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In today’s fast-paced world, speed of construction and efficiency of design have become buzz terms for the construction industry. Once again, ready mixed concrete offers the logical choice for fast-track construction, with efficient yet flexible design alternatives. The answer is tilt-up concrete construction.

What is Tilt-up Concrete Construction?

Tilt-up concrete construction is a building system in which the exterior, load-bearing walls of a structure are constructed from concrete that is cast-in-place as horizontal slabs on the jobsite, lifted upright with a crane and tied together at the top, usually by a truss-type roof system.

Tilt-up concrete construction is not a new procedure. Dating back to the early 1900s, tilt-up construction is a proven building method. With the boom in construction that followed World War II, tilt-up concrete construction emerged as a viable alternative to conventional building techniques. The advent of larger mobile cranes and the emergence of the ready mixed concrete industry spurred tilt-up’s growth.

Today, tilt-up concrete construction is one of the fastest growing segments of the construction industry. From 1995 to 2000, tilt-up construction increased by 111%. According to Ed Sauter, executive director of...
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the Tilt-up Concrete Association (TCA), nationwide over 15% of all industrial buildings are tilt-up concrete in sizes ranging from 5,000 to over 1.5 million square feet. More than 10,000 buildings, enclosing more than 650 million square feet, are constructed annually using tilt-up concrete construction. Though it is most commonly used for warehouse “big-box” type structures, tilt-up concrete can also be used for multi-story buildings intended for any number of commercial uses.

Benefits of Tilt-up Concrete Construction

In most cases, tilt-up concrete construction provides owners with a lower initial construction cost than conventional methods. Fewer skilled laborers are needed for tilt-up construction, vertical forming and scaffolding are eliminated, and there are fewer material-related variables, making costs easier to control. Because ready mixed concrete is locally produced and readily available, long lead times are eliminated and delays are minimized, resulting in an accelerated project timetable and early occupancy.

Flexibility of design is another great benefit of tilt-up concrete construction. Architectural appearance is limited only by the imagination of the designer. The use of reveal strips, in combination with a touch of paint, results in colorful lines and an outstanding appearance for any tilt-up concrete building. Other surface treatments such as brick or stone facing, sandblasting and exposed aggregate finishes can provide a customized look for any building. For the more artistic, intricate shapes, curves and angles can also be easily achieved. Also, a special painting effect called trompe l’oeil provides a three-dimensional, “trick-of-the-eye” appearance. Using tilt-up concrete construction can provide an attractive and economical building for any project. As Sauter points out, “tilt-up concrete makes beautiful buildings possible at costs that rival the most utilitarian industrial building.”

Perhaps the newest buzz word in the design and construction industry is sustainability and tilt-up concrete construction has its place in green building. The benefit afforded by using ready mixed concrete, a material manufactured locally using recycled products, is just part of the environmental advantage. The thermal mass inherent in a concrete structure will reduce the heating and cooling peaks and loads, resulting in smaller, less costly mechanical HVAC systems.

And let’s not forget that durability is a key part of sustainability. Concrete construction provides fire resistance far superior to steel or wood-frame structures. Also, tilt-up concrete structures have demonstrated the ability to withstand wind storms, hail storms and earthquakes better than comparable buildings of other materials. The permanence of tilt-up concrete is proven by the fact that tilt-up buildings erected in the 1940s show little sign of age after more than 50 years. In fact, the TCA proudly boasts that tilt-up buildings dating back to as early as 1906 are still in service today.

But don’t let tilt-up’s permanence overshadow its flexibility. Tilt-up concrete buildings can easily be expanded and modified for growing and changing clients. One tilt-up concrete warehouse in Fogelsville, PA, was actually doubled in size after initial construction had been completed. Owners simply removed one end of the building, expanded the floor slab, constructed and erected additional wall panels and replaced the end wall, without changing or jeopardizing the structural integrity of the initial building.

Structural Design

Most tilt-up concrete building are designed as load-bearing wall systems utilizing a beam column spanning from the roof deck to the slab-on-grade floor. In multi-story buildings, the wall panels are commonly designed as pin-supported where they meet the floor. Panels are formed and cast horizontally so there is no vertical forming or scaffolding required. Today’s high capacity mobile cranes make light work of erecting the cast panels, lifting and setting them into place with ease. Diagonal braces hold the panels in place until they can be tied at the top with the roof truss system and at the bottom to the footer and/or floor slab.

Tilt-up concrete construction is relatively unlimited by size or weight. However, important to design is the height to thickness or “slenderness” ratio of each panel. For a typical 22- to 30-foot panel, a 5.5-inch to 7.5-inch thickness is desired. A slenderness ratio of 50:1 is generally accepted for most tilt-up concrete construction. Currently, the tallest panel erected on a tilt-up concrete jobsite is 96-feet, 9-inches tall, the largest panel is 2,742 square feet and the heaviest is 310,100 pounds!

Engineering design of tilt-up concrete panels is monitored by the American Concrete Institute (ACI) Tilt-up Concrete Construction Committee 551. In its report, ACI 551R, designers are advised that tilt-up concrete panels must withstand service and lifting loads. In many cases, lifting loads are actually greater than any service load the panel may experience. Reinforcement is designed for the lift load and is usually more than necessary.
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for the service load. For 5.5- to 7.5-inch panels, one layer of reinforcing steel is usually sufficient. However, as panel thickness increases, additional reinforcement is necessary.

Applications for Tilt-up Concrete Construction

Tilt-up concrete construction is quite common for single and multi-story warehouse structures due to the fact that buildings as large as 1.5 million square feet are quickly erected and occupied, but it is not limited to this application. Tilt-up construction can be used in any type of low- to mid-rise building. Office buildings are also becoming commonplace today. Two-, three- and four-story buildings can be designed and constructed with ease. Most recently, contractors are finding tilt-up construction to be a cost-effective alternative to conventional construction methods for elevator and stair cores on multi-story structures.

Tilt-up concrete construction lends itself well to shopping centers and strip mall construction because of its versatility of design and excellent fire rating. This benefit also fits well for multi-family apartments, townhouses and hotels. In fact, condominiums as tall as 10 stories have been constructed with tilt-up concrete.

For special applications, tilt-up concrete wall panels can be insulated to provide a climate-controlled environment. By sandwiching insulating material inside the tilt-up wall, or attaching insulation to the interior or exterior faces of the panels, tilt-up construction can be utilized for climate-sensitive applications such as refrigerated storage.

Schools — A Growth Market for Tilt-up Concrete

There are more than 87,000 public schools in the U.S. Of that number, the average building is more than 42 years old and many of the aging facilities are unsafe and unsuitable for occupancy. Educators and public school officials agree that, if schools are to keep up with growing enrollments and changes in the way education is conducted, hundreds, perhaps thousands, of new schools will need to be built in the first decade of the 21st century.

This provides a great opportunity for tilt-up concrete construction because tilt-up offers a cost-effective and fast way to build. The market is very large; school districts expect to spend more than $12 billion annually constructing new schools and additions, while colleges and universities forecast an additional $5.5 billion.

Masonry construction has long been the method of choice for school builders. But tight budgets, labor shortages and time constraints come together to make tilt-up concrete superior to the traditional method. By utilizing tilt-up, construction managers would have fewer subcontractors to oversee (masonry requires at least three as compared to one tilt-up subcontractor), leading to greater savings of time and money. New aesthetic treatments such as thin brick veneer allow tilt-up concrete to be considered in neighborhoods where brick masonry is still preferred. Other similar treatments can provide an architectural concrete block and/or stone finish.

Tilt-up Concrete: Today’s Choice

For any type of building, tilt-up concrete offers all the advantages an owner is looking for: speed of construction; economy; minimum maintenance; architectural appearance; flexibility; fire safety and protection from theft and vandalism. All the factors add up to make tilt-up concrete construction the preferred choice for today’s construction market. For more information, contact the Tilt-up Concrete Association at 319-895-6911 (www.tilt-up.org) or check out NRMCA’s www.ConcreteBuildings.org website.
Georgia Man Named

NRMCA

Driver of the Year

Lifetime Achievement Award Winner…Bobby Dennis, Lafarge North America, SE

“I take it one day at a time. I think about safety all day long and leave any personal worries at home, to avoid being distracted.”

The cream of the crop, the best of the best, the professional’s professional…this is the common terminology used in the description of those nominated for the National Ready Mixed Concrete Association’s 11th Annual Truck Mixer Driver of the Year. Applications from around the nation were analyzed, double-checked and scores were tabulated and scrutinized. The results are in and NRMCA has named Bobby Dennis, of Lafarge, as the NRMCA Mixer Truck Driver of the Year for 2006. A panel of judges from the ready mixed concrete industry selected Dennis as the top driver from a large group of outstanding applicants from all across the United States and Canada.

Dennis was honored for his career achievements, safety record, professionalism, driving competency and customer service skills. He has driven a truck mixer for more than 34 years. “Mr. Dennis demonstrates professionalism in everything he does,” writes Lafarge Vice President Mike Taylor.

“Customers look up to Bobby and most say he’s the best there is!” Dennis has 34 years without a rejected load…34 years without an on the job accident…and 34 years without a vehicle accident of any type. When asked how he accomplished his remarkable safety record, Dennis replied, “I take it one day at a time. I think about safety all day long and leave any personal worries at home, to avoid being distracted.”

The award acknowledges the significant contribution of ready mixed concrete truck drivers to the growth and success of individual companies and the concrete industry. As a salute to the key members of the concrete production team, the award highlights the driver’s career achievements, safety, professionalism, competence and customer service skills. The judges review and grade all applications based on years and months of service to a company, driving record, yardage hauled and licensees and any other special recognition the driver has received. The judges also heavily weigh their decision on supervisors’ comments and customer letters of compliment or testimonials.

Along with the winner, three finalists were also selected by the judges. They are, in alphabetical order, Don Hastert, LRM Industries, Lawrence, KS, (41 years driving a ready mixed concrete truck); Roy Kelly, Ready Mix USA, Woodstock, GA (44 years driving a mixer); and Anthony Lemmon, Southern Concrete Materials, Asheville, NC (the youngster with only 28 years driving a truck mixer!).

As the winner of the 2006 award, Dennis will receive a $5,000 check from the Truck Mixer Manufacturers Bureau. In addition, finalists will receive $500. The Driver of the Year and other finalists for the award will be honored at the NRMCA Annual Convention in March in San Diego. The Chicago-based trade magazine Concrete Products is a co-sponsor of the Driver of the Year program.
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Shaping the Future of Capitol Hill

By Kerri Leininger, NRMCA Director of Government Affairs & PAC Activities

Last November’s elections proved just how quickly the nation’s political landscape can change. Both the Senate and House chambers switched party control for the first time since 1994 and brought many new faces to Washington, D.C. With 61 freshman members of Congress and their staffs roaming the halls of Capitol Hill the need for an active voice in Washington has never been greater.

The Political Action Committee (PAC) has served as a respected vehicle for involvement in federal campaigns for more than half a century. The first PACs were created in 1944, when the Congress of Industrial Organizations (CIO) formed the first one to raise money for the re-election of President Franklin D. Roosevelt. The PAC’s money came from voluntary contributions from union members rather than union treasuries, so it did not violate the Smith-Connally Act of 1943, which forbade unions from contributing to federal candidates. Although commonly called PACs, federal election law refers to these accounts as “separate segregated funds” because money contributed to a PAC is kept in a bank account separate from the general corporate or union treasury.
PACs are regarded as the “good guys” of campaign finance. They are highly regulated as to the people who can be solicited, the amounts that can be given to candidates, and they require extensive reporting to the Federal Election Commission on receipts and expenditures. Recent campaign finance reform laws such as the “Bipartisan Campaign Reform Act of 2001,” also known as “McCain-Feingold,” focused on banning soft money contributions to national parties but left PACs intact and unchanged. Instead of diminishing their roles, “McCain-Feingold” and other campaign finance reform laws have actually underscored PACs roles as reliable providers of needed campaign funds.

NRMCA is currently forming a task force to help make CONCRETEPAC the nation’s leading building materials political action committee.

