Sustainability Fact Sheet

Concrete Thinking for a sustainable world

In an effort to reduce the overall energy consumption of the country, all industries are embracing the concept of sustainable development—the ability to build the facilities and structures we need today without depleting resources for the future. Sustainability seeks to balance the economic, social and environmental impacts, recognizing that population growth will continue.

Sustainable development is a complex challenge because of the close interrelationships between various building functions, climate and materials. Building designers are beginning to implement "whole building" design strategies, where these interdependencies with all building systems are understood, evaluated, and appropriately applied. The end result is a high-performance building.

Challenging the Building Team

Sustainable development challenges the design and construction industry to create buildings that acknowledge the life cycle of a building. Recognizing that operating a building over time is far more energy intensive than developing it, demand for durability and energy performance is growing.

Architects, engineers and builders are choosing concrete for its durability, reduced maintenance and energy performance not found in other building materials like steel or wood. When compared with other building materials, concrete is a responsible choice for sustainable development.

Durability Means Longer Lasting, More Efficient Structures

Durability is a significant sustainable attribute of concrete because it will not rust, rot, or burn, requiring less energy and resources throughout the lifetime of the building to repair or replace. Concrete builds durable, long-lasting structures including sidewalks, building foundations and envelopes, as well as roadways and bridges. As the most widely used building material in the world, concrete structures have withstood the test of time for more than 2,000 years. Because of its longevity, it can be a viable solution for environmentally responsible design.

Energy Efficiency Optimized

Structures built with insulated concrete envelopes have optimal energy performance. With virtually no through-wall air infiltration and substantial thermal mass, homes and buildings constructed from insulated concrete walls are not subject to large daily temperature fluctuations. This means home or building owners can lower heating and cooling bills up to 25 percent–and occupants within these structures are more comfortable. Also heating, ventilating, and air-conditioning can be designed with smaller-capacity equipment.

Additionally, concrete minimizes the effects that produce urban heat islands. Studies have shown that urban environments have higher temperatures in areas where there is less vegetation, and a multitude of dark paved surfaces and roofing. Research by NASA has found that this additional heat causes air conditioning systems to work harder, which uses more energy (up to 18 percent more) and promotes the formation of smog. Light-colored concrete reflects more light than dark-colored materials—thereby reducing heat gain. Light colored pavements also require less site lighting to provide safe night-time illumination levels, whether on parking lots, driveways, or sidewalks.

Recycling Key Focus to Improve Manufacturing Process

In concrete's life cycle, recycling is present from the beginning–many industrial by-products that would otherwise clog landfills can be incorporated as raw material feed to cement kilns. These by-products also reduce reliance on raw materials. For example, in 2005, the industry was able to utilize more than 20.5 million tons of coal combustion by-products like fly-ash and bottom ash in the making of cement and concrete.

Specifically designed and delivered for each project, concrete typically produces very little waste. The major ingredients in concrete, cement, sand and coarse aggregates, are typically obtained and manufactured locally, reducing shipping impacts and benefiting the local economy.

Finally, when a concrete structure has served its purpose, it can be recycled as aggregate in new concrete, backfill, or as road base. In 2006, the Construction Materials Recycling Association estimated that approximately 125 to 140 million tons of concrete are recycled annually. Even the reinforcing steel in concrete (which often is made from recycled materials) can be recycled and reused.