

# Concreting in Cold Weather

Hot weather concreting was discussed already in a couple of earlier posts. Like concreting in hot weather, concreting in cold weather too calls for special care. A brief discussion on the same finds place herein.

When the temperature of a concrete mix is quite low the rate of setting or gaining strength for the concrete gets considerably slower. Hydration of cement, which is responsible for setting of concrete, just about stops when concrete temperature falls below 5°C. This in turn puts breaks on the process of gaining strength drastically. The end result is concrete of quite poor quality.

This is the reason why concreting at a temperature below 5°C is usually regarded as “cold weather concreting” that should set in motion the process of adopting special measures.

Actually, it is the concrete temperature, and not the ambient temperature, which is more important. But, apparently a fall of ambient temperature below 5°C ensures a concrete temp of around 5°C or lesser, the reason why this ambient temp is probably regarded as the threshold point for cold weather concreting. In simple words, when the ambient temp is 5°C or lower, concreting needs special care or measures. Otherwise, the setting of concrete will get hampered seriously and so will the process of it's gaining strength.

Apparently, most of the measures necessary for cold weather concreting should be in place when the temperature falls below 10°C or so. That should be good enough to ensure adequate quality.

One obvious measure which can be and is usually adopted in order to raise the temperature of fresh concrete is to use hot water (not boiling hot) for the mix. Hot water is thoroughly mixed with aggregates for a much longer duration than normal mix before adding cement. Use of frozen or extremely cold aggregates should be avoided at all costs.

Another obvious step is to use protective measures for the concrete against cold. The immediate purpose is to prevent the concrete from freezing during first 24 hours of placing at any cost. Otherwise, strength of the concrete will get reduced drastically.

Protection from cold begins prior to pouring concrete. Concreting can be planned during the hotter part of the day. Fresh concrete should not be placed on cold surface, especially on frozen surface. The surface needs to be heated and also the forms, reinforcing steel etc.

Concrete temperature needs to be checked periodically. At any stage the temp of fresh concrete should not fall below 10°C preferably and in no case should it approach very near to 5°C. This is necessary until the concrete sets

reasonably ie, gain reasonable strength. If necessary, proper heating arrangements such as providing heaters, providing insulating enclosures etc. may be introduced.

In order to ensure generation of extra heat sometimes little bit of extra cement is added to the mix.

Use of water reducing admixtures is usually not advisable in such weather as these normally retards the setting process too. Rather, accelerating admixtures are often introduced to the mix in cold weather to speed up the setting process. If permissible, use of 1.5 to 2% of Calcium Chloride (by weight of cement) is a quite effective for the purpose. It's easily available, quite effective and economical as well.

However, use of Calcium Chloride is not always welcome as it may increase the chloride content in concrete mix beyond allowable limit which in turn might lead to corrosion in steel reinforcement. In fact, this admixture is not at all suggested for pre-cast concrete. So, non-chloride accelerators too are available in the market.

Use of air entraining agents is another measure suitable for cold weather concreting. These agents prevent freezing & thawing of the concrete mix besides reducing bleeding of freshly poured concrete which in turn reduces loss of heat from the concrete. If possible, low-workability mix should be used to reduce bleeding.

Sometimes, high early strength cement is used while concreting in such weather. These cement set quicker than usual cement which is quite helpful in cold weather. Use of high early strength cement is quite prudent especially, when using non-chloride accelerator in the mix.

Concreting in cold weather entails special care while curing. Loss of heat from the placed concrete should be minimised as much as possible. Upon finishing, the concrete surface is covered with impervious sheets to keep it warmer. Where this measure proves not to be effective enough, heating blankets can be introduced.

Curing compounds of best qualities should be used for several days as water curing is not suggested in such weather. Curing needs to be prolonged and stripping of formwork should be delayed as compared to normal weather condition.

Upon sufficient setting of concrete, heat protection measures need to be withdrawn gradually in order to prevent surface cracks.

**Source: <http://civilconstructionresourcez.wordpress.com/2012/04/03/concreting-in-cold-weather/>**