In the ready mixed concrete industry, individuals contribute to NRMCA’s CONCRETEPAC to help elect pro-business, pro-concrete candidates to the U.S. Congress. In 2006, CONCRETEPAC hosted a number of Washington, D.C., fundraisers for federal candidates and disbursed over $162,000 during the mid-term elections. This money came from individual voluntary contributions to events such as golf tournaments, cooking classes and auctions for items ranging from luxury vacation packages to hot new sports cars. CONCRETEPAC also receives substantial contributions from general solicitations.

CONCRETEPAC gives accessibility and visibility to the ready mixed concrete industry and supports grassroots efforts by enhancing access to members of Congress. It also provides an outlet for meaningful political involvement that reduces the need for individuals to penetrate a candidate’s inner circle. Unhampered by any party agenda, CONCRETEPAC’s sole objective is to support NRMCA’s issue-driven advocacy platform. In this respect, CONCRETEPAC should be viewed as the industry’s “401K PAC” as it allows for leveraging of other donors’ contributions in order to achieve a more secure and beneficial future for the industry.

NRMCA is currently forming a task force to help make CONCRETEPAC the nation’s leading building materials political action committee. The CONCRETEPAC Task Force will be responsible for developing and implementing an awareness campaign to inform all segments of the ready mixed concrete industry, from truck driver to CEO, about the importance of engaging in the political process. It will also help devise employee incentives such as matching donor programs or special recognition awards. Most importantly, task force members will be asked to assist with organizing fundraisers in order to help double CONCRETEPAC receipts by the end of 2008.

Joining the CONCRETEPAC Task Force will enable you to become an advocate for a new generation of pro-concrete political activists. NRMCA is currently looking for task force volunteers. By joining you can help shape the future of Capitol Hill!

If you wish to learn more about CONCRETEPAC or how to become a member of the CONCRETEPAC Task Force, please contact Kerri Leininger, director of government affairs and PAC activities, at 888-846-7622, ext. 1159, or by email at kleininger@nrmca.org.
The National Ready Mixed Concrete Association is sponsoring the 2007 Concrete Technology Forum: Focus on High Performance Concrete, scheduled for May 22-24 at the Fairmont Dallas Hotel. The forum will bring researchers and practitioners together to discuss the latest advances, technical knowledge, continuing research, tools and solutions for high performance concrete.

Over 20 technical sessions are scheduled for the three-day symposium featuring over 50 presentations from world renowned researchers and practitioners. The technical sessions present state-of-the-art developments, new construction techniques and product formulations that optimize performance of high performance concrete. Researchers, engineers, architects, contractors, concrete producers, public works officials, material suppliers and concrete industry professionals are invited to attend.

Topics include:
- Self Consolidating Concrete
- Ultra Fast Track Construction
- Extended Service Life
- Industrial Concrete Floors
- Applications and Case Studies
- Performance Specifications and Testing

Featured speakers include:
- Ken Rear, vice president research and support, Lehigh Cement Co., and chairman of the NRMCA P2P Steering Committee on Performance Specifications
- Lou Triandafilou, high performance structural materials engineer, FHWA Resource Center
- Ken Hover, professor and Weiss Presidential Fellow, School of Civil and Environmental Engineering, Cornell University (invited)
- Eldon Tipping, president of Structural Services, Incorporated and member of ACI 302, Guide for Concrete Floor and Slab Construction
- Joseph Daczko, product line manager, BASF Admixtures Inc., and chairman of ACI 237, Self-Consolidating Concrete

More than 40 researchers and practitioners will present technical papers on high performance concrete. Several examples include:

A Study on the Influence of Airfield Deicing Chemicals on Concrete from Alkali-Silica Reaction Perspective
Ketan R. Sompura, Sika Corporation
Prasad Rangaraju, Clemson University

This presentation details the results of a study that was conducted to determine the influence of alkali acetate deicers such as potassium acetate and sodium acetate on ASR in test specimens. In this study, modified ASTM C 1260 and modified ASTM C 1293 tests were conducted, where mortar and concrete test specimens were exposed to deicing chemical solutions. In addition, standard ASTM C 1260 and ASTM C 1293 tests were also conducted. Dynamic modulus of elasticity, Scanning electron microscopy (SEM) and energy dispersive X-ray (EDX) were conducted to study the physical deterioration of test specimens and understand the nature of the reaction and composition of the reaction products. It was found that solutions of potassium acetate and sodium acetate deicers have a significant potential to cause ASR in test specimens prepared with reactive aggregates and minor levels of distress in specimens made with non-reactive aggregates.

Concrete Maturity Techniques to Streamline Workflow and Optimize Material Costs
Michael Fox, Engius LLC

This presentation will introduce basic concrete maturity techniques and how they are used to safely streamline concrete intensive projects. Modern concrete maturity equipment and techniques contribute significantly to quality control efforts, and offer substantial time saving on projects. By instrumenting concrete pours with maturity sensors, the effects of time and temperature on concrete strength are determined in real-time. Since hydration of concrete and therefore strength gain are highly dependent on temperature, the heat trapped in the structure typically accelerates strength gain. This strength gain isn’t accounted for using test specimens. By using concrete maturity sensors in the concrete placement, accurate indica-
tions of in-place strength are available with the press of a button. This allows for optimum timing of construction operations such as form-stripping, post-tensioning and loading of structures. Concrete mix designs can also be optimized based on actual in-place curing conditions, which can also reduce the cost of materials.

Development of the Self-Consolidating Concrete For Slip Form Paving Application
Kejin Wang, Iowa State University
Surendra Shah, Northwestern University

This presentation will provide audiences with an overview of the research project on the development of the self-consolidating concrete for slip form paving application (SF SCC). It will include discussions on (1) the SF SCC mix design development, (2) primary concrete properties (flow ability, compactability, and shape-holding ability of the SF SCC), (3) a lab simulation of the field slip form paving process, and (4) a field trial of slip form paving using SF SCC. The research results have indicated that the newly developed SF SCC does possess sufficient self-consolidating ability and timely shape stability. The set time and strength of the SF SCC is comparable to those of conventional concrete. The lab simulation and field trial results have proven that such a SF SCC is feasible for field application.

Superplasticizers for the Production and Placement of Ready Mixed SCC Having Combined Extended Slump-Flow and Moisture Tolerance
Ara Jeknavorian, Cajin Shi, and Edward Mansky, W.R. Grace

Slump flow retention for ready mixed self-consolidating concrete becomes a concern when the concrete is transported for long distances, and when delays in placing the concrete occur due to unexpected traffic problems or incomplete jobsite preparations. In this study, the performance of a special superplasticizer is discussed that can enable self-consolidating concrete mixtures to have slump flow retention up to two hours without any significant extended setting properties and delay in strength gain. Furthermore, during the period of extended slump-flow, the self-consolidating concrete demonstrates good moisture tolerance and consistent air contents, with and without air entraining
The symposium will culminate with a high performance concrete demonstration in the Dallas area. A product expo featuring more than 20 companies that offer products and services for high performance concrete applications will be open during the conference.

agents. This capability provided by the special superplasticizer formulation is expected to significantly facilitate the successful production and placement of self-consolidating ready mix concrete.

Influence of Supplementary Cementing Materials on Chloride Ion Penetration of Self-Consolidating Concrete

Heather See, Emmanuel Attiogbe, Van Bui, Steve Schaef, and Dan Vojtko, BASF Admixtures

Self-Consolidating Concrete (SCC) mixtures were proportioned with various supplementary cementing materials (SCMs) and evaluated for resistance to chloride ion penetration using the ASTM C 1202 test method. In the first series of evaluations, both conventional slump concrete and SCC mixtures with Class F fly ash at a cement replacement level of 20% were tested. In the second series, SCC mixtures made with Class F fly ash, slag or silica fume, as well as selected binary combinations of these were evaluated. The resistance of SCC to chloride ion penetration is found to be similar to that of conventional slump concrete of comparable composition, indicating that the higher fluidity of SCC is not detrimental to chloride ingress.

The symposium will culminate with a high performance concrete demonstration in the Dallas area. A product expo featuring more than 20 companies that offer products and services for high performance concrete applications will be open during the conference. With the focus on high performance concrete, the 2007 Concrete Technology Forum will provide a venue for researchers, contractors and product manufacturers to inform the industry about state-of-the-art developments, new construction techniques and product formulations that optimize concrete performance.

In addition to NRMCA, sponsors include BASF Admixtures, Concrete Construction magazine, Concrete Producer magazine, Holcim, Lafarge, Public Works magazine, Propex Concrete Systems and Sika Corporation. Organizational Partners include the American Coal Ash Association, American Concrete Institute, American Concrete Pavement Association, American Society of Concrete Contractors, Construction Institute of ASCE, Portland Cement Association, Silica Fume Association, Slag Cement Association, and Texas Aggregates and Concrete Association.

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National Concrete Pours a Strong Foundation for Cayman

NRMCA International Producer Member Thrives

By Alan Markoff

For the past 12 years, National Concrete has poured thousands and thousands of cubic yards of concrete in the Cayman Islands. Based on the company’s recent upgrades, it’s planning on pouring thousands and thousands of cubic yards more. Last year, the company came to a crossroads. Its long-time general manager, Gerson Henriquez, resigned and Garth Arch replaced him as of January 1, 2006.

Arch, who was only supposed to fill in as acting general manager at first, said National Concrete had some decisions to make.

“The company was at a transition point with regard to how to grow and keep up with demand,” Arch said.

Discussions with the Planning Department and the big contractors indicated there were a number of substantial commercial projects slated. In the end, Arch said the company saw no choice than to undertake a multi-million dollar expansion program to increase its production.

“Just the Camana Bay project alone demanded so much concrete that in order to supply everyone else and keep them happy, we had to expand,” he said.

The expansion entailed a new batching plant and upgrades to the existing one; two new pump trucks; nine new mixing trucks; and an increase in staff, including a quality control engineer. Arch said the new 55-foot pump truck alone cost more than $1 million. The added production and delivery capacity has enabled National Concrete to serve its contractor customers in ways never before possible, resulting in some of the largest one-time pours ever in the Cayman Islands.

Just last month National Concrete did an 890-cubic yard pour at Camana Bay for Hadsphaltic International. A few days later it had a pour of 550 cubic yards at the same site. In years past, such large pours would not have even been attempted because delivery of that much concrete would have taken so long the initially poured concrete would start to set before the whole pour was complete.

New Equipment

However, National Concrete’s new equipment allows it to pour a much larger quantity of concrete in a much shorter timeframe. The company’s expansion program is still ongoing. It plans to purchase two more mixer trucks and add a couple of more staff members this year. In addition to the upgrades in staff and equipment, National Concrete is also in the process of making its Sparky Drive compound more consumer-friendly.

“We’ll spend a lot of money improving the compound,” said Arch, noting that the customer parking area is one of the first items on the agenda.

Another improvement to the business has been a more consistent supply of cement, one of the four basic ingredients of concrete and the only one not readily produced in the Cayman Islands. National Concrete gets its cement from National Cement, which gets its cement from sources in Mexico. In the past, there have been instances of cement shortages.

“We had some problems, at the end of last year and early this year, where there were periods when the island was out of cement,” Arch said.
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National Concrete keeps a reserve that would allow them to stay operational for one week after their normal supply runs out. Once the company taps into its reserves, it starts rationing to customers. Fortunately, the supply problems seem to have been corrected and there have been no cement shortages since July 2006 despite the heavy demand, Arch said.

Because it now has two batching plants, and both plants could be used to produce concrete for the same job, National Concrete utilizes a quality control engineer to ensure the consistency of the concrete.

“The concrete business is extremely technical,” said Arch. “On a daily basis we have to make adjustments based on temperature and moisture.”

In addition, the exact composition of raw materials is always changing, requiring constant adjustments, he said. One thing that has not fluctuated much about the concrete business is the cost to consumers.

“Prices have remained stable since November 2005 because the price of raw materials has remained the same,” said Arch.

However, National Concrete has been advised that the cost of cement will rise in May 2007, which means the cost of concrete will increase as well.

“National Concrete has no control over [the cost of cement],” said Arch, adding that people with projects that require concrete would be wise to get them done over the next four months.

Although Arch was only supposed to take over the general manager position on an interim basis, the trained structural engineer agreed to stay on permanently when he was asked.

“Honestly, I find the concrete business fascinating,” he said. “It’s very dynamic. There are many issues that need addressing on a daily basis, which makes it very interesting for me.”

