

GLOSSARY

The following terminology is used throughout this report.

Aggregate

A rock material such as sand, gravel, or crushed rock with which cement or bitumen is mixed to form a mortar or concrete.

Air-Cooled Blast Furnace Slag

(see Blast Furnace Slag Aggregate)

Alkali-Silica Reaction

A concrete pathology due to chemical reactions involving reactive silica from reactive aggregates and the inner solution of concrete. Main effects are swelling, cracking, and reduction in the mechanical properties of affected concretes.

Ash Reburn

Either fly ash or bottom ash or a mixture of both is added in a fine particle condition to the furnace of a pulverized coal boiler in a small proportion to the pulverized coal fed to the furnace. The fuel value that remains in the high carbon coal ash is utilized for heat and steam generation, and the ash is transformed from a material that must be landfilled to one that can be sold and utilized.

Beneficiation

The second step in hard rock mining (extraction being the first); it is the initial attempt at liberating and concentrating the valuable mineral from the extracted ore. Includes the following activities: crushing, grinding, washing, dissolution, crystallization, filtration, sorting, sizing, drying, sintering, pelletizing, briquetting, calcining to remove water and/or carbon dioxide, roasting in preparation for leaching, gravity concentration, magnetic separation, electrostatic separation, flotation, ion exchange, solvent extraction, electrowinning, precipitation, amalgamation, and heap, dump, vat, tank, and in situ leaching.

Blast Furnace Slag

Produced during the production of iron from iron ore when slagging agents (primarily limestone or dolomite) or fluxing materials are added to iron ores in blast furnaces to remove impurities from iron ore. In this process of reducing iron ore to iron, the molten slag forms as a non-metallic liquid that floats on top of the molten iron. The molten slag is then separated from the liquid metal and cooled.

Blast Furnace Slag Aggregate

Blast furnace slag aggregate (BFSA), also referred to as air-cooled blast furnace slag (ACBFS), is produced by allowing the molten slag from iron production to cool and solidify slowly under atmospheric conditions. Once cooled, it is crushed, screened and used as aggregate in applications such as base, concrete, asphalt, rail ballast, roofing, shingle coating, and glass making.

Boiler Slag

Boiler slag is a byproduct from the combustion of coal in power plants. It is melted and fused particles of ash that collect on the bottom of the boiler. Slag forms when operating temperatures exceed ash fusion temperature.

Bottom Ash

Bottom ash (also called power plant bottom ash) is the coarse, solid mineral residue that results from the burning of coal in utility boilers. Bottom ash does not melt and therefore remains in the form of unconsolidated ash that settles on the bottom of a boiler.

Carbon Burnout

A process that combusts fly ash with high carbon, using that carbon as fuel, and produces a premium quality fly ash that can be readily sold to concrete 'ready-mix' facilities.

Cement Kiln Dust

The fine-grained, solid, highly alkaline material removed from cement kiln exhaust gas by air pollution control devices. Much of the material comprising CKD is actually unreacted raw material, including raw mix at various stages of burning and particles of clinker.

Cementitious

Having the property of or acting like cement.

Cenospheres

Very small (10 to 350 microns in diameter), inert, lightweight, hollow, "glass" spheres composed of silica and alumina and filled with air or other gases. They occur naturally in coal fly ash and are recovered from the ash for use as aggregate (filler) in concrete production.

CERCLA

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also known as Superfund.

Char

To reduce to carbon or charcoal by incomplete combustion.

Clinker

Clinker is an intermediate product of hydraulic cement manufacture. Clinker is produced in a kiln and consists of semifused nodules that contain a controlled and intimate mix of clinker (or cement) minerals. Portland cement clinker consists, chiefly, of the four minerals tricalcium silicate (C_3S), dicalcium silicate (C_2S), tricalcium aluminate (C_3A), and tetracalcium aluminoferrites (C_4AF). Clinker is finely ground to make finished cement; in the case of cement, the clinker is interground with a small amount of gypsum and/or anhydrite.

