Illinois Ready Mixed Concrete Association

IRMCA NEWS

The concrete advantage

Sustainable education

How concrete can help projects become LEED certified

What the industry is doing to promote concrete’s green attributes

Volume 27, Number 2
Summer 2008
Decorative concrete from Prairie adds appeal and visual interest to any commercial, institutional or residential application. And decorative concrete is extremely versatile. Available in a wide selection of colors, it can give the look of many other types of paving materials—natural stone, brick, tile and more—at a fraction of the cost.

To find out how decorative concrete can improve your next project, call Theron Tobolski at 708-563-5856.

Prairie...we’re your strongest partner from the ground up.
On the cover

cover photograph
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Contact: Neil DeRynck

- Environmental Audits
- Air and Water Permitting
- Annual Emissions Reporting
- Stormwater Pollution Prevention
- Community Right-to-Know
- Spill Prevention Planning (SPCC)
- Environmental & OSHA Training

WASTE SOLUTIONS
Contact: Chris Biellier

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Concrete – The Sustainable Choice

Welcome to a very special issue of IRMCA News!

We are living in a very environment-conscious society. The “green” movement is on! In every aspect of our lives decisions are being reached only after considering the effect of those decisions on the environment. Advertisers can’t seem to use the word “green” enough as they attempt to identify their products with this popular movement; it’s a pretty savvy thing to do, a no-brainer. In our industry, I’m convinced that each and every major building or paving evaluation made from now on will be made with one very discernable eye on the resulting effects on the environment.

My friends, we deal from strength! I strongly believe that our primary product, ready mix concrete, is quite simply the one building product that offers more sustainable development benefits than any other! Bar none! Sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The purpose of this publication is to draw attention to the many sustainable advantages of concrete that make it the most responsible and conscientious of building material choices.

This special issue is divided into several sections, each of which will highlight a different sustainable “concrete advantage”. Each section will feature the best and latest industry articles on that section’s topic as well as a list of websites and other sources that can be accessed for more information.

I hope that IRMCA members will use this issue to strengthen their knowledge on the many sustainable benefits of ready mix concrete. I further hope that the many decision makers who receive this issue will use it to educate themselves about the most versatile building product in the world and I encourage any and all of you to get in touch with IRMCA or your local industry contact for more information.

Special thanks for this issue go to our newsletter editor Jennifer Bedell for her extra work on this “first-of-a-kind” magazine (for us anyway). Thanks also to our many advertisers who helped defray the costs of this issue. If response is good, we’ll try it again! More information and extra copies of this issue may be attained by contacting IRMCA.

(Bruce’s signature)
Redi-Fill™ from Prairie.
The ready-mixed, cost-effective backfill solution.

Redi-Fill™ is a flowable, self-leveling and self-compacting material that can be applied quickly and easily in any application that demands a return to full use in just a few hours instead of a few days. It’s the perfect solution for sidewalk or street repair where full public usage must be allowed as quickly as possible.

**Redi-Fill™ is an engineered backfill that:**
- Is self-leveling
- Is self-compacting
- Does not require mechanical consolidation
- Dramatically reduces backfill time
- Is delivered from a Ready-Mix truck
- Saves money in total in-place backfill costs
- Can be poured year round without additional cost
- Eliminates callbacks!

**Redi-Fill™ is Cost-Effective!**

Cost comparison vs. conventional granular backfill favors Redi-Fill™ when all factors are considered:

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- Special truck required?
- Backhoe/loader required?
- Tamping required?
- Extra labor required?
- Callbacks necessary?

For more information on Redi-Fill™ applications, benefits and costs, contact Lonny Terzo at 708-417-4808.

Prairie... we’re your strongest partner from the ground up.
Sustainable Advantages of Concrete

Ready mixed concrete makes significant contributions to sustainable development; concrete is in tune with the environment and when considering the cradle-to-cradle impact of any building material, concrete compares very favorably:

1. Extraction – The ingredients in concrete are in abundant supply and easy extraction minimizes depletion of our natural resources. Most quarries are reclaimed for recreational use or returned to their natural state.
2. Processing – Concrete requires very low energy input for manufacture.
3. Construction – Ready mixed concrete is produced locally, keeping fuel requirements minimal. Ingredients are almost always produced and procured locally. There is very little waste in using concrete; it is ordered and used on an as-needed basis. Even left over concrete is reclaimed and/or reused.
4. Operation – There are significant sustainable advantages to concrete buildings and pavements. Concrete's rigid design means heavy vehicles consume less fuel than when travelling over asphalt. Concrete's high thermal mass delivers year-round energy savings in buildings by reducing temperature swings. Concrete is a durable material that actually gains strength over time, extending the life of structures and delaying the need for reconstruction. Concrete walls do not require paints or sealants. Concrete does not sustain the growth of mold and it is easily cleaned. Concrete's reflectance is high, reducing lighting requirements and keeping surfaces cool.
5. Demolition – Concrete is relatively easy to rubilize and can be easily stored near a reclaiming operation.
6. Recycling – Concrete is a nearly inert material which make it an ideal medium for recycled waste or industrial by-products such as fly ash, slag, or some aggregates. Concrete can be 100% recycled as aggregates for new concrete, for base layers, or for fill, thus reducing landfill use.

