the tank to 4 inches Hg using the affixed vacuum device. It is imperative to allow the pressure to stabilize before beginning the test period. Once the pressure reading is stable, ensure the reading is 4 inches Hg and begin timing a 5-minute test duration. The test is completed at the end of the 5-minute period.

- ✓ **PASS:** If the pressure in the tank remains at 4 inches Hg for the entire 5-minute test duration, the tank passes the test.
- ✗ **RETEST:** If at any time during the test the pressure drops below 4 inches Hg, the tank may be retested by resetting the pressure, allowing it to stabilize at 4 inches Hg and restarting the 5-minute test duration. The tank must maintain 4 inches Hg for the entire period to pass the test.

## TROUBLESHOOTING:

- Inspect the equipment and ensure the connection and access points are properly sealed. Oftentimes, the equipment seal is the source of the leak.
- Inspect the tank and listen for a hissing sound caused by air seeping into the tank. If the tank is leaking and the source cannot be located, spray soapy water inside the tank, assemble and reseal the tank, and repeat the vacuum test. Once the test is complete, relieve the vacuum, open the tank and look for bubbles, which will form at the site of the leak.
- If needed, the manufacturer can specify repair materials and procedures for the tank before retesting.

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## SEPTIC TANK HYDROSTATIC TESTING

If hydrostatic testing is to be used, the septic tank must be assembled, sealed and inspected before the test may commence. Fill the tank with water to its operable level – typically taken as the effluent invert – and let the tank stand undisturbed for 24 hours. Some water absorption into the interior concrete surface may occur, and the water level may drop as a result. Restore the tank to its initial water level after 24 hours, if necessary. Once the tank is refilled, the 1-hour test duration may begin.

✓ **PASS:** If the water level remains constant for the entire test period, the septic tank passes the test.

✗ **RETEST:** If the water level falls during the test period, restore the tank to its initial water level. Once the tank is refilled, begin timing another 1-hour test duration. The tank must maintain the water level for the entire 1-hour period to pass the test.

### TROUBLESHOOTING:

- If at any time during the test period the water level drops, the tank may be repaired per the manufacturer's recommendations in accordance with ASTM C1227, and the test procedure may be restarted from the beginning.

the test begins. Fill the tank with water to its operable level, typically the effluent invert. Filling the tank with water up to the top of the tank, into the riser or to the top of the riser is unnecessary and is not specified in the aforementioned standards. Typically, filling the tank to the flow line of the outlet is sufficient. After filling the tank, allow it to remain undisturbed for 8-to-10 hours.

If the water level does not drop throughout the 8-to-10-hour duration, timing of the 1-hour test period may begin. If the water level does fall during the 8-to-10-hour period as a result of moisture being absorbed by the interior concrete surface, refill the tank to its initial water level and let the tank sit for another 8-to-10 hours. Afterward, there should be no further drop in the water level, and timing of the 1-hour test period may begin.

✓ **PASS:** If the water level remains constant for the entire 1-hour test period, the grease interceptor passes the test.

✗ **RETEST:** If at any time during the 8-to-10-hour test period the water level drops, the grease interceptor may be repaired per the manufacturer's recommendations in accordance with ASTM C1613, and the test procedure may be restarted from the beginning.

## GREASE INTERCEPTOR HYDROSTATIC TESTING

Just as with septic tank hydrostatic testing, grease interceptors must be assembled and sealed to the appropriate degree and inspected before

## BEYOND THE TEST METHODS: VACUUM TESTING

Vacuum testing is a relatively quick watertightness integrity test that uses easily transportable equipment and a straightforward procedure.



A tank is considered to have passed the vacuum test if the pressure is held at 4 inches Hg for a duration of 5 minutes.

These attributes make vacuum testing the watertightness test method of choice for many manufacturers. Because the test requires very little space, it can be performed in the yard or even on-site (prior to backfill).

Vacuum testing is also a conservative approach to watertightness testing and can be more stringent than hydrostatic testing. Tanks in service do not operate in a theoretical vacuum, nor do they experience perfectly uniform maximum pressure on all four sides, the top slab and the base. However, these considerations validate the performance ability and strength of precast concrete tanks.

## NPCA PLANT CERTIFICATION CRITICAL SECTION REQUIREMENTS

When watertightness testing is a requirement of the owner, jurisdiction having authority or project specifications, NPCA Plant Certification requires watertightness testing to be demonstrated in accordance with the applicable section(s) of ASTM C1227; ASTM C1719; IAPMO/ANSI Z1000 for septic tanks; and ASTM C1613, ASTM C1719 and IAPMO/ANSI Z1001 for grease interceptors; or the requirements set forth by the authority having jurisdiction, whichever is more stringent. A minimum of one test per year on a septic tank produced in each septic tank form used at the plant must be performed and documented by NPCA-certified plants. The same minimum testing frequency applies to grease interceptors.

For a step-by-step guide on how to conduct a vacuum test, view NPCA's Precast Learning Lab video on vacuum testing at [precast.org/learning-lab](http://precast.org/learning-lab).

*Kayla Hanson, P.E., is NPCA's director of technical services.*



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Employees must be trained on the proper method of applying form release.

# FORM RELEASE AGENTS

## Serve a Greater Purpose

By Claude Goguen, P.E., LEED AP

There is more to form release agents than many realize. Understanding the types, considerations for selection, potential unintended reactions and proper application techniques is key to taking full advantage of one of the unsung heroes of precast concrete manufacturing.

Form release agents are an important component of precast concrete manufacturing. They influence the finished product's quality, forming equipment's longevity and production efficiency. Precast concrete form release products have evolved considerably since they were introduced. Today's products are easier to use and more effective than ever. Still, proper application procedures are key to their efficacy.

### FORM RELEASE AGENTS' PURPOSE

Release agents are everywhere. For example, cooking sprays that facilitate the removal of prepared food from cooking or baking surfaces can be found in nearly every kitchen.

In precast manufacturing, release agents

facilitate the separation of concrete from the forming surface. However, form release agents in the precast industry serve a variety of additional purposes. They are also used for cleaning and protecting formwork and producing a quality concrete surface. However, their ability to fulfill these functions depends on the type used.

### FORM RELEASE AGENT TYPES

Form release agents can be categorized as follows:

- **Barrier:** Provides a physical barrier between the form and the concrete.
- **Reactive:** Contains compounds that react with agents in fresh concrete to produce an interface material.

The earliest barrier form release agents were unmodified animal-, fish- or vegetable-based oils. Petroleum products such as diesel fuel or heating oil were used extensively. This approach evolved into using oils mixed with surfactants such as a wetting agent or emulsifier. These products were functional but were primarily intended for wood forms.

The next form release agents included waxes, silicones, synthetic resins, soaps and other materials to facilitate use with other form types, including steel. These agents are commonly used today.

The one constant has been using petroleum- or vegetable-based oil, which is why form release agents are commonly referred to as "form oils." The other ingredients in the release agents help evenly distribute the oil, carry it to the forming surface and prevent it from staining the concrete's surface. Waxes can also be used as form release agents and initially were applied by hand. The advent of emulsified waxes has enabled rolling or spraying application.

Reactive form releases contain ingredients that chemically combine with the lime in cement. Fatty acids in a reactive form release agent produce a metallic soap after reacting with the lime. This soap is water-insoluble and prevents the concrete from sticking to the form surface. The soap also facilitates air bubble passage, which reduces bugholes on vertical surfaces. Just like the barrier type, reactive form release agents have varying compositions depending on the manufacturer.

### WHICH TYPE OF FORM RELEASE SHOULD I USE?

Many factors come into play when selecting a form release agent, and precasters are advised to work with their supplier to answer these questions.

#### 1. Is it safe to use?

Be aware of any safety risks associated with the form release, including exposure to skin and eyes and potential inhalation. Also ensure that the product meets any applicable OSHA standards.

#### 2. Is it compliant with applicable environmental regulations?

Some products will be exposed to the environment when sprayed, resulting in residue that can be washed away or create particles in the atmosphere. Your state may

have specific regulations regarding runoff water quality and amount of volatile organic compounds (VOC) contained in the product. A 1999 federal regulation set the maximum allowable VOC level in concrete form release agents at 3.80 pounds per gallon (450 grams per liter).<sup>1</sup> Your state may have adopted this regulation or have more stringent rules. For example, some areas in California require a maximum of 250 g/L. Also, if your products will handle potable water, the form release agent may have to meet specific requirements such as NSF/ANSI 61.

#### 3. Is it compatible with the concrete?

Find out if the ingredients in the form release agent adversely react with any other mix constituents, including admixtures, cementitious materials or fiber reinforcing. The form release agent should not soften the concrete surface or create excessive dusting that may affect the surface's durability.

#### 4. Is it compatible with anticipated concrete surface treatments?

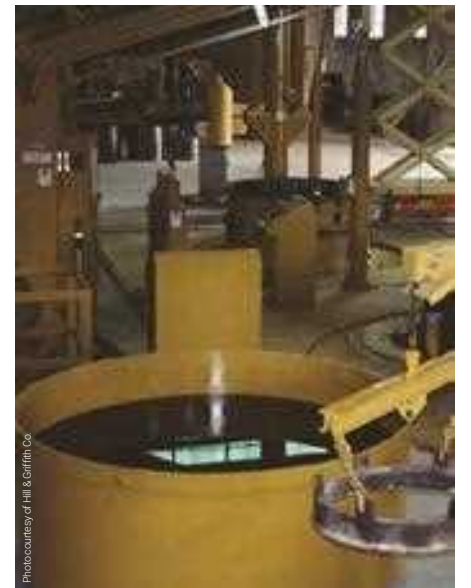
The precast structure's surface may receive additional treatments after stripping such as water/steam curing or curing compounds, sealers or coatings. This must be considered when choosing a form release agent to avoid negative interactions. There also may be further architectural surface treatments including painting, plastering or other finish processes applied at the precast plant or on-site that may adversely react with the form release residue on the concrete's surface. It's best to consult with the manufacturer of the coating or surface treatment.

#### 5. Is it compatible with the forming materials?

What works with steel forms may not work with formliners, blockouts or wood siderails. Some form surfaces may require specific release agents.

#### 6. Will it impact appearance?

A form release agent may inadvertently affect the surface appearance of concrete. Tests should be conducted before committing to a product. Precasters should consider the potential for staining or discoloration, which becomes critical when dealing with architectural elements.



Dip tanks are one method used to apply form release.

#### 7. How easy is it to use?

Some form releases may be more labor-intensive to apply, so this factor must be part of the selection process. In storage, the product may or may not stay in suspension and may require periodic mixing as it's used. If the product requires some time to dry, it's important to know this so you can plan your operations from application to casting. If your operations are delayed for any reason, you should know how long an application can remain on the form before reapplication is necessary.

#### 8. Is it compatible with plant conditions?

Every plant is unique. The product must be effectively used in your plant environment. Consider the highest and lowest casting ambient temperatures and whether the form release agent can be applied within that range. Some agents can thicken in colder temperatures and solidify inside the spraying equipment.

#### 9. Is it cost-effective and readily available?

Once you determine the product cost, the equipment needed to apply it and the associated labor required, then assess whether the product is cost-effective. Some release agents can also protect formwork and other form accessories, which can extend the forming equipment's lifespan. Is your ideal form release agent readily available in your area?



