HAHN READY MIX

Evaporation Rates & Plastic Shrinkage Cracking

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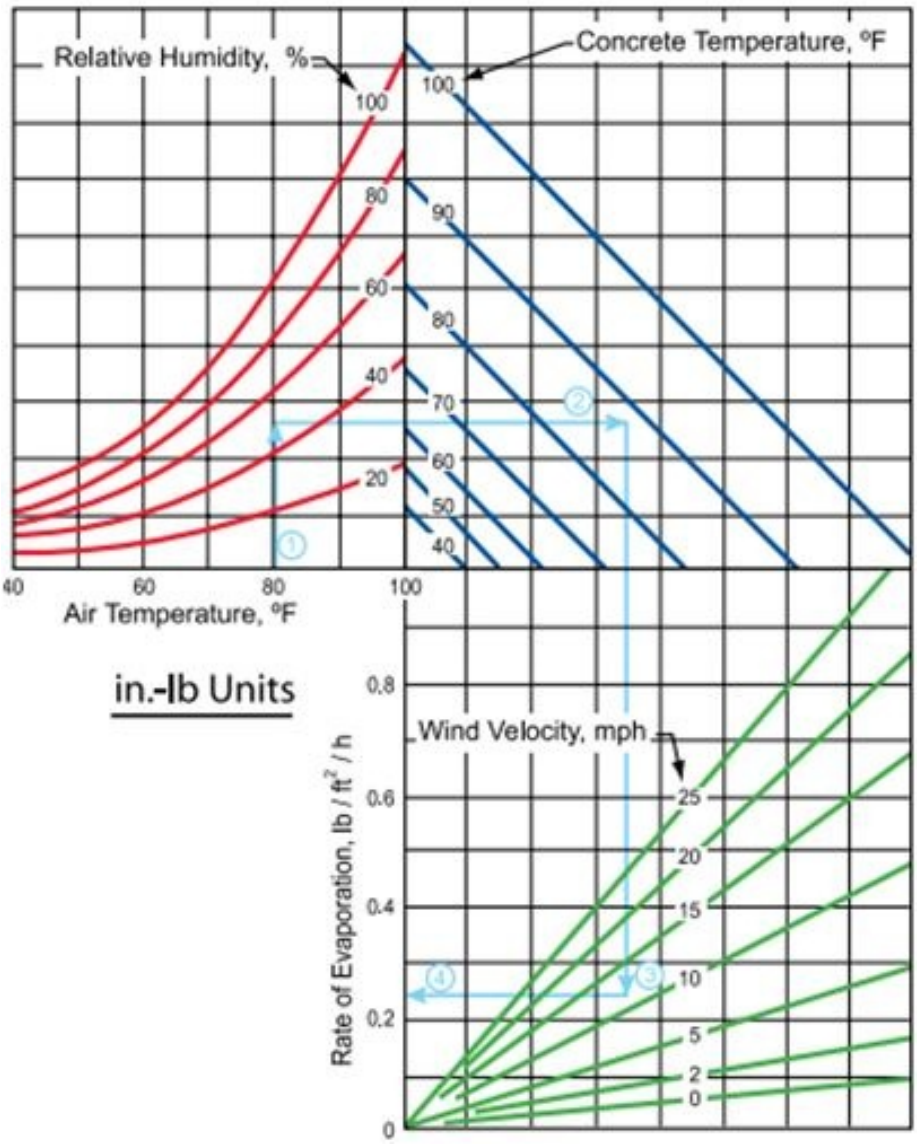
As we enter the summer pouring season, the threat of plastic shrinkage cracking starts to become more prevalent. We have gathered the tips and tricks to avoid this common problem.

