ECOMATERIAL TECHNOLOGIES
A CRH COMPANY

TECHNICAL BULLETIN

HVFA

For Concrete Structures

In 1981, long before using high volume fly ash (HVFA) concrete in structural applications was an accepted practice, EHDD architects used concrete with 40% fly ash in the seawater holding tanks in the Monterey Bay Aquarium for durability considerations. Since then, concrete throughout the country has regularly utilized 20% to 35% fly ash.

The desire from the environmentally-conscious community to mitigate greenhouse gas emissions has resulted in a movement to allow higher fly ash contents than would have been thought possible a few short years ago. In fact, specifiers are now regularly asking for higher fly ash content for performance and environmental reasons. This movement is forcing the concrete industry to research the nature and performance of local materials that allow HVFA concrete to perform as needed.

Performance of HVFA concrete is directly related to performance of local materials. Because of this, proportions of HVFA concrete vary from location to location. As with all concrete utilized in construction, field verification testing and trial placements should be used to make sure HVFA concrete performance meets project needs.

HVFA CONCRETE TIMELINE

Initially, HVFA projects utilized concrete with very low water contents achieved by the use of high dosages of high-range water reducing admixtures. A few of the early projects are listed below:

HVFA concrete can be used in a variety of structural applications. It has been proven as a technology that can accommodate sustainable development and improve the lifespan and performance of structures.

1987	Satellite Communication Facility Ottawa, Canada	50% fly ash concrete used in high durability concrete
1988	Park Lane Hotel/ Office Complex Halifax, Canada	55% fly ash concrete used in columns, beams, and floor slabs
1990	Purdy's Wharf Development Halifax, Canada	55% fly ash concrete used in 62 large caissons
1992	Slope Protection Project Nova Scotia, Canada	60% ash used in shotcrete slope protection

Further research into proportioning HVFA concrete mixtures revealed that higher water content could be

Revision Date: 8-30-26

used while maintaining acceptable performance. This opened the door for the use of mid-range water reducing admixtures and more "user-friendly" concrete. The following HVFA concrete projects were built with the new mix ideology:

1999	GAP Headquarters Building San Francisco, CA	50% fly ash concrete in pile caps and slab-on-grade work; 30% used in column and slab-on-metal deck work
2000	Island Wood Environmental Learning Center Whidbey Island, WA	50% fly ash concrete in footings, stem-walls, and slab-on-grade
2000	Liu Centre for Global Studies Vancouver, Canada	50% ash for foundation and structural elements
2001	Artist Live/Work Studios Vancouver, Canada	50% fly ash concrete for architectural color and finish considerations
2001	University of California Berkeley Berkeley, CA	50% fly ash concrete used in Wurster Hall and Barker Hall seismic retrofits

Many other structures are either underway or in planning as the sustainable building movement develops.

ADMIXTURES

Aggregate proportioning techniques that take advantage of the workability offered by HVFA generate a least-voids condition in concrete, which complements the water reducing action of fly ash. Concurrent with the demand for higher fly ash contents, mid-range and high-range chemical admixtures have been developed to further enhance water-reducing action without causing an unacceptable delay in setting time. Non-chloride set accelerating admixtures have proven useful for controlling set time within contractor requirements for finishing time.

Much of the set time retardation experienced with older HVFA mixtures resulted from past practices using high dosages of older Type A water reducing admixtures on total cementitious materials. Type A admixtures can still be used in moderate dosages based on cement content, but set time can be improved if Type A admixtures are used in conjunction with mid-range and high-range chemical admixtures.

APPROPRIATE APPLICATIONS

HVFA concrete can be used in a variety of structural applications. Fly ash has not only been used regularly in massive concrete applications, but has been used in columns, shear walls, and floor slabs as well. Even though technology has improved HVFA concrete performance, some mixtures may be inappropriate for certain applications requiring very early age performance. Mixtures with 25% to 55% fly ash may be acceptable, depending upon conditions, for mass concrete and foundation applications. Where higher percentages of ash are used, the age of strength acceptance may need to be extended to 56 or 90 days. Column and shear wall work can generally accept 30% to 35% fly ash, especially when time of form-stripping is of concern. Higher cement content (20% to 30% depending on circumstances) may be required to provide appropriate finishing time for slab-on-metal deck exposed to cool temperatures and for achieving strength of 3,000 psi at three days of age for post-tensioned concrete applications.

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.

© 2026 Eco Material Technologies