

Sustainable Development: *The Wave of the Future*

And the Future is Now

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"Sustainable development." "Green building." "Environmentally friendly materials." These terms no longer are part of the vernacular previously reserved only for those who thought it chic to construct buildings with an environmental conscience. Today, individuals, companies and governments worldwide are demanding that energy and the environmental impacts of construction projects be considered long before ground is broken. This dramatic change in thinking has given rise to "green" building rating systems such as the popular U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) program and others.

Efforts to thwart global warming and decrease our overall carbon footprint are discussed daily in popular media and the issue will likely be a main topic of discussion in this year's presidential election. Everyone now claims to want to be a part of the solution. Concrete, however, has always been an environmentally friendly building material and part of the solution, even before the problem was widely recognized.

Concepts that fall within the sustainability framework include decreasing the carbon footprint, increasing energy efficiency, the promotion and use of recycled materials and the further development of environmentally sound construction materials and practices. The RMC Research & Education Foundation has made a significant contribution to forwarding each one of these concepts, with tremendous results and response to these projects.

One area of pavement construction that has seen a particularly high explosion of interest on the part of builders, architects, designers, government officials and others is pervious concrete. With its stellar stormwater management qualities, its positive environmental impact and potential safety benefits, it's not surprising that its popularity has soared in recent years. This surge in interest in pervious concrete has also likely been fueled by several research projects funded and released by the RMC Research & Education Foundation over the last year and a half.

In early 2007, the foundation released two projects developed by the Stormwater Management Academy at the University of Central Florida: "Construction and Maintenance Assessment of Pervious Concrete Pavements" and "Hydraulic Performance Assessment of Pervious Concrete Pavements for Stormwater Management Credit." The reports, funded in cooperation with Rinker Materials and the Florida DOT, support the increased use of pervious concrete by demonstrating its effectiveness in stormwater management practices and through outlining proper maintenance techniques. Both studies also underscore the importance of proper placement and mix design.

The U.S. Senate's Environment and Public Works Committee and the Environmental Protection Agency (EPA) have expressed deep concern over the environmental impacts of various pavements. In an effort to address some of these concerns, the Villanova Urban Stormwater Partnership at Villanova University is undertaking a side-by-side comparison of pervious concrete and porous asphalt. Funded by the RMC Research & Education Foundation, Villanova University, the EPA and Prince George's County, MD the study will examine the differences between pervious concrete and porous asphalt with regard to durability, maintenance requirements, the ability to transmit or filter key contaminants such as hydrocarbons and the ability to mitigate heat-island effects. Given the intense government interest in the environmental impacts of pavement, a key component of this project will include the impact these two pavements have on water quality.

It is not surprising, given the successful use of pervious concrete pavement in parking areas and sidewalks, that the construction and design communities would be interested in expanding its use – along with its environmental benefits – to streets, local roads and even highways in the future. The RMC Research & Education Foundation is working with The CP Tech Center at Iowa State University to study just such a possibility. This pervious concrete mix design for wearing-course applications study will

examine the development of concrete mix designs that have adequate strength and durability for wearing-course pavements.

Additionally, the pavement would have surface characteristics that reduce noise and enhance skid resistance while also providing adequate removal of water from the pavement surface and structure. The development of pervious concrete mixes for use in highways, street and local road applications will examine their suitability for this use as well as their long-term behavior. The tremendous interest in bringing pervious concrete to roadway use is evidenced by the study's co-funding on the part of the Federal Highway Administration, the American Concrete Pavement Association and the Pooled Resources Fund of several state Departments of Transportation.

One explanation given for the hesitation to embrace the use of pervious concrete in Northern climates was the uncertainty of its performance in freeze-thaw conditions. In order to assuage those concerns, the RMC Research & Education Foundation funded a long-term field performance study of pervious concrete's performance in harsh weather conditions. The study, "Portland Cement Pervious Pavement: Field Performance Investigation on Parking Lot and Roadway Pavements," validated the belief that pervious concrete could perform well in freeze-thaw environments, with little maintenance required. The findings of the study will allow Northern states to use pervious concrete with confidence. Builders in cold climates are particularly excited about the prospect of being able to use pervious concrete, not only because of all of its environmental benefits, but also because of the safety benefits it offers. On impervious services, when snow melts and refreezes, the resulting ice poses a danger to pedestrians. Pervious concrete allows melting snow to run through it so there is no ice when temperatures again fall below freezing.

