A variety of proprietary admixtures are available that are reported by their manufacturers to increase workability or water retentivity, lower the freezing point, and accelerate or retard the set. Although they may produce some effects, they can also reduce compressive strength, impair bond, contribute to efflorescence, increase shrinkage, or corrode metal accessories and reinforcing steel. If admixtures are permitted to produce or enhance some special property in the mortar, the specifications should require that they meet the requirements of ASTM C1384, *Standard Specification for Modifiers for Masonry Mortar* (*see Fig. 2-16*).

Also ask the manufacturer for test data that reports performance under field conditions. Tests done in a laboratory at 73°F do not necessarily reflect how an admixture will perform on the job site at 40°F. If relevant data is scarce, test the admixture at an independent laboratory and determine exact dosage rates with the materials which will be used at the job site. Make sure the mortar still meets ASTM specification requirements, and that the admixture does not contribute to other problems such as efflorescence or corrosion of embedded metals. Request and retain test results that support the manufacturer's claims.

Several proprietary *plasticizers* or *workability enhancers* are sold to partially or wholly replace lime in masonry mortar and grout. One plasticizer used as a complete lime replacement contains, among other ingredients, natural bentonite clay as a lubricant. The water-carrying capacity of the clay gives mortar a longer board life than conventional portland-lime or masonry cement mortars.

Other types of plasticizing agents work by changing the viscosity of the mixing water and its evaporation rate, or by modifying the cement reaction rate. This increased workability can be beneficial in relatively stiff, high-compressive-strength mixes.

Physical Requirements for Modified Mortars (In Addition to ASTM C270 Mortar Requirements)

Property	Bond Enhancer	Workability Enhancer	Set Accelerator	Set Retarder	Water Repellent
Minimum compressive strength (% of reference)					
7 day	80	80	80	70	80
28 day	80	80	80	80	80
Minimum water retention (% of reference)	report*	100	report*	report*	report*
Air content of plastic mortar	report*	report*	report*	report*	report*
Minimum board life (% of reference)	report*	120	report*	120	report*
Time of setting, allowable deviation from reference (hr:min)					
Initial set: at least	—	—	1:00 earlier	1:00 later	—
Initial set: not more than	1:00 earlier nor 1:30 later	1:00 earlier nor 3:30 later	3:30 earlier	8:00 later	1:00 earlier nor 1:30 later
Final set: at least	—	—	1:00 earlier	—	—
Final set: not more than	1:00 earlier nor 1:30 later	1:00 earlier nor 3:30 later	—	8:00 later	1:00 earlier nor 1:30 later
Minimum flexural bond strength (% of reference)	110	—	—	—	—
Maximum rate of water absorption (% of reference, 24 hr.)	—	—	—	—	50

*Report test results.

Figure 2-16 ASTM C1384 modifiers for masonry mortar. (*Copyright ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428. Reprinted with permission.*)

Air-entraining agents help hardened mortar resist freeze-thaw damage and improve the workability of wet mortar by creating minute air bubbles in the mix. In hardened mortar, freezing water expands into these air pockets instead of building up pressure, which might otherwise fracture the mortar. In wet mixes, the bubbles act as a lubricant and a water reducer to increase workability and significantly lower water content. Air entrainment may be useful whenever the hardened mortar will be exposed to freeze-thaw cycles in the presence of moisture (such as paver installations). During cold weather, air entrainment may also be helpful because the lower water content of the mortar offers less potential for freezing before set.

Neutralized vinsol resins are used most widely in air-entraining admixtures, but organic acid salts, fatty acids, and hydrocarbon derivatives are also used. Although job-site admixtures are available, air-entraining agents should not be added in the field, because it is difficult to obtain a consistent air content. Instead, air-entrained portland cement or masonry cements, or air-entrained lime, should be used, so that the batching is premeasured. Excess air entrainment decreases both compressive strength and bond strength. ASTM C270 limits the air content of masonry mortars and prohibits the use of more than one air-entrained ingredient in a mix (see Chapter 6).

Set accelerators are sometimes used in winter construction to speed cement hydration, shorten setting time, increase 24-hour strength, and reduce the time required for cold weather protective measures. *Water-reducing accelerators* increase early strength and ultimate strength by reducing the water-cement ratio needed to produce a workable mix. Set accelerators, sometimes mistakenly referred to as “antifreeze” compounds, contain calcium chloride, calcium nitrite, calcium nitrate, calcium formate, or other aqueous solutions of organic and inorganic polymer compounds such as soluble carbonates, silicates and flurosilicates, calcium aluminates, and triethanolamine. Accelerators are added to the mortar mixing water as a percentage of the weight of the cement.

Calcium chloride and other chloride ions contain salts that can contribute to efflorescence. Calcium chloride and, to a lesser extent, calcium nitrate also cause corrosion of embedded steel anchors and reinforcement. Non-chloride accelerators are a little more expensive, but less damaging to the masonry. Chlorides should be prohibited in mortar and grout that contain embedded metals such as anchors, ties, or joint reinforcement. Triethanolamine (TEA) and calcium aluminate accelerators should also be prohibited because of ultimate strength reductions and flash setting problems. Automotive antifreeze should never be used in masonry mortar or grout.

Set retarders extend the board life of fresh mortar and grout for as long as 4 to 5 hours by helping to retain water for longer periods of time. Set retarders, which contain sodium gluconate, sodium lignosulfonate, or sodium citrate, are sometimes used during hot weather to counteract the effects of rapid set and high evaporation rates. With soft, dry brick or block, set retarders are also sometimes used to counteract rapid suction and help achieve better bond. Mortar with set retarders *cannot* be retempered.

Extended-life retarders slow the hydration of the cement and water to give the mortar a 12- to 72-hour board life, depending on the dosage rate. The extended workability allows the mortar to be mixed at a central batching plant where quality control can be closely maintained, and then shipped to the site in plastic tubs. The admixture has little or no effect on setting time, because the retarder is absorbed by the masonry units on contact, allowing normal cement hydration to begin. The extended-life retarders used in ready-mixed mortars contain hydroxycarboxylic acids and other ingredients. Hot weather may require higher dosage rates. Most extended-life retarders