Choosing the proper nozzle is an important step in the application of form release.

**10. Does it work?**

This may seem obvious, but it's important to try products to measure their performance. Over time, the forms may stick to the precast products or leave excessive residue on the form surfaces that must be cleaned. It is always best to establish a relationship with your supplier so that you can address such issues should they arise in the future.

**PROPER APPLICATION**

Best practices for form release application are determined by technique, which includes the following: spraying, wiping and dipping.

**Spraying**

Spraying is the most common application method. Spraying can be performed with a hand-operated spray canister, electric portable sprayers or with a centralized compressed air system. A fine mist of small droplets applied to the forming surface may be optimal while a heavier application may be necessary with barrier type agents.

Two important factors influence the spray's quality: spray tip and pressure. The sprayer tip controls the application. Broader spray nozzles that produce a fan of fine droplets work best. Cone-shaped nozzles work well, but they may produce larger droplets and a higher application rate.

Higher pressures may produce smaller droplets but may also lead to more volume flowing through the tip and more loss of release agent in the environment. It's important to consult with the sprayer manufacturer to determine the optimal pressures. Typically, form release manufacturers state that you need at least 30 psi of pressure to apply form release properly. Some say that a pressure between 30 and 60 psi is sufficient.

When using centralized compressed air systems, it is recommended to use air pressure exceeding 100 psi. Some systems may have just one main air pressure regulator and some have regulators at multiple spraying stations throughout the plant.

When using a reactive release agent containing fatty acids, it's important to know that fatty acids may react with bronze; aluminum; gray, ductile and malleable iron; and mild steel. Brass and bronze spray tips are susceptible to plugging when used at low pressures and to

orifice enlargement when used at high pressures. Using plastic or stainless-steel nozzles can help prevent these issues.

**Wiping**

Swabbing, painting or wiping by hand is a method of form release agent application that eliminates the majority of airborne particulates. This is also a preferred method for specific products including burial vault and architectural products due to the surface finish requirements. However, applying form release by wiping can result in a heavier application that what is needed. Swabbing may result in excess release agent which generally ends up dripping onto the floor or the ground. Wiping the

release agent on the form is more labor-intensive, but can result in an optimum coating thickness and coverage.

**Dipping**

Dipping is a process where the formwork is lowered into a form release holding tank. It's automatic, fast, labor-efficient and helps ensure complete coverage. It's used predominantly in the dry-cast pipe industry. The important thing to consider when using this method is to keep the forms clean prior to dipping and monitor and maintain the dip tank contents for form release quality. The reason for this is concrete residue from forms that may not have been thoroughly cleaned can accumulate in the form release and start to negatively affect its reactive properties.

**AN UNSUNG HERO**

Form release agents are often undervalued. Some tend to think of them as just an aid in the stripping process, but they also can protect and extend the life expectancy of forms and enhance stripped concrete surface quality.

For these reasons, it's important to periodically train employees on proper form release application. To assist in this process, NPCA has developed a video on form release application as part of the NPCA Learning Lab available at [precast.org/learning-lab](http://precast.org/learning-lab). Any costs accrued ensuring the use of the proper form release agent and equipment and mastering the practice of application will pay off in production efficiency, formwork maintenance and overall product quality. **PI**

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

**REFERENCES:**

<sup>1</sup> Federal Register, Vol. 63, No. 176, Friday, Sept. 11, 1998, under 40 CFR-59, [AD-FRL-6149-7], RIN 2060-AE55, National Volatile Organic Compound Emission Standards for Architectural Coatings

NPCA has developed a video on form release application as part of the NPCA Learning Lab available at [precast.org/learning-lab](http://precast.org/learning-lab).

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# Warranties

## PART 2: HOW TO DEVELOP A PRODUCT WARRANTY PROGRAM

Looking to develop written warranties for your precast products?  
Here's what you need to know.

By Bridget McCrea

Even if your customers know you'll correct any issues that they experience with your products, it pays to have a warranty program in place for assurance and to address any challenges that may come up at a later date. Much like you'd expect a new car, laptop or headphones to come with some type of guarantee, your customers will appreciate knowing that your workmanship is covered for a certain period of time.

Precast manufacturers who do not offer warranties are missing out on an opportunity to let the world know that they stand behind their work. This approach not only gives customers a good feeling about working with you, it also helps them rest easier knowing that you'll rectify any issues quickly – typically at no charge to them – should they arise.

### WARRANTY TYPES

A warranty includes terms under which the manufacturer will repair the product (or make an exchange) in the event that it doesn't function as originally described or intended.

"A properly drafted manufacturer's warranty should let the customer know that a manufacturer stands behind the product as the

customer uses it," said David Reischer, Esq., a business law attorney at LegalAdvice.com. "In the warranty, the manufacturer should also represent that there are no defects and that the product is safe for customer use."

Warranties can be either express or implied. Express warranties explicitly set out the terms of the promise. Implied warranties are promises that, although not explicitly included in the contract, say that the manufacturer will stand behind its product.

An express warranty is a written warranty that includes specific language, while an implied warranty is a warranty that exists under the law. The most typical implied warranty is called warranty of fitness for a particular purpose. With this warranty type, a customer, client or owner can sue for breach of contract if a product fails within a certain timeframe. The manufacturer can be sued both for negligence (e.g., building a poor product) and for breach of the implied warranty of fitness for a particular purpose.

"It's kind of like playing soccer with three balls," said J. Robert Keena, attorney at law with Hellmuth & Johnson in Minneapolis. "The plaintiff only has to win under one of those theories."

According to Reischer, express warranties come in different varieties and depend on the product being manufactured and the promises that sellers typically offer. A "power surge warranty" can be used to warrant against damage from an unexpected power surge, for instance, while a "food loss warranty" may promise to offer consumers compensation for spoiled food when a refrigeration product fails.

In most cases, warranties come with time limits and exclude certain things. For precasters, some common exclusions include damage caused by improper installation, the labor required to reinstall the product (in the case of a warranty claim) or product damage that occurs during storage or shipping.

"If, for example, you store products on-site during construction and they get hit or damaged, your warranty should exclude those problems," said Keena, who tells precasters to include time parameters and filing instructions in their warranties. For example, you might require a certified letter outlining the problem within 30 days of discovering it.

Manufacturer warranties typically cover the product for an initial time period and are included at no cost to the customer. The manufacturer should use past experience to fold the warranty cost into the overall product cost. An extended warranty, on the other hand, will promise to make repairs for product failures even after the original manufacturer warranty expires. These extended warranties can be purchased by the customer, similar to how consumers can buy an extended warranty for a new household electronic or a vehicle.

### HOW TO WRITE YOUR WARRANTY

When developing your product warranty, set forth the length of time that your company is going to stand behind the product. This should typically be at least one year. Many manufacturing warranties establish that there is coverage only if the customer maintains or uses the product as directed.

"It's important to note that a warranty does not absolve a manufacturer of legal liability if a purchaser or other third party is injured or killed while using the product," Reischer noted.

While you can draft your warranty language yourself, Reischer advises working with your legal department and/or an outside consultant who has experience in this area. Involve other departments, such as production, shipping and installation to ensure that the language reflects both the operational and financial considerations that go into repairing and replacing defective products.

Be sure to factor in any disclaimers that belong in the text. Disclaimers are a denial or disavowal of legal claim that help set parameters around what will and won't be covered in the event of a problem. However, they don't absolve companies from responsibility in the case of a legal claim.

### THE DOS AND DON'TS OF WARRANTY DEVELOPMENT

Phil Nicolosi of Phil Nicolosi Law, P.C., in Rockford, Ill., said putting your warranty in writing allows the manufacturer to disclaim any implied warranties in many instances while also more clearly spelling out what is and isn't covered in the event of a problem. This puts customers at ease and gives both parties a guide when handling claims. It sets limitations that attorneys and judges can use when making decisions during legal action.

"With express warranties, you can limit someone's ability to file a lawsuit and/or the arguments behind their case," Nicolosi said. "Unless there's a federal or state requirement stating that you have to make

a specific warranty for a certain duration, it's going to be difficult for someone to make an argument when there's a written warranty in place."

From his experience, Nicolosi said it's best when the manufacturer drafts the warranty language first and then passes the language along to an attorney to review and amend as needed.

"The manufacturer should at least take a stab at it first because they know their products, materials and parts better than anyone else does," Nicolosi said.

The exception is any manufacturer that operates with in-house counsel. In this case, the company's internal team likely possesses the appropriate level of organizational and industry expertise.

Regardless of who you pick to draft the warranty language, Nicolosi noted the focus should be on limiting liability in a very clear, detailed manner. Using a warranty template and then adding a 1-year warranty for workmanship and parts on top may satisfy your customers, but it won't protect your company very well in the event of a lawsuit.

"If your warranty is generic and just four or five lines long, you're doing yourself a huge disservice," Nicolosi warned. "Check with your state, the uniform commercial code (UCC) and warranty provisions; determine how they apply to your products; and then reread your language to make sure nothing is unclear or deceptive. Make sure you're going to do everything you say you're going to do within the warranty – it's that simple."

**"A properly drafted manufacturer's warranty should let the customer know that a manufacturer stands behind the product as the customer uses it."**

– David Reischer, Esq., *LegalAdvice.com*

### GOOD CUSTOMER SERVICE

According to Keena, warranties both protect your company in the event of a lawsuit and spread goodwill among customers who know they're getting a quality product that someone is willing to stand behind.

"At least if something goes wrong with the product, your customers know there's going to be a simpler remedy than a lawsuit," Keena said.

Time limits are also important. The time limits for express warranties are contained within the warranties themselves, are established by the precaster and are based on the anticipated service life for which the product is designed. For example, if a particular precast product is designed for a service life of approximately 100 years, then even offering a 5-to-10-year warranty against defects and failures could set a plant apart from competitors that only offer a 1-year warranty or no warranty at all.

A solid express warranty also ensures that customers are taken care of while giving them a remedy in case something goes wrong.

"It's good customer service," said Keena, who tells companies to focus their warranty-developing effort solely on their own activities and responsibilities versus trying to include situations that often can't be controlled, such as an installer's negligence. "You only want to be responsible for your own manufacturing process." **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.*

# Workforce Development & PLANT AUTOMATION

**When employed in tandem, workforce development and automation can future-proof your precast operation.**

By Alex Morales, M. Ed.

Manufacturers across North America are experiencing difficulty finding skilled employees who possess a desire to commit to manufacturing careers. The fear is that this issue, which is currently affecting the construction and precast concrete industries, may worsen over time.

By 2025, 3.5 million jobs will be available in manufacturing – up to 2 million may go unfilled due to lack of available talent.<sup>1</sup> To counteract these difficulties, precasters can turn to workforce development practices and automation systems, which will help their operations stand out among other manufacturing environments as the preferred place to work.

## WORKFORCE DEVELOPMENT

The three basic tenets of a solid workforce development strategy are attracting, training and retaining talent. Attracting talent, especially in anticipation of the workforce shortage prediction for 2025, means understanding the incoming generation and contextualizing the work in your plant in ways that appeal to them.<sup>2</sup> Max Cikerle, sales and marketing director for Schlüsselbauer’s

North American market, believes that means making more than just human resources changes.

“We are an old industry and have been doing the same old thing for a long time,” he said. “In other countries, concrete plants are clean working environments where some even vacuum the floors. To attract the new generation of employees, we have to change the way we think all around.”

