

MnDOT Guidance for Cold Weather Concreting, Curing Concrete Cylinders and Use of Accelerators (10/6/2023)

This document provides guidance to Engineers and Inspectors when administering MnDOT Contracts using the MnDOT Standard Specifications for Construction, 2020 Edition.

CONCRETE PLACEMENT:

2461 – Structural Concrete 2461.3.G.2

G.2 Placement Temperatures

Maintain concrete temperature from 50°F to 90°F until placement.

Unless Engineer approved cold weather protection Plans are in place, do not place concrete when the air temperature is either of the following at the point of placement:

(1) Below 36°F

(2) The National Weather Service predicts the temperature to fall below 36°F within the following 24-hour period

PROTECTION AGAINST COLD WEATHER (Excluding 2401 or 2404):

Review your Contract to determine the specific requirements for cold weather concreting. The following specifications identify the locations of protection against cold weather language. The language is the same in all 5 specifications.

2301 - Concrete Pavement 2301.3M.3

2406 – Approach Panels 2406.3G.3

2521 – Walks – 2521.3E.3

2531 – Concrete Curbing – 2531.3G.3

2533 – Concrete Median Barrier – 2533.3E.3

As an example, here are the requirements for MnDOT Spec. 2521.3E.3 (Walks):

E.3 Protection Against Cold Weather

If the national weather service forecast for the construction area predicts air temperatures of 36 °F [1 °C] or less within the next 24 h and the Contractor wishes to place concrete, submit a cold weather protection plan.

Protect the concrete from damage, including freezing due to cold weather. Should any damage result, the Engineer will suspend operations until corrective action is taken and may subject the damaged concrete to 1503, “Conformity with Contract Documents,” and 1512, “Unacceptable and Unauthorized Work.”

E.3.a Cold Weather Protection Plan

Submit proposed time schedule and plans for cold weather protection of concrete in writing to the Engineer for acceptance that provides provisions for adequately protecting the concrete during placement and curing. Do not place concrete until the Engineer accepts the cold weather protection plans.

Guidance from the Concrete Engineering Unit:

- Ask your Contractors to submit cold weather protection plans and then to enforce it. This makes the Contractor consider what they are doing and have a plan in place.
- Tips for what to look for in a cold weather protection plan include:
 - Keep surfaces (ground, forms, rebar, etc. in contact with concrete free of ice and snow and at a temperature above freezing prior to placement
 - Use of enclosures, windbreaks, portable heaters, insulated forms and plastic blankets are typical materials used to protect concrete from excessively low temperatures.
 - Use of plastic blankets for curing when the temperature is expected to drop below 32 degrees. Use of additional plastic blankets or other lightweight materials (straw) as a separation layer may be needed as the temperature continues to drop.
 - Thermometers/temperature loggers to verify cold weather precautions are adequate, experience indicates that when the temperatures are going to drop below 32F, that monitoring the concrete temperature assures both the Agency and the Contractor that the concrete didn't freeze
 - Thermometers and proper storage facilities for cylinders to verify cold weather precautions are adequate

CONCRETE CYLINDER CURING:

Ensure all cylinders (Standard strength and field control) are protected from freezing. The specifications are no different than during any other time of the year, standard strength cylinders must still be cured and maintained in an ambient temperature range from 60-80°F during initial and intermediate curing.

Guidance from the Concrete Engineering Unit:

- It is the Contractors responsibility to provide the agency with initial and intermediate environments that will maintain a temp range of 60 to 80 degree. Ways to maintain initial and curing tank (intermediate curing) at a temp range of 60° to 80°F.
- Take sample back to field office or warming shack for casting cylinders. Note: Required to start casting within ≤ 15 minutes of obtaining sample.
- Use insulated cooler with heated water from the ready mix truck
- Use tank heater(s)
- Move the storage tank inside

USE OF ACCELERATING ADMIXTURES:

This is an excerpt from MnDOT Spec. 2461.2D, Concrete Admixtures:

Provide admixtures from the Approved/Qualified Products List for concrete grades shown in Table 2461.2-6 and Table 2461.2-7.

This is an excerpt from MnDOT Spec. 2461.2D.2, Use of Accelerating Admixtures:

Use of the following accelerating admixtures require approval of the Concrete Engineer, in conjunction with the Engineer, unless otherwise allowed in the Contract:

- (1) Type C, Accelerating Admixture*
- (2) Type E, Water Reducing and Accelerating Admixture*

The Engineer will permit the use of Type C or Type E accelerating admixtures when the following conditions exist:

- (1) The ambient temperature is below 36 °F***
- (2) An Engineer approved cold weather protection plan is in-place***
- (3) Cold weather protection materials are on-site and ready for use***

Guidance from the Concrete Engineering Unit:

- Accelerating admixtures cannot be the only method to protect the concrete from freezing. All three of these conditions must be met in order to use them. Approval is needed for every placement on which their use is wanted.
- Admixtures containing calcium chloride shall not be used in applications containing steel.

PROTECTION AGAINST COLD WEATHER (2401 or 2404):

Review your Contract to determine the specific requirements for cold weather concreting. The following specifications identify the locations of protection against cold weather language.

2401 - Concrete Bridge Construction

- 2401.3.G Concrete Curing and Protection
- 2401.3.G.5 Protection Against Cold Weather

2404 – Concrete Wearing Courses for Bridges

- 2404.3.D Concrete Placement and Texturing
- 2404.3.E.4 Curing Requirements

Feel free to contact anyone in the Concrete Engineering Unit with questions and/or send in cold weather protection plans for our review to www.conc1off.dot@state.mn.us.