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Visit our Buyers’ Guide online at NRMCA.OfficialBuyersGuide.net
Lawrence Berkeley National Laboratory (LBNL) reports that on warm summer days, the air in large cities can be 6-8°F (3-4°C) hotter than surrounding rural areas. The annual mean air temperature of a city with 1 million people or more can be 1.8-5.4°F (1-3°C) warmer than its surroundings. In Baltimore, Phoenix, Tucson, Washington, Shanghai, and Tokyo, for example, scientific data show that July’s maximum temperatures during the last 30 to 80 years have been steadily increasing at a rate of one-half to one degree Fahrenheit (0.3-0.6°C) every 10 years as a result of urban development.

Additionally, on a clear, calm night the temperature difference can be as much as 22°F (12°C). The National Aeronautics and Space Administration (NASA) demonstrated through satellite imagery that the summer land surface temperature of cities in the Northeast U.S. were an average of 13-16°F (7-9°C) warmer than surrounding rural areas over a three-year period. This is called the urban heat island effect (see Figure 1).

The U.S. Environmental Protection Agency (EPA) explains how an urban heat island (UHI) is created and states that “as urban areas develop, changes occur in their landscape. Buildings, roads and other infrastructure replace open land and vegetation. Surfaces that were once permeable and moist become impermeable and dry. These changes cause urban regions to become warmer than their rural surroundings, forming an ‘island’ of higher temperatures in the landscape.”

Rosenfeld explains it in simple terms—dark horizontal surfaces absorb most of the sunlight falling on them and consequently dark surfaces run hotter than light ones. This is the main cause of the urban heat island effect. On a smaller scale, heat islands can occur not only on a group of surfaces (like hundreds of roofs and pavements in an urban area) but also in the local, surrounding atmosphere (commonly referred to as a microclimate). For example, on a hot, sunny day, the sun can heat dry, exposed urban surfaces, to temperatures 50–90°F (27–50°C) hotter than the surrounding air, while shaded or moist surfaces—often in more rural surroundings—remain close to air temperatures.

One study measured the temperature of various pavement types during a hot 90°F (32°C) summer day and found that dark asphalt had a temperature of 195°F (90°C) at the material surface and weathered concrete had a temperature of 155°F (68°C). The asphalt pavement was 40°F (32°C) hotter than the concrete pavement.

The urban heat island phenomenon was first discovered in the early 1800s in London and has been studied for many years by agencies including the EPA, NASA, LBNL, the Royal Meteorological Society and the French Centre for Meteorological Research of Meteo-France, among others. Starting in the 1970s, NASA began using earth sensing technology to map and measure urban heat islands around the world. Recently, the EPA has also joined the effort to better understand the impact of urban heat islands and to develop strategies for reducing their impacts.

Figure 1. Fewer trees, along with dark colored roofing and pavements cause the heat island effect, raising temperatures in urban and suburban areas.
Greenhouse Gas Emissions

Increased Air Pollution and Impacts of Urban Heat Islands

Burning fossil fuels such as coal or natural gas, counterintuitively, can have detrimental effects on a community’s environment and quality of life, including increased demand on energy, increased air pollution, smog, greenhouse gas emissions, human health effects and decreased water quality.

Increased Energy Demand

Elevated summertime temperatures in cities increase energy demand for cooling. Electricity demand for cooling increases 1.5–2.0% for every 1°F (0.6°C) increase in air temperatures, starting from 68 to 77°F (20 to 25°C). This means that 5–10% of the electricity demand for a city is used to compensate for the heat island effect. Not only do urban heat islands increase overall electricity demand, but they also increase peak demand. During periods of extreme heat, which often occurs on hot weekday afternoons, businesses and households run air conditioning, lights, electronic equipment and appliances. This often overloads the electric utility systems and can result in brownouts or blackouts.

Increased Air Pollution and Greenhouse Gas Emissions

Because most electricity is generated by burning fossil fuels such as coal or natural gas, any increase in energy demand can increase air pollution and greenhouse gas emissions. Air pollutants include sulfur dioxide (SO₂), nitrogen oxides (NOₓ), particulate matter (PM), carbon monoxide (CO) and mercury (Hg). These air pollutants can have negative effects on human health and contribute to the formation of ground-level ozone (smog) and acid rain. Ground-level ozone is formed when NOₓ and volatile organic compounds (VOCs) react in the presence of sunlight and heat causing smog. Acid rain is a broad term used to describe wet and dry deposition from the atmosphere containing high levels of SO₂ and NOₓ resulting from fossil fuel combustion. As this acidic water flows over and through the ground, it can have a negative impact on plant and animal life. Greenhouse gases including carbon dioxide (CO₂) are also generated when burning fossil fuels, so any increase in demand for electricity increases global warming potential.

Reduced Human Health and Comfort

Heat waves are exacerbated in urban heat islands and can result in higher than average rates of mortality. The Centers for Disease Control and Prevention (CDC) estimates that 8,015 premature deaths were caused by excessive heat in the U.S. between 1979–2003. This is more than the number of premature deaths resulting from hurricanes, lightening, tornadoes, floods and earthquakes combined. In addition, increased temperatures and high air pollution levels associated with urban heat islands can result in respiratory difficulties, exhaustion and non-fatal heat stroke. Children, older adults and those with existing health problems are especially affected by elevated temperatures.

Reduced Water Quality

Dark colored pavements and roofing absorbs the sun’s energy resulting in extremely high surface temperatures that can significantly increase temperature of stormwater run-off. This higher temperature stormwater drains into storm sewers and is eventually released into bodies of water like streams, rivers, ponds and lakes. Elevated water temperature can affect the metabolism and reproduction of many aquatic species and can be fatal to some aquatic life.

Counterintuitively, using light colored roofing and pavements can also benefit cities in colder climates. For example, in New York City, the length of the day in December is half that of a day in June. Also, the sun is so low in the sky that it shines on only half the roof or pavement area in December versus June. In addition, New York experiences three times more cloudy days in the winter than in the summer. When you multiply these three factors (1/2 x 1/2 x 1/3 = 1/12) the potential for horizontal surfaces to absorb the sun’s energy is only 1/12 in December as in June. This means that because so little sun ever reaches roofs and pavements in the winter months the benefits of lowering temperatures in the summer far outweighs raising temperatures in the winter.

Mitigating Urban Heat Islands

EPA published a report titled Reducing Urban Heat Islands: Compendium of Strategies that offers compelling reasons for reducing the urban heat island effect. (ix) The EPA report details several strategies to mitigate the effect of urban heat islands which include:

1. Design and material selection for roof structures and surfaces;
2. Design and material selection for pavement surfaces; and
3. The incorporation of more trees, planting and landscaping elements in urban communities.

What these steps demonstrate is the need for a comprehensive approach to mitigate the urban heat island effect. Within each of these mitigation strategies it is important to note that concrete can play a critical role.

In addition, the U.S. Department of Energy (DOE) provides several
The program suggests that by replacing dark colored pavements and roofing with light and heat-reflective concrete-based materials, along with careful planting of trees, the average summer afternoon temperature in urban areas can be significantly reduced. Researchers at LBNL have estimated that every 10 percent increase in solar reflectance could decrease surface temperatures by 7°F (4°C). Further, they predicted that if pavement reflectance throughout a city were increased from 10 percent to 35 percent, the air temperature could potentially be reduced by 1°F (0.6°C) which would result in significant benefits in terms of lower energy use and reduced ozone levels.(x) Another separate study estimated over $90 million per year in savings from temperature reductions attributed to increased pavement albedo in the Los Angeles area.(xi)

Depending on the electric power fuel mix, decreased energy demand associated with cool pavements and roofing will result in lower associated air pollution and greenhouse gas emissions. Cooler air temperatures also slow the rate of ground-level ozone formation and reduce evaporative emissions from vehicles. A 2007 paper estimated that increasing pavement albedo in cities worldwide, from an average of 35 to 39 percent, could achieve reductions in global CO2 emissions worth about $400 billion.(xii)

With proper consideration to certain design aspects for both buildings and pavements in the urban environment, the impact of radiative heat can be minimized and the urban heat island reduced. The important design aspects include reflective surfaces; reducing radiative forcing through insulating materials or using materials that have reduced heat capacity; using porous surfaces that allow air and water to permeate through; and, finally, providing plantings and shade through the use of trees or other landscaped surfaces.