Alan Markoff is a senior photo journalist with the Cayman Free Press. This article appeared in the newspaper’s January 9 edition and is reprinted with permission of Cayman Free Press Ltd.

The Cayman Islands are an overseas territory of the United Kingdom in the western Caribbean Sea comprising the islands of Grand Cayman, Cayman Brac and Little Cayman. They are located in the western Caribbean Sea 480 miles south of Miami, 150 miles south of Cuba and 180 miles northwest of Jamaica.

Although the vast majority of NRMCA’s membership is based in the United States and Canada, it does welcome and encourage producer and associate members from around the world. Currently, the association represents more than 1,400 companies and their subsidiaries, including those from overseas markets. National Concrete and other foreign members enjoy the same benefits of belonging, including discounted publications from NRMCA’s extensive catalog and reduced fees on attending conferences and events.

For more information on membership, contact NRMCA’s Kathleen Carr-Smith at 888-846-7622, ext. 1145 or by e-mail, kcarrsmith@nrmca.org.

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New Perspective on Concrete Durability

Colin L. Lobo, Ph.D., P.E., NRMCA Senior Vice President of Engineering

Introduction
Durability of concrete has always been important because many concrete failures, or signs of such, result from exposure to severe environmental or service conditions. It is generally true that concrete structures need to be repaired or replaced because it is not durable in the environment it was built and not because it is not strong enough to withstand the applied loads. The cost of repair and replacement of deteriorated structures is astronomical.

The ACI 318 Building Code for Structural Concrete includes minimum provisions for concrete materials and design, with a primary goal of protecting the safety of the occupants of the building during and after construction. In the sequence of the code, the chapter on durability precedes that on strength requirements. It clearly states that the more restrictive requirements for durability and strength shall apply. However, the requirements for durability in the current version of ACI 318 are cumbersome and sometimes misinterpreted or overlooked.

Revision Approved for ACI 318-08
For the 2008 version, ACI Committee 318 has approved a significant restructuring of the durability chapter of the Building Code in an effort to clarify the requirements. To ensure that this code change proposal was successful, major technical changes to the durability provisions were avoided in this code cycle. The restructuring involves the definition of various exposure categories that are subdivided into exposure classes depending on the severity of the anticipated exposure. The requirements for concrete are then clearly laid out once the exposure classes are assigned to different structural members. This is essentially the method used by most other international codes to address concrete durability. It offers a few advantages:

- It improves the clarity and flow of the durability provisions, thereby simplifying how a specification can be written. The requirements for concrete apply if the exposure class defined applies to the structural member and should not be otherwise specified.
- For each category a “not applicable” class is provided for the design professional to indicate that the exposure category does not apply to a structural member.
- It facilitates future revisions for performance-based alternatives specific to defined exposure classes. The current provisions are essentially prescriptive to the concrete mixture.
- ACI 318 addresses only the following durability-related exposure categories:
  - Category F for exposure to freezing and thawing cycles
  - Category S for exposure to sulfate solutions in soil or water in contact with concrete
  - Category C for conditions that require protection of reinforcement from corrosion, and
  - Category P for concrete in contact with water that requires a low permeability.

Each category is then subdivided into exposure classes with higher numerals for more severe exposure.

Category F - Freezing and Thawing Exposure
For concrete members subject to freezing and thawing cycles, the exposure classes are defined as follows:

- F0 (Not applicable) – for members not exposed to cycles of freezing and thawing
- F1 (Moderate) – Concrete exposed to freezing and thawing cycles and occasional exposure to moisture and no deicing salts are used. This would apply to

Table F: Requirements for Concrete Subject to Freezing and Thawing Exposures

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>Max w/cm</th>
<th>Min $f'c$, psi</th>
<th>Entrained Air</th>
<th>Limits on cementitious materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>F1</td>
<td>0.45</td>
<td>4500</td>
<td>Lower</td>
<td>-</td>
</tr>
<tr>
<td>F2</td>
<td>0.45</td>
<td>4500</td>
<td>Higher</td>
<td>-</td>
</tr>
<tr>
<td>F3</td>
<td>0.45</td>
<td>4500</td>
<td>-</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Figure 1: Damage due to exposure to freezing and thawing cycles. Courtesy Portland Cement Association.
exterior walls, beams and slabs not in direct contact with soil.

- **F2 (Severe)** – Concrete exposed to freezing and thawing cycles and in continuous contact with moisture. This would apply to structural concrete elements in contact with soil or water.

- **F3 (Very Severe)** – Concrete exposed to freezing and thawing cycles that will be in continuous contact with moisture and exposure to deicing chemicals. For the most part this exposure condition in buildings would apply to slabs in parking garages.

The requirements for concrete subject to different levels of freezing and thawing are summarized in Table F: (see page 24)

These requirements are the same as in the current version of ACI 318. The limit on w/cm is the same for all levels of exposure with the intent to minimize the movement of water into the concrete that makes it critically saturated. Strength requirements in the durability chapter of the code are included in an attempt to match the w/cm and for the acceptance of concrete. The entrained air requirements are referred to a table of required air content based on nominal maximum aggregate size with a lower air content (by about 1.5%) for exposure class F1 than for F2 and F3. The code does permit a reduction of air content for higher strength concrete with a specified strength greater than 5000 psi. Exposure class F3 also has limits on the quantity of fly ash, slag, silica fume or combinations of these because of concern of increased potential for scaling.

**Category S – Exposure to sulfates**

The exposure classes for concrete members in contact with sulfates in soil or water are defined based on the concentration of the sulfates, unchanged as in the current Code:

A current problem in the Code is that there is no standard test method referenced for measuring the sulfate concentration in soil and different methods can provide different results. A new method has been recently standardized and could be referenced in project specifications - ASTM C 1580, Test Method for Water-Soluble Sulfate in Soil. Note that seawater, while typically at a higher sulfate concentration, is classified as a moderate sulfate exposure because the Bureau of Reclamation is cited as the reason for prohibiting the use of calcium chloride admixtures in concrete exposed to higher concentration of sulfates – Exposure Classes S2 and S3.

A revision to the 2008 code will permit the use of alternative combinations of cementitious materials to those in Table S2 that have been qualified by test. ASTM C 1012, Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution, is the referenced method with the expansion criteria, shown in Table S3, as recommended by ACI Committee 201 on Durability. This code provision permitting the use of supplementary cementitious materials such as fly ash or slag for sulfate resistance has been common practice in areas that have higher concentrations of sulfates in soil or water. In the case of Exposure Class S2, the 12-month expansion criterion can be used if the 6-month criterion is not met. The use of cementitious materials with documented good service history is also permitted.

**Table S1: Definition of Exposure Classes for Sulfate Exposure**

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>Water-soluble sulfate (SO₄) in soil, %</th>
<th>Sulfate (SO₄) in water, ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0 (Not applicable)</td>
<td>SO₄ &lt; 0.10</td>
<td>SO₄ &lt; 150</td>
</tr>
<tr>
<td>S1 (Moderate)</td>
<td>0.10 ≤ SO₄ &lt; 0.20</td>
<td>150 ≤ SO₄ &lt; 1500</td>
</tr>
<tr>
<td>S2 (Severe)</td>
<td>0.20 ≤ SO₄ ≤ 2.00</td>
<td>1500 ≤ SO₄ ≤ 10,000</td>
</tr>
<tr>
<td>S3 (Very severe)</td>
<td>SO₄ &gt; 2.00</td>
<td>SO₄ &gt; 10,000</td>
</tr>
</tbody>
</table>

**Figure 2: Example of deterioration of concrete due to exposure to sulfates.**

The more complex chemistry makes it less severe relative to sulfate attack, while corrosion of reinforcing steel is a bigger concern.

Requirements for concrete mixtures exposed to sulfates are summarized in Table S2.

To resist sulfate attack, concrete needs to have a lower w/cm to minimize the diffusion of sulfates into the concrete. Further, the type of cementitious material used is important since it is the aluminate phase in portland cement and in some supplementary cementitious materials that causes sulfate attack in concrete. Prior research by the US

**Table S2: Requirements for Concrete in contact with water-soluble sulfates in soil or water**

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>Max w/cm</th>
<th>Min f’, psi</th>
<th>Required Cementitious Materials - Types</th>
<th>Additional Minimum Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ASTM C 150</td>
<td>ASTM C 595</td>
</tr>
<tr>
<td>S0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>S1</td>
<td>0.50</td>
<td>4000</td>
<td>II</td>
<td>IP(MS), IS(&lt;70)(MS)</td>
</tr>
<tr>
<td>S2</td>
<td>0.45</td>
<td>4500</td>
<td>V</td>
<td>-</td>
</tr>
<tr>
<td>S3</td>
<td>0.45</td>
<td>4500</td>
<td>V + pozzolan or slag</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table S3: Suitability of Cementitious Materials for Concrete Exposed to Water-Soluble Sulfate**

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>Maximum Expansion when tested using ASTM C 1012</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>0.10% at 6 months</td>
</tr>
<tr>
<td>S2</td>
<td>0.05% at 6 months, or 0.10% at 12 months*</td>
</tr>
<tr>
<td>S3</td>
<td>0.10% at 18 months</td>
</tr>
</tbody>
</table>
Category C – Conditions needing Corrosion Protection of Reinforcement

Corrosion is probably the most common visible sign of deterioration in exterior concrete. It has significant safety implications when the effective area of reinforcing steel is reduced by conversion to rust that causes spalling of the concrete cover. Structural safety is more critical for prestressed concrete because of the greater susceptibility of prestressing strands to corrosion and potential for catastrophic failures if these strands are compromised by corrosion.

The exposure classes for conditions that need corrosion protection of reinforcement are:

• **C0 (Not applicable)** - Concrete that will be dry or protected from moisture in service

• **C1 (Moderate)** - Concrete exposed to moisture but not to an external source of chlorides in service

• **C2 (Severe)** - Concrete exposed to moisture and an external source of chlorides in service – from deicing chemicals, salt, etc.

### Table C: Requirements for Concrete in exposures needing corrosion protection of reinforcement

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>Max w/cm</th>
<th>Min ( f'c ), psi</th>
<th>Chloride Ion Limit</th>
<th>Additional Minimum Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reinforced Concrete</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C0</td>
<td>-</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
</tr>
<tr>
<td>C1</td>
<td>-</td>
<td>-</td>
<td>0.30</td>
<td>-</td>
</tr>
<tr>
<td>C2</td>
<td>0.40</td>
<td>5000</td>
<td>0.15</td>
<td>Cover</td>
</tr>
<tr>
<td><strong>Prestressed Concrete</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C0</td>
<td>-</td>
<td>-</td>
<td>0.06</td>
<td>-</td>
</tr>
<tr>
<td>C1</td>
<td>-</td>
<td>-</td>
<td>0.06</td>
<td>-</td>
</tr>
<tr>
<td>C2</td>
<td>0.40</td>
<td>5000</td>
<td>0.06</td>
<td>Cover</td>
</tr>
</tbody>
</table>

Examples of corrosion of reinforcing steel in concrete structures.
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brackish water, seawater or spray from these sources.

Prestressed concrete has lower limits on chloride ions in the concrete mixture. The requirements are as summarized in Table C.

Only the severe condition – Class C2 - has limits on w/cm to minimize the penetration of chlorides through the concrete and to force a slower rate of carbonation, both of which impact the onset of corrosion. The chloride ion limit in Table C refers to water soluble chloride ion expressed in terms of percent by weight of cement. It is measured on crushed concrete samples by ASTM C 1218 at an age between 28 and 42 days. This requirement protects against using concrete ingredients, such as admixtures or marine aggregate that will incorporate chlorides in the concrete mixture. Some of the other ACI documents recommend more conservative chloride ion limits that are under consideration for adoption in the ACI 318 Code in its next cycle. For Class C2 the design professional is notified to pay attention to the clear cover of concrete to the reinforcing steel. For prestressed concrete, the Code specifically requires that the cover be increased by 50%. In reinforced concrete increasing the cover needs to be balanced with the potential for increased and wider cracks.

**Category P – Concrete members in contact with water requiring a low permeability**

Presumably, this exposure condition for structural members in buildings is one where the other exposure conditions are not pertinent. One example might be a water tank in a warm climate.

