An Introduction to Streets and Local Roads Promotion Planning

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Please visit the electronic version of Concrete Infocus at http://www.nrmca.org/news/connections/ for bonus features, including Tech Talk and Safety First.
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It is clear from the economic indicators that the two major market areas that the ready mixed concrete industry has depended on in the past—residential and commercial—will not fully recover their vitality for years to come. In order for our industry to prosper, we must balance our portfolio and take share from our competitors where there is long-term dependable growth. Streets and local roads offer that opportunity.

To assist your local industry efforts, the National Ready Mixed Concrete Association (NRMCA) and the American Concrete Paving Association (ACPA) have worked together to provide tools and collateral for streets and local roads (SLR) promotion. The NRMCA/ACPA promotion tools and collateral are described at the end of this article. NRMCA has also produced an introductory planning guide to suggest approaches to help in launching local SLR promotion efforts. This article is an abridged version of the guide. You may download the complete PDF version from the “Streets & Roads” tab at www.ConcretePromotion.org.

Implementing a successful SLR program will require a continuous, persistent effort on your part, but NRMCA will be there to support you.

Leadership, Consensus & Collaboration

Opening a major market is a challenging task that requires a good plan, quality tools and coordinated effort over time, but it starts with leadership. Whether in a local market or on a state-wide basis, an individual or small group must step forward to develop a consensus among stakeholders that an SLR promotion effort is warranted and that concerted effort will pay off over time.

Such leadership may come from an individual supported by his or her ready mix producer or supplier company or from other segments of the ready mixed concrete community. The consensus for the need for action and the willingness to collaborate must come from all the industry segments. Leadership, consensus and collaboration are essential for a successful SLR program.

MIT Concrete Sustainability Hub

Concrete paving’s advantages are expected to gain added visibility and credibility in 2011 and beyond from research being conducted at the MIT Concrete Sustainability Hub. MIT has already published an interim report with the estimate that the “use phase” of the life cycle for...
Opening a major market is a challenging task that requires a good plan, quality tools and coordinated effort over time-- but it starts with leadership.

Leadership in launching a SLR program will best come from individuals acting with the support of these organizations. Participation and support by leading companies will be essential for any successful program.

State Associations—Because of the varying nature of municipal and DOT decision-making practices, promotion plans need to be developed locally. State ready mixed associations will generally be at the center of an SLR promotion effort but can only be expected to act in response to a unified call by members to move ahead. Such an effort may require a change of association promotion priorities or sources of additional funding to add SLR to an existing portfolio of promotional efforts. State associations will be fundamentally involved in SLR promotion planning and provide regular promotion services to move the plan ahead.

ACPA Local Chapters—Personnel of ACPA local chapters are very knowledgeable about concrete road paving and are likely to have strong relations with DOT officials. Some states are fortunate to have chapters that focus entirely within the state while others may share regional ACPA coverage with other states or have no ACPA local coverage at all. Where available, local ACPA chapters should be asked to support and participate in the SLR promotion effort. Local ACPA chapter promotion efforts may traditionally focus on mainstream paving, but that experience should transfer well to local streets and roads. If the local ACPA chapter can supply technical resources to support the SLR effort it will be an important contribution toward a successful program.

Regional Promotion Groups—RPGs play a fundamental role in funding regional concrete promotion efforts across most of the U.S. through targeted support of state ready mixed associations. It is important that RPGs be kept fully informed of SLR promotion plans by states and are provided assurance that such plans will not negatively impact any promotion arrangements in effect between the state and RPG. Beyond providing that assurance, support for the goals and participation in the planning of SLR programs should be sought and welcomed by states as RPGs may assist the effort in various ways, including providing technical support in RPG regions with qualified personnel.

Contractors—Concrete does not get placed without contractors and an SLR promotion initiative is hampered without their involvement. Contractor participation should be sought from the beginning of the planning effort. This may be a major challenge, particularly in markets with little or no existing SLR market share (recommendations for securing contractor participation appear below). When the asphalt industry goes in to talk to their local official, they are the producer and the contractor. Contractors greatly enhance promotion teams because customers can be confident that all facets of SLR operations are in place for successful placements.

Research/Analysis/Assessment

With the support of a sufficiently broad segment of the ready mixed community that an SLR promotion program would be valuable, it is worthwhile at the outset of the planning process to make sure that all necessary elements for success are available and


Promotion Roles

National Associations—The role of NRMCA, ACPA and the Portland Cement Association (PCA) is to provide promotion tools and targeted assistance to help advance the promotion effort at the local and state level. National associations can encourage SLR promotion but are not able to provide local leadership or take the lead in developing promotion plans which must reflect local conditions. NRMCA is available to make state presentations to assist in developing support for SLR programs and is willing to assist in the promotion planning process through the participation of regional National Resource Directors (NRDs). One benefit NRDs can provide is to share their knowledge of the experience of other states in developing SLR programs. NRDs will also provide or help arrange training in the use of ACPA’s StreetPave program, an important SLR promotion tool that is fully explained in the resources section at the end of this document.

Ready Mixed Concrete Producers, Cement Companies, Industry Suppliers—Leadership in launching a SLR program will best come from individuals acting with the support of these organizations. Participation and support by leading companies will be essential for any successful program.

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highways accounts for up to 85% of greenhouse gas emissions, which is relevant as well for many municipal roads. More complete research results will be published by MIT during 2011.

The MIT reports will go a long way in providing independent, third-party validation to the life-cycle message from one of the most highly regarded institutions in the world. Creating awareness of the MIT findings in local media and among municipal officials should be part of every SLR promotion strategy. The MIT Interim Report on the
that there is an understanding of how SLR decisions are made in your state. These are key questions that must be answered:

Where will technical support for SLR promotion come from in your area?

Support from local or regional ACPA chapter representatives will be invaluable where it is available both on technical issues and for introductions to state DOT and other officials. National associations are not able to provide ongoing local technical support but may be able to on occasion. NRMCA is willing to assist in exploring technical support solutions on request.

What contractors in your area are willing to assist in developing a concrete SLR market?

Finding contractors that are willing to become part of the promotion team is a particular challenge when little or no market yet exists, but the effort is worthwhile as the involvement of even a single reputable contractor will be of great benefit. The obvious carrot for participation is the opportunity for the inside track on projects as promotion efforts become effective.

Is the state DOT, county or local municipality responsible for making decisions on local roads?

The answer can vary greatly. In some states the DOT is responsible for almost all road decisions, although in many states counties and cities both have jurisdiction for some local roads. In any case, the state DOT is likely to have strong influence on local decisions.

Who owns the asset?

The government party responsible for maintaining local roads once they are built may be different from that making key recommendations or decisions on construction. If so, the ultimate asset owner should be included in promotion outreach.

What policies are in place about SLR project bidding and awards?

Existing practices may be for an asphalt specification only, opportunity for alternate bids or alternate design/alternate bid. The local situation will dictate important planning strategies and promotion practices. Be aware that subdivision street requirements are sometime different.

What existing SLR projects can help demonstrate the competitive benefits of concrete?

Gather information on past projects that support concrete promotion. Examples could be successful concrete street projects or competitors’ projects that have experienced cost overruns or not lived up to performance expectations. Cataloging existing roads with increasing life-cycle competitive, as many MPO’s, cities, counties and townships are finding out. Even so, a growing number of agencies/owners are looking beyond those competitive first costs to find even greater savings over the intended design life of the pavements. This flyer explores the basic considerations used to determine the objective life-cycle costs analysis (LCCA) of pavement systems.

