Beautiful belongs on walls, you’re half right.

fgsPermaShine® floor
Equinox Fitness Center, NY
Contractor: Green Earth Floors
I have been looking forward to an issue of Concrete News devoted the most important man-made building material for a long time.

Some years ago I took a picture of a street sign that captured the corner of Portland Avenue and Cement Street. One in a million. I don’t have a house on that corner, but my home has been in Portland cement concrete all my working career—4 decades long this year. Now, I am very happy to bring the subject up front and personal to you, our faithful and interested readers with this issue.

On the surface, like many complex things, this magical gray powder looks common enough. But when you add water the party begins. And when that happens you better be ready because, like the tides, hydrating Portland cement waits for no one.

There are many misperceptions about Portland cement in the building industry. It is a victim of many unanswered accusations. But, here are a few things I have come to know about Portland concrete, the world’s “most popular building material.”

- **It's complicated.**
- The water cement ratio is the **MOST** important thing you can learn about its predictable long term strength and durability.
- The control of the hydration of Portland cement (curing) has the second most dramatic effect on its long term strength and durability.
- Thomas Edison was very important in the development of today's cement industry.
- As soon as you add water to it, it changes.
- It has NOT changed a lot over the past 100 years, but how it is used has changed a lot.
- It works well with other complimentary cementing materials.
- It uses a lot of energy to create, but provides one of the longest lasting, most durable building materials ever created.
- With care, today's modern concrete structures can outlast the Pantheon in Rome.

As always, I hope you find this new edition of Concrete News informative and useful. We appreciate your business and interest.

Best regards,

Greg Schwietz

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**Notes from Greg**

—Greg Schwietz, Publisher
L&M Concrete News

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**Congratulations to Stu Wood for 20 Great Years!**

Stu Wood, the L&M Chief Chemist, just celebrated his 20th anniversary with the company last summer. Stu oversees all construction chemical testing, competitive testing, and technical support calls from the field.

After serving our country in the U.S. Air Force for 21 years, Stu decided to put his University of Iowa chemistry education to the test and came to L&M as a chemist. He started out testing various concrete chemical formulations, learning and tinkering in the lab.

L&M Construction Chemicals’ founder, Larry Schwietz and former L&M president, Greg Schwietz, were instrumental in cultivating the environment for Stu to succeed. Stu played an important role in developing popular, market-proven L&M products, such as EMERYTOP 400™, DURATOP HP™, FASTRAK™, and DURAPATCH™ VOH.

Stu wears multiples hats at L&M and is always quick to answer technical questions both from colleagues and from the field.

Thank you, Stu, for your exceptional, 20+ year contribution to the L&M Team!
Distributor Profile with Gordon Heins, A.G. Heins Company, Tennessee

A.G. Heins is a family-owned and operated construction products distributor that began in 1920. President and Chairman Gordon Heins’ grandfather founded the company, and worked until he was 95. Gordon came on-board in 1981, and worked with his father and grandfather for 3 years before his grandfather passed away.

Today, all 3 of Gordon’s children are actively involved in the business, its 4th Generation, spanning 95 years.

We spoke with Gordon about the company's customers, its employees, and its long-standing history with L&M.

A.G. Heins is a building products supplier offering diverse product lines to the building materials market. In addition to product recommendations, the firm gives referrals, job quotations, and specification consultations. A.G. Heins’ geographic reach is east Tennessee. The company has two locations: one in Knoxville, and one in Blountville, TN. Gordon's younger son, Alex, manages the store in Blountville. Jacob, Gordon's older son, and Anna, his daughter, work at the Knoxville location.

The company’s customers include general contractors, sub-contractors, walk-in trades, concrete pros, and masons. A.G. Heins sells a diverse line of construction products covering much of the building envelope, such as concrete chemicals, slate and tile roofing materials, synthetic stucco and stone. Gordon says the diverse line of products helped the business during the tough years. Additionally, the diversification of the product line keeps the firm actively competitive versus the bigger retailers. In fact, it is one of the company’s main points of differentiation.

A.G. Heins competes against others who offer narrower product lines. Another interesting point of difference: Gordon is a registered architect as is executive vice president Jon Williams. This makes communicating with architects easy—they speak their language. They're not just trying to sell products. Gordon and Jon want them to know they understand their projects. As Gordon says, “Not many architects run a buildings materials supply business.”

