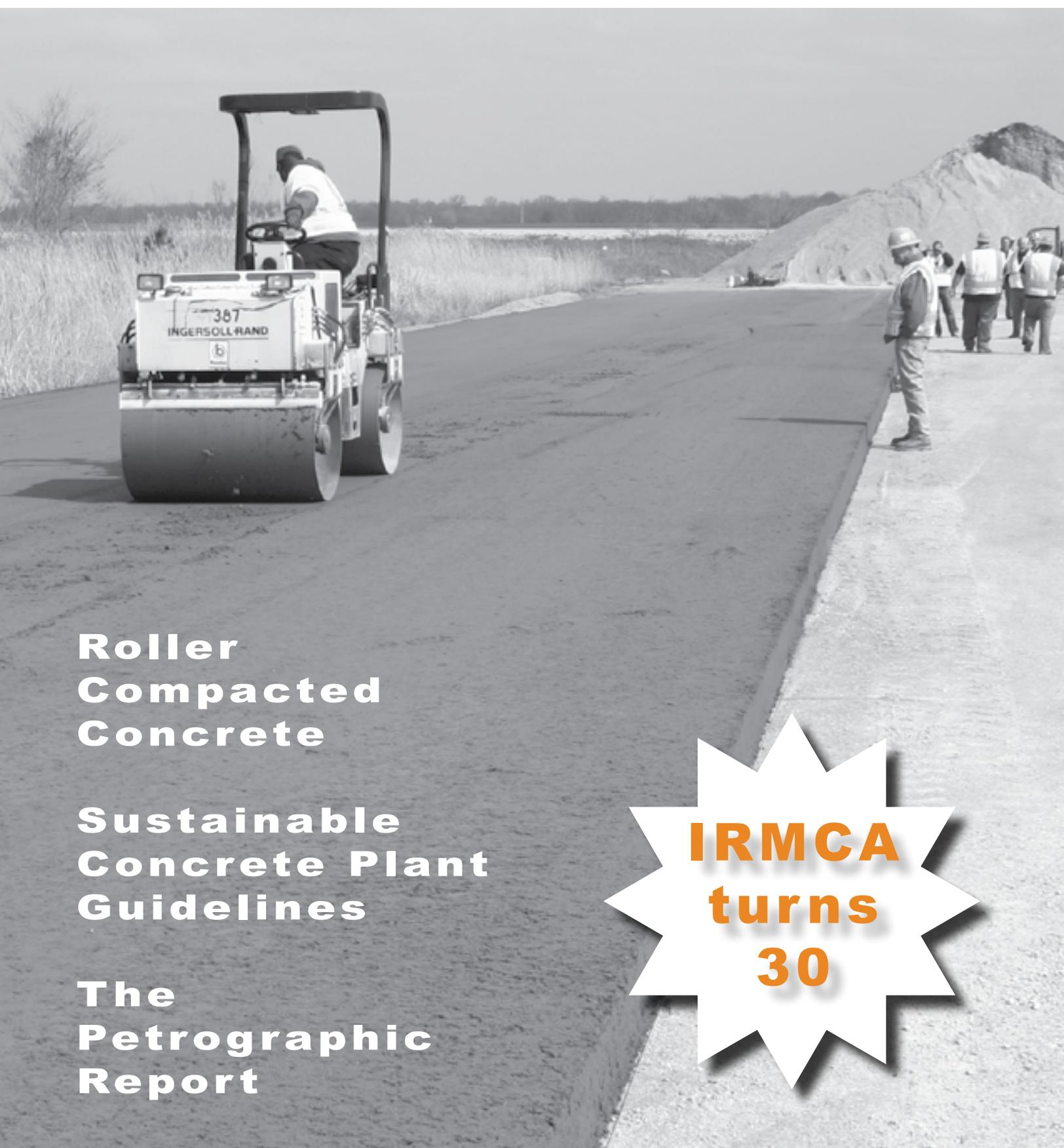


IRMCA News

Spring 2011 Vol. 30, No. 2

Illinois Ready Mixed Concrete Association



**Roller
Compacted
Concrete**

**Sustainable
Concrete Plant
Guidelines**

**The
Petrographic
Report**

**IRMCA
turns
30**

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Cover photo is of an RCC demonstration.



Board of Directors Report

The Board of Directors, in addition to routine IRMCA business, is addressing these issues:

- **Short and Long Range Planning** – the Executive Committee and the Executive Director are meeting and will present the board with both short term (personnel changes) and long term proposals that will identify needs and opportunities.
- **Technical Committee** – IRMCA will be reactivating its Technical Committee to address many issues, including IDOT relationships.
- **Finances** – Staff was directed to investigate ways to increase revenue and research other state associations dues structures.
- **Membership Drives** – Staff was directed to identify all ready mix companies in Illinois who do not currently belong to IRMCA. Once a list is compiled and the economy recovers somewhat, we will begin a producer membership drive followed by an effort to increase associate membership.
- **Sustainability Committee** – Staff reported that establishment of this committee is progressing slowly and that NRMCA representatives have been invited to attend the inaugural meeting.
- **Short Course** – Discussions were held concerning content for the 2012 Short Course (January 9 & 10). One option is to have general morning sessions and then break into at least 2 special interest sessions in the afternoon.
- **Annual Out-of-State Meeting** – Staff was directed to contact both Iowa and Indiana Associations to gauge interest in meeting together in 2012 (WRMCA leaves state only every other year).
- **Legislation** – IRMCA and its Government Affairs Consultant continue to follow and be involved in prevailing wage legislation, workers compensation reform legislation, weight laws, and other issues.