Reflective Surfaces

It is well known that lighter surfaces tend to reflect solar light and heat while dark surfaces tend to absorb light and heat. A measurable parameter of solar reflectance is albedo, which is simply the percentage of solar energy or short-wave radiation (typically visible light reflected by a surface). A higher albedo signifies greater ability to reflect light away; thus, greater albedo reduces the amount of solar energy absorbed by a structure and keeps it cooler. It is important to note that albedo also affects temperatures below a surface, because less heat is available at surfaces that are highly reflective which reduces the latent heat that would be transferred into the materials below. Albedo is typically measured on a scale of zero to one. Another similar measure is solar reflectance index (SRI) that incorporates both solar reflectance and thermal emittance in a single measure to represent a material’s temperature exposed to sunlight. SRI is measured on a scale of zero to 100.(ix)

Solar reflectivity affects cooling and heating energy use in buildings and the urban climate. At the building scale, dark roofs and cladding are heated by the summer sun that in turn raises the summertime air-conditioning demand for the building. “Cool roofs” are roofs that are designed to maintain a lower roof temperature than traditional roofs while the sun is shining. Cool roofs have surfaces that reflect sunlight and emit heat more efficiently than hot or dark roofs, keeping them cooler in the sun.

There is a sizable body of measured data documenting energy-saving effects of cool roofs.(xiii) Both simulated models and field experiments on individual buildings in Ontario, California and Florida show that coating roofs white reduces summertime average daily air-conditioning electricity use from 2-63%. Low roof temperatures lessen the flow of heat from the roof into the building, reducing the need for electricity for space cooling. Since roof temperatures peak in late afternoon, when summer electricity use is highest, cool roofs can thereby reduce peak electricity demand. Prior research has indicated that savings are greatest for buildings located in climates with long cooling seasons and short heating seasons, particularly those buildings that have distribution
ducts in the plenum, cool-coatable distribution ducts on the roof, and/or low rates of plenum ventilation.(xiv, xv)

In another example, researchers monitored buildings in Sacramento with lightly colored roofing and cladding and found these buildings used up to 40 percent less energy for cooling than those with darker surfaces. The contrast in Figure 3 demonstrates how albedo can affect the surface temperature of a building by reflecting solar heat energy. The resulting lower outside air temperatures can slow urban smog formation and improve human health and outdoor comfort. Reduced thermal stress may also increase the lifetime of cool roofs, lessening maintenance and waste.

For pavements, Figure 4 demonstrates the correlation between albedo and pavement temperature for several pavement surfaces in Phoenix. Note that conventional concrete and Ultra-Thin Whitetopping (UTW) pavements, which generally have higher albedo measurements, have the lowest pavement surface temperatures. With pavements making up nearly 40% of the urban landscape, there is great potential for a reduction in urban heat islands through the use of highly reflective pavement surfaces like conventional portland cement concrete and concrete with white cement and/or slag cement which tends to increase pavement albedo.

Moreover, research on the reflectivity of concrete pavements indicates that concrete pavements can help reduce lighting costs, energy demand and enhance safety on roads and parking lots(xvii). The essential quality that appears as the brightness of an object is called luminance. Luminance is the intensity of brightness and is measured in candela per unit area of a surface. Higher luminance values are associated with brighter surfaces. The average luminance of concrete pavements was determined to be 1.77 times that of asphalt pavements. As a consequence, asphalt parking lots use 57% more electrical energy than concrete parking lots. It also became evident that better uniformity of the luminance also could be achieved with concrete surfaces.

For the conclusion of this article, please see the digital edition of the November–December Concrete InFocus found at http://www.nrmca.org/news/connections/

Back in July, I had the great privilege to testify on behalf of our company and our industry before the House Committee on Education and the Workforce during a hearing titled, Rushing Union Elections: Protecting the Interests of Big Labor at the Expense of Workers Free Choice. The hearing was in regard to the Notice of Proposed Rule Making published by the National Labor Relations Board (NLRB) on June 22, 2011 which aims to overhaul the election process for employee unionization. The new rule would, in part, shorten the amount of time between the notice of a union election request and when an actual secret ballot is held from between 45 to 60 days, down to just 10 to 21 days.

The entire process was electrifying. I was so honored to be asked and given the opportunity to testify regarding a matter of vital importance to our family, our employees and company, our industry and the business community. During the interview process for determining whether I was an acceptable witness, I had some initial concerns about the time being away from our company and whether I was qualified to testify. After talking with a legislative staff person during the interview process it quickly became apparent that if selected, I needed to make the time to testify given the vital importance of the matter and the desire for me to share my experiences with union organizing and how shortening the election process could have such a negative effect on the process.

When the National Ready Mixed Concrete Association (NRMCA) notified members of the legislative committee that I would be testifying on this matter, I got several emails from NRMCA members stating the importance of this matter to their company and thanking me for testifying. I valued the input and shared their comments and concerns with the congressional committee.

At the hearing I heard many views on the proposed rule. My nervousness soon went away when given the opportunity to share my experiences and concerns. My answers were not based on some type of scientific survey or professor’s opinion; they were based on real life experiences as a ready mixed concrete producer and small business owner.

After the hearing I was given the opportunity to be part of the committee chairman’s press conference and later saw pictures and
All in all it was a once in a lifetime experience that I can share with my family and friends. If given the opportunity, I strongly encourage others to participate.

As someone who has experienced an organizing drive, I was able share how the proposed rule would have hurt and complicated the process.

In particular, the overall current time frame allowed and needed between the notice of election and the execution of the election was critical to accurately inform our employees about the issues. The time frame allowed our company to fully assess and subsequently hire the right legal representation for our situation. Most small ready mixed concrete companies and small companies in general do not know what they can or cannot say to their employees about or during a union organizing drive. When an employer receives an election petition, which is often when they first become aware that their employees are facing a union election, it frequently takes longer than seven days to find and hire a consultant to advise them on their rights, abilities and complexity of union elections. Under the new rule the shortened time frame does not take into account the time it takes to accurately identify all the issues needing consideration.

We support employee’s right to make informed decisions collectively about their employment future. We also believe in protecting an employer’s right to be part of the process and to have the ability to honestly and effectively communicate an employer’s position to employees without obstruction. Employees deciding their employment future should not be a snap decision. It is only fair that before a group of employees decides on their collective bargaining rights that they receive information from both the union and their employer about what unionizing really achieves.

All of these issues needed to outlined, and still do. Given the critical importance of this issue, it is important that we actively engage to defeat this proposal.

During our organizing campaign employees would ask what is going on and why do we have to go through this. Employees need time to get their questions fully answered, to discuss their questions and concerns with their fellow employees and employer.

Our company has 13 ready mix plants and 3 portable crushing plants, covering 12 sand and gravel pits. Shortening the process to as little as 10 days makes it almost impossible to reach of all the employees at all of these different sites to address questions and concerns, let alone hire a labor attorney, inform our supervisors and employees of the process, and make the necessary filings and responses.

We used the entire 42 days allotted to meet all of these requirements. I believe the current rule should not be changed. The current NLRB election process works. According to the U.S. Chamber of Commerce, the NLRB’s most recent annual report states that the median time for an election from the time a petition is filed is 38 days, and more than 95 percent of the time elections occur within 56 days.

Reasons given at the hearing in support of the rule included: it is intended to reduce unnecessary litigation, streamline procedures, facilitate the use of electronic communications, and document filing. But the costs of this proposed rule far outweigh the suggested benefits.

Potentially shortening the entire election process to just 10 days dramatically decreases the time employers have to speak with their employees about union representation and effectively blocks small business from obtaining legal and other advise about how to talk to employees during a union organizing drive. Employees deserve to hear both sides. The proposed rules are an attack on free speech and due process.

Our current economy is struggling, and we believe if this rule is implemented it will effectively kill jobs. For this reason I testified that as a small business owner, “…please don’t forget about us, we create jobs too. And I am just so concerned with this process that it would become too short, too difficult to comply with, such that we won’t have an informed, legal and fair vote for everyone. I’m very concerned about it.”

