



Concrete, Masonry & Soils Guidelines for Wintertime Construction

January 2024

The last week of January is typically the coldest week of the year, but a Polar Vortex has arrived ahead of schedule. Now is the perfect time to review the special measures required to successfully place concrete and construct masonry walls and foundations during extremely cold weather.

Flatwork, Poured Walls and Structural Elements

Freezing can cause irreparable damage to fresh concrete.

If concrete freezes while it is still fresh or before it has developed sufficient strength, water within the concrete mix develops ice formations, resulting in the disruption of the cement-to-paste matrix. This causes an irreparable initial loss of strength of up to 50 percent. The durability of the concrete will also be adversely affected.

Protection is necessary when average daily temperatures are below 40°F.

Cold weather is defined as a period when average daily temperature falls below 40°F and ambient temperatures are no greater than 50°F for more than one-half day of any 24-hour period over three consecutive days or longer. The colder the air and ground temperatures, the longer concrete is susceptible to damage due to freezing temperatures.

Protection is typically needed for 2-7 days.

Concrete gains strength more slowly at low temperatures and must be protected from freezing until it attains a sufficient strength, either from the degree of saturation being significantly reduced by hydration or achieving a minimum compressive strength of 500 psi. This period of protection can take from 2 days to 7 days depending on weather conditions and the type of structural element or flatwork.



Insulated blankets, tarps, straw covered with plastic sheeting, enclosures, insulated forms, and heaters are common methods of

concrete protection in cold weather. Proper use of these materials should protect concrete from freezing during and after placement and also retain the heat generated by cement hydration.

Subgrade soils require protection prior to concrete placement.

Footing and slab subgrade soils also require protection against frost and freezing temperatures during construction to maintain the stability of the subsoils.

Freezing temperatures cause expansion of the moisture in subsoils resulting in “heave.” And when frozen subsoils thaw, a resettling is likely to occur. Proper insulation, such as concrete insulated blankets or straw and plastic membrane, should be used to reduce the impact of freeze/thaw action.

In general, when temperatures range from 20°F to 32°F, the application of 12 inches of straw and plastic membrane on subsoils is appropriate. When temperatures range between 20°F and 0°F, the placement of a plastic membrane and 18 inches of straw is required. Insulation is removed from subsoils just prior to concrete placement. When temperatures are below 0°F, consider not placing concrete until warmer temperatures return.

Forms and metallic embedments should be kept from freezing.

In addition to the base surface, the temperature of the concrete forms and metallic embedments in contact with the concrete should be kept from freezing. This might require insulating or heating subgrades and contact surfaces prior to concrete placement.

How cold weather concrete construction impacts project schedules:



Concrete blankets protect the fresh poured concrete walls and the newly constructed masonry block tower.



Concrete blankets protect the newly placed concrete slab-on-grade of the gymnasium floor in this new structure.

1. The slower rate of concrete setting, curing and strength gain will increase the time required for finishing operations and will delay building upon the new concrete pads, floors, or structural elements.
2. Depending on the type of cement used, degree of exposure to cold weather, and the type of initial loading the elements are subjected to, forms should not be stripped or thermal protection removed from new concrete structural elements for 1 to 6 days after placement.
3. Extra time must be allotted for personnel cold weather safety measures such as warm-up breaks for crew members.

Technical tips for cold weather concrete:

- Chemical admixtures and other modifications to the concrete mixture can accelerate the rate of setting and strength gain but do not prevent concrete from freezing.
- Water curing is not recommended when freezing temperatures are expected. Membrane-forming curing compounds or impervious paper and plastic sheeting are typically used for concrete slabs. Cure at recommended ACI temperatures.
- Concrete test specimens used for acceptance of concrete should be stored in insulated boxes with adequate temperature controls.
- Combustion heaters in enclosed spaces must be vented for safety reasons and to prevent carbonation damage of newly placed concrete surfaces.
- Concrete temperatures must be monitored throughout setting, as the temperature of the concrete determines the effectiveness of protection, regardless of air temperature.
- Placing concrete in cold weather provides the opportunity for better quality, as cooler initial concrete temperatures will typically result in higher ultimate strength—provided that the concrete is properly cured and protected from freezing.

Masonry Construction and Protection

Cold weather masonry construction is defined as an ambient air temperature below 40°F. Cold weather masonry construction may proceed at temperatures below 40°F provided:

1. The materials and site are properly prepared.
2. Mortar and grout ingredients are heated.
3. New masonry construction is protected from freezing ambient temperatures.

Materials and site preparation steps include:

- Masonry units are typically covered with tarps or concrete blankets to keep them dry prior to placement. Depending on temperatures, skids may be stored within the heated tented masonry wall location. Masonry units having a temperature below 20°F or containing frozen moisture, visible ice, or snow on placement surface(s) cannot be installed.
- Visible ice and snow must be removed from the top surface of existing foundations and/or masonry work that are to receive new construction. These surfaces must be heated above freezing while not doing damage to existing structures.
- During cold weather masonry construction, Type III Portland cement (high early) should be considered in lieu of Type I Portland cement to help accelerate setting time. The acceleration reduces curing time and generates heat which is beneficial in cold weather.



Masonry block and brick are stored within a heated tent to keep the materials above 40°F.



Propane heaters run continuously to keep the tented work area above 50°F so that brick installation can proceed during cold weather.

The following cold weather masonry construction and protection practices should be followed for when ambient air temperatures are below 40°F.

Ambient Air Temperatures	Masonry Construction Practices	Masonry Protection Procedures
40°F to 32°F	Heat sand or mixing water to produce an overall mortar temperature between 40°F and 120°F at time of mixing. Grout does not require heated materials unless below 32°F.	Protect newly placed masonry using a weather-resistant membrane covering for 24 hours after completion.
32°F to 25°F	Heat sand or mixing water to produce an overall mortar temperature between 40°F and 120°F at time of mixing. Maintain mortar temperature above freezing until used. Heat grout aggregates and mixing water to produce an overall grout temperature between 70°F and 120°F at time of mixing. Maintain grout temperature above 70°F until used. Heat autoclaved aerated concrete (AAC) masonry units to a minimum of 40°F before installing thin-bed mortar.	Protect newly placed masonry using a weather-resistant membrane covering for 24 hours after completion.
25°F to 20°F	Follow same construction procedures as set forth for 32°F to 25°F, but heat masonry surfaces under construction to 40°F. Use wind breaks or enclosures when wind velocity exceeds 15 mph. Heat masonry to minimum of 40°F prior to grouting.	Protect newly placed masonry using weather-resistive insulating blankets, or equivalent, for 24 hours after completion. Extend time period to 48 hours for grouted masonry, unless using Type III cement only.
20°F and below	Follow same construction procedures as set forth for 25°F to 20°F but provide enclosures with auxiliary heat to maintain air temperature above 32°F within the enclosure.	Maintain newly placed masonry temperatures above 32°F for at least 24 hours after completion by using heated enclosures, electric heating blankets, infrared lamps, or other acceptable means. Extend time period to 48 hours for grouted masonry, unless using Type III cement only.

Note: Glass unit masonry cannot be installed when ambient air temperature is below 40°F.

For a detailed technical advisory see: [Recommended Construction Practices & Protection for Cold Weather Masonry](#)

Contact Bob Hiles at 614.895.1400 or bhiles@gci2000.com for specific strategies for your cold weather concrete and masonry work.



GEOTECHNICAL
CONSULTANTS INC.

720 Greencrest Drive, Westerville, OH 43081 | 614.895.1400 phone www.gci2000.com

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