(Re)Formation of the IRMCA Technical Committee

IRMCA is re-activating its Technical Committee, which will meet in June. The Technical Committee is charged with addressing issues such as new mix requirements, specification changes and material issues, and it pays particular attention to IDOT relationships, including meeting with IDOT annually. The committee will report important developments to the board and membership and will respond to members' questions, suggestions and concerns.

Topics may include the new IDOT spec book, a new system for IDOT mix approval, testing labs and consistency, performance mixes, scaling and responsibility, and more.

This announcement was e-mailed to all members in early May and many who have responded and asked to be involved - thank you. If you missed the e-mail and would like to be part of this important committee, please notify JoAnn at irmca@irmca.org or call her at 800-235-4055 and she will add you to the list. All who have indicated interest will be notified by e-mail of the meeting date, place and time.

2011 is IRMCA's 30th anniversary!

Help celebrate by sharing photos and memories. Contact the staff at 800.235.4055 or irmca@irmca.org.

IRMCA NEWS

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Illinois Ready Mixed Concrete Association



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*Working together to create value,
teach excellence, and produce quality.*

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George Mobarak, Vice President
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Jim Amelung, Mike Blunier, Kyle Cain,
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Mission

To be the voice for the ready mixed
concrete industry in Illinois. To promote
the use of quality ready mixed concrete
through innovative educational programs.

To accomplish common goals as an
organization that cannot be done individually.



NEW MEMBERS

Mid Illinois Contractors, Inc.

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IRMCA Golf Outing

September 7, 2011

Pine Lakes
Golf Club



RECEPTION SPONSORS

Barnes Industrial Group
Buzzi Unicem, USA
Cemex
Continental Cement Company
ESSROC Cement Corporation
Hanson Material Service
Holcim (US)
Illinois Cement Company
Lafarge North America
Lehigh Cement Company
McNeilus Company
St. Marys Cement
Vulcan Materials Company
WR Grace & Company

Illinois and Wisconsin Associations Meet in Florida

2011 Joint Annual Convention

In late February members of the Illinois Ready Mixed Concrete Association and the Wisconsin Ready Mixed Concrete Association met at the Naples Beach Hotel and Golf Club in Naples, Florida, for a joint winter meeting.

The event included a welcoming reception, daily educational seminars, separate board meetings, a golf outing, a parting dinner gala and a spirited poker tournament. Speaking to the associations were Brian Borowski, Lafarge, who addressed the current fly ash crisis; Ann Daugherty, CTL, who spoke to members and guests on 10,000 year-old concrete; Mitch Mariotti, VCNA Prairie, who talked about and compared environmental issues facing both states; Amy Miller, NRMCA, who spoke on promotion initiatives; and Greg Scurto, Scurto Cement Construction, who told about his company's promotion, specification and production projects.

Combining the two associations allowed for good meeting numbers, quality speakers and the opportunity to interact and learn from each other. Thanks to the members who attended and to the staffs of both associations for all the work coordinating this joint venture. Participants have urged both states to consider doing it again.

Counterclockwise from left: Bruce Grohne, IRMCA, and Cherish Schwenn, WRMCA, in a planning session; (l-r) Kevin Rustemeyer, Matt Moeller, Jim Amundson, Mike Moeller; (l-r) Denise & Greg Surto, Martin Ozinga III, Justin & Annie Ozinga.



Director's Note - "don't hurt none to have 80 degree sunny weather every day."

Resources for Members

IRMCA has many materials available for members. Please browse the available resources page @ www.irmca.org to find items such as: the "Do's & Don'ts of Concrete Care" sticker, 75¢ apiece; the "5 Requirements of Residential Driveway Construction," 75¢ apiece; and the "Build Green with Concrete" bumper magnet, \$3.50 apiece. And there are many other items available for purchase or free download.

Do's & Don'ts
Of Concrete Care

- Don't* use deicers (salt) on exterior concrete during its first year of service.
- Do* use clean sand in case of ice or snow.
- Don't* use deicers containing ammonium sulfate or ammonium nitrate-EVER; this includes most lawn fertilizers.
- Do* remove all fertilizer off concrete before it gets wet.
- Don't* let deicers drip from your vehicle and remain on the slab.
- Do* remove snow and ice as quickly as possible.
- Don't* ignore your driveway.
- Do* use an approved concrete sealer at least every two years.

Illinois Ready Mixed Concrete Association (309.862.2144 / 800.235.4055)

The
Requirements of Residential Driveway Construction

Do's & Don'ts of Concrete Care

Build Green with Concrete

Build Green with Concrete

Illinois Ready Mixed Concrete Association • www.irmca.org

IRMCA
Contributions

Some of the contributions IRMCA has made to the concrete industry in the past thirty years...

Contractor Safety

OSHA awarded IRMCA a Susan B. Harwood grant; the funds were used to develop contractor safety training materials and courses.

Scholarships

The Association has given over \$75,000 in scholarships to students studying civil engineering or construction management.

Hazard Awareness

IRMCA worked with members and OSHA to develop the Hazard Awareness Manual, which addresses several of the potential safety hazards in a ready mixed operation.

State Weight Laws

The Association, its members and industry lobbyists worked to affect favorable changes to state weight laws.

Driver Training

IRMCA wrote a driver training manual that is easily adapted to fit the individual needs of member companies.

Pervious Concrete

The Association developed a Pervious Manual to assist when pervious concrete is specified.



2011 marks the 30th anniversary of the Illinois Ready Mixed Concrete Association. Throughout the year each issue of the *IRMCA News* will feature highlights of IRMCA's history.

Specifications

IRMCA, members, contractors and local officials developed two specifications manuals to address issues encountered in exterior flatwork.

