

AN ABSTRACT OF A THESIS

**EARLY-AGE SHRINKAGE OF HIGH PERFORMANCE CONCRETE
DECK SLABS UNDER DIFFERENT CURING METHODS**

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High Performance Concrete (HPC) has been promoted recently by the Federal Highway Administration (FHWA) for use in highway structures such as bridges and rigid pavement. The features of HPC include improved durability and strength performance characteristics.

Shrinkage is the decreasing of the volume of the materials. The development of shrinkage is directly proportional to the rate of moisture loss in the concrete. Applying curing materials after the initial setting of concrete will help to retain moisture in the concrete, thereby decreasing the likelihood of cracking in the concrete due to drying shrinkage.

Though the ultimate shrinkage of the HPC is lower than that of the normal-strength concrete, the early-age shrinkage of the HPC is higher. Higher early-age shrinkage can cause initial cracking in the concrete and decrease the strength performance of the concrete.

Tests were conducted to study the effects of curing methods on the development of HPC early-age shrinkage. The Tennessee Department of Transportation's HPC mixture was chosen for the study. The loss of concrete moisture that relates to shrinkage developments, and the increase in temperature of the concrete resulting from the use of curing methods were also examined in this research. Before the tests were conducted, the development of the TDOT HPC shrinkage was predicted by using the ACI 209R-92 model, the GZ model, and the Hansen's model. Four slab specimens and twenty cylinders were cast twice for two curing durations -3 days and 7 days. Burlap blankets, cotton mats, curing compound, and polyethylene blankets were chosen as curing materials. The shrinkage development of the concrete cured with the four different curing methods were analyzed. The relationship between the curing methods and the temperature of the concrete during the early-age of the hydration process were studied. The measured concrete shrinkage data were compared with the predicted concrete shrinkage.