Concrete has long been known as the most versatile building product in the world. It is only relatively recently that it is being recognized for the significant and valuable role it plays in protecting and enhancing our environment. These and other sustainable advantages of concrete will be discussed in full in the following pages of this publication.
The Environmental Benefits of Concrete

By Phillip Kresgo, NRMCA National Resource Director

As Barbara Wolcott stated in her article, “Sustainable Building: Future Friendly Pays Back,” (Permanent Buildings & Foundations Magazine, August 1998), sustainable construction is “simply making educated choices to provide for the present, without compromising future generations’ resources.” In this age of environmental awareness, coupled with astronomical growth, we have become more sensitive to the concepts of sustainable building. Stemming from the “green movement” within the construction industry, sustainable building is a means of providing for the necessities of residential and commercial development, while limiting that development’s negative impact on the environment to a minimum.

Concrete is a versatile product that has existed in various forms for centuries. In fact, its durability alone makes concrete a natural choice for sustainable construction. However, only recently has concrete become known for its significant role in protecting and enhancing our environment. Choosing concrete as a construction material actually helps protect our natural resources and offers consumers benefits that are not available from other building materials.

Cement, Concrete and the Environment

Many people use the terms cement and concrete interchangeably. More accurately, cement is only one of the ingredients used in the production of concrete. Portland cement is the fine powder that when mixed with water binds the sand and coarse aggregate into the material we call concrete. In layman’s terms, cement is to concrete as flour is to a cake. In a normal concrete mix, cement constitutes about 10-15% of the total weight.

Portland cement is one of the most widely used materials in the world today. In the United States alone, more than 120 million metric tons of Portland cement is used annually. Of that, approximately 75% is used in the manufacture of ready mixed concrete. Of all the ingredients used in concrete, cement is the only one that has any energy intensive consequence. The other materials—sand, stone or gravel and water—have very low energy requirements. Additionally, these other materials are readily available almost anywhere. Because they are locally produced, fuel requirements for handling and transportation are minimal.

That being said, it should be noted that the cement industry has taken several steps over the last few years that make their environmental record worthy of promotion. Since 1975, the U.S. cement industry has both increased its energy efficiency and reduced its greenhouse emissions by 33%. Of the four construction material manufacture processes (petroleum refining, steel production, wood production and Portland cement production), cement makes the lowest demand on U.S. energy consumption, accounting for only 0.3%. Additionally, the industry recycles 75% of its cement kiln dust and in 2001 alone recycled 53 million scrap tires, used as fuel in the cement kilns. Together, this makes concrete a very energy efficient building material.

Let’s take a look at some of today’s concrete applications and the role they play in sustainable development.
Recycled & Reclaimed By-Products in Concrete

For years, fly ash has been used in concrete mixes, providing a high quality product in an economical fashion. Fly ash is a by-product of coal-fired generators used to produce our electricity. In recent years, ground granulated blast-furnace slag (GGBFS), itself a by-product of the steel industry, has been used in concrete mixes as well. These supplementary cementitious materials (SCMs) exhibit cementitious properties when in the presence of Portland cement and water. The result is a high-strength, low-permeable concrete mix that will provide long lasting structures and pavements.

Use of SCMs typically reduces the amount of Portland cement required in concrete by anywhere from 10-30%. However, recently mixes have been designed utilizing much higher replacement values (up to 50% replacement in some cases). By incorporating higher percentages of these recycled materials, concrete not only becomes a more favorable material for sustainable construction, it also helps to extend the lives of our landfills.

While we often think of our natural resources as being endless, we must remember that they are anything but. In some areas, quality aggregates for concrete are already at a premium. The main focus of sustainable development is preservation of our resources for future generations. With that in mind, does it make sense to waste quality aggregates on generic fill material? Flowable fill utilizes more recycled and/or by-product material than new in its manufacture. Waste sands, foundry sands, crushed glass and fly ash, as well as other non-spec materials, can all be used in Flowable fill, sometimes in fairly large quantities. This allows the producer to save the quality materials for manufacture of concrete and reduces the need for additional aggregates. Use of recycled and reclaimed materials in flowable fill also reduces the amount of material that would normally end up in the waste stream.

Insulated Concrete Forms

Insulated Concrete Form (ICF) systems have numerous benefits to the design and construction communities. Ease of construction, reduced man hours per project and considerable acceleration of the total construction timeline are just a few. Perhaps one of the biggest benefits is the energy savings realized with ICF construction. When combined with the thermal mass of concrete, an ICF wall can easily achieve insulation factors of R-30 and higher. An average reduction of 30-40% in annual heating and cooling costs is commonplace with ICF construction.

