In this issue:
You’re Hired!
Earn a Scholarship Now
Concrete Can Do That?
Mastering the FE and PE Exams
The Importance of Internships
Looking for a top-notch resource on precast concrete for your next assignment? NPCA’s website features a wealth of material on precast concrete, including product-specific information, case studies and a wide variety of magazine articles in our expansive archive. The best part? It’s free, and only a click away.

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Global Ingenuity  
Outstanding precast concrete designs found around the world.  
By NPCA Staff

Funding the Future  
NPCA Foundation scholarship recipients take their education to new heights. 
By Mason Nichols

Sky High  
Precast concrete wind turbine towers enable major advancements in wind energy production. 
By Mason Nichols

Imagination to Infinity  
Precast concrete’s endless versatility has resulted in many award-winning projects. 
By Bob Whitmore

You’re Hired! 
Follow these tips to secure employment in the engineering or construction industries. 
By Bridget McCrea

Mastering the FE and PE Exams  
It’s all about preparation. 
By Kayla Hanson and Claude Goguen, P.E., LEED AP

Beyond Practicality  
Colorful, floating and eye-catching concrete. 
By Mason Nichols

The Intern  
Obtaining an internship will increase your chances of being hired after graduation. 
By Ayaz Ahmed
As a building material, precast concrete is incredibly versatile, capable of serving as the crucial design component of awe-inspiring projects. As evidenced by the projects below, engineers and architects use precast concrete to design the award-winning structures of tomorrow.

A SLANTED VIEW: BELLA SKY HOTEL, COPENHAGEN, DENMARK

Precaster: Contiga Tinglev
Contractor: NCC
Architect: 3XN
Engineer: Rambøll
Consulting Engineers (M&E): EKJ

Scandinavia’s largest hotel, Bella Sky, adds modern elegance to Copenhagen, Denmark’s capital city. It was designed as the perfect world-class structure for the trending neighborhood of Ørestad.

“We have knowingly worked towards designing a building unlike anything else in Copenhagen — and we did that because Ørestad, which is a new city neighborhood, is also unlike any other place in Copenhagen,” said Kim Herforth Nielsen, principal and founder of 3XN, the project architects.

3XN designed Bella Sky’s two towers to lean apart at 15 degrees, a daring architectural approach. Tilting 65 feet more at the top than at the bottom, the towers represent the first tilted precast concrete construction in the world.

“The effect of the leaning towers has also resulted in corner rooms where the building angles create a view which is actually underneath the room,” Nielsen said. “It gives the illusion of floating above the view itself.”

In addition, one tower bends outward by 12 degrees, making the 250-foot structure appear to twist in the wind. Located near the Copenhagen Airport, the hotel could not be designed as one tall tower due to flight safety regulations. Aluminum and glass façade panels cover the precast concrete building, which includes hollowcore slabs, beams and internal columns.

“Abroad, a building such as Bella Hotel would normally be built using in-situ concrete or steel,” said Kaare Dahl, project engineer at Rambøll. “But in Denmark we have a tradition of using precast concrete units. It is cost-effective, results in fewer flaws in the individual units and is far more comfortable to work with.”

The Danish Precast Concrete Association (DPCA) is proud of the Bella Sky Hotel.

“Bella Sky is not only an icon for precast,” said Poul Erik Hjorth, director of DPCA. “It also has moved the limits for precast. When you can design and construct such a building with concrete elements; you can use precast solutions everywhere.”

Bella Sky Hotel recently received a fib Award for Outstanding Concrete Structure from the International Federation for Structural Concrete.
Every well-known retail store has an iconic symbol or phrase. For Macy’s, it’s a red star. Target has the red bull’s-eye and Walmart has the slogan “Save money. Live better.” One Canadian retail company is also integrating a signature architectural look. Headquartered in Québec, Canada, fashion retail chain La Maison Simons knows the importance of making bold statements. The company has been selling popular high-quality fashion since 1840. So when company officials decided to expand the business in 2012, they turned to architecture firm LEMAYMICHAUD Architecture Design, who has worked with Simons for the past 30 years, to design a custom look for two new locations.

One store that is drawing a lot of attention – especially at night – is located at the Galeries d’Anjou shopping mall in Montréal. The building’s exterior is comprised of 138 precast concrete insulated wall panels manufactured by Béton Préfabriqué du Lac (BPDL). Each panel features close to 600 inset recesses with some panels housing fiber optics outfitted with colored disks. The 2,355 colored disks change over the course of the day from Simons’ branded green to a sparkling light.

Casting proved to be a challenge for BPDL on panels located around the store’s entrances. The depth and diameter of the recesses differed on a single row on each panel. Custom molds had to be fabricated to maintain distance consistency and often the molds were limited to one cast. Each panel is lightly sandblasted. According to Phillipe Blais, architect with LEMAYMICHAUD, the vision was to create two perceptions of the store – casual during the day and chic at night. Precast concrete was the only material flexible enough to create this dazzling look.

“The use of precast concrete panels eliminated the need to create the building’s envelope on site; everything was done in the precast contractor’s plant in perfect weather conditions and the installation was completed in less than two months,” Blais said.
The design for the La Trobe Institute of Molecular Science in Victoria, Australia, bursts the bonds of typical campus structure geometry.

According to architect Carey Lyon, “The campus master plan dates back to 1968 and the objective was clear – the design of this new building is to break the mold belonging to the decades of the ’60s and ’70s,” he said. “Obviously, we gave the façade a visual metaphor for cell research.”

