

# Fly Ash Concrete Modified Strength Projects

In order to remain current with sustainable concrete design and construction practices, it is becoming more important to enable ready mix producers to supply innovative performance mixes that contain optimum percentages of fly ash. These mixes can be used to meet sustainable development practices, durability and exposure requirements, associated life-cycle costs, LEED building credits, economic incentives and other performance needs.

It is common for concrete specifications to require strength in 28 days, but often strength is not needed at that time. In fact, 28-day strength requirements are a limiting factor to durable concrete. Headwaters Resources spent two years working with the Los Angeles, San Diego and Riverside/San Bernardino Counties on extending the 28-day strength requirement in the governing specification to exceed 28 days. This extended age acceptance has been approved and will be printed as an addendum in the 2006 “Greenbook, Standard Specifications for Public Works Construction”, which is recognized completely or in part across Southern California and into San Diego. Where previously only 28-day specifications were allowed, now 35-, 42-, and up to 56-day strengths are accepted. It is important to note that extended strength parameters are not for every application. However, if extended age strengths are acceptable, higher percentages of fly ash can be used. With the right expertise, mix designs can be amended to reflect a percentage of strength at designated time-frames with an ultimate strength overall.

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*Developing sustainable concrete structures to last 100 years or more can require extending the common 28-day strength specifications. With extended age strength parameters, better, more durable concrete can be achieved.*

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Utilizing the experience of the local ready mix producer, proper mix designs can be developed to optimize the projects timeline in order to achieve the highest quality concrete for the project.

Fly ash lends the following benefits to extended age strength concrete:

- Mitigation of ASR, sulfate attack, corrosion, and attack from other aggressive chemicals
- Decreased moisture intrusion, less permeable concrete
- Increased durability
- Supports EPA, RCRA, Executive Orders both state and federal, DOE & DOD initiatives designed to utilize recovered / recycled materials, and encourage sustainable development
- Lower total life cycle costs, longer concrete life
- Slower speed of hydration, better structural integrity
- Less water needed in concrete production, leading to water conservation
- Reduced drying shrinkage and creep
- Reduced CO<sub>2</sub> emissions and CO<sub>2</sub> generation
- Reduced heat of hydration (depending on % usage), which leads to less cracking
- Improved overall esthetics
- Reduced maintenance costs

Listed below are just a few projects driven by the need for long lasting, high quality concrete that have allowed for 35-, 42-, and 56-day or more strength specifications/requirements.

Project or Owner	Fly Ash Percent	Age Strength Acceptance
Caltrans	25-35%	42 days for certain applications
Nevada DOT	20-25%	42- to 56-day acceptance for bridge decks, structures
Naval Facilities Engineering	25-40%	28- to 56-day acceptance and “as needed for durability”
San Diego County Water Authority – Olivenhain Dam	65%	For RCC dam: 90-, 120-, 240-, -365-day acceptance
Children’s Museum of LA	50%	28-, 56- and 90-day acceptance
Sky Train, Vancouver	50%	28- and 56-day acceptance
CANMET work	state of the art, high-volume	28- to 56-day acceptance
Washburn Airport, North Dakota	35%	28-, 56-and 90-day acceptance

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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