What are plastic shrinkage cracks?
Plastic shrinkage cracks occur when the surface of plastic concrete dries out. This normally happens when the water in the surface of the poured concrete evaporates from the surface faster than the rate of bleed before the concrete reaches initial set. Plastic shrinkage cracks generally are accompanied by a sticky finish that finishers may describe as being “spongy”. The cracks tend to be wavy and typically run vaguely perpendicular. They also terminate in the slab, meaning they don't go all the way to the edge, the way a drying shrinkage crack will.

When do we need to be worried about plastic shrinkage cracking?
Generally, when evaporation rates are high, bleeding reduced, or set times extended, plastic shrinkage is more likely to occur. High evaporation rates occur when humidity is low, winds speeds are high, and ambient temperatures are lower than the concrete temperature. There is a bit of a threshold when concrete temperatures are in the 60's or lower where the relationship with the ambient temperature are not as important.



Above is a chart for measuring evaporation rates, but we have created an easy spreadsheet that can be more used to predict evaporation rates for the following day: https://docs.google.com/spreadsheets/d/e/2PACX-1vS8Jof46LK71v9tGs0OTU9ydyADD8BT_blEt3_tKyDg5wO5AMX7WCadlG7rfdroMwr9106QFzksGqNK/pub?output=xlsx

To use the spreadsheet, we recommend inputting data from the hourly weather forecast from the National Weather Service, and giving us a call for expected concrete temperatures.

Additionally, there is a device called a Kestrel 5200 which supplies real-time evaporation rates on a jobsite. More economical, an easy trick is to pay attention to when your lips are drying out and you find yourself licking them often or using chapstick... might be a sign that the evaporation rates are high.

What evaporation rate is acceptable?
In general use the following rules of thumb.

0-.1lbs/ft^2/hr: Optimal for pouring exterior concrete.

.1-.175lbs/ft^2/hr: Elevated risk for plastic shrinkage cracking and sticky finishing.

.175-.25lbs/ft^2/hr: Severe risk for plastic shrinkage cracking and sticky finishing.

.25+lbs/ft^2/hr: Conditions unsuitable for any unprotected exterior concrete pour.

How can we mitigate the risk of plastic shrinkage cracks when conditions are not ideal?

The good news is we have a lot of options to help minimize the effects of a high evaporation rate.

- - Dampen the subgrade. The first and normally easiest option to help reduce plastic shrinkage cracking, wetting down the subgrade allows the concrete to bleed a little more, and allows more time before the concrete dries out.
- - Use a vapor barrier. Vapor barriers do not allow moisture to exit the concrete on the bottom side, forcing the concrete to exhibit more bleeding.
- - Use microfiber. Microfibers are an effective protection against plastic shrinkage cracking in exterior flatwork.
- - Use evaporation retarders. Evaporation retarders such as Confilm or SpecFilm can be used directly after finishing operations to protect against surface evaporation. These products are NOT finishing agents and should never be worked into the concrete.
- - Accelerate the set. Removing a retarder or even adding a bit of accelerator reduces the time before initial set and reduces the amount of time water is evaporating off the surface of the concrete. Use this method with caution, as accelerating the set in warm temperatures could mean there is not adequate finishing time.
- - Set up windbreaks. For severe wind days, setting up a wind break can significantly reduce the evaporation of your concrete surface.
- - Fog the slab. As a last resort, fogging or misting the surface will introduce extra water to the surface of the concrete protect against evaporation. Be very careful not to allow water to drip or pool on the surface and never finish the water back into the slab. DO NOT ever use a hose or sprinkler on plastic concrete to try to achieve the same effect as a fogger.
- - Cure promptly. Adding a curing compound after finishing operations are completed will help seal the water in the concrete and prevent surface evaporation.

Another important note:

When evaporation rates are high, finishing operations tend to be significantly more challenging. The temptation often arises to “bless” the slab with water or even spray it down. **Never add water to the surface of plastic concrete at any time other than through a fogger, as this creates a locally high water/cement ratio at the surface of the concrete and results in a high likelihood of scaling, crazing cracking, and durability issues.**

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