CCP Benefits and Risks

Proper use of CCPs in building applications yields environmental, economic, and product-performance benefits. Using CCPs in an environmentally safe manner saves virgin resources, and reduces energy consumption and greenhouse gas emissions (GHG). In addition, it helps reduce the need for landfill space and new landfills. CCPs also makes good economic sense, they are often less costly than the materials they replace.

Environmental Benefits

Greenhouse Gas and Energy Benefits. The reuse of CCPs reduces the emission of GHGs in many ways. The primary way CCP use reduces GHG emissions is through coal fly ash for it takes the equivalent of 55 gallons of oil to produce a single ton of cement. In addition, chemical reactions that occur during the production of portland cement also produce GHGs. The pozzolanic properties of coal fly ash make it a useful replacement for a portion of the portland cement used in making concrete. Fly ash can typically replace between 15 to 30 percent of the cement in concrete with even higher percentages used for mass concrete placements. As an added benefit, it makes the concrete stronger and more durable than concrete made with only portland cement as the binder. Another way that using CCPs in place of virgin materials reduces GHG emissions is by reducing the energy-intensive mining operations needed to generate virgin materials. Reduction in mining energy use leads to reduction in GHG emissions.

Benefits from Reducing the Landfilling of CCPs. Beneficially using CCPs instead of landfilling them also reduces the need for additional landfill space. The U.S. annually landfills over 73 million tons of CCPs. The landfill space required is the equivalent of placing 26,240 quarter acre home sites under 8 ft of CCPs. Landfill space in the U.S. is at a premium and many energy facilities no longer have adequate storage space for CCPs. Beneficially using CCPs reduces the need to locate and develop new disposal facilities and any adverse environmental or health effects associated with them.

Benefits from Reducing the Need to Mine Virgin Materials. CCPs can be substituted for many virgin materials that would otherwise have to be mined. These include, lime to make concrete, natural gypsum for wallboard and gravel for roofing granules. Using virgin materials for these applications means mining them, which can destroy green fields and wildlife habitats. It makes more sense to use existing materials that would otherwise be disposed of than to mine new ones, while, simultaneously reducing waste and environment destruction. Reducing mining of virgin materials also conserves energy.

Performance and Economic Benefits

Each type of CCP has its particular performance benefits. Fly ash can create superior products because of its self-cementing properties. Combining fly ash with portland cement

mixtures can produce stronger and longer-lasting buildings than concrete made with only portland cement as the binder. This not only reduces costs of maintaining buildings but provides the additional environmental benefit of reducing the need for new concrete to repair or replace aging buildings – meaning also a significant reduction in future energy consumption and GHG emissions. Boiler slag, is sought-after as a replacement for sand in blasting grit, since it is free of silica. Its use eliminates the potential health risk of silicosis.

Environmental and Health Risks

Environmental and Health Cautions Associated with Concrete and Other Encapsulated Uses

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When coal ash is used in concrete for building roads and bridges, its constituents—such as heavy metals—are bound (encapsulated) in the matrix of the concrete and are very stable. Leaching of these constituents for all practical purposes does not occur.[1]

Occupational issues associated with coal ash use in concrete include the handling of dry coal ash prior to or during its inclusion in a concrete mix or exposures during demolition of concrete structures. In these cases, work inhalation and skin contact precautions should be observed as described on the Environmental and Health Information page.

Environmental and Health Cautions Associated with Unencapsulated Uses

Studies and research conducted or supported by Electric Power and Research Institute (EPRI), government agencies, and universities[2] indicates that the beneficial uses of CCPs in highway construction have not been shown to present significant risks to human health or the environment. But, as with many other common substances, precautions and sound management practices should be applied when using coal ash in unencapsulated uses. Water and air are the two media most likely to be affected by coal ash or coal ash constituents.

Ingestion, inhalation, and skin contact are the ways that humans and other living things could be exposed to coal ash. Other issues that may need to be addressed are leaching of elements such as mercury and metals into ground water, contamination of vegetation and the impact on other elements on the food chain, and airborne dust. In most cases, however, the way that coal ash is used, the engineering requirements for that use, and the handling and management methods applied minimizes exposure to the ash.

For more information, see the Environmental and Health Information page.

The Fossil Fuel Combustion Waste page has information on damage cases relating to the placement of CCPs.

Information on trace constituent levels in CCPs

Accompanying the Agricultural Uses for Flue Gas Desulfurization (FGD) Gypsum Brochure, EPA has provided some preliminary data about the trace element constituents of FGD gypsum and mined gypsum. The data are available in a PDF summary (PDF) (1pp, 16K) or a detailed Excel form (XLS). (166K)