PowerPoints for Presenting to Municipal Decision Makers/Specifiers (Free PowerPoint downloads)

Two versions of a scripted presentation have been developed to explain
If an official acknowledges a lack of interest in supporting concrete at least you know where he or she stands. But an enthusiastic response without corresponding action is even more harmful if it unduly delays forward progress.

Online Resources


This site features a wealth of material to support concrete promoters across most concrete applications, with downloadable presentations, promotion collateral, videos, photos and many other resources, almost all of it free. A new section of the site has been added for SLR promotion that makes available most of the promotional tools mentioned in this document.


This is an NRMCA Web site that has been launched as an addition to the online ConcreteAnswers Series that is targeted to specifiers and already familiar to many. The content focuses on the features and benefits of concrete streets and roads and will include upon request links to organizations engaged in SLR promotion.

NRMCA appreciates the invaluable contributions to the development of this guide from many concrete industry promoters, including Don Ingerman (Titan America), Gordon Smith and John Cunningham (Iowa Concrete Paving Association), Bob Long (Mid-Atlantic Chapter ACPA), Doug Easter (Virginia Ready-Mixed Concrete Association), Jerry Reese (North Carolina Concrete Pavement Association) and NRMCA’s national resource directors: Dan Huffman, Phil Krogue, Jon Hansen, Vance Pool, Doug O’Neill and Amy Miller. To provide feedback for future editions of the guide, contact Glenn Ochsenreiter at glenn@nrmca.org.
industry and residents. They can improve or impair safety, traffic flow and aesthetics. Concrete streets are usually comparable on initial cost and dramatically reduce maintenance costs, accidents, drainage problems and complaints.

• Be prepared with examples of existing streets that are substandard and dangerous.
• Where it is lacking, support for concrete alternative bids within the specification is essential.
• Get StreetPave endorsed as an approved design guide—especially where MEPDG is already approved, though note that StreetPave is not simply a replacement for MEPDG.
• Obtain a letter from DOT providing as much support as possible from most basic to advanced, i.e., that concrete is an authorized SLR paving material, that StreetPave is supported, that concrete is requested as alternate.
• Produce an SLR concrete specification and design guide if appropriate and work with state and municipalities to adopt. A DOT that does not have a design guide for concrete may be willing to adopt one or willing to endorse one.
• Seek correction or clarification of any published guidelines that are working against concrete acceptance.
• States or municipalities should not be obligated to maintain substandard subdivision roads placed by developers. Push for adoption of reasonable subdivision street standards and seek to establish a preference for concrete streets in subdivision ordinances. Supporting such a mission shows an interest in the public good and creates more concrete opportunities.

Public Affairs Strategies

If reasonable appeals for concrete consideration made to state and local agencies do not yield adequate results, a public affairs strategy may be appropriate. The first step is to engage elected officials as they should be willing to participate in discussions that can lead to more cost-effective, better performing and safe streets and roads.

• Recognize you may need a public affairs strategy for getting concrete any specification/bidding opportunity.
• Every government official in the chain should be considered as fair game for a promotional appeal.
• Be ready with the facts and figures showing the importance of the concrete industry in your state or area (employment, economic activity, etc.).
• Meet with the City Council (or appropriate government body), one person at a time if necessary to make the case for concrete by pointing out the public benefits of a level playing field.
• If an official acknowledges a lack of interest in supporting concrete at least you know where he or she stands. But an enthusiastic response without corresponding action is even more harmful if it unduly delays forward progress. Push for specific actions and a timeline. Move up the ladder if action is not reasonably forthcoming.
• The mayor, county executive or governor is likely the top rung of elected officials to meet with—be ready with a concise and effective presentation that has been tested and honed. If receiving a less than positive response, meeting with the officials’ political opposition may be useful.
• Many states have non-partisan “think tanks” on key issues. Look to get involved in transportation-related issues to gain awareness and support for concrete roads.
• Get supportive politicians or community organizations to directly submit proposals and recommendations for any needed activity such as specification or bidding procedure revisions.
• Seek support from influential state representatives that might be willing to introduce state legislation encouraging approaches supportive of concrete, such as performance specifications that could be tied to life-cycle assessment.

Developing Concrete SLR Opportunities

Gaining support from state and municipal agencies for concrete to be able to compete fairly for local street projects is essential but not an end in itself. Ongoing general promotion is also needed to turn municipal possibilities into realistic project opportunities.

• It is worthwhile from the outset, at every opportunity, to show that all facets of the local concrete industry will work together to produce quality local roads, including RM producers, cement companies, contractors, and relevant industry organizations and associations.
• Start talking with developers early to get their support. Ask developers who are enthusiastic about concrete streets to share their interest with appropriate officials.
• Offer concrete municipal streets and roads seminars and demonstrations for all relevant agencies and constituencies.
• Look for opportunities to attend and/or take a booth at appropriate conferences and shows and seek speaking opportunities at state transportation conferences and other suitable venues.
• Participation in local chapters of environmental and engineering groups (such as USGBC and ASCE) is a good way to spread the word and gain influential allies.
• Make promotional information available and post success stories on appropriate Web sites.
• Make promotional use of MIT results as they become available.

Getting the Job

With reasonable accommodation from state and municipal agencies and growing interest in the benefits of concrete for local roads, it is time to turn opportunities into projects. These are some recommended practices for increasing the odds in favor of concrete.

• Getting some initial projects is crucial and a willingness to proceed with small test projects can pay dividends.
• Many communities start with concrete intersections and then move ahead with concrete streets.
• Review “letting reports” and other project information sources for upcoming projects and work with local contractors to provide alternate/value engineered estimates.
• Know pavements and material costs in your area.
• Identify projects and move forward as early in the process as possible.
• Find the owner, civil engineer and geotech. Bring in members of the promotion team that represent all facets of a successful concrete project, including RM producer and contractor.
• Use StreetPave software to show decision-makers an “apples-to-apples” comparison of concrete and asphalt designs.
• Utilize other promotion support materials and tools (detailed earlier).
• Negotiate design with the civil engineer and geotech.
• Give price quotes and follow up with all parties regularly until a concrete project is awarded and the project is built and open to traffic.
Temporary Law Can Mean HUGE Tax Savings for 2011 Equipment Buyers

By Christian A. Klein

Improving business conditions aren’t the only reason forward-thinking companies are making new capital investments this year. Congress and the president have enacted temporary tax laws to encourage companies to buy now. The incentives created in December 2010 are the most significant in a generation. If your company purchases equipment in 2011, you can dramatically reduce what you send to Uncle Sam this year.

The Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010 (TRJA) extended and expanded the depreciation bonus created in 2008. For 2011, it’s an unprecedented 100 percent; for 2012, it’s 50 percent. By lowering your taxable income, bonus depreciation can significantly cut your 2011 and 2012 federal tax bills, freeing up cash in the near term.

Assume you buy and place in service in 2011 a new piece of equipment costing $100,000. Using bonus depreciation, you can “write off” the full amount this year, reducing your taxable income by $100,000. If you’re in the 35 percent tax bracket, that can reduce your 2011 tax bill by $35,000.

In 2012, things get a little more complicated: the depreciation bonus will fall to 50 percent. You’ll be able to write off half the purchase cost plus the percentage of the remaining basis you’d ordinarily write off in the first year. For a $100,000 machine with a five-year MACRS life you’ll be able to write off $60,000 ($50,000 with bonus depreciation plus one-fifth of the remaining $50,000 in basis).