Precasters should reevaluate all processes, including advertising a vacancy, how they onboard and treat incoming workers, and how they manufacture products overall.

After attracting new workers, the next step in workforce development is training.<sup>3</sup> According to the Bureau of Labor Statistics, the median employee tenure in the United States – or the point at which exactly half of all workers had more tenure and half had less tenure – was only 4.1 years as of January 2020.<sup>4</sup> This means that training should begin immediately upon hire to capture the passion of new employees early and encourage them to stay.

Despite its advantages, training alone is insufficient as a retention strategy.<sup>5</sup> Retention strategies should incorporate what you learned



The median employee tenure in the United States – or the point at which exactly half of all workers had more tenure and half had less tenure – was only 4.1 years as of January 2020.<sup>1</sup>

about the incoming generation when working to attract them. They should also include an effort to cultivate relationships with new employees. This can include listening to what’s important to them individually along with enacting change or adding value as determined by their feedback.

“Retention is about better, cleaner and safer work environments for our team to treat employees better – not taking plant floor workers for granted,” Cikerle said.

Even with a solid workforce development strategy, some manufacturers experience continued difficulty finding talent. The prevalence of technology jobs or options in the gig economy can exacerbate workforce shortages for precasters, leading some to consider automation to reduce the required number of full-time workers.

## AUTOMATION

Automation is changing the landscape for many precast plants by making the production process more consistent, more efficient, safer and less labor-intensive. The reduction in required labor causes many to consider automation as a replacement for workforce development activities. Balancing labor costs with the capital investment required to automate

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will vary from plant to plant. Precasters should consider costs and ask questions like:

- ▶ **What percentage of our current processes can be automated?**
- ▶ **How much will it cost to purchase equipment, install it and train employees on the new system?**
- ▶ **What labor cost savings can I realize after automating?**

However, considering automation is not just about the process, equipment and labor.

“There is a certain level of volume that needs to exist to create financial payback for any kind of capital investment like automation,” said Brad Schmidgall, CEO at Afinitas. “But that volume really depends on the market.”

The cost of raw materials, maintaining equipment, current staffing levels and more are impacted by production volume. These factors must be taken into consideration, along with the plant’s market pricing for their products.

“Sooner or later, manufacturers will have no choice concerning automation, regardless of size,” Cikerle noted. “Because it’s about creating better work environments for employees with technology.”

Schmidgall agreed.

“For a long time, the precast industry has been a construction site under a roof,” he said.

“It’s time to transition to a true factory environment and identify as

manufacturers with measurable processes and systems.”

### AUTOMATION AND TRAINING

Besides the potential cost savings and process improvements, precasters need to consider the cost and/or practicality of advancing current workers, asking questions such as:

- ▶ **What new skills are needed to work in the automated environment?**
- ▶ **Do any of my current employees already possess the skills needed?**
- ▶ **For employees who do not possess the necessary skills, is my current crew amenable to change and able to upskill?**

“Another driving factor in automation isn’t just replacing the cost of labor – it’s that you can’t find labor,” Schmidgall said. “Across the entire world, it is becoming increasingly more difficult to find skilled and reliable labor to work in a manual precast facility.”

With predictions that skilled labor shortages will become more problematic over time, the ability of current employees to upskill and succeed in a new, automated production environment is paramount. As such, training is not necessarily an area of potential savings when evaluating a decision concerning whether to automate. Analyzing comparative data between the training required to onboard new employees into your current plant environment and the training that would be required of current employees within an entirely new automated production system is recommended.



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## NEW TYPE OF EMPLOYEE

The skill set required of employees in an automated environment differs from that of employees in a traditional precast plant. A report from McKinsey Global Institute states, "The adoption of automation ... will transform the workplace ... [and] will also change the skills required of human workers."<sup>6</sup> The report predicts that by 2030, there will be a 14% decrease in the number of man-hours spent on physical and manual tasks and a 15% decrease in man-hours spent using basic cognitive skills. In the same timeframe, the report predicts a 55% increase in the number of man-hours spent using technological skills. This represents an incredible shift in skills over a 15-year period, which may make it difficult to upskill quickly.

"We've worked with one plant where an employee who used to manually install inverts in manholes thrived in the upgraded environment that was less strenuous," Cikerle said. "In other plants, employees had difficulty adapting to change."

Schmidgall thinks the new, younger generation's experience with technology may help plants automate.

"It's a perfect population to work in a high-technology environment," he said. "They're technologically savvy and are less likely to be intimidated by technological advances on the plant floor than some long-time employees."

According to Schmidgall, knowing your staff and planning accordingly will put your plant in the best position for future success.

"When a precaster builds an automated facility, I've found that it can be highly beneficial to bring in a new plant manager or lead maintenance engineer from the outside – specifically one who has worked in highly automated environments like the automotive industry," he said. "They bring a background in preventative maintenance that is helpful and are typically not intimidated by automated equipment and their control systems."

The decision to find a new type of employee brings us back to the three-part workforce development strategy. You will still need to attract, train and retain this new, experienced employee as well as the new tech-savvy employees that the automated environment will attract.

## AUTOMATION FOR THE WORKFORCE

If you've considered automating processes in your plant to create an environment that requires fewer employees, you will find that it becomes a workforce development strategy itself, rather than a replacement.

"Automation doesn't just reduce labor, it eliminates steps in production, enables you to create a leaner process and improves the plant floor work environment," Cikerle said.

Schmidgall added that automation is generally successful for those who implement it at their plants.

"Not one of the people I know who have embraced the new generation of workers and new automated environments regrets their decision," he said.

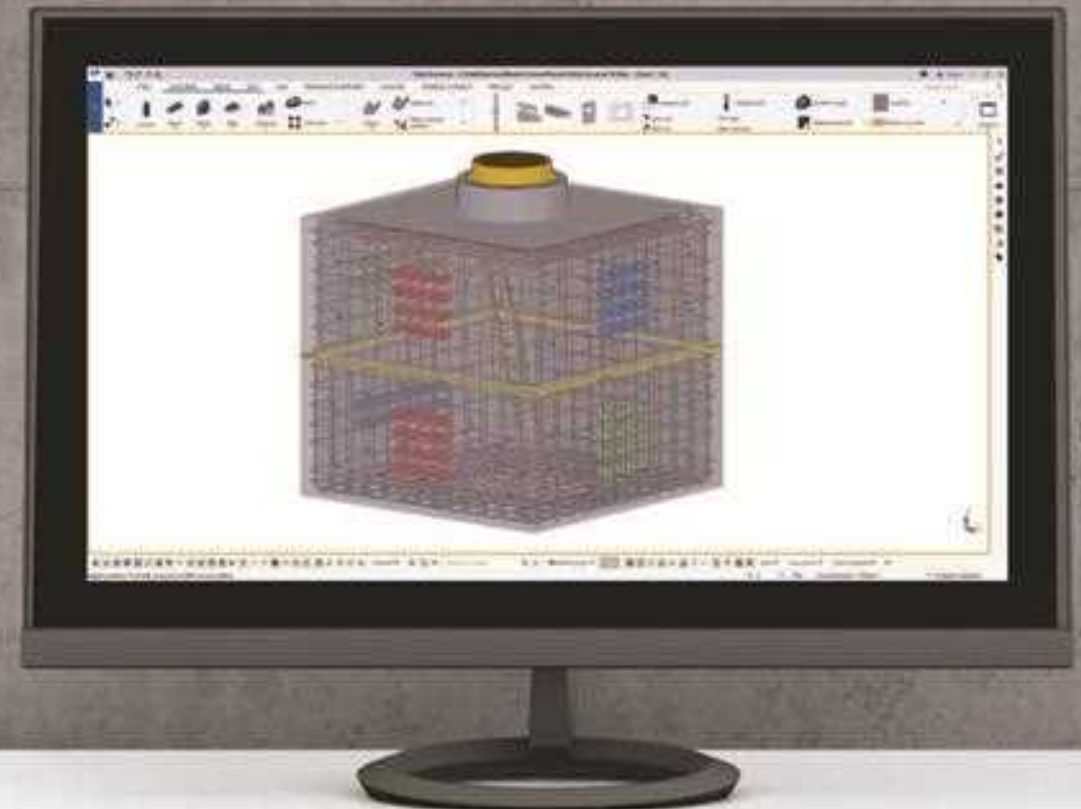
Automation and plant floor process improvements are solid strategies to help attract younger generations. But even the most advanced production environments still need to attract, train and retain their employees. Automation is not a substitute for workforce development tactics. It does, however, offer a good start to enhancing your plant environment as you work to remain a competitive employer in the industry. **PI**

*Alex Morales, M.Ed., is NPCA's director of workforce development.*

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# RAISING THE BAR with NPCA Plant Certification

By Phillip Cutler, P.E.

With so much competition in the marketplace, precast concrete manufacturers should look at ways to set themselves apart and attract more business from engineers and specifiers. Providing shipping or delivery incentives and rolling out new marketing strategies may prove helpful. But no matter your approach, NPCA Plant Certification should be on your short list.

While certification is often required just to bid on a job, there are many additional benefits for your business. As Lisa Roache, CEO of Gainey's Concrete Products in Holden, La., said, "Discipline and integrity come with NPCA certification."

Each of the following advantages is a key component of a precast operation that is on track for success. The NPCA Quality Control Manual for Precast Concrete Plants provides a non-prescriptive approach to selected requirements in support of these areas.

## PRODUCT QUALITY

The certification process begins with the most fundamental approach: a commitment from management and personnel to manufacture the highest-quality product during every pour. There is no path to success without this dedication from leadership and a similar response from personnel. Sound processes and manufacturing procedures also help make this your company culture. Certified plants must continually meet stringent requirements to maintain certified status; however, they are free to choose how to get there via the processes and procedures that shape quality production.

Bill Bundschuh, president of Kansas City-based PRETECH Corporation, explained that, even though his state does not require certification to submit bids for work, his company still commits to NPCA Plant Certification.

"We are going to manufacture a quality product no matter what,

so why not shoot for a quality bar recognized by specifiers?" he said. "Why should we reinvent the wheel when the NPCA manual and program contain everything we need? We sell our products on quality."

Drew Wieser, plant manager at Wieser Concrete Products in Roxana, Ill., noted that his company operates with a similar mindset.

"At the end of the day, we are members of NPCA because we are committed to building the best possible precast products we can," he said. "We believe that NPCA certification holds us accountable and helps us accomplish this goal. Even when we are not producing for a DOT specifically, we still hold to the same requirements of NPCA certification, so it helps us on all the products we make."

## PRODUCTION EFFICIENCY

Production efficiency requires a systematic manufacturing approach. A documented set of plant-specific policies and procedures will lay the necessary groundwork to set up an efficient production space. With processes and policies in writing, this will help establish a higher level of product consistency.

Coupling this with highly efficient production operations helps streamline processes and eliminate waste. Again, the NPCA Quality Control Manual for Precast Concrete Plants provides a great outline of general and product-specific requirements – no matter which products you manufacture. Applying an efficient and systematic approach to material validation, mix design, batching and mixing, testing, casting, stripping, yarding, and shipment are all critical steps on the path to success.

