



## It's the season for plastic cracking

CCANZ Regional Engineer, Dene Cook, tells you how to avoid those nasty cracks.

**W**ith spring upon us, and summer fast arriving, we are now entering the high-risk period for early age cracking. Higher day temperatures and those awful equinox winds along with low evening temperatures are a perfect recipe for the creation of cracks. If you want to

minimise your exposure to the cost of investigating and rectifying unwanted cracks, now is the time to understand the issues and the action you can take to avoid problems. This article looks at plastic cracking – early thermal cracking will be covered in a future issue.

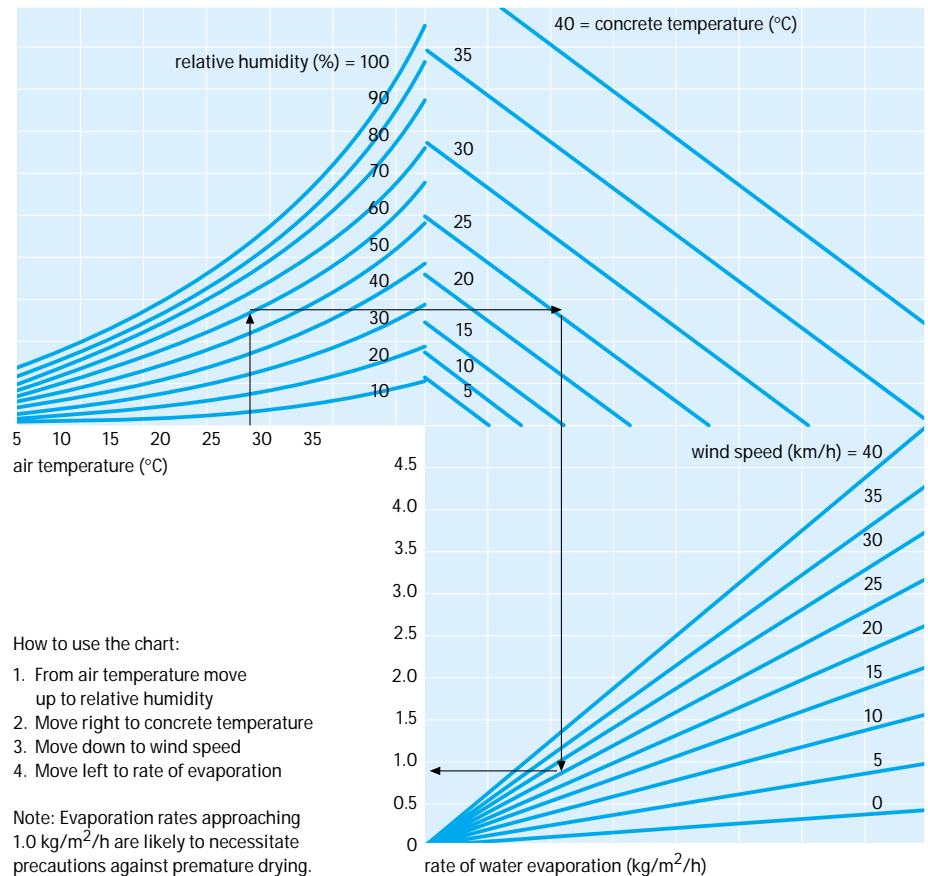


Fig 1: The effect of concrete and air temperatures, relative humidity, and wind velocity on the rate of evaporation of surface moisture from concrete.



### Plastic Cracking

This form of cracking derives its name from the fact that it occurs while the concrete is still plastic – or not hard and set. Once concrete is in place, evaporation can only occur from the free surface. In the absence of appropriate precautions, and unfavourable drying conditions, the rate of evaporation at the surface can be greater than the rate with which water within the concrete can migrate to the surface to make good the loss. In these situations the surface dries and shrinks leading to surface cracks.

If these cracks are noted early it may be possible to re-compact the concrete to remove them. However, if they are noticed after the concrete has hardened, re-compactation will not be possible.

### What do they look like?

Typical characteristics include:

- the cracks occur either while finishing or within 30 minutes to six hours of finishing;
- the cracks are often not straight and have a jagged appearance;
- cracks may intersect each other forming T junctions or acute angles;
- they are surface related but may extend deeper with subsequent drying of the slab.

### What can you do to avoid these?

The best protection is to understand when the risks of plastic cracking are greatest so that appropriate action can be taken. The main variables that control the evaporation rate are:

- wind speed;
- relative humidity;
- concrete temperature;
- air temperature.

The greatest risk of plastic cracking occurs on hot, dry, windy days. Figure 1 provides a method of estimating the evaporation rate given the above information. When the estimated evaporation rate exceeds 1 litre/m<sup>2</sup> per hour, precautions need to be taken to prevent plastic cracking. New Zealand experience suggests this limit is adequate. However, it is recommended that a conservative approach is adopted when deciding to take precautions as in countries such as the United Kingdom it is advised that plastic cracking protection should be instigated at half this evaporation rate.

Typically one of the more significant variables is the wind speed. This is why in Britain it is often called “wind cracking” as a reminder that it is primarily caused by air movements causing drying of the surface. In New Zealand’s warmer, drier environment, however, temperature and humidity are equally important. Some protection can be obtained by preventing air movement over the slab with the use of a wind break. The use of polythene will prevent both evaporation and air movement. It should be used with caution though when trying to obtain a consistent colour to the slab. Generally the use of polythene produces shade differences due to differing moisture conditions associated with wrinkling of the polythene. Polythene can be laid on the surface with sufficient rolled back in sections to allow finishing to be completed.

Other precautions that can be adopted include:

- the use of proprietary anti-evaporant alcohols. These are simply sprayed onto the surface, to provide a thin layer of alcohol that reduces water evaporation rates at the concrete surface. These products are inexpensive and can be applied with a weed sprayer. It is important to note that these products are not curing agents, and will need to be re-applied if the surface is disturbed;
- water misting, this can be difficult to achieve in windy conditions;
- polypropylene fibres, these are typically added at the batching plant and therefore their use requires planning.

With an understanding of the causes and precautions that can be taken to avoid plastic cracking, this common surface defect should, to coin a phrase, evaporate. **C**



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