

## Performance Summary of Common Concrete Admixtures

Legend:

+ Common Use or Principal Benefit

\* Other Use or Benefit

? Caution Required, may have negative impacts.

Admixture	Strength	Durability	Workability	Appearance
<b>MetaMax® High Reactivity Metakaolin ASTM C618</b>  <i>(Also meets performance criteria of ASTM C1240)</i>	+ Highly reactive, produces additional cementitious bonds to produce high strength concrete.	+ Significantly reduces permeability to control corrosion, alkali silica reaction, efflorescence and other problems.	+ Improves workability, reduces requirements for HRWR compared to silica fume, and simplifies finishing and curing.	+ White color, uniform consistency, and better workability improve concrete appearance.
<b>Silica Fume ASTM C1240</b>	+ Highly reactive, produces additional cementitious bonds to produce high strength concrete.	+ Significantly reduces permeability to control corrosion, alkali silica reaction, efflorescence and other problems.	? Sticky and more difficult to finish, requires more superplasticizer or HRWR than metakaolin. May require special curing.	? Not controlled for appearance. Typically black to dark gray color.
<b>Fly Ash ASTM C618</b>	* Creates additional cementitious bonds.	* Reduces permeability to improve durability.	* Spherical particles reduce friction, enabling easier placement and finishing.	? Color varies depending on source. Typically medium to dark gray color

Water-Reducing and Viscosity Modifying	<b>Water Reducers</b> <i>ASTM C494</i>	+ Lower water to cementitious materials (w/cm) ratio = higher strength.	+ Produces lower w/cm ratio to create denser, less porous concrete.	+ Creates a more workable mix without addition of extra water.	* Reduces water required for mix. (Excess water can cause concrete to pale.)
	<b>Mid-Range Water Reducer</b> <i>ASTM C494</i>	+ Lower w/cm ratio = higher strength.	+ Produces lower w/cm ratio to create denser, less porous concrete.	+ Reduces "stickiness" of concrete to improve finishing of flatwork.	* Reduces water required for a mix. (Excess water can cause concrete to pale.)
	<b>High-Range Water Reducer (Plasticizer)</b> <i>ASTM C494</i>	+ Lower w/cm ratio = higher strength.	+ Produces lower w/cm ratio to create denser, less porous concrete.	+ Flowable mixtures simplify placement. Often used in pumpable mixtures and areas with congested	* Improves consolidation to reduce defects at concrete surface.
	<b>Accelerator</b> <i>ASTM C494</i>	+ Increases early strength.	+ Improves protection against early freezing.	+ Promotes high early strength to allow earlier load bearing or removal of forms. Aids in cold weather placement.	? Calcium chloride admixtures can discolor surface.
	<b>Retarder</b> <i>ASTM C494</i>	+ Increases time of initial set to raise hydration efficiency.	+ Reduces heat of hydration which leads to thermal cracking.	+ Extends time available to place and finish concrete.	* May reduce cold joints. Permits complete finishing procedures in hot weather.

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<b>Other Admixtures</b>	<b>Air-Entraining</b> <i>ASTM C260</i>		+ Improves resistance to freeze-thaw damage.	* Microscopic air voids create a smoother, more cohesive mixture.	
	<b>Fiber Reinforcing</b> <i>ASTM C1116</i>	+ Increases flexural and tensile strength, impact resistance, ductility, and toughness. Some types also provide structural-grade reinforcement.	+ Resists shrinkage and thermal cracking.	+ Replaces welded-wire secondary reinforcement.	? Use products that are not visible on finished surface.
	<b>Color Additives</b> <i>ASTM C947</i>			? Do not cure with water.	+ Create wide spectrum of shades and hues to complement design.

Based on table in January 2002 *Construction Specifier* article by Michael Chusid, FCSI, [www.chusid.com](http://www.chusid.com)