In speaking with fellow ready mix producers and small business owners on this issue, I was struck by the fact that many of my colleagues are unaware of this proposed rule, which is flying under the radar screen given our current financial crisis and Washington D.C.’s response. When I shared this information at our Wisconsin Family Business Forum, companies expressed concern and asked how they can become involved to stop the implementation of this rule. We rely on organizations like the NRMCA to flag these issues and give us an avenue to express our opinions and outrage.

I was given the opportunity to share our views on this rule for our family, our business and members of our industry. I shared how this rule could potentially have a life changing effect on our employees, our company and future generations of our family business. I shared how the process can be very complex and confusing to comply with, that small business owners want to comply with the law and that we want the process to be done properly and lawfully. I also stated that our employees looked to us to explain the organizing process, to respond to accusations and supply information so that they could make an informed decision.

Given the critical importance of this issue, we must actively engage to defeat this proposal. We need to get the word out as to this proposal, and work with our friends in the industry to stop these proposed rules. When the NRMCA asks that you contact your legislator on a matter such as this, please participate.

Joining the NRMCA’s Government Affairs Committee is an excellent way to stay informed about matters important to our industry and to become involved in the process.

Participate in legislative fly-ins to Washington D.C.; legislators want to hear from their constituents. The opportunity to express, one-on-one, our industry views on matters important to our industry is invaluable. Plus, Washington is a beautiful city and a great place to bring the family to see the monuments, museums, etc.

Give your legislator a plant tour. Take the opportunity to explain to your legislator the ready mixed concrete manufacturing process and what is important to our industry.

U.S. Representative Tom Petri (R-6-WI) (we have several ready mixed concrete plants within his district) was on the committee I testified before. I had previously met Representative Petri at a legislative fly-in and gave the Congressman a plant tour at one of our ready mixed concrete plants. Representative Petri personally introduced me at the hearing.

Become involved. Our economy is struggling and we all have concerns about the future direction of our country. Make your voice heard!
Recession-Driven Derailment: Do Not Let Your Employees Jump Track

By Ashley Sisk, consultant, FMI Corporation

Construction firms across the globe have recently experienced a series of layoffs, budget freezes, cost-reduction measures and consequent low morale because of the recession. Companies that have typically enjoyed an abundance of talent, jobs and funding are now finding difficulties in managing the turnaround of a company that is struggling. Ironically, many companies are experiencing some voluntary turnover from those employees who “survived” the layoffs. Other employees are experiencing derailment, finding little to no passion or enjoyment with their work as they did only a few months ago.

Many managers believe that those still employed at the firm after others have been let go would be grateful that they even have a job. However, evidence from this and other recessions suggests that many of these remaining employees feel overworked, threatened and vulnerable. In nearly all these cases, the opportunity for derailment emerges and morale suffers.

Morale affects performance. During this recession, reduced performance threatens construction firms with a double-edged sword. While businesses are doing what they must in order to survive, employee morale threatens to make matters even worse. Derailment occurs when high-performing employees become disengaged with their jobs and are no longer working up to their potential. Some of the causes of employee derailment include lack of recognition, no opportunity for career growth, differences in opinion with managers or personal reasons. With recession-related derailment, the causes are usually the same, with the addition of “survivor guilt,” increased workloads and stress levels. However, the number of derailed employees increases; so instead of having just one or two people who are not living up to their potential, there could be many. Recession-related derailment results in productivity declines, customer service failures, increased sick days or tardiness, declining sales, increased costs and lower profit margins.

The only way to escape these problems is for construction companies to be proactive in addressing overall employee morale before any of the other symptoms occur. Without a proactive strategy, employee disengagement will most definitely occur and organizational health is at risk.

Let us back up for a moment. How has the recession caused morale to drop and derailment to occur? In many firms, morale starts to decline when management becomes aware that the financial crisis that has affected the globe has now become its crisis as well. Almost immediately, these firms begin to create a lean workforce and reduce or eliminate as many overhead costs as possible. Unfortunately, the changes that may be essential to company survival are the same actions that are sending employees off the tracks. Furthermore, while these changes are occurring, the communication between management and their employees is suffering. Rather than hearing about the firm’s survival strategies firsthand from the senior leadership team, the gossip mill takes over, often raising anxiety to new and exaggerated levels. Employees become confused, angry, detached and eventually resigned to the possibility that they might lose their jobs. In many cases, the less information that management provides to its people (including those who have been laid off), the stronger the impact of the assumptions that replace open and factual communication, and the greater chance of disengagement.

Layoffs are stressful enough for those who lose their jobs; but those who are left...
behind also suffer as firms expect them to do more with less. However, given the current economic climate, it is imperative that employers take action to improve overall employee morale and keep productivity up. Here are a few leadership strategies that may help managers navigate through the recession in an honest and ethical way. These strategies are designed to minimize the chance for recession derailment and to establish a healthier organizational environment for those left behind.

Avoid a series of layoffs if at all possible.

Even if a series is not intended, the second round strongly implies that there will likely be more, and nothing destroys morale more quickly than a series of layoffs. Management should openly discuss the challenges it faces with all employees. It may be uncomfortable, especially for those who are conflict-avoidant, but employees will respect the honesty. People get it when you say, “We’re not doing salary increases this year because we’re focused on protecting everyone’s job stability right now. We’re going to take care of you with raises once we can do it safely.” Show loyalty by brainstorming with various departments and employees on ways to cut back to ensure everyone keeps his or her job. For example, at least one company has undertaken a four-day workweek with a 20% pay reduction for some grades and 15% reduction of others as a means of hanging on to as many employees as possible. This is difficult to do with field employees; but when employees know you are doing everything you can to keep them onboard, you may be surprised at the ingenuity and selflessness they can demonstrate when given the opportunity.

Increase the frequency of communication within firms.

Communication reduces anxiety and can stabilize, if not improve, morale. Do not delegate this responsibility to lower levels. Top management must do it. Furthermore, do not resort to management by memo. Everyone can appreciate an inspirational thought via e-mail; however, if managers are not getting face time with their employees, they will not have an accurate measure of actual employee morale. Reinstitute “management-by-walking-around” principles. Get to know your people. Find out what motivates them and attempt to put them into positions where they can be the most productive and adding to the bottom line.

Maintain the morale of those who remain, and make it a top priority.

This might include showing interest in your employees’ personal lives; making sure you know the names of their spouses and children; showing your sympathy when they are dealing with hardships; taking note of their interests; and always treating them as people. Encourage employees to become re-engaged at work by allowing them to have a say in their work goals, company policies and procedures, and potential projects. This allows them again to feel a sense of worth within the company. Then, when appropriate, celebrate company successes and give credit where it is due—even for the smallest victories. Simple rewards for a job well done can boost morale. It can be as small as lunch, an afternoon off or a note of appreciation. Not only does this boost morale, but also helps avoid derailment and burnout. Employees need a healthy work/life balance. Perhaps the nine-to-five standard will need to change in this economy to improve productivity, and that does not mean longer hours. Encourage working smarter, not harder.

Continue developing your people.

Even in this tight economy, organizations need to create cost-effective development programs by implementing some of the following:

Mix classroom, online and peer learning opportunities. It will save travel time and expenses and, in the case of peer learning, create situations for employees who may not typically work together to learn from one another. An example of this is technical training via a Webinar or online format.

Create learning that solves real-world problems. The current economy has presented new organizational challenges. Use these challenges as opportunities to bring your people together. Employees will feel empowered to see their recommendations implemented and form valuable professional relationships that will help them do their jobs more effectively.

Enhance leadership. Create programs that help your leaders engage with employees one-on-one and one on group. Choose programs that offer advice on how to provide meaningful feedback. If there are changes in the workplaces, allow senior leaders to explain those changes, rather than leaving explanations to the individual supervisors. Even use your field supervisors without current project assignments to coach, train and mentor younger staff members, in addition to their traditional use as estimating support.

