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14 High moisture slabs in Decorative Concrete? Solve it! Read on.
Standards in the concrete industry are an organic and sometimes agonizingly slow documentation of the results of real world trial and error. On the surface, if you find yourself to be a creature of habit or a person who hates change, working with concrete may appear to be the right field to spend your remaining days. There is always comfort in the familiar, and concrete, on its surface, may appear to be the most unchanging field available. But don’t be fooled: concrete is a changing animal.

For generations, the Holy Book of the concrete industry has been the now seven volume set of the Manual of Practice authored and published by the American Concrete Institute. It’s a how-to guide for the concrete practitioner. Arguably one of the most read, referenced and cursed chapters (document) is 302.1R-15, Concrete Floor and Slab Construction, most recently updated in 2015 (last update was 2004). In this issue Pat Harrison, Vice President of SSI and Committee Vice Chairman of the 302 committee since 2004, offers a practical short course, pointing out some of the recent changes in this ever evolving document and offering important words of caution on what to expect and what not to expect from this document.

This issue’s guest concrete expert for our popular Concrete Contractor Soap-Box is Rick Stone, Structural Engineer and Senior Project Manager of Madison Concrete in Philadelphia. Interestingly, his time on the soapbox focuses on one complaint: standards that don’t keep up with advances in the concrete industry. Read his comments and learn from him on how you can improve your next concrete project.

As this year’s World of Concrete continued to feature polished concrete, it is obvious that it remains the industry’s new girlfriend, even though it has now been well over ten years since her entrance to the market was loudly broadcast to the construction industry. When will the love affair cool? Probably not in the near future. Specifier and green construction expert, Paul Nutcher, provides an easy-to-grasp update on the new LEED 4.0 guidelines, and underscores why concrete and, in particular, polished concrete will continue to be the darling of green construction. With continued improvements in polished concrete appearances and durability, expect to see an increase of this transformational process applied to your future concrete projects.

Finally, to wrap up another thought provoking issue, we will continue to tantalize your concrete tastes and expand your understanding of its potential with articles about industrial topping installations, polished concrete in new retail construction, product solutions for moisture problems, and boundary breaking, innovative distributors and leaders, like our business friends at Natural Stone Solutions in Miami, Florida.

We wish you another great year of growth in this wonderful industry. This is our 17th year of publishing Concrete News and introducing concrete industry experts and innovative experiences to you. We hope you find it beneficial.

Best regards,

Greg Schwietz
When Alex founded NSS in 2002, Edgar introduced him to Greg Schwietz, former president of L&M Construction Chemicals. After meeting Greg, Alex then brought on the L&M Construction Chemicals product line.

A concrete industry veteran, Alex has over 24 years of experience in the floor care and polished concrete industries. Alex has trained hundreds of polishing contractors over the years. A recent polished concrete and coatings seminar NSS co-hosted with LATICRETE was a resounding success. Polished concrete and coatings contractors traveled far to get in-person training from Alex and Alejandro on LATICRETE® L&M™ Construction Chemicals and SPARTACOTE® Resinous Flooring Systems.

Ruben says, “When Alex goes out to train contractors on how to use the equipment, the rapport he has is exceptional. We offer honest, no nonsense expertise and support they love to both new and experienced polishing contractors. It is easy to talk to all of us for support and advice and to get the right solutions.”

Alex adds, “When we sell equipment, we give a lot of added value to the sale. The customer gets consulting from us. If they run into issues in their jobs, even if it is a product we don’t sell, we give them an honest recommendation. We train a key person on the products, which is usually the owner or manager. Someone close to the company so he or she can train new employees as they are hired. We call it ‘Train the Trainer.’ By doing this, I never have to train a company twice.”

Looking to the future, NSS plans to build upon its already great relationship with LATICRETE and Alejandro through co-hosting seminars and trade show exhibitions and expanding NSS customers’ product offerings.
Hyde Concrete, privately owned by Greg Hyde, is a concrete contractor that specializes in decorative concrete and difficult projects, such as industrial hardeners and toppings like L&M™ EMERYTOP 400™. Recently, Hyde acquired Stevenson Concrete, a concrete company that specializes in commercial and industrial work and cast-in-place projects. The two concrete contractors had done several projects together in the past. Hyde had previous experience placing L&M EMERYTOP 400 at a waste transfer station in the greater Washington D.C. area.

Greg Hyde initially found out about the Smithsonian job 18 months previous to its installation. The lead came in through LATICRETE Technical Sales Representative, Vic Scotese. Hyde met with the general contractor, which was a joint venture between Clark, Smoot and Russell. Scotese and Hyde did a project site visit, and then Hyde gave the GC a proposal. Hyde followed up consistently over the next 12 months and then the job went cold. Around the 18 month mark, having heard nothing about the project in 6 months, Hyde thought the project lead was dead and had moved onto other projects. But then, he got a phone call one day from a Clark project manager and they wanted to talk about the project. The job then went from ice cold to red hot in a matter of one phone call.