There are some important nuances to keep in mind:

First, to qualify for bonus depreciation, the equipment must be new. That means the “first use” must occur with the taxpayer who claims the benefit. Used equipment that doesn’t qualify for bonus depreciation might still qualify for Sec. 179 expensing (see below).

The equipment has to be placed in service in the year in which you claim the bonus (2011 for 100 percent and 2012 for 50 percent). In other words, if what you’re buying takes a long time to deliver, don’t wait until December to place your order.

Next, the property must to fit into one of the categories for which bonus depreciation is allowed: property depreciable under the Modified Accelerated Cost Recovery System (MACRS) with a recovery period of 20 years or less (most tangible property used in a business will fall into this category), as well as select water utility property, computer software and leasehold improvements.

Bonus depreciation is elective, not mandatory. You don’t have to use it if you don’t want to. And it applies for both regular and alternative minimum tax purposes.

But there are some potential downsides. The more you depreciate now, the less you’ll be able to depreciate later. In other words, your tax bill in future years may be higher because you’ll have less to deduct. Also, if you depreciate 100 percent now and sell the asset before the end of the asset’s MACRS recovery period, it may increase your tax bill in the year you sell. (Like-kind exchange (LKE) can help mitigate some of that potential depreciation bonus “hangover.”) And some states don’t recognize the depreciation bonus, which may result in additional tax complexity.

But when considering the downsides, consider this: Would you rather take the tax break now and invest the money in your company, or would you rather let the U.S. government hold onto it for you for the next several years?

Congress also recently changed Sec. 179 expensing rules. For the 2011 tax year, companies can expense up to $500,000 as long as total purchases don’t exceed $2,000,000. For each dollar over, the eligible expensing amount correspondingly drops by one dollar. The TRJA extended Sec. 179 expensing through 2012 but lowers the benefit to $120,000 with a $500,000 phase out threshold. Eligible taxpayers can combine Sec. 179 and bonus depreciation for even bigger tax savings.

From a tax standpoint, there’s never been a better time to invest in your company’s future. Of course, this article doesn’t constitute specific tax or legal advice, so be sure to check with your accountant or tax professional if you want to take advantage of the law. But don’t wait … the clock is ticking!

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Concrete is a building product of which cement is the key ingredient. Cement is a fine, soft, powdery substance made of calcium, silicon, aluminum and iron. Cement is then mixed with water and aggregate (rock and sand). The mixing formula for concrete depends upon its intended use.

Concrete has many building applications. Some of the most prevalent uses include building roads, streets and sidewalks. Many of today’s largest buildings are made from concrete. Building foundations and basements have been made from concrete for many decades. In recent years, concrete has become very popular for floors in houses and patios. The versatility of concrete depends upon its intended use.

Concrete has many building applications. Some of the most prevalent uses include building roads, streets and sidewalks. Many of today’s largest buildings are made from concrete. Building foundations and basements have been made from concrete for many decades. In recent years, concrete has become very popular for floors in houses and patios. The versatility of concrete even allows it to be used in decorative applications.

Concrete as a building material has some distinctive advantages. Concrete’s mass and weight make it very resistant to high winds, explosion and impact. It also has a high endurance to very high temperatures without losing structural integrity. Because of this characteristic, it meets stringent fire codes without additional fire proofing treatments. Experts believe that concrete is a safer building material to use on the job site than most other building materials.

Concrete is an eco-friendly building material. It is very efficient because the ingredients require little processing. Most of the components are acquired locally which minimizes transportation energy. Concrete building systems combine high insulation with high thermal mass and low air infiltration to make buildings more energy efficient. Concrete has a long service life which increases the time between repair, maintenance and reconstruction. Because of its long service life, concrete’s associated environmental impact is minimized.

When used as pavement or exterior cladding, the urban heat island effect is reduced, requiring less energy to be used for heating and cooling homes and buildings. Concrete also does its share of utilizing recycled materials. Byproducts such as fly ash, slag and silica fume are used to make concrete. This reduces landfill materials and the carbon footprint. Concrete also helps reduce the “green house effect.” This is done through a process called carbonation. It absorbs CO2 throughout its lifetime.

The future of concrete as a building material is very bright. High tech has been employed in the development of the manufacture of concrete. Through sciences, such as chemistry, rheology, physics and others, ultra-high performance fiber-reinforced concrete has been created. The qualities of this new technological concrete allow it to be used where steel reinforced concrete will not work. Because it is able to absorb deformations without breaking, it can be used in expressway bridges. Because of its self-compacting characteristics, it can also be used to produce works of art with very unusual shapes. This new ultra-high fiber-reinforced concrete is extremely durable. It can be used in aggressive or dangerous applications, such as in sea water and nuclear power plants.

The Romans invented and used concrete. It was then forgotten about for nearly 1500 years. Since its rediscovery in the early 19th century, it has become a very important material. The introduction of steel reinforcement concrete has played a critical role in building this country. Now with the development of ultra-high performance fiber-reinforced concrete, it will play an even larger and more critical role in future construction. Concrete has affected my life, because I have learned how to use it at Anthis Career Center in Fort Wayne, Indiana. Mr. Jewell is a student at Anthis Career Center and supporter of the NRMCA.

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Mr. Jewell is a student at Anthis Career Center in Fort Wayne, Indiana. The Indiana Ready Mixed Concrete Association submitted the winning essay. The winner receives a college scholarship in the amount of $5,000 if he or she chooses a concrete-related curriculum or $2,000 for a curriculum of his or her choice. For more information on how your state can participate in NRMCA’s National High School Essay Contest, please contact Nicole Maher at 240/485-1158 or via e-mail at nmaher@nrmca.org.
n our first article we looked at how much time we listen versus talk in a sales interaction, which is a critical success factor. The second common mistake made by salespeople is not having a good process. Dictionary.com defines process as “a systematic series of actions directed to some end.” In order to be repeatable, measurable and continuously improved selling needs to have a defined process.

When a salesperson uses a defined process he or she can better prioritize time, compartmentalize progress, assess win rates of various strategies and look for opportunities to shorten the selling cycle. A process can improve both effectiveness (won loss %) and efficiency (# of calls to the right people delivering the right message at the right time). These are two keys to increasing sales, assuming you have the right team in place to get the job done.

What is a selling process? It is a set of discreet steps or gates you pass through on the way to winning or losing a sale. An example of a selling process in our industry could be:
1. Project identified
2. Design phase
3. Competitors identified
4. Bidding
5. Project awarded
6. Concrete awarded
7. Reference

By having a process, it makes it easier for the salesperson and the manager to communicate effectively using more time to talk tactics and less time communicating status. It makes it easier to train new salespeople if you have a process. Having a process makes life easier for everyone involved once people adapt to the change.

Managing the process is a topic that many books have been written. There are tons of software programs available to automate the process. Until you have a good process you are wasting your time automating. Each salesperson has to have a consistent way of reporting and tracking the process. I have seen it done successfully with post it notes, Day Timer’s, calendars, Outlook and numerous software applications. Having personally rolled out processes in Excel in three organizations and four customer relationship management software programs, I am a fan of automating the process. If you have a team automated you can see macro trends, revenue shortfalls and other issues much sooner so that you can take action and adjust plans to address the issues before they hit.