From the 200-millimeter thick precast external wall, hexagonal precast concrete cells blast out of the structure’s façade to starkly symbolize cell research. And the façade is made all the more dramatic and daring with the use of vibrant colors and wood finishes. Notice that the hexagons are positioned randomly and even offer spaces for students and classes to meet. PS

Endnotes

1 More than 7,000 precast elements were used in the main structural system. View the precast structural model for the Bella Sky Hotel by visiting precast.org/bella.
What do you want to be when you grow up?
Every kid has been asked this question. Depending on your age at the time, the answer may have varied, but the question likely induced either dreams of the perfect job or a bit of panic.

While thinking about the future is exciting, a much more important question typically isn’t asked until years later.

How are you going to pay for all of this?
With the cost of books, housing and tuition constantly on the rise, attending college can be as much about financial planning as it is taking courses. Thankfully, the NPCA Foundation (NPCAF) supports students enrolled in engineering, architectural and construction-related curricula through its scholarship program.

Undergraduate and graduate students from across the U.S. and Canada have benefitted considerably from NPCAF’s aid, resulting in eased financial burdens and an increase in internship and job opportunities. Below, the experiences of several scholarship recipients from a variety of backgrounds and majors are outlined, detailing the opportunities NPCAF helps make possible.

JARED SCHIMMELPFENNING
School: Purdue University
Major: Construction Engineering and Management

Jared Schimmelpfenning spent plenty of time working with his hands while growing up in central Illinois. Projects varied, but you could always find him alongside his dad and grandfather, helping in any way he could.

“I would push wheelbarrows with concrete and whatnot, just working with them and trying to learn as much as possible,” Schimmelpfenning said. “That’s kind of where it all started.”

Being an NPCAF scholarship recipient helped Schimmelpfenning secure an internship in Texas with Kiewit, where he worked on the massive $1.1 billion DFW Connector project. The experience gave him the opportunity to work in the field, operating some of the heavy machinery on site.

Schimmelpfenning cited the NPCAF scholarship as key to his ability to take advantage of the opportunities available to him at Purdue University. He also noted that his experience has provided him with the solid foundation needed for his career in construction engineering and management.

“The NPCA Foundation has made a huge difference in my life,” he said.

As he seeks to perfect his craft, Schimmelpfenning will continue to benefit from the groundwork laid while operating alongside family in his early years. This, coupled with funding from the NPCAF scholarship, has him positioned for future success.

NICOLE BEHNKE
School: Iowa State University
Major: Civil Engineering

The daughter of a bridge contractor, Nicole Behnke developed a strong connection to the construction and precast concrete industries from a young age. As a child, her father would consistently ask her the same question as the two drove around town.

“Guess who built that bridge?”

Today, Behnke’s devotion to engineering is as strong as ever, and she considers NPCAF an important component in her continued success.

“Being an NPCAF scholarship recipient has allowed me to gain some really, really great internship experiences,” Behnke said. “The Foundation has been integral in making my continuing education possible.”

With NPCAF support, Behnke has interned as a field engineer on a highway project in Foley, Minn., and as a transportation
engineer for the $600 million St. Croix River Crossing Project, also in Minnesota. As a result of her experiences, she will likely be able to ask her father a very important question in the not too distant future.

“Guess who built that bridge?”

DAVID AMORIM
School: University of Manitoba
Major: Civil Engineering

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

“My parents were always like, ‘No, you have to do better. You can’t become a construction worker,’” Amorim said.

What did he do to allay his parents’ fears? Naturally, he allowed his fascination to grow even stronger.

That fascination led Amorim to pursue a graduate degree in civil engineering at the University of Manitoba, where he researched precast concrete bridge deck panels and ultra high performance concrete joints. Thanks to NPCAF support, he was able to focus nearly all of his efforts on working in the lab.

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

Despite the many successes he has experienced so far, Amorim continues looking ahead. He hopes to spend some time working in the industry before potentially returning to school to pursue a Ph.D.

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

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

IRENE KURTZ
School: Notre Dame
Major: Chemical Engineering

As a child, Irene Kurtz fondly recalls spending a great deal of time at universities, zipping and darting through the engineering labs where her father worked. Kurtz’s father, a structural engineering professor, inspired her initial passions for both the engineering field and the use of concrete.

“I grew up at college,” Kurtz said. “I’ve seen the research side and the hands-on side, which is why I’m so interested in engineering.”

Kurtz was able to successfully switch both schools and majors, transferring from Lafayette College in Pennsylvania to Notre Dame to study chemical engineering. Kurtz stressed that the decision was made possible thanks to the aid of her NPCAF scholarship.

“Switching majors – even as only a sophomore – is a huge leap,” she said. “It has helped so much with books, and now I’m staying at Notre Dame over the summer for research. That’s only possible because of the funding from the scholarship.”

Ultimately, Kurtz hopes to help the environment and the world’s population by advocating for green building practices.

A COMMITMENT TO GROWTH

Obtaining a top-notch education is vital to post-graduation success, but the process can place a heavy burden on your wallet. Through the support of NPCAF scholarships, students from a variety of universities are moving ever closer to achieving their career aspirations.

The good news is, you can too. For more information on NPCAF and to apply for the scholarship program, visit precast.org/foundation.

Mason Nichols is NPCA’s external communication and marketing manager.
Sky High

Precast concrete wind turbine towers enable major advances in wind energy production.

By Mason Nichols

In 2020, global installed wind power capacity is expected to reach 792,000 megawatts (MW). That’s enough energy to meet the electricity needs of nearly 130 million homes.

As the number of wind turbines across the world continues to increase each year, so too does the need for units designed to maximize energy production. Steel towers – the current standard in the wind industry – are unable to reach heights greater than 330 feet, where steadier winds capable of higher energy output can be found. To combat this limitation, engineers are turning to precast concrete.

NEW APPROACHES

In Spain, Norten PH engineered a precast tower manufactured in segments and intended for on-site assembly. Thanks to a strong self-consolidating concrete mix design, each turbine is capable of attaining heights up to 396 feet.

