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Historic Concrete Investigations
at Pointe-du-Hoc, Normandy, France

By Tanya Wattenburg Komas, Ph.D. and Richard Burt, Ph.D.

The Concrete Industry Management (CIM) Program at California State University, Chico, working with an existing Texas A&M University project, had the honor of participating in a unique research opportunity that was partially made possible through student travel sponsorship generously offered by NRMCA. In March 2008, Tanya Wattenburg Komas, Ph.D., faculty with the Chico State CIM program, traveled to Normandy, France, to conduct non-destructive testing of the concrete structures at the historic World War II D-Day landing site at Pointe du Hoc with five CIM students, including Chad Golden, Andrew Billingsley, Courtney Sheehan, Alexx McAvoy and Robert Hostettler. Larry Olson, PE, owner and president of Olson Engineering, volunteered the use of his company’s equipment and his time for on-site student training so they could complete the testing. Involvement of Chico State in the project began as a result of the need to determine foundation depths for use in Texas A&M University’s work to document and evaluate the overall site and cliff.

Significance of the Site
Pointe-du-Hoc is the most culturally important historic site of the 1944 World War II Normandy invasion. Celebrating the 40th anniversary of D-Day, President Reagan, on top of the Observation Post remarked that “Their mission was one of the most difficult and daring of the invasion: to
climb these sheer and desolate cliffs and take out the enemy guns.” (Brinkley, 2005) President Reagan was referring to the early morning of June 6, 1944, when Lt. Col. James Earl Rudder led elements of the 2nd Ranger Battalion in one of the most famous and heroic actions of D-Day. Their mission was to destroy 155mm cannon capable of firing on troops and ships landing on Utah and Omaha beaches (Ambrose 1989, Historical Division, U.S. War Department 1946, Lane 1994, McDonald 2000). (Figure 1).

Pointe-du-Hoc is a medium coastal battery consisting of a variety of structures such as gun emplacements, casemates and personnel and ammunition bunkers. Constructed as part of Hitler’s Atlantic Wall campaign, it was strategically placed between the Utah and Omaha invasion beaches. The site was designated a class A Historic Site by the French Government on 28 February 1955. The site was formally transferred to the American Battle Monuments Commission (ABMC), a small, independent agency of the Executive Branch of the U.S. federal government, for perpetual care and maintenance on January 11, 1979, and remains a monument to those who sacrificed on that fateful day (Figure 2).

The Question of Concrete Quality

At the height of the construction of the Atlantic Wall from mid-1942 to mid-1944 over 13,234,500 m³ of concrete was placed by the Todt Organization (Saunders, 2001) in what was considered at the time one of the greatest construction undertakings since Roman times (Handbook of the Organization Todt, 1945). The urgent need to construct the defenses led to construction continuing through the winter and increasing allied bombing led to scarcity of high quality cement and coarse aggregate (Saunders 2001, Dorsch 1979, Schmetzer 1979). These are all factors that would affect the quality of the concrete.

Construction was underway at Pointe du Hoc in August 1942 when the battery was spotted by aerial reconnaissance and was continuing at the time of the invasion in June 1944 (Allied Central Interpretation Unit, 1944). There appears to be two distinct phases of construction. The first phase involved the construction of the six circular gun emplacements for the 155mm guns and the support buildings (Personnel, Ammunition, Anti-Aircraft and Hospital Bunkers and the Observation Post or Fire Control Post). The second phase involved the construction of four gun casemates that were intended to replace the open gun emplacements.

From 25, April 1944, the site was subject to intensive bombing from medium and heavy bombers dropping 500, 1000 and 2000 lb. bombs. The easy identification of the Pointe resulted in accurate attacks during daylight raids. Destruction of the site continued on D-Day when the site was subjected to naval bombardment from several ships, including the 14 inch guns of USS Texas. Photographs taken after the battle show the site virtually covered with bomb and shell craters that are still clearly present today (Figure 3).
Several questions remain regarding the concrete fortifications at Pointe du Hoc. What are the differences in the quality of the concrete between the different structures and different construction phases? How did the quality of concrete affect the amount of damage sustained during Allied bombing? How much deterioration of the concrete and corrosion of the rebar has occurred since D-Day, especially given the location in the high chloride environment near the ocean?

Concrete Evaluation Project

Setting the stage for the concrete evaluation was ongoing survey and documentation work and cliff evaluation by the team from Texas A&M University funded by a grant from the American Battle Monuments Commission (ABMC). That work at the site began in September 2003 with the goal of producing a comprehensive site plan and determining the conditions of the eroding cliff face. Observations of the remains of the structures noted during the survey and documentation work suggested anomalies that raised concerns about the consistency and quality of the concrete and thus questions about the future stability of the structures. Among the noted anomalies were that some of the structures were remarkably intact while others showed very little damage as a result of the bombing; the concrete may not have cured completely at the time of the invasion, and differences in aggregate types and grading.

Chico State became involved in the project because of their expertise in historic concrete evaluation and repair as part of the CIM program. While the on-site testing began because of the need to determine foundation depths, the project afforded the CIM students the opportunity to become proficient at operating the Olson Engineering state-of-the-art non-destructive testing equipment while collecting valuable data about the overall existing conditions of the concrete and reinforcing in several key structures. It also allowed the students to compare the use of newer equipment with more traditional units such as the Schmidt Hammer. (Figure 4).

Research Method

There have been three components to the concrete research to date, including laboratory testing, historic document research, and on-site testing.

Laboratory tests were completed in December 2006 at Construction Technology Laboratories (CTL), Chicago. CTL donated the use of its laboratory facilities and allowed the faculty from CSU Chico to work with its professional personnel to conduct laboratory testing of concrete and cement samples from the Pointe du Hoc site. The tests were undertaken to determine the mix proportions and compressive strengths of two samples of concrete from different structures built at different times. Tests were

Figure 4: Inside the Observation Post, Courtney Sheehan tests relative concrete strength with a Schmidt (rebound) Hammer while Chad Golden uses a Cover Meter to determine location, size, and cover of embedded reinforcing.

Figure 5: Cement that was never used as a result of the D-Day invasion. The form is that of the sack in which the cement cured after having been left on the ground after D-Day.

Figure 6: Casemate that appears to have been under construction at the time of the D-Day invasion and was destroyed by a bomb prior to completion. The sack of hardened cement in Figure 5 sits nearby.
CONCRETE

also performed to determine the cement composition from a sample obtained from a hardened sack of cement that remained on the site from the date of original construction. The cement appears to have been intended for use in completing a new concrete block casemate that was destroyed by a bomb prior to completion (Figures 5 & 6). The combined tests revealed similarities and differences between the concrete samples.

Locating and evaluating historic documents related to the concrete materials and construction at the site is on-going. This research has revealed such historic documents as those from the Ministry of Supply’s Advisory Council on Scientific Research and Technical Development “Anti-Concrete

Figure 7: Chad Golden (on top of the casement) holds a transmitter that is sending ultrasonic pulses through the approximately 80 inches of concrete where Robert Hostettler (inside) is holding the receiver. Andrew Billingsley (seen through the barbed wire) is running the test data via a field ruggedized computer on the velocity of the sound waves to determine soundness of the concrete.

Figure 8: Close-up of Ultra Sonic Pulse Velocity test on Observation Post interior wall with two-sided access.

Figure 9: Alexx McAvoy and Robert Hostettler conduct an impact echo test on the Observation Post. Impact Echo Tests can be conducted with one or two-sided access.
Conclusion

It is the hope of the collaborative Texas A&M University and California State University, Chico teams and many others that the important work of surveying, evaluating, and preserving the landscape and structures at Pointe du Hoc will continue. The importance of this endeavor cannot be understated, particularly as it relates to the younger generations. For the faculty and student researchers from both institutions, their hands-on experiences with this project have not only enabled them to learn a great deal about site and structural documentation and evaluation, but also given them the life-changing experience of having participated in honoring the individuals who sacrificed so much at that pivotal point in the history of the world. The continued presence and accessibility of sites such as Pointe du Hoc promise to help keep alive the memories and lessons of this and other such important sites along the Normandy Coast and throughout the world.

Further Information

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Dr. Tanya Wattenburg Komas holds a Ph.D. in Architecture from Texas A&M University, a Certificate in Historic Preservation from Texas A&M University, an MS in Historic Preservation from Columbia University, New York, a BS in Landscape Architecture from the University of California, Davis, and is a member of the International Concrete Repair Institute and the Association for Preservation Technology International. Dr. Komas is on the faculty of the Concrete Industry Management program at CSU, Chico, and is an invited Corresponding Fellow of the Center for Heritage Conservation, College of Architecture, Texas A&M University. Dr. Komas has extensive experience in building design and preservation, directs academic and professional research in concrete repair and preservation and in the development of computer graphic methodologies for use in many areas of the building professions.

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A Common-Sense Log Requirement

By Robert Sullivan
Senior Vice President of Government & Legal Affairs

Since 1942, with the passage of the Federal Reports Act (FRA), Congress has been interested in promoting the quality, integrity and utility of information collected and disseminated by the federal government. The FRA established the policy goals of minimizing the paperwork burden on U.S. businesses and assuring the necessity and usefulness of information collected from the public and used or disseminated by the government.

However, the federal paperwork burden continued to balloon over the decades, and in 1980 Congress again took steps to reduce the paperwork burden on U.S. businesses and to promote the utility and quality of data collected and disseminated by federal agencies by passing the Paperwork Reduction Act (PRA). This act marked the first effort by Congress to comprehensively manage the federal government’s information collection activities. The PRA was enacted for the primary purpose of minimizing the federal paperwork burden on the public, and maximizing the utility of collected and disseminated information. Notably, small businesses were specifically identified as intended beneficiaries of the PRA reforms. Unfortunately for the ready mixed concrete industry, things have not worked out as Congress planned under the PRA.

Driver’s Daily Log

The federal government has regulated the hours of service (HOS) of commercial motor vehicle operators since the late 1930s; the Interstate Commerce Commission (ICC) promulgated the first HOS regulations under the authority of the Motor Carrier Act of 1935. See 49 U.S.C. § 31502(b)(1). Jurisdiction over HOS regulations passed from the ICC to the Federal Highway Administration in 1995, and then to the newly created Federal Motor Carrier Safety Administration (FMCSA) in 2000.

Since its creation by the ICC in 1938, a driver’s daily log form has been used to aid motor carriers and drivers alike in their efforts to observe the HOS regulations. The log has a grid format with 15 minute increments and is completed by the driver to record the hours for each duty status. By looking at the submitted log, a motor carrier and a driver may determine the number of hours available for on-duty purposes. This is especially important for long-haul drivers in cross country dispatch that need to know the number of hours available to be on duty and be confident that the maximum HOS limitation will not be exceeded. The limitations as recorded in the log are designed to provide a general scale beyond which a driver is considered to be too fatigued to safely operate a commercial motor vehicle.

In addition, the driver’s daily log has been the primary regulatory tool used by the federal government, state governments, drivers and commercial motor carriers to determine a driver’s compliance with the HOS regulations. The information obtained from the log is used to place drivers out of service when

This small fix would provide real relief from a paperwork burden that has plagued the ready mixed concrete industry for decades.
they are in violation of the maximum limitations at the time of inspection. It has also been used in determining a motor carrier’s overall safety compliance status in controlling excess on-duty hours, a major contributor factor in fatigue induced accidents.