Sales Tax

The Association and its members united to support Vans Material's successful effort to change Department of Revenue rulings, resulting in the removal of sales tax from ready mix parts and equipment.

Employee Training

IRMCA, members and OSHA produced a safety training video, *Laying the Groundwork*, for use in employee training.

Bass Pro store being constructed in East Peoria.



Bass Pro Comes to East Peoria and Specifies Concrete

Construction is well under way on the new Bass Pro Shop in East Peoria, Illinois. Located on riverfront property formerly known as the CILCO ash pond, the 145,000 square foot store plans to open in fall of 2011 and will employ at least 200 full time workers and will help attract visitors to the area.

AECOM of Peoria is serving as the engineer for the overall property plan and, interestingly, Midwest Foundation of Tremont is driving over 500 steel beams 70 feet into the ground to stabilize the structure, because it is being built on sand and peat.

R. A. Cullinan of Peoria received the concrete contract for the development and supplying the specified IDOT mixes is Illinois Ready Mixed Concrete Association member Roanoke Concrete Products. Of particular interest with this project is that concrete was specified by Bass Pro for all the roads and parking areas - not an alternate, but specified! Indeed, when an asphalt alternate was proposed, the owner reiterated that the project will "go concrete."

Congratulations to all involved in bringing Bass Pro to East Peoria and particular congratulations to Bass Pro for choosing the most sustainable, durable, light-reflective and maintenance free product for its parking lot!



Part of the concrete parking lot; there is still much more paving to be done.

Mike Miller Hyundai of Peoria Chooses Whitetopping

What's a business owner to do? His large asphalt parking lot area is in total disrepair – again! Raveling where trucks park and turn, rutting all over, potholes – not a pretty picture. Adding to this owner's concern is the fact that his parking lot is his showroom floor!

Mike Miller of Mike Miller Hyundai in Peoria, tired of patching and overlaying his asphalt parking lot/showroom floor, was more than willing to listen to friends when they recommended he consider concrete. A visit to a recently whitetopped auto dealer lot in nearby Morton convinced Miller that he should give concrete a serious look.

IRMCA producer member LaHood Construction and IRMCA contractor member Mid-Illinois Contractors, bolstered by technical support from IRMCA associate member Jim Amundsen of W.R. Grace and IRMCA consultant Randell Riley, P.E., began a promotion effort that lasted for almost a year. This persistent joint effort was successful! Miller became convinced that

not only would a concrete overlay give him an upscale looking parking lot/showroom floor, but would also be the best possible “life-cycle” investment decision he could make.

Mid-Illinois is placing the properly designed overlay strip-by-strip in a manner that will least disrupt dealership operations and anticipates a summer completion. LaHood Construction is supplying the almost 120,000 square foot of concrete. All involved are anxious for the finished product. And won't it be interesting to watch owners of competing dealerships drive by every day? Hmmm...



(Above) North lot complete; (right) first placement complete.

IRMCA Member Demos Roller Compacted Concrete

On May 3 interested developers and others were invited by Ozinga Brothers, Inc. to an Ozinga central mix batching operation at the Vulcan Materials quarry in Joliet, for a demonstration of Roller Compacted Concrete (RCC) placement. Scurto Cement Contracting employees and others placed and rolled the RCC as part of a steep entry road into the quarry that leads to the batch plant.

The extremely “stiff” RCC was batched into dump trucks in 10 yard loads, driven to the road, dumped in front of a GOMACO spreader designed especially for RCC, spread, rolled and cured. Testament to the product’s strength and early durability is that dump trucks were running up and down the 1st half of the RCC road that had been placed 3 days earlier. Indeed, deliveries to and from the quarry were never interrupted.

Many in our industry are “bullish” on the future of RCC. Watch for announcements of opportunities to learn more about this product.

From top: dumping into the spreader; placing on a steep slope; rolling the RCC.

Get IRMCA involved!

IRMCA will gladly support and publicize members’ promotion efforts. If you would like to include IRMCA when promoting or just participating in a special project, call Bruce at 800-235-4055.



RCC as a “Base” Product

Illinois Ready Mixed Concrete Association producer member Prairie Material recently delivered Roller Compacted Concrete (RCC) to one of the freight rail yards of CSX in Chicago to be used as a 10” base material for an asphalt topping. Naturally, we in the industry always hope that a RCC placement will be all that’s used on a project, but that’s not always reality. In this case the railroad had determined to pave with asphalt yet wanted the strength and stability of concrete as a base. The versatility and economics offered by RCC gave the owner what it needed and provided a good project for the ready mix supplier.

IRMCA is committed to expanding its promotion of the use of Roller Compacted Concrete. Watch for upcoming regional opportunities.

Rolling the RCC and (insert) saw cutting, which is not always necessary.



Super Store Chooses Concrete

There's a brand new development on the south side of Springfield and it's looking great! The Legacy Pointe Town Center, being advanced by the Lincoln Land Development Company of Springfield, will soon have its first business open - and it's a big one. Scheels All Sports Super Store is opening a 200,000 square foot retail store that will employ 300 and showcase sports equipment, sportswear, shoes and more, including entertainment opportunities such as a shooting gallery, multi-sport simulators and food shops.

Of great interest – and it's hard not to notice – is the fact that the huge parking area and all access roads are concrete. The concrete contractor, Vee-Jay Cement Contracting of St. Louis, worked with IRMCA member Capitol Ready Mix to present the developers with a concrete bid that was competitive with asphalt.

Another reason that the developer chose concrete was that they want this and future development at Legacy Pointe to be upscale and concrete provides the upscale appearance they desire.

Legacy Pointe hopes that more development will come soon. When it does, let's hope that the quality project at Scheels will be a good example for future businesses making construction decisions.



