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## Cement formulation change to lower emissions

In an effort to reduce emissions and provide important environmental benefits, the Portland Cement Association (PCA) is seeking approval to include up to 5 percent ground limestone in the American Society for Testing and Materials (ASTM International) C150, the prescriptive standard for portland cement.

Speaking to the press at the November Greenbuild 2003 conference in Pittsburgh, Penn., Tom Chizmadia, PCA board member and chairman of the association's Environment and Energy Committee, said the proposed change would bring U.S. standards into line with those in Canada and Europe where the addition of limestone has been used successfully for decades.

"Such reductions could add significantly to the environmental gains already achieved by the cement industry, and are clearly in line with the nation's global climate policy goal of reducing greenhouse gas emission intensities," Chizmadia said. "With the addition of ground limestone, our industry can provide the same quality product as we do under current ASTM standards."

In early 2003, PCA made the proposed change to ASTM C150 to allow the addition of limestone. It took until late October for the proposal to gain the necessary vote of 90 percent or higher to advance the proposal. The committee was expected to move the proposal to the next level in December.

He said environmental benefits include a reduction in use of raw materials, reduced energy consumption and reduced greenhouse gas emissions. Greenhouse gases such as carbon dioxide, methane or chlorofluorocarbons are emitted from a variety of sources and are believed to contribute to global warming by trapping heat between the earth and the atmosphere.

Assuming 2.5 percent limestone as an estimate of the average use of limestone in practice, the annual benefits would be:

- Reduction in raw materials use of 1.6 million tons.
- Reduction in energy use of more than 11.8 trillion BTUs.
- Reduction in carbon dioxide emissions of more than 2.5 million tons or by approximately 2.6 percent per ton of cement produced.
- Reduction of cement kiln dust of over 190,000 tons.

Chizmadia said the importance of including up to 5 percent limestone in order to positively affect the industry's environmental performance is directly related to how cement is made.

"Limestone is the key raw ingredient in cement," he explained. "We blast it from our quarries, crush it, cook it to over 2,700 degrees Fahrenheit, and then crush it



some more into the fine powder that is required to make second most used construction material in the world."

Inclusion of limestone in portland cement provides key environmental benefits.

"By substituting limestone in Portland cement we can reduce the energy consumption required to cook the equivalent amount as a raw material; we can reduce almost on a one-to-one basis the CO2 emissions resulting from the heating process; and we can do so while providing the same quality product as we do under current ASTM standards."

Chizmadia noted that Limestone additions are used throughout the world with great success. In Canada, limestone addition in portland cement has been permitted for decades and the industry has seen an average of 2.5 percent limestone included.

He said these reductions would add to the environmental gains already made by the cement industry, and are in line with the Bush Administration's climate change initiative, called "Climate VISION," designed to reduce greenhouse gases through voluntary industry programs.

The PCA has a three-part plan for achieving a 10 percent reduction of carbon dioxide emissions per ton of product between 1990 and 2020 that addresses manufacturing, product formulation and product application.

- Manufacturing Process — Reduced emissions through increased efficiency, decreased fossil fuel use, and greater use of alternative fuels and recycled materials.

"A major contribution to meeting this goal has been the commitment by member companies to invest in upgrading, replacing and constructing newer, more efficient cement plants, many of which have replaced the less efficient wet process plants with the more energy-efficient dry process plants."

Chizmadia said it now takes 33 percent less energy to manufacture a ton of cement than it did in 1975. "Beginning in the mid-90s, we were one of the first industries to study the issue of climate change. We developed a carbon dioxide emissions protocol and means by which to record emissions reductions through the Department of Energy's 1605 (B) Greenhouse Gas Reporting Program."

- Product Formulation — Formulate cements using a lower proportion of calcined materials, thereby reducing carbon dioxide emissions per unit of product.
- Product Application — Develop and promote concrete products that provide sustainable solutions for the building, design and construction industry.

"Concrete is a key ingredient to energy-efficient structures," he said. "Roads built with concrete reduce the urban heat island effect because of concrete's light color. Concrete pavements enhance fuel efficiency of automobiles, and parking areas built with concrete reduce storm water runoff."

"High performance concrete is now more durable than ever with the advent of synthetic, chemical, as well as mineral admixtures such as fly ash, slag and silica fume. The materials enhance concrete performance, attributes and strength."

This article appears in the [January 2004 issue](#) of Concrete Monthly.



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