One of the other keys to success in this business, Gordon says, are the relationships built over time. Gordon has known Greg Schwietz for over 30 years. He values Greg's concrete industry knowledge and, more importantly, his friendship. Greg visits A.G. Heins regularly, and helps them with product expertise. Additionally, Gordon enjoys working with LATICRETE L&M product rep Rob Poitevent. Gordon has known and worked with Rob for over 20 years. Gordon says Rob has excellent product and industry knowledge, and that he helps his guys consult in the field.

Since A.G. Heins sells most of the building envelope, they already had great familiarity with the LATICRETE L&M product line. The LATICRETE product offerings dovetail perfectly into the distributor's assorted product line.

Gordon says even though they’ve been in business for 95 years, tradition doesn’t sell anything to anyone. No one rests on laurels. Each day, they prove their worth to their customers and prospects and partners. A.G. Heins' employees work hard to earn the sale. The major big box players coming into their market are a threat. Therefore, A.G. Heins constantly re-invests in its relationships. Gordon reiterates that being around forever doesn’t guarantee you anything in the building materials supply business. There is always going to be change in the industry, even when it comes to communication.

Like most leaders in the concrete business, Gordon sees changes in the marketplace. New products are always coming online. Gordon concludes, “If you're on the leading edge, you can get into a niche for awhile. But it is only good for so long. You always have to look for niches where you can get in and make some decent profit. It's always going to be a niche market. The product expertise really helps to set A.G. Heins apart as well as the relationships with the generals, subs, and architects. Price isn't everything.”

For more information about A.G. Heins, contact:
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President & Chairman
A.G. Heins Company, Inc.
www.agheins.com
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In the spring of 2013, LeChase Construction, the general contractor on the Amphenol Aerospace Manufacturing project, contacted The MJA Company, asking them to submit a polished concrete proposal. The spec called for a polished concrete contractor to take a freshly placed slab in a new building to a 400 grit sheen level, perfect for an industrial warehouse. There were a total of 12 qualified polishing proposals submitted.

In early 2014, The MJA Company crew participated in several pre-construction meetings—including a pre-pour—that were vital to the successful outcome. Additionally, the team performed on-site mockups for the owner, architect, and general contractor.

The general contractor selected The MJA Company for the job based upon their 16 years of polishing experience, their reputation of excellent craftsmanship, and the results of their mockups. Vic Scotese, Technical Sales Rep, got L&M FGS PERMASHINE™ polished concrete system in the specification, and Marty Harrington, Technical Sales Rep for New York, helped secure the job.

The project schedule was tight—the timeline called for 200,000 sq. ft. of concrete be polished and approximately 30,000 ln. ft. of control joints be filled, with over 1,000 ln. ft. of perimeter joints and diamonds around columns. Project staff included 10 field personnel and working supervisors. Project managers scheduled polishers to work in 2 shifts of 10 hours each. Fully cognizant of this very demanding project schedule, the company made sure that every team member was home each weekend.

After the pre-con work was complete, the team went to work on the 90 day cured slab. The crew filled saw cuts, big cracks, and cold joints with L&M JOINT TITE™ 750 polyurea joint filler. A leaky roof allowed some water to drip down onto the new slab, so they patched these bad areas with L&M DURAFLOOR HP™, a polishable wear topping.

Once the slab’s imperfections were corrected, it was ready for polishing. After some experimentation, the crew decided on the following diamond grit sequence: 100 resins wet, followed by 200 resins wet, then 400 resins dry. Some floor areas required 50 resins wet, continuing on to the rest of the diamond sequence.
“The general contractor selected The MJA Company for the job based upon their 16 years of concrete experience, their reputation of excellent craftsmanship, and the results of their mockups.”

All resins were SASE’s Zenith pads. After the 400 resins, the surface was hardened, densified, and dustproofed with two coats of L&M FGS HARDENER PLUS™. Finally, the crew applied L&M PERMAGUARD™ to protect the new floor from staining. The polishing crew stated that the ease of the L&M FGS PERMASHINE™ products helped the project run smoothly and on time.