From the inception of the log requirement 70 years ago, exemptions from preparing the driver’s daily log have been allowed for drivers of commercial motor vehicles who operate wholly within a specified distance from their normal work reporting location (e.g., garage, terminal or plant). Currently, a 100 air-mile (equivalent to 115.08 statute miles) radius log exemption is applicable if:

1. The driver returns to the work reporting location and is released from work within 12 consecutive hours;
2. At least 10 consecutive hours off duty separate each 12 hours on duty;
3. The driver does not exceed 11 hours maximum driving time following 10 consecutive hours off duty; and
4. The motor carrier that employs the driver maintains and retains for a period of 6 months accurate and true time records.

This exemption, which is found in 49 C.F.R. § 395.1 (e), was first provided in 1980 as part of an effort to reduce the paperwork burden on drivers and motor carriers (See 45 FR 22042). However, the historic basis for the exemption has always been grounded in the understanding that drivers in the short-haul trades are less subject to the fatigue related effects of extended hours of driving time associated with cross country travel. Indeed, over the years the exemption radius has been steadily increased to take into account improvements in highway designs, expansion of roadways in metropolitan areas and improved truck design (See 42 FR 55109, 55110).

Ready Mixed Concrete Operations

As noted above, the 100 air-mile exemption has been used by the FMCSA and its predecessor agencies to meet paperwork burden reduction and regulatory flexibility mandates. However, as currently promulgated it contains a fatal flaw that ironically serves to exacerbate paperwork burdens for the ready mixed concrete industry.

Like many other short-haul operators, concrete mixer truck drivers are on-call and deliver product on a just-in-time basis. They operate exclusively in the short-haul construction industry, generally beginning and ending each shift at the same plant location and rarely exceeding a 50 air-mile radius of the work reporting location. In fact, industry studies show that a concrete mixer truck driver’s average delivery is only 14 miles from the ready mixed plant and concrete mixer truck drivers are actually driving only 4 to 6 hours per day. As a result, concrete mixer truck drivers are eligible for the 100 air-mile radius log exemption contained in § 395.1 (e) and ready mixed concrete producers employing these drivers are subject to the reduced recordkeeping requirements specified in § 395.1 (e) (5). This latter provision enables a company to keep track of concrete mixer drivers’ hours through an electronic time clock that indicates the start time, number of hours on duty, and the time the driver gets off work each day. Unfortunately, concrete mixer truck drivers are often unable to take full advantage of the 100 air-mile radius exemption. This is almost always caused by a driver surpassing the 12-hour on-duty threshold contained in § 395.1 (e)(1)(ii) due to the unpredictable nature of concrete delivery requirements. In these instances, drivers are required to complete lengthy log sheets on the days they exceed the threshold (See FMCSA 395.1 Interpretation #22).

The new HOS regulations afford drivers a maximum of 14 consecutive hours of on-duty time per shift (after which drivers may not drive), yet drivers who otherwise meet the requirements of the 100 air-mile radius log exemption must still complete a log if they exceed 12 hours of on-duty time during the shift. Unlike in the long-haul trades, it is very difficult in the ready mixed concrete industry to predict on any given day whether the 12-hour threshold will be surpassed. If the driver surpasses the threshold but did not expect to do so, he or she must go back and retroactively log his or her duty status for the entire day. This is simply not practical for concrete mixer truck drivers, as their duty status changes frequently throughout the day and completing an accurate log from memory is a difficult task. To preempt such difficulties, many ready mixed concrete producers have instructed their drivers to log every day just in case they happen to exceed the 12-hour threshold, which is contrary to the intent of the 100 air-mile radius logging exemption.

The FMCSA has claimed that the 12-hour return to work reporting location limit is a necessary safeguard to ensure that drivers adhere to driving time limitations. (See 64 FR 72373, 72375). Yet, as indicated above, concrete mixer truck drivers only drive 4 to 6 hours per day, definitely not fatigue inducing conditions. Requiring them to return to the plant within 12 hours so that they don’t exceed 11 hours of driving time is regulatory overkill and unnecessarily burdensome. Notwithstanding repeated requests from NRMCA and other short-haul operators, the FMCSA has yet to provide any data to underpin the seemingly arbitrary 12-hour return time limit.

A Common Sense Fix

The PRA requires agencies to ensure that their paperwork collection requirements have practical utility, are not duplicative and impose the least possible burden. In the case of the 100 air-mile radius log exemption, all three of these congressional directives have been ignored by the FMCSA. As a result, concrete mixer truck drivers and other short-haul drivers have for years been forced to complete a burdensome paperwork requirement from which they are clearly exempt.

To show its commitment to the PRA, FMCSA should institute a process that would provide a common-sense fix for the 100 air-mile radius exemption. The remedy would simply involve raising the 12-hour on-duty threshold in § 395.1 (e)(1) (ii) and § 395.1 (e)(1)(ii)(A) to 14 hours, thereby making these provisions consistent with the maximum allowable number of hours per shift, after which the driver may not drive. This would allow concrete mixer truck drivers to take full advantage of the 100 air-mile radius log exemption for the entire 14 hours of on-duty time.

Moreover, this small fix would provide real relief from a paperwork burden that has plagued the ready mixed concrete industry for decades. The costs associated with having to unnecessarily complete the drivers’ daily log in terms of money spent on reporting, the time taken by drivers to fill out the logs, and the overall drain on manpower in the process is truly burdensome. In comments to all the recent HOS rulemakings the National Ready Mixed Concrete Association has outlined the simple steps that can be taken to reduce this burden without compromising safety. It is our hope that FMCSA will take these steps.

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RMC Research & Education Foundation: Serving the Public One Project at a Time
The mission of the RMC Research & Education Foundation is to support research and educational programs that will increase professionalism and quality in the concrete industry. But the work of the Foundation does much more than that by helping to protect the public and improve the quality of life for all citizens. The Foundation’s programs provide a wide range of benefits: strengthening buildings to protect life and property from weather disasters; providing energy savings in this time of skyrocketing energy costs; developing training materials for those who are new to the industry and to enhance the skills of professionals in the industry, among others.

The fight to overcome the wrath of Mother Nature in the form of hurricanes, tornadoes and floods is fought in almost every region of the country. Following the devastation and destruction of Hurricane Katrina in the Gulf Coast region in 2005, the Foundation partnered with the Mississippi Concrete Industries Association (MCIA) and Mississippi State University to produce “Coast in the Eye of the Storm – Hurricane Katrina: August 29, 2005” which evaluates how building systems hold up to high winds, storm surge and flooding. The findings of the study helped spur changes in building codes in Mississippi and could also be applied to areas devastated by deadly tornadoes and river flooding such as those experienced by communities in the Midwest over the past year.

Energy costs for items like gasoline and home heating oil continue to rise, squeezing the budgets of Americans nationwide. Fuel efficiency standards are being scrutinized and additional avenues of decreasing the country’s dependency on oil are being sought. One of the Foundation’s latest projects is a study on the effect of pavement type on fuel consumption and emissions. Being conducted at the University of Texas at Arlington, the study will focus on urban driving conditions on streets and local roads that will build on previous research that examined these issues on highways. The project includes a correlation to government data so that the model can be used to calculate fuel consumption savings and environmental benefits of a variety of pavement types by municipalities and state DOTs to assist in their decision-making. Beside the obvious benefit of saving fuel through the use of concrete pavements, the work will also be used to help understand the overall carbon footprint of concrete vs. asphalt pavements over the design life of the project.

After a harsh winter, many people are still reeling from the high costs of heating their homes. As hot summer temperatures approach, potential record-breaking electricity costs and possible rolling blackouts loom. One of the ways to curb high energy use in both winter and summer is to build with energy efficient building materials such as concrete. In fact, as noted in the Ready Mixed Concrete Industry LEED Reference Guide, “Buildings constructed of cast-in-place, tilt-up or insulating concrete forms (ICF), possess thermal mass to help moderate indoor temperature extremes and reduces peak heating and cooling loads. In many climates, these buildings use less energy than non-massive buildings with walls of similar thermal resistance.” Utilizing concrete to reduce energy costs is just one way that concrete may contribute toward gaining additional points in projects certified by the United States Green Building Council’s (USGBC) Leadership in Energy and Environmental Design (LEED) program.

Concrete pavement’s light coloring and high reflectivity allows parking lot owners to use less lighting while offering increased brightness, saving energy costs while protecting the safety of patrons at the same time.

Increased recycling efforts nationwide will not only decrease the need for new resources but will also decrease costs for raw materials and disposal fees. Recycling and the use of recycled materials are increasingly becoming more popular within the construction industry as innovations and research studies demonstrate the benefits of recycling. One recent example is the...
The primary mission of the RMC Research & Education Foundation is to improve concrete and educate professionals within the industry for the benefit of the public-at-large.

Foundation’s “Crushed Returned Concrete as Aggregates for New Concrete” final report released last fall. Not only will the increased use of recycled concrete decrease the need for raw materials, it will result in significant decreases in materials sent to landfills. Communities are already struggling with landfills that are at maximum capacity so every opportunity to minimize their use is welcome – by both companies and the people they serve.

As manufacturing jobs are moved overseas, many people are finding the need to move to new industries and be retrained. The RMC Research & Education Foundation funded the development of several important training tools to assist professionals just coming into the industry as well as those gaining new responsibilities in their jobs. Some of these materials include the development of a Financial Management Course for the Ready Mixed Concrete Industry, the Plant Manager Certification Course, a student textbook and instructor materials for the Plant Operator Certification, the Ready Mixed Concrete Sales Manager Training Course and a brand new course – The Effective RMC Supervisor. All of these courses and materials provide detailed training opportunities so that the professionals in all areas of the concrete industry may expand their knowledge base and maximize their potential – whether they are just coming into the industry or are expanding their responsibilities. Having better educated employees at all levels of the company also means ensuring a quality product, as concrete quality can be influenced by the decision-making and actions of a variety of individuals within a company.

Training materials offer benefits beyond helping to assimilate new employees to the industry. Providing additional training to professionals helps them learn to be safer on the job, protect themselves, coworkers and those in the communities in which they work. As more and more concrete delivery professionals come from the Spanish-speaking community, it is important that they have access to training materials as well. Often they will understand and be better able to apply training materials when they have the opportunity to read materials in their native language which is why the RMC Research & Education Foundation funded the translation of two important training tools into Spanish – The Truck Mixer Driver’s Manual and the Study Guides for the Concrete Delivery Professional certification program. These materials will help some new drivers to the industry to better understand and absorb the information, making them safer drivers and better employees.

With the winter season comes the pothole season causing commuters to grumble about the increasing number of pavement ruts resulting from severe winter weather. However, the work of the RMC Research & Education Foundation is helping to improve the quality of our nation’s infrastructure through a variety of educational programs and research projects designed to improve concrete and the knowledge base of those who work with it. Our many studies examining pervious concrete have repeatedly demonstrated the benefits of its use and will provide users with the information necessary to maintain it properly. Similarly, the Pervious Concrete Contractor Certification, of which the Foundation funded the craftsman text, will ensure its proper placement. The Foundation’s work in the area of the Prescriptive-to-Performance (P2P) Initiative will also allow to industry to make great strides in enhancing the quality of our nation’s infrastructure as more projects are specified using performance specifications over prescriptive specs. These solutions will not only provide the nation with better materials but will help to stretch infrastructure dollars further as well, making everyone happy.

When people consider the question of how to make roadways safer, most solutions offered often include decreasing speed limits or adding speed cameras. The concept of the selection of pavement type has not yet entered the realm of increasing roadway safety. However, the RMC Research & Education Foundation is funding research to examine the use of pervious concrete pavements for streets and local roads, which would contribute significantly to road safety. Pervious concrete pavement allows water to run through it, which would considerably decrease road spray. Pervious concrete also would offer enhanced skid resistance and would offer noise reduction. Additionally, beyond the energy saving benefits noted earlier, bright and reflective concrete pavements contribute to the safety of those who may be stranded on the side of the road at night by providing greater reflectivity of highway lights than its darker pavement counterparts. In this instance, the peace of mind offered by something as simple as a brighter pavement should not be underestimated.