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>Max w/cm</th>
<th>Min $f'_c$ psi</th>
<th>Additional Minimum Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>P1</td>
<td>0.50</td>
<td>4000</td>
<td>-</td>
</tr>
</tbody>
</table>

The exposure conditions are defined as:
- **P0 (Not applicable)** - Concrete where low permeability to water is not required
- **P1 (Required)** - Concrete required to have low permeability to water

The requirements for concrete are summarized in Table P.

The Code indicates that the primary means of reducing the permeability of concrete is to maintain a low w/cm. The w/cm for exposure class P1 is the least restrictive compared to the other exposure classes where it is controlled. Clearly, with today’s technology and the use of supplementary cementitious materials, there are many ways by which one can achieve a low permeability for concrete.
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Concluding Remarks

The ACI 318 Building Code addresses only a limited number of durability concerns that impact the performance of concrete structures, since it focuses on minimum requirements to protect public safety. There are other aspects of durability design professionals must consider to satisfy owner needs. These include but are not limited to alkali aggregate reactivity, abrasion, cracking and spalling related to temperature, shrinkage and creep. Activity underway in ASTM is in the process of developing more rational requirements for alkali aggregate reactivity that will address the reactivity of the aggregates and the service function of a particular structure (i.e., such as a dam is considered more critical than a sidewalk). Other durability provisions specific to environmental structures are covered in the ACI 350 Code.

This revision to the ACI 318 Code lends more clarity to the durability provisions for concrete. The clear definition of the exposure classes and the parallel requirements for concrete eliminates reasons for the design professional to impose restrictions on concrete if they are not needed. For instance, there is no reason to impose a maximum w/cm ratio on an interior building column where the primary performance function is strength. Improvements to this revision are surely possible and those will be developed in the next Code cycle, including proposing performance-based alternatives. The next phase is to incorporate these exposure classes in a reference specification, like ACI 301, and for them to be used in project specifications.

A conceptual schedule for classes of concrete in a building might look like Table X.

In this case, the pertinent w/cm that is needed for a specified durability class will need to comply with the specified requirements and documented in a submittal. When the specified strength, $f'_c$, that pertains to a durability exposure class exceeds that required for loads, that higher strength level will govern and serve as the basis for the acceptance criteria for concrete strength. In the example above, $f'_c$, for the foundations and slabs on grade will be at 4500 psi and the maximum w/cm of that class of concrete will be 0.45 as required for Exposure Class F2.

Colin Lobo is a member of ACI 318 and ACI 301 and was involved in developing this code change proposal for the durability provisions in Chapter 4 of ACI 318.
Advantages of using OMYA Calcium Carbonate in concrete

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- Better workability
- Improved finishes
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- Reduced segregation
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- Lower pump energy
- Reduced abrasion
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Equivalent Designs: Concrete vs. Asphalt

This summary publication outlines recommended designs for the three most common road classifications, including life cycle cost analysis.

One key component of comparing pavements is developing equivalent designs. In this analysis the equivalent designs were developed using design procedures from each pavement industry. The concrete thickness was based on ACPA’s new state-of-art StreetPave design software and the asphalt thickness was determined using the Asphalt Institute’s procedure. By using both industry-recognized procedures, local agencies can make informed pavement decisions based solely on the estimated total load carry capacity for a given design period.

StreetPave incorporates a life-cycle cost module so designers can evaluate the total costs passed on to the taxpayers for 30 to 40 years or longer.

Asphalt paving prices are related to oil prices. The latest economic indicators from Engineering News Record show asphalt paving prices are continuing to increase during this extended period of oil price inflation. Ready-Mix concrete has increased less than 6% over the past year and has leveled off in recent months. Below are graphic representations of both concrete and asphalt prices over the past twelve months, reported in ENR’s August 2006 issue.

The examples illustrated in this chart were for a Mean Average Annual Temperature (MAAT) of 45 degrees Fahrenheit. Figure 1, shows the various MAAT regions for determining asphalt pavement thicknesses. Concrete pavements are not sensitive to environmental temperatures and thicknesses do not increase with rising mean average ambient temperatures.

**Mean Annual Temperature (MAAT)**

![Figure 1: Increases in MAAT from 45 to 60 or 60 to 75 requires additional asphalt thickness.](chart)

### 20 City Average

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Price</th>
<th>% CHG. Month</th>
<th>% CHG. Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asphalt Paving</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PG 58</td>
<td>Ton</td>
<td>277.00</td>
<td>+0.6</td>
<td>+43.1</td>
</tr>
<tr>
<td>Cutback, MC800</td>
<td>Ton</td>
<td>299.09</td>
<td>+0.3</td>
<td>+12.0</td>
</tr>
<tr>
<td>Emulsion, Rapid SET</td>
<td>Ton</td>
<td>257.32</td>
<td>+0.2</td>
<td>+15.8</td>
</tr>
<tr>
<td>SLOW SET</td>
<td>Ton</td>
<td>251.02</td>
<td>+0.2</td>
<td>+11.7</td>
</tr>
<tr>
<td><strong>Portland Cement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type one</td>
<td>Ton</td>
<td>92.92</td>
<td>+0.3</td>
<td>+5.5</td>
</tr>
<tr>
<td><strong>Masonry Cement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-lb. bag</td>
<td>Bag</td>
<td>6.38</td>
<td>+1.8</td>
<td>+11.0</td>
</tr>
<tr>
<td><strong>Gravel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1/2” down to 3/4”</td>
<td>Ton</td>
<td>10.72</td>
<td>0.0</td>
<td>+4.1</td>
</tr>
<tr>
<td>3/4” down to 3/8”</td>
<td>Ton</td>
<td>10.40</td>
<td>0.0</td>
<td>+0.3</td>
</tr>
<tr>
<td><strong>Crushed Stone</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base course</td>
<td>Ton</td>
<td>8.23</td>
<td>+0.8</td>
<td>-0.2</td>
</tr>
<tr>
<td>Concrete course</td>
<td>Ton</td>
<td>8.69</td>
<td>+0.8</td>
<td>+2.3</td>
</tr>
<tr>
<td>Asphalt course</td>
<td>Ton</td>
<td>9.09</td>
<td>0.0</td>
<td>+0.6</td>
</tr>
<tr>
<td><strong>Sand</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>Ton</td>
<td>7.98</td>
<td>0.0</td>
<td>+3.9</td>
</tr>
<tr>
<td>Masonry</td>
<td>Ton</td>
<td>8.82</td>
<td>+0.2</td>
<td>+5.1</td>
</tr>
<tr>
<td><strong>Concrete Ready-Mix</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,000 psi</td>
<td>cy</td>
<td>84.51</td>
<td>+0.2</td>
<td>+4.8</td>
</tr>
<tr>
<td>4,000 psi</td>
<td>cy</td>
<td>88.70</td>
<td>+0.1</td>
<td>+5.3</td>
</tr>
<tr>
<td>5,000 psi</td>
<td>cy</td>
<td>93.22</td>
<td>+0.2</td>
<td>+5.6</td>
</tr>
<tr>
<td><strong>Std. Modular Brick</strong></td>
<td>M</td>
<td>348.91</td>
<td>+0.7</td>
<td>+2.8</td>
</tr>
<tr>
<td><strong>Concrete Block</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal-weight 8” x 8” x 16”</td>
<td>C</td>
<td>127.50</td>
<td>+0.9</td>
<td>+4.4</td>
</tr>
<tr>
<td>Lightweight: 8” x 8” x 16”</td>
<td>C</td>
<td>150.80</td>
<td>+0.8</td>
<td>+13.4</td>
</tr>
<tr>
<td>12” x 8” x 16”</td>
<td>C</td>
<td>173.04</td>
<td>+1.7</td>
<td>+3.2</td>
</tr>
<tr>
<td><strong>Masons Lime</strong></td>
<td>Ton</td>
<td>198.22</td>
<td>0.0</td>
<td>+3.2</td>
</tr>
</tbody>
</table>

Table 1: Data reported in ENR August 2006 Issue
The life-cycle cost analysis (LCCA) provided with each road classification shows the initial, rehabilitation, and maintenance costs for the equivalent concrete and asphalt sections. In these examples, concrete strength was 4000 psi and the design did not include integral curbs. If either the concrete strength were increased or an integral curb and gutter were used as design options, the initial concrete cost would be reduced. The LCCA example is based on:

1. ENR August 2006 Issue 20 City Average prices
2. Initial Costs 1-mile 12’ wide pavement with curbs place separately
3. Design Period 40 years
4. If integral curbs are placement with concrete pavement an additional $45,000 can be saved on initial costs

### Concrete Properties

1. Flexural Strength 600 psi
2. Reliability 80%
3. k-value 100
4. Design Life 30 years

### Asphalt Properties

1. MAAT 45 degrees F
2. Modulus of Resilience (subgrade support) 3000 psi
3. Design Life 30 years

### Residential

(ADTT 3 trucks/day, 11,500 ESALs, 2-lane with curbs) initial costs

![PCC - 6.5'' Subgrade - HMAC - 6'' Granular Base](image)

### Collector

(ADTT 100 trucks/day, 405,000 ESALs, 2-lane with curbs)

![PCC - 6.5'' Subgrade - HMAC - 6'' Granular Base](image)

### Minor Arterial

(ADTT 500 trucks/day, 3,500,000 ESALs, 4-lane with curbs)

![PCC - 6'' Granular Base - HMAC - 6'' Granular Base](image)
2006 NRMCA Commitment to Environmental Excellence Award Winners

The National Ready Mixed Concrete Association’s Commitment to Environmental Excellence Awards competition offers producers of ready mixed concrete national recognition for outstanding contributions to protecting the environment and maintaining sound management practice in their operations. The program salutes companies that have not only met but surpassed governmental compliance measures and demonstrated a commitment to environmental excellence through plant and staff investment. The program provides awards in three categories based on the plant’s production volume. Category A includes all production facilities smaller than 50,000 cubic yards annually, Category B is designated for plants that produce 50,000-100,000 cubic yards and Category C entries are for plants producing more than 100,000 cubic yards annually. Any NRMCA member company producing ready mixed concrete from a fixed plant location in the U.S., its territories or Canada was eligible to enter.

The entries were reviewed by a panel consisting of regulatory officials, national association executives and independent industry and environmental consultants. The submissions are judged based on a written narrative covering 10 evaluation criteria and photographs of the plants that clearly demonstrate the incorporation of environmental systems into the plant’s operation. Plants must show excellence in site aesthetics with a series of photos that portray our industry with pleasing images. The judges weigh their decisions heavily on site-specific written plant procedures that include emergency planning, inspections, best management practices and environmental audits. Winning plants include those which demonstrate excellence in environmental employee training, air quality management, water and solid waste management, and community relations. Finally, the judges wrap up their score sheets by examining each plant’s compliance history, ensuring no federal, state or local violations. They also consider operating challenges such as restricted site areas, zoning and environmental permits, spill prevention and job wash-out procedures.

This year, the judges decided, based on the high quality of the entries, to award no second or third place winners, but to instead honor the most outstanding facilities with Environmental Excellent Awards. In addition to the excellence awards, the judges awarded two special “Comeback Kid Awards” to companies with older plants that have demonstrated the ability to revive these plants from an “era-gone-by” to outstanding, environmentally state-of-the-art facilities. All the winning companies are to be honored at an awards presentation ceremony at the NRMCA Annual Convention March 18, 2007 in La Jolla, CA. Winning facilities will also featured in an article in an upcoming edition of Concrete Products magazine.

Environmental Excellence Award
Category A
< 50,000 cubic yards
Lafarge, Trussville, AL
Transit Mix Concrete and Materials, Ft. Hood, TX

Category B
50,000 to 100,000 cubic yards
Glacier Northwest, Everett, WA

Category C
> 100,000 cubic yards
Cemex, Apache Junction, AZ
Catalina Pacific, Sun Valley, CA
Ocean Construction, Grandville Island, BC

Comeback Kid Award
Category B
50,000 to 100,000 cubic yards
Chandler Concrete, Durham, NC

Category C
> 100,000 cubic yards
Central Concrete, San Francisco, CA
DIN system

Bucket elevators with DIN system are characterised by their simple design. It is a tried and proved way of attaching the buckets.