Similarly, Enercon, a wind turbine manufacturer based in Germany, developed a new line of units for a project in the Netherlands. By using precast concrete towers, the turbines reach an astonishing height of 440 feet.

But researchers are also studying increasing tower heights in the U.S. In 2014, The Department of Energy awarded engineers at Iowa State University a $1 million grant to investigate how high-strength precast concrete can be used to build taller, more productive towers. With support from the grant, Sri Sritharan, a professor at Iowa State and head of the College of Engineering’s Wind Energy Initiative, developed “Hexcrete,” a wind turbine tower that consists of several precast concrete components manufactured with high-strength or ultra high performance concrete.
PUTTING PRECAST TO THE TEST

Since being awarded the grant, Sritharan and his students have expanded their research and put their precast solution to the test. The Hexcrete system offers many advantages, including:

- Simplified transportation.
- Easy tower assembly on site.
- Reduced project costs.

Sritharan and his team recently put the Hexcrete system through a series of stress and fatigue tests. One full-scale test examined design assumptions and verified the force transfer in a Hexcrete cell. The other test involved taking a 12-foot-high, 6.5-foot-wide precast section and applying 100,000 pounds of force to it every 1.25 seconds. Sensors attached to the unit collected data for weeks, and, according to Sritharan, the precast performed to expectation. Additional fatigue tests to ensure the structural integrity of the precast towers are ongoing.

The DOE claims that all 50 states in the U.S. can benefit from wind power with increased hub heights, something that can be made possible with precast. But in order to do so, towers must be able to reach approximately 460 feet high. That height would make turbines viable for areas of the U.S. previously not considered for wind energy production. Sritharan’s research team is currently designing Hexcrete towers to reach this new height.

For Sritharan, this means two things: greater wind energy production for a reduced cost and the ability for precasters across the U.S. to manufacture a new product line, something which would benefit local economies.

“By doing columns and panels like we are using, most precasters can produce [the Hexcrete system],” he said.

SUCH GREAT HEIGHTS

When other building materials reach their limits, precast concrete remains up to the challenge, allowing the wind industry to meet the increasing energy needs of an ever-expanding global population.

To learn more about the efforts of Sritharan and his research group, visit precast.org/hexcrete.

Mason Nichols is NPCA’s external communication and marketing manager.

Endnotes
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Imagination to Infinity

The strength and versatility of precast concrete products has enabled the completion of many unique, award-winning projects.

By Bob Whitmore

Engineers and architects learn more every day about the advantages of designing and building with precast concrete. Increasingly sophisticated mix designs and production techniques enable precast manufacturers to create structures that meet the exacting specifications of designers.

Whether underground or above-ground, precast products have emerged as critical components in the modern modular construction environment. Here are a few examples from the National Precast Concrete Association’s Creative Use of Precast Awards of the unending possibilities of precast. For more details on these and other projects, visit precast.org/awards.
**BIGGER, BETTER AND WILDLIFE FRIENDLY**

**Project:** Highway 407 East Expansion  
**Location:** Whitby, Ontario  
**Precaster:** Anchor Concrete Products

Precast concrete culverts alone are a fairly standard product. However, the specifications on this job were anything but standard. The precaster, Anchor Concrete Products, provided a solution for a highway infrastructure project that called for supersized culverts under a new highway in Whitby, Ontario. Anchor developed an innovative, two-piece “clamshell” culvert that incorporated a cantilevered joint, allowing the contractor to place the pieces using only a crane. This reduced costs and enabled speedy installation, with each 38.6-ton section placed in less than seven minutes.

The precast culvert is one of the largest in the area and is an integral part of developing sustainable highway infrastructure and protection for natural wildlife. The culvert provides a natural stream bottom and a pathway for wildlife to cross under the road rather than above where danger to the animals and motorists would be imminent.

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**NO DETOURS**

**Project:** Brooks Run Modular Arch Span  
**Location:** Highway 61, Bullitt County, Ky.  
**Precaster:** Sherman-Dixie Concrete Industries

When a road widening project called for a new bridge to be built in Kentucky, precast concrete’s structural and cost benefits offered the most viable solution. Due to Federal Emergency Management Agency flood map restrictions, the bridge required a complicated “no rise” hydraulic design. Additionally, the design called for 23 feet of backfill from the top of the arch to the top of the road, a significant dead load for a 46-foot span. Sherman-Dixie provided the solution with its ECO-SPAN Versa Series Multiple Radius Arch.

The modular precast components worked well with the phased construction plan, which minimized traffic impact and eliminated costly and inconvenient detours. The existing bridge remained in service during the first phase while more than half of the new bridge was constructed. During the second phase, the work crew installed 24 of the 36 precast arch sections and traffic was shifted to the new bridge. The old bridge was then demolished and replaced by the remaining 12 arch sections. Some of the project’s many improvements include a wider road, a clear span opening that will minimize future maintenance and a higher roadway elevation. Overall, this precast solution demonstrates the enormous benefits of precast to all departments of transportation involved in accelerated bridge construction.
HISTORICAL DETAILS WITH MODERN AMENITIES

Project: The Alexander  
Location: Edgewater, N.J.  
Precaster: Smith-Midland Corp.

Tasked with replicating the architecture of New York City’s Park Avenue circa 1945 for The Alexander, a nine-story apartment building in Edgewater, N.J., Smith-Midland Corp. manufactured precast concrete wall cladding with historical details such as cornices, reveals and bull noses. Each of the manufactured panels is a buff color with an acid-etched finish.

Due to the lightweight design of the system used, many project costs were reduced, including those associated with the building foundation, structure, shipping and installation. Additionally, the project featured 1,024 LEED-friendly exterior panels, combining a proprietary precast concrete product with traditional architectural precast totaling nearly 100,000 square feet. Thanks to the design of the panels, the building façade will remain virtually maintenance free for many years to come.