## CUSTOMER SERVICE

Another key component for high-performing plants is top-notch customer service, a goal that may seem easy but can be difficult to accomplish in practice. On the other end of the spectrum, poor customer service can have catastrophic effects on your company's bottom line – even with just a handful of bad or subpar reviews. News travels fast, and with enough poor performance, customer loyalty can go away even faster.

Whether it's a critical delivery date that must be met or a loyal customer that needs a favor, great customer service is a must-have for your business. NPCA Certified Plants with high product quality and efficient operations will generally be in a great position to offer quality customer service thanks to program requirements.

## SAFETY

While NPCA Plant Certification is not a safety program per se, there are certain minimum requirements established and related to plant safety that certified plants must meet. In plants where the staff is fully trained, processes and procedures are documented, expectations and requirements are fully understood, and a safety program exists, employees will work efficiently with safety top of mind.

## CONTINUOUS IMPROVEMENT ACTIVITIES

Most precast plants participate in some form of continuous improvement. This is important, because if you're not moving forward, business will grow stagnant and eventually fail. As the saying goes, "If you always do what you've always done, you'll always get what you've always got."

In 2019, the NPCA Quality Assurance/Quality Control Committee added continuous improvement requirements as an option for plants to potentially receive a perfect score on their annual plant audits. The committee chose four unique areas in which plants can document improvements: areas of production, processes, facilities and operations. Without these continuous improvement elements, plants can only achieve a maximum score of 92. Over the past two years, the number of NPCA Certified Plants participating in continuous improvement efforts has increased from 18% of all plants in the program to 28%. In addition, plants can participate

in document upload, additional industry-related employee education and semi-annual self-audits.

"We are always looking to do better," Bundschuh said. "The NPCA program made us use the manual, and it has become second nature to our quality personnel."

## MARKETING

Whether your local market requires NPCA Plant Certification or not, certified plants can use the items noted above as well as their own personal experiences as selling points when meeting with specifiers. Tracking and monitoring concrete strengths, providing history related to product quality along with production and product delivery data, and providing a copy of your annual audit report and corrective actions may also be used as selling points towards your companies quality assurance commitment.

## CONFIDENCE AND ASSURANCE

Greg Roache, president of Gainey's Concrete Products, summarized the importance of NPCA Plant Certification – including the methodologies outlined here – in achieving success.

"The NPCA QC Manual offers a summary of industry best practices that, if followed, gives us great confidence and assurance that quality products will be produced with supporting recordkeeping," he said.

With a dedication to quality products and the support of the program, that same confidence and assurance in your own products will also be felt by project owners and the specifying community.

For additional information on the NPCA Plant Certification program, visit [precast.org/certification](http://precast.org/certification) or contact Phillip Cutler, P.E., director of quality assurance programs, at [pcutler@precast.org](mailto:pcutler@precast.org) or 800-366-7731. ■

*Phillip Cutler, P.E., is NPCA's director of quality assurance programs.*





## A Small Investment,

# A Major Impact

Making your voice heard among those developing the codes and standards that shape the precast concrete industry may be easier than you think.

By Eric Carleton, P.E.



## Pop Quiz!

Do you know what ASTM International, AASHTO and ACI have in common? Do they all have a major impact on the precast concrete industry? Do they all allow for industry participation? Are they all standard-making bodies?

If you don't know the answer to the pop quiz above, you're in luck. In this article, you'll learn important information that will help you better understand each of these organizations and how your involvement within their standards-making processes will simultaneously strengthen your precast operations and improve the industry as a whole.

It is important to be knowledgeable about product and testing standards, along with related concrete production guide documents. One way to become familiar with a standard is to carefully read the associated document. But like all learning, the best way to understand and retain the knowledge is to dive deeper. In this case, that means becoming engaged and involved in the process of developing and improving these standards. Getting involved primarily means three things:

- ▶ **SHOW UP.** Become a member of one or more of the institutions and attend meetings.
- ▶ **SPEAK UP.** Participate in discussions, respectfully voice your opinions and volunteer to assist or lead task groups.
- ▶ **STAND UP.** Vote on ballot items when available and submit public comments on important standards or code issues.



### ASTM INTERNATIONAL

In the U.S., the standards most familiar to the precast concrete industry come from ASTM International, which is often referred to simply as ASTM. Since being founded in 1898, this organization has grown to more than 30,000 members dedicated to developing product standards and testing methods

using a proven consensus-based process. This process includes a variety of checks and balances to ensure all interested parties are heard.

Many NPCA members manufacture products required to meet ASTM standards requirements. Project specifications will often reference ASTM testing methods even for precast products that do not have an associated standard – such as sound wall panels, mechanically stabilized earth (MSE) wall panels and tunnel liner segments – to verify concrete quality and requirements concerning compression strength, entrained air content, flexural strength and freeze/thaw. Additionally, the acceptable raw material requirements of the cement, aggregates, admixtures and other components will likely be required to meet various ASTM standards.

### ASTM is comprised of more than 140 technical committees responsible for publishing 12,000 individual standards.

ASTM is comprised of more than 140 technical committees responsible for publishing 12,000 individual standards. One of the most important technical committees in our industry is ASTM Committee C27 on Precast Concrete Products. C27 focuses on precast products including utility structures, architectural and structural products, water and wastewater containers, glass fiber-reinforced concrete and precast autoclaved aerated concrete.

Committee C13 on Concrete Pipe includes subcommittees devoted to reinforced and non-reinforced concrete pipe and concrete low-head pressure pipe. This committee, which is nearly 100 years old, also covers the standards for circular precast manholes, precast concrete box sections (culverts), 3-sided bridge structures, joints for concrete structures (rubber gasket, butyl and bitumen sealants, external wraps) and the effects of biogenic sulfuric acid on concrete pipe and structures (microbial induced corrosion, or MIC).

Finally, Committee C09 on Concrete and Concrete Aggregates is a massive group, consisting of 30 subcommittees. C09 deals with all facets of concrete's raw materials, sampling, testing, normal and lightweight aggregates, fibers and testing of fiber concrete, requirements for ready-mix concrete, and more. This committee also includes subcommittee C09.47, which continues to

develop and modify industry standards for self-consolidating concrete.

If any of these standards are important to your product lines, or you wish to learn more about them, you may consider joining ASTM. To do so, visit [astm.org/membership](http://astm.org/membership). With your membership, you can join as many technical committees as you'd like.

As mentioned previously, ASTM uses a consensus-based methodology for decision-making. This is to ensure that the technical committee's votes are balanced between industry members (producers of a product) and owners (users or purchasers of the project) along with general interest groups (knowledgeable participants who are not financially tied to a product standard or test). Membership permits access to committee activities, meetings, agendas and minutes, along with the opportunity to vote on formal ballot items. Depending on the status of your business or your job function, your membership classification may be "producer." This could result in you being placed on a wait list within the committee or subcommittee until a producer membership becomes available. However, the wait list status does not preclude you from participating.

ASTM members can sign up to receive notifications concerning any new committee work item or revision of an existing standard. This will allow you to be ahead of the curve both with developments within ASTM as well as the precast industry as a whole.



### AASHTO

More than a century ago, 14 state highway engineers formed the American Association of State Highway Officials. The organization's main focus was to secure federal aid and legislation for improving highway and transportation systems. In 1973, the group sought to include the broader transportation sector, resulting in a name change to the American Association of State Highway and Transportation Officials (AASHTO).

AASHTO is often mistaken as a government institution, but it's a private, not-for-profit association with a voting membership comprised of state highway officials. Non-

voting membership is provided to Federal Highway Administration employees and Canadian province representatives.

Today, AASHTO's two technical committees – the Committee on Materials and Pavements (COMP) and the Committee on Bridges and Structures (COBS) – have a direct impact on the precast concrete industry.

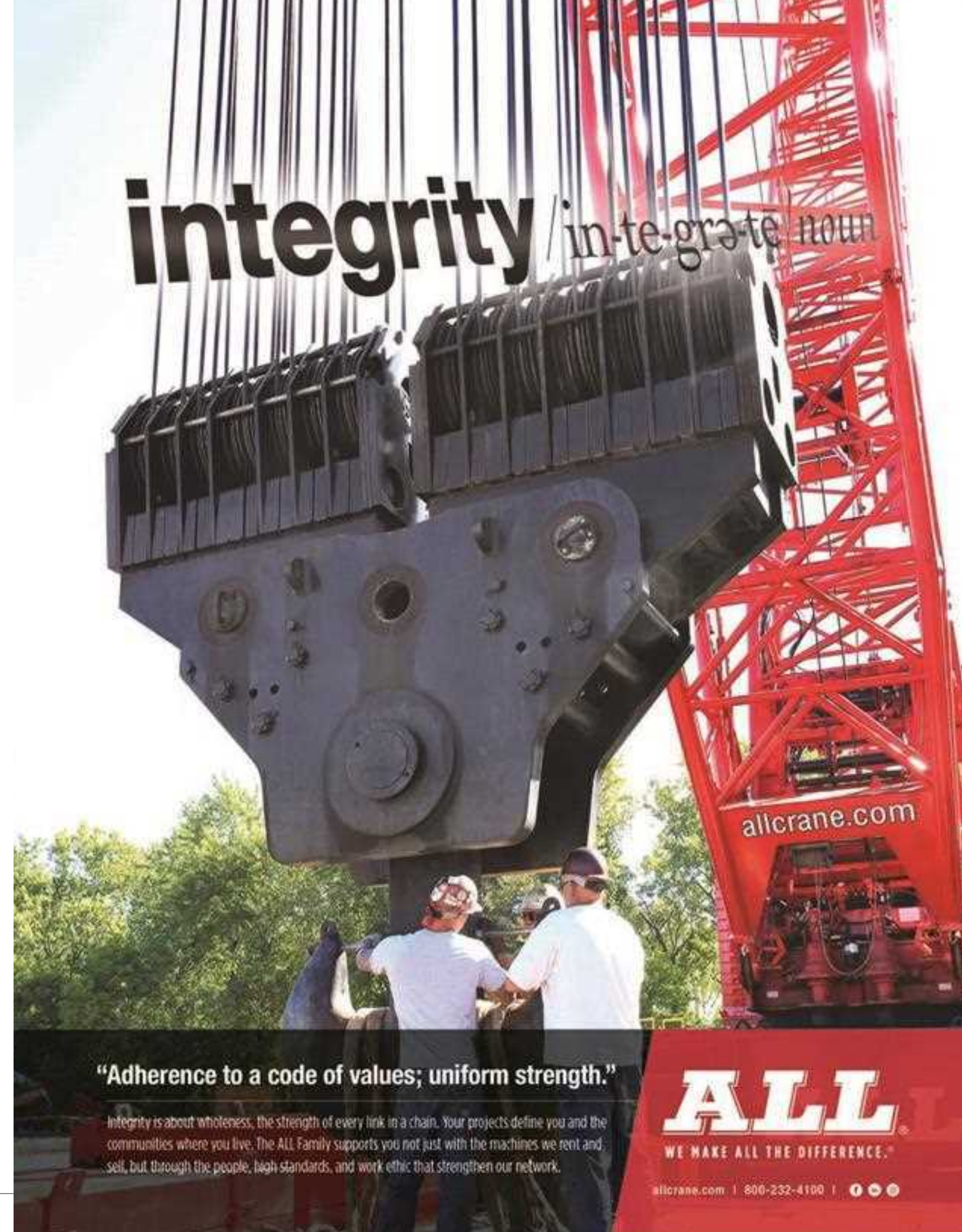
### AASHTO's two technical committees have a direct impact on the precast concrete industry.