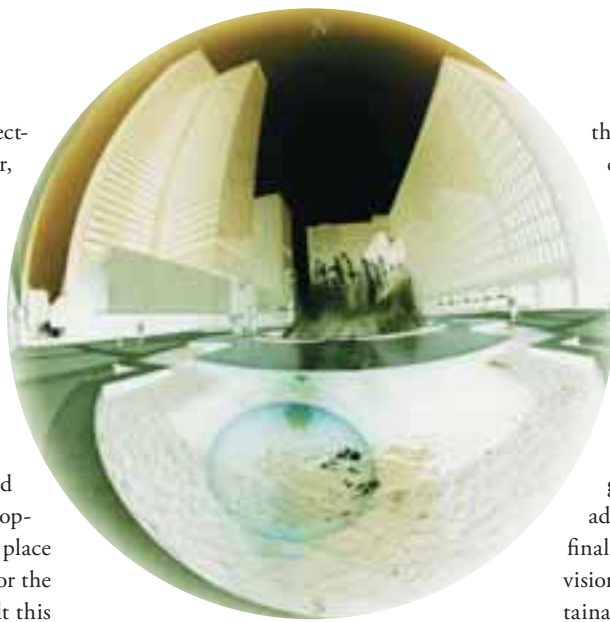
A concrete design and its mix could perfectly meet specifications, but if the concrete isn't placed correctly, any subsequent problems are a black eye on the entire industry. Pervious concrete pavement, like other

concrete projects, must be placed correctly to maximize performance. However, not as many contractors are familiar with pervious concrete as they may be with the placement of other concrete mixes since it is a newer application. For this reason, the RMC Research & Education Foundation funded the development of a “Pervious Concrete Contractor Certification Craftsman Text” to complement a certification offered by the National Ready Mixed Concrete Association. Ensuring the proper training of concrete contractors who place pervious concrete was a high priority for the industry, and the Board of Trustees felt this educational tool would provide an opportunity for contractors to better acquaint themselves with the nuances of pervious concrete and its proper placement.

The RMC Research & Education Foundation strives to ensure that it does not engage in duplicative research. With the eruption of pervious concrete research projects both in the United States and abroad, and with a steady stream of pervious concrete research proposals proliferating within the research community, the foundation wanted to compile a comprehensive list of past, current and proposed research projects on the subject. Working with Dr. Heather Brown with the Concrete Industry Management program at Middle Tennessee State University (MTSU), the original pervious concrete research compilation was released in the summer of 2006. A revised compilation was released in the spring of 2008 in an effort to include information on projects completed since the original compilation was released and to add links to access many of the research papers.

The foundation’s Board of Trustees always wants to review all existing data when considering new proposals, not only to avoid duplication but also to be aware of projects and/or data that may encourage or discourage additional examination.

A hallmark of the green building tide is the increased number of building projects seeking certification in the USGBC’s LEED program and the growing number of governments, agencies and companies requiring that new construction be LEED-certified. Given the many ways in which the use of concrete contributes to the qualification process for LEED points, the RMC Research & Education Foundation chose to



fund the development of the “Ready Mixed Concrete Industry LEED Reference Guide” in cooperation with the Portland Cement Association. The guide provides a dual educational purpose. First, it educates designers, architects and others involved in building projects about how concrete can contribute in the LEED certification process. Secondly, it educates those in the concrete industry about the LEED program.

The foundation’s Board of Trustees recognized the growing popularity of sustainable-development rating systems and seized upon the opportunity to showcase how well concrete’s energy and environmental benefits fit with the LEED program.

Concerning the recycling aspect of the sustainable-development movement, the foundation’s study “Crushed Returned Concrete as Aggregates for New Concrete – Final Report” is extremely popular. The intense interest surrounding the report stems not only from the findings’ potential to save the concrete industry up to \$300 million annually in materials and disposal costs, but also how the use of crushed concrete aggregate supports sustainable construction initiatives. The study demonstrated that crushed concrete aggregate (CCA) can be properly reused in fresh concrete, with concrete still meeting performance requirements. The data from this study will be used by NRMCA and partnering organizations to support changes in specifications to allow increased use of CCA for a variety of concrete applications.

The RMC Research & Education Foundation is partnering with several organizations in its efforts to advance other sustainability-related efforts. This is demonstrated

through its support of the American Concrete Institute (ACI) Strategic Development Council’s (SDC) development of a sustainability vision roadmap for the concrete industry. Through workshops funded by the foundation and other industry companies and organizations, SDC will draft the vision and roadmap document, with the outcomes presented to concrete and masonry-related association groups to seek their endorsement and adoption of the recommendations. The final document will define the industry’s vision of utilizing concrete effectively in sustainable construction and will outline specific industry needs and initiatives to support that vision. The foundation is also working with the Water Environment Federation and the American Society of Civil Engineers to update a manual of practice entitled “Design of Urban Runoff Controls” that will include detailed information on pervious concrete. Additionally, the foundation is looking into proposals for funding the development of a sustainable plant guideline for the ready mixed concrete industry as more and more large, national construction users require a sustainable approach by their suppliers.

Never before have the concepts of sustainable development and green building been more important than they are today. In looking toward the future, the concrete industry will play an extremely important role as energy and environmental considerations become a priority in the design, building and construction communities. The RMC Research & Education Foundation, as part of its charter to support projects that will benefit the concrete industry and the citizens of the United States, will continue in its commitment to seek and support projects that promote sustainable development. Of course, it’s easier to do that when you start with a superior material like concrete. But even the best can become better!

Many of the reports and final studies referenced in this article are available for download from the foundation’s Web site at www.rmc-foundation.org. Information on how to submit proposals or make a contribution to the foundation is also available from the Web site. Or, contact Executive Director Julie Garbini or Program Director Jennifer LeFevre at jgarbini@rmc-foundation.org or jlefevre@rmc-foundation.org for more information. ■

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