The proprietary 360 degree concrete-to-stud connection isolated the exterior precast concrete cladding from the structural stresses associated with wind loading, steel frame movement, expansion and contraction, and seismic shock. The result is a residential building both structurally sound and pleasing to the eye.

TAKE ME OUT TO THE PLAYGROUND

Project: Baseball Glove  
Location: Maidu Regional Park, Roseville, Calif.  
Precaster: Universal Precast Concrete

From the sound of a bat crushing a fastball to the sight of a star player racing toward home, there’s nothing quite like an experience at the ballpark. Thanks to some well-coordinated planning and a little ingenuity, a larger-than-life precast concrete baseball glove is bringing that experience out of the stadium and onto the playground.

To create the unique, 8,500-pound piece, Universal Precast Concrete manufactured a complex mold complete with the intricate stitching patterns typically found on a baseball and baseball glove. The complex curvature of the pieces meant the mold had to be fabricated with precise detail at all angles. Created in two parts, the ball and glove were cast with insets, allowing them to attach seamlessly. After casting, workers grinded the glove to hide the seams made by the mold, then stained and painted the piece. The baseball glove doubles as a playground climber and centerpiece for a California park, where it inspires the imagination of the children who play with it each day.

Bob Whitmore is NPCA’s vice president of Communication and Public Affairs.
YOU'RE HIRED!

Follow these tips and guidelines to improve your chances of getting hired in the engineering or construction industries.

By Bridget McCrea

With her college graduation date rapidly approaching, Kayla Hanson knew it was time to put some elbow grease into finding her first engineering job. A graduate of Purdue University's civil engineering program, Hanson pulled out all of the stops. She attended every one of the institution's career fairs, including a major event in the fall and several others scattered throughout the year. Attending taught her a valuable lesson – namely, that she wasn't prepared to deal with recruiters one-on-one. As a result, she visited the campus's career center to get help writing a resume and to learn how to conduct a successful job interview.

“We did some mock interviews and also discussed the types of jobs that I'd be applying for,” said Hanson, a civil engineer with the National Precast Concrete Association. “The career center was a great resource. My resume was basically a disaster before I tapped into that resource to help reword and reorganize it.”

For the “mock” interviews, Hanson dressed in business attire and learned how to effectively answer questions and highlight her strengths in front of a potential employer.

Hanson also benefited from the career center’s networking connections, which often help students find insider leads on current job openings and opportunities. Through the same department, students can have their names put on mailing lists designed to alert them about potential job openings.

“By participating, I learned about companies that I’d never even heard of,” Hanson said, noting that students have an instant advantage when their own universities participate in such networking and the related career fairs.

“Sometimes if you're just looking online for random positions you don't necessarily have an advantage,” Hanson said, “but as a college student, you know that those potential employers are interested in graduates of your specific school. That gives you a leg up.”

Hanson, in fact, did get a leg up in that manner when she was perusing her email and learned NPCA had contacted her school about an opening for a civil engineer. Highly interested in concrete production – but unable to take any concrete-specific courses in college – Hanson’s first reaction to the job posting was, “Hey, that sounds like an awesome job.” She researched NPCA and its mission and activities, contacted the organization, applied for the position and was hired.
PATHWAY TO SUCCESS

Jeff Beaudin, president of career coaching firm LaunchPOINT in Nashville, Tenn., said graduates need to sharpen their pencils and carefully explore the engineering and construction opportunities in front of them. Coming out of a recession that created an extremely tight job market, today’s grads have many options. They also have a high level of competition to deal with.

“Everyone is smart and has the skills and knows about their target industries,” Beaudin said. “The trick is to stand out from that crowd and differentiate yourself in a way that gets the employer’s attention.”

Good communication skills also go a long way in helping graduates snag their jobs of choice, as do the strategies and tactics that they can use to find and obtain those desired positions.

The good news, according to Beaudin, is that today’s graduates have a plethora of technology-based options at their disposal. Whether they need help polishing their resumes, connecting with professionals or searching through current job postings, young people have many different resources at their fingertips.

“Technology will help you weed through all of the information and pinpoint the best possible companies and/or positions,” Beaudin said.

He tells graduates to remember that the hiring process is still very much a “people” experience. So while you can find jobs and submit resumes online, it’s often the face-to-face interviews that can make or break a candidate’s chances.

Like Hanson, Beaudin also sees great benefit in leveraging university internship and study abroad opportunities. Relevant job experience should be featured prominently on a resume, particularly if the job candidate helped the company work smarter, better or faster.

“If I’m looking at your resume and I see that one of your projects saved your employer $500,000,” he said, “then I’m going to want to talk to you about that.”

Having worked with numerous job seekers over the years, Beaudin said a good resume quantifies the impact an individual has had both on and off campus. And even if the accomplishment didn’t shave a half million dollars off a company’s bottom line, it’s probably still worth highlighting.

“Invariably, candidates focus on their responsibilities and completely forget to quantify the impact that they had on the company,” he said.

To other engineering students who need help carving out their own career paths, Hanson suggests the FE exam as a good starting point. A six-hour test, it includes separate versions for civil, chemical, mechanical and aerospace engineers.

9 Ways to Improve Your Chances of Getting the Job

As director of career services at Saint Anselm College in Manchester, N.H., Sam Allen knows all too well the key challenges new graduates face when they enter the job market. Allen offers this advice to recent grads on how they can use their own networks to gain employment:

1. **Networking is a contact sport.** Social media is helpful in identifying and initiating connections, but personal and sustained contact is the best way to maintain relationships. Don’t overlook the phone calls or in-person meetings.

2. **Always be professional in your communication and dress.** First impression, ONLY impression.

