

COLD WEATHER CONCRETING

There are two elements of cold weather concreting which should be a concern: (1) Setting Time and (2) Rate of Strength gain. Cold weather is defined as a period when, for more than 3 consecutive days, The average daily air temperature is less than 40 degrees F or the air temperature is not greater than 50 degrees F for more than 12 of any 24 hour period. At 32 degrees F, the rate of hydration and strength gain is very slow; and below freezing, it's nearly nil. Slab losses moisture and /or heat rapidly in cold weather atmospheres. These factors will affect strength gain and long term durability of the concrete.

TIPS FOR PROTECTING CONCRETE IN COLD WEATHER

1. Warm Sub grade, Reinforcing, and forms; don't place concrete on frozen sub grade.
2. Provide sufficient insulation blankets or heaters for the scheduled concrete placement. Maintain concrete temperature above 50 degree F by insulating or heating for three days.
3. Use insulation blankets to retain internal heat concrete generated by the concrete.
4. Use heated enclosures to block wind, keep out the cold, and conserve heat.
5. Don't use unvented combustion heaters; carbon dioxide from the heater can cause soft, dusting floors.
6. Use Air Entrainment if concrete is exposed to freeze thaw.
7. Use proper Curing methods as soon as possible
8. Contact your Ready Mix Producer to discuss heating water and aggregates, or adding an accelerating admixture, increasing cement content or using Type III Cement.

COLD WEATHER

- Can Freeze mix water, reducing concrete strength up to 50%.
- Increases concrete set time up to one-third for each 10 degree F decrease in air temperature.
- Retards concrete Stiffening.
- Slows concrete Strength gain.

PRECAUTIONS

- Precautions should be taken when air temperature drops below 40 degree F.
- Cure to protect against freezing until concrete reaches 500-psi compressive strength.
- Protect concrete against multiple freeze-thaw cycles until it reaches 3500-psi compressive strength.

CARBONIZATION

Carbonization creates a soft dusty surface on normal concrete. It is most prevalent in cold weather concreting. Carbonation is a chemical reaction in the concrete, which forms calcium carbonate (which kills cement). Carbon dioxide gases accelerate this action. Carbonation can affect concrete to various degrees from light dust on the surface to a depth of 1/4 inch or more.

TO LESSEN CARBONATION DAMAGE

- Use a water cure or a membrane curing compound and block carbon dioxide gas from the concrete. Membrane film should be uniform and heavy.
- Use an accelerating set admixture in the
- concrete.
- Use vented heaters
- Open the building to fresh air during pouring to ventilate exhaust fumes from trucks, troweling machines, etc.