System 65

The bucket mounting, by means of double link attachment, permits ultimate bucket support during scooping up and emptying. The variable spacing between buckets allows adapting of the system to the conveying requirements. Furthermore, technical aspects like high conveying capacity, high conveying speed and elevation distance as well as quiet action of the system are characteristics. The use of high wear resistant components results in long service life of the entire chain system.
Baby Boomers are Once Again a Force to Reckon With:
The Impact of an Aging Workforce on the Ready Mixed Industry

By Joan Dandurand

The Coming Workforce Tsunami is a presentation that I’ve had the opportunity to facilitate at NRMCA and many state ready mixed concrete association conferences. This presentation was designed to create awareness of the demographics supported by the Bureau of Labor Statistics and American Trucking Association pointing to the very probable driver shortage, of which the ready mixed industry has and is experiencing. Some of the facts presented are: Baby Boomers are approaching retirement age (the average driver is 47 years old); the birthrate of succeeding generations is 10 percent less than the Baby Boom generation; there are more women than men in the workforce; and Hispanics are and will continue to be the fastest growing ethnic group in the workforce. The question then becomes, is awareness enough? What is the industry doing to present itself as the industry of choice for drivers (and others)? What are we doing to retain the drivers that we have?

The Coming Workforce Tsunami is a 35,000-foot look at workforce issues for our industry. This article focusing on the impact of an aging workforce on our industry takes it down to about 18,000 feet and again asks the question, ‘Based upon this awareness, what action are we taking?’ In a 2006 survey conducted by AARP of 1000 business executives, 83% were ‘aware’ of the ‘aging workforce’ demographics but only 16% were developing a strategy beyond the normal focus of the HR department. What will be the impact of an ‘aging workforce’ on your organization?

FACT: There were 78 million babies born between 1946 and 1964. This demographic phenomenon was called the Baby Boom. We of the Baby Boom generation have molded and shaped society and the economy in many ways simply by moving through it en masse. Based upon our actions, we were called hippies, yuppies, yuppies and the ‘me’ generation. Our desire to continuously improve ourselves through education, demonstrating loyalty to our employers and ‘putting work first’ have earned us the current labels of the ‘new treasure trove of talent,’ and the ‘wisdom workers.’ Researchers are calling us reliable, settled, compassionate and honest. . . . would your parents have thought that of the Woodstock generation? As the first of us turned 60 this past year, once again we made headlines. The topic of the ‘aging workforce’ and its impact on business and the economy is a complex one. I’ll touch upon a few of the topics as they relate to possible challenges to employers. Boomer retirement en masse is one such issue.

In the U.S. today, there are approximately 22.8 million people aged 55 and older who are working. They comprise approximately 16% of the workforce. The number of workers age 55 and over is growing four times faster than the workforce as a whole. If you were to analyze your workforce today, you’d probably find that close to half are Boomers who might be ‘eligible’ to retire over the next 8 to 15 years. If half of your workforce were to retire over the next 8 to 15 years, what would be the impact to your organization be? The term being given to this scenario is ‘brain drain.’ How do you replace 10, 15, 20 years of institutional (as well as technical) knowledge, whether it be the president, a sales rep, a director of quality control, a dispatcher, batchman or driver supervisor?

A recommended first step would be to develop a succession plan for each of your key positions. In today’s business climate and especially in a ready mixed operation, succession planning is not limited to the top level of leadership of an organization. Unlike other industries, we can’t send jobs ‘off shore’ and even though we are using technology to improve many areas of operations, we remain a labor-intensive industry. While analyzing your operations today relative to future operations, it will become clear what those key positions are. Succession planning involves understanding what the future of your organization might look like, recruiting the best, developing skills and abilities and preparing this future workforce for advancement.

To prepare your current key workers (Baby Boomers) to train, educate and manage their successors (GenXers, currently aged 27-45), they need to understand that this new workforce is driven by a different set of motivators than what they’ve been driven by. GenXers work to live, not live to work; they want to learn through technology and they have a constant hunger for more knowledge; promise of overtime pay is not a motivator, personal satisfaction with their job is; they want to understand the big picture about the company and how this big picture will influence their employment and growth; they are creative thinkers, independent, results-oriented and skeptical; they will change jobs often. Are your organization’s employment policies, training methods, and work processes designed to support the training and retaining of the GenX workforce? Are your managers ready to adjust their management style to the GenX workforce?

In looking at other issues surrounding the ‘aging workforce,’ we need to look at the fact that many Boomers are postponing retirement for a variety of reasons. There are 76 million Boomers set to retire by 2010; however, AARP reports that 79% won’t be retiring by 65 either because it’s financially impossible (haven’t saved enough or were negatively impacted by the post-9/11 reces-
sion) or work is a passion. This truly ‘aging workforce’ can affect employers in a variety of ways:

• Just because a 55-year-old doesn’t ‘feel’ that he/she is physically/mentally ready for retirement, as we get older, our bodies break down and the ‘potential’ for injury increases. In actuality, experience is the indicator of ‘potential’ for injury. The lack of experience of a newer worker tends to bring about more injuries to them versus the older worker. However, when the older worker does get hurt, the extent of injury is more costly and it takes him/her longer to recover and get back to work. The employer’s cost comes in lost productivity and increases in medical premiums.

• Employing an ‘aging workforce’ might well mean higher incidence rates of certain types of chronic diseases. The top three long-term disabilities employers can expect to see among employees aged 55 and older are: cancer; arthritis and other joint inflammations; and cardiovascular disorders. According to MetLife, approximately a third of all LTD claims received from employees aged 55 and older are for one of these conditions. Knowing this, employers might consider investing in targeted workplace wellness and prevention programs such as nutrition counseling, exercise and weight management programs, blood pressure testing and cancer screenings. On average, 10% of a working population will be on LTD during the course of a year; however, those 10% are consuming 50% of that population’s medical expenditures.

• Two incomes were the norm for the Baby Boomers, which necessitated daycare, after-school programs, summer camps and parents of Boomers focusing their retirement on caring for their children’s children. This made it possible for Boomers to balance work and raise children. As the Boomers age, so do their parents. A growing challenge has become the need for the Boomers to now balance work and caring for their aging parents or spouse. The stress related to this balancing act is very real and might impact the workplace. As an employer, ensure that your EAP is there to offer counseling on this issue. To retain this worker, employers need to open the way for a flexible work schedule where none might have existed before.

The reality is that the Baby Boomers are once again making their mark on society, business and the economy. The new reality for employers is that the Boomers are working longer and with that comes issues surrounding the impact of this ‘aging workforce’ on your organization and the industry as a whole. What action is your organization taking to manage and retain the ‘aging workforce’ and to attract, recruit, train and retain those ‘key’ workers who represent the future of the industry? To dig deeper into these issues or to investigate what other issues might exist, visit www.aarp.org; www.conference-board.org; www.worldatwork.org.

Joan Dandurand is program manager for the Concrete Industry Management (CIM) Program at Arizona State University. Contact her at joan.dandurand@asu.edu or 480-296-1808 with comments or questions.
What is the Concrete Industry Management (CIM) Program” and “Why did you choose it” are questions I’ve heard frequently over the past five years. Those same questions crossed my mind when I first learned about the program my senior year in high school. Honestly, the concrete industry was the last thing on my mind as a declared pre-med major gearing up to attend Middle Tennessee State University (MTSU) in the fall of 2002.

My road to the CIM Program began when my best friend’s father and CIM patron, Ward Poston, told me I would be a great fit for a new program at MTSU. I was impressed by CIM’s distinction as the only program of its kind in the world, but still hesitant until Ward took me to the university to meet the faculty. My first introduction was Dr. Heather Brown, a professor for the program. “There is a woman professor in this major!” was my first thought and a comforting one at that. As a woman, I was a little nervous as to how I would be accepted in a male-dominated major. Dr. Brown made a great impression on me. Taking on a relatively new and unknown program was appealing to me, and the concrete industry was rapidly growing with many jobs available all over the country. If that were not enough, Ward helped me secure a full scholarship from Master Builder’s. I soon switched to the CIM major and took Concrete 101 in the fall.
As I progressed through the program, I found there is a misconception about what the CIM program is and its curriculum. CIM was not merely a concrete degree but instead offered a multi-disciplinary curriculum that provided students with the opportunity to study interrelated aspects of the business world. At the time, all CIM students followed the production, sales and service track with a business administration minor. CIM students were responsible for all the same core requirements that other majors demanded such as English, history and chemistry. We also took business-related courses like accounting and business law, and of course there were the “concrete classes.” I won't explain them all, but I'll give you a taste of some of the key courses. Fundamentals of Concrete taught about admixtures, how to create mix designs, and required students to obtain ACI Level 1 certification in order to pass the course. Concrete Construction Methods provided an introduction to specialties such as whitetopping, tilt-up and pervious. The intricacies of estimating, contracts, and codes & specs were taught in Understanding the Concrete Construction System. In addition, CIM students learned how to manually schedule trucks and to identify all the parts of dry and central mix plants in the production and delivery classes. Furthermore, we could choose from cognates such as marketing, foreign language or safety.

Most importantly, the program focused on developing our skills as future leaders. Students were required to give at least one presentation for each “concrete class.” I researched and presented on several topics including a concrete repair job, an environmental safety audit of a pipe plant and the business decision process of comparing the costs and benefits of an acquisition versus a Greenfield. These all provided preparation for the most important presentation I would give. Capstone was the senior year culmination of the CIM curriculum. I've never known stress like I knew while building that project. What was the project? I started my very own ready mixed concrete company. I was assigned with building an entire organization from the ground up. My tasks included preparing budgets from one to 10 years, a strength, weakness, opportunity & threat (S.W.O.T.) analysis on competition, scouting a location, creating a balance sheet, reporting a break-even analysis, forming an executive summary, outlining my competitive edge, configuring a sales forecast and deciding on a marketing strategy. Each student created a business plan that he or she presented with the hopes of obtaining a pretend bank loan to begin his or her business.

CIM’s uniqueness was not only found in the coursework but also in the way the industry supported the program. Patrons and industry leaders went out of their way to support the program. As I progressed through the program, I found there is a misconception about what the CIM program is and its curriculum. CIM was not merely a concrete degree but instead offered a multi-disciplinary curriculum that provided students with the opportunity to study interrelated aspects of the business world. At the time, all CIM students followed the production, sales and service track with a business administration minor. CIM students were responsible for all the same core requirements that other majors demanded such as English, history and chemistry. We also took business-related courses like accounting and business law, and of course there were the “concrete classes.” I won't explain them all, but I'll give you a taste of some of the key courses. Fundamentals of Concrete taught about admixtures, how to create mix designs, and required students to obtain ACI Level 1 certification in order to pass the course. Concrete Construction Methods provided an introduction to specialties such as whitetopping, tilt-up and pervious. The intricacies of estimating, contracts, and codes & specs were taught in Understanding the Concrete Construction System. In addition, CIM students learned how to manually schedule trucks and to identify all the parts of dry and central mix plants in the production and delivery classes. Furthermore, we could choose from cognates such as marketing, foreign language or safety.

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to bring opportunities to CIM students. Company sponsored socials were held most Tuesdays and Thursdays throughout the semester. Dinner and a presentation were provided by the companies from across the country. Socials allowed students to become familiar with companies they may interview or intern with in the future. Most companies would offer on-campus interviews in conjunction with their social. It was an amazing benefit to have a company conduct interviews at your university. Every semester the patrons visited the MTSU campus to hear students’ concerns and suggestions regarding the program. Most students’ favorite program perk was the trips. Seniors were eligible for program-funded trips to events like World of Concrete, the National Ready Mixed Concrete Association’s (NRMCA) annual convention, and CON/EXPO-CON/AGG. CIM students greatly benefited from those networking opportunities. I was able to attend the NRMCA convention and CON/EXPO-CON/AGG in Las Vegas my senior year. Twelve students from the program attended. We were allowed to sit in on committee meetings and break-out sessions. I remember attending Karthik Obla and Lionel Lemay’s presentation, “Prescriptive to Performance or P2P.” That was my first chance to hear about the new initiative of using performance-based criteria for concrete mixes instead of choosing from an established prescription mix. Bob Sells of Tarmac offered industry advice and stories to the students when he took us to dinner during the convention. And Bob Garbini, NRMCA’s president, made sure each student knew the importance of always having a business card and resume on hand. NRMCA members were eager to meet with CIM students and hear about their future career goals.