The primary mission of the RMC Research & Education Foundation is to improve concrete and educate professionals within the industry for the benefit of the public-at-large. As a 501 (c) 3 organization, the Foundation accepts tax-deductible contributions from corporations and individuals and therefore must provide a tangible benefit to the citizens of the United States. As part of that goal, the Foundation will continue to help communities and individuals around the country to face the challenges they encounter every day.

For more information about the work of the RMC Research & Education Foundation or to recommend a project for funding consideration, please visit www.rmc-foundation.org or contact Executive Director Julie Garbini or Program Director Jennifer LeFevre at 1-888-846-7622 or at jgarbini@rmc-foundation.org or jlefevre@rmc-foundation.org, respectively.
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Part 5: Waterproof Concrete

Concrete Doesn’t Just Come In Vanilla Anymore

By A. Vance Pool, Senior National Resource Director, NRMCA

With the recent enthusiasm for sustainable construction, waterproof concrete is seeing resurgence in a number of applications.

This is the fifth article in a series on some of the different types of value added concrete you can choose to include on your menu of products to actively promote in a local marketplace. Some of those choices include concrete with fibers, quick setting mixes, decorative concrete, waterproof concrete, flowable fill, self consolidating concrete (SCC), easy finishing mixes, “Green” concrete, pervious concrete, high strength concrete and corrosion resistant concrete. In our last article we highlighted the applicability of decorative concrete and how to actively sell and promote it. This article will take a look at waterproof concrete.
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Waterproof concrete, while a new concept to many people, has been around a long time. Approximately 20 years ago a number of floating bridges were constructed for Seattle, which literally were floating concrete barges used because traditional bridge building methods would have been too costly in the deep water. Built in a shipyard dry-dock in sections, they were floated and moved into position by tugboat. They were then fixed to the bottom with steel cables attached to concrete “anchors.” These bridges have performed admirably and at a significant cost savings to taxpayers versus the alternative methods. With the recent enthusiasm for sustainable construction, waterproof concrete is seeing resurgence in a number of other applications.

What kind of applications? They are limited only by the imagination of the designer. Green roofs are a natural fit. By utilizing a concrete structural system and deck, the waterproof concrete may eliminate the use of a membrane. Though some designers are taking a conservative approach and using it as a “belt and suspenders” method so that when the membrane fails they do not have to remove the entire roof garden to replace it immediately – as would likely be the case when only a membrane is used. Other applications include hard-scaping when a water feature is on top of the concrete, like in a zoo or other unique habitat. Underground parking garages, exposed top decks of parking structures or podium decks are often other candidates for waterproof concrete.

There are a number of ways to create waterproof concrete (not to be confused with damp proof concrete). The most commonly used methods today involve either Hydrophobic/liquid or Crystal Growth powdered admixtures included in the concrete mix. Some of the benefits of waterproof concrete include potentially lower initial costs of materials. For example: when eliminating a membrane system, you also eliminate the possibility of damaging the membrane during construction; when the waterproof concrete is exposed, leaks are easily identified through cracks and can easily be repaired; when covered from one side most repairs can generally be repaired from the other side.

When compared to alternative construction methods, waterproof concrete offers many advantages. Ease of use and speed of construction need to be considered by the decision maker. While a niche market, there is opportunity to expand your value added product menu of choices to include this unique product.

Special thanks to Dave Frentress of Glacier Northwest, A CALPORTLAND Company, for content and photo.

For more information on NRMCA’s promotion program, contact Pool at (281) 557-8415 or via e-mail at vpool@nrmca.org.
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California GREENING:
How one Ready Mix Producer Met the Industry’s Environmental Challenge

By Frank Cavaliere
Communications Manager, NRMCA
At a time when the energy conservation movement was not nearly as entrenched across the U.S. as it is now, the California Portland Cement (CPC) Company made a corporate-level decision to get ahead of the curve in one of the nation’s most environmentally-aware states. The Glendora, CA-based producer of building materials with operations across much of the western United States launched a companywide effort to reduce its overall energy consumption by joining the U.S. Environmental Protection Agency’s (EPA) ENERGY STAR program in the mid-1990s and a formal energy program in 2003. This long-term, sustained effort has culminated with CPC being recognized by federal officials for the fourth year in a row.

A few months ago, EPA gave CPC a 2008 ENERGY STAR Sustained Excellence Award in recognition of its continued leadership in protecting the environment through energy efficiency. The company’s accomplishments were recognized at an awards ceremony in Washington, DC, on April 1. CPC, an ENERGY STAR partner since 1996, was honored for its long-term commitment to energy efficiency. In 2007, CPC continued its energy reduction trend by reducing energy intensity by 2.5% from 2006 levels for a savings of nearly 363 trillion Btu. This savings reduced CO2 emissions by 34,366 metric tons, the equivalent of providing electricity to 4644 American homes. Across the U.S., top companies and organizations are continuing to promote energy efficiency through participation in ENERGY STAR. Last year alone, Americans, with the help of ENERGY STAR, saved $16 billion on their energy bills and reduced greenhouse gas emissions equivalent to those of 27 million vehicles.

“CPC is committed to helping protect the environment through our energy management program and sustainability practices,” said CPC’s Chief Executive Officer Jim Repman in a news release. “Our longstanding partnership with ENERGY STAR shows our organization’s commitment to energy efficiency. We understand that partnering with ENERGY STAR is an important step in improving the environment.”
California Portland Cement Company is a major producer of cement, concrete and concrete products, aggregates and asphalt in the western U.S. Founded in 1891, CPC operations have spread throughout California, Arizona, Nevada, Idaho, Oregon, Washington and Alaska. Company headquarters is in Glendora.

The 2008 Sustained Excellence Awards are given to organizations that have exhibited outstanding environmental leadership year after year by reducing greenhouse gas emissions by setting and achieving aggressive goals, employing innovative approaches and showing others what can be achieved through energy efficiency. These awards recognize ongoing leadership across the ENERGY STAR program, including energy-efficient products, services, new homes and buildings in the commercial, industrial and public sectors. Award winners are selected from more than 9,000 organizations that participate in the ENERGY STAR program.

“We are proud to recognize CPC’s continued efforts with the 2008 ENERGY STAR Sustained Excellence award,” said Robert J. Meyers, principal deputy assistant administrator for EPA’s Office of Air & Radiation. “Year after year partners like CPC are examples of the benefits of a long-term commitment to energy efficiency. Their actions are leading the way in saving energy and helping to protect the environment.”

ENERGY STAR was introduced by the U.S. Environmental Protection Agency in 1992 as a voluntary market-based partnership to reduce greenhouse gas emissions through increased energy efficiency. Today, ENERGY STAR offers businesses and consumers energy-efficient solutions to save energy, money and help protect the environment for future generations. More than 9,000 organizations are ENERGY STAR partners committed to improving the energy efficiency of products, homes, buildings and businesses. For more information about ENERGY STAR, visit www.energystar.gov or call toll-free 1-888-782-7937.

Becoming a Star

The EPA describes a multi-step process which CPC and other companies have fol-
allowed to achieve ENERGY STAR status. The agency summarizes CalPortland’s efforts on its Website as follows:

**Establish an Energy Team/Energy Management at All Levels** – CalPortland’s energy program involves all parts of the organization, from the CEO and senior vice president for operations to energy teams at the plant level. Senior management does not serve as a figurehead role on the energy team, but rather is involved with the functioning of the energy program through regular energy team meeting attendance and review of all projects. CalPortland has structured its energy program with a central corporate energy team supported by plant energy teams that ensure program support and innovation goes in both directions between plants and headquarters. There is even a team comprised solely of process engineers from across the corporation who work on energy use in production. The CEO’s involvement with the energy program demonstrates to the organization that managing energy effectively is a company priority. This team succeeded in saving more than 138 million KBtu in 2004 alone.
Define Technical Steps and Targets – When CPC reorganized its energy team, it first looked to the ENERGY STAR Guidelines for Energy Management for an overall management framework. Next, it became active in the ENERGY STAR Cement Focus, and studied the ENERGY STAR Energy Savings Opportunities in Cement Manufacturing guide to determine technical measures the company could take toward energy efficiency in its plants. Energy managers then created a checklist for target initiatives such as specific schedules of audits to be performed, creation of new specifications for equipment operation and other plant energy-saving opportunities to evaluate. As a result of these efforts, CalPortland is now making substantial progress toward meeting specific energy objectives, such as decreasing energy use from compressed air and maximizing their process efficiency.

Determine Roles and Resources/Focusing on Process Pays – Many industrial manufacturers are hesitant to look to the process of production for improvements in energy performance. However, CPC realized early on that it could only create a successful energy program with the involvement of process engineers, so the company established a Process Energy Team along with their other plant teams to address the main use of energy at its plants: the manufacturing process. Many organizations see process energy as an "untouchable" use of energy because plant managers are often wary of energy teams changing the production process. CalPortland negated this fear and found a way to involve those who are the essential guardians of the company’s profit: the production engineers. CalPortland also gave its vendors responsibility for their energy performance by securing agreements from them that they each must meet CalPortland’s premium efficiency requirements for motors and other parts. The cumulative effect of California Portland’s groundbreaking program was an energy savings of over 138 million Btu’s in 2004 alone.

Implement Action Plan/Internally Promoting Program Achievements – CPC uses annual sales and operations strategy meetings to promote the energy program to executives and middle management in order to ensure their continued support of the energy program. At the annual strategy meeting, the corporate energy manager gives a presentation outlining the energy program goals and achievements. Participation in these meetings puts energy management on the corporate strategy agenda. To maintain the strategic emphasis, energy management is a topic of discussion at all quarterly corporate cost review meetings, and is a frequent agenda item at executive, staff and board meetings. Continued executive involvement has paid off; in 2005 the energy saved from improved efficiency totaled nearly 48 million kBtu, enough energy to power 1,100 homes for a year.

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Continued executive involvement has paid off; in 2005 the energy saved from improved efficiency totaled nearly 48 million kBtu, enough energy to power 1,100 homes for a year.
A significant deliverable recently released to support the NRMCA’s P2P Initiative is a Guide to Specifying Concrete Performance – A Phase II Report of Preparation of a Performance-Based Specification for Cast-in-Place Concrete. The document was developed by the research team of Ken Hover, Cornell University, R. Doug Hooton, University of Toronto and John Bickley, consultant, with funding support from the RMC Research & Education Foundation.

The guide specification covers performance requirements for concrete on the basis of measurable properties using available standard test procedures for design loads, durability and other service conditions. These provisions can be selectively incorporated as appropriate for different concrete structures based on service conditions, severity of environmental exposure and assigned project costs for inspection and testing. It is understood that for most concrete structures, the level of performance testing or mixture pre-qualification recommended may not be necessary. The proposed specification clauses are supported by commentary to provide additional guidance to the design professional. In establishing performance requirements for concrete mixtures, it is recognized that responsibility for expected service life and functionality are not borne by the contractor or concrete supplier. The serviceability conditions and code requirements are recognized to be a design function that should be translated into provisions in contract documents.

The guide specification is organized into three parts. Part I addresses those specification provisions that are based on the concrete materials requirements of ACI 318-08, Building Code for Structural Concrete. It incorporates the new Exposure Class concept
The guide specification covers requirements for concrete on the basis of measurable properties using available standard test procedures for design loads, durability and other service conditions.