What can we learn from this recession? No one can afford to wait and see which way the market is going to go, and those planning to stay ahead of the curve and avoid recession-related derailment must take action now. Organizations must get to know who their employees are, what they need as it relates to communication, morale and development, and how to alter their organizational strategies to meet those needs. Simply paying people without providing useful roles only helps morale a little. Pay plus personal contribution to both the present and the future enables people to feel better about themselves and about their company.

Take the time to create a general structure that allows leadership to communicate with its team, while at the same time focusing attention on the needs of the individuals that remain. Once leaders understand this, there are a number of cost-effective programs as well as rewards that companies can put in place that will lead to improved learning opportunities and, in turn, will promote an engaged workforce that stays on the job for long-term business success.

Ashley Sisk is a consultant with FMI Corporation. She may be reached at 919.785.9242 or via e-mail at asisk@fminet.com.

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Can C.R. Herro do for the housing industry what Lee Iacocca did for the automobile industry? If you look at the mission of these two gentlemen, you see a lot of similar traits.

• Iacocca had to leave Ford and go to Chrysler to get his ideas noticed. Herro left the cement/concrete/aggregate industry to join the predominantly wood focused home building industry.

• Iacocca championed unibody car construction at Chrysler as one method of making cars more efficient. Herro is championing ICF concrete construction as a way to make homes more efficient.

• Iacocca, an engineer by training, found his true strength when he switched from engineering to marketing. Herro earned his master's in environmental engineering from the Illinois Institute of Technology and now as vice president of environmental affairs for Meritage Homes, he's in charge of establishing new green standards across the entire home-building industry.

• In a time gone by when the auto industry responded to the challenge for better miles per gallon, an item every car shopper now considers when buying a car, Herro is talking about posting a national Home Energy Rating System on every home built.

The single family home is likely the largest investment most people will make. But in a market of mass production and fast turnaround, C.R. Herro is working to raise the bar to change the current model, a model that in the past has been to build to minimum code standards and only changed when builders were forced to do so by those codes. Herro is out to prove that building “quiet, cleaner, safer, and costing less to operate” homes can be done with production builders like Meritage Homes, one of the top ten home builders in the nation.

Herro explains: “Meritage’s core success in transforming the housing industry is in identifying credible enhancements to building practices and working to make them a standard feature in all our homes. The scaling of good products to standard features involves cost/benefit, production efficiencies, national availability, trade implementation and cycle time.”

He went on to talk about Meritage’s experience with concrete framing in insulating concrete forms to replace conventional wood framing in exterior walls. “ICFs have the potential to provide improvements in all of these areas. Meritage is specifically working with a modified panel ICF which appears to have the best opportunity to provide a direct improvement in function to the consumer, all while being cost competitive, easier to build and shorten cycle times. I anticipate our first ICF community in late 2011, with expanded ICF use over the next few years. I truly believe once we can transition the building practice from custom to production, the efficiencies of scale and performance improvements will result in a significant change in building practice in the U.S.”

“It is interesting to hear him talk about the two generations who are the most interested in green and their completely different opinions about why green building matters. According to C.R., the Boomers are tired of escalating energy bills and love the idea of controlling their costs without sacrificing their lifestyle. The Millennials, tech-savvy cynics that they are, are looking for an honest approach to reducing the carbon footprint—and enjoying running their homes on mobile apps,” wrote Colleen Edwards on her blog http://therealstoryblog.com/

C.R.’s passion for green began in school. He earned a bachelor’s of science in physical and life science from Arizona State University, a master’s in environmental policy from Governors State, and a master’s in environmental engineering from the Illinois Institute of Technology. He also spearheaded research and program design for environmental pollution control, remediation and business development throughout the U.S. His processes have established new methods in flue gas desulfurization, industrial process design, land redevelopment and building design.

So we have to ask the question. “Are we on the verge of a massive paradigm shift in the way the housing industry responds, recovers and builds in the future?” Since “Meritage Green,” an ambitious home building program aimed at building extremely energy-efficient homes and offering them at very affordable prices was introduced in the summer of 2010, other top ten builders have taken notice of what is happening at Meritage. One could almost compare it to the auto industry change influenced by the Chrysler K car.
Technical Related Publications

1. 2PCIP100 – Concrete In Practice Package - Concrete in Practice Sheets are short 1-page discussions on various concrete topics and are written in a “What? Why? And How” scheme and are intended to provide information on a non-technical format. The CIP topics are researched and written by members of NRMCA’s Research Engineering and Standards Committee. These are a great resource to give to your contractors and customers. **English CIP Full Set 2PCIP100** - contains 20 sets of each CIP topics 1-42. **Spanish CIP Full Set 2PCIP100es** - contains 20 sets of each CIP topics 1-42. ($220 members, $320 non-members); **English Single Set 2PCIPS** & **Spanish Single Set 2PCIPSes** ($27 members, $110 non-members)

2. 2P170 – ASTM Standards for Concrete Technician Certification– Updated in April 2010, this publication includes 12 ASTM practices and test methods related to testing fresh and hardened concrete, including those required for ACI grade 1 field-testing and strength testing technician certification. ($42 members, $190 non-members)

3. 2P133 – In-Place Concrete Strength Evaluation: A Recommended Practice – Revised in July 2011, this Practice contains guidelines for use when strength tests fail to meet specifications. It is based on research by the Association and others and on past experience with strength controversies. The guidelines include investigation procedures, testing methods and precautions, and assignment of responsibility. It addresses the degree of strength deficiency that warrants further evaluation; a sequence of steps to follow in the investigation; and actions that should result from the investigation along with suggestion of allocation of costs. The revisions address current requirements in industry codes and standards. ($12 members, $48 non-members)

Environmental Related Publications

4. 2PEMRM - Environmental Management for the RMC Industry- With more than 250 pages, more than 125 full color images and input from nearly all the major ready mixed concrete companies in the U.S. this document presents the environmental issues that surround the manufacture of ready mixed concrete. The document describes best industry practices for water management, air quality management, admixture, chemical and fuel storage issues, noise management, hazardous waste management, best management practice for fleet maintenance shops, plant aesthetics, plant closures, environmental security and sustainability issues. The publication also describes the organizational makeup of regulatory bodies (Environmental Protection Agency and state and local Environmental Departments) that govern the ready mixed concrete industry and describes agency inspection and tips for preparation of EPA audits. ($75.00 members, $350.00 non-members)

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

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**Best Sellers from the NRMCA Bookstore**

- **Technical Related Publications**
  1. 2PCIP100 – Concrete In Practice Package
  2. 2P170 – ASTM Standards for Concrete Technician Certification
  3. 2P133 – In-Place Concrete Strength Evaluation: A Recommended Practice

- **Environmental Related Publications**
  4. 2PEMRM - Environmental Management for the RMC Industry
  5. 2PLCI - LEED Calculator for the Concrete Industry

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6. 2P188 – Truck Mixer Driver’s Manual
   – This manual educates truck mixer drivers about concrete and customer relations. This booklet also highlights driver duties, safety precautions, equipment inspection and maintenance procedures, and what the driver should do in case of an accident. Also available in Spanish – 2P188S; ($14 members, $54 non-members); (20 or more copies $12 ea. members, $54 ea. non-members.)

7. 2P159 – Concrete Plant Operators Manual
   – 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. ($25 members, $100 non-members)

Promotion Related Publications

8. 2PPSLRFB – Streets and Local Roads Flip Book
   – The ‘Concrete Streets’ flip book is designed to introduce the benefits of concrete street paving to decision makers in public works, city engineers, city management and their consultants. It comes complete in a ready to use easel flip book, and includes a PowerPoint version on CD-Rom for local customizing or to use in a lunch and learn presentation. ($29.00 members, $29.00 non-members)

9. 2PPSLR – Street & Local Road Promotion Handouts
   – These three attractive flyers are designed to provide support to members and partner associations that are interested in advancing local concrete promotion for streets and local roads. This package set includes “Cost and Performance of Streets and Roads” and “Sustainability Considerations for Streets and Roads” - which are executive overviews, and “Life-Cycle Costs of Streets and Roads,” a technical fact sheet. Each package contains 25 copies of each of these one-page (two-sided) colored flyers. ($17 members, $20 non-members)

10. 2PPB50 – Pervious Concrete: When It Rains, It Drains Promotion Brochure (Pkg. of 50)
    – As customers and influencers in every part of the country are under increasing pressure to move toward increased sustainability, the many “green” and economic advantages of pervious concrete are attracting more and more attention. This promotional brochure, developed through the NRMCA-sponsored Concrete Collateral Working Group and targeted to owners and architects, clearly makes the case for pervious. As interest in pervious continues to grow, these brochures should be left behind on every promotion and sales call. ($52.50 members, $52.50 non-members)
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As part of a broader quality initiative, NRMCA’s Research Engineering and Standards (RES) Committee has been developing brief technical information topics packaged as Technology In Practice (TIP) sheets. The TIPs are modeled on the popular Concrete In Practice (CIP) series. While the CIP series are intended for use by the industry with customers or other entities to explain various technical issues the TIP series is intended for industry personnel to

continued on page 18

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As of now, five topics in the TIP series have been completed. Additional topics are under development. NRMCA is also soliciting ideas for TIP topics. Please send suggestions to Karthik Obla at kobla@nrmca.org.