3. **Approach networking like it is a sales job.** Research, prospect, connect and follow up. Do your homework before every contact. Assess what you want to learn and what takeaways you expect. Always send thank you notes and ask to stay in touch.

4. **Follow up!** Go back to your network periodically to reinvigorate your relationships.

5. **Start with your zone of comfort.** Begin with friends, co-workers, former supervisors, faculty, coaches, etc. While someone may not be in the career of interest to you, they may know someone who can help you. Not every lead results in a sale, but all leads can result in a referral.

6. **Use your career services and alumni offices.** They have a wealth of information on professionalism and networking. Most of these offices work with external contacts every day.

7. **Use the alumni feature on LinkedIn to identify alumni from your school.**

8. **See if there are any professional associations or meetings in your area that are open to new professionals.** Many locations have formalized young professional networks in conjunction with the local chamber of commerce.

9. **Stamina is key.** Don’t let rejection get you down. There is no such thing as a bad contact, only a contact that wasn’t properly managed.
“You’ll be tested on your entire four- or five-year curriculum,” Hanson said. “Passing this test is the first step toward becoming a P.E.”

Hanson sees the FE as particularly relevant for those who want to show potential employers more than just good grades. “This test shows that you know how to apply the knowledge obtained while you were in school,” she explained, “and proves that you didn’t just cram for exams. You retained the information and will now be able to apply it in actual situations.”

Another way to boost your status is by taking part in as many internships and co-ops as possible, and by participating in or leading campus-based organizations that focus on interests like business and engineering. Hanson also suggests reading through job postings carefully and then using the keywords included in the post to improve the language in your own resume.

Finally, be sure to start your search early because “it will take longer than you expect,” said Hanson, who is extremely pleased with the position she chose.

“Remember that you really can’t be over-prepared,” she said, “so take advantage of all of the career-related offerings that your college provides and use these resources to hit the job market well-prepared and braced for success.”

WHY ARE YOU HERE?

When working with job seekers, Beaudin hands out a list of 21 questions a prospective employer may ask. Regardless of how the specific questions are framed, the basic queries will always be:

- Why are you here?
- What can you do for us?
- Do I trust you?
- Can I afford you?
- How will you fit in with my team?

Learn how to answer these basic questions effectively and you’ll greatly enhance your chances of getting the job.

“Pretty much everything revolves around these queries, even if they aren’t asked directly or in that format,” Beaudin said. “To ensure the best results, prepare all of your answers around those basic thoughts.”

To prep job seekers for their interviews, Beaudin points out the difference between the knowledge that’s in your brain and the words that come out of your mouth.

“You’re brain is an absolute supercomputer,” he tells them, “but your mouth is more like a cheap device that you can buy at Walmart for $9.95. Because of this, you have to give your mouth time to catch up with your brain by practicing and rehearsing ahead of time.”

According to Beaudin, practicing aloud is the best approach.

“The first time you do a mock ‘live’ interview you’ll probably be shocked at how difficult it is to get the right information from your brain to your mouth,” he said. “You’ll stumble and mess up, but with the right amount of practice you can learn to master the process.”

Lastly, Beaudin urges job seekers in the engineering and construction fields to set aside time for their searches, resume creation and interviewing. Don’t just wait until you have “spare time” to kick off this very important step, he said, “because it’s a full-time job in and of itself.”

One good way to overcome this challenge is by using time block scheduling, a process in which you block off two-hour segments and then dedicate that time to some aspect of your job search.

“It’s very easy to get distracted by other things, particularly if you’re still in school,” Beaudin said, “but if you allocate the time and put the energy into it, the payoff will come.”

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.

Working with Recruiters

Having worked with a large number of construction and engineering graduates over the last few years, Michelle Comer, a practice leader with The Messina Group in Chicago, said contract and contract-to-hire positions are a good choice for recent graduates.

“These types of positions allow the graduate to see if the employer is a good fit,” Comer said, “while also gaining experience in the field.”

Where does one find these contract positions? Comer said a good starting point is the staffing companies that specialize in engineering placements and have an inside track with employers.

“Companies know that when an agency presents resumes, the candidate has been sourced per their specifications,” Comer said, noting that the agency will also act as a candidate’s advocate when it comes to securing an interview.

“When a company advertises a job opening, they may get 100 applications, of which 10% are aligned with the position’s skill requirements,” said Sarah Benz, a senior recruiter at The Messina Group. “With a staffing agency, they will only get five highly-specific resumes. So the likelihood of your resume getting in front of the decision maker is much greater.”
You’ve undoubtedly heard of the infamous Fundamentals of Engineering (FE) exam. The six-hour exam, developed by the National Council of Examiners for Engineering and Surveying (NCEES), is offered in seven engineering disciplines. Created for recent and soon-to-be graduates of ABET-accredited engineering programs, the FE exam serves as the first step toward earning a Professional Engineer (PE) license. By passing the FE exam, students earn the title of Engineer in Training (EIT) or Engineering Intern (EI), an important component of securing employment after completing their degree.

Obtaining PE licensure offers great career opportunities, including the ability to stamp and seal designs, provide consulting services and even serve as principal of a firm. After passing the FE exam, engineers are typically required to work a minimum of four years in their respective fields under the mentorship of a PE before being eligible to take the PE exam. Eligibility and curriculum requirements for taking the FE and PE exams vary by state, as does EIT and EI designation.¹

FE EXAM BASICS

The FE exam is a computer-based test consisting of 110 multiple choice questions. It is offered year-round at NCEES-approved Pearson VUE test centers, which are listed on the NCEES website. The exam appointment is 6 hours long and consists of a nondisclosure agreement (2 minutes), a tutorial (8 minutes), the exam (5 hours and 20 minutes) and a scheduled break (25 minutes). This timetable allows examinees slightly less than three minutes per question.