The polishing equipment used on the project included: 2 SASE 780 machines and 1 PDG 8000 with vacuums, 1 Tennant 8200 ride-on and 2 Tennant 5700 walk-behind machines, 2 burnishers and 2 AST GMP025 joint pumps.

The key success factor in this polishing job was excellent communication among all the stakeholders involved, including the manufacturer, the distributor, the general contractor, the owner, the project managers and site supervisors. This allowed everyone to be on the same page and ensure timely project completion under a difficult deadline. The MJA Company’s Mark Finch did an excellent job of coordinating and facilitating this communication.

Marty Harrington sums up the Amphenol FGS polished concrete project as follows: “The Amphenol FGS PERMASHINE was by far the largest polished concrete flooring project I have ever been involved with, and it went off without a hitch. It was a pleasure to work with Mark, Tim, Landrey and the rest of The MJA crew and witness the expertise with which they performed. It has already resulted in additional projects being awarded where we can continue to work together.”

The Amphenol floor opened for service in March 2014.

About The MJA Company

The MJA Company is an established company specializing in the treatment, repair, and renovation of exposed concrete surfaces.

The MJA Company’s commitment to its workforce and exceptional industry reputation allows us to recruit and retain some of the very best craftsmen.

The MJA Company’s tagline is the core of our business: “Your Project. Our Reputation.”
Cement is one of the world’s most popular building materials and has been used for over 2,000 years. Structures such as the Roman Coliseum were constructed using a form of cement. Some are still standing today. Cements changed very little until 1824 when an Englishman, Joseph Aspdin, received a patent for his new method of proportioning and blending raw material based upon chemistry. He named his product Portland cement because mortar made with his product had a color similar to a natural building stone that was quarried from the Isle of Portland off the coast of England. Improvements by Aspdin and others have led to the cement we are currently using. Portland cement has not changed significantly in the last 100 years.

In 2004, the Portland Cement Association surveyed all 123 cement plants in the U.S. and Canada (P. Tennis, J. Bhatty, 2005). This survey collected and compared cement data in three different areas: chemical and phase composition, fineness, and strength. This data was then compared to survey data from 1994 and the early 1950’s. These surveys proved there have been very few chemical changes. While cement is still made up primarily of calcium, silica, alumina and iron, there has been a slight change in the phase composition. Tri-calcium silicate (C₃S), the compound primarily responsible for early strengths, has increased, while dicalcium silicate (C₂S), the compound responsible for later age strength, has decreased.

These phase composition changes, as well as an increase in fineness (Blaine) result in modern cements that have higher early strengths. There has been a demand in construction to increase early strengths to speed up construction processes, allowing wall forms to be stripped earlier and pavements and slabs to be opened to traffic sooner. Although cube compressive strengths between the cements from the 1950’s and the 1990’s are not directly comparable due to a change in the water content used to make the strength samples, the table shows an approximation of the strengths and how they have gone up since the 1950’s. (See table, right.)

### Blended Cements

One of the bigger changes in the cement industry is the increase in the amount and types of blended cements being manufactured. Blended cements combine Portland cement with Supplemental Cementitious Materials (SCMs) and other minerals to produce cements with specific enhanced properties. SCMs are materials such as fly ash, ground granulated blast furnace slag, silica fume, calcined clay and volcanic ash. These materials are either blended with ground cement or interground with cement clinker at the finish mills in tightly controlled proportions. The SCMs chemically combine with the hydration products of the Portland cement to reduce the permeability of concrete and increase concrete durability.

Blended cements can be formulated to mitigate Alkali Silica Reaction (ASR) in concrete containing reactive aggregates. Blended cements can also be formulated to increase sulfate resistance in concrete exposed to high sulfate soils and water. Certain blended cements can be used to lower the heat of hydration in mass concrete, such as dams and large foundations.

Blended cements can also have gypsum contents optimized for the blend of the cement and SCMs. Gypsum is
Concrete is a Green building material. Durable concrete has a long service life that expends very little energy, giving it a long, sustainable life cycle.

used to control the setting of cement to prevent false and flash sets in concrete. The gypsum does this by controlling the alumina portion of cements. Some SCMs also have alumina compounds that can compete with the alumina compounds in the Portland cement for the gypsum. This can lead to rapid slump loss and setting problems in concrete. Blended cements can have increased gypsum to optimize the SCMs.

