VILLAGE OF HUNTLEY

GUIDELINES FOR "COLD WEATHER CONCRETE"

Objectives:

- To limit damage to concrete due to freezing at early stages.
- Assure that the concrete develops the required strength for safe removal of forms.
- Maintain curing conditions that foster normal strength development without using excessive heat and without causing critical saturation of the concrete at the end of the protection period.
- Limit rapid temperature changes, particularly before the concrete has developed sufficient strength to withstand induced thermal stresses.
- Provide protection consistent with the intended serviceability of the structure.

The items stated in this handout may be used as the basis for the acceptance or rejection of any concrete work placed during periods of cold weather. Building Inspector approval to place concrete during cold weather conditions does not relieve the contractor/builder of responsibility to protect uncured concrete in accordance with recognized standards of practice. Both the International Residential Code (IRC) and International Building code (IBC) reference the ACI 318 Standard which references the ACI 306R Standard, Guide to Cold Weather Concreting. Practices noted below are intended to align with these standards.

Code Requirements: The building code requires that the minimum compressive strength of concrete for footings be 2500 psi, for foundation walls 3000 psi. The code also specifies that the concrete be air entrained. The total content (percent by volume of concrete) shall not be less than 5% or greater than 7%.

Cold Weather Concrete Placement Defined: The provisions that follow apply to "cold weather" which is defined as a period of three consecutive days when the average daily temperature is below 40° F, during the protection period and not above 50° F for more than half of any one of those three days. The average daily air temperature is the average of the highest and the lowest temperatures occurring during the period from midnight to midnight. A "cold weather" situation is solely based upon actual on-site temperatures, and not upon forecasted temperatures.

Protection During Cold Weather: In cold weather it is important to protect newly placed concrete from freezing and to maintain curing conditions to ensure adequate strength development. Concrete that does not attain acceptable strength must be removed. It has been shown through data analysis that if concrete freezes, it does not continue to gain strength in a manner consistent with normal concrete performance.

Construction Practices: Follow provisions of the ACI standards or the summary of practices noted below.

- The temperature of any forms, steel, and sub-grade must be a minimum of 35° F at the time of concrete placement.
- The sub-grade may be thawed by the use of a thermal blanket or an external heat source. The sub-grade may have to be re-compacted after complete thawing.
- All snow and ice must be removed so that it does not occupy space intended to be filled with concrete. Hot air may be used for this purpose.

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• Concrete placements must be protected with insulating materials immediately upon placement completion and surface temperature of concrete must be maintained at a minimum of 50° F for a minimum 72 hours during cold weather. Commonly used insulating materials include polystyrene foam sheets, urethane foam, foamed vinyl blankets, mineral wool or cellulose fibers, straw, and insulated blankets or batt insulation. Use of double R-5.1 insulating blankets is a common method of protection in temperatures from 20° F to 40° F. Insulating materials shall be on site at time of Pre-Pour inspection.

• No concrete placement shall take place if the average daily temperature falls below 20° F.

• When placing high early strength concrete or utilizing approved accelerators, Type III Portland cement, or where the cement ratio is increased to 600 lbs. per yard or at a 4,000 psi mix, the concrete shall be protected from freezing at a temperature of 50° F for at least 48 hours.

** When pouring conventional concrete during "non-cold weather" conditions, protection from freezing shall be maintained for at least 24 hours.*

• Footings may be permitted to be unprotected for a maximum time period of twelve hours to allow foundation walls to be formed and for the placement of concrete. This condition is permitted only after the footing concrete has reached a minimum of 500 psi compressive strength, usually about two days after placement for most concrete maintained at 50° F. The foundation wall concrete can be placed using one of the approved methods with the footings and wall totally covered again and cured as detailed.

• At the end of the protection period concrete should be cooled gradually to reduce crack inducing differential strains between the interior and exterior of the structure.

Inspection Process:

• The implementation of cold weather concrete requirements will be at the discretion of the inspectors at the time of inspection - inspection requests for concrete inspections will not be restricted.

• Inspectors will only approve concrete placement for the same day as the inspection.

• Inspectors may check that the temperature of all forms and steel reinforcement used, be a minimum of 34° F at the time of inspection prior to concrete placement.

• Inspectors may be checking that the temperature of any sub-grade is completely free of frost and maintaining a consistent minimum temperature of 34° F. In the case where the sub-grade was thawed re-compaction of the sub-grade may be required.

• Concrete batch tickets may be required to determine departure time, concrete strength, & additives.

• If the inspector believes the concrete has not been properly protected, they may require additional testing and engineering.

NOTE: Calcium chloride shall not be used for an accelerator.