ECOMATERIAL TECHNOLOGIES
A CRH COMPANY

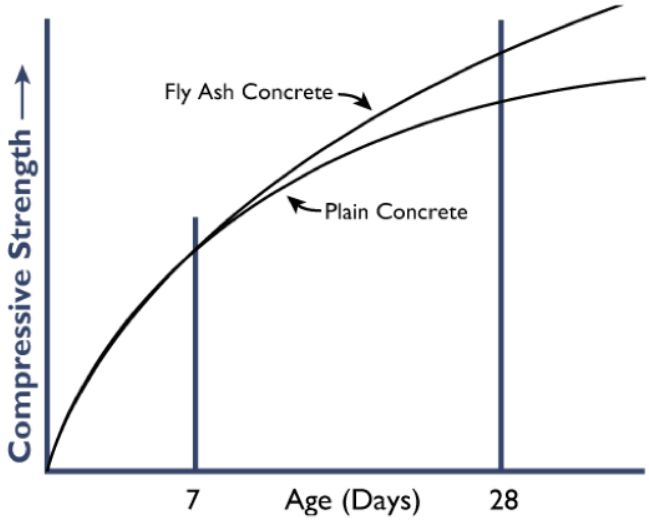
TECHNICAL BULLETIN

Strength
of Fly Ash Concrete

COMPRESSIVE STRENGTH

Strength gain contributed by portland cement occurs very rapidly at early ages up to about seven days, after which it slows markedly. Strength development contributed by fly ash occurs through chemical combination of reactive fly ash glass with calcium hydroxide generated by hydration of portland cement. This process is called pozzolanic activity.

A fly ash concrete mix, designed for equivalent performance to conventional concrete at normal ages, will generally gain strength more slowly at early ages. After about seven days, the rate of strength gain of fly ash concrete exceeds that of conventional concrete, enabling equivalence at the desired age. This higher rate of strength gain continues over time, enabling fly ash concrete to produce significantly higher ultimate strength than can be achieved with conventional concrete.



Fly ash concrete can be designed to achieve any level of strength obtainable by concrete containing only portland cement.

Fly ash concrete designed for equivalent performance at seven days or earlier will yield practically the same strength gain prior to the design age. At all ages thereafter, fly ash concrete will exhibit much higher strength gain than conventional concrete.

Concrete made with Class C fly ash (as opposed to Class F ash) has higher early strength because it contains its own lime. This allows pozzolanic activity to begin earlier. At later ages, Class C behaves very much like Class F, yielding higher strengths than conventional concrete at 56 and 90 days.

UNIFORMITY

Statistical analyses of compression tests have shown that the use of fly ash often lowers the variability of strengths (lower coefficient of variation). This can result in a reduction in "overdesign", yielding a direct cost savings to the concrete producer.

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FLEXURAL STRENGTH

In general, a relationship exists between the compressive and flexural strengths of concrete. Concrete which has a higher compressive strength will have a correspondingly higher flexural strength. This holds true for fly ash concrete. However, in many cases, fly ash concrete has demonstrated flexural strength exceeding that of conventional concrete when compressive strengths were roughly equal.

HIGH STRENGTH CONCRETE

In instances where high strength concrete has been specified (above 7,000 psi), fly ash has consistently proven its usefulness. After a certain amount of cement has been added to a mix (usually about 700 pounds), the addition of fly ash usually results in higher strengths than an equal amount of added cement. This is especially true for 56 and 90 day strengths. Production of high strength concrete requires the use of high quality fly ash at a minimum of 15% by weight of total cementitious materials.

For more information or answers to questions about the use of fly ash in specific applications, contact your nearest Eco Material Technologies Technical Sales Representative or call 1-770-684-0102.

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