

Bill Spitzer & Associates Cementitious Grout Overview

ITWPRC 100 Non-Shrink

- Meets or exceeds CRD C-621 & ASTM C-1107
- Unit weight: 50 lb. bag or 3,000 lb. super sack
 - 50 lb. bag yield depends on water added; 0.44 ft.³ to 0.45 ft.³
- Application temperature range: 45 °F to 90 °F

Shrinkage Compensator Admixture

- This technology greatly reduces drying shrinkage but will not eliminate it
- Reduces stresses induced from one dimensional surface drying, Curling
- ASTM C-494 Type S

Mid-Range Water Reducer (MRWR)

- MRWR increase workability without increasing the w/c (water-cement ratio)
- Water reduction of 5% - 15%
- ASTM C-494 Type A and/or F
- Polycarboxylate technology
 - Electrostatic dispersion - a state created by the admixture which allows it to attach to the cement grains electrically and repel other admixture molecules and cement grains.
 - Steric Hindrance - a state created by the massive size of the admix molecules attached to the cement grains that prevents contact of the grains and promotes fluidity of the cement paste. It also takes longer for the admixture to be overtaken by the gel formation around the cement grain caused by the hydration reaction.
 - Increases finishability

Blended 60/40 River Sand

- River sands are spherical, which increases workability
- No gapped gradation of fine aggregate
- Less water demand
- Better mortar content
- May have some small rounded river stones

Blended Cements

- Type III primary & Type I/II secondary (ASTM C-150)
 - Type III – High early strength cement for rapid set
 - Type II – Moderate heat of hydration & moderate sulfate resisting cement
 - Sulfates in soil/moisture/water can expand the hydrated cement
 - Type I – Normal, general cement
 - No gapped gradation of fines
 - More efficient strength & heat of hydration gain
 - Better paste content

Professional Grade Materials & Manufacturing

- High QC verification program
 - Every 5 batches sampled
- Laboratory on site of manufacturing
- Retain samples for future reference



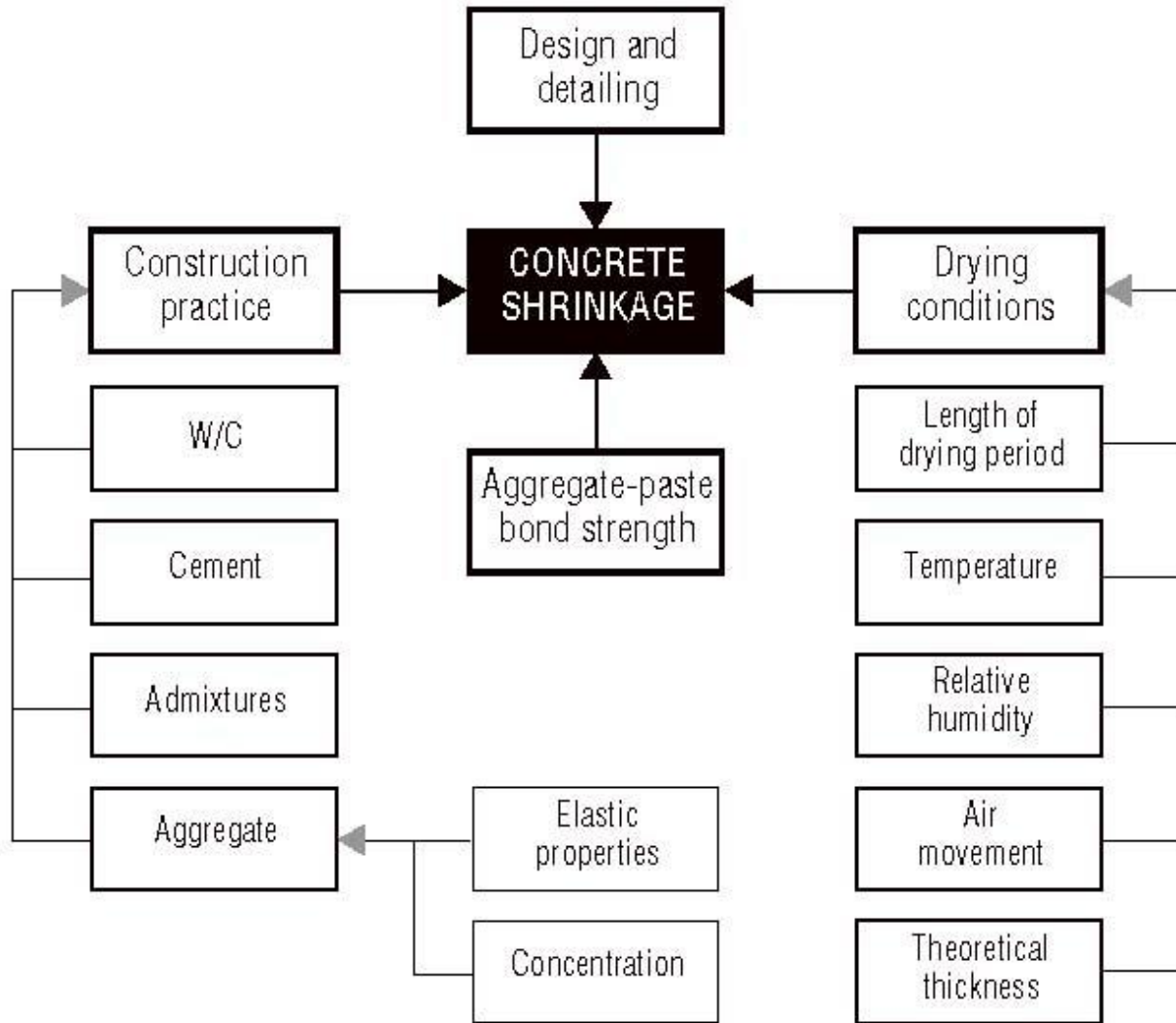
Expected attributes when mixed at these proportions:

PRC-100	Plastic 0.87 gal 3.23 L	Flowable 0.91 gal 3.54 L	Fluid 1.19 gal max 4.4 L max
3 Day PSI ASTM C-109	5,900	5,400	4,800
7 Day PSI ASTM C-109	8,900	7,700	6,200
28 Day PSI ASTM C-109	11,500	8,400	7,700
Initial Set ASTM C-266	3.5 hours	4 hours	4.6 hours
Final Set ASTM C-266	4.75 hours	4.8 hours	4.85 hours
Expansion % CRD D-621	0.07	0.03	0.02

Other Testing	ITWPRC 100 Non-Shrink
Static Modulus of Elasticity ASTM C-469	3 days 2.64×10^6 psi 28 days 3.00×10^6 psi
Coefficient of Thermal Expansion ASTM C-531	4.76×10^{-6} in/in °F
Flexural Strength ASTM C-78	3 days 1,055 psi 28 days 1,430 psi
Splitting Tensile Strength ASTM D-496	3 days 550 psi 28 days 750 psi
Strength of Anchors ASTM E-488 1 ¼" bolt in 2 ½" hole w/9" embedment	Tensile 53,200 lbs. Shear 24,300 lbs.
Strength of Anchors ASTM E-488 ½" bolt in 1 ⅝" hole w/4" embedment	Tensile 7,100 lbs. Shear 2,000 lbs.