Concrete construction project timelines are typically tight, and this one was no exception. The Hyde team was given a 5 day window to prepare the existing concrete surface, and then mix, pour, and place the L&M EMERYTOP 400 topping. They were not given the entire surface at once, so they had to break the job up into near-equal topping placements of 3,000 sq ft (279 sq m) each. The total square footage of the project was 11,500 sq ft (1068 sq m) with the topping’s depth at 1 inch (2.5 cm) thickness.

The design team built the National Museum of African American History to the highest, exacting standards—Smithsonian Institution buildings are built to last. The designers wanted the most durable concrete surface on the loading dock and work bay areas with two separate bays that would see consistent forklift traffic. Therefore, they specified L&M EMERYTOP 400 by LATICRETE International, Inc.

The design team built the National Museum of African American History to the highest, exacting standards—Smithsonian Institution buildings are built to last.
CONCRETE SURFACE PREPARATION

The new building’s initial concrete contractors gave the new slab an aggressive rake finish 18 months prior to the topping. As such, the profile necessary for a hardener topping was already worked into the surface. The Hyde team went in with 4,000 PSI (28 MPa) washers and powerwashed the existing surface. Hyde said the original concrete cleaned up very well and opened up the surface to prepare it for the L&M™ EMERYTOP 400™ topping.

On top of the powerwashed surface, the Hyde crew applied a bonding slurry of L&M EVERBOND™ and Type 1 cement to bind the topping to the existing substrate. Once it is mixed, the concrete contractor brooms the slurry onto the surface immediately prior to the L&M EMERYTOP 400 being placed, ensuring no puddling of the material. This bonding slurry is highly flexible and it is temperature insensitive, unlike epoxy bonding agents that have minimum temperature cure levels.

The Hyde team brought two ten-yard concrete read-y-mix trucks to the site. They began loading one mixer with a number of Supersacks (3,000 lbs [1361 kg] of material) of L&M EMERYTOP 400. As soon as the mix sequence transpired and pouring began, they started putting in water for the next load into the next truck. They then placed the topping mix and then loaded up the second truck with the next batch of material. Hyde said they had very good environmental conditions for placing the L&M EMERYTOP 400 topping because it was indoors. L&M E-CON™, the “finisher’s friend,” was then sprayed onto the freshly placed topping in order to prevent surface crusting and to aid in its placement and its early hydration. After the power float and the power trowel steps, the Hyde crew wet cured L&M EMERYTOP 400 using water and concrete curing fabric. The concrete curing fabric was kept wet and maintained excellent hydration of the fresh topping for 7 days.

Once again, Scotese was on-site the first day of the installation. He confirmed surface prep, mixing procedures and ensured that the specs were followed. He wanted to verify that everyone was on the same page with project logistics. Greg Schwietz, former President of L&M Construction Chemicals, was on site as well for observation and analysis. Hyde said it was great to have a LATICRETE voice there, confirming the tech data sheets and helping to guide the project along according to specification.

Continue on back cover.
Birdsboro, PA – JP Masarco, General Contractor on the new Boyer’s Market construction project, required an experience polished concrete contractor to grind, hone, and polish approximately 32,000 square feet (2973 sq m) of new concrete. The project schedule called for numerous trades working simultaneously and off-hour shift work to meet its tight opening deadline.

Masarco contacted Jon Jones, Jr. Owner of Budget Maintenance and long-time FGS PERMASHINE™ polished concrete contractor, to test whether they would fit the bill. Vic Scotese, the regional LATICRETE Technical Service Representative, and Jones showed the architect and the floor owners numerous past successful polishing jobs in the greater Philadelphia area, including Giant Food stores and Shop Rite stores. Upon seeing Budget Maintenance’s exceptional polishing work and agreeing on a price, Budget was awarded the contract to polish Boyer’s new concrete using the FGS PERMASHINE polishing system.

Jon Jones, Jr., with numerous years of polishing experience, managed the Boyer’s project and worked very closely with the general contractor. He met with the Masarco project team and got a feel for its requirements. He immediately saw all of the other trades present and knew it would be difficult to protect Budget’s finished polishing areas with such a busy jobsite. He informed the general as such and the general promised to keep other trades off of the finished floor areas. It was a harbinger of things to come.

Beginning in early June and working nights, the Budget team, comprising of four men, began grinding with 40 grit metals on the slab. The new concrete proved difficult to open up, so the team used a grind aid to allow for an easier cut. They employed SASE Quik Cuts early on in the polishing process and migrated to Diamatic resins as it progressed. After the Budget crew cut the concrete with 200 grit resins, they densified the floor with FGS HARDENER PLUS. These concrete portions were then cut with 400 grit resins. Next, the main retail space of Boyer’s concrete floor was dyed L&M™ VIVID DYE™ Phoenix Sun while the produce zone was dyed Leather Brown.