Teamsters' Central States Pension Fund

For many years there has been growing alarm over the liability that participating owners face for the consistent underfunding of their multi-employer defined benefit plans. Of particular concern for many IRMCA producers is the state of the Teamsters' Central States Pension Fund to which they are signatory. Acting on the request of one such producer, IRMCA arranged for Mr. Andy Martone of Bobroff, Hesse, Martone & Doetzel in St. Louis to talk to interested members. Mr. Martone was recommended by the IL-AGC as the most informed person we could engage; indeed, Mr. Martone represents the management side of this complex relationship and already includes ready mix operations among his clients.

The meeting was held at the Holiday Inn & Suites in Bloomington on May 23 and more than 25 IRMCA producer members and staff attended. Mr. Martone addressed the current fiscal state of the fund; unfunded liability and how it affected members; the effects of the UPS departure from the fund; and non-payments from Yellow Freight. He spent a great deal of time answering questions and offered to keep in touch with our Association and members.



Sustainable Concrete Plant Guidelines

A resource to help companies become better stewards of the environment

By Jennifer Bedell

What response can you give to a customer who asks about your environmental stewardship? Has your company taken measures to reduce its impact on the environment? Now is the time to evaluate your operation and implement necessary changes, because decision-makers are increasingly looking for concrete producers with sustainable practices. A new resource, *Sustainable Concrete Plant Guidelines, Version 1.0*, funded by RMC Research & Education Foundation, can help you through this process.

The *Guidelines* were released in February after a pilot program trial and year of review, and they include a CO₂ calculator, an emissions calculator, a safety worksheet, a guidelines checklist and a materials transportation calculator. Before building sustainable practices with these materials, however, the *Guidelines* recommend that you first establish a foundation by completing these four steps: 1) comply with federal, state and local environmental regulations; 2) implement and maintain an Environmental Management System (EMS); 3) if not included in the EMS, complete an energy audit; and 4) create a site plan that shows all potential environmental hazards, as well as methods to control or contain these hazards.

After a foundation has been established you can use the *Guidelines* to evaluate your company's operation and identify ways to make it more sustainable. The *Guidelines* are

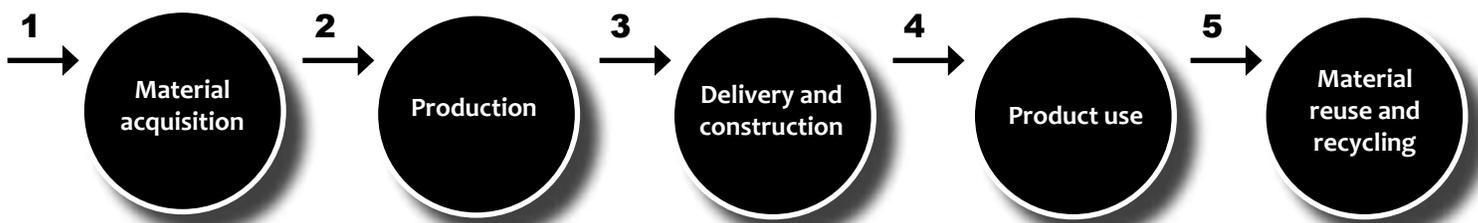
organized according to the five life cycle phases of concrete construction (see *Figure 1*) as established in the NRMCA Sustainability Initiatives. Most of the *Guidelines* relate to at least one of these Key Performance Indicators (KPI): embodied energy (total energy used in production); carbon footprint (total amount of CO₂ emitted due to production); potable water use (use of drinking water); waste created (materials disposed in an unproductive manner); and recycled content (materials reclaimed for reuse).

The *Guidelines* were primarily authored by West Main Consultants and William C. Twitty. Other contributors include NRMCA Senior Vice President Lionel Lemay, concrete producers and industry consultants. The *Guidelines* serve as a basis for NRMCA's Sustainable Plant Certification program, though Foundation Executive Director Julie Garbini comments, "Whether concrete producers seek the full Certification or not, the use, guidance and implementation of any of the recommendations included in the *Guidelines* will improve concrete companies' environmental operations and will give them specific practices to refer to when asked by community members and customers alike about their own sustainability practices."

The *Guidelines*, calculators and checklists are available on CD or for download @ www.rmc-foundation.org. More information about the Sustainable Concrete Plant Certification process can be found @ www.nrmca.org.

Figure 1

Guidelines organized by five lifecycle phases of concrete construction



The Petrographic Report

What the designer needs to know

By Richard D. Stehly and Adam J. Brewer

It's safe to say that the most contentious report in the concrete industry is a petrographic report—a report that's usually requested because a concrete did not perform as expected. A petrographic report can be associated with litigation, adding a special level of importance to the work. Unlike a simple test method such as for compressive strength, petrography is not one single technique or set procedure, and the result—the report—does not comprise simple data that can be readily understood or compared with other test results.

Rather, petrography uses a suite of techniques, primarily employing optical microscopy, and requires professional judgment in selecting the locations from which to extract cores, selecting the sample from a core for detailed examination, determining appropriate specimen preparation and storage techniques, obtaining data and observations, and interpreting the results. Much of the information obtained is qualitative or semi-quantitative, making it sometimes difficult to compare reports made by different petrographers on cores taken from the same location.

WHY DO PETROGRAPHIC STUDIES?

In the broadest terms, petrography is a branch of geology that focuses on detailed descriptions of rocks. For this article, we're going to focus on the man-made rock we know as concrete.

Petrographic techniques often require more time for the preparation and examination of specimens than can be accommodated in construction quality assurance. Because

they often require hours of highly skilled labor, they may be too expensive for routine testing. Thus, they are used mostly for dealing with problems, often in the context of litigation. They are also highly informative in research projects, as they provide very detailed information about the concrete itself and any deterioration that may have taken place.

