

Acceptable Use of Calcium Chloride in Concrete

ASCC Position Statement #31

ACI 318-08, “Building Code Requirements for Structural Concrete,” with some exceptions, allows calcium chloride as an accelerating admixture for cast-in-place concrete. But many specifications prohibit its use. This is unfortunate because calcium chloride is the most efficient and least expensive accelerator used in concrete. It is particularly useful when flatwork is placed in cold weather because both finishing and covering the slab with insulating blankets can be started earlier. Chloride accelerators also reduce the time required for curing and protection from freezing of structural concrete frames. Increasing the rate of early-strength development permits earlier removal of forms and earlier opening of construction.

Prohibiting use of calcium chloride accelerators is of special concern when project specifications for concrete require 20% to 50% of the portland cement to be replaced by fly ash. Using up to 50% fly ash replacement in cold weather increases costs because strength gain is slower and the duration of protection, which may include heating with fossil fuels, must also increase.

For reinforced concrete that is dry or protected from moisture in service, ACI 318 permits a maximum water-soluble chloride ion (Cl^-) content in concrete, of 1% percent by weight of cement. “Understanding Chloride Percentages” (ACI SP 102-11), showed that the common dosage of 2% flake calcium chloride by weight of cement produces 0.98% chloride ion by weight of cement. Thus, if there were no other sources of chlorides in the concrete, the 1% limit on chloride ion in ACI 318 would still be met with a 2% dosage of flake calcium chloride when in-place concrete will be dry or protected from moisture. The chloride content of aggregates can vary greatly, with some coastal aggregates containing more chlorides. So when calcium chloride admixtures are permitted, it is important to ensure that the chloride ion limits aren’t exceeded due to chlorides present in the aggregates or mixing water.

ASCC contractors urge producers to determine the water-soluble chloride (ASTM C1218) of all concrete making materials and engineers to permit the use of calcium chloride in amounts that don’t exceed the water-soluble chloride ion maximum percentages allowed by Table 4.3.1 in ACI 318-08, as follows:

Maximum water-soluble chloride ion (Cl^-) content in concrete, percentage by weight of cement	
Reinforced Concrete	Prestressed Concrete
1.00	0.06
0.30	0.06

The 1% value applies to concrete dry or protected from moisture in service, while the 0.3% value applies to concrete exposed to moisture but not to external sources of chlorides. A blanket restriction on any use of calcium chloride in reinforced concrete increases cost to the owner and may also result in slowed progress when some of the project is being built under cold weather conditions.

Under some conditions, ACI 318-08 prohibits the use of calcium chloride. ASCC contractors will work with the producer and engineer to encourage an acceptable use of calcium chloride that provides benefits to the owner. If you have any questions, contact your ASCC concrete contractor or the ASCC Technical Hotline at (800) 331-0668.



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