After the L&M VIVID DYE was locked in with a coat of FGS HARDENER PLUS™, the crew moved onto the 800 grit levels. From there, the floor really began to shine. After the 800 grits, they hit the floor with a 1,500 grit pad and followed that with a coat of L&M PERMAGUARD™, a topical sealer and stain protector for polished concrete. The crew worked efficiently and effectively throughout the third shifts, often finishing several thousand feet worth of polished concrete per grit per shift.

The presence of others trades during the day made working conditions difficult. Since no lifts were properly diapered, they leaked oil and hydraulic fluids onto the new concrete during the day. Budget had to clean up these spills as best they could, and then re-grind these areas back to their respective grit level. A leaky roof continuously dripped water onto the working and finished areas. Pipe cutting was often found on the floor. And painters painted walls in spaces just before the Budget crew was to grind them, leaving drywall pieces and paint adhered to the floor.

Despite the challenges, the Budget crew persisted and improvised as required. They realized that, like other construction projects, this one would have its own difficulties to overcome. They worked the floor spaces Masarco gave them each night and kept pushing the project to completion. After approximately five weeks of polishing work, the Budget team turned the floor over to the owner.
Jon Jones, Jr., summed up the project: “This one was a challenge for us from day 1 through completion. Many items came up that should have been extra charges. As a company, we try to work through things and not have change orders throughout any project unless completely necessary. My hat is off to Dan Moore and Joe Moore for communicating everything in the field to me on a daily basis. Dan was my field supervisor on this job. He had full project responsibilities and he was training Joe in a foreman role. It was Joe’s first large job in that role and Dan really helped guide him along the way. They stayed the course despite the challenges every day. They went above and beyond to provide the owner with a floor that will last forever. We all learned a lot on this one.”

Jon Jones, Jr., Project Manager
Budget Maintenance
800 Industrial Highway
Pottstown, PA 19464
1-610-323-7702
jdjones@budgetmaintenance.com

When properly maintained, polished concrete lasts for years.
Polished Concrete Contributes Points and Sustainable Product Attributes in New LEED v 4.0

The Material and Resources credit category in the new Leadership in Energy and Environmental Design (LEED) v4 for new construction will emphasize a reduction in the environmental impacts of building materials, including its embodied energy throughout a product’s life cycle. The U.S. Green Building Council’s (USGBC) newest version of LEED, set to go into effect in October 2016, offers project teams, including concrete contractors, a list of new requirements for measuring a material’s impacts. These requirements include: extraction of the raw materials, its processing, its transportation, the maintenance of the product once it has been permanently installed, and then its disposal or potential for recycling or reuse. The new Materials and Resources (MR) category in LEED differs greatly compared to the previous version because LEED 2009 had assessed the environmental impact of a product against only single sustainable attributes, such as how much recycled content a product contained or was it manufactured with rapidly renewable materials or sourced and manufactured locally, among others. This is compared to a life cycle approach, sometimes referred to as a cradle-to-gate perspective, for assessment of green products in the new LEED v4.

The solid waste stream in the United States contains about 40 percent construction and demolition waste. Therefore, the LEED MR Credits seek to address the environmental impact of this waste through source reduction, material reuse, and recycling. Cumulatively, LEED projects have diverted more than 80 million tons of waste from landfills, and are expected to divert 540 million tons (489,879,760 tonnes) by 2030. Not all materials are salvageable nor do they have the potential for resale, so conversion of waste to energy has grow regionally in the United States as well as internationally. Seattle diverted 175,000 tons (158,757 tonnes), which was an average of 90 percent of their construction waste from their landfills from 2000 to 2011. Some countries across the globe actually have more waste to energy facilities than landfills due to construction debris diversion programs. Turning construction debris into a resource and keeping it out of landfills is often referred to as a cradle-to-cradle approach.

Specifying products with lifecycle in mind can be complex. Still, some architectural firms have already implemented some or all of LEED v4 on recent projects. Several years ago, the USGBC released beta versions of the new LEED credits being considered for inclusion in the new version within a Credit Library so project teams could attempt one or more of the new credits. While the LEED v4 was voted on and approved by a consensus of USGBC members several years ago, its implementation has been delayed three times. This is due to the complexity of the new process the USGBC wants manufacturers to complete in the assessment of the sustainable attributes of its products.