ASTM C856, "Standard Practice for Petrographic Examination of Hardened Concrete," describes the techniques that may be used. The petrographer will select appropriate techniques based on the questions he or she is trying to answer and the capabilities of the laboratory. The information that could be obtained includes the type of aggregates and whether they have reacted with anything; the air-void system parameters (using ASTM C457); the quality of the cement paste; the presence and estimated quantity of supplementary cementitious materials (SCMs); the estimated water-cementitious material ratio (w/cm); the presence and possible causes of cracks; the presence and identification of deposits in cracks and voids; and evidence (which may or may not be conclusive) suggesting the cause(s) of such deterioration as spalling, cracking, scaling, dusting, blisters, or delamination.

WHO CAN BE A PETROGRAPHER?

As previously indicated, petrography requires a good deal of judgment. While a proper foundation of education and experience is essential for a petrographer, you can't obtain a university degree in concrete petrography. ASTM C856 requires that "the supervising concrete petrographer

shall have college level courses that include petrography, mineralogy, and optical mineralogy, or 5 years of documented equivalent experience, and experience in their application to evaluations of concrete-making materials and concrete products in which they are used and in cementitious-based materials.” Typically, the courses would have been part of a degree program in geology with emphasis in mineralogy and optical microscopy—that is, in the application of optical microscopy to the study of rocks.

Although concrete is essentially artificial rock, there are differences between it and natural rock that will affect everything from preparing the thin sections to interpreting the observations. To learn about concrete, the geologist needs to work alongside an experienced concrete petrographer, preferably as part of a team of other professionals in related disciplines. It’s also helpful if the petrographer gains some experience at the job site, as this provides the context for the detailed work of examining specimens in the laboratory.

Similarly, petrographers are not specifically licensed as such by state licensing boards. Some states issue licenses to geologists with certain credentials and experience. We believe the work should be conducted under the supervision of a licensed professional, whether a geologist or an engineer.

HOW CAN I GET THE MOST OUT OF A PETROGRAPHIC REPORT?

Communication

Many people make the mistake of sending the petrographer a core (or worse, simply a random piece of concrete) obtained at the site. They provide no real information about the sample or the site, yet they expect the petrographer to produce a meaningful report.

Keep in mind that this is a report for which you will be paying hundreds of dollars per sample and for which you could be waiting several weeks. You want it to be as informative as possible. The more information the petrographer has to begin with, the better the context for conducting the examination. Just as you wouldn’t go to your doctor for a diagnosis without saying anything about the symptoms you’re experiencing, you shouldn’t send a core to a petrographer with no further information.

The kind of information you should provide includes whatever “symptoms” you observed—cracking, say—and when you first noticed them. You need to provide whatever information you have about the history of the project, the exposure conditions, relevant dates (for example, when the concrete was placed and when it first showed signs

Roanoke Open House

Customers, suppliers, neighbors and friends attended a Roanoke Concrete Products Breakfast and Open House on Saturday, May 21, at the Spring Bay operation of Roanoke. President Kyle Hodel, General Manager Mike Blunier and other employees served up a pancake and sausage breakfast and gave attendees a tour of the brand new, state-of-the-art batching facility. Also on hand was IRMCA board member Jim Amelung of the Barnes Industrial Group, who supplied and installed the new plant.

Roanoke Concrete has been an active member of the Illinois Ready Mixed Concrete Association since its inception and Mike Blunier currently serves on the board of directors. Congratulations to Roanoke on the new facility and for the successful open house.



of distress), the location of the project, and any available documentation. Such documents as the concrete mixture design submittal, project specifications, and concrete delivery tickets could all prove useful.

Because you probably don't know—though you may suspect—what the problem is, you should err on the side of giving too much information rather than too little.

“Be sure to take a sample that includes the problem you're concerned about as well as a sample from a comparable area that doesn't have the problem.”

Photographs can be helpful, although sometimes sketches—particularly when you are trying to find the cause(s) of cracking—are more useful. It's also good to include a drawing of the site or the structure showing where the photographs and the sample(s) were taken. If you are concerned about cracking, map the cracks on a drawing of the structure, slab, or pavement.

Generally, the petrographer will make a standard set of observations on each sample. In some laboratories, the petrographer will routinely conduct these observations before receiving any information about the context; in other cases, the information will come in before the examination begins or while it's going on. Any of these practices is acceptable so long as the petrographer's report is written in light of the contextual information.

Sampling

Ideally, an engineer or experienced field technician should decide where and how to take the samples for examination. Because of the cost of the tests, very few samples are taken compared to the amount of concrete they represent. It behooves you to make sure they capture the information of concern. There are no universal rules about where and how to take the samples, but there are some guidelines. Be sure to take a sample that includes the problem you're concerned about as well as a sample from a comparable area that doesn't have the problem. For example, if you are investigating the cause(s) of cracking, take a core centered on a crack and one nearby.

If you're investigating the delamination of a concrete overlay, take one core near the edge of a hollow-sounding area and one where the overlay seems well bonded to the substrate, to provide a potentially helpful comparison. In any case, document where you took the cores, preferably by sketching the approximate location on a drawing of the area and with photographs.

The samples you take will nearly always be cores rather than broken pieces found at the site. Fractured surfaces will necessarily represent the area that was weakest or where the stress was highest, not the typical material. Also, if there was something in the crack, it may fall out, become contaminated, or react with something in the air or the water. It's better protected within a more or less intact core.