COMP is a group of material engineers and lab technicians who establish material and testing standards used for transportation construction. The committee is further broken down into subcommittees, including 4a Precast Drainage Structures, which impacts the precast industry. Many of the AASHTO precast product standards reference or mimic their respective ASTM standards. For example, ASTM C478 and AASHTO M199 both apply to precast concrete manholes. However, there are slight variations that do exist, so be aware of them to maintain compliance with your state's department of transportation specifications. More information on COMP can be found at [materials.transportation.org/](http://materials.transportation.org/).

As mentioned, voting membership within AASHTO is restricted to DOT employees. AASHTO committees are comprised of appointed state representatives with a requirement that no state is represented by more than one voting member. Though industry is not allowed to vote, it is encouraged to participate in proposed new or revised standards discussions. You can get involved by attending and participating in COMP meetings and conference calls or through active dialogue on the issues with your local DOT materials engineering department. If all parties agree, the local DOT official can bring your concerns to the meeting or ballot.

COBS is comprised of DOT structural design engineers who develop the design methodology for all concrete, including precast transportation structures. This group is responsible for writing and maintaining the LRFD Bridge Design Specifications manual.

The primary subcommittee within COBS related to buried precast products is T-13 Culverts. Though the name implies "pipe," the scope of this committee includes all



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drainage-related structures, including inlets, manholes and box culvert. MSE walls and large precast block section wall design criteria fall under subcommittee T-15 Substructure and Retaining Walls. Another important COBS subcommittee that has developed many important documents related to accelerated bridge construction and the associated prefabricated bridge elements and systems is subcommittee T-4 Construction.

Like the rules within COMP, only DOT appointed representatives have a vote within COBS and private industry does not have a vote, but is permitted to register to attend committee meetings for information and discussion. Contact your local DOT's bridge engineering department for any issues requiring attention.



American Concrete Institute

*Always advancing*

**ACI**

The final member of the “century club” group is the American Concrete Institute, which was founded in 1904. ACI was originally created to improve the quality and consistency of preformed concrete masonry block. The group's first convention was held in 1905, and it sought to share information and experience; to promote best practices with various uses of cement through conventions, papers and meetings; and to study materials, machinery, and methods. Interestingly, these objectives are still being met through today's modern ACI committee and convention structure.

While ASTM and AASHTO COMP develop material and testing standards, ACI committees develop best practices documents and “how to” guides. Examples include how to repair concrete structures, develop concrete mix designs or apply best practices for cold weather or hot weather concrete placement. Additionally, many ACI committees develop building code documents which are adopted by legislative bodies to become the rule of law as to the methods of designing and building concrete structures. Other ACI committees are responsible for the development of the important technician certifications –

including field technician, SCC and strength testing technician – which are requirements for many precast plant certification programs. ACI's large committee structure touches on every aspect of concrete.

**The individuals who make up these committees are the leading concrete experts. They gather twice a year for ACI's conventions and with many conference calls.**

The individuals who make up these committees are the leading concrete experts. They gather twice a year for ACI's conventions in addition to many conference calls. Several committee meetings take place at these conventions, along with a variety of technical sessions and paper presentations on all things concrete. If you're looking to learn more about best concrete practices or the latest cutting-edge technology, this is the organization for you and your company.

Like the other organizations referenced here, each committee requires a balance of members from industry, government and academia. Committee membership begins with an application that is reviewed by the respective committee's leadership. The committee's current membership and availability will determine if you will be placed as a voting member. Typically, new members become involved with various committees by active participation at the subcommittee level, then work toward main committee membership appointment by the chairperson. Regardless of the voting membership status, committee meetings are open and pertinent participation by all attendees is encouraged.

**DIVE IN**

In 2021, consider showing up, speaking up and standing up with one or more of these vital industry bodies. Doing so will allow your voice to be counted among the industry leaders developing the codes and standards that shape our precast world.

For more information about how you can get involved, email NPCA Vice President of Technical Services and Professional Development Marti Harrell at [mharrell@precast.org](mailto:mharrell@precast.org). PI

*Eric Carleton, P.E., is NPCA's director of codes and standards.*

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# then & NOW

Then & Now is a new series for *Precast Inc.* magazine this year. Each issue, NPCA will catch up with companies previously featured in what was then called *MC magazine*.

## Barbour Concrete

For the first Then & Now feature, NPCA caught up with Dan Barbour and Amy Burnett of Barbour Concrete in Independence, Mo. Barbour Concrete was featured in the Fall 1995 issue of *MC magazine*. At the time of the story, their parents, Jim and Daneen, were running the company. Dan had just joined full time the year prior, and Amy would join it the following year. Dan now serves as company president, while Amy is vice president. Barbour Concrete is proudly celebrating its 75th anniversary this year.



Dan Barbour



Amy Burnett

**Q:** Your feature article in the Fall 1995 issue of *MC magazine* focused on adapting your company to changes in the industry and the marketplace at that time. How much has your company changed in the 25 years since that time?



**A:** The biggest, craziest thing we have seen was the impact of the 2008 recession and the fact that we were able to survive it while others were not. We still make a lot of the same products, as well as some new ones. We are also proud to be celebrating our 75th anniversary this year. Things change through the generations. Our dad would tell the story about when his father got so upset when he bought a \$400 calculator. Now, we are buying \$100,000 pieces of equipment or doing things that he had a hard time wrapping his mind around. When he started in this, he never had the thought of us having the need or the ability to pick up 100,000 pounds. The size of our products and the scope of the projects we work on has grown.

**Q:** When that story ran, your parents (Jim and Daneen) were running the company. Now, you two have left your mark on it. How do you think each of your parents would feel about the company today and where it is headed?

**A:** Mom passed away very early in that span, but dad continued to be involved and was a sounding board until about two-and-a-half years ago. The transition was never scheduled or mapped out for us. It's been an evolutionary thing. From mom's perspective, I think she'd be very proud. Dad was very proud.

**Q:** What were some of the best lessons your parents taught you?

**A:** Treat people the way you want to be treated. Work hard. Take notes. Base hits score runs – you don't have to swing for the fences every time. Be realistic.

**Q:** Another key aspect to the story was your reliance on employees for not only the day-to-day business, but also helping you identify where you need to grow and change. Talk a little about the team you have today and their contributions to the company.

**A:** Some of those people who were here when that first article was written are still here. One gentleman who retired at the end of 2020 was here 46 years. He would have seen our grandfather, our father and now us run the business. We have another who has been here more than 30 years in the office. More than 70% of our staff has been with us 7-10 years or more. We have a lot of

people involved who have been here across the generational gap, and we are trying to find the next generation of people who will keep us going into the next generation. They feel like they are a part of the family, and we treat them with respect.

**Q:** Dan, you talked about training in that article. How has your approach to training changed over the years?


**A:** Once we feel like they are a fit, we start training them to be more productive, more efficient and to better understand what they are doing and why they are doing it. I think NPCA's training validates what we tell them. NPCA has been a tremendous help to us so that it's not just us, but there is another source telling them how and why things are done.

**Q:** What are big shifts you see coming in the next 25 years?

**A:** One of the biggest shifts I see will be with labor. When I came back here in 1994, I told my father that my guess was that blue collar workers would be in short supply, and he thought I was crazy. But here we are having trouble finding that type of labor. People don't seem to want to get into the trades anymore, and we lost so many construction workers during the recession who never came back. We have not come close to replacing that.





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**Q:** Your father spoke about the importance of his NPCA network to generate new ideas and solve problems. How important has your NPCA network been to you two during your time leading the company?

**A:** It goes back before we even worked here. Growing up, their friends were always around so it's a lifetime thing. We remember being little tikes in 1974 when the Convention was in Kansas City for the first time and the Board of Directors dinner was at our house. Mom and dad always said they had



Amy Burnett, Jim Barbour and Dan Barbour

to give back to the industry because the industry had given them what they had. It's extremely important to continue those relationships. The transition was fairly seamless because we all saw those things

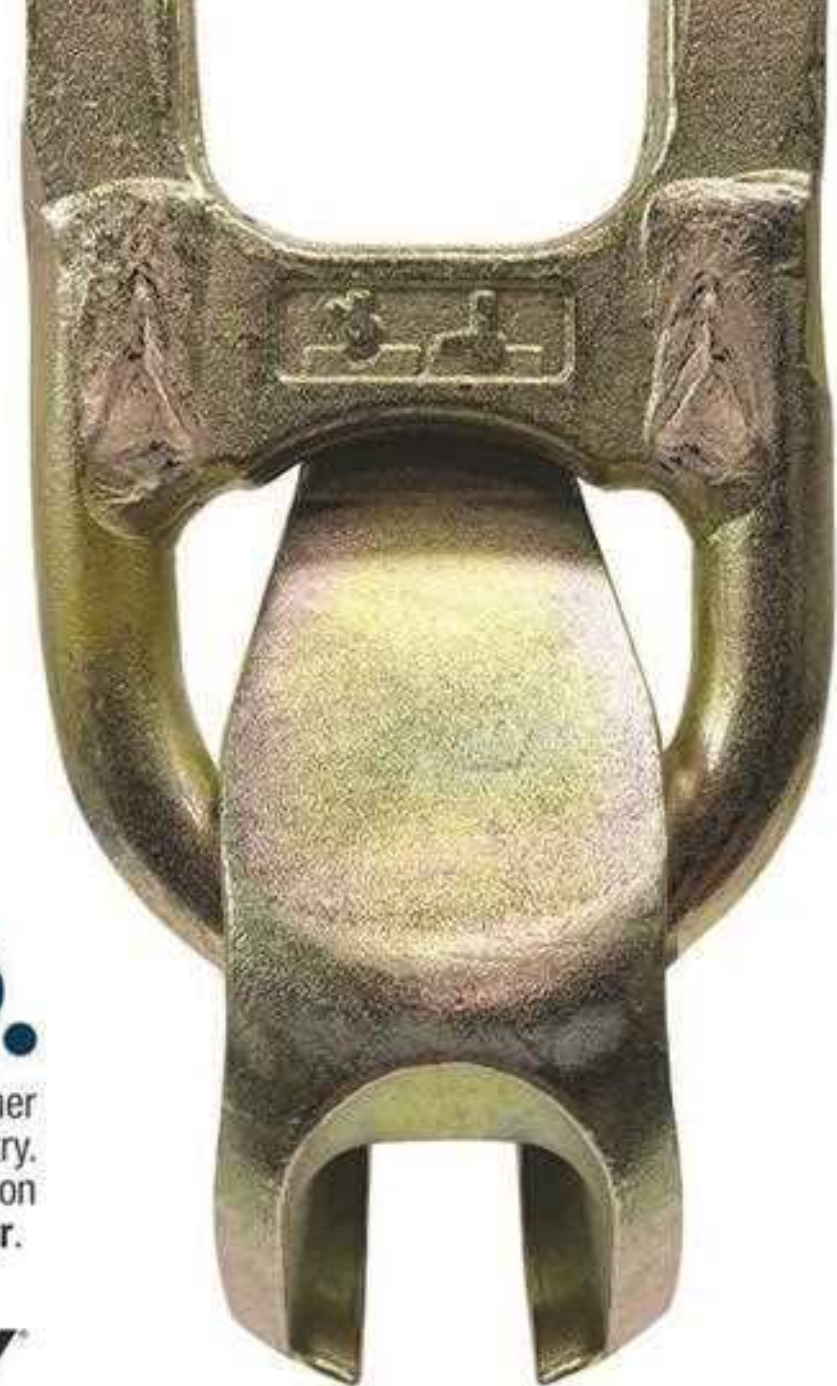
were important and wanted to help each other. Our plant manager was just talking to me about a relationship he has developed. Our employees who travel with us are learning and understand the importance of it. You're going to get back twice as much as what you put into it.