The MR credit category covers new construction of a building or a major renovation project. Generally, renovations that displace 50 percent of a building’s occupants would be a LEED new construction project. The project team should consult the minimum program requirements (MPR) for information on additions. In regard to products, they must be “permanently installed,” which means materials and products that are attached to a building or that create the building. For example, materials for concrete formwork would not be included. LEED eligible products include enclosure and structural elements, framing, interior walls, installed finishes, cabinets and casework, doors, roofs, and polished concrete, such as the FGS PERMAshINE™ polished concrete system by LATICRETE. Generally, most of these materials fall under MasterFormat Divisions 3-10, 31, and 32, but some products covered by MR credits may be outside these divisions.

Polished concrete can help increase demand for products that are extracted and manufactured within a 500 mile (805 km) radius of the job site because cement, aggregates and concrete surface treatments can all be regionally produced. This practice of purchasing regional materials supports the use of indigenous resources and reduces the environmental impacts of transportation.
To qualify as a LEED Regional Material, a building product has to be extracted, harvested or recovered—as well as processed and manufactured—all within 500 miles of the project site for a minimum of 10% (based on cost) of the total material’s value used during construction. An additional LEED point is available if the total regional material’s value reaches 20%.

A product includes the necessary services and physical components to serve its function. Each concrete component is considered a separate product since each component in concrete serves a different function. Products shipped to a project site, such as concrete masonry units, would be considered a single or separate product.

**The FGS PERMASHINE™ polished concrete floor system can assist in many ways toward a more sustainable and higher certification of a LEED building project.**

There are single product attributes such as recycled content and regional materials that concrete construction can contribute to. Of the products from LATICRETE International, the FGS PERMASHINE™ polished concrete floor system can assist in many ways toward a more sustainable and higher certification of a LEED building project. The Regional Materials credit in LEED is often referred to as the “concrete credit.” Since concrete comprises a large portion of a commercial building project’s materials’ weight or cost, depending on how the project team decides to report its green materials, the regional credits, recycled credit and potentially some other new credits can be obtained with the FGS PERMASHINE polished concrete floor system.

For a thorough examination on polished concrete and LEED v 4.0 certification, please see the FGS PERMASHINE LEED v4.0 polished concrete whitepaper available here: [http://www.fgspermashine.com/request-literature.php](http://www.fgspermashine.com/request-literature.php).

Institutional environments love polished concrete because of its high polish, its longevity, and easy maintenance.

**Paul Nutcher**

Paul Nutcher, CSI, CDT, USGBC, AIA Allied, is the president of Green Apple Group, LLC, a marketing, technical, and sustainability consulting firm. He has more than 11 years of building industry experience as a specifications and technical writer, educator, and marketing consultant to product manufacturers and design & construction professionals. He has written over 100 articles and speaks nationally on various design and construction topics at conferences and corporate events. He is a co-host of the podcast Commercial Conversations available on iTunes®. Nutcher has served in various leadership roles with the Construction Specifications Institute (CSI), the U.S. Green Building Council (USGBC), and the American Institute of Architects (AIA) Allied Committee. He can be reached at pnutcher@greenappleconsult.com or 407-574-2152.

Alex de Quesada with one of his StoneCrete grinders.
Richard Stone is a structural engineer with 20 years of concrete contracting experience. His day-to-day work duties include project management supervision and structural analysis and consultation. He works with concrete crews each day and is often called in as a consultant for structural engineering questions and evaluations to ensure requirements compliance.

Madison Concrete has earned a highly-esteemed reputation, performing exceptional concrete work in a variety of markets including infrastructure, residential & commercial towers, casinos, parking structures, and stadiums such as Lincoln Financial Field and the Wells Fargo Center in Philadelphia.

We recently sat down with Rick and asked him about Madison Concrete's projects, his engineering experience, and the Greater Philadelphia construction market.

J: Please give us some background on Madison Concrete and what markets your firm focuses on.

R: Madison was started by Jim Dolente Sr. in 1969. The company initially did a lot of small commercial projects, foundations, and flatwork. These were typically small offices. The scope of the projects began to increase in the mid 1980s. Madison grew with this acceleration into structural concrete, cast-in-place, hospitals, and office buildings.

Madison Concrete focuses on serving a wide variety of markets, including sports & entertainment, multi-family residential, parking structures, educational & institutional, correctional facilities, healthcare, commercial & office, industrial and heavy highway.

J: Does Madison Concrete actively market its services or do you find you get more jobs through relationships with general contractors and the design community?

R: We have a parochial market in that there are only four or five concrete subcontractors that can do large, complicated work. This market is stable. We don’t have a lot of out-of-towners come in and take work. There are some NY construction managers here in Philly but they’ve been here so long they are like locals.

We focus more on structural concrete. They have five high-rise structural concrete jobs going on right now.

Madison Concrete is a union company. We employ union carpenters, iron workers, and concrete workers. Our geographic work area extends to Atlantic City and the Jersey coast up to New Brunswick and west to State College, PA. Madison’s work region is about a 100 mile (161 km) radius around Philadelphia.