ACI 318-08. In some cases performance alternatives and associated criteria are suggested to current prescriptive code provisions – for example, the use of ASTM C1202 testing (resistance to chloride penetration) in lieu of meeting the w/cm requirements of ACI 318. Using performance alternatives to prescriptive code provisions would require the concurrence of the building official.

Part II addresses the workability and temperature of fresh concrete in terms that are fully compatible with the requirements of ACI 301-05. Part III offers optional specification requirements that are not currently addressed by either ACI 318 or ACI 301, and would be specified only when applicable to the special needs of a particular project. These optional provisions apply only when specified and no default requirements apply.

This guide specification concentrates on performance and not on means, methods or materials, and while there are multiple requirements herein for submittal of concrete performance records, there are no requirements for a full disclosure of ingredients or mixture proportions. This does not imply, however, that non-standard materials or ingredients are acceptable without prior notification and approval of the engineer of record. However, should concrete as supplied fail to meet one or more performance requirements, the purchaser may need to know the composition of the mixture in order to determine the causes of failure and to evaluate the adequacy of the work.

In many cases the guide specification provides the contractor/producer with one or more options for demonstrating compliance with specification requirements. The option chosen by the contractor/producer, along with the required information that must accompany each option, is to be documented in a pre-construction submittal to the engineer of record.

The guide specification includes performance tests and criteria for laboratory evaluations at a pre-qualification stage, for samples obtained at the jobsite for verification and for in-place tests for referee testing in the case of failing verification tests. In general the specifier will approve the proposed concrete mixture in advance of construction operations (pre-qualification), and in many, but not all cases, specified properties of the pre-qualified mixture will be verified for acceptance at the point of discharge. Pre-qualification permits evaluation of a proposed concrete mixture on the basis of more detailed or time-consuming laboratory-type performance tests that are not generally suitable for jobsite verification.

The owner of the structure anticipates that the performance defined in the specification is achieved in the structure. An important aspect of testing the properties of concrete from samples obtained from the structure is the change of control of the product from the concrete supplier to the concrete contractor and the appropriate assignment of responsibility if specification requirements are not met. It is anticipated that as performance specifications evolve, there will be a need for increased coordination and partnering between these two parties to ensure that specified requirements are achieved. In this guide specification, most tests and criteria for properties of concrete in the structure are deferred to referee evaluations when there is non-compliance with samples obtained at the point of discharge.

Significant effort was expended by the research team and the P2P Steering Committee in arriving at consensus recommendations published in this document. Compromises were necessary on testing in-place concrete and the types of tests conducted on samples obtained at the jobsite. Another concern was the reliability of jobsite sampling handling and care, especially for some sensitive durability tests.

ACI has formed an Innovative Task Group (ITG) that is developing a report in a 2-year time frame on performance requirements for concrete materials. The ITG is using this guide specification as a basis for its report. It is anticipated that the ITG report will provide specific recommendations for revisions to current ACI standards. NRMCA is also establishing a focus group of engineers and contractors to discuss opportunities and barriers to implementing this guide specification in actual projects.

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The U.S. concrete industry is committed to continuous environmental improvement through process innovation and product standards that lead to reduced environmental impact.

What is climate change?

Climate change or global warming is the increase in the average temperature of the Earth’s atmosphere and oceans as a result of the buildup of greenhouse gases in our atmosphere. Greenhouse gases can either be released by natural events such as volcanic eruptions or human activity such as deforestation or burning fossil fuels to manufacture products, power our cars and trucks, or to create the energy to heat and cool the homes and buildings in which we live and work. Livestock, agriculture, landfill emissions and use of chlorofluorocarbons in refrigeration systems are other sources of greenhouse gases resulting from human activity.

Carbon dioxide is one of several greenhouse gases that can cause global warming by trapping the Sun’s radiant energy in our atmosphere. This process is called the greenhouse effect. In general, carbon dioxide, or CO₂, is exhaled by humans and animals and utilized by plants during photosynthesis. Additionally, carbon dioxide is created by the combustion of fossil fuels or plant matter, among other chemical processes. Greenhouse gases include water vapor (36-70%), carbon dioxide (9-26%), methane (4-9%) and ozone (3-7%), among others. The percentages indicate the approximate range of the greenhouse effect resulting from these greenhouse gases. Water vapor, the most abundant greenhouse gas, is not affected by human activity.

Atmospheric concentrations of CO₂ are expressed in units of parts per million by volume (ppm). Since the beginning of the Industrial Revolution in the late 1700s, the concentration of CO₂ in our atmosphere has increased by about 100 ppm (from 280 ppm to 380 ppm). The first 50 ppm increase took place in about 200 years, from the start of the Industrial Revolution to around 1973; the next 50 ppm increase took place in about 33 years, from 1973 to 2006. It is estimated that 64% of the CO₂ in the atmosphere is due to burning fossil fuels.

Many scientists believe global warming will cause a rise in sea level, increase the intensity of extreme weather and change the amount and pattern of precipitation. Other effects could include changes in agricultural...
yields, glacier retreat, species extinctions and increases in disease. These effects could severely impact the Earth’s ability to support life. Many scientists believe recently observed global warming is partially caused by greenhouse gas emissions from energy production, transportation, industry and agriculture.

Does concrete manufacturing produce CO₂?

Water, sand, stone or gravel, and other ingredients make up about 90% of the concrete mixture by weight. The process of mining sand and gravel, crushing stone, combining the materials in a concrete plant and transporting concrete to the construction site requires very little energy and therefore only emits a relatively small amount of CO₂ into the atmosphere. The amounts of CO₂ embodied in concrete are primarily a function of the cement content in the mix designs.
As with all industrial processes requiring energy, manufacturing cement does result in the generation of CO₂. For the most part, CO₂ is generated from two different sources during the cement manufacturing process: 1) use of fossil fuels in the burning process, and 2) calcination, when calcium carbonate is heated and broken down to calcium oxide with the release of CO₂.

According to the Department of Energy, cement production accounts for 0.33% of energy consumption in the U.S. The current level is low compared with other industries, such as petroleum refining at 6.5%, steel production at 1.8% and wood production at 0.5%. On average, 927 kg (2044 lb) of CO₂ are emitted for every 1000 kg (2205 lb) of Portland cement produced in the U.S.5

The U.S. cement industry accounts for approximately 1.5% of U.S. CO₂ emissions, well below other sources such as heating and cooling our homes (21%), heating and cooling our buildings (18%), driving our cars and trucks (33%) and industrial operations (28%).6 Global CO₂ emissions from cement production (298 million metric tons of carbon in 2004) represent 3.8% of total global CO₂ emissions.7 Global emission contributions from cement production are likely to decrease as countries like China replace inefficient kilns. The U.S. cement industry has made considerable strides to improve its energy efficiency and reduce emissions.

How much CO₂ is embodied in concrete?

Concrete uses between 7% and 15% cement by weight depending on the performance requirements for the concrete. The average quantity of cement is around 250 kg/m³ (420 lb/yard³). As a result, approximately 100 to 300 kg of CO₂ is embodied for every cubic meter of concrete. A significant portion of the CO₂ produced during cement manufacturing is reabsorbed into concrete during the product life cycle through a process called carbonation. One research study estimates that between 33% and 57% of the CO₂ emitted from calcination will be reabsorbed through carbonation of concrete surfaces over a 100-year life cycle.8

How does concrete compare to other building materials?

Concrete compares favorably to other building materials such as steel, wood and asphalt when analyzing energy consumption and CO₂ emissions. Concrete building systems such as insulating concrete forms and tilt-up concrete incorporate insulation, high thermal mass and low air infiltration to create energy efficient wall systems that save energy over the life of a building. The result is significantly lower CO₂ emissions related to building occupancy when compared to wood and steel frame construction.

In one research study comparing energy performance of various concrete wall systems to wood frame and steel frame structures, concrete wall systems reduced energy requirements for a typical home by more than 17%. By comparison, a stick-frame house would have to be built with 2x12 lumber and R-38 insulation to achieve the same energy performance as the insulated concrete wall comprised of 150 mm (6 in) of concrete and two layers of 60 mm (2 in) thick rigid insulation.9

Another research study compared the energy cost of a steel framed building with lightly framed exterior walls to that of a concrete framed building with concrete exterior walls to determine the benefit of thermal mass. The analysis was conducted for six different cities in the U.S. Energy cost savings for the concrete frame building were 5% in Miami, 10% in Phoenix, 16% in Memphis, TN, 18% in Chicago, 21% in Denver, and 23% in Salem, OR.10

Another research study compared the energy of production for concrete and other common building materials for raw material extraction, transportation and manufacturing. The study concludes that the energy required to produce one metric ton of reinforced concrete was 2.5 GJ/t (2.2 million BTU/ton) compared to 30 GJ/t (25.8 million BTU/ton) for steel and 2.0 GJ/t (1.7 million BTU/ton) for wood. The same study compared the CO₂ emissions of several different building materials per 1000 kg (2205

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Figure 1 – CO₂ Concentrations in Earth’s atmosphere during the last 400,000 years.9

Figure 2 – 2005 U.S. CO₂ emissions by category.
lb) for residential construction and concluded that concrete accounted for 147 kg (324 lb) of CO₂, metals accounted for 3000 kg (6614 lb) of CO₂, and wood accounted for 127 kg (280 lb) of CO₂.11

In another study that compared the embodied CO₂ in concrete and steel framed buildings on a per-square-meter basis, concrete accounted for 550 kg of CO₂ per square meter of floor area (112 lb/ft²) and steel accounted for 620 kg of CO₂ per square meter of floor area (127 lb/ft²).12

In fact when it comes to homes and buildings, it’s not the manufacturing and construction phase that generates most of the CO₂. It’s the operational phase where heating, air conditioning and appliances generate most of the CO₂ throughout a structure’s lifetime. In one study, approximately 98% of the CO₂ emissions from a home were from the use of natural gas appliances throughout its 100-year lifetime. Only about 2% was attributed to the manufacturing and construction phase.13

Studies conducted by National Resources Council of Canada compared fuel consumption and emissions for a 100 km (62.14 mi) section of a major urban arterial highway, one paved with asphalt and the other paved with concrete. These studies concluded that heavy trucks traveling on concrete pavement accumulate statistically significant fuel savings, ranging from 0.8% to 6.9%. These fuel savings lead to reductions in greenhouse gas emissions and air pollutants.14,15

Athena Institute conducted a life cycle analysis on concrete and asphalt roadways to compare embodied energy and global warming potential for construction and maintenance over a 50-year life cycle. The study concluded that for a high volume highway, the asphalt pavement alternative required three times more energy than their concrete pavement counterparts from a life cycle perspective. The most recent progress involves newly introduced guidelines that will allow for greater use of limestone as interground material in finished cement. This will have no impact on product performance but will ultimately reduce CO₂ by more than 2.5 Mt (2.8 million tons) per year in the U.S. Using interground limestone in cement is already common practice in Europe and Canada.

What is the concrete industry doing to reduce greenhouse gases?
The cement industry was among the first to tackle the issue of climate change. Since 1975, the cement industry has reduced emissions by 33%. Portland Cement Association members adopted a voluntary Code of Conduct, (principles, performance measures and a reporting protocol) to support the Cement Manufacturing Sustainability Program. By the year 2020, the industry plans to voluntarily reduce CO₂ emissions by 10%, energy use by 20% and cement kiln dust by 60% below a 1990 baseline.17

The primary options for reducing the quantity of CO₂ generated during cement manufacturing process are to use alternatives to fossil fuels, change the raw ingredients used in manufacture and intergrind additional materials with the clinker. The most recent progress involves newly introduced guidelines that will allow for greater use of limestone as interground material in finished cement. This will have no impact on product performance but will ultimately reduce CO₂ by more than 2.5 Mt (2.8 million tons) per year in the U.S. Using interground limestone in cement is already common practice in Europe and Canada.