**Q:** At the time of that story, your kids were still young, and you didn't know if any would be interested in joining the business. How has the next generation played into the family business?

**A:** We both have a son involved with the company, both working on trying to understand and learn the industry. Both are Master Precasters and travel with us to the shows. They are starting their lives in the industry. We're not ready to be done, and we don't know what the timeline looks like, but it will be an evolution. We'll remain flexible and make sure they learn the entire business. In this industry, and at this size, you don't think about retirement or "chase the rabbit" to retirement. Our parents stayed involved, and we will as well. You just get a little bit longer vacation. Our dad knew what was going on pretty much until he passed.

**Q:** What are your hopes for Barbour Concrete for the next 25 years?

**A:** I don't think I can dream to that point because a lot of stuff is evolutionary. My grandparents would have said bird baths and flower pots were the greatest thing. Dad said manholes were going to be the greatest thing. Now we're doing telecommunications shelters, retaining walls and a lot of other things that have just been a part of the natural progression. **PI**



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# FALL PROTECTION IN THE PRECAST CONCRETE INDUSTRY

By Mason Nichols

**Establishing processes, using the right equipment and developing a strong safety culture are all key to safely working from heights.**

Year after year, falls are the leading cause of death in the construction industry. In 2018, falls contributed to 33.5% of all recorded deaths, representing more than 330 fatalities.<sup>1</sup> Falls are one of construction's "Fatal Four" accidents.<sup>2</sup> Fall protection also is consistently listed as the top offender on the Occupational Safety and Health Administration's "Top 10 Most Frequently Cited Standards."<sup>3</sup>

Precast concrete manufacturers place concrete into a form, load material onto a trailer and perform maintenance on equipment. All these activities and many others can require working from heights. What can precasters do to protect their team members in these situations? Fall prevention begins with understanding the associated OSHA standards

for general industry and construction. Based on that understanding, providing employees with the appropriate safeguards and protective equipment, and continually establishing a culture of safety, serves as the backbone for an effective program.

## APPLICABLE OSHA STANDARDS

Two OSHA standards govern work taking place at precast plants and on job sites – 29 CFR 1910 Subpart D for general industry and 29 CFR 1926 Subpart M for construction. The general industry standard (1910.28 (b)) specifies that employees working at 4 feet or more above a lower level shall be protected from falling, while the construction standard (1926.501(b)(1)) ups this requirement to 6 feet or more above a lower level.

Michael Cunningham, environmental health and safety compliance manager for Oldcastle Infrastructure and NPCA Safety Committee member, said the majority of operations taking place within a precast plant are regulated by the general industry standard. Once a product is shipped to a job site, the construction industry standard will typically come into play.

## OSHA lists several general recommendations to prevent employee injury due to falls:

- Guard every floor hole into which a worker can accidentally walk (using a railing and toe-board or a floor hole cover).
- Provide a guardrail and toe-board around every elevated open-sided platform, floor or runway.
- Regardless of height, if a worker can fall into or onto dangerous machines or equipment, employers must provide guardrails and toe-boards to prevent workers from falling and getting injured.
- Other means of fall protection that may be required on certain jobs include safety harness and line, safety nets, stair railings and handrails.

## Additional OSHA requirements play a role in fall protections, such as:

- Provide working conditions that are free of known dangers.
- Keep floors in work areas in a clean and, so far as possible, a dry condition.
- Select and provide required personal protective equipment at no cost to workers.
- Train workers about job hazards in a language that they can understand.<sup>4</sup>

The above lists represent what you can do at a basic level to protect your employees. According to OSHA's "Hierarchy of Controls," the No. 1 goal in addressing working from heights should be elimination. Removing the hazard by eliminating it from the associated task is always the best solution. Because doing so is not feasible in every situation, alternative approaches and appropriate equipment – including guardrail systems, safety net systems, physical barriers and personal fall protection systems – are necessary.

**"Upper management has to recognize just how crucial fall protection is and the severity of the hazards associated with working from heights."**

– John Coniglio, *Occupational Safety and Environmental Associates*

## EXAMPLES IN THE PLANT

Precast plant employees may face a variety of operations that require work from heights. Below are several examples, along with steps that should be taken to ensure compliance and safety.

### **A worker climbs up a 10-foot portable ladder to inspect rigging.**

In this situation, the worker is performing the task above the 4-foot height referenced in 29 CFR 1910 Subpart D. However, according to 1910.28(a)(2)(i), the restrictions set forth in the standard do not apply to employees working on portable ladders. Fall protection is technically not required, and the employee can complete the task without any special considerations. However, Cunningham advised against



Proper railing and gates can prevent falls when working on taller forms.



becoming complacent with workers who use portable ladders.

“As a company, you can either be compliance-based or risk-based,” he said. “If an OSHA inspector walks through the door, technically you’re safe because an employee is working on a 10-foot portable ladder, and you aren’t going to be cited. But that doesn’t mean that the employee won’t get hurt if they fall off the ladder.”

“In these cases, we try to look for safer alternatives. Even if you are in compliance with OSHA standards, someone can still be seriously hurt.”

**A worker positions himself on top of a 4-foot-tall form to pour a product.**

It is possible to climb to the top of forms without appropriate fall protection systems in place to place concrete in the form. Doing so at 4 feet or above, however, violates the OSHA standard.

Amanda Richardson, industry specialist with HUB Industrial Supply, noted that the best approach would be to retrofit the form with a catwalk and guardrails so that employees can work from the 4-foot height with the appropriate fall protection in place. While precasters can retrofit the forms themselves, Richardson suggested working directly with a supplier who can help get your forms into compliance.

Care should also be taken if a form is close to, but not at or above, the 4-foot height requirement. As Cunningham explained, even if a 44-inch-tall form is compliant, employees may still be significantly injured by a fall from the top of the form. Additionally, while retrofitting is a great option for existing forms, consider sizing, dimensions and appropriate fall protection systems for any new forms you plan to purchase. Working directly with a supplier ahead of time is the best way to plan for fall protection on new equipment.



**A worker hops on top of a trailer in the yard to position a completed product for transport.**

Employees can end up working from heights when positioning pieces for shipment. This can happen with flatbed trailers. While this may appear to be a harmless task, flatbed trailers typically measure anywhere from 58-to-62 inches high, meaning that any employee who engages in this activity should have a fall protection system in place.

According to Cunningham, the resolution is to work your way through the hierarchy of controls to eliminate the hazard. Ask

Employees could end up working from an unsafe height when positioning pieces for shipment on a flatbed trailer.

questions like, “Does the employee have to be on top of the trailer to assist in this operation?” and “What alternative measures exist to help strap this product down?”

Engineering controls and guardrails aren’t generally feasible with loading and transport, so you may find that equipping your workers with personal fall protection systems – in conjunction with available anchor points – is the best solution.

**CULTURE IS EVERYTHING**

The examples listed above represent potential encounters with working from heights at precast plants, but there are countless additional scenarios where workers may be working from heights. In addition to creating safety plans that address these types of situations and considering all aspects of your operation, one of the best ways you can prevent injuries is by establishing a strong safety culture.

John Coniglio, managing director for safety consulting firm Occupational Safety and Environmental Associates in Orchard Park, N.Y., said culture starts at the top.

“Upper management has to recognize just how crucial fall protection is and the severity of the hazards associated with working from heights,” he said. “Then, they must get directly involved so that employees understand their expectations. Everyone down the line has to march to the same drum – that’s what culture is all about.”

Cunningham agreed, adding that what has been successful for Oldcastle is ensuring that all team members actively watch out for each other’s safety.

**“They [management] must get directly involved so that employees understand their expectations. Everyone down the line has to march to the same drum – that’s what culture is all about.”**

– John Coniglio, Occupational Safety and Environmental Associates

“For us, it’s making sure that our employees and their supervisors are always monitoring and looking out for one another,” he said. “If someone is working on a 10-foot step ladder when they don’t need to be, another employee is engaging them and saying, ‘Hey, let’s go grab you a scaffold or this work platform so we can do this in a safer manner.’”

Oldcastle pairs this culture-driven approach with processes and controls in place. That way, most hazards – including working from heights – are either eliminated or engineered out of the equation.

Establishing a strong safety culture means team members understand that they must always check their equipment before use. As Richardson explained, the best approach is to inspect equipment, such as harnesses and lanyards, to confirm each piece is in working condition with no frays or kinks. For other equipment, such as scaffolding, make sure all bolts are fastened and secured.

Beyond these checks, Richardson emphasized contacting your suppliers for support, along with leveraging the many resources available from NPCA.

NPCA offers a wide variety of resources on safety topics such as its bi-monthly safety series and its safety videos available at [precast.org/safety](http://precast.org/safety).

“I also strongly encourage producers who may have questions on working from heights and appropriate safety measures to reach out to the NPCA Safety Committee for assistance,” she said.

**IT TAKES EVERYONE**

Many factors play a role in ensuring workers’ safety as they operate from heights in a precast plant. Planning and strategizing around your approach is crucial because a variety of operations within plants require employees to work above the 4-foot-high limit established by OSHA’s general industry standard.

Start by identifying situations in which tasks will be performed above the limit, then engineer them out or eliminate them wherever possible. For the remaining tasks, provide your employees with the work environment and equipment they will need, including guardrails, catwalks and harnesses, to stay protected. Finally, establish a culture where all members of your team, from leadership to the production floor, place a premium on safety and watching out for one another. **PI**

*Mason Nichols is a Grand Rapids, Mich.-based writer and editor who has covered the precast concrete industry since 2013.*

**REFERENCES:**

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- 2 <https://www.osha.gov/Publications/OSHA3146.pdf>
- 3 <https://www.osha.gov/top10citedstandards>
- 4 <https://www.osha.gov/fall-protection>

▶

NPCA offers a wide variety of resources on safety topics such as its bi-monthly safety series and its safety videos available at **[precast.org/safety](http://precast.org/safety)**.

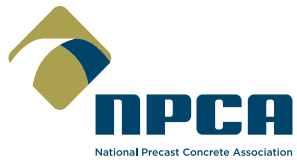
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# Working For You

## IN REVIEW

The NPCA professional staff works to expand the use of quality precast concrete products in many ways. To keep you informed of these ongoing efforts, we created the **Working For You** page at [precast.org/working-for-you](https://precast.org/working-for-you).

This recap provides a year-in-review of professional staff activities throughout 2020. Visit the **Working For You** page to read the full stories or to learn more.



### Certification and Specifications

Chris Frederick, director of certification and regulatory services, continues to promote precast and NPCA Plant Certification to federal agencies, state departments of transportation, cities and counties. In 2020, plant certification earned recognition in state specifications for Alaska, Montana and Arizona, and in city specifications for Green Bay, Wis. These efforts to promote precast specifications and NPCA Plant Certification result in more jobs and project bids for NPCA members.