A few other terms that come up when talking about the selling process you may want to know:

Opportunity: A chance to win business. An example might be “Concrete parking lot at Walmart store number X”. The same project might have an opportunity “Integral colored floor at Walmart Store X”. Why separate the two? You might only win one. You can measure better and understand each selling process and have better focus on each opportunity.

Pipeline or Funnel: A sales pipeline is a look at what is coming down the pipe; projected success rates, revenue and forecasts.

Success rate, won loss rate, kill rate and many other names: The number of opportunities won divided by the number worked on over a specific time frame.

Having a good selling process is a fundamental step in improving your team’s efficiency and effectiveness in selling. Top salespeople have a process. The key is finding the best process and getting the whole sales team to use it. Part three will discuss not understanding the buyer’s decision making process.
Best Sellers from the NRMCA Bookstore

Technical Related Publications
1. 2PCIPS  - Concrete In Practice Package - Concrete In Practice Sheets are short 1-page discussions on various concrete topics and are written in a “What? Why? And How” scheme and are intended to provide information on a non-technical format. The CIP topics are researched and written by members of NRMCA’s Research Engineering and Standards Committee. These are a great resource to give to your contractors and customers. English CIP Full Set 2PCIPS  - contains 20 sets of each CIP topics 1-42. Spanish CIP Full Set 2PCIPSes  - contains 20 sets of each CIP topics 1-42. ($220 members, $320 non-members); English Single Set 2PCIPS & Spanish Single Set 2PCIPSes ($27 members, $110 non-members)

2. 2PLS - ASTM Standards for Concrete Technician Certification - Updated in April 2010, this publication includes 12 ASTM practices and test methods related to testing fresh and hardened concrete, including those required for ACI grade 1 field-testing and strength testing technician certification. ($42 members, $190 non-members)

3. 2PE003 – Guide to Improving Specifications for Ready Mixed Concrete – This publication uses Master Specification CSI format, Section 03300 for cast-in-place concrete to propose specification clauses and provides accompanying commentary as guidance. Provisions of ACI 318-08, Building Code for Structural Concrete, as it relates to requirements concrete ingredient materials and mixtures, production and delivery are incorporated in this document. ($25 members, $50 non-members)

4. 2PE004 - Thermal Measurements of Hydrating Concrete Mixtures - This publication introduces readers to SAC equipment, applications and basics of how to plan and conduct an effective SAC testing program. Interpretation of SAC thermal profiles are also discussed. ($35 members, $60 non-members)

Environmental Related Publications
5. 2PLCI - LEED Calculator the Concrete Industry - The Recycled Content and Regional Material Calculator for the Concrete Industry (LEED calculator) is an Excel-based program which calculates the concrete’s contribution to the LEED 2.2 Recycled Content and Regional Material credits. The calculator allows input on project information, concrete producer and other applicable information. The program provides the results in a single page letter which can be provided to the LEED Accredited Professional, project manager or building owner. ($30.00 members, $120.00 non-members)

6. 2PCSR01 - Concrete’s Contribution to LEED 2009 NC (Pkg. of 20) - Concrete Sustainability Reports (CSR) are technical publications that discuss various sustainability related topics. They are intended to provide a summary of complex topics to help design professionals and concrete industry professionals utilize concrete sustainably. CSR01, the first in the series, provides a brief description of the LEED 2009 green building rating system and how concrete can contribute within each credit category. Examples of how concrete can be used to influence points in LEED are presented and a table summarizing how concrete contributes to each credit is provided. 8 pages. ($15.00 members, $25.00 non-members)

Promotion Related Publications
7. 2PPB1 - Concrete Parking Promotion Flip Book - The 20 page flip-chart book comes complete with an up-to-date parking lot presentation that also provides the promoter key additional information that the specifier does not see. This approach helps every promoter stay organized, reinforce the key points and also cover additional helpful information to support the specifier. The Pitch Book also comes with a Windows PowerPoint version on CD for electronic presentations which also enables editing and printing of page updates to the flip-chart book. ($29.00 members, $29.00 non-members)

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Variation in Concrete Strength and Air Content Due to Fly Ash
Part VI of Concrete Quality Series

By Karthik Obla, Ph.D., P.E., VP, Technical Services

Parts I and II of the Concrete Quality series discussed that a good measure and benchmark of concrete quality is the Standard Deviation (SD) of compressive strength test results. The primary factors that impact the SD are variability associated with materials, production and testing. In order to reduce the strength standard deviation the concrete producer needs to manage those aspects of variability that can be controlled. This article discusses concrete strength and air content variability due to variation of fly ash from a single source.

Variability of fly ash shipments from a given source

A 1998 PCA/NRMCA survey reported that fly ash was used in more than 55% of all ready mixed concrete placed in the USA. A subsequent survey (unpublished due to reduced response) validated that fly ash use has been consistently increasing over time. Due to sustainability and performance benefits the use of fly ash continues to grow. Fly ash is an industrial by-product produced due to coal burning in an electric power utility. Electric utilities are primarily focused on optimizing power generation and are not concerned with fly ash quality or variability. Fly ash properties may change depending on type and origin of coal used, blends of coal used, changes in the burner and other factors.

Back in the late 1980s the NSGA/NRMCA Joint Research Laboratory developed a draft Standard Practice for Evaluation of Uniformity of Fly Ash from a Single Source. The practice was used to conduct a detailed experimental study on 4 different fly ash sources – three ASTM C618 Class F fly ashes (F1, F2, F3) and one Class C (C1) fly ash. From each source 10 fly ash samples were procured per month, each on a different day, for 6 months, spread evenly throughout the period, for a total of 60 samples. The fly ash samples were procured from ready mixed concrete plants with each sample representing a different fly ash shipment. A large stock of cement was also procured and kept in sealed containers to maintain its properties during the course of the whole experimental program. The following tests were conducted on each fly ash sample:

1. Moisture content, Loss on Ignition (LOI), Fineness - percent passing the No. 325 sieve, Density, Water requirement, 7 day Strength Activity Index (SAI) – all tests according to ASTM C311
2. Uniformity of color compared to the previous shipment – see Appendix for details
3. Foam index test – see Appendix for details
4. Mortar air content and loss in air (modified C311) – see Appendix for details

Duplicate tests were run on three randomly selected fly ash samples from each group of 10. All the tests were conducted on the duplicate samples with the exception of uniformity of color. For the strength activity index one control reference cement mortar batch was cast for every 10 mortar batches cast with the fly ash samples. The same reference cement mortar strength was used for calculating the SAI of the 10 fly ash samples. Since cement from one shipment was being used for the reference cement mortar cubes the variation in cement mortar strengths provided an indication of the mortar testing variation. A statistical analysis of some of the experimental results is compiled in Tables 1a-d.

Air Entrainment

Tables 1a-d shows that the LOI varies several fold between shipments for each of the 4 fly ash sources. The mortar air content for a specific AEA dosage also varied between shipments for each of the sources. It varied the least for fly ash C1 (13.1% to 14.6%); it varied the most for fly ash F3 (11.1% to 18.4%) and varied moderately for Fly ash F1 (8.1% to 13.4%) and fly ash F2 (9.7% to 13.5%). So in terms of its effect on the ability to entrain air the different fly ash sources can be ranked in terms of more to less variable as follows: F3 > F1 > F2 > C1.