What is the concrete industry doing to reduce greenhouse gases?
The U.S. concrete industry is committed to continuous environmental improvement through process innovation and product standards that lead to reduced environmental impact. National Ready Mixed Concrete Association members have implemented the P2P Initiative (Prescriptive to Performance Specifications for Concrete) which provides concrete producers more flexibility to optimize concrete mixtures for intended performance that will also reduce environmental impact, including CO₂ emissions.
Traditionally, construction specifications for concrete have required unnecessarily high quantities of portland cement along with other limits on the use of supplementary cementitious materials. These limits are incorporated in the industry’s standards and specifications. The P2P Initiative proposes to eliminate many of these limits and evolve to performance-based standards. This will reduce the environmental impact of concrete as a building material.\textsuperscript{18}

The U.S. concrete industry uses a significant amount of industrial byproducts such as fly ash, blast furnace slag and silica fume to supplement a portion of the cement used in concrete. In 2006, the U.S. electric power industry generated a total of about 124.8 Mt (137.6 million tons) of coal combustion ash of which about 43% was used in construction and industrial processes. The cement and concrete industry use accounted for more than 22.5 Mt (24.9 million tons) in 2006.\textsuperscript{19}

The use of slag has increased significantly, resulting in large reductions in CO\textsubscript{2} emissions. Besides use as a cementitious material, iron slags are used as raw feed in cement manufacture and aggregates in concrete mixtures. The USGS reports a total of 11.6 Mt (12.7 million tons) of iron blast furnace slag (air-cooled and granulated) produced in 2006 of which 4.2 Mt (4.6 million tons) is granulated and 94% of this is used as a cementitious material.\textsuperscript{20}

The concrete industry also incorporates a variety of environmental best management practices in the production of its product. These include the reuse and recycling of waste from concrete manufacture such as water and unused returned concrete. It also incorporates waste byproducts from other industries such as recycled industrial waste water, foundry sands, glass and other materials that would typically end up in landfills.

**Conclusion**

The concrete industry is dedicated to continuous environmental improvement through process and product innovation. Concrete performs well when compared to other building materials but when it comes to sustainable development there are always opportunities for improvement. As with any building product, concrete and its ingredients do require energy to produce which in turn produces carbon dioxide or CO\textsubscript{2}. The amount of CO\textsubscript{2} produced during the manufacturing process is relatively small when compared with other building materials and when compared with other human activities such as heating and cooling our homes and buildings or operating our cars and trucks. Concrete’s many benefits help make it an environmentally friendly choice for construction with one of the lowest carbon footprints of any building material.


\textsuperscript{2} Carbon Dioxide Information Analysis Center, http://cdiac.ornl.gov/pns/faq.html

Note: This article was presented at the 2008 Concrete Technology Forum: Focus on Sustainable Development, May 20-22, 2008, in Denver, www.concretetechnologyforum.org. A more detailed discussion of this topic is presented in the NRMCA publication Concrete CO\textsubscript{2} Fact Sheet available for download at www.nrmca.org/greenconcrete.
Pade, Claus et al. The CO$_2$ Uptake of Concrete in the Perspective of Life Cycle Inventory, International Symposium on Sustainability in the Cement and Concrete Industry, Lillehammer, Norway, September 2007.
National Ready Mixed Concrete Association, P2P Initiative, http://www.nrmca.org/P2P.
U.S. EPA’s Enforcement Initiative and the Ready Mixed Concrete Industry: What You Need to Do

By Douglas E. Ruhlin
Principal Environmental Consultant, Resource Management Associates

In October of last year, the United States Environmental Protection Agency (EPA) announced a major enforcement initiative to be carried out during the three-year period of 2008-2010. Three main industrial areas were chosen for this enforcement effort: 1) homebuilding construction, 2) “big box” store construction, and 3) “ready mixed concrete with crushed stone and sand and gravel operations” (Note that the EPA identified this group as having three sub-groups, comprised of sand and gravel producers, crushed stone producers and ready mixed concrete producers.) These industries were chosen, from the thousands possible, due to their size, diversity and “levels of observed noncompliance,” which led the EPA to conclude that this problem was “national in scope.” In other words, the ready mixed concrete industry, across the entire United States, will be the subject of a focused, targeted enforcement initiative from the U.S. EPA for the next three years.
ment under the NPDES regulations. The EPA always retains oversight on the state agency, including enforcement. Therefore, this enforcement initiative represents what for many will be a new enforcer in town – the EPA (in addition to the current state agency) – one who may not be as friendly as the local inspector has been!

The differentiation between process waters and stormwater is significant at a ready mixed concrete plant, and may prove to be the source of the EPA’s perceived level of noncompliance within the industry. Process water (otherwise known as process wastewaters) typically includes mixer truck barrel washout, barrel and chute exterior washoff, as well as many other sources (see also “Stockpiles and Stormwater,” July 2007 Concrete InFocus). Stormwater is rainfall that comes into contact with materials at a concrete plant that can contribute to runoff pollution, such as sand, cement, oils, etc.

When process water and stormwater are combined, the resultant product is known as a commingled discharge. Generally, most concrete plants have an NPDES stormwater discharge permit that permits only stormwater discharges (and prohibits process water or commingled water discharges).

So, the EPA’s enforcement effort may be directed toward two areas at ready mixed concrete plants: 1) failure to ensure compliance with the facility’s NPDES stormwater discharge permit, such as not having a current or adequate Stormwater Pollution Prevention Plan, failure to implement adequate BMPs, failure to conduct required monitoring, etc., or, 2) the unauthorized presence of process and/or commingled discharges under a concrete plant’s NPDES stormwater discharge permit. Therefore, it is critical to ensure that these areas are evaluated and addressed at each concrete plant.

The USEPA has already begun conducting compliance inspections related to this enforcement initiative. It is important to note that these inspections can (and likely will) “open the door” to the entire facility’s environmental efforts, such as compliance under the Spill Prevention, Control and Countermeasure (SPCC) regulations, air quality permit compliance, chemical reporting activities, etc. In other words, once the EPA has entered a concrete plant site, anything may be fair game. Experience to date has shown this to be the case. Experience has also shown that violations encountered can be dealt with severely by the EPA, including significant financial (civil) penalties, administrative and/or operational required changes and even the possibility of corporate or personal criminal penalties.

What can a concrete plant do to minimize its chance of becoming a target of this enforcement initiative? First of all, make sure that each and every concrete plant is covered by an appropriate NPDES permit that accurately reflects the types of discharges present on that site. Secondly, ensure that
each and every plant is managed by personnel trained and knowledgeable in environmental issues, particularly the NPDES permit and its requirements, what is allowed to be discharged under the plant’s permit (and what isn’t) and, most importantly, the difference between stormwater and process water. Thirdly, ensure that responsible plant personnel are familiar with their NPDES permit – the best way to do this is to thoroughly read and understand the permit issued to the facility. Finally, consider a comprehensive environmental audit of your plant to evaluate your level of compliance (given the nature of this enforcement initiative, you may wish to conduct this audit in a manner which best preserves the privileged nature of the results generated). If you are unsure of where you stand relative to these issues, seek qualified assistance as soon as possible. Remember, this 3-year enforcement period has already begun and inspections have commenced!

Two other actions you ought to consider at this time to minimize your exposure to environmental enforcement are training/education, and implementation of a Green-Star certified Environmental Management System (EMS). Simply put, a trained, knowledgeable workforce is your best defense against environmental problems. NRMCA offers the best, most comprehensive environmental training course for the concrete industry (NRMCA’s Environmental Professional Certification Course, held several times each year, is next tentatively scheduled for late fall in New Orleans – watch the E-NEWS for further information). This course provides the information needed to ensure that those issues behind the EPA’s enforcement initiative are appropriately managed and under control at a concrete plant.

Secondly, every concrete producer ought to consider the development and implementation of an Environmental Management System (EMS), which can then be certified under NRMCA’s Green-Star Certification Program. An EMS can help a concrete producer install a systematic approach towards continual environmental improvement at a particular concrete plant, and includes aspects such as training and environmental compliance evaluations (for further information, see “What is an EMS,” January 2008 Concrete InFocus Magazine). The development and implementation of a Green-Star EMS can provide many benefits to a concrete plant, including an enhanced environmental compliance level, which will provide the best defense against future environmental enforcement. It is also noted that today, the EPA generally makes the development and implementation of an environmental auditing program and/or EMS a requirement of any enforcement action, including those served against concrete producers in the past.

The bottom line is that the time to act is now! Some simple activities now can provide a large dose of insurance against this 3-year USEPA enforcement effort. If you’re unsure where you stand relative to these issues, seek qualified assistance immediately. Furthermore, consider additional training and the implementation of an EMS. Doing this now can help you avoid becoming another enforcement horror story!

Contact Ruhlin at Resource Management Associates, P.O. Box 512, Forked River, NJ 08731; (609) 693-8301; www.resourcemanagementassoc.com; or via e-mail at druhlin@resourcemanagementassoc.com.

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Imagine

By Ana Bracero

Through the ages, concrete has been used in creating monumental buildings, strong forts and connecting bridges throughout the world. Moreover, concrete, in some cases, has been used to create sanctuaries to protect from invasion, attack and even the weather. In my case, concrete protected me from the outside world and provided me with a home. My home was a simple three-bedroom concrete home that was painted a pale pink. The rooms mostly ranged from a cream to blue. On rainy days, the rain would serve as a lullaby soothing me to sleep. While the house was simple, it provided my family and me with everything that we needed. It provided a fort, a home and a hiding spot. The strong, yet, slightly rough concrete stood tall. Even when catastrophe appeared on the island, the house stood its ground, while everything around it lay in ruins.

This catastrophe occurred September 21, 1998, and it came to be known as George. A category three storm struck seventeen islands in the northeast Caribbean and killed more than five hundred people. The inhabitants of the islands were told to protect themselves against the storm, by getting supplies and boarding windows, but nothing could have prepared us for the destruction that hurricane George brought upon my home.

The shiny September day in the island of enchantment quickly became night when the storm started surrounding the island. The once calm soothing wind became a rampaging roar that shook the ground. For hours we were boarded up in our home hoping that trees would not fall upon us, and for hours we waited for news that it was finally over; but night came and the storm continued and so did the destruction. However, by dawn everything was quiet and the sun was starting to peek out from the west, which was our sign that it was relatively safe to exit our concrete home and explore our surroundings. The shock of all the fallen trees and destroyed homes all around us was so dramatic that the tears were finally released, and we finally were brave enough to look upon our home. It came as a miracle that our simple pink concrete home was still standing, strong and unharmed. Our home, which had just been a home, was transformed into a shelter and a sanctuary.

The destruction that George brought upon my home island of Puerto Rico was immense. But the concrete that surrounded my house guarded my family and me from the dangers that the hurricane brought. In addition, being able to feel safe in one’s home is a blessing. Knowing that our house was made of concrete, a strong, hard building material that is composed of sand, gravel, cement and water, gave us the reassurance that our home would stand in the toughest of conditions and that is what it did in the case of my life. Concrete shielded us from a natural disaster and at the same time demonstrated the power and security that concrete gives those who are surrounded by it.

