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# DRYING SHRINKAGE VALIDATION

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## OBJECTIVE

Calibrate the HIPERPAV drying shrinkage model for Nebraska, Arizona, Minnesota, North Carolina and Texas.

## STRATEGY FOR CALIBRATING DRYING SHRINKAGE MODEL

The drying shrinkage model used in HIPERPAV is based on the method of Bazant <sup>(1)</sup>

The parameters factors that presented the cross-section shape ( $k_s$ ), the cement type ( $\alpha$ ), and the type of curing ( $\alpha_2$ ) had to be adjusted. These parameters were adjusted based on a linear regression type of error analysis. In principle, if the model perfectly predicts the experimental data, all the points in a plot of theoretical shrinkage strain vs. experimental shrinkage strain will fall on a line with 1:1 slope ( $R^2 = 1.0$ ).

If the model prediction is not perfect,  $R^2$  will decrease. The calibration parameters were optimized to obtain the highest  $R^2$ . All parameters are summarized in table 1.

Table 1. Calibration coefficients for Arizona, Minnesota, Nebraska, North Carolina, and Texas PCC split cylinders in the drying shrinkage model.

	Arizona	Minnesota	Nebraska	North Carolina	Texas
$K_s$	1.4	1.4	1.4	1.4	1.4
$\alpha_1$	1.1	0.9	1.3	1.4	0.8
$\alpha_2$	1.2	1.2	1.2	1.2	1.2

The theoretical and experimental drying shrinkage strains vs. time plots are shown in figure 1, and the theoretical drying shrinkage strains are compared directly to the experimental ones in figure 2 for Arizona. The plots of experimental drying shrinkage for other States are shown in reference 2.

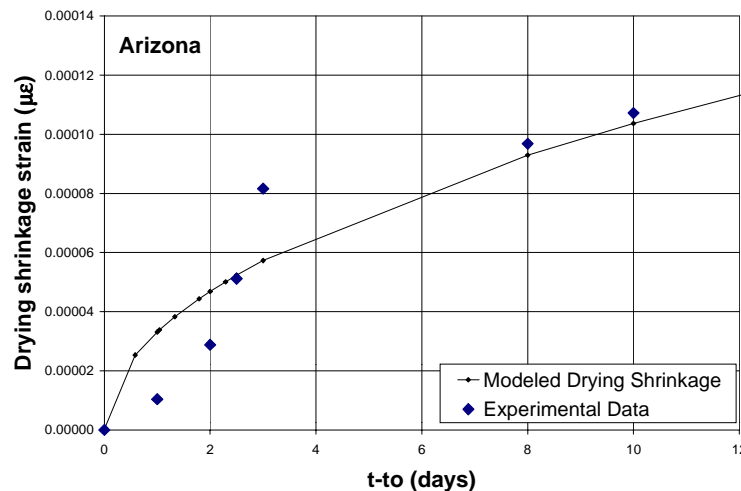


Figure 1. Comparison between experimental and theoretical drying shrinkage strain vs. time (days) plots for Arizona PCC ( $k_s = 1.4$ ,  $\alpha_1 = 1.1$  and  $\alpha_2 = 1.2$ ).

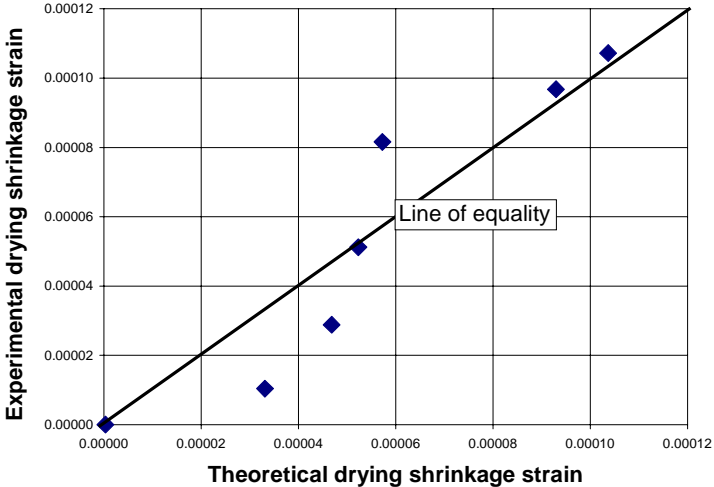


Figure 2. Comparison of experimental and theoretical drying shrinkage strains for Arizona concrete ( $R^2 = 0.90$ ) (Negative experimental data disregarded).

**REFERENCES**

- (1) RILEM Draft Recommendation 107-GCS Guidelines for the Formulation of Creep and Shrinkage Prediction Models, *Materials and Structures*, 1995, Vol. 28, 357-365
- (2) Technical Memorandum No. 10, Drying Shrinkage Validation