Coal Combustion Products (CCPs)

The materials produced primarily from the combustion of coal as a part of the coal fired power plants operating processes. CCPs include fly ash, bottom ash, boiler slag, flue gas desulfurization materials, and other types of material such as fluidized bed combustion ash,

cenospheres, and scrubber residues. The characteristics and physical properties of CCPs vary. In general, the size, shape, and chemical composition of these materials determines their beneficial reuse as a component of building materials or as a replacement to other virgin materials such as sand, gravel, or gypsum.

Comprehensive Procurement Guidelines

Program authorized by Congress under Section 6002 of RCRA and Executive Order 13101 that requires EPA to designate products that are or can be made with recovered materials, and to recommend practices for buying these products. Once a product is designated, procuring agencies are required to purchase it with the highest recovered material content level practicable.

Concrete

Concrete is a building material made by mixing a cementing material (such as portland cement) along with aggregate (such as sand and gravel) with sufficient water and additives to cause the cement to set and bind the entire mass.

Cyclone Boiler

A coal combustion technology that creates a cyclone-like air circulation pattern causing smaller particles to burn in suspension, while larger particles adhere to a molten layer of slag that forms on the barrel walls.

Flotation

A process in which the minerals floated gather in and on the surface of bubbles of air or gas driven into or generated in the liquid in some convenient manner.

Flue Gas Desulfurization

Process and technologies by which sulfur oxides are removed from flue gas (the gaseous products of combustion that exit a boiler through a flue or stack) after combustion.

Fluidized-Bed Combustion (FBC)

A coal combustion process in which fuel is burned on a bed of incombustible material (e.g., sand and limestone) while combustion air is forced upward at high velocities, making the particles flow as a fluid.

Fluxing Materials

A material used to remove undesirable substances as a molten mixture. It may also be used to prevent the formation of, or to dissolve and facilitate the removal of, oxides and other undesirable substances.

Coal Fly Ash

Coal fly ash is the finely divided mineral residue that results from the combustion of ground or powdered coal in coal-fired power plants. It consists primarily of glassy, spherical particles comprised of silicon, aluminum, iron, calcium, and magnesium. The majority of the fly ash generated by combustion is removed from stack emissions using electrostatic precipitators or fabric-filter bag houses. Some varieties of fly ash are useful as pozzolans or SCM and others can be used as raw material for clinker manufacture and as fine-grained construction aggregates.

Foundry Sand

High quality silica sand that is a byproduct from the production of both ferrous and nonferrous metal castings. The physical and chemical characteristics of foundry sand depend on the type of casting process and industry sector from which it originates.

Granulated Blast Furnace Slag

A sand-sized glassy, granular product produced during the production of iron from iron ore. It is formed by quickly quenching (chilling) molten slag. Can be ground very finely into ground granulated blast furnace slag (GGBFS) giving it moderate hydraulic cementitious properties.

High-Performance Concrete

A concrete: made with appropriate materials combined according to a selected mix design; properly mixed, transported, placed, consolidated and cured so that the resulting concrete will give excellent performance in the structure in which it is placed, in the environment to which it is exposed and with the loads to which it will be subject for its design life.

Low-NO_x Burners

A type of gas burner that significantly reduces the formation of oxides of nitrogen.

Micrometer

A widely used device in mechanical engineering for precisely measuring thickness of blocks, outer and inner diameters of shafts and depths of slots.

Particulate Matter

Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in the air or emissions.

Portland Cement

Portland cement is a type of hydraulic cement composed primarily of hydraulic calcium silicates. Hydraulic cements are the binding agents in concretes and most mortars. Portland cement is a generic term for the type of cement used in most concrete. Portland cement is produced by pulverizing clinker that consists primarily of hydraulic calcium silicates. Clinker also contains some calcium aluminates and calcium aluminoferrites and one or more forms of calcium sulfate (gypsum) are interground with the clinker to make the finished product.

