Hot Weather Concreting
Best Practices

Causes of Hot Weather Concreting

- High Temperatures
  - Average daily temperature greater than 77°F (ACI)
- High Winds
- Low Relative Humidity
- Solar Radiation

Effects of Hot Weather Concreting

- Plastic shrinkage cracking
- Accelerated slump loss
- Loss of entrained air
- Quicker set time
- Thermal cracking

Best Pre-Pour Practices

- Plan and be prepared!
- Look at the upcoming weather forecast
- Hold a pre-pour conference
  - TDOT, the contractor, and the concrete producer should all be present.
  - Discuss actions that should be taken by all parties to ensure quality concrete
**Best Pre-Pour Practices**

- **Concrete Producer:**
  - Shade aggregate stockpiles
  - Sprinkle water on coarse aggregate stockpile
  - Adjust mix proportions due to the moisture content
  - Use chilled water or ice in place of mix water
  - Must not exceed water/cement ratio for the design
  - Use liquid nitrogen to cool the concrete
  - Submit a hot weather mix design for approval
  - Use water reducing and set retarding admixtures
  - Use of Class F fly ash or slag can lower heat generation

- **Contractor:**
  - Schedule pours for the night or early morning
  - Avoid delays in delivery, placement, and finishing of concrete
  - Have ample laborers to be able to handle the amount of concrete
  - Schedule trucks to maintain a consistent moving operation to avoid any stop/start delays
  - Have evaporation control measures on-site

**Best Practices During the Pour**

- **Inspector:**
  - Ensure design water/cement ratio has not been exceeded by the addition of ice or chilled water (added at the plant or on-site)
  - Ensure measures are in place when evaporation rate exceeds 0.2 Lbs/S.F./Hr (Use nomograph)
  - Check discharge time of the concrete (501.10, 604.13)
    - For example if pouring structural concrete:
      - 90 minutes if air temperature is less than 90°F
      - 60 minutes if air temperature is 90°F or above (bridge decks)
  - Test concrete temperature
    - Maximum allowable concrete temperature is 90°F (604.11)

**ACI nomograph for estimating rate of evaporation of surface moisture from concrete**

- Figure 604.16-1 on Page 246 in TDOT Standard Specifications for Road and Bridge Construction 2015

- Shown example:
  - 65°F Air Temperature
  - 45% Relative Humidity
  - 60°F Concrete Temperature
  - 20 mph Wind Velocity
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**Best Practices During the Pour**

- **Inspector:**
  - Initial curing for concrete test cylinders:
  - Immediately after molding and finishing, store specimens in a cure box for a period up to 48 hours.
  - Temperature in cure box shall range between (AASHTO T-23):
    - 60°F-80°F for mixes with design strength below 6000 psi
    - 68°F-78°F for high early strength cylinders (≥ 6000 psi)
  - Storage temperature shall be controlled by use of heating and cooling devices, as necessary.
  - Within 30 min. after removing molds, cure specimens with free water maintained on surface at all times at a temperature of 73.5°±3.5°F

- **Contractor:**
  - Dampen forms and reinforcement (604.16)
  - Use evaporation measures when required
    - Plastic sheeting
    - Fog spray
    - Windbreaks
    - Sunshades
  - Place and finish concrete ASAP!
  - Begin curing procedure immediately after the water sheen disappears from the surface (604.23)
Best Post-Pour Practices

- Keep surfaces damp and protected from the sun for (604.23):
  - 120 hours for bridge decks and other slabs
    (Use a continuously fed soaker hose system)
  - 72 hours for all other surfaces
- Protect concrete from a rapid temperature drop (40°F drop in first 24 hours-ACI 305.1-06)
- Use insulation blankets or other approved method for regulating concrete temperature