Figures 1a-d shows that for fly ashes F1, F2, and F3 the loss in mortar air content increased as the initial mortar air content decreased thus suggesting that when the fly ash affected the mortar air content it is likely to lead to an increased loss in air content with time as well. As expected, fly ash C1 had the lowest loss in air content (up to 1%), fly ash F3 had the highest loss in air content (up to 6%) followed by F1 (up to 5%), and F2 (up to 3.5%).

Figures 2a-5a show the relation between LOI and mortar air content for samples of fly ashes F1, F2, F3, and C1, respectively. Figures 2b-5b show the relation between foam index and mortar air content for samples of the same fly ashes. Fly ashes C1 and F2 did not have good correlations between LOI vs. mortar air content and foam index vs. mortar air content. One possible reason could be that fly ash C1 and to a lesser extent...
fly ash F2 had a very low variation in mortar air content between the different samples to begin with. Fly ash F3 had the best correlations whereas fly ash F1 had acceptable correlations for LOI and mortar air content. Fly ash F3 had the largest change in LOI content. It appears that LOI and foam index tests can be useful at estimating the effects on air entrainment only for fly ash sources that demonstrate a large variation in air entrainment.

The LOI and mortar air content results of samples of all 4 fly ash sources are plotted on Figure 6a. Similarly, the foam index and mortar air content results of samples of all 4 fly ash sources are plotted on Figure 6b. From the plots it is clear that a change in LOI or foam index will have a different effect on mortar air content for each source. So before one can use LOI or foam index values at estimating the effects on air entrainment it is important that a correlation be developed between the LOI or foam index and mortar air content for that fly ash source.

The relative color visual rating was plotted against the change in mortar air content between successive samples of each fly ash source. One would have expected the darker fly ashes to have increased reductions in mortar air content (assuming that increased carbon content could result in the darker color). Unfortunately no such correlations were found. Relative color does not appear to be a good way of estimating the effects of the fly ash sample on air entrainment. At best it may indicate something has changed from the previous shipment.

Figures 7a-d shows the relation between relative density (RD), also referred as specific gravity, and mortar air content for fly ashes F1, F2, F3, and C1 respectively. Fly ashes C1 and F2 did not have good correlations between RD and mortar air content while Fly F3, and F1 had better correlations. The lower RD is likely due to increase in carbon content and hence leads to lower air content.

As expected, moisture content had no correlation with mortar air content for any of the fly ashes. Fineness had an average correlation with mortar air content for fly ash F3.

**Strength Activity**

Fly ash mortar strengths generally varied over a wider range as compared to companion control mortar strengths with the reference portland cement. The Coefficient of Variations (COVs) of the fly ash mortar strengths were about 4% for fly ash sources F1, F2 and F3. The corresponding COVs of the control mortar strengths of the reference cement was only about 1% with the exception of the control mortar strength tested for fly ash F2 which was inexplicably higher. The COV of the fly ash mortar strengths for source C1 was also much lower at 1.4%. This suggests that the variation in strength for fly ash source C1 was largely due to testing whereas fly ash F1, F2, F3 had a statistically significant mortar strength variation, greater than that attributed to testing variation.

The range (difference between the maximum and minimum strength attained by samples from a given fly ash source) of the 7 day fly ash mortar strengths was about 700 psi for fly ash sources F1, F2 and F3 and 243 psi for fly ash C1. The average range of the 7 day fly ash mortar strength of the three fly ash sources F1, F2 and F3 was 682 psi. Concrete testing was not conducted in this study but of interest would be how this range of mortar strengths would translate to concrete strengths. In an earlier article it was shown that for the same cement source, strengths of mortar cubes tested according to ASTM C109 correlated well with strengths of concrete cylinders tested according to ASTM C39*. An average 1379 psi range in C109 mortar strength (w/c = 0.485) between the cement samples corresponded to an average 820 psi range in concrete strength (w/c = 0.58) for the same samples. If a similar correlation is expected an average range in 7 day fly ash mortar strengths of 682 psi can correspond to an average range in concrete strength of 400 psi as long as the same cement is used for both the mortar mixtures and the concrete mixtures.

Moisture content, LOI, specific gravity and color had no correlation with SAI for any of the fly ashes. Figures 8a-d shows the relation between fineness and the 7 day SAI for fly ashes F1, F2, F3 and C1, respectively. Fly ash C1 and F2 did not have a correlation where as fly ashes F1 and F3 tended to have higher strengths with increased fineness as expected though the correlations were still weak. Blaine fineness results (ASTM C204) if available may be used to detect changes at the lower end of the particle size distribution that have a greater influence on concrete strength.

**Fly Ash Testing Required by ASTM C618 and C311**

Table 1 in ASTM C311 provides the minimum sampling and testing frequency for the fly ash. For established fly ash sources moisture content, LOI, and fineness tests need to be conducted at a frequency of the smaller of daily or every 400 tons; Density, SAI and various other chemical tests listed in ASTM C618 are to be conducted on composite samples monthly or every 3200 tons whichever comes first. Composite samples do not reflect the true variation that is likely from fly ash shipments. The same composite sample test result may be applicable to many different fly ash shipments to the same concrete plant. To comply with C618 the fly ash marketer conducts LOI and fineness testing 1-3 times a day depending on the daily production at the fly ash source.

ASTM C618 also has a uniformity requirement for density and fineness. It states that the density and fineness of individual samples shall not vary from the average established by the 10 preceding tests, or by all preceding tests if the number is less than 10, by more than 5% (for density) and 5% retained on No. 325 sieve (for fineness).

**Suggested Producer Actions - Air Entrainment**

Concrete air entrainment is perhaps the most important factor that is affected by fly ash. The concrete producer should make it a point to receive LOI and fineness test results conducted on the same day the shipment had left the fly ash source. Sometimes the test results may be available only at the end of the day after the fly ash shipment had left for the concrete plant. It is worthwhile for the concrete producer to develop an understanding with the fly ash marketer to receive those results.

If the LOI test result varies from the previous fly ash shipment that by itself is of little value. It is suggested that fly ash marketers develop a correlation between LOI and mortar air content for that fly ash source. If there is no correlation between LOI and mortar air content then the fly ash marketer can develop a correlation between foam index and mortar air content for that fly ash source. If there is no correlation between foam index and mortar air content as well then the fly ash marketer could conduct mortar air testing every time the LOI test is conducted at the fly ash source. This systematic approach provides the concrete producer some understanding of the effect of the fly ash shipment on air entrainment before the fly ash is used in concrete.
The concrete producer could also conduct the foam index or the mortar air content test at the concrete plant when a fly ash shipment is received. These tests can be completed in less than 15 minutes by operators without any significant training. If the mortar air content attained is for example 50% less than that achieved for the previous fly ash shipment the decision can be made to increase the AEA dosage in the concrete made with the new fly ash shipment by at least 50%. The first few concrete trucks that use the fly ash from the new shipment should be tested for air content in accordance with ASTM C231[14]. Depending on those concrete test results AEA admixture dosages for future truck loads could be adjusted. The concrete producer could skip the foam index or mortar air test and conduct concrete air content testing while maintaining the same AEA dosage as for the previous fly ash shipment. This approach may take a little longer to clearly identify the effect of the new fly ash shipment on air entrainment because there are many other factors involved in batching and measuring air content from a concrete truck.

RD of fly ash could also be an indicator for the effect of the fly ash on air entrainment. However, RD is conducted on composite fly ash samples and therefore the data is attained less frequently and as discussed earlier may not be representative of the shipment received. The concrete producer should check to ensure that the fly ash meets the uniformity requirements for density. It is also important to use the correct RD for the fly ash in the mixture proportions.