NPCA encourages members to get involved with the association's committees, such as Quality Assurance/Quality Control, to help steer the plant certification program and push the needle in favor of quality precast products. On the Working For You page, you can also view a map of current state, city, municipal, county and other specifying entity requirements. Contact Chris Frederick via email at [cfrick@precast.org](mailto:cfrick@precast.org) or call (800) 366-7731 with questions pertaining to specification of NPCA Plant Certification.



### Marketing

Targeted advertisements have resulted in more than **200,000** visits to [precast.org](https://precast.org) in 2020. NPCA's efforts on Facebook and Facebook and Twitter have netted more than **1,150,000** impressions and resulted in **5,634** new followers.

### Codes and Standards

NPCA professional staff members have attended or participated in conference calls for more than **75** meetings, as they actively represent the precast concrete industry on **40** groups, committees and task forces.

### Specifier and Academic Outreach

With restrictions on travel beginning in March 2020, many organizations began to offer webinars in place of in-person education. NPCA was no different in 2020 but managed to conduct **45** presentations (both in-person and virtually) to **5,339** specifiers and students across the country this year.

#### Specifier outreach

NPCA trained **4,835** specifiers via **33** presentations offered at both in-person and virtual specifier events, including the 2020 Specifier Webinar Series.

NPCA professional staff offered **17** in-person presentations to **1,524** specifiers from January to mid-March prior to shutdowns due to the COVID-19 pandemic. The outreach program switched gears in May and began offering virtual education to specifiers for the remainder of 2020.

The four installments of NPCA's 2020 Specifier Webinar Series kicked off in May and covered topics in jointed precast concrete pavement, stormwater, infrastructure and microbially induced corrosion. This was a record-breaking year for specifier webinar attendance, which collectively led to **2,063** specifiers trained – a **162%** increase from 2019 attendance. The table below illustrates a steady yearly increase in registrations and attendance for specifier webinars from 2016 to 2020.

Specifier Webinars	Registered	Attended
2016	1,117	781
2017	961	601
2018	809	466
2019	1,308	786
2020	4,647	2,063
<b>Total</b>	<b>8,842</b>	<b>4,697</b>

#### Academic outreach

NPCA professional staff trained **504** civil engineering, construction management and concrete industry management students within the first three months of the spring semester and throughout the fall semester in 2020. As colleges and universities across the nation moved to remote instruction for the fall, so did the outreach program's strategy for reaching this audience. Offering virtual guest lectures to students and faculty allowed NPCA to continue developing relationships with programs at Purdue University, California State University Chico, and Oregon State University, while also leading to new ties with Stevens Institute of Technology in New Jersey.



### Other Activity

#### Free year of professional membership offered to graduating students

NPCA began offering a free year of Professional Membership to graduating Student Members in spring 2020. Since then, NPCA has converted **9** Student Memberships to Professional Memberships. This added benefit is aimed at keeping students entering the workforce engaged with NPCA as they embark on careers in the construction, manufacturing or specifying industries.

#### Precast Days 2020

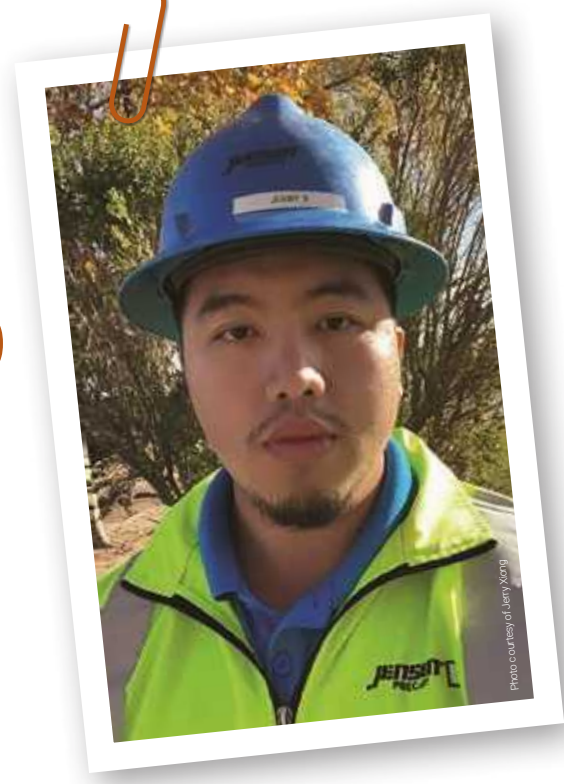
More than **30** plants across the U.S. participated in Precast Days 2020. COVID-19 restrictions caused many plants to shift to a virtual format, and NPCA provided webinar-based programming and virtual plant tours for all plants. The virtual Precast Days events and in-person events collectively brought in **693** registrations and more than **460** attendees to the live sessions and events.

This year has brought many challenges and caused nearly every business to pivot – sometimes more than once. NPCA is no exception. Yet, despite the changes, it has been a very successful year and these same efforts will be carried into 2021 until we are able to resume in-person outreach efforts.

**For more information on NPCA's outreach efforts, contact Ashley Benson at [abenson@precast.org](mailto:abenson@precast.org) or (800) 366-7731.**



# NPCA Scholarship Recipient Sets Sights on Future in Precast



With the help of an NPCA Foundation scholarship, **Jerry Xiong** found his calling in the precast concrete industry.

With the help of an NPCA Foundation scholarship, Jerry Xiong found his calling in the precast concrete industry. Every year in the U.S., more than 1.7 million private scholarships and fellowships are awarded to promising young students. For many, these funds are vital. In fact, Sallie Mae says 25% of higher education is funded through scholarships and grants.

However, scholarships can actually serve a dual purpose of providing much-needed funds and teaching recipients about an industry. NPCA Foundation scholarships serve both of these objectives, and California State University, Chico, graduate Jerry Xiong is the perfect example of how this can benefit the individual and an industry.

## A GREAT OPPORTUNITY

When Xiong graduated from high school he set his sights on mechanical engineering, but soon realized that probably wasn't the best career path for him. He was in that program for a year before switching over to computer science. After realizing that also was not the right fit, he began to explore other career and educational opportunities that would allow him to be more hands-on with work.

When attending an on-campus session about construction management and civil engineering, he stopped at a booth that introduced students to opportunities in the Concrete Industry Management (CIM) program, and Xiong was immediately interested. Individuals running the booth talked to him about working with concrete, understanding soil quality, and making the distinctions among concrete, asphalt and cement.

"It was something interesting and something new for me to learn about," Xiong said. "I did more research and switched my major to the CIM program."

After declaring his new major, Xiong learned about the NPCA Foundation scholarships and quickly filled out the application. He was

soon looking for a way to apply his technical knowledge in a real-world work environment, which the scholarship also provided.

While in school, Xiong learned the details of raw materials and mix design, the latter of which is a critical component of good precast production.

"We learned all about the different aggregates, which mixes to use in which types of environmental conditions, and many other points that proved useful when I started working in the field," said Xiong, who feels that he graduated with a broad understanding of precast design and production. "I learned a little bit of everything, and that really helped when it came time to actually start working."

## FOCUSING ON SCHOOL

The scholarship helped cover Xiong's rent, bills and other expenses and allowed him to focus on school and graduate as quickly as possible. The CIM program gave Xiong a strong, fundamental knowledge of concrete. He learned about project management, production and quality practices. For some hands-on experience in precast, he completed an internship with Oldcastle Infrastructure in Stockton, Calif.

In 2018, Xiong applied for another internship, this time at Jensen Precast's Sacramento, Calif., location. He liked that the company was working toward its NPCA certification, family-owned and had an environmentally sustainable operating approach.

"I really enjoyed my internship (at Jensen)," he said. "I did a lot of cycling from department to department, doing training and learning the ropes."

Upon graduating from CSU Chico's CIM program, Xiong received an email from the Jensen plant manager he worked for, Mike Gardner, asking him if he would be interested in a position as the plant's quality control supervisor. Xiong accepted and in that position he's responsible

for all facets of quality, including pre-pour, post-pour, pressure testing and revisions.

"He regularly works with our engineering team, updating it on all of the details and ensuring compliance," said Gardner, who has been working with Xiong for about a year. "Jerry also works closely with our regular vendors, like Caltrans and Sacramento Municipal Utility District."

Gardner said Xiong's work ethic is second to none, giving him a lot of potential in the precast industry. From the technical perspective, Gardner says he appreciates Xiong's expertise.

"He's here every day putting in the work and he's a natural leader," he said. "Jerry also isn't afraid to speak up when he needs to."

Xiong felt his education gave him a leg up when applying for jobs in the precast industry. He said he learned much more than the basics and expanded on that knowledge during his internships. In a technical field like precast, he said having that knowledge and the skills and experience from his internships is key. Gardner agreed and sees a bright future for Xiong.

## A MORE SUSTAINABLE FUTURE

Since joining Jensen in 2018, Xiong has managed numerous quality control projects while also helping the location obtain its NPCA certification. Today, he works all over the plant, ensuring that all quality control issues are managed and that the plant is compliant.

Looking ahead, he's hoping to have an even greater impact in the sustainability realm, where companies like Jensen have a real opportunity to get more heavily involved with environmentally sustainable initiatives like concrete recycling.

"We learned about concrete recycling in school, which is only going to gain in importance as materials become depleted," said Xiong, who added that Jensen both recycles its concrete and reuses its materials. "Recycling is efficient, effective, and it helps reduce waste and costs. It's also better for the environment and for both present and future generations." **PI**



Visit [precast.org/foundation](https://precast.org/foundation) to apply for a scholarship.



# Joint Concrete Products Document Clarifies Certification Requirements

NPCA Staff Report

Joint Concrete Products List JCPL						
Product Name	ASTM Standard	AASHTO Standard	PCI Category	NPCA	PCI	Both
<b>Agricultural Products - Nonprestressed</b>						
Runway Sills				X		
Circle Pave Sills				X		
Circle Closures				X		
Agricultural Fencing and B-Barms				X		
Pavement				X		
Elemental Slabs				X		
Elemental Sidewalk Borders				X		
Other Agricultural Products				X		
<b>Building and Site Ancillaries</b>						
Air Conditioning Base				X		
Architectural Products	CSA 101 (see notes on PCI category below)			X		
Architectural Products, Cladding			AI		X	
Basement Extensions				X		
Basement Walls/Foundation Systems			CS			X
Benches				X		
Building Slabs, Nonprestressed			CS			X
Specialty Wall Structures			CS			X
Chimney Bases				X		
Columns, Nonprestressed			CS			X
Commercial Sign Systems			CS			X
Core Slabs, Parking Decks & Benches				X		
Custom Concrete Products			CS			X
Finishing			CS			X

Small text at bottom left of table: JCL - Page 1 of 7 - May 2008

The National Precast Concrete Association and the Precast/Prestressed Concrete Institute issued a joint document to alleviate marketplace confusion regarding certification programs for precast and prestressed concrete products.

Both NPCA and PCI administer widely accepted, independent, third party-audited plant certification programs. Working together on these certification programs has been a priority for both organizations since 2013 as part of a wider effort to align key efforts, including their annual trade shows, marketing, government affairs, technical and safety materials, and education and training.