J: What points of differentiation does Madison Concrete possess versus the competition?

R: Our goal is to deliver a superior level of service from a quality and schedule aspect. Our goal is to be the go-to concrete contractor in our market. We have the expertise and experience to do just about any complicated concrete project. Our resume shows this, such as high-rise construction to the shipyards to high quality finishes in museums. We know post-tension construction well. And we have executed several projects using the pre-cast concrete stay-in-place form system, which provides good benefits to schedule and quality.

We’re only as good as we were on our last project. If we can push a project to a successful conclusion, it helps our clients. They are concerned about safety and schedules and quality.

J: What specific concrete industry changes have you seen over the past 10 years? Say, in efficiencies in concrete construction? Are these efficiencies making things better or worse?

R: There have been huge advances in the material science in concrete. Unfortunately, the building codes and standards don’t often reflect that. Our experience has been that the specs and standards provide criteria for accept or reject that no longer really apply. There has been good advancement in forming systems. These offer great labor savings opportunities. Layout has changed, too. The days of the level and steel tape are gone. We use GIS and GPS and data transfer to do field layout. We’re also using BIM. The downside of BIM is it doesn’t have the same level of detail and it pushes responsibility down onto the general contractors and subcontractors. The current levels of documentation don’t seem to be as good as they were 10 years ago.

Some level of control of construction management seems to be missing. It may require a re-evaluation of what everyone’s role within the project may be. On occasion, the level of documentation we receive seems to be poorly thought out. This may be due to inexperience on the designer’s part.

J: Tell us about a recent high profile construction job Madison recently performed. What challenges did you run into and how did you overcome them?

R: We handle a lot of high-profile construction jobs: The Shipyard, Lincoln Financial Field, Waterfront Square and the Wells Fargo Center.
We overcome challenges by planning, planning, and planning, and then working our plan. We adjust as necessary to things that change. It is about constantly looking ahead and taking the long view on any project. We plan for contingencies and variations. We do this very well. Scheduling. Quality. How we make our decisions. Always be planning. Always be ready to re-visit the plan.

Safety is a big deal for us. We’ve worked hard on safety for a long time. We have a full-time safety staff always on alert.

Every project has its challenges. We’re working a difficult project right now in downtown Philly called the Cira Walnut project that will be the new corporate headquarters for FNC Corporation. It is a 52-story structure with the first 28 floors as structural steel framing and the floors above that are cast-in-place concrete, which will be residential. It is complicated because the core of the structure is cast-in-place concrete and the schedule is tight. We’re staying ahead of the structural steel schedule. The form work is difficult. We’re currently on the 33rd floor, and we’re on schedule.

**JB:** If you could change one thing about the concrete business, what would that be?

**RS:** The perception is that concrete contractors are always trying to sneak one by everyone else. The truck shows up on the job site and it gets tested for slump. The engineer tests it and says the slump tests off the spec. People think the sky is falling. Slump test is not necessarily a clear indicator of the quality of that concrete. PSI testing may result in differences. I’d like to see the standards become more in line with the advances in materials and techniques. ACI and ASTM are constantly updating their standards, but it is at a glacial pace.

**JB:** What gaps do you see in concrete construction? What’s missing?

**RS:** Modern day standards. Construction tolerances are a great example. ACI standards for tolerances are not helpful because they can be interpreted in multiple ways. Committees are working hard to address that.

**JB:** How do the residential concrete markets differ from the commercial concrete markets?

**RS:** Primarily, when times aren’t so good, the institutional clients have substantial resources they can make available for construction. When the economy is slow, the institutional market is likely the only market doing construction. When, the economy is hot, institutions hold off.

The last two years, we’ve seen a lot more residential development. Four of our principal projects currently are residential. The FNC project is a good example. Residential has more developers vs. commercial markets. If there is a new office being built, it’s being done for a particular client.

**JB:** In my discussions with concrete contractors, I’ve found that they have trouble finding experienced concrete workers to fill open positions. What career opportunities do you see for workers in the concrete industry? Is this a good space for young people to be in?

**RS:** We have an advantage in that we are a union company. We can address manpower needs by working through the union. Over the past year, the union has had trouble providing adequate labor for all the contractors. Last summer, the demand for carpenters was so great that the carpenter labor the union provided did not have much experience in concrete. It is a cyclical issue. When times are good, the demand is high.

They’re good about getting young men and women to go through the apprenticeship program. A lot of experienced carpenters are hitting retirement age. It will be difficult to develop new talent to fill these retiring guys, though we see carpenters working hard to recruit new talent. We try hard to find talent, retain it, and develop them into foremen and superintendents.

We have a staff of estimators and project managers and the usual business departments on staff in the office.

**JB:** How do you handle things when they go wrong? Do you have an SOP in place? How does Madison Concrete fix bad situations?