In the study discussed earlier color did not prove to be a good indicator for air entrainment. It would be useful to conduct the color test using handheld colorimeters that are available nowadays. These are less subjective and it would be of interest to see if a correlation can be developed between the results of the colorimeter test and the mortar air content.

Suggested Producer Actions - Strength Activity

The results of the study discussed earlier suggested that different fly ash shipments from a given source can contribute to a variation in concrete strength. A concrete producer interested in reducing this strength variation can attempt to adjust the concrete mixture proportions based on the expected strength variation due to fly ash. The producer should pay close attention to the fineness and SAI values. The first thing is to ensure that the C618 uniformity requirements for fineness are met. The producer can develop a control chart of fineness test results for the shipments received at the concrete plant and adjust mixture proportions if certain control chart limits are exceeded. It is suggested that the control chart limits be set at 5% above and below the average fineness value. When the higher fineness limit is exceeded (i.e. there is a higher percent retained) it means that strengths can be lower as the fly ash has coarser particles. It is suggested that for every increase in fineness value of 5% the compressive strength of concrete be increased by 150 psi through the use of a lower w/cm.

SAI could also be an indicator for variation in concrete strength but the SAI test results suffer from several disadvantages: 1. SAI tests are conducted on composite samples; 2. 7 day SAI values are likely to be available many days after the fly ash shipment has been received at the concrete plant; 3. SAI is conducted by the fly ash marketer using its reference cement. Fly ash interaction with the cement used by the producer may be different in which case the variation in SAI test results may not necessarily correlate with the variation in compressive strength of concrete produced at the plant. Nevertheless it is useful to plot both the 7 and 28 day SAI values as soon they are obtained. Concrete producers can use it to troubleshoot low concrete strengths in evaluating whether the cause for the low concrete strength can be attributed to a reduction of the SAI. Other factors, such as mixing water, air content, batching errors, testing errors etc., should also be considered.

Other Tests

Thermal measurements of hydrating concrete mixtures is another tool at the disposal of the concrete producer[15]. Essentially, this test involves casting a mortar or a concrete cylinder and measuring its temperature rise in an insulated environment over a 24 hour period. The temperature profile can provide indications of concrete setting time, early age strength development and potential interaction problems between cementitious materials and admixtures. Significant variations in temperature profile can indicate potential variation in the above properties. When these tests are done periodically at the concrete plant they can provide a means to study the overall variations due to shipments of cement, fly ash/slag and chemical admixtures. Once a change in the overall behavior has been identified individual material shipments could be tested to identify the root cause of the change.

Summary of Suggested Producer Actions

- Develop an understanding with the fly ash marketer so that all the LOI, fineness, foam index and mortar air content (if available) test results conducted on the same day the fly ash shipment left the plant are attained.
- Encourage fly ash marketers to develop a correlation between LOI and mortar air content or LOI and foam index for that fly ash source. If there is no such correlation encourage fly ash marketer to conduct mortar air testing every time the LOI test is conducted at the fly ash source. This systematic approach provides the concrete producer with some understanding of the effect of the fly ash shipment on air entrainment before its use in concrete.
- Develop company policy on adjusting AEA dosage based on foam index or mortar air content test results using the new fly ash shipment.
- At a minimum test the first few concrete trucks that use the fly ash from the new shipment for air content in accordance with ASTM C231 and adjust AEA dosage accordingly.
- Check to ensure that the fly ash is meeting the uniformity requirements for density and fineness. Use the correct RD for the fly ash in concrete mixture proportions.
- Develop a control chart of fineness test results for the shipments received at the concrete plant. Develop company policy to adjust concrete mixture proportions if certain control charts limits are exceeded.
- Plot the 7 and 28 day SAI values as soon they are obtained. Use it to troubleshoot low concrete strengths in evaluating whether the cause for the low concrete strength can be attributed to a reduction of the SAI. Consider other factors, such as mixing water, air content, batching errors, testing errors etc. Retain 5-lb samples of fly ash from each shipment for 3 to 6 months in sealed containers so that these
can be tested at a later point if necessary. Sampling procedure are described in ASTM C311.

If possible conduct thermal measurements of hydrating concrete mixtures and look for significant variations in temperature profile.

References
2 Obla, K.H., “Sources of Concrete Strength Variation – Part II of Concrete Quality Series”, Concrete InFocus, July-August 2010, Vol. 9, No. 4, NRMCA, pp. 21-23.  
8 Obla, K.H., “Variation in Concrete Strength Due to Cement”, Concrete InFocus, Nov-Dec 2010, Vol. 9, No. 6, NRMCA, pp. 8-12.  

Appendix

Uniformity of Color

An approximately 1 in. thick layer of fly ash shall be carefully placed on the top of the previous sample of ash in a 1000 ml hydrometer jar (ASTM D422). Rate the color of the current sample in comparison to the immediately preceding sample according to Table A1.

Mortar Air Content and Air Loss (Modified C311)

ASTM C311 suggests using air entraining admixture (AEA) dosage to target mortar air content of 18%. Research had indicated that to attain 18% mortar air content an excessive amount of AEA dosage was required which was ineffective in evaluating the effect fly ash will have on air entrainment. Therefore AEA dosage to target mortar air content around 12% was used. The AEA is added to the mixing bowl while the sand is being introduced. The rest of the steps are similar to that recommended in C311.

The loss of mortar air was measured as follows. Immediately after weighing the 400-ml measure (for gravimetric mortar air content measurement) the mortar, including the mortar used for flow determination, is returned to the mixing bowl. The bowl is covered to prevent evaporation. After a 45 minute rest period (from the time of mixing) the bowl is uncovered and remixed at medium speed for 5 minutes. The target flow of 80 to 95 is attained with some water adjustments after which the mortar air content is measured again gravimetrically by weighing the mortar filled 400-ml measure.

<table>
<thead>
<tr>
<th>Table A1: Visual Estimator of Fly Ash Color Uniformity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade</strong></td>
</tr>
<tr>
<td>-2</td>
</tr>
<tr>
<td>-1</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>+1</td>
</tr>
<tr>
<td>+2</td>
</tr>
</tbody>
</table>

Foam Index Test

The foam index test measures rapidly the effect of a fly ash sample on the required air-entraining admixture dosage to obtain the required entrained air content in concrete, and will help detect a change in fly ash properties from previous shipments. The foam index test has not been standardized by ASTM. The procedure described here has been used at NRMCA since later 1970s. Place 16 grams cement + 4 grams fly ash in a wide mouth glass bottle. Add 50 mL water, cap bottle and shake for 1 minute. Add air-entraining agent (diluted 1:20 with water) in measured increments using an accurate pipette. After each addition, cap and shake vigorously for 15 seconds. Remove cap and observe the stability of the foam. The amount of diluted air-entraining agent needed to produce a stable foam that just covers the surface is the foam index of the fly ash. The foam index test can also be run on 20 grams of cement alone to understand the influence of cement shipment. The foam index test might also be run with 40 grams of sand to understand the influence of sand shipments.
**Table 1a Data Analysis of Results of Fly Ash source F1**