- **TIP 1 – Quantifying Concrete Quality** – provides ideas on identifying items to measure and quantify the impact of a quality goal that positively impacts the company’s bottom line;
- **TIP 2 – Establishing the Required Average Strength of Concrete** – summarizes the general process of establishing the required strength for concrete based on the strength specified in project specifications in accordance with ACI standards;
- **TIP 3 – Aggregate Sampling for Laboratory Tests** – discusses procedures to ensure that samples obtained for quality control tests are representative of the stockpiles or other storage locations from where they are obtained;
- **TIP 4 – Aggregate Sample Reduction for Laboratory Tests** – addresses procedures to properly reduce the size of a larger field sample to a smaller size that is required for laboratory tests; and
- **TIP 5 – Capping Cylindrical Concrete Specimens with Sulfur Mortars and Unbonded Caps** – summarizes the key points in the applicable standards for capping strength specimens and the reasons for these requirements.

($10.00 members, $40.00 non-members) **TIPs can be obtained from the NRMCA Bookstore by contacting Jacques Jenkins at jjenkins@nrmca.org.**

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**Specifications of Concrete Quality**

Concrete is one of the most widely used construction materials in the world. It is used in a variety of applications, from building structures to infrastructure projects. The quality of concrete is critical to ensure the durability and performance of these structures. By following best practices in specifying concrete quality, contractors can improve the overall performance of their projects and reduce costs over the long term. This article provides guidance on how to specify concrete quality, including the factors to consider when selecting concrete mix proportions and construction methods. It also highlights the benefits of aligning with the Concrete Quality Council’s Code of Practice and offers tips for integrating quality control into construction projects.

**Tips for Specifying Concrete Quality**

- **Consider Structural Requirements:** The strength and durability of concrete depend on factors such as the materials used, the mix proportions, and the curing process. It is essential to consider the anticipated loads and environmental conditions to ensure the concrete meets the required specifications.
- **Use Appropriate Mix Proportions:** The mix proportions of concrete determine its workability, density, and strength. To achieve the desired strength and workability, contractors should use a mix design that incorporates local materials and meets the project’s specific requirements.
- **Implement Quality Control Measures:** Quality control measures, such as testing concrete for compressive strength, can help ensure that the concrete meets the specified standards. By regularly testing concrete, contractors can identify any issues early in the construction process and make necessary adjustments.
- **Adhere to the Concrete Quality Council’s Code of Practice:** The Concrete Quality Council’s Code of Practice provides guidance on specifying concrete quality, including the selection of materials, mix proportions, and construction methods. Adhering to this code can help contractors ensure that their projects meet the highest standards of quality.

By following these tips, contractors can improve the quality of their concrete projects, which can lead to lower costs and increased durability over the long term.
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- **Mustang** - New low-profile portable

The Mustang plant will be exhibited at the ConExpo Show.

NEW Stephens RCC Mixer:

The new mixer will allow an existing dry batch plant to be transformed into an RCC or central mix plant. The New RCC mixer will be exhibited at the World of Concrete Show and the ConExpo Show.

NEW Stephens/Inventure Reversing Drum Mixer:

Stephens has acquired the exclusive rights to manufacture and supply the Inventure Reversing Mixers in Canada and the USA. The new design and updated frames will make the mixer even more maintenance friendly. The NEW Stephens/Inventure Reversing Mixer will be exhibited at the ConExpo Show.

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**New heavy portable Falcon**

- Standard frame will support up to two 1000 bbl silos
- Standard frame will support up to 200 ton agg bins
- Optional frame will support up to 400 ton agg bins
- Plant can be designed with 36" belt, water batcher and holding tank for 200 yph production
- Central dust collector can also mount on plant to save yard space
- Standard frame to be designed to typical zone 1 seismic calculations

**New low-profile Mustang**

- 400 bbl in truss silo
- 70 ton agg bin
- 30" transfer belt
- Two (2) 10" screws
- Optional: in truss central dust collector available
- Standard frame designed to typical zone 2 seismic calculations

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**NEW Stephens/Inventure Reversing Drum Mixer**

Stephens has added several other options as standard equipment.

The new Stephens/Inventure Reversing Mixer will be exhibited at the ConExpo Show, booth # 5707.

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**Unique Features:**

- The newly designed frame will make clean-up and maintenance easier, and the new design will allow for a water hose or broom to easily clean under the mixer.
- The patented “swing out” hinged charging chute also allows for quick and easy access inside the mixer.
- Stephens has added several other options as standard equipment.

The new Stephens/Inventure mixer will be exhibited at the ConExpo Show, booth # 5707.
The Urban Heat Island Effect and Concrete’s Role in Mitigation

Radiative Forcing

Radiative forcing is a measure of how the energy balance of the Earth-atmosphere system is influenced when factors that affect climate are altered. The word “radiative” signifies that the factors affect the balance between incoming solar radiation and outgoing infrared radiation within the Earth’s atmosphere. Positive forcing tends to warm the surface while negative forcing tends to cool it. (i)

Figure 5 demonstrates how radiative forcing is linked to other aspects of climate change as per the Intergovernmental Panel on Climate Change (IPCC). Human activities and natural processes cause direct and indirect changes in climate change drivers. In general, these changes result in specific radiative forcing changes, either positive or negative, and cause some non-initial radiative effects, such as changes in evaporation. Radiative forcing and non-initial radiative effects lead to climate perturbations and responses like global and local temperature fluctuations, changes microclimate precipitation or can even cause extreme weather events. (ii)

Utilizing high albedo surfaces will reflect solar energy and therefore reduce the radiative forcing or produce a negative forcing effect. However, for both pavements and buildings it is also important to consider the heat capacity, thickness, density, porosity and permeability of a material to fully understand its affect on radiative forcing.

Concrete pavements, for example, typically have an overall thinner pavement structure in comparison to other pavement types for a given traffic level and soil foundational support. With this thinner pavement structure in conjunction with high albedo, concrete pavement can reduce radiative forcing thus reducing the urban heat signature in comparison to other pavement types that are thicker and darker. In addition, the cooling rate for thinner concrete pavement structures may be quicker than other pavement types, which again will reduce radiative forcing.

In a report written by Akbari, et al, the authors state that using cool roofs and cool pavements in urban areas, on average, can increase the albedo of urban areas by 0.1. The authors estimate that increasing the albedo of urban roofs and paved surfaces will induce a negative radiative forcing of 4.4x10^{-2} W-m^{-2} which is equivalent to offsetting 44 Gigatons of emitted CO₂.(iii)

On a global scale, negative radiative forcing can result in huge reductions in global warming potential. At a recent conference, Energy Secretary Dr. Steven Chu stated, “If you replace all the building roofs today with white roofs and you go to cement style pavement instead of blacktop style pavement, it would be a reflection of the sunlight back into space that would be the equivalent of as if you took off all the automobiles of the world for 11 years.” Dr. Chu goes on to add, “And guess what, it’s about the same cost, white versus black.” (iv)

Shading, Infiltration and Evapotranspiration

Another mitigation strategy to reduce urban heat islands is to provide shade or canopies over pavements (e.g. shade canopies over residential streets or parking lots) or shade next to buildings. Traditionally, trees are used to provide the needed shade as well as provide CO₂ transpiration and evapotranspiration. The challenge in these situations is the amount of impervious cover in the urban environment which limits the infiltration of water into the surrounding soils and then into the tree root balls.