Another distinguishing aspect of the program was the required internship that each student had to complete before graduation. I was fortunate enough to meet Julie Luther while she was visiting MTSU as a CIM patron. She worked for NRMCA as vice president of government and industry relations. At the time, I had never heard of NRMCA; however, our discussion evolved into an internship with NRMCA at the association’s headquarters in Silver Spring, MD. Before the internship, I had a limited view of how I might actually be able to use my degree. NRMCA opened up doors I had never imagined. I loved the experience. They allowed me to work in areas ranging from education to government affairs to promotion. I knew association work for the industry was where I was headed. I came back to school in the fall with a new direction and drive.

After three and a half years of study, I obtained my bachelor of science degree from MTSU in December 2005. While many of my fellow grads were pleased to take positions in quality control, plant management or sales, I came to work here at NRMCA. A great internship has turned into a great job. I’ve had the opportunity to travel, meet congressional leaders and contribute to the governmental affairs and promotional efforts of the association. While I am learning new things about this industry every day, my CIM degree has prepared me well to meet the challenges ahead.
Building a Happy, Productive and Talented Workforce

By Greg Smith

Everyone has had a bad hair day, but how about a bad tie, bad hat or bad shoe day? More and more companies are putting together contests on the ugliest dressed. Another company sponsors an annual turkey bowl. Employees go out on the loading dock, take a frozen turkey and try to knock down as many empty wine bottles as possible. This is not evidence of companies gone nuts, but tactics used to ward off a serious business problem.

The biggest problem facing business today is how to motivate and engage workers. The other problem slapping them in the face is high turnover. Today’s mobile employees are loyal only to themselves and jump ship for better benefits, higher pay and greater opportunity.

Pay and benefits are important, but you have to do something different in order to attract and retain the best people. That something may equate to a fun, flexible workplace that gives more freedom and responsibility. Wouldn’t it be great if you enjoyed going to work? What if your supervisors showed appreciation for what you did?

The front line is the bottom line. A company experiencing high turnover has a serious financial problem. It costs anywhere from $4,000-$15,000 to recruit, hire and train an entry level employee. One company lost 420 of the 431 employees hired in one year. If it costs $4,000 per employee, that equates to a $1.7-million loss. Unfortunately, most employers are not aware how much the package costs and also how much additional business they have to generate to cover those costs. Choose your own reward — sounds like fun!

Employee Dollars

At Phoenix Solutions Inc., employees award an “employee dollar” to fellow employees who do something special or exceed company expectations. Each month the employee with the most dollars gets movie tickets, dinner and a plaque with his or her name as “Employee of the Month.”

Management by Fooling Around

Herb Kelleher, the chairman, co-founder and former CEO of Southwest Airlines, combined fun and hard work into something he calls “management by fooling around.” At the nonconformist airline, everything — from the tickets and boarding passes to the casual dress and occasional costumes attendants wear — clearly demonstrates that something is different.

Payday

A Milwaukee office manager doesn’t just give out paychecks on payday — employees also receive a “Payday” candy bar with each check.

Man Overboard Award

CIGNA believes in rewarding employees who go above and beyond for their customers. The Man Overboard Award is a life-saving ring, which the president presents to an employee at a special ceremony. CIGNA also pays teams for implementing ideas that improve productivity with awards as high as $25,000.

Choose Your Own Reward

A Miami-based business owner rewards her employees with parties, expensive dinners, chauffeured shopping sprees, spa sessions and cooking lessons with Chef Paul Prudhomme. She lets her employees decide what they want, then figures out how much the package costs and also how much additional business they have to generate to cover those costs. Choose your own reward — sounds like fun!

Engineering Bucks

The technicians at Weather Channel in Atlanta created their own recognition system called Tech Bucks. All they did was Xerox a dollar bill and give five of them out at the beginning of each month. They give them to each other for doing a good job. At the end of the month they tally up who got the most and the winner gets a special prize.

Dancing the Macarena

Employees at PeopleSoft, Inc. still haven’t forgotten the day that former CEO David Duffield danced the Macarena in front of 500 happy coworkers. Duffield does not act like a boss. His office is a cubicle, he answers his own phone and opens his own mail. Annual employee turnover is 3 percent or one quarter of the national average. Employees who earn outstanding service awards get either $500 in cash or stock options.

The Extra Mile

United Services Automobile Association (USAA) provides blank “thank you” note stationary to their workers for a program called The Extra Mile. Employees are encouraged to say “thank you” to each other for the help they receive at work. The most surprising thing happened on the first day USAA printed the notes...They ran out! The company couldn’t keep up with the demand.
Even though you took time during the work day to thank the employee who went “above and beyond,” go a step further and call them at home after dinner to say thanks. You might be surprised how much this can mean.
Fat Friday
Just about everybody loves to eat, right? At Texas A&M the first Friday of each month is celebration time. Everyone brings food to share and they celebrate birthdays for that month as well as work anniversaries.

Surprise Celebrations
Often it’s the unexpected and informal that employees enjoy as much as formal awards. Conduct frequent, unannounced recognition and award celebrations, such as having a pizza party. If you don’t know of a reason to have a party for the work force, invent one.

Gold Stars and Frogs
At Wachovia Bank, each Monday morning they set milestones for the week with input from staff members. On Friday, employees receive a Gold Star and $2 (funny money) for each milestone met. Employees can also recognize their peers with a sticker of a frog, which is worth $1. Staff members display the gold stars and frogs on a white cardboard poster. At the end of each month, they hold a random drawing for a dinner ($50) and movies ($25).

Having Fun
Hal Rosenbluth, CEO of Rosenbluth International (the nation’s fourth-largest travel services company), believes in creating a fun work environment. He starts by hiring “nice people,” since he believes nice people like to work together and have fun. Officers dedicate every Tuesday afternoon to serving high tea and discussing corporate values and other matters of importance to new recruits at the company’s Philadelphia headquarters. There’s a toll-free phone number for any associate to contact Rosenbluth.

Faux Pas Award
Sometimes it’s fun to recognize an employee’s goof. Try the “Faux Pas Award” — a plaque or trophy passed around the organization at a monthly social event with the current recipient’s name engraved. The “keeper” of the award is responsible for selecting the next deserving recipient.

After Dinner Phone Call
Even though you took time during the work day to thank the employee who went “above and beyond,” go a step further and call them at home after dinner to say thanks. You might be surprised how much this can mean.

Breakfast with the President
The HR department of Nations Healthcare, Inc. initiated a ‘Breakfast with the President’ program to improve communication between employees and the CEO. Each breakfast begins at approximately 8:15 a.m. with coffee and biscuits served by the staff and ends when the discussion ends. Results: higher morale and a sense of open communication.

Gregory P. Smith shows businesses how to build productive and profitable work environments that attract, keep and motivate their workforce. He speaks at conferences and is the president of a management consulting firm, Chart Your Course International, in Conyers, GA. Phone him at 770-860-9464 or email greg@chartcourse.com. More information and articles are available at www.chartcourse.com.
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For more details, call LANXESS at 1-800-526-9377 or visit us at Bayferrox.com.
This is the fourth installment in our series on how to go from outstanding salesperson to superior sales manager. In the last three issues we looked at some basic tenants of making this transition. We looked at the selling process, managing the sales pipeline and our last issue looked at the sales performance dashboard. In this issue we are going to spend our time discussing coaching and mentoring. In this article I will be joined by Tim McMahon, president of Strategy Mapping Selling, a sales and management training firm that works with many leading ready mixed producers and suppliers. Strategy Mapping Selling developed NRMCA’s new sales management training program. We will answer a few common questions about coaching and discuss strategies for more effective coaching.

Vance: Former salespeople who are just getting started in sales management are usually new to coaching. What do you see as the three biggest challenges they face?

Tim: The first is probably becoming not just a “sales manager” but also a “sales leader.” In other words, becoming perceived by the sales team as not only the person with management authority but also as a leader who has a plan to help the team achieve real success.

The second challenge is optimizing the performance of each sales rep and each sales territory to assure that each territory is performing at the highest level realistically possible in revenue, margin and share.

The third challenge is hiring, retaining and developing the best possible salespeople, i.e., those who have the capability and drive to achieve optimum results.

Vance: I agree that leadership is a key attribute of a successful sales manager. I think leadership by example is one important component of earning the respect of the sales people being managed.

Optimizing a territory builds on the issues I discussed in my earlier articles; understanding the sales process, managing the sales pipeline and using a dashboard of metrics. Utilizing these tools and a number of others are a few of the levers one can pull to optimize a territory.

What is the difference between a sales manager and a sales leader?

Tim: Anyone can be a manager in the sense that it’s a position appointed by the company. It’s a position of authority and certainly a manager can “lead” by using authority (“Do what I tell you and do it my way.”) — but that’s not the way to achieve the best results. A leader, on the other hand, is someone who the sales team believes has a solid plan or strategy to achieve real success and who focuses his or her efforts on helping each sales rep effectively execute the plan. In other words, the sales team willingly follows
their leader because he or she is “The Man with the Plan.”

**Vance:** The days of autocratic leadership are nearing an end. Team-based consensus processes that leverage the talents of the entire group are the model many successful organizations use today. Effective sales management leaders facilitate strategy and tactics and manage the personal development of their people. This is a big change from the days of counting call reports. Planning is truly a skill that good sales people usually acquire.

How can a sales manager optimize each territory and each sales rep?

**Tim:** The short answer is helping the sales rep create a true business plan for his/her territory — a plan that focuses a rep’s efforts on accounts with the greatest potential to impact revenue, share and margin growth as well as creating strategies to strengthen customer relationships and build competitive position. This isn’t just a one-time effort but an action plan that a manager will use throughout the year to coach the sales rep. Helping managers do this, by the way, is one of the cornerstones of the new NRMCA sales management program.

**Vance:** I couldn’t agree more. Knowing how to grow, maintain or even fire customers to enhance a portfolio of customers is a new idea to many folks. The same can be said of managing what markets or segments to attack (residential, commercial, DOT, retail, religious, etc.). Optimizing the product mix coming out of the back of the truck is an idea whose time has arrived. Small changes in product mix can have impressive effects on the bottom line of an enterprise. Just look at how many dollars of profit fibers generate. Imagine having a whole stable of products consistently delivering those results. Again, it takes planning and execution to drive a business forward to profitability and stability.

How can managers do a better job of hiring, retaining and developing their people?

**Tim:** There is no greater responsibility of management than getting, keeping and growing sales people. Unfortunately, skills like interviewing, performance assessment, motivating and coaching don’t get the management attention they need. For the most part these are not innate skills — managers who are trained and know how to use them effectively have a distinct edge in their ability to build high-performing salespeople and teams. Most managers, however, are incredibly busy each day dealing with the details of business and too often these are considered “soft skills” that are not really all that necessary. It’s just not so.

**Vance:** Hiring (and firing) is a cornerstone of good businesses. Many business gurus will tell you that hiring people is the most important thing you do. I wholeheartedly agree! Just look at Google. A number of search engines have come and gone. A few even found the spotlight for a short period of time. But look at Google’s model. They continue to innovate and add value. While concrete is not a Web business, there are a number of important lessons we can learn from them!

Most managers were promoted because they were excellent sales reps, but being an effective sales manager is about more than just that — ask any sales manager!
tal to driving business away from “commodity” sales models. By teaching these skills to more and more of our industry’s front line sales people, we elevate our industry and advance concrete as the building material of choice it should always be. Think about items some would consider commodities that people pay premium or ultra premium prices for. Does anybody remember when water was free? Not $0.25 to $1.50 per half liter. The cola industry has created a market that didn’t exist just a few years ago. In most cases, water is equal to or more expensive than soda! The value of marketing and selling should not be underestimated.

Tim, NRMCA has recently launched a new Sales Management Development Course, which you have taught twice now, what can you briefly tell us about it?