But the environmental benefits go beyond here. Utilizing ICF systems for above-grade construction can save as many as 13 trees per house, based on an average 2,000-square-foot home. Additionally, because of their minimal weight, transportation costs of ICF components are considerably less than conventional construction materials, resulting in lower consumption of fossil fuels and therefore less environmental impact. ICF systems have been identified as “Energy Star” products by the Environmental Protection Agency (EPA), qualifying ICF construction for special mortgage considerations.

Durability is certainly a key to sustainability in regard to construction. The solid construction of an ICF structure is synonymous with durability, providing security against the elements. In tests performed at the University of Texas, ICF construction was one of only three wall types that could withstand the impact of debris from a hurricane or tornado. (Not surprisingly, the other two - cast-in-place concrete and core-filled concrete masonry units - both utilized ready mixed concrete.)

Concrete and Cool Communities

As urban growth continues, densely developed areas or “heat islands” become more common. These heat islands are areas

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of concentrated development where due to dark roofs, loss of vegetation and dark pavements, ambient air temperature can increase by 7 to 10 degrees Fahrenheit over those of suburban and rural areas. The typical reaction is to “crank up the air conditioning.” However, this only leads to an increase in energy consumption and related emissions. Studies indicate that smog increases approximately 3% for every degree of temperature.

The Urban Heat Islands Pilot Project, part of nationwide “Cool Communities” initiatives, has studied these heat islands and promotes alternative to conventional development. The best approach is to combine vegetation with lighter colored reflective building and paving materials. Concrete stands out as an obvious choice.

Because of its lighter color, concrete does not absorb heat like other, darker colored pavements. Use of concrete for local roads and parking lots can combat the increase of these heat islands. As an example, the Lawrence National Laboratory in Berkeley, CA, has estimated that approximately 40% of the Los Angeles area is covered by buildings and roads that could be made 30% more reflective during their next resurfacing. Because of its heat reflectivity, resurfacing those areas with concrete would not only lower the city’s summer temperature by as much as 9 degrees, but would also lower the need for air conditioning by 18% and reduce smog by approximately 10%. This is the equivalent of removing three to five million automobiles from the roads. In dollars, this relates to about $90 million per year in cost benefits.

Additional cost savings can be realized with concrete pavement. Studies have shown that concrete’s rigid pavement design means heavy over-the-road trucks consume less fuel than when driving on asphalt pavement.

Being lighter in color, concrete is also more light reflective. Parking areas paved with concrete not only are cooler but also brighter and require less lighting at night. Light standards for typical parking area can be reduced by as much as a third to a half through the use of concrete pavement.

The benefits don’t stop on the ground. Concrete plays a vital role in the design and construction of green roofs, which are a combination of high albedo materials and vegetated cover with growing media taking the place of bare membrane, gravel ballast, shingles or tiles. Green roofs not only reduce heat absorption, they also can be used as part of the total stormwater management best management practice (BMP). Lightweight concrete can be used to create the sloping deck of a green roof system. Concrete structured systems are also often used to support the heavy loads caused by soil needed for the growing media.

**Pervious Concrete**

Speaking of stormwater management, without increased development, the percentage of pervious land space has decreased significantly. The stormwater runoff across these impervious areas has had a negative impact on the quality of our aquifer. A 1995 EPA study found that “urban runoff contributes to damage in more than 26,000 river and stream miles, and pollutes more than one million impaired lake acres.” As a result of the study, the EPA has directed states to assess their waters for runoff damages and to create watershed-based programs to repair existing damages and prevent further erosion and pollution.

Once again, the ready mixed concrete industry has the answer. Pervious concrete pavement can play a key role in any stormwater BMP. As part of an infiltration system, pervious concrete allows stormwater to seep into the ground, replicating as close as possible the predevelopment permeability of the site. Ground-water is recharged and water resources are preserved. Stormwater runoff is reduced and therefore runoff quality is improved. In many cases, pervious concrete pavement eliminated the need for retention ponds. Use of pervious concrete will minimize the reduction of permeability and maximize the ability to develop on smaller parcels of land, a key to low impact development (LID).

**Cradle-to-Cradle Assessment**

Environmental life-cycle assessment (LCA) is a procedure used to systematically evaluate the environmental impacts of a product or system. An LCA considers environmental impacts from all possible sources, including extraction of raw materials, manufacture, service life and demolition. In other words, LCA is a “cradle-to-grave” assessment of a product. More recently, a “cradle-to-cradle” approach has been desired, counting on the re-use/recycling of materials after demolition.

Concrete stacks up well in any comparison. Concrete uses fewer raw materials for manufacture than other pavement materials. With its rigidity and durability, concrete pavement has a much longer service life than flexible pavements. And at the end of its service life, concrete is 100% recyclable. The crushed can be re-used as aggregate for new concrete or utilized as a base material.

Concrete is a durable material that actually gains strength over time and conserves resources by reducing maintenance and the need for reconstruction. These are just some of the reasons that concrete should be the building materials of choice for structures and pavements as we make sustainable development the accepted practice of the construction industry.