fact sheet

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Cement, Concrete, and the Environment

When evaluating the environmental aspects of building materials, concrete's sheer pervasiveness makes it easy to overlook. It's with us everywhere—from homes to buildings to highways. But using concrete as a construction material actually helps protect our natural resources and offers consumers benefits that aren't available with other building products.

In an era of increased attention to the environmental impact of construction and sustainable development, concrete has much to offer.

Resource efficient: Using concrete minimizes the depletion of our natural resources. Its ingredients come directly from readily available materials: water, aggregate (sand and gravel or crushed stone), and cement. Cement is composed of 75% limestone—the most common mineral on earth. Although extracting any raw material from the earth takes a toll on the environment, extracting the raw materials for concrete has a lower impact than that of other construction materials. Because the ingredients for concrete are so plentiful, supplies are virtually inexhaustible.

Quarries, the primary source of raw materials, are readily reclaimed for recreational, residential, or commerical development. Or they can simply be restored to their natural state.

Recycled and recyclable: Concrete is a nearly inert material that makes it ideal as a medium for recycling waste or industrial byproducts. Many materials that would otherwise be deposited in landfills are used in making concrete. Aggregate, for example, can contain blast furnace slag, a byproduct of steel-making. Other aggregates used to create a lightweight concrete consist of recycled polystyrene. Almost all concrete contains fly ash, a byproduct of coal-burning electric plants. Of the almost 20 million tons of fly ash produced each year, 7 million tons are used in concrete.

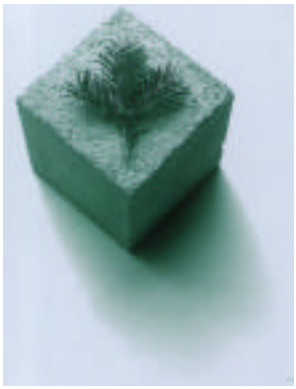
The process of making cement also uses waste materials. Scrap tires have high energy content and supplement coal as fuel. And industrial byproducts such as ash from coal combustion, fly ash from power stations, and mill scale and foundry sand from steel casting provide the silica, calcium, alumina and iron needed for making cement. Even kiln dust, a solid waste generated by cement manufacturing, is often recycled back into the kiln as a raw material.

Old concrete that has reached the end of its service life can be recycled and reused as aggregate for new concrete mixtures. Concrete yields 45% to 80% usable coarse aggregate and can be crushed and reused in new concrete or as a base material.

Reinforcing steel used in concrete is made from recycled steel. And like concrete itself, old rebar is recycled into new.

Energy efficient: Concrete requires small percentages of only one product of any energy intensive consequence—portland cement. Cement content in typical concrete ranges from 10% to 15%. The other ingredients for concrete—aggregate and water—have very low energy requirements.

Energy for transportation is low because concrete is produced locally.



Materials used for making concrete are in great supply and exist almost everywhere. This means that concrete products and ready-mixed concrete can be made out of local resources and can be manufactured near the jobsite. Because it is shipped locally, fuel requirements for handling and transportation are minimized. At least 60% of all concrete is made within 100 miles of the jobsite.

Once in place, concrete offers significant energy savings over the lifetime of the building or 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. Concrete pavement is also light-reflective and requires less energy than other materials to illuminate.

In homes and buildings, concrete's thermal mass plays a role in its energy efficiency. Insulation must be added to all building materials to obtain high R-factors, but thermal mass also is a factor. Concrete's high thermal mass provides significant benefits when used to construct buildings. By storing and releasing the energy needed for heating or cooling, concrete's thermal mass delivers year-round energy benefits by reducing temperature swings in homes and buildings. While insulation attempts to reduce energy losses through the building envelope, concrete's thermal mass uses walls themselves to store and release energy.

Modern concrete wall systems use both insulation and thermal mass to deliver an energy-efficient building.

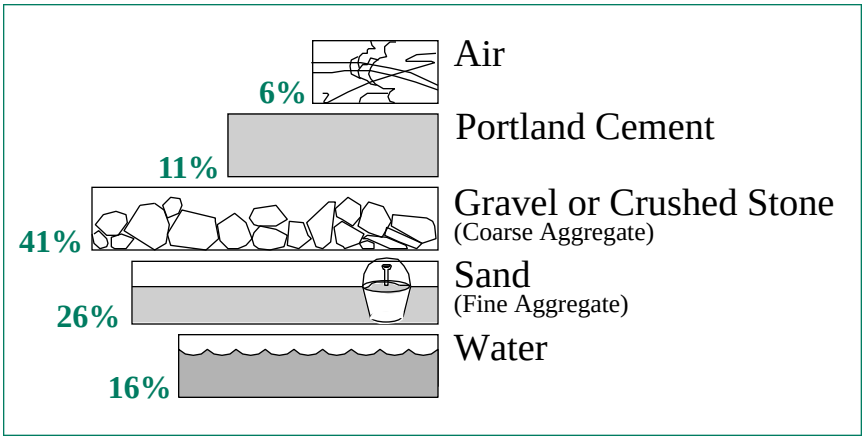
Waste minimization: Using concrete minimizes construction waste: whether cast-in-place or precast, concrete is used on an as-needed basis. Whatever amount is left over can be reused in total or reclaimed and used as aggregate in new concrete.

Long life: Concrete is a durable material that actually gains strength over time and conserves resources by reducing maintenance and the need for reconstruction. This makes concrete an affordable, long-term building product.

Concrete is a versatile product that has existed in various forms for centuries. But only recently is it becoming known that concrete plays a significant and valuable role in protecting and enhancing our environment.

Cement vs. Concrete

Although the two words **concrete** and **cement** are used interchangeably, cement is actually one of the ingredients in concrete. It's the fine gray powder that, in combination with water, binds sand and gravel or crushed stone into the rocklike mass known as concrete. Therefore, even though cement constitutes only 10-15% by weight of concrete's total mass, cement is the essential binding agent in concrete.



The Environmental Council of Concrete Organizations is a coalition dedicated to promoting the environmental benefits of concrete and its role in safe and sustainable construction.
ECCO members are companies, organizations, and individuals affiliated with the concrete industry. Together, they are committed to developing and disseminating information on the environmental benefits of concrete and concrete products.