The document, available at [precast.org/jcpl](http://precast.org/jcpl), allows specifiers to determine easily whether products require NPCA certification, PCI certification or whether either is allowable. This clarification ensures the accurate specification of certification programs and that all appropriately certified plants can bid the project.

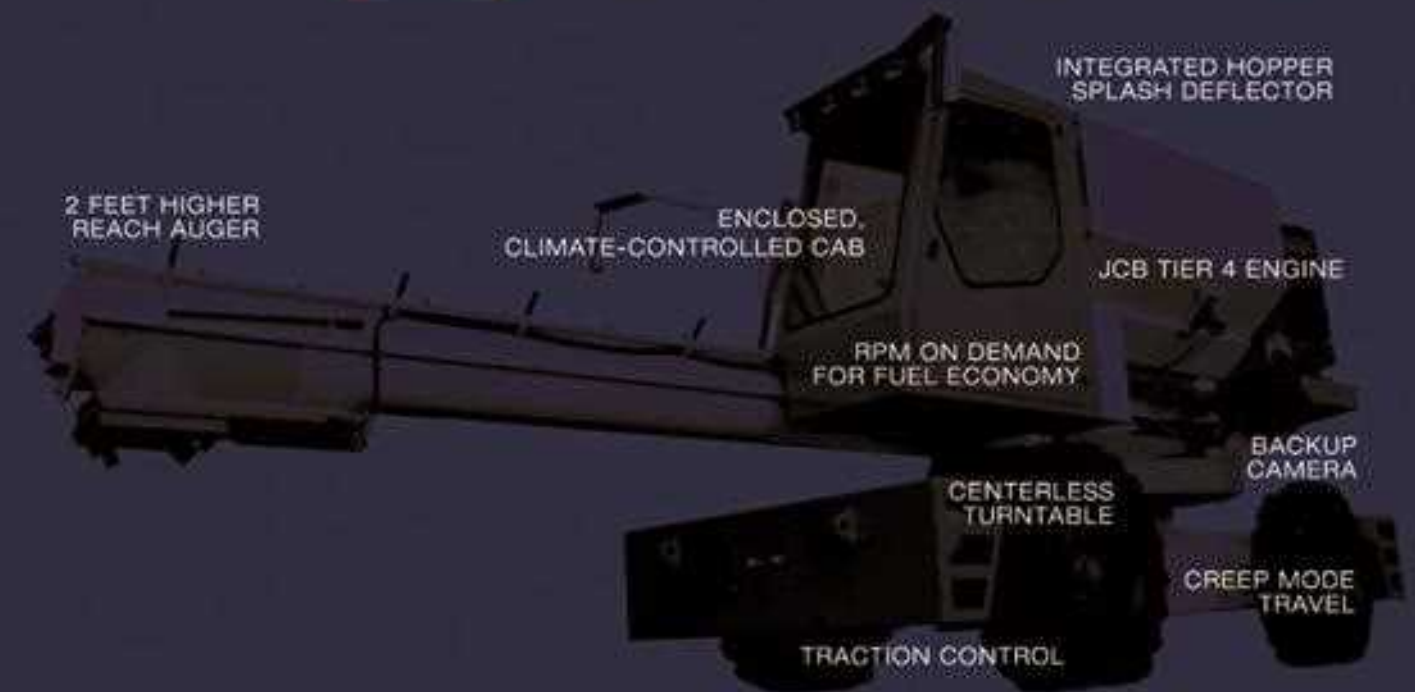
NPCA and PCI members are encouraged to share this document with specifiers, DOTs and any other individual, company or agency that would benefit from the breakdown it provides.

“The partnership between NPCA and PCI grows stronger every day, and the clarification that this document provides is a service to specifiers, as well as to members of both organizations,” said NPCA President Fred Grubbe, MBA, CAE. “Precast concrete products continue to be a critical component of our nation’s infrastructure projects and will be even more prominent when Congress passes a national infrastructure bill in the near future.”

“Members from both organizations have worked together to provide more clarity to owners and specifiers, as well as to our membership and the industry, to ensure that precast and prestressed concrete products remain at the highest possible quality, added Bob Risser, P.E., president and CEO of PCI. “The ultimate goal is customer satisfaction.” PCI

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# PEOPLE & PRODUCTS

**People & Products** is a forum where NPCA members and nonprofit organizations can share information on new products, personnel promotions, acquisitions or service announcements concerning the precast concrete industry. Items are printed on a space-available basis.

For possible inclusion, send your press releases and photos to [kstelsel@precast.org](mailto:kstelsel@precast.org).



Kevin Book

## Amifast Names New CEO

Amifast recently announced **Kevin Book** as its new CEO. Book comes to Amifast from the oil and gas service/supply sector, bringing more

than 10 years of executive-level commercial and operations experience. Book has an engineering background and his executive experience ranges from public company IPOs to privately held small businesses.

## Afinitas Announces Promotions

Afinitas promoted two of its Afinitas Forming Systems Division team members, who will also be added to the division's leadership team.



Matt Karnes

**Matt Karnes**, who served as the general manager of the Afinitas Forming Systems Division Columbus facility, will serve as the director of engineering for the Afinitas Forming Systems Division. **Mitch Boss**, who was the manufacturing leader at New Hampton Metal Fabrication, will now serve as the Afinitas Forming



Mitch Boss



Jason Lambert

Systems Division Manufacturing Manager. **Jason Lambert** was also promoted to the position of North American Supply Chain Leader.

## Manitex International Launches Truck-Mounted Crane

Manitex International announced the launch of its TC65159 truck-mounted crane. The TC65159 will feature a 65-ton base rating and 5-Section, 159-foot, full-power, proportionally extended boom. It will have a 168-foot tip height and 206-foot tip height when equipped with a 1-piece, 38-foot offset lattice jib. The TC65159 will offer asymmetrical outrigger positioning and increased ground penetration.

## Nox-Crete and TigerLoc Announce Distribution Agreement

Nox-Crete and JK Thermal have announced a partnership, which includes an exclusive distribution agreement of domestic



TigerLoc

TigerLoc products from Nox-Crete's United States headquarters. TigerLoc, used as a thermal break product with window and door openings within a concrete wall assembly, can now be purchased directly from Nox-Crete.

## Taylor Sudden Service Unveils New Locations

Taylor Sudden service has opened new direct factory locations in Elizabethtown, Ky., and Corpus Christi, Texas. The locations will provide parts sales, service and rentals for various Kentucky and Texas counties.



Harry Bair

## SIGMA Sales Manager Retires after 34 Years in Industry

SIGMA Territory Sales Manager **Harry Bair** retired at the end of 2020 after 34 years in the industry, with the

last 24 years at SIGMA.



Rob Ertler

## Marks Metal Technology Names New Sales/Sr. Engineer

**Rob Ertler** has joined Marks Metal Technology in its Concrete Forms Division. Ertler

has 16 years of mechanical engineering and

project management experience, including six years in concrete form and accessory design.

## Scale-Tron Launches New Version of SiloWeigh II Pro

Scale-Tron recently introduced its latest version of the SiloWeigh II Pro. New features include a vibration and wind filter, plus a new weather filter to enhance accuracy. The new features give the product the ability to handle both round and square divided silos with equal or unequal division, silos stacked on top of each other, and two or three silos on a shared frame.

## Oregon Department of Transportation Approves RimRiser

The Oregon Department of Transportation (ODOT) has reviewed the RimRiser shimless adjust to grade systems for municipal castings and precast tops and has approved



RimRiser

both systems for use on ODOT projects. The systems will be added to ODOT's QPL and specifications in the next cycle of updates.

## ALLPLAN Launches Innovative 3D Modeling Tools for Precast

ALLPLAN has unveiled new automated design tools to create fully detailed 3D modeling of precast concrete structures. Automated Python Parts (APPs) build on ALLPLAN's support of the precast concrete industry with new tools that streamline the design and detailing process, particularly for buried structures and buildings. **PI**

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# CALENDAR OF EVENTS



**May 20-22, 2021**  
**THE PRECAST SHOW 2021**  
 Ernest N. Morial Convention Center  
 New Orleans, La.



**Oct. 28-30, 2021**  
**NPCA 56TH ANNUAL CONVENTION**  
 The Broadmoor Hotel  
 Colorado Springs, Colo.



**March 3-5, 2022**  
**THE PRECAST SHOW 2022**  
 Kansas City Convention Center  
 Kansas City, Mo.



**Nov. 3-5, 2022**  
**NPCA 57TH ANNUAL CONVENTION**  
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## TITAN TALES - The User Experience

### An IT Issue...and an Idea

**BOOTH 801**  
 THE PRECAST SHOW

*Garden State's quest for a new business management system led to a relationship that changed the precast concrete industry.*

**G**arden State Precast was just getting started when Kirby O'Malley realized they needed a new type of business management system. Kirby, his brother Gene and partner Dan Morris purchased the plant in 1999, and they were staring at an IT system that was clunky and antiquated.

"I needed to find somebody, and the precast industry didn't have anything," O'Malley said. They were looking for a vendor to help them wrap their arms around the accounting and IT side of the business. "We had bought some new computers, and the person who sold them to us knew James and Magda Muka," O'Malley said. "He told us, 'I know these people who are really smart and have a small company.'" That was the beginning of a long relationship that changed both companies, and, in essence, the precast concrete industry.

At the turn of the century, Muka Development Group was a small accounting firm focused in other business sectors in New Jersey and New York region. O'Malley introduced them to the precast concrete industry and asked whether they could develop some precast-specific software.

#### Immersed in the Industry

James Muka, a CPA, spent months at the Garden State facility in Farmingdale, N.J., learning about the industry. "He was watching what we did, and how we scheduled and how we did our engineering and takeoffs," O'Malley said. "So, he really immersed himself in the precast industry, and that's how we got started."

Fast forward 20 years, and Garden State Precast has a thriving business that runs exclusively on what is now known as Titan 3000 – a full-blown precast concrete plant management system used by precast plants throughout North America. It all started with an IT issue and an idea.

"We do everything on Titan," O'Malley said. "Credit, collections, all our receivables, all our invoicing. That's one of the things I like about it. It does everything – soup to nuts. We don't need a separate Excel spreadsheet for something. Everything is there."

Garden State Precast has worked extensively with Muka Development Group over the years in testing new modules. They are currently working on implementing the QCTitan mobile app at the plant, as the company continually moves toward becoming paperless. They've

already taken giant steps down that road. It started early on with a Titan accounting module.

"I had James come over to the plant and showed him all the paper we had," O'Malley said. "So, he developed a module and we got rid of 28 filing cabinets. We only have one filing cabinet left in the company. Everything gets scanned in, and it's all accessible. You can access it from your phone.

You can access it remotely, and that's been a big thing because so many of us work remotely now."

Customers appreciate it also, O'Malley said. "When we do our quoting, we can put it in almost any form that the customer wants. The data goes in, and we can bring it out any way they want. Our customers really enjoy the fact that we can customize it for the way in which they want to receive the quote. Same information. But some people like it one way, some people like it the other way. We can send it electronically. It's a modern convenience our customers really like, because our quotes are really easy to understand," he added. "It's always a good thing when your customers have confidence in what you're doing."

The team at the Muka Development Group would definitely agree with that statement!



**Kirby O'Malley**



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