Tim: To begin with, I’m pleased to say that the NRMCA Sales Management Development Course has been exceptionally well received and the comments from managers who have participated have been outstanding. The course really focuses on each of the three challenges — management leadership, territory optimization and the “get, keep and grow” sales rep development strategies. Most importantly, it’s a true ready mixed industry training program that was designed to fit the real world challenges of ready mixed sales managers. We had the input and help of sales managers and executives from across the industry to make this an exceptional program.

We believe this can not only enhance the success of producers but also make the industry one that is seen as an attractive career track for the best salespeople.

Our training approach is unique as well. In fact, it is the most state-of-the-art, leading-edge training program offered in any industry today — and that’s something we can all be exceptionally proud of. Each program runs over a period of about five months — we begin with a live classroom session on territory optimization and coaching followed by a monthly series of key management skill e-learning modules supported by collaboration and “best practice” videoconferences. In this program, managers not only learn new ideas, they put them into action then share and discuss results with their peers.

Tim and Vance: There is a truism that a sales manager is only as good as the performance of his or her sales reps. Most managers were promoted because they were excellent sales reps, but being an effective sales manager is about more than just that — ask any sales manager!

Ready mixed sales managers have the opportunity to be as good or better professional managers than sales managers in any other industry, anywhere. We believe this can not only enhance the success of producers but also make the industry one that is seen as an attractive career track for the best salespeople.

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Dealing with Multicultural Staff

By Eileen Dickson, Senior Director of Education, NRMCA

Thirty-three years ago when Sam Pierce started his ready mixed concrete company, his staff of six was white, male and liked to hunt and fish. Times have changed. Now his employees, though still predominantly male, also include three other large groups, African Americans, Russians and Hispanics, all of whom have off-duty time recreation as diverse as the group. Because Sam landed some big government and commercial contracts the past seven years, when he needed to hire staff quickly, he paid a bonus to employees for referrals. Sam found that when they recommended a family member or friend, work expectations were understood before a job candidate arrived for the interview. They knew days were long, the work challenging, schedules swung and he paid a fair wage with benefits. And because his staff worked hard, his business grew beyond his wildest expectations. Nevertheless, this was not “Paradise.” Now with 70 trucks and multiple locations, blending

The first challenge is how Americans communicate with each other versus other cultures. Simply put, Americans are upfront and direct. We say what we mean. The meaning is not under the surface; we leave little to interpret.
his diverse group at various plants into a cohesive team is a challenge. As it turns out, the employees at plants on the northern end of town are predominately Russian; western plants’ staff are Hispanic, and the northern plants are fairly balanced between white and black. For big pours, trucks arrive from multiple sites. This places special demands on his area manager, who is seen as the great arbitrator when conflict arises. Pierce Ready Mix is not alone.

Seven years ago, Christopher Mickelson’s grown children approved their father’s decision to sell their healthy ready mixed concrete business to a larger competitor. Since then, the new-bigger-better company had been sold to Rhodes SSA, a multinational construction materials holding company that has a global presence and is vertically integrated. Post-merger executives meet in Asia or Europe more often than the U.S. Many times the U.S. leadership teams feels their “go-get-'em” and upfront methods are misinterpreted to the point where many in the original group that made the U.S. company such a viable buy had left or had been “retired.” Their international counterparts, try as they may, saw conflict arise from the differences in how decisions are made.

U.S. businesses are international melting pots. In the case of software development, many teams are Indian and American; in the car industry, Japanese and American; in the chemical industry, Swiss, German, English and American. Buying teams of Americans and Koreans, American and Chinese, Americans and Mexicans are very common. And the list goes on and grows more diverse. Because of this, there has been a recent onslaught of research studies that specifically examine the challenges of working in multicultural environments, to the point where University of Pennsylvania’s Wharton School of Business, among other U.S. business schools, has a whole division and a monthly newsletter examining international, multicultural business operational challenges and methods.

A recent study in the Harvard Business Review points to four root causes of issues: whether an ethnic group’s communication style is direct or indirect; multiple cultures dealing with each other’s accents and language fluency; how differing groups interpret deference to authority and hierarchy; and finally, the conflicting norms among different cultures’ decision-making processes. If a manager or an employee can figure out which of the four is the challenge, then an appropriate strategy to address the issue can be chosen.

Roots

The first challenge is how Americans communicate with each other versus other cultures. Simply put, Americans are upfront and direct. We say what we mean. The meaning is not under the surface; we leave little to interpret. Few cultures are as direct. For many cultures, the meaning in a message is embedded in the way the message is presented. As an example, Asian cultures communicate indirectly. Communication back and forth means they are listening. Many Americans interpret the dialog as working through a process whereby parties are agreeing or disagreeing. So when Americans think progress is being made, that is typically not the case. We bring a problem to the forefront so we can talk about it and work toward a solution, and if it’s serious, ego and rank are put aside. Culturally, Asians find this approach embarrassing and confrontational. To cope, their culture deems it appropriate to back away, provide less information and access, in fact, isolate the (American) offender from their (Asian) communication norm. This stifles the problem for Americans who think their method of putting everything out in the open is a way to work toward a solution. Instead, many of the issues between parties might not surface.

The second challenge is the trouble with accents and fluency in each other’s language. There is deep frustration when parties feel they don’t have the words to express what they think and feel. The second challenge is the trouble with accents and fluency in each other’s language. There is deep frustration when parties feel they don’t have the words to express what they think and feel. It can unfairly reflect upon a person’s level of competency. Because of our upfront nature, the American
What the facilitator did was concentrate on the drivers’ various expertise so their schedules, and then plant locations, matched the job’s requirements, not cultural location comfort.

fluent in English in a group will typically take the communication lead, leaving others with little to say. This action can reflect negatively, and many times unfairly, on the quiet person’s value and intelligence. Non-fluent English speakers can become frustrated, less motivated to contribute, be they a mixer driver or vice president of accounting. Interpersonal conflicts can arise that have nothing to do with the knowledge or the contribution to the solution the non-English speaker might have.

The third challenge is the fact that different cultures have different attitudes toward authority and hierarchy. For example, in Mexican culture, respect is shown by reflecting humility in speech. Whether a person of Mexican heritage understands something or not, his/her respectful reply is in a form of an open-ended question. An American will interpret that person’s respectful, open-ended question as a sign that the person is wavering on the answer or does not understand, which is not necessarily true. As a result, drivers, for example, can interpret that their respectful open-ended question-reply to a dispatcher or supervisor is interpreted that the driver did not know what he was talking about. Something so simple could get blown out of proportion by both parties.

The fourth challenge is the various international norms for decision making. As a rule, Americans are known to be quick decision makers whose analysis of the issues is not as in depth, something contrary to most cultures. Other cultures may, for example, decline to share information until they understand the full scope of the issue before they will talk about the details.

Strategies for Solution
There are four strategies experts point to that can work toward finding a solution: acknowledge the cultural gaps and work around them; change the makeup of the team; set norms early or bring in a higher level manager; and remove a team member when all other options fail. Which strategy works best depends on the situation.

Adaptation
For Americans, many times solutions include the belief that other cultures need to assimilate or integrate “as our ancestors did” or the world needs to recognize the U.S. as the Super Power. In a more globally aware, diverse world, these concepts are being challenged. Taking a page from diplomats who deal with multicultural populations where it is critical to protect the different cultures within an area, adaptation methods rather than assimilation favor more lasting solutions. Called “fusion,” adaptation practices and attitudes work when the various members acknowledge their cultural differences and figure out how to live with them without changing teams or job assignments. Studies show this method works best because it not only involves less managerial involvement but also because the solutions come from within the group as members learn from the process. That is, members deal with their differences and assume responsibility to figure out how to work with them. An example is an exceptionally
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First, managers must intervene early and set norms. Second, they must engage all the players so employees see that their challenges stem from cultural differences, not personality differences. Finally, successful solutions need to arrive creatively and with a sense of humor.

an aware group of Rhodes’s mid-level U.S. and English managers who did not have access to higher level executives. They were on their own so they had to work together. Recognizing their issues stemmed from their different culturally driven decision methods, e.g., the Americans who wanted to fast track recommendations, and the English who wanted to take more time to methodically identify every pitfall. In a compromise, some forged ahead while others worked slower to identify pitfalls in a more analytical approach. The team did not move as fast as the Americans had hoped, yet they were not as methodical as the English wanted. In the end, there was consensus about their conclusion and recommendations.

Structural Intervention
Sam Pierce with his American, Russian and Hispanic drivers, plant operators and dispatchers, decided the only way he was going to meet the stringent time requirements in a large DOT was to be proactive from the start. Essentially, he knew that he had interpersonal friction between two sets of drivers from three plants, predominately between the Americans and Russians. Conflicts stemmed from perceived status differences and language tensions. Therefore on the day that Pierce Ready Mix won the DOT job, Sam set up a face-to-face meeting inviting both groups. His purpose was not to dwell on the many day-to-day problems at a previous job but to identify the goals that would show both sets of drivers that they were meeting the job’s specs. Since they all had a great work ethic, Sam assumed that all he needed to do was explain the importance of the job to the company’s revenue, and therefore their income and overtime potential. What he found was that as the owner, when he spoke it closed the dialog and prevented the infighting. His solution? Hold a second required meeting, this time run by an outside facilitator who was not a hierarchical threat and was able to get lots of participation from drivers. In reality, the facilitator became the mediator to see that various solutions had a process to work through that was fair to all parties.

What the mediator told Sam was that the workforce was not evenly distributed among his various plants so the sub-ethnic groups strengthened various preexisting differences. What the facilitator did was concentrate on the drivers’ various expertise so their schedules, and then plant locations, matched the job’s requirements, not cultural location comfort. Therefore, the more experienced drivers with more technical knowledge were scheduled at critical times and at various plants. That helped batching, scheduling and delivery. The facilitator then called in small mixed groups of American and Russian...
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drivers, re-mixing the participants each time, so over the job, the drivers got to know and respect everyone else. By the end of the job, the whole group was much more cohesive.

Managerial Intervention

Rhodes’s U.S. cement buyer had significant shipping expertise dealing with the Chinese, yet dealing with the export pressures with the Chinese bureaucracy continued to create havoc for Rhodes in the U.S. and Europe. Having learned over the years that approaching his Chinese counterparts’ superiors to push shipping schedules forward faster was a severe breach of etiquette and loss of face, the cement buyer approached his own superiors so they in turn could approach those Chinese equal in status and power.

Another example of managerial intervention is when Rhodes hired many Portuguese bookkeepers in their Providence, RI office. While they spoke grammatically correct English, they had a pronounced accent over the phone, clearly heard when they called to collect late payment or to clarify billing invoices with contractors. In setting the ground rules for his team, the Rhodes Providence accountant addressed his team of bookkeepers directly, telling them they had been chosen for their skill, not their fluency in English, and that they were going to have to work around their language problems. When they had their customer service training, they were advised to acknowledge their accents up front, telling customers that if they were not understood, to please stop them and ask questions.

Exit

Pierce Ready Mix set up a temporary office that just worked on issues for the multi-year DOT contract. One of the project’s managers was Russian, the other Hispanic. Conflict developed between the two over how to approach problems. The Russian’s temper would flare and his tone would become hostile and dogmatic, while the Hispanic would question why it could not be done another way. Clearly over time, their differences moved from cultural to personal. When the project ended and the temporary field office closed, both could have transferred to another Pierce location. The Russian just left Pierce over the differences because he would not adapt to working in a more culturally diverse environment and also could not adapt to the Hispanic man’s communication style.

In conclusion, it should be noted that not all multicultural issues are based on communication issues. Sometimes they are side problems stemming from fundamental managerial problems. Nevertheless when communication is the crux of the matter, and while all solutions have potential complications, generally speaking there are patterns to successfully work through the problems. First, managers must intervene early and set norms. Second, they must engage all the players so employees see that their challenges stem from cultural differences, not personality differences. Finally, successful solutions need to arrive creatively and with a sense of humor.

The work of the RMC Research Foundation is having a profound impact on the concrete industry. This is evidenced through foundation study data that has resulted in regulatory changes saving the industry millions of dollars from unnecessary and ill-conceived regulations and that have improved the environment and increased workplace safety, the hundreds of industry personnel who’ve participated in training programs and certifications developed through funding by the foundation, and from research that is making tremendous strides toward improving concrete and expanding its applications. The latest release from the RMC Research Foundation is a Spanish translation of the National Ready Mixed Concrete Association’s (NRMCA) *Truck Mixer Driver’s Manual* (TMDM) into *Manual del Conductor de Mixer*.