Blended cements are manufactured to comply with ASTM C 595, Standard Specification for Blended Cements. The blended cements are designated as Type IP(X) for pozzolan blended cements containing fly ash, or natural pozzolan SCMs, such as calcined clay or volcanic ash or Type IS(X) slag blended cements, where (X) is the percent of SCM in the blend. For example, Type IS(25) is a blended cement with 25% slag.

In recent years, another type of blended cement has been gaining popularity in North America, Type II. This is a Portland cement type that contains interground limestone. Cements blended with up to 35% ground limestone have been used for many years in other parts of the world and are often the predominating cement used. By intergrinding limestone, the clinker content of the cement can be lowered. Lowering the clinker content helps to reduce the CO2 emissions per ton of cement and thereby per cubic yard of concrete.

Concrete is a Green building material.

Durable concrete has a long service life that expends very little energy, giving it a long, sustainable life cycle. Reducing the CO2 emissions during manufacturing helps concrete be an even more sustainable building material. Research has shown that controlling the fineness and the particle size distribution during intergrinding results in a cement that produces similar properties as concrete made with other types of cements.

The cement industry faces increasing regulatory issues and is constantly striving to reduce energy consumption. As the industry responds to these challenges, changes in the manufacturing process may result in slight changes in the cements produced. The cement industry will be working with the chemical and admix industry, concrete producers, researchers and specifiers to provide cements that will produce durable and sustainable concrete that can last for centuries.

REFERENCES:
For more information on cements go to The Portland Cement Association website: http://www.cement.org.
www.cement.org/tech/pdfs/pl992.pdf


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Dave is a graduate of the University of Wisconsin and a registered professional engineer in Kansas and Wisconsin. Dave has over 30 years experience in the cement and concrete industry.

He is a Fellow of the American Concrete Institute, a member of the Board of Directors and serves as the chairman of the Curing Concrete Committee. Dave is also a member of the Parking Lot, Pervious Concrete and Hydraulic Cements Certification Program and Chapter Activities Committees.

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Concrete's “recent” history dates back to 1824, when Joseph Aspdin invented Portland cement. While it is true that the Romans had a cementing material similar to Portland cement, during the Middle Ages, the art of making this cementing material was lost. It was not until Joseph Aspdin's innovation that the true concrete art was brought back to life.

By 1900, the first standardized testing procedures for Portland cement had been written. Before that time very little testing was done, and very little cement was produced.

In 1909, Thomas Edison was issued a patent for the first rotary kiln. The rotary kiln revolutionized the production of Portland cement. Prior to the rotary kiln, cement was produced by heating large caldrons filled with limestone and clay. Upon cooling, a hardened mass would form. This hardened mass was then pulverized to produce Portland cement. Production was slow and costly.

The rotary kiln is nothing more than a long cylinder-like tube, about 300 feet long and about 12 feet in diameter, lined with firebrick. It is inclined 15 to 20 degrees from the horizontal. Raw materials are loaded in at the upper-end of the rotary kiln and heated to about 2400°F. As the rotary kiln turns, the raw materials flow "downhill." Along the way, they are converted into thousands of golf ball-sized, spherical cinders called "clinkers." These clinkers are then mixed with gypsum and pulverized. The end product is Portland cement.

The rotary kiln made it possible for Portland cement to be produced as a continual flow-through process. Using the rotary kiln, large amounts of Portland cement could be produced—exactly as it is today:

Thomas Edison anticipated that he would need large amounts of cement to produce concrete for the concrete houses he wanted to build. Unfortunately for Thomas Edison, concrete houses did not catch on. He built a few such homes, however, some of which can be seen today in Union, New Jersey. Edison would likely be impressed with the advancements in concrete home construction.

A key event in the early history of concrete was the introduction of air entrainment for freeze thaw protection in 1930. The discovery of air entrainment was a serendipitous event. As the story goes, some lubricant accidentally found its way into a batch of Portland cement. When the cement was used in concrete, the high pH of the concrete changed the lubricant into soap. The concrete’s mixing action caused the soap to entrain air in the material. As luck would have it, this batch of concrete was placed in an area that was subject to freezing and thawing where it did not deteriorate. This was a big "Aha!" moment in the history of concrete.

