

City of Bend Technical Guidance for:
Private Development Engineering Department
Construction and Right of Way – Engineering Inspection

Creation Date: Nov 7, 2016

Revision: December 27, 2016

Author: **Kyle Thomas, P.E. – Construction & ROW Manager**

Purpose:

To provide technical guidance for cold weather concrete plans.

Background:

Historically, night time temperatures drop below 32 degrees starting in late September early October. With cold weather, the need to change how concrete is produced and installed is necessary to prevent damage. When the temperature of freshly poured concrete drops below 40 degrees, the hydration process stops. If the hydration process stops in the first 12-24 hours, concrete will be susceptible to damage because it has not reached the critical strength benchmarks. Normally, concrete needs to exceed 550 psi in this time frame to prevent damage and if the curing process is slowed full strength concrete will not be achieved. Concrete will be more susceptible to cracking, spalling and shorter lifespans if it is placed without additional precautions.

Standards:

Commercial grade concrete (GCC) used for sidewalks, driveways, ADA ramps or other ROW improvements is covered by section 00440 of the 2008 ODOT standards and specs, and as amended by the Bend Standards and specs:

- ODOT 00440.40(d) Weather – Do not place CGC when the air temperature is below 35° F without approval. Protect CGC from freezing if the air temperature is expected to drop below 35° during the first five days after placement.
- 00440.40(d) Weather – DELETE and REPLACE with the following:
 - Concrete is to be placed when the air temperature in the work zone is at least 35°F.
 - Concrete shall not be placed on frozen ground.
 - Concrete work shall be protected from freezing for seven days after placement, blankets or other insulation methods

will be used to protect the concrete for a minimum of seven days and recording thermometers will be used to verify the concrete surface temperature does not fall below 32°F.

- The Inspector can require the Contractor to provide a minimum recording thermometer, having not less than 2° divisions, to verify that the temperature at the surface of the work does not fall below 32°F. The reading shall be taken as close to the surface of the concrete as possible.
- Any concrete indicated as being damaged from freezing shall be rejected and replaced.

– ACI 306

Guidance/approved cold weather plan:

The need to pour concrete in weather that is below 35° F is necessary because of unpredictable weather patterns and short construction season. All concrete placed below 35° shall be approved under the following prescribed cold weather concrete plan:

- Concrete may be placed when the ambient air temperature is 25° F and rising, and the projected day time temperature high will be above 35° F for 2 days (unless otherwise approved by the City Engineer);
- Concrete shall not be poured below 25° F;
- Concrete may not be poured on frozen ground;
- If subgrade is frozen, all frozen material must be removed and new compacted base must be placed before concrete is poured;
- Concrete subgrade must be inspected by the City prior to placing concrete;
- At a minimum, ambient temperatures from 30°F to 40°F hot water will be used to maintain concrete temperatures not less than 55°F at placement;
- At a minimum, ambient temperatures from 25°F to 30°F hot water will be used to maintain concrete temperatures not less than 55°F at placement and 1% non-Chloride accelerator;
- Provide batch tickets to City Engineering Inspector;
- The City may require the use of a Hi/low thermometer to record the temperature of the placed concrete for 7 days. Concrete must be maintained at 40° during this time;
- If concrete temperature falls below 40° F the City may choose to have the concrete removed and replaced at the contractors/permittee expense, and;
- Prevent concrete from freezing for 7 calendar days after concrete is placed;
- At a minimum cover all concrete at night if the seven day forecast shows a potential for freezing. It is up to the contractor to determine the best practice for protecting the concrete.

- Alternate cold weather concrete plans may be submitted for review but approval is at the City's discretion.

Rule of thumb:

- If there is a chance that temps may fall below 35° F at night cover concrete. If day time temps are projected not to exceed 35° F cover concrete.

Acceptable Weather services for Bend Oregon

<https://www.wunderground.com/us/or/bend>

<https://weather.com/weather/today/l/97701:4:US>

<http://www.accuweather.com/en/us/bend-or/97703/weather-forecast/335268>

<http://forecast.weather.gov/MapClick.php?lat=44.065&lon=-121.2993#.WGLJxFPaeUk>

<http://www.ktvz.com/weather>