One of the greatest challenges facing the ready mixed concrete industry today is a current and potentially devastating shortage of drivers. Many new drivers to the industry are increasingly coming from the Spanish-speaking community. While all drivers holding commercial driver’s licenses must be able to speak and read English well enough to acquire a CDL, they aren’t necessarily fluent enough to be able to fully take advantage of training materials available to them. For this reason, the Board of Trustees of the RMC Research Foundation chose to fund the translation of one of NRMCA’s most popular publications. The TMDM has long been considered one of the industry’s best resources for drivers. Its compact size and practical tips on a wide range of topics, including driver duties, safety tips, customer relations, maintenance tips and other valuable information, make it a must-have for all drivers. The translation of this manual was
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done in partnership with the Latin American concrete association and was done in Peruvian Spanish, which is generally considered to be the most widely used dialect in the United States.

The Spanish version of the TMDM is the first of two Spanish language translations funded by the RMC Research Foundation.

The second is a translation of NRMCA’s Certified Concrete Delivery Professional (CDP) program modules and will be released soon. The translation of the CDP materials will give Spanish speaking drivers the opportunity to become certified by providing them with training materials they will be better able to understand and apply.

For more information about this or other projects supported by the RMC Research Foundation or to learn how to submit a proposal for funding, please visit www.rmc-foundation.org. To order hard copies of the Spanish TMDM, please visit www.nrmca.org or call 888-846-7622.

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Great Projects Come From Great Minds

By Jennifer LeFevre, RMC Research Foundation Program Director

The RMC Research Foundation was founded to improve and advance the ready mixed concrete industry through research and education. Many of the issues addressed through the work of the RMC Research Foundation have come about because of an obvious need within the industry. Other projects came as requests from organizations wishing to partner on a project or were recommended to the foundation by universities or others within the industry. While not every project proposed to the RMC Research Foundation’s Board of Trustees is approved for funding, the discussion and debate of all ideas presented to the foundation often result in the development of additional concepts and projects for foundation trustees to consider. It is these discussions and subsequent conversations with researchers and others throughout the industry that help the RMC Research Foundation to forward the best possible programs that will provide the most benefits for the industry and the communities they serve.

The ultimate fundraising goal of the RMC Research Foundation is to achieve a $20 million endowment that will provide approximately $1 million annually in interest income for program funding in perpetuity. Currently, annual project funding is about $500,000. Current industry needs and the value a specific project will bring to the industry play a large part in determining program funding. Research projects have included those related to health and safety, the environment and the Prescriptive-to-Performance (P2P) movement and concrete applications. Educational programs have included support of the Concrete Industry Management (CIM) program and the development of industry certification and training programs and materials such as textbooks and guides. The value of pooling industry funds also allows the industry to share risk for projects such as theoretical research. However, all projects approved by the RMC Research Foundation will contribute to the essential goals of improving the quality and professionalism of the ready mixed concrete industry.

The process for submitting a project for consideration by the RMC Research Foundation Board of Trustees is very straightforward. The foundation’s Grant Guidelines and sample application format may be downloaded from the website at www.rmc-foundation.org. The proposal should include vital information such as amount of funding requested, duration of the project, a brief description of the project and information about the anticipated outcomes and how the project would benefit the industry. The proposal may include any additional details that may be helpful to the process. However, if someone has an idea for a project, a conceptual proposal may be submitted in an effort to find out if the foundation leadership believes the project would have enough merit to justify the development of a full-blown proposal. Proposals are first considered by the foundation’s advisory council and then by its program committee. The advisory council consists of industry members whose expertise is critical in discussions of the value different projects would bring to the industry and the public at large. Advisory council members include ready mixed concrete industry professionals, university researchers and professionals from allied organizations. They provide feedback about the merits and concerns of each project through regular conference calls. Their input is then communicated to the program committee, which consists of members of the foundation’s board of trustees. The program committee also debates the merits and possible drawbacks of each project, taking into consideration budgetary issues, industry needs and the recommendations of the advisory council. Like the advisory council, the program committee also communicates through regular conference calls. Finally, the proposal is forwarded to the RMC Research Foundation Board of Trustees for approval or rejection. They will consider the recommendations by the advisory council and the program committee and will also look at the program budget and needs of the industry.

The members of the RMC Research Foundation’s Board of Trustees understand the significant responsibility they have in selecting the programs that will receive funding. So far, the results speak for themselves with many of the foundation’s projects providing quantifiable benefits to the industry and general public. Many of the original RMC Research Foundation contributors have chosen to increase and extend their initial pledges because they have seen the value of the work the foundation is bringing to the industry. The ready mixed concrete industry is stronger today because of the high value projects that have come from great minds working together.

If you have an idea for a proposal to be considered by the RMC Research Foundation, please visit www.rmc-foundation.org or contact the foundation at 866-846-7622 for more information.
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It is estimated that 2007 will be the hottest year in recorded history! The British Meteorological Office reported in January that a resurgent El Nino and an increase in greenhouse gases will result in a 1.2-degree Fahrenheit increase over the long-term average. The increase in temperature results in higher energy prices, greater CO\textsubscript{2} emissions from residential and other heating and cooling units and an overall reduction in available fossil fuels. Developing a balanced design approach for residential homes, including a structure with a high thermal mass, would help reduce energy consumption. This will reduce the dependence on air-conditioning systems, thus reducing the dispersion of CO\textsubscript{2} and the increase in global greenhouse gas emissions.

Thermal mass in the most general of forms is any mass that absorbs and stores heat energy. In the building system, it is the mass of the building elements that stores heat during the hottest periods of the day and releases the heat during the cooler evening hours, as shown in Figure 1. Concrete is one of the primary building materials that provide advantages of thermal mass in building systems. In the winter season, the high thermal mass concrete home absorbs radiant heat from the sun and is gradually released back into the home during the night when the outdoor temperature drops. Concrete is an ideal building material for residential structures desiring high thermal mass due to its high specific heat, high density and low thermal conductivity. The distinct benefits to the thermal mass of concrete construction in residential design are:

- Heat is absorbed by the concrete exterior and slab during the day, reducing the internal temperature
- Heat is released by the concrete exterior and slab during the day, stabilizing the internal temperature

**Figure 1.** Benefit of high thermal mass during summer and winter seasons.
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• Moderate shifts in peak loads of energy requirements due to the reduction in high fluctuations between indoor and outdoor temperatures.
• Heat transfer through a high thermal mass home, one constructed of concrete, is reduced, therefore, less energy is used to heat and cool the home.
• The thermal mass of concrete delays peak temperatures and reduces and spaces out peak energy loads, therefore, may shift the energy demand to off peak periods when utility rates may be lower. The damping and lag effects of a high thermal mass building are shown in Figure 2.

Several studies have researched the impact of high thermal mass concrete residential structures on energy savings. The Oak Ridge National Laboratory (ORNL) published a study comparing the energy performance of high thermal mass wall technologies with the typical residential light-weight wood-framed technologies. The ORNL report detailed a residential home constructed of Insulated Concrete Form (ICF) construction, the use of foam forms, which are filled with ready mixed concrete at the site. The ICF walls provide a high thermal mass when compared to a typical wood framed construction home. The results of the study indicated that the average potential whole building energy savings (ICF house vs. conventional wood-framed house) for all U.S. locations is approximately 8%. Figure 3, reproduced from the ORNL report, shows the energy savings from a high thermal mass construction for various U.S. cities.

Figure 2. Damping and lag effect of thermal mass.
With the inevitable rise in outdoor temperatures leading to higher energy use, additional CO₂ emission and more expensive heating and cooling bills, increasing the thermal mass of residential homes through the use of concrete construction is a viable option for sustainable design. Increasing the thermal mass of a building can provide cooler summer indoor temperatures, a shift in the peak energy load leading to possible monetary savings and an overall reduction of energy up to 10%.


Erin Ashley is director of codes and sustainability for the National Ready Mixed Concrete Association. She provides technical support to NRMCA members and state affiliates regarding local building codes and standards and promotes the adoption of statewide minimum building codes. She represents NRMCA on various national building code committees and green building standard committees. Ashley provides education and training programs for concrete producers, contractors, engineers and architects with a focus on building codes and sustainability. She can be reached at eashley@nrmca.org.

Figure 3. A potential whole building energy which can be saved in 10 U.S. locations by the replacement of conventional wood frame walls by ICF walls.
The MINER Act:
What Vertically Integrated RMC Producers Need To Know About Proposed Changes in Assessments

By Thomas Harman, NRMCA and Andrew O'Hare, PCA
As a direct result of the mining catastrophes that occurred in early 2006, Congress amended the Federal Mine Safety and Health Act of 1977 (the ACT) last year to improve the safety of mines and mining. The Mine Improvement and New Emergency Response Act of 2006 (the MINER Act) was signed into law by President Bush on June 15, 2006. Although most provisions in the amended law are relevant to coal mining, and particularly to underground coal mining, all producers must be apprised of and comply with sections in the law that pertain to operations regulated by the Mine Safety and Health Administration (MSHA); this includes cement, sand, gravel and stone (CSSG) production facilities.

The most noteworthy aspect of the new law as it relates to CSSG production facilities is a proposal to change the civil penalty assessment structure published on September 8, 2006. In the proposed rule, the MSHA suggests eliminating the single penalty assessment, currently at $60. Single penalties typically are uncontested by operators. Should the agency remove the single penalty assessment in the final rule, a potential outcome would be for companies to raise objections to paying de minimus citations and such citations would be decided through legal procedures. In this situation, the Federal Mine Safety and Health Review Commission (FMSHRC) would hear cases that deal with conditions having no potential to cause injury or illness.

In addition, MSHA proposed to significantly change how the agency reviews citation history. MSHA suggested that the current 24-month review period be decreased to 15 months and that a new category, “Repeat Violations of the Same Standard,” be added. Given that surface facilities are mandated by statute to be inspected two times per year, and that underground facilities are inspected four times per year, the net effect of decreasing the review period should be negligible.
However, repeat violations may be problematic for operators. Some mandatory health and safety standards are subjective depending on which inspector is inspecting a CSSG facility. For example, interpreting what constitutes an accumulation of combustible materials such as paper products is unique to the individual inspector in the absence of a discrete measurement of the paper. Put another way, what one inspector deems as an accumulation of combustibles that warrants a citation may be simply viewed as needing to be removed by another inspector. A repeat violation that is subjectively issued adds a challenge to operators they have not had in the past.

The time to request a conference with MSHA to discuss a citation was also changed in the proposed rule. MSHA currently allows 10 working days to request a conference from the time the citation is issued. MSHA proposes to change that time frame to five working days.

Special assessments are addressed in the MSHA proposal. Significantly, the agency removed the eight criteria for recommending special assessments and replaced the section with “flexible” determinations by MSHA that are related to the normal assessment criteria, such as company size, good faith, operator negligence, etc. Administering special assessments at the agency’s discretion is arbitrary on the part of MSHA.

Finally, flagrant violations are addressed. These infractions are subject to a maximum penalty of $220,000 under Section 8 of the MINER Act. Flagrant violations are those that result from “a reckless or repeated failure to make reasonable efforts to eliminate a known violation of a mandatory health or safety standard that are substantially and proximately caused, or reasonably could have been expected to cause death or serious bodily injury.”

MSHA published its evaluation criteria for both “reckless failure” and for “repeated failure.” In both cases, the following three conditions must occur: a citation is significant and substantial; the injury or illness is permanently disabling or fatal; and the citation is classified as “unwarrantable failure.” “Reckless failure” means that the operator showed “reckless disregard” in creating the violation; “repeated failure” means that there were at least two times in the past 15 months when there were “unwarrantable failure” violations of the same safety or health standard at the location.

Since MSHA proposed these changes to its assessment structure, Richard Strickler has assumed the position of assistant secretary for mine safety and health. Strickler received a recess appointment from President Bush. Strickler’s team is implementing the congressional mandates outlined in the MINER Act.

1. The Federal Mine Safety and Health Act of 1977, Public Law 91-173, as amended by Public Law 95-164, approved November 9, 1977
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