Strictly, the term portland cement in the United States is limited to the Types I through V varieties (and their air-entrained variants) as defined in ASTM C- 150; these types are also collectively called straight portland cement. Apart from the straight varieties, “portland cement” when used loosely (a common industry practice) can also include a number of similar hydraulic cements, including blended cements that are based on portland cement clinker plus gypsum.

Powdered Activated Carbons

Made up of crushed or ground carbon particles, 95%–100% of which will pass through a designated mesh sieve or sieve. It is generally added directly to other process units, such as raw water intakes, rapid mix basins, clarifiers, and gravity filters.

Pozzolan

A pozzolan is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but which will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementing properties (ASTM C-618).

Pozzolana

A pozzolanic volcanic ash or tuff.

Pulverized Coal Boiler

A coal combustion technology that burns finely ground (powdered) coal in suspension.

RCRA Subtitle D

The portion of the Resource Conservation and Recovery Act regulations that primarily address non hazardous solid wastes.

Selective Non-Catalytic Reduction

A method for reducing nitrogen oxide emissions in conventional power plants that burn biomass and coal. The process involves injecting either ammonia or urea into the firebox of the boiler at a location where the flue gas is between 1600 °F and 2100 °F to react with the nitrogen oxides formed in the combustion process. The resulting product of the chemical reaction is elemental nitrogen (N₂), carbon dioxide (CO₂), and water (H₂O).

Selective Catalytic Reduction

a process where a gaseous or liquid reductant is added to the flue or exhaust gas stream and is absorbed onto a catalyst. The reductant reacts with NO_x in the exhaust gas to form water vapor and nitrogen gas.

Silica Fume

Also referred to as microsilica or condensed silica fume, ultrafine particles of disordered silica formed as a byproduct of the manufacture of silicon metal, silicon carbide, and silicon alloys (e.g., ferrosilicon). It is used as a pozzolan or SCM.

Slag

Slags are valuable co-products of iron and steel production. Ferrous slags are produced by adding slagging agents (chiefly limestone or dolomite) and/or fluxing materials to blast furnaces and steel furnaces to strip the impurities from iron ore, steel scrap, and other iron or steel feeds. The molten slag forms as a liquid silicate melt that floats on top of the molten crude iron or steel and is tapped from the furnace separately from the liquid metal

Slag Cement

Slag cement is the manufactured product from granulated blast-furnace slag governed by ASTM C 989. Increasingly on the U.S. market, the term slag cement is used for a 100% GGBFS product that is sold as an SCM.

Slagging Agents

A material, such as limestone, dolomite, lime, and silica sand, which serves, through the formation of a slag, to strip impurities from ores, during the smelting of metallic ores. Slagging agents commonly perform a dual function as a flux.

Sorbent Injection

Involves the addition of an alkaline material (usually hydrated lime or soda ash) into the gas stream to react with the acid gases. The sorbent can be injected directly into several different locations: the combustion process, the flue gas duct (ahead of the particulate control device), or an open reaction chamber (if one exists). The acid gases react with the alkaline sorbents to form solid salts that are removed in the particulate control device.

Steel Furnace Slag

A molten or fused solid byproduct from the processing of iron or scrap steel in a basic oxygen furnace or electric arc furnace produced as limestone or dolomite is used as a flux to remove impurities. Steel furnace slag is cooled similarly to air-cooled blast furnace slag, has similar properties to it, and is used for many of the same purposes. Steel slags containing large amounts of dicalcium silicate are prone to expansion and commonly are cured in piles for some months to allow for this and for leaching out of lime.

Supplementary Cementitious Material(s) (SCM)

SCMs are materials that can be incorporated within blended cements or in concrete mixes as partial substitutes for portland cement. Common examples are GGBFS, fly ash, silica fume, and pozzolana.