Ana Bracero is a student at South Green High School in Greenville, TN. The Tennessee Concrete Association submitted the winning essay. The winner receives a college scholarship in the amount of $5,000 if she chooses a concrete-related curriculum or $2,000 for a curriculum of her choice. For more information on how your state can participate in NRMCA’s National High School Essay Contest, please contact Nicole Maher at 240/485-1158 or via e-mail at nmaher@nrmca.org.
Confined Space Entry

The most cited OSHA standard in the ready mixed concrete industry

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

Confined spaces come in all shapes and sizes. The OSHA standard for Confined Spaces is found at 29 CFR 1910.146 and is the most cited federal OSHA standard for the ready mixed concrete industry. Entry is considered to have occurred when a person breaks the plane on the opening of a confined space with any part of his body. The Federal OSHA definition of the confined space means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work; and
2. Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and
3. Is not designed for continuous human occupancy.

Ready mixed concrete facilities have a myriad of confined spaces (hoppers, mixer drums, concrete and fly-ash silos, etc.). These spaces pose a special challenge as they must be maintained on a regular basis to keep the plant and company financially healthy.

Entering confined spaces calls for a team approach. There is the entrant, the attendant and the entry supervisor. At times, the attendant can also serve as the entry supervisor. An entry permit must be completed along with atmospheric testing of the confined space. Lockout/tagout of the confined space along with any additional permits such as a Hot Work Permit (welding, grinding and any spark producing activity) will have to be obtained.

Atmospheric testing is probably one of the most overlooked aspects of permit-required confined space entry. Many times a hazardous atmosphere cannot be seen or smelled, but it is there.
The entrant is the person that enters the space and performs the work. Entrant duties include:

- Knowing the hazards that may be faced during entry, including information on the mode, signs or symptoms and consequences of the exposure;
- Properly using the confined space entry equipment;
- Communicating with the attendant to monitor entrant status and enabling the attendant to alert entrants of the need to evacuate the space;
- Exiting from the permit space as quickly as possible whenever ordered by the attendant or entry supervisor;
- Alerting the attendant whenever:
  - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation
  - The entrant detects a prohibited condition
  - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation; the entrant detects a prohibited condition or an evacuation alarm is activated.

The attendant is the person that is stationed outside the permit confined space that monitors the entrants and who perform all the attendant duties. One of the most important duties of the attendant is to ensure that a communication system exists in which the attendant can communicate with the entrant. It is also the attendant’s responsibility to understand how to contact the rescue service. The attendant’s most important duty is to monitor the entrant. Attendant duties include:

- Knowing the hazards that may be faced during entry, including information on the mode, signs or symptoms and consequences of the exposure;
- Being aware of possible behavioral effects of hazard exposure in authorized entrants;
- Continuously maintaining an accurate count of authorized entrants in the permit space and ensuring the means used to identify authorized entrants;
- Remaining outside the permit space during entry operations until relieved by another attendant;
- Communicating with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space;
- Monitoring activities inside and outside the space to determine if it is safe for entrants to remain in the space and ordering the authorized entrants to evacuate the permit space immediately under any of the following conditions:
  - Attendant detects a prohibited condition
  - Attendant detects the behavioral effects of hazard exposure in an authorized entrant
  - Attendant detects a situation outside the space that could endanger the authorized entrants
  - Attendant cannot effectively perform their duties
- Summoning rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permitted space hazards;
- Taking the following actions when unauthorized persons approach or enter a permit space while entry is underway:
  - Warning the unauthorized entrants that they must stay away from the permit space
  - Informing the authorized entrants and entry supervisor that unauthorized persons have entered the permit space.
  - Performing non-entry rescues
  - Performing no other duties that might interfere with the attendant’s primary duty to monitor and protect the authorized entrants

The entry supervisor is the person (such as the employer, foreman or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required. One of the most important duties of the entry supervisor is to ensure that a rescue service is available. The duties of the entry supervisor include:

- Verifying that rescue services are available and that the means of summoning them are operable;
- Removing unauthorized individuals who enter and who attempt to enter the permit space during entry operations;
- Determining, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with the terms of the entry
permit and acceptable entry conditions are maintained.

Atmospheric testing is probably one of the most overlooked aspects of permit-required confined space entry. Many times a hazardous atmosphere cannot be seen or smelled, but it is there. Here are the minimum limits for acceptable entry into a permit required confined space:

- Oxygen 19.5% - 23.5%
- Lower Explosive Limit < 10%
- Carbon Monoxide < 35 ppm
- Hydrogen Sulfide < 10 ppm

Any other atmospheric condition that may exceed the Permissible Exposure Limit (PEL) (Silica):

Respirable Dust = \( \frac{10 \text{ mg/m}^3}{\% \text{SiO}_2 + 2} \)
Total Dust = \( \frac{30 \text{ mg/m}^3}{\% \text{SiO}_2 + 2} \)

The atmosphere must be testing in the order above. Many of the new atmospheric testing meters can test all these besides silica at the same time. The atmospheric testing meters also have a self-check function in that if the unit is not functioning properly, it will automatically shut down. These meters will need to be calibrated on a regular basis so it is wise to have at least two at your facility. If the atmosphere does not meet the conditions for entry, you can use a forced-air system to pump in outside air and exhaust the air from the confined space. This is a good method but the atmosphere must still be monitored to ensure other contaminants such as truck exhaust is not being forced into the space.

So now that we have determined that everyone is trained, a confined space permit has been obtained, and atmospheric testing meters are on hand; we are now ready to execute the confined space entry. Here’s a summary of the steps for confined space entry:

- Determine scope of work
- Notify affected personnel
- Obtain entry permit
- Verify rescue availability
- Lockout/tagout energy sources
- Additional Permits – Hot Work
- Set up ventilation & lighting
- Monitor atmosphere & record on permit

After the work has been completed, ensure all the entrants have exited the space and secure the confined space opening. Return the permit to the entry supervisor. The entry supervisor shall keep the entry permit for one year. Notify the affected employees that the confined space is ready to be used and remove the lockout/tagout equipment on the energy sources.

In conclusion, permit-required confined space entry is the most cited Federal OSHA standard with many hidden dangers of potentially hazardous atmospheres to areas in which material can engulf an entrant. Confined Space Entry also calls for a team approach as there are a lot of details and hazards that need to be thought through and documented. Take the time to look around your facility and see if there’s any way to modify the job so confined space entry can be engineered to help protect the employees and ensure that maintenance on the confined space is done more safely and efficiently.

For more information, contact Ayers at 240/485-1155 or via email at dayrers@nrmca.org.
A Quality Plan to Establish Your Company’s Credibility

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

The NRMCA P2P Initiative to evolve specifications for concrete from prescription to a preferred performance-based alternative is now in its fourth year of implementation. One of the barriers identified by the P2P Steering Committee was a potential lack of trust by engineers of that ready mixed concrete producers could deliver on performance-based requirements. The key item to overcome the lack of trust was to develop a means to establish the credentials and knowledge-based qualifications of a concrete producer. Toward that end, the P2P Steering Committee recognized that documenting process control and other quality systems toward assuring the quality and performance of the product would go a long way toward building trust.

The decision was made to develop a standard format for a Quality Manual that a concrete producer could use to develop its own. Preliminary discussions additionally considered developing a quality certification program that would serve as adequate documentation for project submittals.

The project was contracted with William C. Twitty, Jr., P.E., consulting engineer, Greenville, S.C. and funded by RMC Research & Education Foundation. Mr. Twitty was eminently qualified to take on this project, having worked in the ready mixed concrete industry, served on the ACI Committee 121 on Quality Assurance and provided consulting services on quality systems for the ready mixed and precast concrete industries. He worked very closely with a task group of the P2P Steering Committee in developing the documents.

The document was developed along the general headings of ISO 9000 standards on Quality Management Systems making it pertinent to the ready mixed concrete industry. The primary document is the Preparation Guidelines for Quality Manual for Ready Mixed Concrete Companies. The purpose of these guidelines is to assist ready mixed concrete producers in the preparation of a Quality Manual (QM). The Quality Manual developed by a company documents the quality processes that the company has in place to insure quality of the company’s products and services. The guidelines allow for the structured development of a Quality Manual that should be clear to all responsible personnel of a ready mixed concrete producer. The Quality Manual is flexible in design and can be customized to follow the quality processes of a specific concrete producer. To cover the overall Quality Management System (QMS) in a ready mixed concrete company, the recommended quality plan is covered in fifteen sections. General guidance along with examples is provided relative to what should be covered in each section and subsection.

The sections of the Quality Plan include the following:

1. **Introduction** – covers a general overview of the company and the products and services it provides. The company’s Quality Policy is clearly stated in this section indicating the support of executive management in achieving its quality goals.

2. **Quality Management System (QMS)** – provides an overview of the company’s Quality Management System developed in the Quality Manual. It outlines the
responsibility and authority for maintaining the Quality Manual, activities that support it and the necessary documentation that ensures that it followed.

3. Management Responsibility – This section validates management support for its QMS and states its measurable quality objectives. It discusses the management planning to develop and revise the Quality Manual, and describes systems and monitoring for product realization. The section describes the personnel responsible for control and communication of the Quality Manual and implementation of the company’s QMS. It also addresses management review to track improvements of its QMS and states the work environment it will provide for optimum performance of its employees.

4. Customer Focus – describes the company’s activities toward ensuring customer satisfaction – states general goals, procedures for collecting customer input and complaint management, and activities for interacting with customers to demonstrate the value provided by the company.

5. Human Resources – states the company’s philosophy with recruiting and retaining qualified personnel, defines minimum qualifications for all roles, training and career enhancement of its employees and the procedures it uses to establish quality awareness company-wide.

6. Facilities, Plant(s) and Equipment – describes the production infrastructure of the company, including plants and laboratory facilities. The section establishes the standard procedures for monitoring accuracy of measuring devices and equipment maintenance, including stating required frequencies.

7. Materials Management – indicates the materials used by the company for producing its products, defines the process for selection of materials, expectations of its suppliers, processes used for conformance monitoring of received product and procedures for handling and storing material at the production facilities. It also addresses the procedures and responsibilities of managing customer’s materials used for the projects.

8. Concrete Mixture Development or Selection – describes procedures used for selection of materials and establishing mixture proportions for various classes of concrete and products furnished. It describes the Company’s process of evaluating project specification requirements and pricing its product prior to bidding. It describes the process of validating mixture performance for project requirements, submittals, responsibility for control on established mixtures and collection of data documenting product performance delivered to projects.

9. Purchasing – defines purchasing process, procedures for purchasing agreements and purchase orders, record maintenance of purchased products, inventory control and verification of product obtained to the purchase agreements.

10. Order Processing and Dispatching Procedures – establishes procedures for receiving and recording orders, scheduling and dispatching, batching instructions to personnel involved and records maintained and retention period for orders.

11. Concrete Production – discusses the production planning process, details of ready mixed concrete production and details of steps followed on a daily basis. Establishes the production environment provided for optimized efficiency and control of plant operations. It addresses deviations from normal procedures when producing specialty products.

12. Concrete Testing – describes the types of tests and frequencies performance for process control and product monitoring for ready mixed concrete in the fresh and hardened state. Also addresses the company testing conducted to validate results of third party inspection testing.

13. Concrete Delivery and Site Control – describes the procedures to be followed for the delivery of product and procedures at the jobsite, including truck tracking, jobsite observations and information recorded, and identification and traceability relative to location in a project a product is placed.

14. Concrete Troubleshooting – describes the procedures used by the company for following up and resolution process of customer complaints, investigating a deficiency, analysis of the problem and the report generated following the resolution.

15. Measurement, Analysis and Improvement – this section of the Quality Manual establishes the process of monitoring, measuring and analyzing product performance measures. It discusses steps taken to improve product performance as a result of this monitoring. It also establishes procedures to be taken when non-conforming product is identified.

