

**NOTES ON COLD WEATHER CONCRETING.**Summarised by  
Arvo Tinni**RTA requirements:**

- 1 Concrete must not be placed when air temperature in the shade is below 5°C or above 36°C. (*Note that it is silent on what happens when the temperature drops below 5°C.*)
- 2 Concrete must not be placed if its temperature at the point of discharge from transport vehicles is less than 10°C or more than 32°C.

**Notes from the American Concrete Institute (ACI) Manual of Concrete Practice:**

- 1 Cold weather is defined as: "A period when for more than 3 successive days the mean daily temperature drops below 5°C". *Note that this is a more stringent condition than laid down by RTA, except that placement is still allowed provided certain conditions are observed.*
- 2 Unformed concrete surfaces should be protected from freezing for at least 24 hours after concrete is placed.
- 3 For slabs <300 mm thick the minimum concrete temperature at placement and subsequently must be maintained for 3 days at 13°C.
- 4 However, it also lays down the following criteria:

For air temperature:	Minimum concrete temperature as mixed:
> -1°C	16°C
-18°C to -1°C	18°C
< -18°C (!!!)	21°C
- 5 *Here the important thing to note is that concrete can be placed at well below zero air temperatures, provided the specified curing temperature of 13°C is maintained for at least 3 days. Obviously some form of protection from low temperature is required.*
- 6 The actual temperature of the concrete surface determines the effectiveness of the protection, regardless of the air temperature.
- 7 Concrete must always be placed at near the lowest allowable temperature.
- 8 Concrete which is placed at low temperatures above freezing (5-13°C) and which is not allowed to freeze and which receives long time curing, develops higher ultimate strength, greater durability and is less subject to thermal cracking than similar concrete placed at higher temperatures.
- 9 High placement temperatures will impair concrete properties, although it may expedite finishing in cold weather.
- 10 The time limit of likely damage by freezing corresponds roughly with the time at which the concrete attains a compressive strength of 3.5 MPa.

- 11 Appreciably higher temperatures do not afford proportionally longer protection against freezing because heat loss is more rapid with greater temperature differentials.
- 12 The mix temperatures should not be more than 6°C above the recommended minimum of 13°C.

### **Protection:**

- 1 The heat of hydration during the first 3 days is probably sufficient to maintain the concrete temperature above the recommended minimum.
- 2 The heat is usually retained by insulating blankets which are suitable for unformed surfaces. The following are some of the commonly used materials:
  - Polystyrene foam sheets
  - Urethane foam (*this can only be used to spray the outside of forms and requires subsequent sealing*).
  - Foamed vinyl blankets.
  - Encased mineral wool or cellulose fibre mats.
  - Straw.
  - Various types of heated tents.

### **Conclusion**

*The cold weather concreting procedures, protections from freezing and curing requirements are unsuitable for large scale paving operations*