Make sure the samples are large enough to do the tests you have in mind. It's not uncommon to conduct multiple types of tests on cores from the same site. Ideally, you won't do petrographic analyses on cores that have already been used for compressive strength testing, but if the cores are long enough you could cut slices of them before doing the compressive strength tests. In some cases, the only specimen available has already been used for compressive strength testing. If necessary, it could be stabilized with epoxy and examined petrographically. It will, of course, contain cracks induced by the testing. ASTM C457 and C856 have requirements for minimum sizes of specimens for examination.

Properly label and wrap the cores. The label should be clear, unequivocal, indelible, and preferably informative (not just a sequential number or letter). Write directly on the core (but not on a surface you plan to examine) and/or on the plastic bag you are using to hold the core. A core that is cracked or scaled or otherwise fragile should be taped (duct tape is ideal) on the outside of the bag to hold it together; don't put tape on the core itself. Another good way to protect the core is to put it into a cylinder mold of the correct size so that it doesn't rattle around; seal it with tape to keep it closed. If you aren't hand carrying the cores to the laboratory, you will need to pack them carefully to make sure they aren't damaged.

Be sure to include enough information with the samples themselves that the recipient knows what they are, where they were taken, what needs to be done with them, and who to contact. If the cores pertain to litigation or there is reason to believe that they may be involved in litigation at some point, the package should also include chain of custody forms.

Often, petrographic studies are not the only test methods being used to determine the cause or causes of distress in the concrete. If other tests are being conducted, the petrographer should be informed. Sometimes the petrographer can cut the core in such a way as to allow the same core to be used for more than one test—for example, allowing sections on opposite sides of a diametral cut to be used for chemical analysis and petrography. Coordination between the petrographer and those conducting other testing is very helpful in keeping everyone informed and resolving any apparent contradictions in findings.



Fig. 1: Popout due to alkali-silica reaction (photographed at an angle). The white line delineates the boundary between the top surface (above line) and the polished surface perpendicular to it (below line). The offending shale particle can be observed in the base of the popout.

WHAT'S IN THE REPORT?

Although the format and even some of the specific content of a petrographic report depend on the person or laboratory that produces it, the reports generally have similar contents. The background or introduction covers what the sample represents, where and when it was obtained, client information, and any other information supplied by the person who submitted the samples. Sometimes this section will indicate why a sample is being examined. Some laboratories include the main findings early in the report.

The report generally includes observations on overall sample dimensions—usually just length and diameter, but if there are two or more distinct layers they should be separately dimensioned; surface condition—intact, rough, smooth, deteriorated, coated, and any notable features observed, such as scaling or aggregate popouts (Fig. 1); reinforcement—whether any reinforcing bars or fibers are visible; and general physical condition.

Coarse and fine fractions of aggregates are usually described separately. Other observations on aggregates can include:

- Mineral types identified;
- Maximum size (coarse aggregate only)—note that this is based on observation of a cut surface, usually along a diameter, and may not capture the full size of the largest aggregate particle;
- Grading—this will be a qualitative observation that the aggregate appears well graded, gap graded, very fine, or very coarse;
- Angularity; and

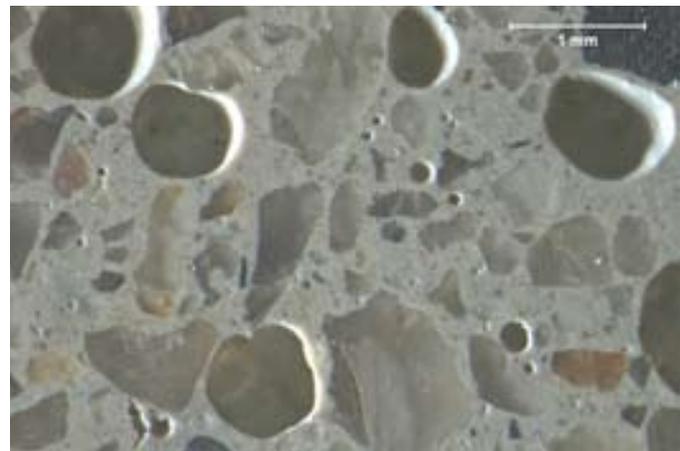
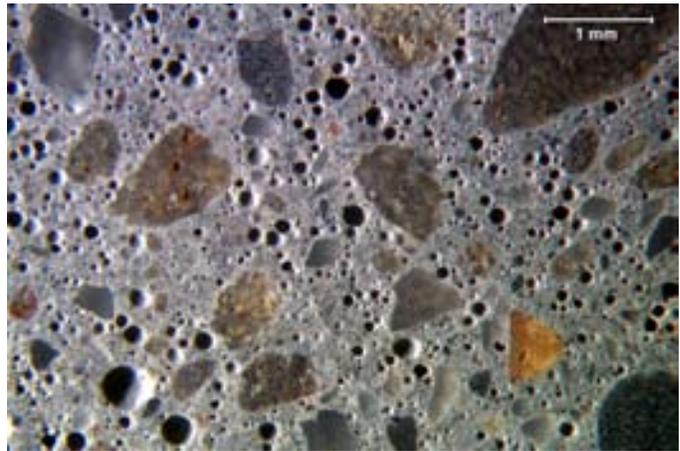


Fig. 2: The upper photograph shows a concrete with fine, well-distributed air voids consistent with freezing-and-thawing durability; the lower photograph shows a concrete with a few coarse air voids.

- Distribution—whether the coarse aggregate appears to have segregated or is more or less evenly distributed within the concrete.