**RS:** We have a plan in place. Again, it’s all about planning. We try to mitigate risk. Quality issues are broad. We address minor things through education. For example, the slump test example given earlier. All foremen understand that a slump test is not a true indicator of the potential concrete strength.

If there is a structural issue, I’ll get involved and evaluate it and see whether it meets the design requirements. If I can’t handle it, I’ll bring in a consultant to help out. Madison’s SOP is great communication and immediate action when things go wrong to work to a positive solution.

When the Tropicana parking structure collapsed, we knew about it immediately. We happened to be working very closely to that structure. We immediately started to talk about what we would have done in that situation: 1) How do we prevent that; 2) What plan do we have in place if it happens; and 3) Execute the plan.
ACI 302: Here’s What’s in It for You.
Pat Harrison, FACI

ACI Committee 302.1R-15 Guide to Concrete Floor and Slab Construction is the latest revision to the document that affects as many in the concrete construction industry as any other developed by the American Concrete Institute. This document has become the standard of care for the installation of a very simple concrete element in concept, but one which misses the mark in meeting the expectations of the client in more instances than just about any other in concrete construction. Often incorrectly referenced in its entirety in contract documents, all recommendations provided in this guide must be “restated in mandatory language for incorporation by the Architect/Engineer” in those documents as specific requirements.

I have often considered the 302 document as the standard for reasonable expectation from all parties in the design and construction of concrete slabs on ground. Although this is not a code or specification document written in mandatory language, it is referenced often when determining the best practices for installation and design detail. This is not always clear when batching, placing and finishing concrete. There are so many variables from the production of materials, varying placement conditions, and availability of qualified craftsmen found at each site that each placement is truly a custom installation every time.

Although there are no significant changes from the previous revision in 2004, there continues to be ongoing discussion within the committee of how this document is keeping up with the logistical practice of modern installation methods. A good example of this is the further fine tuning of the recommendation for use and location of vapor barrier/retarders since 1989.

302.1R-89 – Vapor barriers aggravate the problem of plastic and drying shrinkage cracking. Their use should be avoided if ground moisture conditions permit. If ground conditions require their use, a 3 inch (75 mm) layer of approved granular, self-draining compatible fill over the vapor barrier (and under concrete) reduces these problems.

ACI 302.1R-96 – If a vapor barrier or vapor retarder is required due to local conditions, these products should be placed under a minimum of 4 inch (100 mm) of trimable, compactible, granular fill (not sand). Please see addendum at the end of this document [this was the first inclusion of a flowchart for determining when and where a vapor barrier/retarder should be used].

ACI 302.1R-04 – The committee recommends that each proposed installation be independently evaluated as to the moisture sensitivity of subsequent floor finishes, anticipated project conditions, and the potential effects of slab curling, crusting, and cracking. The anticipated benefits and risks associated with the specified location of the vapor retarder should be reviewed with all appropriate parties before construction. Figure 3.1 (revised flowchart) can be used to assist this evaluation process.

ACI 302.1R-15 – Vapor retarder/barrier location—The decision to locate the vapor retarder/barrier in direct contact with the slab’s underside had long been debated. Experience has shown, however, that the greatest level of protection for floor coverings, coatings, or building environments is provided when the vapor retarder/barrier is placed in direct contact with the slab. Placing concrete in direct contact...
with the vapor retarder/barrier eliminates the potential for water from sources such as rain, saw-cutting, curing, cleaning, or compaction to become trapped within the fill course. Wet or saturated fill above the vapor retarder/barrier can significantly lengthen the time required for a slab to dry to a level acceptable to the manufacturers of floor coverings, adhesives, and coatings. A fill layer sandwiched between the vapor retarder/barrier and the concrete also serves as an avenue for moisture to enter and travel freely beneath the slab, which can lead to an increase in moisture within the slab once it is covered. Moisture can enter the fill layer through voids, tears, or punctures in the vapor retarder/barrier.

Placing concrete in direct contact with the vapor retarder/barrier requires additional design and construction considerations if potential slab-related problems are to be avoided. When compared with identical concrete cast on a draining base, concrete placed in direct contact with a vapor retarder/barrier shows more settlement and exhibits significantly larger length change in the first hour after casting, during drying shrinkage, and when subject to environmental change (Suprenant 1997). Joints that open wider than what is normally anticipated are called dominant joints (Walker and Holland 2007). Dominant joint behavior can be made worse when the slab is placed in direct contact with a vapor retarder/barrier that reduces friction from the base. Where reinforcing steel is present, settlement cracking over the steel is more likely because of increased settlement resulting from a longer bleeding period. There is also increased potential for a greater measure of slab curl.

