

## Concrete Evaporation: The Factor You Can't Afford to Ignore Understanding and Calculating Evaporation Rate



**Concrete doesn't need days to develop problems — sometimes it only takes hours.** One of the earliest and most damaging issues a slab can face is rapid surface moisture loss. When evaporation outpaces the concrete's ability to retain water at the surface, shrinkage begins immediately—long before the material has gained the strength to resist it. This is where plastic shrinkage cracking starts. It's fast, unpredictable if unmonitored, and permanent once it happens. The good news is that it's also measurable.

### What's Actually Happening at the Surface

Right after placement, concrete is in a transitional state:

- **Bleed water is rising to the surface**
- **The slab is still plastic and workable**
- **Tensile strength is essentially zero**

Under stable conditions, this process balances itself. But when environmental forces pull moisture away too quickly, that balance breaks. The surface begins to dry and contract while the underlying concrete remains unchanged. That mismatch creates internal stress — and the slab responds by cracking. This is not a mix design issue. It's a jobsite conditions issue.

The Four Variables That Control Concrete Evaporation		
<b>Concrete Temperature (Tc)</b>	<b>°F</b>	Hotter concrete increases vapor pressure.
<b>Air temperature (Ta)</b>	<b>°F</b>	Warmer air absorbs more moisture.
<b>Relative humidity (r)</b>	<b>%</b>	Lower humidity increases drying potential. Expressed in decimal form.
<b>Wind speed (V)</b>	<b>mph</b>	Airflow removes moisture from the surface continuously.

### An Industry Standard Equation

Based on concrete industry standards as outlined by the American Concrete Institute this equation is commonly used to calculate concrete evaporation rate:

$$E=(Tc^{2.5}-r(Ta^{2.5}))(1+0.4V)(10^{-6})$$

Where:

- E = evaporation rate (lb/ft<sup>2</sup>/hr)**
- Tc = concrete temperature (°F)**
- Ta = air temperature (°F)**
- r = relative humidity (decimal form)**
- V = wind speed (mph)**

## Breaking the Equation Down

While the formula may look complex at first glance, it's simply combining three effects:

1. Temperature-driven moisture potential  
The difference between concrete temperature and air temperature (adjusted by humidity) defines how strongly moisture wants to leave the slab.
2. Wind amplification  
The term  $(1 + 0.4V)$  increases evaporation as wind speed rises.
3. Scaling factor  
The multiplier  $(10^{-6})$  converts the result into a usable evaporation rate.

### Example Calculation

#### Given the following field conditions:

Concrete temperature ( $T_c$ ) = 80°F  
Air temperature ( $T_a$ ) = 75°F  
Relative humidity = 30%  $\Rightarrow r = 0.30$   
Wind speed ( $V$ ) = 7 mph

#### Plugging into the formula:

Temperature component:  
 $80^2 - (0.30 \times 75^2)$   
Wind factor:  
 $(1 + 0.4 \times 7) = 3.8$   
Final result:  
 $E \approx 0.16 \text{ lb/ft}^2/\text{hr}$

## Reading the Result: What the Numbers Mean


The calculated value isn't just a number—it's a decision point. Use the following ranges as a guide:

- **Less than 0.10 lb/ft<sup>2</sup>/hr**  
Low Evaporation Risk. Place and finish as planned — but keep an eye on conditions.
- **0.10 to 0.20 lb/ft<sup>2</sup>/hr**  
Moderate Evaporation Risk. Conditions favor caution. Increased awareness and minor adjustments may be required.
- **0.20 to 0.30 lb/ft<sup>2</sup>/hr**  
High Evaporation Risk. The surface is losing moisture faster than it can recover. If you don't adjust — wind breaks, fogging, timing — you should expect cracking.

## There's an Easier Way

Triangle Ready Mix offers a very simple to use concrete evaporation calculator on our website. Simply enter the four variables of Concrete Temperature, Air Temperature, Relative Humidity, and Wind Speed, and the calculation is done for you automatically. Just visit [TriangleReadyMix.com/evaporation-calculator](https://www.trianglereadymix.com/evaporation-calculator).

### Evaporation Calculator



Concrete Temperature °F

Air Temperature °F

Relative Humidity %

Wind Speed mph

Evaporation Rate