

When placing concrete in cold climates, certain precautions should be taken to avoid damage from freezing. Freezing can cause ice crystals to form in the paste of freshly placed concrete, which can retard the strength gain of concrete and reduce its durability.

Cold weather precautions should be made when the air temperature is expected to fall below 5°C (40°F) during concrete placing and curing. The precautions require protecting the concrete with insulation or heated enclosures so that it cures properly and stays sufficiently warm in order to prevent freezing.

Protection methods differ between concrete structures above-ground and on-ground; however, the following general precautions should be kept in mind.

1. Reinforcing steel and embedded fixtures should be free of ice.
2. Avoid casting concrete against frozen concrete or frozen ground.
3. Avoid backfilling with frozen fill.
4. Provide enough protection around the concrete to ensure proper curing lasting either 3 days at a minimum concrete surface temperature of 10°C (50°F), or for the time necessary for the concrete to reach 40% of the specified strength. If in doubt, protect the concrete for as long as possible.

CONCRETE ABOVE GROUND

When concreting above ground the following guidelines are recommended.

1. Insulate the top of the Logix ICF wall, around openings and other exposed concrete surfaces with insulation having a minimum R-value of R8 (RSI 1.41). Rigid foam is recommended for the insulation material.
2. Secure the insulation with tape and seal any joints that may expose the concrete to outdoor air conditions.

Rigid foam is recommended for the insulation material. However, other materials can be used provided it has a minimum R-value of R8, and will not absorb moisture.

The recommended R-value, including the insulating value of the Logix ICF foam panels, provides enough insulation for temperatures as low as -25°C (-13°F), and should help keep the concrete surface temperature at 10°C (50°F) or higher. For ambient temperatures colder than -25°C (-13°F) the builder may need to consult with local concrete suppliers to determine a cold-weather concrete mix suitable for local climate conditions. In addition, more insulation or heated enclosures may be required.

CONCRETE ON GROUND

Casting concrete on frozen ground can cause uneven settlement when the ground thaws, and eventually cracking of the concrete structure. Frozen ground should be treated to ensure it stays thawed before the pour and during the curing period. The following guidelines are recommended.

1. Thaw the ground prior to placing concrete.
Some recommended methods are:
 - a. Covering the subgrade with insulation for a few days.
 - b. Removing and replacing with unfrozen fill.
 - c. Spreading a layer of hot sand, gravel or other granular material if the grade elevations allow.
 - d. Providing heated enclosures.
Hydronic heaters under insulated blankets can thaw deep frozen ground at a rate of 0.3m per day.
2. After placing concrete insulate the footing either by:
 - a. Placing unfrozen backfill
 - b. Creating an enclosure using tarpaulin or other suitable material, including space heaters if necessary.

ADDITIONAL PRECAUTIONS

Special attention should be paid to exposed concrete surfaces, such as slabs and footings, where shrinkage cracks may be visually unappealing or potentially problematic.

Shrinkage cracks can occur during the initial curing period if the concrete is overheated from excessive insulation and/or increase in air temperature. Ideally the concrete surface temperature should be as close to 10°C (50°F) as possible but no more than 30°C (86°F) during the curing period. Conduct daily temperature readings as close to the concrete surface as possible, especially during significant increases in air temperature. Based on temperature readings adjustments in the amount of insulation should be made accordingly.

Shrinkage cracks can also occur if the exposed concrete surface is introduced to a sudden change in air temperature. This can occur if the insulation provided to the concrete is removed and the concrete is shocked by the direct exposure to cold air. If the difference in temperature between the concrete surface and ambient air is more than 20°C (68°F), avoid cracking the concrete surface by gradually removing the insulation or heat source until the difference in temperature is less than 20°C (68°F). For heated enclosures, simply shutting off the heat source and allowing the enclosure to cool down close to air temperature should help prevent cracking.

Exposed corners and other concrete edges, such as edges of columns and corbels, are more vulnerable to freezing temperatures and should be insulated two to three times more than required.

Working with concrete in cold weather requires a little more effort, but following the above guidelines will help ensure the end result is a strong, high quality concrete structure. For more information please contact info@logixcf.com.