Over the last several years, pervious or porous pavement systems have been
developed that provide direct infiltration of rain water into soil systems beneath the pavement structure. Typically, pervious pavements are constructed with a porous surface, an optional filtration material to filter out potentially harmful pollutants in the water and a permeable subbase from single graded stone (See Figure 6). (v)

The porous surface can be constructed with pervious concrete which contains little or no sand, creating a substantial void content. Using sufficient paste to coat and bind the aggregate particles together creates a system of highly permeable, interconnected voids that drains quickly. Typically, between 15% and 25% voids are achieved in the hardened concrete and flow rates for water through pervious concrete are typically around 480 in/hr (0.34 cm/s), which is 5 gal/ft²/min (200 L/m²/min), although they can be much higher. The infiltration of water into the soil can be a significant contributor to increased tree root ball growth which leads to fuller and denser tree canopies.

As mentioned previously, the light color of concrete pavements absorbs less heat from solar radiation than darker pavements and the relatively open pore structure of pervious concrete stores less heat, again, helping to lower heat island effects. However, in some instances, even with pervious pavements, tree root growth can be hindered due to highly compacted soils around pavement structures and buildings and a lack of suitable soils. To assist with tree root growth, and consequently tree canopy growth, suspended pavement systems have been developed.

Gordy states that suspended-pavement systems offer the best combination of structural strength and large volumes of quality soil. He continues by defining suspended-pavement system as consisting of an underground post-and-beam structure and a deck with pavement on top. The structure supports the weight of the pavement and additional loading by pedestrians and vehicles, leaving the space for large volumes of uncompacted soil for root growth and stormwater treatment. This approach also protects pavement and curbs from the uplifting pressure of strained roots. Stormwater can be allowed to infiltrate the soil in several ways, such as via permeable pavements, drainage slots, curb-cut inlets and sheet flow to open planting areas. (vi) In fact, pervious concrete pavement in conjunction with loosely compacted soils in a suspended system can provide the desirable combination of adequate water infiltration and soil conditions for optimal tree root growth.

Another shading strategy is to cover parking areas or spaces with photovoltaic cells (solar panels). Panels not only provide shading for the pavement and parked cars, but the electricity generated can be used to power nearby buildings. Panels were installed at the University of California San Diego Hopkins Parking Structure which demonstrates a perfect example of combining photovoltaic cells as parking canopies with high albedo concrete in the driving lanes (see Figure 7).

Green roofs or vegetated roofs are also an innovative technology that can help mitigate urban heat islands and provide a range of public benefits. A green roof is a vegetative layer grown on a rooftop that provides shade to surfaces and removes heat from the air through evapotranspiration. Green roofs can be installed on a wide range of buildings, including industrial, educational and government facilities; offices; other commercial property and residences. For the most part, green roofs impart significant load to a structure and are often supported by concrete slabs.

A green roof is able to reduce urban heat islands through the plants and growing media. They provide the basis for evapotranspiration, reducing ambient air temperatures and generating a net cooling effect for the surrounding buildings. Plants absorb water through their roots and emit it through their leaves—this movement of water is called transpiration. Evaporation, the conversion of water from a liquid to a gas, also occurs from the surfaces of vegetation and the surrounding growing medium. Together, evapotranspiration cools the air by using heat from the air to evaporate water.

Reduced surface temperatures also help buildings stay cooler because less heat flows through the roof and into the building. Lower green roof temperatures result in less heat
transfer to the air above the roof, which in turn keep urban air temperatures lower. Combined with the effects of shading, reflective surfaces, thermal mass transfer and insulation—significantly reduces heat gain within buildings, reducing the need for air-conditioning.

Additionally, the lower ambient temperature above a green roof increases the efficiency of roof-mounted HVAC systems through cooler air intakes. Air-conditioning systems begin to lose efficiency at about 95°F. Drawing cooler air into the system can help to reduce energy costs. Green roofs tend to maintain an ambient temperature of 90°F, creating optimal conditions for air-conditioning. (viii) For example, studies at The Field Roofing Facility in Ottawa, Canada, concluded the green roof significantly moderated the heat flow through the roofing system in the warmer months. The average daily energy demand for space conditioning due to the heat flow through the roof was reduced from 20,500-25,600 BTU/day (6.0-7.5 kWh/day) to less than 5,100 BTU/day (1.5 kWh/day). (ix)

Modeling studies also show that, especially with sufficient moisture for evaporative cooling, green roofs could play a role in reducing atmospheric urban heat islands on a city scale. A study in Toronto, Canada, predicted that adding green roofs to 50 percent of the available surfaces downtown would cool the entire city by 0.2-1.4°F (0.1-0.8°C). (x) A similar study in New York City based on a scenario assuming 100 percent conversion of all available roofs area to green roofs, estimated a temperature reduction of about 0.4°F (0.2°C) for the city as a whole.

An entire urban area can benefit from implementing these mitigation strategies. If an entire community drops a degree or so in temperature, then everyone’s air-conditioning load goes down—even those buildings that are not directly shaded or that still have dark roofs, cladding and pavements. This indirect annual savings would total an additional 12 percent—0.7 billion kilowatt-hours or $70 million. Implementing mitigation strategies would lower the need for peak electrical generating capacity by about 1,500 megawatts—equivalent to two or three large power plants. (xii)

**Government Initiatives and Building Codes**

There are two national initiatives in the U.S. that are focused on reducing surface temperatures of buildings and pavements. The first is the Cool Roofs Initiative launched by DOE. According to Energy Secretary Dr. Steven Chu, “Cool roofs are one of the quickest and lowest cost ways we can reduce our global carbon emissions and begin the hard work of slowing climate change,” and he is urging other government agencies to follow his department’s lead of switching to cool roofs.

The second initiative is the Cool Pavements Initiative detailed in the previously mentioned report Reducing Urban Heat Islands: Compendium of Strategies. The Cool Pavements Initiative highlights research work and strategies being implemented by LBNL, Arizona State University, and the National Academies of Science’s Transportation Research Board. These initiatives highlight the critical part that concrete materials can play in providing highly reflective surfaces for both buildings and pavements.

In addition, green building standards such as the LEED Green Building Rating System and the International Green Construction Code (IgCC) provide incentives and minimum requirements for reducing urban heat islands. In LEED, incentives are provided for buildings that incorporated light colored roofing and pavements, pervious pavements, covered parking areas, green roofs and shading as strategies for reducing the urban heat island effect. IgCC has minimum requirements for incorporating these mitigation strategies. New standards for green roadways and infrastructure such as the GreenRoads rating system and the Envision infrastructure rating system incorporate standards for light colored pavements and roofing along with other mitigation strategies.

**The Life Cycle Benefits of Mitigation**

Reducing the urban heat island through mitigation strategies in an existing urban landscape is a long process. However, implementing these strategies in new developments or through the rehabilitation process of existing buildings and pavements can have a significant impact on the global warming potential (GWP) related to these structures. An important aspect to these strategies is the need for a combined approach to maximize the benefit of the mitigation strategies at the least possible cost over the life cycle of the structure.

Over the past two years at the Massachusetts Institute of Technology (MIT) Concrete Sustainability Hub, life-cycle analysis methodologies have been developed to assess construction materials and processes on GWP from buildings and pavements. As stated by MIT, life-cycle analysis methodologies exist for both environmental and economic impacts, known respectively as life-cycle assessment (LCA)
and life-cycle cost analysis (LCCA). These methodologies enable engineers, designers and decision makers to better understand the impacts of infrastructure and the opportunities that exist to reduce them.

Furthermore, MIT continues by stating that life-cycle assessment considers all life-cycle phases, from initial construction to demolition. System boundaries are drawn to capture each mechanism by which pavements and buildings impact the environment. These boundaries not only include the materials and construction activities, but also the operational, maintenance and end of life phases of the life cycle. (xii)

After two years of research on LCA and LCCA of concrete pavements, GWP was quantified for 12 major roadway classifications used in the United States.(xiii) The research results were used to estimate national GWP caused by new concrete pavement construction each year. The functional units also serve as baselines to identify and quantify GWP reduction opportunities and their cost effectiveness.