In 1936, under the direction of FDR, the Hoover Dam project began. The two primary reasons for the project were flood control and job creation. This was the largest concrete project to date. The concrete pours were very large. The temperature rise during the early stage of hydration had to be addressed. This required the development of a Portland cement with a lower heat of hydration. After this was developed, the temperature of the concrete was further controlled by placing conduit in the mass of the concrete and circulating cool water through it. If these steps had not been employed, it would have taken 150 years for the dam face to cool to ambient temperature.

Large, unprecedented construction projects, such as the Hoover Dam, require creativity and innovation. Ironically, the Hoover Dam was a government project that came in ahead of schedule and under budget. After being in service for a few years, the Hoover Dam paid for itself.

During World War II, it was very difficult to ship war goods across the country. In 1956, President Eisenhower asked Congress for, and got, the Federal Interstate Highway Act. Concrete built these highways coast to coast. It was a good thing that by then we had a good understanding of the importance of air entrainment. Otherwise, our concrete highways would not have stood the test of time.

Past and present, there have been a number of innovations that affected the way concrete is produced and used. As late as the early 1970s, in some parts of the country, concrete was being specified by the number of bags of cement in a cubic yard of concrete. By the mid 1970s, almost all concrete was being specified by the compressive strength produced after 28 days of curing. This change in the way concrete was specified allowed for the use of chemical admixtures, which further allowed for improvements in concrete's plastic and hardened state.

Today, both decorative and polished concrete are popular. Diamond polishing allows for the resurfacing of old, worn-out concrete floors, giving them new service life. Decorative concrete artists use the surface as a canvas on which art is produced. Concrete is not just the structural gray building material that typically gets covered up. Now, it generates new architectural interest as decorative concrete showcases beauty and durability.

To bring concrete to its present state of art has taken the genius of the inventor of the light bulb, two US presidents, a world war, and an accidental discovery, plus new innovations that are only a few years old. It has been said that concrete is man’s oldest and greatest building material. Concrete has come a long way, and concrete pros write its history every day.
By Jeff Bonkiewicz
Editor

An Interview with Jason Gonder, senior vice president of Cornerstone Construction Services located in Orlando, FL.

Jason leads construction projects through the pre-construction and construction phases. He has primary responsibility for the Master Budget, the Master Schedule, and the Quality Plan. He coordinates and manages all estimating, field staff, and office staff. He serves as point man for the general contractor, the owners, and design professionals. He has 17 years' experience in working with owners, general contractors, designers, and engineers from conceptual/bid stage through final turnover and acceptance.

JB: Please give us a little background on your concrete contracting company and what markets Cornerstone focuses on.

JG: Cornerstone is a 26 year-old concrete contracting business. We are primarily a cast-in-place contractor, but we do lots of other types of concrete work. We do local government work for the City of Orlando. We work on Orange county's projects. We primarily handle the Central Florida area. Cornerstone does theme park work as well.

JB: How has the industry changed over the years and how has Cornerstone adapted to those changes?

JG: We adapted to doing smaller jobs. The waste transfer station work has helped a lot. We like that work quite a bit. We educated ourselves. We got more involved in the industry. We got certified with ACI and ICRI. Additionally, we learned how to do things cheaper. It grounded our expectations for future work.

JB: What makes your contracting company different? What actions have you found that make you guys successful?

JG: We'll handle multiple scopes of work that are fairly odd. We can combine different scopes that another company wouldn't take. We can do pavers. We can do site furnishings. We'll do demolition. We'll build metal buildings. We try to stay very involved with the project and do what it takes to help out in documentation and change orders. And hanging in there when things don't go so good.

JB: What's your least favorite part about this business?

JG: Early morning pours. 2 AM pours. In Florida, that's the nature of the beast.

JB: Cornerstone does lots of high profile concrete work. What's been your experience working on these types of projects?

JG: They're challenging and rewarding. We've been working at the Amway Center's exterior work and foundations. We've also been at the new performing arts center downtown. Theme Parks—it doesn't get much higher profile than that. We have a good relationship with the generals. The City of Orlando has been a long time client as well.

JB: Does Cornerstone work on many LEED projects? If so, how do those differ from your perspective?

JG: The Amway Center is LEED. The downtown performing arts center is LEED. Since we're concrete guys, LEED is more paperwork. You're tracking down recycled content and post-consumer recycled content. There is a credit for regional materials within 500 miles. The rebar is recycled content.