Each exam within a specific discipline is different. An algorithm is used to assemble the exams, so each will be a unique collection of 110 questions providing the same relative level of difficulty and the same number of questions per subject area across all the exams given in a particular discipline. Examinees are allowed to use an electronic reference provided by NCEES. All exams, including those completed by repeat takers, are scored to the same standards. Results are reported as either pass or fail, and the examinee will receive a diagnostic report of their performance in each section of the exam only if the exam is failed.

The NCEES Examinee Guide provides helpful information regarding how to register for an exam, finding exam dates and locations, permissible calculators, the check-in process and what to bring along on exam day.

SECRETS TO SUCCESS

Adequately preparing for the FE exam may seem like a daunting task due to the breadth of subjects and depth of material. Additionally, because of the demanding coursework faced by second-semester senior engineering students, it's common for students to put off FE exam preparation, or to keep it as the
last item on the week’s agenda. This, and the resulting lack of adequate preparation, can be prevented with proper planning.

ALLOW SUFFICIENT TIME FOR PREPARATION

The FE exam tests students’ comprehension and retention of nearly four years of coursework, as well as their ability to successfully apply the acquired knowledge. Summarizing an entire engineering curriculum into one exam results in a limitless possibility of questions that may appear. Allowing ample time to prepare is crucial.

TAKE ADVANTAGE OF NCEES’S DISCIPLINE-SPECIFIC EXAM SPECIFICATIONS

The exam specifications document lists the subjects covered in each discipline’s exam. The document also provides a breakdown of the subjects’ subtopics and an approximate number of questions you may expect to receive in each subject area.

DECIDE WHEN TO BEGIN

Determine the demands you’ll face during the semester you plan to take the FE exam, as well as the demands you’ll need to balance the semester prior to the exam. Based on these demands, select an appropriate semester or school break to begin your exam preparation.

10 Tips for FE Exam Preparation

1. Plan conservatively by starting early and allowing ample time every week solely for FE exam preparation.
2. Take care of yourself.
3. Fuel your body and your brain with balanced meals throughout the day.
4. Exercising will help you feel more energized and boost your mood.
5. Make sure you get enough sleep each night and keep your sleeping schedule as consistent as possible, even on weekends.
6. Although it may be tempting during the final days leading up to the exam, “all-nighters” will actually do more harm than good. If you plan ahead and follow through, you should feel adequately prepared without feeling the need to stay awake all night.
7. Take advantage of practice exams and other preparation materials available through NCEES and online retailers.
8. Review notes, homework and exams from courses you’ve already completed.
9. Be prepared for every subject listed in the exam specifications for your discipline and, if necessary, learn the material that may be unfamiliar to you.
10. Attend preparation and help sessions offered by your school and seek help from professors and teaching assistants.
show 62% to 71% passed the civil construction, civil structural, civil geotechnical and civil transportation test, while 71% passed the water resources and environmental exam. These were all first-time takers. Repeat taker pass rates are much lower.

The eight-hour, 80 multiple choice question PE exam is structured to test the examinee’s ability to practice competently in his or her particular engineering discipline. Questions require a variety of approaches and methodologies including design, analysis and application. For the civil test, the morning module focuses on the breadth of civil engineering while the afternoon session focuses on a depth area you choose during registration. The choices are construction, geotechnical, structural, transportation, and water resources and environmental. Because the PE exam is open book, you can bring any bounded reference material you want, as long as the materials remain bound during the entire session.

PREPARATION IS ESSENTIAL

Your first impulse may be to dust off your old college textbooks and start studying topics on your own. However, this may not be the best approach. Consider obtaining review materials

CHOOSE A TIMELINE TO DEVELOP YOUR SUBJECT MATTER STRATEGY

Abiding by a conservative timeline may help you reach your FE exam preparation goals while maintaining your academic standing and limiting your stress level. Planning how each day will be spent at the beginning of your week will help ensure you have sufficient time for everything on your to-do list.

An important part of successfully managing this major undertaking is maintaining balance. As tempting as it may be to bury yourself in books and practice problems, it’s also beneficial to dedicate adequate time for both mental and physical rest.

TAKING THE NEXT STEP: THE PE EXAM

Once you’ve passed your FE exam and have worked for four years in the industry as an EIT or EI, you’re ready to change those letters at the end of your name to PE. The only obstacle before you is the Principles and Practices of Engineering (PE) exam. This exam can be challenging, especially since you’ve been out of school for a few years and may be a little rusty on studying. The pass rates from April 2016 PE exams listed on the NCEES website show 62% to 71% passed the civil construction, civil structural, civil geotechnical and civil transportation test, while 71% passed the water resources and environmental exam. These were all first-time takers. Repeat taker pass rates are much lower.

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PREPARATION IS ESSENTIAL

Your first impulse may be to dust off your old college textbooks and start studying topics on your own. However, this may not be the best approach. Consider obtaining review materials
specifically designed for the PE exam. There are numerous online resources that sell preparation packages suited to your particular exam category. You can find sample exams and answers on the NCEES website at ncees.org. Working through these practice exams is highly recommended. You can also join a study group or take a prep class online or at a local college. Engineering associations such as the American Society of Civil Engineers (ASCE) and National Society of Professional Engineers (NSPE) offer online tools and webinars to help you pass the first time.

**ENGINEERING EXCELLENCE**

An incredible amount of resource material and preparation advice is available online for both exams. Take advantage of these resources. Live prep courses can also be very effective. No matter what your strategy, preparation will be your key to success. Good luck! PS

Kayla Hanson is a technical services engineer with NPCA and passed the FE exam in 2013.

Claude Goguen, P.E., LEED AP, is NPCA’s director of Sustainability and Technical Education and has been a P.E. for 12 years.