As illustrated, the guideline document goes into significant detail of a Company’s QMS. The guidelines are further supported by appendices with additional information on laboratory resources, guideline for conformance monitoring (testing) of ingredients and products, required competencies of company personnel, project checklists, sample forms and internal audit procedures.

Supporting the Guideline document is an accompanying example Quality Manual of a fictitious ready mixed concrete company – Global Ready Mix, Inc., where details in each section of an actual Quality Manual are illustrated by example. It is recognized that the Quality Manual for each producer will vary significantly in terms of the sections covered and the details, based on the size and capability of the organization, the type(s) of market served, and the geographic locations of their plants.

The proposed Quality Manual is comprehensive and includes sections that are not of interest to the purchaser of concrete. As the original intent of this project was to establish the credibility of a concrete producer to an external customer, the P2P Steering Committee extracted those portions of the Quality Manual that would be pertinent to an external audit. The proposed External Audit Checklist serves as possible documentation to satisfy the external customer that the Company has a good QMS. In the future, the Committee might decide to evolve this into a producer certification program if the need for this external audit process by a third party is considered significant toward the adaptation of performance-based specifications.

The Quality Management System for Ready Mixed Concrete Companies, in three parts is available from NRMCA or at www.nrmca.org/p2p.
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COMING SOON: NRMCA’s Ready Mixed Concrete Fleet Manager Certification Course

By Greg Vickers
Managing Director of Operations, NRMCA

In tough economic times, we take a second look at all aspects of our operations to improve efficiency and save money. Educating fleet maintenance managers in such times takes on even greater importance than when we’re busy. Our fleet managers are responsible for a major portion of company assets, so any improvements they can make during slower business periods have a significant effect on the bottom line.”
- John Carew, president, Carew Concrete Corporation, Appleton, Wisconsin - Past Chairman of NRMCA’s Operations, Environmental and Safety Committee

NRMCA’s OES (Operations, Environmental and Safety) Committee has gotten underway developing a new and exciting educational offering to benefit the concrete industry: the Ready Mixed Concrete Fleet Manager Certification Course.

As the quote above from John Carew indicates, any effort that results in a fleet manager becoming a better supervisor and a savvier businessman makes a big difference to his company’s profitability.

The list of key roles a ready mixed concrete company’s fleet manager plays in his organization’s success is long. A fleet manager helps management determine when a truck mixer - or any other piece of equipment - is costing more to maintain than can be justified given its present value. He decides which maintenance tasks should be outsourced and which should be done in-house. He ensures that the company is getting the best possible value from outsource service providers, including spring and radiator shops, towing and recovery services and tire services. He is charged with analyzing and reporting on equipment downtime, fuel, tire and other fleet costs to make sure the company is not wasting money. He often negotiates with vendors to make sure the company is getting the best possible deal on parts, etc. And he makes sure the company develops and holds onto quality mechanics. The list of key elements within the fleet manager’s job description also includes several areas where he is responsible for minimizing the company’s exposure to liability.

At the OES Committee’s April meeting in Nashville, the Operations Task Group agreed on the goals for this exciting new educational offering. They mapped out the course curriculum and prioritized the many topics that they feel need to be addressed.

Nationally-renowned fleet management consultant John Dolce has been retained to write key elements of the course. Mr. Dolce, who many ready mixed fleet managers already know through the seminars he has conducted at CONEXPO-CONAGG shows, will also be the course’s lead instructor. Association staff and Operations Task Group members will round out the course’s teaching team. Between Mr. Dolce and the others involved in the course’s development and delivery, students will receive plenty of generic as well as ready mixed-specific fleet management training.

The Ready Mixed Concrete Fleet Manager Certification Course will be the fifth course offering under the association’s STEPS (Seminar, Training & Education Programs) program within the Operations and Production Career Track. The other courses in this career track are the Plant Manager Certification Course, RMC Safety Certification Course, RMC Environmental Professional Certification Course and the Effective RMC Supervisor Certification Course. When the Fleet Course is available, Certified Concrete Professional designation will be granted to anyone who passes any four out these five core Operations and Production courses plus elective requirements.

The inaugural Ready Mixed Concrete Fleet Manager Certification Course should be offered in the last quarter of 2008. Call or e-mail Greg Vickers for further information at 240-485-1136 or gvickers@nrmca.org
Ethics, Compliance and Profit

By Eileen Dickson
Managing Director of Education, NRMCA
You’d think that after a 20 year cycle of business scandals, and a flurry of regulations to curb further wrongdoing, they would wane. From the Keating Five savings and loan debacle to today’s sub-prime mortgage lender fiasco, a host of unsavory actions continue to hit evening news. Cooking the books, laying off workers without severance pay while senior executives receive generous compensation packages, hiding information that should be in the public domain, polluting the environment, and ignoring the local community are familiar themes. From tobacco, oil and financial executives to housing loan officers, these obvious bad guys deftly mishandle corporate responsibility, creating crisis after crisis. A few bad actors are so self-absorbed with a sense of their entitlement that they become household names, like Martha Stewart and Bernie Ebbers.

Many times, when actions such as theirs, or someone in our own company, hit the gossip circuit, we ask ourselves why these people had such obvious slips in judgment. Platitudes like, “Can you look at yourself in the mirror?” or “Would your mother or kids approve?” aren’t strong enough conscience-drivers to stop legal and/or ethical lapses. According to a global survey commissioned by the American Management Association and conducted by the Human Resource Institute, pressure to bend comes from two broad areas: from external pressure emanating from senior management or a Board of Directors, demanding employees meet unrealistic business objectives or deadlines; or, directly from a hubris employee who put his/her career and livelihood before right and wrong. The survey’s analysis points out that folks are prone to make unethical choices when they work in a cynical environment, where morale is diminished, when employees fail to instruct staff about industry-specific unethical actions, and, when caught, the employee’s consequences do not equal the gravity of his/her action. Other drivers are the belief that one has no alternative but to blindly follow the boss’s orders; that an action is OK because everyone else does it; that a negative action will actually help the organization; or the reverse, that is, the action deservedly punishes an organization.

Yet most business ethical mishaps aren’t front page fodder. Research has shown time and time again that unethical acts are more than likely the result of opportunistic foibles and failings of good people rather than the greed and selfishness of bad ones. For example, when a contractor, working on a bid for a public project, accepts a very large shipment of expensive prime steaks from a producer the contractor has never done business with, an ethical question should arise in both the sender’s and receiver’s minds. Or,

• When a producer tells a supplier that he’ll make that capital purchase but follows up with a statement that his child’s high school soccer team is seeking corporate sponsorships for new equipment and travel expenses; or,

• When on a contractor’s questionnaire, a producer purposefully omits that his company was recently fired from a similar job because they failed to meet specification requirements; or,

• When the producer built in money in a public project contract to host a celebration for employees at the project’s conclusion; or,

• When a producer’s employee uses returned concrete, already paid for by a customer, for his/her home’s driveway without permission and/or financial reimbursement to the company; or,

Research has shown that unethical acts are more than likely the result of opportunistic foibles and failings of good people rather than the greed and selfishness of bad ones.
When nervous by the downturn in the construction market, a sales rep recently hired from the producer’s arch rival, offers his/her currently sales manager his ex-employer’s proprietary job cost analysis standards and bidding notes.

If one is concerned about ethical business behavior, experts clearly note that companies must not only communicate a corporate culture that lays out a path for legal and ethical business compliance but must also identify the situational factors that hinder their employees from doing the right thing. There are three drivers that appear to push good employees in the wrong direction.

The first are the collection of company or industry “scripts” used in familiar situations, based on past learned behavior. Simple examples are automatically congratulating someone when hearing about his birthday, or getting a cup of coffee when first arriving at work, or punching a time clock. These repetitive, simple actions are given no thought. We cruise on automatic pilot without any careful consideration or full attention because we have experienced the situation so often. This kind of script can also lead to unethical behavior, “just because that’s the way we’ve always done it.”

For example, one unethical (environmental) lapse from years ago was that mixer drivers never gave it a second thought when cleaning out their drums and chutes. The highly alkaline wash water ran into nearby drains, sewers and streams. Their actions were not only lapses in customer service and quality control, but also were often based on “scripted” behaviors condoned by management by omission of direction.

While dealing with job site processed water has a very different script today, the reality is that the action, in of itself, remains repetitive. Its ethical solution has been driven by compliance regulations and new technologies that allow containment. Another recommendation to deal with scripted behavior is to force people to think about their action by taking away the routine that puts them on automatic pilot. We do that with mixer drivers when we send them to different pours because they continually have to make fresh judgments based on the job site’s conditions. They not only become exposed to different approaches in similar situations but also that variety can distribute stress more evenly, a side effect that allows drivers to stay mentally sharper and not fall back on a past, incorrect behavioral script.

The second situation where one can get caught in an unethical situation is our natural tendency to get a task done without paying any attention to the peripheral distractions along the way. For example, a clear lapse in business ethics would occur when your recently hired sales rep from your fiercest competitor offers to share his ex-employer’s proprietary bidding process cost standards. The sales rep does so because she knows that you, as her new employer, are driven to win the most bids. Studies have shown that employees cross this kind of line when they are pushed to the point that they cannot gain a perspective about the task at hand. This inattention to the actual business process can get them in trouble.

The last situational problem that gets employees into ethical trouble is the tendency to exclude certain people from the loop. This occurs when individuals or groups of employees are perceived as outside the boundary in which moral values and considerations of fairness apply. Years ago, women and minorities were discounted in the workplace as not having the ability to
Today, companies have expanded their scope to not only hire but assure their inclusion. Yet in a NRMCA focus group of ethnically diverse mixer drivers, complaints abound that they are rarely asked to contribute their thoughts to the business process, simply because of their entry level status. Hard to understand that practice when the driver pool not only represents around 60% of ready mix industry employees, but most often, are a producer’s most visible employees to customers and the public. While not justifying these frontline workers’ responses, they are not alone in echoing this fact. According to a McKinsey and Company 2006 survey of more than 800 U.S. organizations:

- Less than 50% of employees reported their organization, as a whole, was well managed.
- 60% of employees did not trust top management “to always communicate honestly.”
- 62% said their leaders “did not do a good job explaining important business decisions.”
- 61% said senior management did not confront issues before they become major problems.

Earlier studies found:

- 76% of employees surveyed saw illegal violations or actions against company standards in the past year;
- 49% believed that the company would lose public trust if the actions became public; and,
- In spite of federal protection, whistleblowers suffered retaliation when they reported wrongdoings, including 69% who lost their jobs or were forced to retire.

In today’s evolving business environment, most well run companies see employees’ input as critical driving factors influencing corporate governance, responsibility and actions. Many companies realize that in order to succeed, they must earn the respect and confidence, not only from customers, but also their employees. Specifically, a company’s business practices expands beyond the certification of financial statements required by the Sarbanes-Oxley Act to include compliance and business processes programs that assure their corporate culture promotes not only legal but also ethical requirements, internally as well as externally.

While some executives report that such integrity-based policies are better dealt with from afar, that is, relying on their employees to use their own judgment, more and more see clearly spelling out guidelines as a way to limit the company’s legal liability. Should a lawsuit occur, the company can state the problem would not have occurred had the trained employee obeyed the company’s ethical code of conduct. Executives also use their ethical code or guideline as a public statement illustrating that the company is a good corporate citizen.