I am LEED-certified, and we have two other people that are LEED certified as well.

JB: Cornerstone performs many Emery Top 400 jobs in your region. Are these exclusively waste transfer station jobs or are there other applications? Also, how has Cornerstone nailed this niche?

JG: So far most have been waste transfer station jobs. About 12 years ago, we got our first transfer station rehab project. I had done that sort of work before, working with high strength, thin toppings. We kept going after it. The competition wasn't too fierce going after the waste transfer stations. [Laughs.] They're typically cycled at 5 to 8 years. Some municipalities have multiple transfer stations we'll work at that cycle. We'll also do steel repair work and drainage repair.

We handle recycling centers, too.

JB: What do you do when things go wrong and the owner or architect is unhappy? What's been your experience with fixing bad situations?

JG: We believe in open and honest communication. Try to figure out exactly what is wrong, and go fix it. You may need to demo-out something that you've done, or offer continued on page 10...

“We believe in open and honest communication. Try to figure out exactly what is wrong, and go fix it.”
— Jason Gonder
Famous concrete structures include the Hoover Dam, the Panama Canal and the Roman Pantheon. The concrete dome of the Pantheon is the world’s largest unreinforced concrete dome.

After the Roman Empire collapsed, use of concrete became rare until the technology was re-pioneered in the mid-18th century. Today, concrete is the most widely used man-made material (measured by tonnage).

The world record for the largest concrete pour in a single project is the Three Gorges Dam in Hubei Province, China by the Three Gorges Corporation. The amount of concrete used in the construction of the dam is estimated at 16 million cubic meters over 17 years.

The world record for concrete pumping was set in 2009, during the construction of the Parbati Hydroelectric Project, near the village of Suind, Himachal Pradesh, India, when the concrete mix was pumped through a vertical height of 2,346 ft

The world record for largest continuously poured concrete floor was completed in 1997, in Louisville, Kentucky by design-build firm EXXCEL Project Management. The monolithic placement consisted of 225,000 sq. ft. of concrete placed within a 30-hour period.

The record for the largest continuously placed underwater concrete pour was completed in 2010, in New Orleans, Louisiana by contractor C. J. Mahan Construction Company, LLC of Grove City, Ohio. The placement consisted of 10,251 cubic yards of concrete placed in a 58.5 hour period using two concrete pumps and two dedicated concrete batch plants. Upon curing, this placement allows the 50,180 sq. ft. cofferdam to be dewatered approximately 26 feet below sea level to allow the construction of the Inner Harbor Navigation Canal Sill & Monolith Project to be completed in the dry.


Concrete: For the record

The Roman Pantheon’s concrete dome is around 2,000 years old, give or take a few weeks.

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Concrete: For the record

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The word concrete comes from the Latin word “concretus” (meaning compact or condensed), the perfect passive participle of “concrescere”, from “con-” (together) and “crescere” (to grow).
Installing The World’s Toughest Floor.

EmeryTop 400™

1. Prep begins by scarifying surface. Scarifier attached to skid-steer loader.

2. L&M EMERYTOP 400 is bonded to existing concrete with L&M Everbond™

3. L&M EMERYTOP 400 “Super-Sacks” mixed with concrete mixing truck

4. Placement of L&M EMERYTOP 400™

5. Finishing L&M EMERYTOP 400 with power-trowel

6. L&M EMERYTOP 400: The World’s Toughest Floor
Everyone knows that Portland cement is a key ingredient in concrete. While it hasn’t changed much throughout the years, concrete mix design professionals have developed the ability to manipulate their project mix designs in accordance with specific construction project requirements.

Jereme Montgomery, Executive Director of the Nebraska Concrete and Aggregates Association, discusses Portland cement and its evolution in today’s concrete.

It’s concrete, not cement.

Have you ever fallen on a “cement” sidewalk and skinned your knee? Then, you were pretty dusty! Portland cement is a powder that chemically reacts with water to form a hardened ‘glue’ that bonds rocks together called concrete. Although cement is only 10-12% of the total volume of a cubic yard of concrete, it may be the most important ingredient regarding constructability and durability of a concrete mix. Let’s take a closer look at this aggregate binder.