**Endnotes**

1. Check ncees.org/state-links to verify your state’s requirements.
2. mayoclinic.org/healthy-living/fitness/in-depth/exercise/art-20048389
3. mayoclinic.org/healthy-living/adult-health/in-depth/sleep/art-20048379
4. collegestats.org/2012/07/all-nighter-101/
5. ncees.org/engineering/pe/

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**10 Tips for PE Exam Preparation**

1. Talk to others who have taken the exam. Ask them about their experience and if they have any advice on preparation.
2. Tell friends, family and co-workers about your upcoming exam so they will understand the modifications in your schedule necessary for preparation.
3. Create a review schedule that allocates enough time for each subject you plan on studying.
4. Assemble reference materials as you progress. Use color-coded tabs (if permitted by your state) to mark the most useful pages. It’s important to devise a method to access relevant information quickly. Those eight hours go by quickly.
5. PE exam specifications and design standards are posted online six months before the exam. Check this page to determine what subjects will be addressed on the exam as well as what codes and specifications are needed.
6. Using a friend or co-worker’s PE exam reference guide may save you money, but make sure you’re using the current edition. Changes in exam formats and emphasis can occur from year to year.
7. Start by working on your strengths. What do you know well? Spend time at first to sharpen your knowledge and expertise on these subjects. Then, identify your weaknesses and work on them. Before the exam day, focus again on your strengths. This will increase the confidence you need on test day.
8. Take plenty of practice exams. Most PE exams contain 80 questions in eight hours. That’s six minutes per question. Pace yourself during practice exams to make sure you are able to stay on course. For example, take 20 questions you’ve never seen and answer them in under 120 minutes.
9. Don’t cram the day before. Relax and get a good night’s sleep. This is important as all the preparation in the world will not make up for your inability to focus due to lack of rest.

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**Get Free Education Courses from NPCA**

NPCA offers free education to students interested in the building construction or precast concrete industries. We offer our flagship course, Production and Quality School (PQS) Level I online to students who want to gain a comprehensive understanding of the precast concrete manufacturing process. NPCA also offers free education courses and passes at The Precast Show. The Precast Show is an international trade show focused exclusively on the precast and prestressed concrete industries.

To learn more and to register for any of these education courses, please visit precast.org/education.
For some, concrete is viewed as more practical than exciting – a dull, monochrome building material remaining unchanged for centuries. In reality, concrete is incredibly versatile and capable of functioning as the key component in a vast array of unique and exciting construction projects.

In many scenarios, the evolution of concrete technologies has enabled breathtaking and convention-shattering results, allowing engineers and architects to unlock the massive potential of the world’s most heavily used building material.1

COLORFUL

For LUCEM Lichtbeton of Germany, concrete was meant to be more than gray.

Featuring light-emitting concrete panels capable of displaying up to 16 million colors, the LUCEM Façade project at RWTH Aachen University lights up just before sunset, with each panel returning to a natural stone appearance during the day.

The façade has the potential to be converted into a large display screen because each panel can be controlled independently. Additionally, by implementing different arrangements of fibers, stunning patterns can be achieved. Panels can also be placed in both interior and exterior environments, increasing the product’s range of application.

LIVING, BREATHING

Researchers at the Universitat Politècnica de Catalunya (UPC) in Barcelona, Spain, are putting a whole new spin on the term “green building.”

The Structural Technology Group at UPC developed a biological concrete that functions as a “living façade,” supporting the growth of lichens, mosses and other microorganisms. Currently, vertical garden systems – designed to achieve the same effect – require complex supporting structures. However, UPC’s biological concrete allows for organisms to grow directly on the surface, achieving a striking aesthetic effect while also offering several environmental advantages.

Researchers hope to succeed in accelerating the growth of organisms on the biological concrete so that surfaces acquire an attractive façade in less than a year.

FLOATING

Sure, you’ve seen concrete on roadways, but what about on water?

Precast concrete manufacturers have cast floating dock systems capable of both counteracting the buoyant forces of water and withstanding the harsh weather patterns typically associated with port and harbor locations.

Jefferson Concrete Corp. of Watertown, NY., and Shea Concrete Products of Wilmington, Mass., both partnered with...
Marinetek on separate projects to manufacture precast concrete floating dock systems for locations in the Northeast. For each precaster, successful project completion has resulted in stable, low-maintenance docks for the customers that are both functional and pleasing to the eye.

STRONGER, THINNER, MORE VERSATILE

Concrete is just straight lines and typical shapes, right? Wrong.
With ultra high performance concrete (UHPC), architects, engineers and designers are creating thin, intricate pieces and long, swooping and winding spans for a wide variety of forward-thinking projects.

Made with propriety cement blends, specialized admixtures, fiber reinforcement and very fine granular aggregates, UHPC is a highly flowable and incredibly versatile construction material. It can exhibit compressive strengths up to nearly 30,000 psi and flexural strengths approaching 7,000 psi, making it ideal for complex sections. UHPC’s strength characteristics – along with superior particle packing and a very low water content – contribute to its remarkable ductility and resistance to abrasion, freeze/thaw cycles, corrosion and impact.

UHPC has been used in projects ranging from cutting-edge architectural applications to bridges and high-rise construction.

EYE-CATCHING

Thanks to advancements in technology, concrete can now serve as a blank canvas for unlimited design possibilities.
At McGill University in Montreal, Québec, a residence hall’s precast concrete façade features stills from a Thomas Edison film that appear to move depending on the angle an individual takes when viewing the building. The technique used to make the panels, called photoengraving, dramatically transforms the residence hall from a simple structure to a work of art.

The photoengraving process includes everything from scanning the selected pictures into a computer to the use of a computer numerical control milling machine. In the end, polyurethane is poured over the finished concrete milling model, creating the formliner. This formliner serves as a negative over which the concrete is poured. The result is an eye-catching precast panel that can depict any imaginable scene.