Observations on paste generally include:

- Air content (Fig. 2)—this could be visually estimated or, if ASTM C457 was performed on the same core, details of the air-void system parameters may be presented. If the durability to cycles of freezing and thawing is at issue, the full ASTM C457 analysis should be performed;
- Estimated proportion by volume—percent of the sample that is paste (not aggregate);
- Carbonation—depth of carbonation and whether it varies near cracks. Carbonation is the reaction of calcium hydroxide in the hydrated cement paste with carbon dioxide in the atmosphere to form calcium carbonate. The pH of carbonated concrete is 8.5 or less¹—much lower than that of uncarbonated concrete (which has

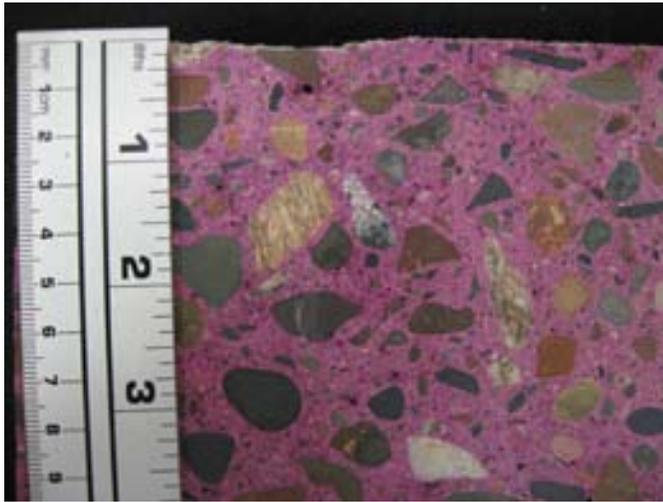


Fig. 3: Phenolphthalein turns deep pink [darkly shaded area] if the pH is above about 9.5. The upper photograph shows a concrete with negligible carbonation, whereas the lower photograph shows a concrete that is heavily carbonated.

a pH of 12 or more). The usual test method is to wet the cut surface of the concrete with phenolphthalein indicator, which turns a deep pink when it's in basic (high pH) solutions (Fig. 3). Carbonation depths can be an indication of the quality of the concrete—if the concrete is known to be relatively young and carbonation has proceeded well into the surface, it could be poor-quality concrete. It could also be an indication of the exposure conditions. Carbonation depths near cracks that are new relative to the age of the concrete may be significantly less than near those that formed early in the life of the concrete;

- SCMs—fly ash and slag cement are visible under the optical microscope; if present, there should be an estimated volume as a percent of the cement paste.

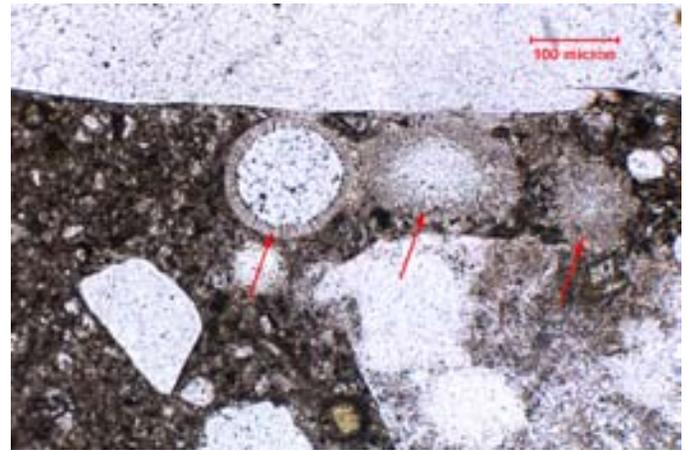


Fig. 4: Needle-shaped ettringite deposits line the air voids (indicated by arrows).

Individual silica fume particles are too small to see under optical microscope, but agglomerations of particles may be visible;

- Paste-aggregate bond—whether the bond appears to be strong or weak; presence of bleed water voids or air-void clusters under coarse aggregate particles;
- Paste color—may suggest the presence of SCMs. In general, concrete with a higher w/cm is lighter than similar concrete with a lower w/cm . Uneven color could indicate insufficient mixing, multiple-stage batching, or retempering with water at the site;
- Hardness—qualitative indication of the strength of the paste;
- Microcracking—microcracks perpendicular to the original exposed surface indicate something about the quality of the curing. Other microcracks could indicate stresses or signs of deterioration, depending on their location and orientation;
- Deposits (Fig. 4 and 5)—if there are deposits in the cracks or voids, they should be noted and identified. Deposits of ettringite (Fig. 4) or calcium hydroxide indicate that the concrete was saturated with water at some point. Alkali-silica gel (Fig. 5) indicates the presence of reactive silica (generally from a susceptible aggregate) and saturation with water, probably over an extended time. Deposits of other materials indicate that some dissolved materials infiltrated from the environment;
- Bleed-water channels—indicate that the concrete experienced bleeding before setting;
- Estimated w/cm —by comparing a thin section of the concrete with a library of thin sections of concrete of known composition, the petrographer can estimate the w/cm within a reasonable tolerance (which should be



Fig. 5: Alkali-silica gel (arrows) in voids near reactive gneiss particle.

indicated in the report); typically it would be expressed as “estimated at 0.40 to 0.45”; and

- Degree of hydration—expressed as a percent. Three weeks of moist curing at temperatures between 20 and 35°C (68 and 95°F) would result in a degree of hydration of roughly 70%.²

All test methods used should be briefly described with reference to ASTM or other standards. If the methods are unique to that laboratory or company, they should be described in more detail. Other information might include the type of coolant (water or oil) used in the laboratory saw, whether thin sections were made, or whether electron microscopy was used to supplement the optical microscopy.

Some laboratories don’t allow the petrographer to draw conclusions, leaving that to the engineer. Sometimes the evidence obtained by petrography is definitive on its own; sometimes it suggests more than one possibility that would require additional testing by other methods to pin down. Any conclusions should be well supported by the evidence presented. It’s particularly helpful if the report includes photographs that support the conclusion.