<table>
<thead>
<tr>
<th>Mortar Air, %</th>
<th>Final Mortar Air*, %</th>
<th>LOI %</th>
<th>Foam Index, oz/cwt.</th>
<th>RD</th>
<th>7d Fly ash Strength, psi</th>
<th>7d SAI, %</th>
<th>7d Control Strength, psi</th>
<th>% Retained No. 325</th>
<th>Water demand, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>10.8</td>
<td>8.9</td>
<td>1.2</td>
<td>2.01</td>
<td>2.166</td>
<td>3773</td>
<td>80.1</td>
<td>4711</td>
<td>26.5</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.7</td>
<td>3.5</td>
<td>0.5</td>
<td>0.29</td>
<td>0.12</td>
<td>151</td>
<td>3.7</td>
<td>52</td>
<td>5.2</td>
</tr>
<tr>
<td>Coef., of Variation, %</td>
<td>15.3</td>
<td>39.1</td>
<td>43.7</td>
<td>14.3</td>
<td>5.6</td>
<td>4.0</td>
<td>4.6</td>
<td>1.1</td>
<td>19.8</td>
</tr>
<tr>
<td>Maximum</td>
<td>13.4</td>
<td>13.9</td>
<td>2.1</td>
<td>2.40</td>
<td>2.44</td>
<td>4064</td>
<td>88.0</td>
<td>4791</td>
<td>38.3</td>
</tr>
<tr>
<td>Minimum</td>
<td>8.1</td>
<td>3.6</td>
<td>0.3</td>
<td>1.35</td>
<td>1.92</td>
<td>3354</td>
<td>70.0</td>
<td>4618</td>
<td>19.3</td>
</tr>
</tbody>
</table>

*Final mortar air as measured after 45 minutes (40 minutes of rest followed by 5 minutes of mixing)*

**Table 1b Data Analysis of Results of Fly Ash source F2**

<table>
<thead>
<tr>
<th>Mortar Air, %</th>
<th>Final Mortar Air*, %</th>
<th>LOI %</th>
<th>Foam Index, oz/cwt.</th>
<th>RD</th>
<th>7d Fly ash Strength, psi</th>
<th>7d SAI, %</th>
<th>7d Control Strength, psi</th>
<th>% Retained No. 325</th>
<th>Water demand, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>11.8</td>
<td>10.5</td>
<td>2.0</td>
<td>1.58</td>
<td>2.17</td>
<td>3516</td>
<td>77.5</td>
<td>4538</td>
<td>23.9</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.9</td>
<td>1.9</td>
<td>0.5</td>
<td>0.17</td>
<td>0.04</td>
<td>137</td>
<td>2.8</td>
<td>184</td>
<td>3.0</td>
</tr>
<tr>
<td>Coef., of Variation, %</td>
<td>8.0</td>
<td>18.1</td>
<td>25.4%</td>
<td>10.9</td>
<td>1.8</td>
<td>3.9</td>
<td>3.7</td>
<td>4.1</td>
<td>12.5%</td>
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<tr>
<td>Maximum</td>
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<td>13.0</td>
<td>3.1</td>
<td>1.92</td>
<td>2.27</td>
<td>3820</td>
<td>82.0</td>
<td>4806</td>
<td>32.0</td>
</tr>
<tr>
<td>Minimum</td>
<td>9.7</td>
<td>6.6</td>
<td>0.7</td>
<td>1.15</td>
<td>2.06</td>
<td>3214</td>
<td>68.0</td>
<td>4287</td>
<td>16.8</td>
</tr>
</tbody>
</table>

*Final mortar air as measured after 45 minutes (40 minutes of rest followed by 5 minutes of mixing)*

**Table 1c Data Analysis of Results of Fly Ash source F3**

<table>
<thead>
<tr>
<th>Mortar Air, %</th>
<th>Final Mortar Air*, %</th>
<th>LOI %</th>
<th>Foam Index, oz/cwt.</th>
<th>RD</th>
<th>7d Fly ash Strength, psi</th>
<th>7d SAI, %</th>
<th>7d Control Strength, psi</th>
<th>% Retained No. 325</th>
<th>Water demand, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>14.5</td>
<td>10.8</td>
<td>8.0</td>
<td>3.74</td>
<td>2.40</td>
<td>3466</td>
<td>84.7</td>
<td>4093</td>
<td>22.4</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.8</td>
<td>3.6</td>
<td>2.1</td>
<td>0.91</td>
<td>0.06</td>
<td>143</td>
<td>3.4</td>
<td>66</td>
<td>4.3</td>
</tr>
<tr>
<td>Coef., of Variation, %</td>
<td>12.5</td>
<td>33.7</td>
<td>26.3%</td>
<td>24.3</td>
<td>2.3</td>
<td>4.1</td>
<td>4.0</td>
<td>1.6</td>
<td>19.4%</td>
</tr>
<tr>
<td>Maximum</td>
<td>18.4</td>
<td>19.3</td>
<td>12.5</td>
<td>5.76</td>
<td>2.60</td>
<td>3956</td>
<td>97.0</td>
<td>4214</td>
<td>30.5</td>
</tr>
<tr>
<td>Minimum</td>
<td>11.1</td>
<td>5.2</td>
<td>3.6</td>
<td>1.54</td>
<td>2.32</td>
<td>3215</td>
<td>79.0</td>
<td>4034</td>
<td>13.2</td>
</tr>
</tbody>
</table>

*Final mortar air as measured after 45 minutes (40 minutes of rest followed by 5 minutes of mixing)*

**Table 1d Data Analysis of Results of Fly Ash source C1**

<table>
<thead>
<tr>
<th>Mortar Air, %</th>
<th>Final Mortar Air*, %</th>
<th>LOI %</th>
<th>Foam Index, oz/cwt.</th>
<th>RD</th>
<th>7d Fly ash Strength, psi</th>
<th>7d SAI, %</th>
<th>7d Control Strength, psi</th>
<th>% Retained No. 325</th>
<th>Water demand, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>14.1</td>
<td>14.2</td>
<td>0.5</td>
<td>1.18</td>
<td>2.66</td>
<td>4393</td>
<td>96.0</td>
<td>4577</td>
<td>18.1</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.3</td>
<td>0.6</td>
<td>0.2</td>
<td>0.10</td>
<td>0.03</td>
<td>62</td>
<td>1.6</td>
<td>56</td>
<td>0.9</td>
</tr>
<tr>
<td>Coef., of Variation, %</td>
<td>2.5</td>
<td>4.5</td>
<td>33.6%</td>
<td>8.9</td>
<td>1.3</td>
<td>1.4</td>
<td>1.7</td>
<td>1.2</td>
<td>5.1%</td>
</tr>
<tr>
<td>Maximum</td>
<td>14.6</td>
<td>15.3</td>
<td>1.2</td>
<td>1.54</td>
<td>2.73</td>
<td>4513</td>
<td>99.0</td>
<td>4653</td>
<td>19.9</td>
</tr>
<tr>
<td>Minimum</td>
<td>13.1</td>
<td>12.8</td>
<td>0.3</td>
<td>1.15</td>
<td>2.57</td>
<td>4270</td>
<td>93.0</td>
<td>4531</td>
<td>16.5</td>
</tr>
</tbody>
</table>

*Final mortar air as measured after 45 minutes (40 minutes of rest followed by 5 minutes of mixing)*
FIGURE 1. Increased Air Loss with Reduced Mortar Air Content for a Fixed AEA Dosage
(a) Fly ash F1; (b) Fly ash F2; (c) Fly ash F3; and (d) Fly ash C1.

FIGURE 2. Effect on Fly ash F1 Mortar Air Content at a Fixed AEA Dosage due to
(a) LOI; and (b) Foam Index.