The communication gap occurs between the company and employees when the company scripts do not practice what is preached. If integrity statements are just used as a marketing tool for employees, customers and the public, they not only demoralize employees but also become publicly deceptive practices. Everyone needs to walk the walk, and talk the talk, including:

- Top management following their own policies
- Reinforcing the written ethical codes to employees, orally and in writing, especially at critical junctures
• Implementing doable and understandable policies for employees
• Placing monitor compliance and improvement systems that touch every employee
• Executing clearly stated consequences in the case of disobedience.

There is reason to do so. One only needs to look at the collapse of a long list of recent firms that seemed to be at the top of their game, including Arthur Anderson, Bear Sterns, Enron and Global Crossing, to see the impact of corporate scandals on a company's market valuation and long-term viability. Research shows that companies who actively promote integrity not only attract a better caliber of employees and customers but also retain them. Beyond that, investors notice, too. In Moral Intelligence, the authors look at the connection between strong moral principles and business success. In fact, their study shows that the best performing companies have leaders that not only promote ethical intelligence but that the company's performance is consistently higher in lots of ways – gross sales, profit, talent retention, company reputation, and customer satisfaction. McKinsey & Company's research indicates that investors are willing to pay a 12-14% premium for companies with high governance standards. Along the same lines, the Quarterly Journal of Economics reported that shareholders returns were 8.5% higher with responsive companies versus those that are run by uncommunicative managerial dictatorships.

As a result, many companies develop internal policies that relate to the ethical conduct of all employees. Some are straightforward, broad concepts that form a corporate ethic statement. Others develop corporate ethics codes that detail behavior requirements and policies. Both spell out the company's expectations of its employees as well as offer guidelines to handle some of the more common ethical issues that might arise. The goal is to build ethical acumen, consistency in action, and to avoid ethical breaches. These statements, typically signed...
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by employees, also put them on notice that the company will not tolerate, or support, such actions.

Once the statements and conduct guides are developed, many companies hold workshops that explain the policies and include discussions of specific behaviors that employees could encounter. Corporate ethical policies can include dealing with:

- Suppliers and vendors, including gifts, meals, entertainment and travel
- Privacy issues with employees and customers
- Environmental and safety issues
- Handling company assets for personal use, including computers, company vehicles, expense accounts, telephones, etc.
- Antitrust issues, including pricing and proprietary information
- Conflicts of interest
- Booking revenue, billing and managing both internally within vertically and horizontally corporate division partnerships and externally with vendors, suppliers and customers.
- Steps to address issues as they arise, before, and if, they escalate.

Deep down, ethical behavior can be tied to motivation. What’s in it for us? While it is idealistic to believe that every employee, from the seasoned CEO to the entry-level new hire, is in the game for the passion of excellent performance, most, when honest, will ‘fess that they work for the money, the material success and recognition it buys. Yet along the way, being guided by the same principles we try to instill in our kids assures us that we will sleep better in our own big bed rather than the cold, narrow cot at the “Big House.”

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Pressure to Meet Unrealistic Business Objectives and Deadlines Is Leading Factor for Unethical Corporate Behavior, New Survey Suggests; American Management Association and Human Resource Institute Provide In-depth Look at the Ethical Enterprise, Business Wire, Jan 17, 2006, findarticles.com/p/articles/mi_m0EIN.

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Seven Steps to Build Customer Loyalty

by Greg Smith

Most businesses spend more time and energy trying to find new customers instead of retaining those they have. The logic behind customer retention is simple: it costs far less money to keep customers happy than to spend much more money recruiting new ones. Loyal customers tell their friends about your business and will spend more money than new customers.

I dread eating at airports. If you travel as much as I do, you are probably familiar with the “3 b’s” as it applies to airport fare: bad food, bad attitudes, bad timing. I had an early flight to catch at the Ontario, California, airport recently. I found myself standing outside the closed and gated doorway to an Applebee’s restaurant ten minutes before they opened up. I just knew they would be late and expected to receive the usual grumpy service common at most airports the world over. I was wrong!

Bam! The clock struck five; the lights popped on, and this charming lady opened the doors. She greeted me with a smile, a warm “hello” and told me to sit anywhere I wanted. I never had seen such a positive attitude at 5:00 in the morning.

For the next hour, I watched Felicia cheerfully greet customers, many of which she called by name. They were the “regulars,” she said. Felicia was the remarkable person who made that small restaurant pleasant and memorable. Next time I return to the Ontario Airport, I guarantee you this is the restaurant I am going to first.

The seven steps to build customer loyalty are as follows:

1. **Select the right people.** In the book, *From Good to Great*, Jim Collins said, “People are not your most important asset, the RIGHT people are.” Most businesses do a poor job of hiring people. They hire just anyone and place them on the front-line with customers. Spend more time recruiting and hiring the right people with good personalities. Focus on those who are friendly and demonstrate an interest and enthusiasm for the job. Consider using personality profiles as part of the hiring process. These profiles help identify true personality characteristics of your applicants.

2. **Sensationalize the experience for your customers.** Good service is not good enough. A Gallup survey showed a customer who is “emotionally connected” to
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For every complaint there are at least 10 other customers that visited your business who have the same criticism. A portion of those 10 people just took their business to your competitor. Look at customer complaints as an opportunity for improvement.

4. Sustain on-going training and reinforcement. Good customer service skills are not natural for most people. Effective customer service training must be reinforced and taught on a recurring basis. For example, the Ritz-Carlton hotels provide a thorough customer service training program for all employees during their orientation. Then, each supervisor conducts a daily “line-up” to review one of the commandments with his employees 10 minutes before each shift.

5. Specify incentives for good behavior. Yes, employees want to be paid well, but they also want to be treated with respect and shown appreciation. The front-line supervisor has the greatest impact on motivating and retaining employees. Reward those who exceed the standards and provide development for those who do not.

6. Survey your customers and reduce your defection rate. On average, businesses lose 15-20% of their customers each year to their competition. All businesses encounter this defection rate, but few do much about it. To improve retention, one client sends out a customer service report card to its top customers every month. This requires an evaluation based on four specific criteria. They tally the results and make sure employees see the scores. This motivates the employees to do a better job.

7. Seek customer complaints with enthusiasm. For every complaint there are at least 10 other customers that visited your business who have the same criticism. A portion of those 10 people just took their business to your competitor. Look at customer complaints as an opportunity for improvement.

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7 2P159 – Concrete Plant Operator’s Manual – Jointly prepared by the Concrete Plant Manufacturers Bureau and NRMCA, this manual is a comprehensive guide for the batch plant operator. It includes valuable information on materials, batch tolerance and aggregate moisture, calculations, plant maintenance, safety and more. ($23 members; $92 non-members)

8 2PFFPB1 – Flowable Fill Flip Chart “Pitch” Book – Due to the great reception the Concrete Parking Promotion Flip Chart “Pitch” Book, NRMCA is introducing additional flip-chart books to assist in promoting the benefits of concrete to specifiers. The latest is a comprehensive 20-page presentation on Flowable Fill. The presentation includes attractive, clear and compelling information for the specifier, backed by key additional information that the specifier does not see. This approach helps every promoter stay organized, reinforce the key points and also cover additional helpful information to support the specifier. The Pitch Book also comes with a Windows PowerPoint version on CD for electronic presentations which also enables editing and printing of page updates to the flip-chart book. (1-9 copies $35 ea.); (10 or more copies $30 ea.)

9 2PCP – Pervious Concrete Pavements – Pervious concrete as a paving material has generated tremendous interest due to its ability to allow water to flow through itself to recharge groundwater and minimize storm-water runoff. This introduction to pervious concrete pavements reviews its applications and engineering properties, including environmental benefits, structural properties and durability. Both hydraulic and structural design of pervious concrete pavements are discussed, as well as construction techniques. ($15 members, $15 non-members)

10 2PRD033DVD – Driver Training DVD – Save Your Skin – This lesson focuses on the dangers and the caustic nature of concrete and related cement products and how it affects our health. Workers exposed to cement-related products can suffer from skin problems ranging from dry skin and rashes all the way to severe burns that leave permanent scars. Included in the lesson are items of personal protective equipment needed to avoid skin exposure, along with procedures necessary when a person’s skin is directly exposed to cement related products. This lesson is for anyone who works with or around concrete, concrete block, cement, mortar grout or any other cement related products. 15:12 min. 2007 ($70 members, $90 non-members)
I have heard about legislation pending in Congress called the “Employee Free Choice Act” that would replace private ballot elections with a card-check system when a worker decides whether or not to join a union. Is card-check the most effective way to determine the wishes of a majority of employees?

No. Federal courts have repeatedly ruled that private ballot elections are the most foolproof method of ascertaining whether a union has the support of a majority of employees, noting that workers sometimes sign cards not because they intend to vote for the union in an election, but to avoid offending the person who asks them to sign (often a fellow worker), or simply to get the person off their back.

Please note: The column contained here should in no way be considered a substitute for competent legal counsel. It is only meant as a guide to help employers know when it is necessary to consult an attorney on issues pertaining to labor-management relations and other workplace issues.

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<td>Stephens Manufacturing Co., Inc.</td>
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<td>Terex Roadbuilding</td>
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<td>Travis Body &amp; Trailer, Inc.</td>
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<td>Trimble Mobile Solutions</td>
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<td>Westcon MFG Inc. TTEAM Conveyors</td>
<td><a href="http://www.theamconveyors.com">www.theamconveyors.com</a></td>
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</table>
OUR WATER CHILLERS OFFER A SUPERIOR MIX EVERY TIME AND PRODUCTION COST SAVINGS UP TO 95%!

Today minimizing overhead cost is a must. That’s why it makes sense to replace ice with one of our water chillers! Now precisely control water temperature and volume, for a superior mix batch after batch—and dramatically reduce the cost to do it. So cooling concrete is no longer just for spec jobs anymore! Plus, payback can be as short as one season. Also offering chilled concrete for just pennies per yard, gives you a significant competitive edge. Say goodbye forever to lost profits. Kiss off ice, on-site refrigeration and manual handling.

Pearson water chillers set the standard for quality. That’s why we can offer a “first in the industry” two year warranty on parts and labor! Features encompass rugged construction; simple operation; digital diagnostics; state-of-the-art heat exchanger; maintenance free, hermetic compressors; an EER rating to 10.2, plus a lot more. With in-house and national tech support. Standard units cool 200 to 6000 yds./day. Rentals are also available.

Ice is costly. Our air-cooled water chillers are today’s cost-effective answer that automates and simplifies the process. Reasons why Pearson water chillers are specified by more of the ready mix industry then any other brand!

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HOT WATER HEATERS • INSULATED TANKS • RECYCLED WATER TEMPERATURE CONTROL SYSTEMS • WATER CHILLERS • ACCESSORIES
Within 30 years the world’s population will double, with most of the growth occurring in cities. Replacing soil and vegetation with man-made surfaces on this scale can lead to a problem called the Urban Heat Island Effect—vast, stationary “hot spots” that retain heat even after the sun sets, requiring increased energy consumption to cool homes and businesses.

To find sustainable solutions to this and other problems, the people of CEMEX have partnered with the U.S. EPA National Center of Excellence at Arizona State University to establish the Sustainable Materials and Renewable Technologies (SMART) program. As part of the program, CEMEX is developing new pavement technologies to reduce the Urban Heat Island Effect and improve storm water management, such as proprietary pervious concrete for use in parking lots throughout Arizona to research and document the benefits of these materials. Significantly cooler pavement and minimized storm water runoff are just two of the benefits of pervious concrete. The data generated by these tests will be used by state and local agencies around the country to formulate policies and specifications for “greener” pavements.

Proof that by working together, we can build better cities and a brighter, sustainable future.

To learn more about this and other unique CEMEX projects, we invite you to visit www.cemexusa.com.