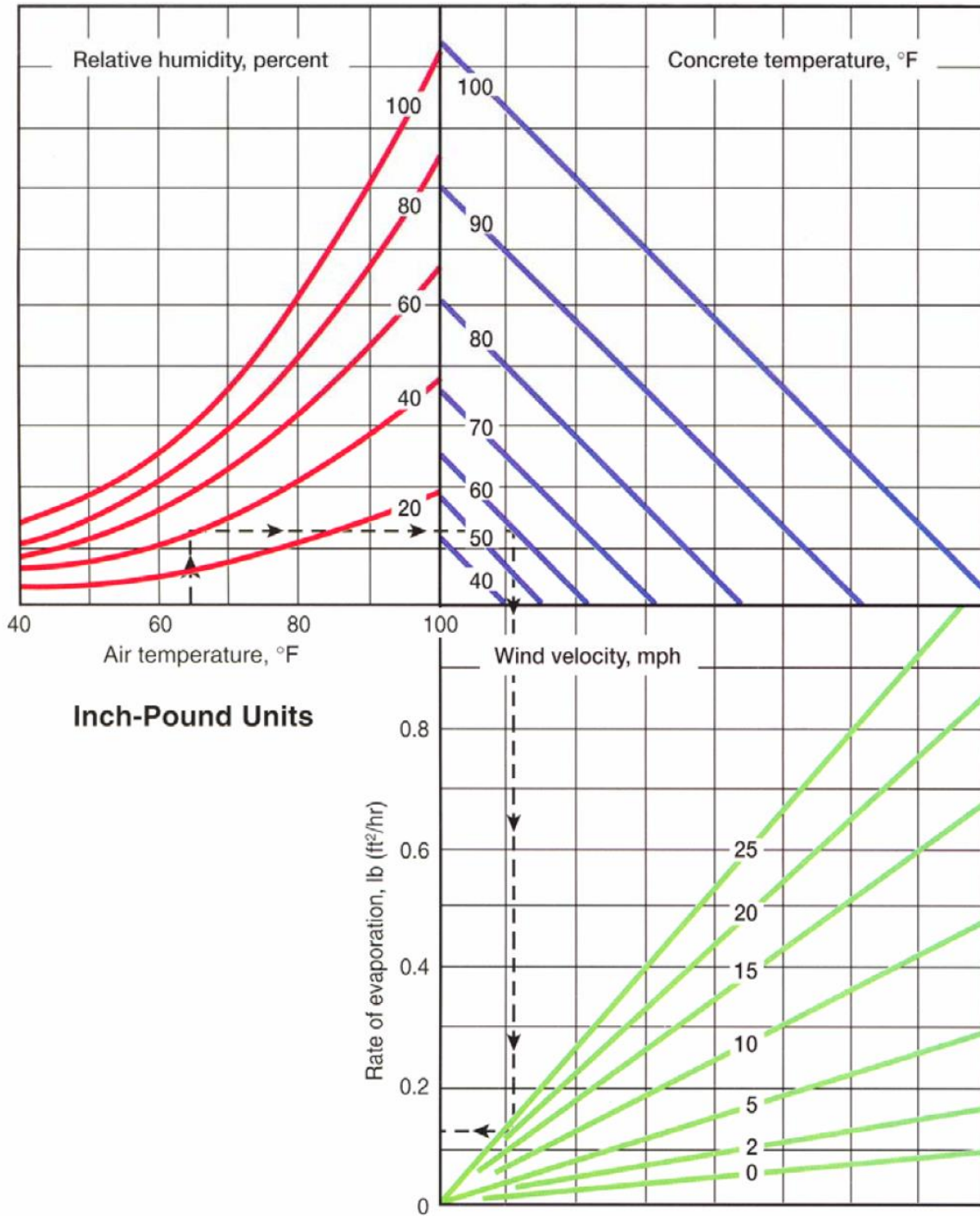


This diagram illustrates the many potential factors and practices that contribute to shrinkage with cementitious materials:





The following graph illustrates the theoretical rate of evaporation for a known air temperature, relative humidity, cementitious temperature, and wind velocity. The dotted lines show the estimated evaporation rate of 0.13ft²/hr.

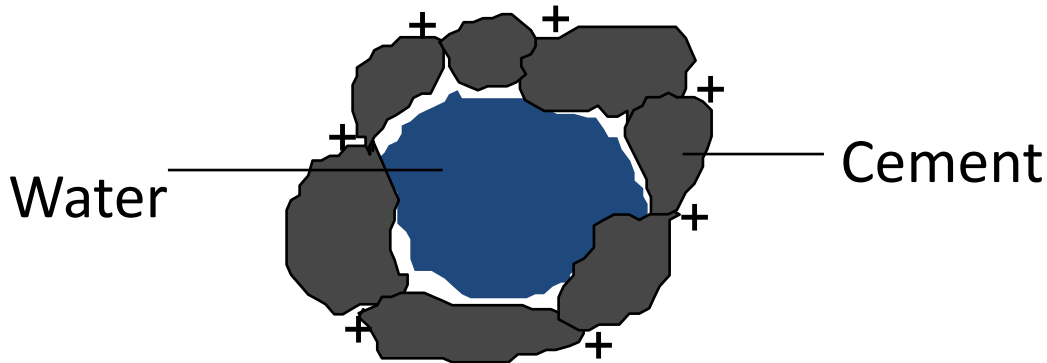


Source : Design and Control of Concrete Mixtures, 14th edition , PCA, Skokie Illinois



Diagram of how water reducers work:

When cement comes in contact with water, dissimilar electrical charges at the surface of the cement particles attract one another, which results in flocculation or grouping of the particles. A good portion of the water is absorbed in this process, thereby leading to a cohesive mix and reduced slump or flowability of the grout.



Water-reducing admixtures essentially neutralize surface charges on solid particles and cause all surfaces to carry like charges. Since particles with like charges repel each other, they reduce flocculation of the cement particles and allow for better dispersion. They also reduce the viscosity of the paste, resulting in a greater slump. (Source: Miller, Brian. "Revealing the Mystery of Admixtures: Water-Reducing and Set-Controlling." *Precast Magazine*. National Precast Concrete Association, May 29, 2010.)