Among the evaluated reduction strategies, the two that reduced embodied emissions the most were increased use of supplementary cementitious materials (SCM) like fly ash in concrete paving mixes and properly designing the concrete pavement for the traffic and soil strength and avoiding over design. These two reduction strategies demonstrate simultaneous cost and emission savings, ranging as high as hundreds of dollars saved per ton of CO2 equivalent reduced. Scenarios were also studied where increasing albedo, promoting end-of-life carbonation by concrete, and decreasing vehicle fuel consumption through reduced pavement roughness would effectively reduce GWP at costs comparable to the current price of carbon in the global market.

Conclusion

The urban heat island effect has been known and studied for decades and we know that it can cause increased energy consumption, elevated emissions of air pollutants and greenhouse gases, compromised human health and comfort, and impaired water quality. We also realize that a comprehensive approach to mitigating against urban heat islands can be achieved through the use of appropriate construction materials and changing the actual landscape of our urban environments. The use of light colored pavements as well as cladding and roofing in our urban areas can contribute to overall energy savings and reduced carbon emissions. Because concrete is light in color, it absorbs less heat and reflects more light than dark-colored materials, therefore maintaining a relatively low surface temperature. Concrete has been demonstrated to have a positive impact on the localized ambient temperatures and can reduce energy required to air condition buildings.

In addition, we can implement other strategies such as pervious pavements, shading and green roofs, all of which rely on concrete to further mitigate the urban heat island effect. Methodologies now exist to help quantify, from both an environmental and economic perspective, the impact that mitigation strategies may have on combating global warming potential and urban heat islands. Concrete is an important and sustainable building material that can be used to mitigate the urban heat island and is proven to be economical through life-cycle cost analysis.

References


Research work recently done at the Concrete Sustainability Hub (CSH) at the Massachusetts Institute of Technology (MIT) clearly demonstrates the need to shift the way decision-makers and industry stakeholders think about the cost and sustainability of buildings and pavements. The groundbreaking research is well-timed as our country continues to deal with economic concerns, but also stays focused on minimizing carbon footprint to preserve the environment.

The work of the MIT CSH is being performed with a multi-discipline approach. Top MIT researchers are attacking the sustainability issue in a variety of ways, including understanding the DNA of concrete so that its carbon footprint can be reduced through concrete science and understanding the full life cycle impacts – both positive and negative – of concrete infrastructure. Understanding the true costs and relative trade-offs to changing the manufacturing processes, design and use, and construction methods of concrete buildings and pavements is where the industry can truly distinguish itself and where decision-makers can derive the most value both economically and environmentally.

According to Wikipedia, life cycle assessment (LCA) is a technique to assess environmental impacts associated with all the stages of a product’s life from-cradle-to-grave (i.e., from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling). The goal of LCA is to compare the full range of environmental effects in order to improve processes, support policy and provide a sound basis for informed decisions. The Wikipedia definition of life cycle cost analysis (LCCA) is the whole-life cost, the total cost of ownership over the life of an asset. Despite these well-recognized definitions, however, the practice of LCA and LCCA in construction has largely missed key elements which can have a major impact on the true environmental and economic costs. The work at the MIT CSH has helped to fill these critical gaps and truly advance the field of construction-related life cycle assessments.

For example, MIT CSH researchers found that greater than 90% of CO₂ emissions associated with buildings are due to the energy associated with operating the building. However, up until now, life cycle assessments have exclusively focused on the “embodied energy,” or manufacturing and initial construction phases. By excluding the operating phase, decision-makers are clearly missing the greatest area of potential impact both environmentally and economically.

In the case of pavements, MIT CSH researchers found that the operating (use) and rehabilitation phases account for between 33 percent and 44 percent of the CO₂ emissions for interstate highways. This again demonstrates an area of great impact and potential improvement. By developing best practice LCA models that include the operating phase, the MIT CSH researchers are helping the construction industry to improve the accuracy and transparency of existing and future life cycle assessments, and providing legislators, codes and standards bodies, and design professionals with a comprehensive, unbiased way to make sound decisions.

MIT CSH researchers have applied these concepts to evaluate strategies to lower concrete’s carbon footprint and overall environmental impact. A major advancement is the incorporation of a cost-effective analysis to determine whether a given environmental reduction strategy makes sense economically. As an example, among the strategies evaluated for concrete pavements, the two that reduced embodied emissions - increased use of fly ash and reduced overdesign - were found to lower the CO₂ emissions by approximately 10% and 17% respectively, while also saving upfront costs.

Clearly using this full life cycle approach helps us to understand the true carbon footprint of construction and how it can be most effectively reduced, but it is also essential to making good long-term financial decisions at a time when federal, state and local governments are facing major budget crises. For example, the MIT CSH researchers used their comprehensive LCCA approach to evaluate the real cost of pavement throughout.
a 50-year lifetime, beyond initial construction costs. Researchers started with the Federal Highway Administration’s (FHWA) Life Cycle Cost Analysis in Pavement Design Interim Technical Bulletin, a process that accounts for both initial construction and future rehabilitation. However, they again found a key issue missed in the existing model—accounting for changes in the prices of building materials over the life of the pavement. MIT CSH’s research showed that during a 50-year timeframe, the mean real price of concrete decreases by 20 percent, while the mean real price of asphalt increases by 95 percent. To allow states to address this, MIT CSH researchers developed a paper and a procedure that departments of transportation can readily adopt to account for inflation.

Clearly, the MIT CSH researchers have demonstrated the need for complete LCA and LCCA evaluations, including the operating or “use” phase. Their work provides a much-needed pathway forward for key stakeholders to make sound decisions. However, along the way, they’ve also identified challenges to implementing this kind of comprehensive analysis. Existing data on the use phase, particularly for pavements, has sometimes been conflicting, subjective and variable. Take for example the issue of fuel consumption and emissions. The researchers quickly identified that this was an area of major potential impact—especially on heavy traffic roadways. However, much of the research that had been done was conflicting, and the variables—such as roadway structure, vehicle types, temperature, etc.—were very hard to control accurately. So, once again, they developed a new approach to understanding how pavement properties affect fuel economy. The researchers created the first-ever mechanistic pavement-vehicle interaction (PVI) model that relates fuel consumption to pavement material and structural properties. This model provides realistic estimates of changes due to deflection.

Pavements that deflect or bend slightly under traffic loads cause cars and trucks to run in a slight depression that increases fuel consumption. MIT CSH researchers found that pavements with greater stiffness offer better fuel economy for the vehicles that travel on them. As an example of the initial results, the researchers looked at typical material properties for concrete and asphalt pavements and found that an asphalt pavement had to be up to 60 percent thicker than concrete pavement in order to achieve the same level of stiffness and fuel economy. With fuller development of this model, it will be possible to more accurately include the impacts of pavement properties on fuel usage in both environmental and cost analyses.

In the coming years, the MIT Concrete Sustainability Hub will continue refining its LCA models and economic analyses to help the industry improve and achieve its sustainability goals. The Concrete Science platform of the MIT CSH will play a major role in providing the scientific breakthroughs at the atomistic level that will provide the greatest benefit to the environment. By focusing on these three areas—concrete science, building technology, and econometrics—the MIT CSH is helping the industry and the nation to overcome challenges and prepare for the next wave of sustainable construction investment. ■

The MIT Concrete Sustainability Hub was established in 2009 in collaboration with the Ready Mixed Concrete (RMC) Research & Education Foundation and Portland Cement Association. The MIT CSH’s latest LCA and LCCA reports can be downloaded at http://web.mit.edu/cshub/index.html. Check the Web site monthly for one-page briefs on significant breakthroughs and regularly for news about the Hub. For more information on the RMC Research & Education Foundation and its programs, visit www.rmc-foundation.org.

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Is Workplace Civility Important?