The following are examples of some of the more significant changes:

**Chapter 4 –** classification of concrete slabs on ground (previously Ch. 2), has been updated to more descriptively name the class for the intended use. In lieu of the previous single or two course identification, reference to “Institutional/commercial”, “Industrial”, “Heavy industrial” floor types gives the reader a better perspective of proper application. What was previously referenced as a “Class 6-Single course” floor is now designated as “Class 6-Heavy Industrial.”

**Chapter 5 –** Design Consideration (previously Ch. 3) still “addresses the design of concrete floors as it relates to their constructability.” There was extensive discussion concerning the removal of this chapter, due to redundancy of publication in ACI 360 Guide to Design of Slabs on Ground. It was determined that this chapter should stay as guidance to the contractor of what the designer of record should be including in the contract documents. This includes constructible tolerance specifications, joint locations and detailing, as well as planning meetings, quality assurance and control requirements. There is still duplication between the 302 and 360 documents. Therefore, the reader should have current copies of both to ensure they are looking at the most current recommendations from ACI.

**Chapter 10 –** Placing, consolidating and finishing. Another significant addition to the new 302 document is addressing the concern of trowel finishing lightweight concrete that typically requires entrained air to achieve specified unit weight maximums, and coarse aggregate that migrates to the surface. With the increased observation of delaminating surfaces in lightweight concrete, a subcommittee was established to test mockup installations and eventually provide recommendation. Two field studies were conducted jointly with participants from both ACI and the American Society of Concrete Contractors (ASCC) to determine likely causes and recommendation to reduce occurrence of surface delamination when finishing lightweight concrete. The findings were reported in a 2007 Concrete International article. From this study sections, 10.11.1 Common causes of delamination and 10.11.2 Finishing options to reduce risk of or avoid delamination were added to the document. Particularly in colder weather with delayed bleed, the committee provides “Recommendations to minimize the probability of delamination include carefully timing the start of floating operations, using only walk-behind finishing machines, equipping the finishing machines with float blades rather than float pans, and avoiding burning the finish with repeated troweling passes.”

**Chapter 13 –** Causes of Floor and Slab Surface Imperfections (previously Ch. 11). This chapter addresses many concrete characteristics that concrete finishers often find themselves trying to explain to a customer. There has never been a perfect concrete slab placement. For that reason there will always be a need to explain to the client the potential cause, remediation and long-term expectations of imperfections. This chapter, drawing several references from the Portland Cement Association, 2001, “Concrete Slab Surface Defects: Causes, Prevention, Repair” document, is a great resource for explaining and illustrating common blemishes found in slab on ground placements. Greatly enhanced, including more information on both probable cause for slab imperfections, there are also several added remedial recommendations for the deficiencies. Near-surface aggregate shadowing, more common with the advent of coarser aggregate mixes over the past decade that reduce the long term material shrinkage potential, is addressed in this revised chapter as well.

The most recent changes to the ACI 302 include further refinement of the standards of logistical placement and design detailing for slab on ground (and suspended slabs). The committee membership that develops and maintains this document consists of a collective of individuals with years of practical design and construction expertise that continue to focus on practical and efficient recommendation for slab on ground installation. Any concrete flatwork contractor should have a full understanding of this document for proper installation and assessment of contract design requirements. Not only is this document a valued resource for the contractor’s understanding of state-of-the-art concrete slab construction, it is also a valuable tool for the same contractor to both establish and maintain reasonable expectations from all parties for each custom slab installation.
High Moisture Slabs a Problem in Decorative Concrete?

Not any more.
In today’s design and construction market, we see most architects and engineers requiring a vapor barrier to be placed beneath the concrete slabs on grade to prevent moisture pressure from creating problems within the building. Vapor pressure can cause VCT, sheet vinyl, epoxy coatings and almost any type of non-permeable flooring to dislodge and fail. This moisture is also the main cause for mold to grow throughout a building to the point of the structure becoming uninhabitable. Entire schools have been torn down because of mold growth.

Additionally, we have to deal with efflorescence on bare concrete floors. This is the process of osmotic pressure driving moisture through a permeable substrate, in this case, hardened concrete, and pushing calcium salts to the surface. This results in white salt deposits staining bare concrete floors. This unsightly white staining causes the owner to wash the floor daily or simply live with the white-stained floor.

Fortunately, LATICRETE has a solution to the vapor transmission problem! Just because your current building was not built with a vapor barrier does not mean that the vapor problem cannot be resolved. LATICRETE developed a new technology to deal with mitigating moisture problems in concrete floors. This product is called DRYTEK™ Moisture Vapor Barrier or MVB.