ENDLESS POSSIBILITIES

Despite its reputation as an unchanging material, concrete offers infinite opportunities for advancement and creativity. As architects and engineers continue to push concrete’s boundaries, only the limits of human imagination will get in the way, leaving the door open for the students of today to become the construction industry innovators of tomorrow. PS

Mason Nichols is NPCA’s external communication and marketing manager.

Endnote
1 According to the Concrete Joint Sustainability initiative, twice as much concrete is used globally than plastic, aluminum, steel and wood combined. sustainableconcrete.org/?q=node/42
Given the ever-increasing costs of higher education, it’s not unfair to ask: Is a college degree really worth it? Despite the financial burdens sometimes associated with earning a degree, the answer is still a resounding yes.

According to a recent Pew Research Center study, young adults “with only a high school diploma earn 62% of what the typical college graduate earns.” The study also found college graduates aged 25-32 working full time earn roughly $17,500 more annually than young adults with only a high school diploma.

Further, the report noted a majority of college graduates regret not taking additional steps to better prepare themselves for entering the workforce. So what can you do as a student to increase your chances of getting an exciting job offer upon – or even before – graduation? The answer lies in your ability to secure an all-important internship.

**A COMPETITIVE ADVANTAGE**

The next logical question one might ask is: What are the top desired skills an employer is looking for in a college graduate? In a National Association of Colleges and Employers survey, 200 employers were asked to provide the top skills they seek when hiring college graduates. Here is the resulting list, ranked in order of importance:

1. Ability to communicate verbally with people inside and outside an organization
2. Ability to work in a team
3. Ability to make decisions and solve problems
4. Ability to plan, organize and prioritize work
5. Ability to obtain and process information
6. Ability to analyze quantitative data
7. Technical knowledge related to the job
8. Proficiency with computer software programs
9. Ability to create and/or edit written reports
10. Ability to sell and influence others

Item 7 notes employers seek prospects with the technical knowledge necessary to do the job. But how can you acquire this knowledge before graduation? This is where internships, which allow you to learn the technical skills employers are looking for, come into play.

Academic institutions have caught onto this need and are increasingly including internship programs in their curricula. For example, Concrete Industry Management (CIM) programs, including those at Middle Tennessee State University, Texas State University, Chico State University and New Jersey Institute of Technology require a 400-hour internship to graduate. An increasing number of construction management schools as well as engineering schools are also adding an internship requirement to their curricula.

**A SHOT IN THE ARM**

The main benefit of an internship is the student significantly increases his or her chances of landing a job upon graduation. In fact, according to NACE statistics, 60% of college graduates who participate in an internship receive at least one job offer.

Participating in an internship can also help students gain the real-world experience all employers seek. As mentioned earlier, some of the top skills employers look for in recent college graduates include the ability to work in a team, solve problems and communicate effectively. These skills are best acquired by spending time in a working environment. During an internship, students get the opportunity to engage in multiple projects and interact with other team members, including customers, to develop such skills.

In addition to widening a student’s skill set, internships...
provide the shot in the arm many need in order to gain a rewarding position in their industry. Without the real-world experiences and skills garnered through internships, resumes may fall short in comparison to others submitted for the same jobs.

By completing an internship, the student also gets the opportunity to make the critical connection between theory and practice. Observing how to implement theory in a practical environment allows the student to gain the confidence necessary to be a successful employee.

The list of benefits is seemingly endless. Students also:

• Find out exactly what professionals in various functions do, which can help them refine their career choices.
• Become professionals who can relate their learning in the classroom and adapt it to the workplace.
• Become more attractive to employers because they’re already trained and can be productive immediately.
• Significantly improve the level of job and salary offers they receive upon graduation.
• Develop professional behavior and social skills within their industry.

SECURING AN INTERNSHIP

There are many ways to secure an internship, but a student’s most valuable resource is the faculty and staff at his or her school. Selecting a faculty advisor early on is important, as this individual will serve as a student’s mentor and will be a valuable resource throughout college and beyond. Students need to make sure to ask their mentor for referrals and advice regarding available internship opportunities.

To further increase their chances of obtaining an internship, students can also attend social networking events in which employers visit campuses and engage with students. One best practice is to conduct research about the company in advance and have a broad understanding of the company’s products and philosophy before engaging in conversation.

THE PRECAST CONCRETE INDUSTRY

For students interested in a career in the precast concrete industry, an important resource is the National Precast Concrete Association. NPCA’s website (precast.org) contains a list of all producer members by location as well as company product lines. One way to initiate contact is to find a local precast producer nearby and ask for a plant tour. Most will be happy to show students around.

Alternatively, students can contact a producer member directly to express interest in becoming an intern. The NPCA website also offers industry newsletters and learning opportunities available through webinars and seminars.

PRECASTERS OF TOMORROW

The precast concrete industry is actively seeking qualified interns to enhance the overall quality of production and to fill a need of qualified young professionals in the field. Even if an internship is not a requirement, it’s advisable to take the initiative to identify precast concrete producers in the area and contact them for summer employment opportunities. The internship gained could lead to an ideal job in the future.

Ayaz Ahmed is an associate professor in the Concrete Industry Management Department and the program coordinator for the CIM MBA program at Middle Tennessee State University.

Endnotes

1 pewsocialtrends.org/2014/02/11/the-rising-cost-of-not-going-to-college/
2 naceweb.org/s10242012/skills-abilities-qualities-new-hires.aspx
3 naceweb.org/s08012012/paid-intern-job-offer/
Receive up to $14,500!

The NPCA Foundation offers undergraduate and graduate scholarships for students pursuing degrees related to the building, construction or precast concrete industries, including engineering, architecture, construction management and more.

Visit precast.org/scholarships to learn more and apply today!