By Eileen Dickson, Vice President of Education, NRMCA

Today we see a gamut of behaviors that demonstrate a lack of respect and civility, both inside and outside the workplace. Studies and polls indicate that Americans view incivility as a serious problem that is getting worse. According to The Cost of Bad Behavior by Christine Pearson and Christine Porath, it is far more widespread than people realize—and incivility in the workplace has devastating effects. Here are just a few of the statistics from their research study of 800 employers: 96 percent experienced incivility at work; 94 percent of workers who are treated uncivilly say they get even with their offenders; 48 percent of employees claim they were treated uncivilly at work at least once a week; only 10 percent said they witnessed civility every day; 40 percent reported that the incivility of their work environment has them looking for new employment even in today’s tough job climate. These and other findings illustrate that disrespectful and poor behavior drain productivity and negatively influence both an organization’s bottom line and the overall economy. It has been suggested by P. M. Forni, the co-founder of The Johns Hopkins University Civility Project, and author of the bestseller Choosing Civility, that in a number of professions, people skills may be more important over the long term than occupational, technical hard skills.

Atlanta-based, former Equal Employment Opportunity Commission (EEOC) trial attorney Stephen Paskoff notes in his writings that whether consciously or unconsciously, many senior and mid-level managers think that survival in today’s crazed, frantic, pressured workplace requires parallel tough stances in business practices as well as with staff. Actions with employees include motivation tactics of intimidation, disregard, dishonesty, avoidance or perhaps a strong focus on production in of itself as opposed to focusing on the people who have to produce. A study from University of North Carolina showed that the instigator of the uncivil behavior is more than three times as likely to be a person of higher status and a worker with valued talent. The attitude is that workplace civility can return when things are better.

Paskoff’s observations are reiterated in this issue of Concrete In Focus’s feature article, “Recession-driven Derailment...,” where author Sisk notes that many construction industry job holders in this recession feel overworked, threatened, vulnerable and disengaged from the work they are “bound” to execute. Critical to Sisk’s point is that such low morale affects performance. Employees become disengaged, apathetic and even angry. They put in less effort, produce lower quality work and burn out. That stress-driven environment drives some workers to leave the company (12 percent), when their management views the very same folks as the “chosen few” to lead the charge in tough times as well as when climbing out of the hole. For a producer working on surviving this extended downturn, such loss in productivity, efficiency, talent and,
Incivility Taking a Toll on Your Bottom Line?

Inevitably, profitability is excruciating. Evidence mounts. According to Leiter and Maslach in Banishing Burnout, the annual cost of job stress alone due to incivility at U.S. corporations is $300 billion.

Still think because your end of year cubic yards numbers look like they were delivered by the Grim Reaper, your employees’ work environment is not of concern? Then perhaps ask your human resource team to analyze if your rising costs of employee comp claims and medical benefits might tie into increased stress, which in turn, creates all kinds of health issues, including obesity, heart problems, depression and insomnia. Besides the cost of unhealthier employees impacting your annual health care expenses, what about the liability risk of a catastrophic event like a rollover or fatality stemming from those same problems? The EEOC and the Society of Human Resource Management’s (SHRM) statistics show these expenses are rising even with fewer employees. Far more people are filing claims against their company for harassment and hostile work environment than the company’s customers filing for non-performance. SHRM’s research shows again and again, without civil civility, ethics, trust and inclusion in the workplace. It takes a concerted effort, high level leadership skills, constant reinforcement, awareness and discipline. For many, these essential workplace soft skills are neither inherent qualities nor intuitively obvious. If they were, we wouldn’t face so many of the issues referenced above.

Many folks know society expects rules of civility because they were drummed into us as children. If resurrected and extended beyond personal lives to the workplace, employees up and down the chain-of-command can serve as role models to spread good behavior. Simple first steps include management’s full buy-in to increase awareness that incivility is a malaise of frustration that can debilitating the organization in a market environment that can’t afford to be debilitated any more. Once admitted, the “cure” starts with a team developing accountable, written standards of behavior that are modeled by all. The team’s goal is not to develop a poster of platitudes but a system that recognizes civil behavior. To change “it’s all about me,” all need to be trained and coached. That means senior management participates in the training to show commitment – and learn. The exercise by the group is especially helpful for those that lack self-awareness (like some of the perpetrators) and have no idea how dramatically egregious allegation could probably have had an easy, simple and just solution.

Adding to the points already noted, when NRMCA teaches a technical or operations course that incorporates a section on the “people skills” portion of the job function, participants’ course reviews ask that much more time be spent on the topic, yet when made available in workshops unto themselves, few attend. Disinterest ranges from ethical practices, employment law awareness training to supervisory and leadership skills, all specifically addressing the people aspects of ready mix business challenges. So who is disinterested, management paying for the workshops or the mid-level staff who request such training?

There’s absolutely nothing easy about building and maintaining civility, ethics, trust and inclusion in the workplace. It takes a concerted effort, high level leadership skills, constant reinforcement, awareness and discipline. For many, these essential workplace soft skills are neither inherent qualities nor intuitively obvious. If they were, we wouldn’t face so many of the issues referenced above.

1. Before acting, consider the impact of your words and actions on others.
2. Create an inclusive work environment. Only by recognizing and respecting individual differences and qualities can your organization fully realize its potential.
3. Self-monitor the respect that you display in all areas of your communications, including verbal, body language and listening.
4. Understand your triggers or “hot buttons.” Knowing what makes you angry and frustrated enables you to manage your reactions and respond in a more appropriate manner.
5. Take responsibility for your actions and practice self-restraint and anger management skills in responding to potential conflicts.
6. Adopt a positive and solution-driven approach in resolving conflicts.
7. Rely on facts rather than assumptions. Gather relevant facts, especially before acting on assumptions that can damage relationships.
8. Include others in your focus by considering their needs and avoiding the perception that you view yourself as the “center of the universe.”
9. View today’s difficult situations from a broader (big picture) and more realistic perspective by considering what they mean in the overall scheme of things.
10. “Each one influence one” by becoming a bridge builder and role model for civility and respect. Act in a manner whereby you respect yourself, demonstrate respect for others and take advantage of every opportunity to be proactive in promoting civility and respect in your workplace.

Still too abstract? The Society of Corporate Compliance boils it down to good manners. They, with the Ann Post Manners blog share their top social expectation in the American workplace as follows:

- Greet each other with a smile and or hello.
- Respect each other’s privacy; knock before entering.
- Focus on colleagues, not your smart phone, email or text messages when in a meeting.
- Be on time.
- Identify yourself when on the phone.
- Speak quietly in a tone that can be heard when in an open office or cubical environment.
- Keep personal cell phones off or set on vibrate.
- Take personal calls in a private area.
- Keep shared calendars up to date and free of private appointments.
- Use salutations, please/thank you in emails.
- Employee kitchen fridge and sink rules: if you put it in, you can take it out.

Why change? It is the right and most civil thing to do.

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**Bibliography:**


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**Q A**

Why is Supervisor and Manager training so important when trying to avoid potential litigation?

In a recent case out of Tennessee an employee claimed that she was discriminated against but didn’t report it. Part of the Company’s defense was that the employee did not follow the appropriate reporting requirements. The Company also showed evidence that the employee received a copy of the policy and was directed to read it.

Although the employee admitted receiving the policy and that she was directed to read it, she claimed she didn’t read or understand the reporting requirements. The Court focused on the fact that there was no evidence presented that the employee or the supervisor had been trained on the policy or the reporting obligation.

The Court rejected the Faragher/Ellerth Defense which can be used when the employer has taken all appropriate action and the employee declines to avail him/herself of the policies and opportunity for correction.

Using this defense is helpful for Companies when the company is doing the right things but keep in mind that documenting that you have a policy and having an employee sign an acknowledgement is not enough. Management responsibilities extend beyond just going to training class or just having an employee sign a sheet of paper. Managers are responsible for ensuring the comprehension and understanding of polices. Management should be aware of protected categories and know the types of behaviors that constitute harassment as well as how to respond to complaints. It’s also extremely important that the supervisor ensures they have a workplace free from discrimination and harassment by monitoring their workforce. If there is any doubt on how to handle a situation or whether or not a situation or behavior constitutes discrimination or harassment, supervisors should immediately involve Human Resources and/or seek legal guidance.

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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