Types of cement:

First, there are different types of cement. ASTM C150, the standard specification for Portland cement, categorizes cement into 5 different types. For this article, let’s focus on a couple of categories:

**Type I Cement** is a general purpose cement most commonly used for general construction. People often ask, “Has cement changed over the years?” In short, the answer is “Yes.” Although the chemical composition has not dramatically changed, today’s cement is ground finer than in the past. The reasoning is due to construction schedules. Owners want to move-in sooner, therefore contractors need to move faster. If the cement particle is finer, it has more surface area that reacts with the water to hydrate and harden faster. The faster the concrete gains strength, the faster contractors can strip forms or open structures to traffic.

Let’s take another type, **Type III Cement**, which is commonly referred to as a “high-strength” cement. Mix designs using that cement are typically used for paving repairs, allowing DOTs and municipalities to open the street within hours instead of days.

Blended cements:

Another change in cements is the use of blended cements, such as Type IP cement. The “P” refers to pozzolans. Popular examples of these pozzolans are fly ash, silica fume, and slag. Some are a byproduct of coal. Some are a byproduct of steel. Some are a byproduct of silicon. For example, one type of blended cement used in Nebraska is Type IPF cement, where 25% of the Portland cement is replaced with Fly Ash. This type of cement is required by the Nebraska Department of Roads (NDOR) for state work.

The benefits of pozzolans in concrete are threefold. First, these are materials that would normally go to the landfill and can now be used in concrete as a recycled material. Second is economic gain. Depending on where you are located, pozzolans are typically cheaper than cement. The third benefit is improved durability properties. Since pozzolans are smaller in size than cement grains, they ultimately create a denser, more durable, finished, hardened concrete mass, often referred to as particle packing. Other benefits of blended cements may include increased strength, workability and improved finishability of a given mix.

“In the future, you will see an increase in ternary mixes, utilizing three different cementitious components in the mix.”

It's important to remember that these blended cements may not hydrate like a “straight” cement mixture. While they
Although cement is only 10-12% of the total volume of a cubic yard of concrete, it may be the most important ingredient...

are proven to have higher ultimate strengths, it takes longer to achieve specified strengths, especially in colder climates. Some specifiers have moved to a 56-day strength requirement versus the traditional 28-day strength requirement. In the future, you will see an increase in ternary mixes, utilizing three different cementitious components in the mix.

“Today, there are many, many ways to proportion a mix.

Thousands of mix options:

While the engineer writes the spec, it is difficult for the engineer to specify constructability, placeability, or finishability. Therefore, chemical admixtures play a big role in taking a basic concrete mix and making it do things you want it to do. We use chemical admixtures to make the concrete harden in cold weather or slow down its hardening in hot weather. We use chemical admixtures to make non-pumpable mixes pumpable and also to make concrete workable with very little water. The advancement of chemical admixtures is by far the most dynamic component of concrete over the past few decades.

There used to be only a few different concrete mixes. Today, there are many, many ways to proportion a mix. Concrete placement properties can be completely customizable to the concrete project and the installer.

The clock is ticking…

Concrete is a perishable product—the mix is only produced as early as 20 minutes before it arrives on-site! Communication between the engineer, construction manager, producer and installer is critical to the success of each concrete project. A plan must be in place before the concrete mix arrives on the job. If quality control plans are executed, concrete projects usually go quite well, making concrete the world’s greatest building material.

About the Author:

Jereme Montgomery has a Bachelor of Science degree in Construction Management from the University of Nebraska. He has over 18 years experience in concrete. Since 2006, he has promoted concrete and aggregate products as the Executive Director for the Nebraska Concrete & Aggregates Association. He is also the current President for the American Concrete Institute-Nebraska Chapter and current member of the Construction Industry Advisory Council for the Durham School of Architectural Engineering & Construction.

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Successful paintings need to start with a good quality canvas. When referring to Polished Concrete, our canvas is a good, quality concrete floor. Proper mix design, professional finishing techniques and optimal curing are some of the obvious elements of an exceptional Polished Concrete floor.