FIGURE 3. Effect on Fly ash F2 Mortar Air Content at a Fixed AEA Dosage due to
(a) LOI; and (b) Foam Index.

FIGURE 4. Effect on Fly ash F3 Mortar Air Content at a Fixed AEA Dosage due to
(a) LOI; and (b) Foam Index.

FIGURE 5. Effect on Fly ash C1 Mortar Air Content at a Fixed AEA Dosage due to
(a) LOI; and (b) Foam Index.

FIGURE 6. Effect on Fly ash (all) Mortar Air Content at a Fixed AEA Dosage due to (a)
LOI; and (b) Foam Index. All 4 fly ashes are plotted on each of the above plots.

FIGURE 7. Effect on Fly ash Mortar Air Content at a Fixed AEA Dosage due to RD
(a) Fly ash F1; (b) Fly ash F2; (c) Fly ash F3; and (d) Fly ash C1.
Can an employee decide when he or she wants the starting date to be established for a potential leave of absence covered by the US Family Medical Leave Act (FMLA)? What if he or she decides he or she doesn’t want an FMLA?

Let’s lay a bit of ground work first. The Family Medical Leave Act of 1993 (FMLA) is a federal law that provides certain employees with serious health problems, or those who need to care for a child or other family member, with up to 12 weeks of unpaid, job-protected leave per year. It also requires that group health benefits be maintained. For an individual to qualify for FMLA, an employee must be employed by a business with 50 or more employees within a 75 mile radius of his/her work site. The employee must have worked for the employer for at least 12 months and 1,250 hours within the last 12 months.

Assuming you meet the criteria above to qualify for FMLA, the start date of an approved FMLA is critical because it establishes the 12 month period during which an employee is entitled to 12 weeks of unpaid leave for a qualifying event. If the employer has information or knowledge of an event that could possibly qualify for FMLA (birth/adoption/foster child placement, employee’s own serious health condition, care for the serious health condition for a spouse, child or parent, certain military exigency leave situations), then the employer is required to give notice to the employee and ask for additional information. If this notice is properly given, then the employer can designate the start of any approved FMLA leave based on the documentation provided (health care provider or other appropriate documentation). The employee has the responsibility to give as much advance notice as possible in situations that are planned (like the birth/adoption of a child, scheduled medical procedures that qualify, etc…). As a result, the employee cannot arbitrarily determine the start date of a leave that qualifies for FMLA. This will be determined by the supporting documentation.

In addition, an employee who refuses to provide information because he or she does not want to utilize FMLA is not required to do so. The prudent course for an employer is to treat a potentially qualifying event as it would if an approved FMLA was in place. There should be documentation of the distribution of the required forms and notification as well as the employee’s refusal to provide any supporting documentation. In addition, the employee should be given the 12 weeks of unpaid leave during the 12 month period that would be recognized as the FMLA period. Taking this approach will more likely serve the employer well if there is a subsequent issue or termination because of absences.

If you’re unfamiliar with Family Medical Leave Act (FMLA), you should check the Department of Labor Web site for a fact sheet on the Act. You will find valuable information regarding employer and employee responsibilities as well as the required notification forms for potential events covered by the Act.

If you have a specific question regarding the administration of FMLA or a concern regarding a specific situation, you should consult with your HR professional and/or seek legal counsel.
Repair Shop Safety

Part II

By David Ayers, CHMM, CSP, MS, Managing Director of Compliance, NRMCA

Repair shops are often out of sight and out of mind at a ready mixed concrete facility. Mixers see all sorts of use, from off road use to deliver a load to tight city streets strewn with potholes and high curbs. Mechanics work hard at keeping the fleet running. There are a variety of accidents that can happen in repair shops. This article is Part II of III of Repair Shop Safety.

The storage and use of flammable and combustible liquids are very common safety issues in RMC repair shops across the country. The two primary hazards associated with flammable and combustible liquids are explosion and fire. Safe handling and storage of flammable liquids requires the use of approved equipment and practices. Many repair shop fires have been caused by the improper storage and use of flammable and combustible liquids. The OSHA standards break down the chemical or substance by its flashpoint and then divides the substances into several classifications. First, a few definitions:

• **Flash Point** means the minimum temperature at which a liquid gives off enough vapor to form an ignitable mixture. In general, the lower the flash point, the greater the hazard.

• **Flammable liquids** have flash points below 100°F and are more dangerous than combustible liquids, since they may be ignited at room temperature.

• **Combustible liquids** have flash points at or above 100°F. Although combustible liquids have higher flash points than flammable liquids, they can pose serious fire and/or explosion hazards when heated.

Flammable and combustible liquid definitions are further broken down into classes. All flammable liquids are Class I liquids. A Class IA substance has a flashpoint of less than 73 degrees and a boiling point of less than 100 degrees. A Class IB substance has a flashpoint below 73 degrees but a boiling point greater than or equal to 100 degrees. A Class IC substance has a flashpoint of greater than 73 degrees but less than 100 degrees.

The combustible liquids are Class II and Class III liquids. Class II substances have a flashpoint of greater than 100 degrees and less than 140 degrees. Class III substances are further divided into Class A and B. A Class IIIA substance has a flashpoint of greater than 140 degrees but less than 200 degrees and finally a Class IIIB substance (not shown above) will have a flashpoint greater than 200 degrees.

Some common shop substances, their classification, common name and flashpoint are listed for reference. Proper storage of these substances is one of the major keys to reducing your shop’s fire liability as well as general housekeeping principles. Flammable and combustible liquids should be stored in safety cabinets (also known as “fire cabinets”) when not in use. Doors on metal cabinets must have a three-point lock (top, side, and bottom), and the door sill must be raised at least 2 inches above the bottom of the cabinet. The fire cabinets must have a prominent and very conspicuous label of Flammable – Keep Fire Away. The maximum quantity to be stored in a fire cabinet is 60 gallons of Class I and/or Class II liquids or no more than 120 gallons of Class II liquids. You may use as many cabinets as necessary. Always ground the flammable and combustible liquid storage cabinets.

Finally, it cannot be emphasized enough that the improper storage of flammable and combustible liquids contributes greatly to a ready mixed concrete plant’s fire potential along with environmental liability (not mentioned in this article). Flammable and combustible liquids are a vital component in keeping the mixers running but proper storage is a must. These substances not only cause a potential for fire and explosion but are very slippery and have contributed to many slip, trip and fall accidents. The number one injury in the ready mixed concrete industry. Repair Shop Safety, Part III will focus on the storage and transfer of flammable and combustible liquids.

<table>
<thead>
<tr>
<th>Class</th>
<th>Common Name</th>
<th>Flash Point (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class IB</td>
<td>Gasoline</td>
<td>-45</td>
</tr>
<tr>
<td>Class IB</td>
<td>Acetone</td>
<td>0</td>
</tr>
<tr>
<td>Class IC</td>
<td>Mineral Spirits</td>
<td>85-110</td>
</tr>
<tr>
<td>Class II</td>
<td>Fuel Oils</td>
<td>100-130</td>
</tr>
<tr>
<td>Class IIIA</td>
<td>Petroleum distillates (Parts cleaning sink solution)</td>
<td>148</td>
</tr>
<tr>
<td>Class IIIB</td>
<td>Motor Oil</td>
<td>392</td>
</tr>
</tbody>
</table>

The number one injury in the ready mixed concrete industry. Repair Shop Safety, Part III will focus on the storage and transfer of flammable and combustible liquids.