Technical Bulletin 1

Fly Ash Types & Benefits

The American Society for Testing and Materials (ASTM) defines pozzolan as "a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value, but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties."

Class F and Class C fly ash are products of the combustion of coal in large power plants. Fly ash is collected in electrostatic precipitators or baghouses, then transferred to large silos for shipment. When needed, fly ash is classified by precise particle size requirements, thus assuring a uniform, quality product.

Fly ash is the best known "pozzolan" in the world – and one of the most commonly used.

Class F fly ash is available in the largest quantities. Class F is generally low in lime, usually under 15%, and contains a greater combination of silica, alumina and iron (greater than 70%) than Class C fly ash.

Class C fly ash normally comes from coals which may produce an ash with higher lime content — generally more than 15% often as high as 30%. Elevated CaO may give Class C unique self-hardening characteristics.

Although both types of fly ash impart a wide range of qualities to many types of concrete, they differ chiefly in the following ways:

CLASS F

1. Most effectively moderates heat gain during concrete curing and is therefore considered an ideal cementitious material in mass concrete and high strength mixes. For the same reason, Class F is the solution to a wide range of summer concreting problems.
2. Provides sulfide and sulfate resistance equal or superior to Type V cement. Class F is often recommended for use where concrete may be exposed to sulfate ions in soil and ground water.

CLASS C

1. Most useful in "performance" mixes, prestressed applications, and other situations where higher early strengths are important.
2. Especially useful in soil stabilization, since Class C may not require the addition of lime.

Concrete manufacturers, engineers, architects, developers and contractors all have an interest in specifying or using fly ash on a routine basis to improve the quality of their project and to increase their cost effectiveness.

Ready Mix Producers. A ready mix producer has several reasons for using fly ash in concrete.

1. Fly ash can compensate for fines not found in some sands and thereby enhance pumpability and concrete finishing.
2. Fly ash will result in a more predictable and consistent finished product that will ensure customer acceptance.
3. Fly ash offers flexibility in mix design providing a greater range of mixes – from liquid soil at 100 psi to high strength (8,000 plus psi concrete) – produced by the same batch plant without exotic equipment.
4. Fly ash improves the flowability of the concrete, which translates into less wear and tear on all the producer's equipment, from batching facilities to trucks.
5. Fly ash enables the producer to customize designs to each customer's needs, thus providing the producer a competitive advantage.

Engineers and Architects. Engineers and architects will find that fly ash provides the following benefits:

1. It enables engineers and architects to provide the client with a superior and more durable finished concrete.
2. Fly ash produces a high strength concrete that accommodates the design of thinner sections.
3. Fly ash permits design flexibility accommodating curves, arches and other pleasing architectural effects.
4. The addition of fly ash to the mix is a built-in insurance for later-age strength gain in concrete.
5. Fly ash ensures that the concrete will qualify as a durable building material.
6. Fly ash contributes to the aesthetic appearance of the concrete.

Developers, Contractors, Owners. Fly ash concrete provides the following advantages to developers, contractors and owners:

1. The workability of fly ash concrete generally ensures that the speed of construction is faster, which translates into a quicker return on investment.
2. Fly ash in the mix accommodates more creative designs.
3. Since fly ash concrete is not as vulnerable to deterioration or disintegration as rapidly as concrete without fly ash, it ensures low-maintenance buildings that will retain their value over the long-term.

For more information or answers to questions about the use of fly ash in specific applications, contact your nearest Headwaters Resources Technical Sales Representative or call 1-888-236-6236.

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