SUMMARY

Petrographic methods can be among the most informative ones used in an investigation, whether that investigation is being conducted to solve a construction problem, conduct research, or help an expert witness formulate an opinion to present in court. To get the most out of the petrographic report, you need to provide as much information about the site and the history of the project as you can, obtain representative samples large enough for the anticipated tests, and properly label and pack them. You should also make sure the petrographer knows what issue is of concern and whether litigation is involved or expected.

Typically, a full petrographic examination can take several weeks, and the laboratory may have a considerable backlog of work ahead of yours. If you need an answer right away, let the petrographer know; it may be possible to take a quick look and give you a call, then follow up with the detailed report later. Sometimes, the quick look is enough to tell you what you need to know to make the correction or repair at the job site and move on with the work. When the full report comes in, you can decide what caused the problem and assign costs accordingly.

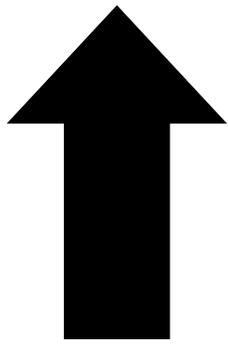
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What's Happening Up North

Concrete First Coalition

We continue to make inroads promoting concrete streets and whitetopping in the Chicagoland area. We've met with suburban mayors, their staffs and consulting engineers. We began our promotion effort with various City of Chicago officials but have had to curtail those efforts until the new mayor has made all of his staff changes. We originally touted that the rise in asphalt prices has made the cost of concrete equal to or lower than the cost of asphalt, and the State of Illinois now requires IDOT to consider life cycle cost when designing roads. With the rise in the cost of gasoline and the public emphasis on sustainability those are facts easily understood and accepted. So now we are talking to designers about considering overlays with whitetopping instead of asphalt and how to efficiently design streets with concrete in situations where asphalt was, more or less, automatically specified.

IDOT

District 1 has asked the local producers, under the umbrella of IRMCA, to meet and discuss the possibility of creating standard industry mix designs based on specific gravity (SpG) rather than sources. This would allow many producers to use the same mixes if the SpG of their aggregates falls within the same established ranges. This would create less of a hassle for the producer if he chooses to change sources and would drastically reduce the number of mixes that IDOT has to administer. The local producers have each run several "redesigned" mixes and submitted them to IDOT for review. District 1 is now taking the concept to Springfield for consideration.

Chicago Concrete Committee

A relatively new technical group has been formed under the umbrella of IRMCA. Its members include producer QC personnel, professional engineers, architects and material suppliers. The group meets for quarterly roundtable discussions of issues currently affecting the concrete industry. The subject of the last two meetings has been bond failure of flooring on commercial and industrial floors. This is a serious problem which is related to the retention of moisture in the concrete.

Joint Association Promotion

It has become apparent that there is a great deal of redundancy in the promotional efforts of the various concrete-related associations and, in some cases, one association may even contradict what another association has said. In order to unify our efforts, and in some cases our presentations, IRMCA, ACPA, Concrete First Coalition and the Concrete Reinforced Steel Institute (CRSI) now meet periodically to coordinate their efforts and communicate their recent experiences. As a group they have met with some of the local concrete producers to offer them support in their promotional efforts.

Tell It Like It Is

By John Albinger

I Am Confused

I'm confused, and at my age confusion is sometimes a prelude to senility or Alzheimer's. So, what am I confused about? Well, this confusion is related to the economy. In the last few years there have been many difficult and even sad times for many of us. In order to survive, many companies, in all industries, have been forced to reduce costs and let people go. Unemployment by itself is a terrible thing. For many of those people the only hope is that when times get better jobs will once again be available; or will they? Many of us remember "the good times" when the work was there. We could afford to employ people and productivity was not as important as it is today, at least it didn't appear to be. Some people use the word "fat" to refer to those days and fat is what we were. As a country we were fat. Today we're certainly not as fat as we used to be; in fact, most of us (at least industrially) are pretty lean and being lean isn't a bad thing. The question: how lean is good? If we personally lose too much weight we can become emaciated. Can businesses become emaciated?

What bothers me is what we lose when we take people out of a process; the talking, the face to face communicating, the shaking of hands, the relationships, the trust.

In all industries automation, and the efficiency it brings, has reduced the need for people. Good or bad that's the way it is and that's the way it will continue to be. (I know, my father said the same thing.) Automated production systems and sophisticated reporting systems have eliminated jobs in all industries. Maybe there are aspects of progress we don't like, but that's the way it is.

What bothers me is what we lose when we take people out of a process; the talking, the face to face communicating, the shaking of hands, the relationships, the trust. I know, more and more people believe these relationships aren't as necessary as they used to be and not as affordable as they used to be. I'm not totally naïve. I know business will get better and we'll be profitable once again, even with fewer people. But if profit is why we are in business what can be wrong? Ah – my confusion!

One problem with atomization and computerization is that neither is change receptive. Implementing a new good idea is now a matter of developing costly software and then if the idea isn't as good as we hoped we may be stuck with it. How many times have you heard, "We can't do that, the system doesn't let us?" Grocery store, car dealership, concrete producer, it doesn't matter. So the question is, "Is progress inhibited by automation, the implementation of computerized systems, fewer relationships and fewer people?" If you want to know the answer, ask any young person. Maybe a better question to ask would be, "Is the saw the problem or the carpenter?"

Next time I'll get back to more fun things, like scaling. We should feel comfortable with talking about scaling, after all we've been "talking" about it for 50 years.

I think I feel better now. Now I can get off my soap box - NAH!