DRYTEK Moisture Vapor Barrier is a single-coat, 100% solids, liquid applied, two-part epoxy coating specifically designed for controlling moisture vapor emissions from new or existing concrete slabs. MVB is applied prior to installing DRYTEK self-leveling underlayment, decorative toppings and SPARTACOTE® resinous concrete coatings. DRYTEK Moisture Vapor Barrier exceeds ASTM F3010 standard with a perm rating of 0.052 grains/h/ft²/in. Hg (3 ng/h • m² • Pa) at only 12 mils thickness. The product can be installed on concrete as new as 5 days old and has a very low VOC rating.

Once concrete moisture problems have been mitigated with this product, an endless choice of flooring options are possible. If carpet or tile is the chosen floor solution, we can top coat the MVB with DRYTEK® LEVELEX™, a self-leveling, cementitious underlayment producing a perfectly flat surface.

Polished concrete floors are sweeping the flooring industry and now we can create a new “skin” over existing concrete to create a “like new” floor. This solution has been widely adopted by the retail market to convert vacated store space into a pleasing atmosphere for a new tenant. The L&M™ product line offers a polishable overlay called L&M DURAFLOOR HP™ that can be polished in as little as 12 hours using the FGS PERMASHINE™ polished concrete system. Using the MVB as a bond coat and primer ensures that the floor will be sound and not subjected to moisture problems with the concrete substrate.

Resinous coatings can also be used in conjunction with MVB. In this case, the MVB acts as the primer coat for the SPARTACOTE concrete coatings systems. DRYTEK Moisture Vapor Barrier is available in 8 colors, thus reducing the need for extra applications of SPARTACOTE base coatings. SPARTACOTE clear coats can be applied directly over the MVB or any of the SPARTACOTE coating systems. The pigmented metallic coatings are growing rapidly in the resinous flooring market. Where SPARTACOTE Metallic coatings systems are selected, you simply install the MVB pigmented in black and the SPARTACOTE metallic pigmented product can be applied directly over the MVB, saving the coatings applicator time and the floor owner both time and money in faster return to service.

Installation is quite simple. First, shot blast or grind the floor to a CSP 3 - 5 (Concrete Surface Profile as defined by the International Concrete Repair Institute) to remove all surface contaminants and to create a proper profile for bonding. Vacuum all dust from the floor to ensure proper adhesion. Concrete cracks and surface spalls can quickly be repaired using SPARTACOTE FAST FIX™ concrete crack repair mender and minutes later the MVB can be installed.

Call your local LATICRETE technical sales representative for details on the DRYTEK and SPARTACOTE family of products!
There are numerous success factors in accomplishing a high-profile project such as the National Museum of African American History. Clear communication and support from the general contractor is a big one. As Hyde says, “We were shutting down their loading dock for three weeks. I did a lot of prep work. I had lots of checklists. I made lots of phone calls. There was lots of communication, ensuring everybody had a clear understanding of their roles and responsibilities, who is doing what and when. We tried to ensure that there was nothing unforeseen. I dedicated a lot of attention to the job.”

Scotese agreed with Hyde, saying, “The Pre-Con (pre-construction) meeting was essential. You can’t put a price on preparedness, and Greg was very prepared for this project. The pre-con meeting makes sure the GC understands the impact of what you’re doing. It ensures that everybody’s on the same page, project schedules, materials, lead times on materials, storage requirements, access to space, etc. We had weekly phone calls that all the materials, shipping, and logistics aligned with the project schedule. The timing of the shipments was very important because you don’t want product just sitting there out in the rain.”

Scotese continued, “Hyde’s preparation was extraordinary. He knew what he needed to be successful. He understood the needs of the job. He spoke with the General Contractor to ensure they understood his needs and the work involved. Also, the LATICRETE team came together to make this project work. They knew there was a critical path and that we did not have a lot of wiggle room for things to go incorrectly. The LATICRETE team really stepped up. All of the product had to be manufactured rapidly, within 6 weeks of project approval. There were six truckloads of L&M™ EMERYTOP 400™ that went into this job. LATICRETE eastern regional sales manager, Jay Owens, recommended we have weekly conference calls to ensure we were all on the same page. This worked well, even if the calls were only 10 minutes. Of course, it never hurts to have an experienced person there that understands the logistics and products and processes to ensure a successful project. Having someone there to guide them through the first day is very helpful. The pre-con meeting is vital in order for these jobs to be successful.”

Hyde concluded the story by stating amazement at this near-flawless concrete project. “I’ve never had a project this complex go as cleanly as this project has gone. From the GC to the distributors to the product arriving on time to us getting the right space at the right time. We were lucky we had the experience with the L&M EMERYTOP 400 topping from before. We were not walking into this blind. Everybody did what they said they would do.”

Greg Hyde, President & Owner
Hyde Concrete
8249 Waterford Rd. Unit A
Pasadena, MD 21122
Phone: 410-349-0008
www.hydeconcrete.com

Stevenson Concrete
16909 York Rd
Monkton, MD 21111
Phone: 410-329-2136
www.stevensonconcrete.com