

Admixtures for cold weather

Cold weather provides new challenges to the concrete worker. Cold weather can increase concrete set times, retard concrete stiffening and slow its strength gain. It is also interesting to note that cold weather concrete has superior properties to concrete placed in hot weather. If the concrete doesn't freeze and is cured properly, it reaches a higher ultimate strength, is more durable, and less susceptible to thermal cracking. Concrete in the plastic state freezes when the mix temperature is less than -2°C and the concrete is left undistributed long enough for ice crystals to form. Once ice has formed, hydration stops and strength development is seriously impaired. Fresh concrete frozen during the first 24 hours can lose 50% of its potential 28 day strength. A number of these problems can be overcome through the addition of admixtures to concrete.

Accelerators

Accelerating admixtures can help offset the effects of low temperatures by increasing the rate of cement hydration. This aids in the concrete setting time and the development of early strength in the concrete. Dose rates of accelerator vary depending on the ambient temperature at the job site.

Air entraining agents

Entrained air greatly improves concrete freeze/thaw resistance to damage. The addition of an air

entraining agent causes millions of extremely small air bubbles to be introduced into the concrete matrix. This 'entrained' air remains in the concrete where the larger, naturally 'entrapped' air will make its way to the concrete surface during normal placing operations. As ice develops it occupies a much larger volume than its original liquid, and exerts great pressures within the concrete which can damage the cement paste. The presence of the air entrained bubbles allows for some release of this pressure. Repeated cycles of freezing and thawing will eventually lead to a deterioration of concrete, the small bubbles slow this process. Air entrainment also leads to increased workability and general durability of the concrete.

Superplasticisers

Superplasticisers are high range water reducers. These can lead to a 10% - 30% reduction in the water content of a given concrete mix, but with workability characteristics of a normal slump mix still retained. This is an important factor in cold weather because if the water/cement ratio of a concrete mix is reduced the resultant concrete will have enhanced durability and strength characteristics. Superplasticisers are generally used when a low slump concrete is specified but good easy-to-place concrete is still required. The effects of superplasticiser are limited to about 45 minutes from the time of mixing so care must be taken when scheduling loads.

Consult your Allied Concrete representative for specialised information.

0800 4 ALLIED (0800 425 5433)
www.alliedconcrete.co.nz

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