Let's start with the mix design of the concrete. Keep in mind we still have economics, LEED® and practicality to consider when designing the concrete mix. Some specifications insist on straight cement mix designs with no admixtures allowed. This is slightly “old school,” not exactly state-of-the-art. We usually allow up to 15% cement replacement using fly ash, a recycled material. A 15% fly ash mix can still be properly finished. Remember: Fly ash overuse may cause blistering and delamination as it delays the slab’s set time.

Conventional water reducers and accelerators work well in polished concrete. However, there have been several unexplainable instances where specialty admixtures, such as shrinkage compensating products, yielded some strange results. Fiber reinforcement is definitely not desirable as they detract from the purity of the surface.

The bottom line: If you do not have any examples of a product used successfully on a polished concrete project, don’t use it, or do a mockup whenever possible.

**Placing & Finishing:**

Placing and finishing is key in the outcome of a good polishing job. First off, power screeding is essential in driving out the entrapped air and bringing enough paste to the top to meet the specification. Striking-off concrete with a 2” x 4” by hand simply does not produce a quality job. Most specifications call for a FF of 40 – 50 for polished concrete. This means using advanced finishing methods. Don’t use a 42” conventional bull float. Instead, start with a 60” channel float for initial straightening and then follow that with a bump cutter and check rod. These tools range from 8’ to 24’ in width. Cutting and filling the surface with these tools, working at 90-degree angles to each pass, ensures the flattest floor possible.

The desired finish on an ACI Class 5 and Class 6 floor specification is for a minimum of 3 passes without “burning” the surface. Occasionally, concrete finishers think that when the floor is going to be ground, a smooth finish is not required. This is not true. Polishers want it flat and well finished.

**Curling:**

Curling is the next big obstacle. Once we’ve produced a perfect floor, the challenge is keeping it that way. Reducing curling is a function of maintaining temperature and keeping moisture content the same on the top and the bottom of the slab. This is difficult to do when the designer insists on a
vapor barrier directly below the concrete, as opposed to placement over 2” – 4” of compacted granular fill as ACI suggests. Immediate curing after final finishing is one of the best ways to approach the issue.

**Our recommendation:**

Our recommended method is to cure the concrete with L&M CURE ™. This is a membrane-forming cure that meets ASTM C-309 and dissipates as construction traffic wears the product. The remaining residue will easily come off with the first metal bond grinding step. The reason I prefer a tightly applied cure is that it ensures a mottle-free, final appearance. Differential cure is then virtually eliminated. Protection methods may then be employed without the fear of discoloration, striping, etc.

Wet cure blankets are still a popular method of curing. Although expensive, they do a good job of curing in a short period of time without leaving membranes that need to be removed. Overlapping sheets or taping-off the seams will cause differential cure and leave permanent marking in the floor. Also, remember to immediately rinse and scrub the floor with an auto-scrubber after removing the sheets. Failure to do so will cause a build up of salt that is very difficult to remove from the concrete surface.

Saw cutting the slab properly is critical to avoid curling and cracking. Plan your saw cutting on 10’ – 12’ grids and no more than 12’ - 6”. Always cut off re-entrant corners and embedment items.

See chart (left) and the Concrete News article, Pinwheel Joint Techniques, from September 2008 (Vol. 8, No. 2) at www.lmcc.com/concretenews

Protection is a tricky endeavor as there are so many variables that play into the success or failure of a floor. A recent job by one of my installers required them to grind, polish and dye the concrete when it was only 8 days old. The job was then masterfully covered with a breathable material.

The cover was removed 58 days later when he noticed that the dye had adhered to the covering. In addition, the slab was covered with all of the salts from the bleed water still trying to escape. The entire job had to be re-done—starting from scratch—this time with all of the woodwork in place. Don’t let this happen to you.

**Lesson:** Be sure to wait for the slab to de-water before you grind. This subject just requires some common sense before attaching anything to the floor. A dissipating cure helps remove some of the unknown variables.

It is next to impossible to put a time frame on how long it takes concrete to de-water to an acceptable level as pouring conditions vary greatly. This is not a problem in hot, dry climates, but many of us live in the cold climates where a “day is not a day.” Waiting the recommended 28 days means the environment needs to be at 70 degrees for 28 days. A winter pour in North Dakota may not see 70 degrees in the building for several months. Therefore, the timetable changes proportionately.

In pouring environments with variable conditions, the best motto is “Don’t guess—test.”

**Find answers to your questions:**

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