

Yoshida Award: Research Paper Category

Exposure Test and Numerical Simulation on the Influence of Outdoor Weather Action on the Drying Shrinkage of Concrete

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Drying shrinkage of concrete is a traditional research issue in concrete engineering, but investigations have mainly focused on indoor tests under constant temperature and humidity. There is demand for a method of predicting the drying shrinkage of concrete members in the actual outdoor environment. In particular, there have been insufficient investigations of the effect of various environmental effects such as time-varying temperature and humidity, rainfall and sunshine. This is considered an outstanding issue of concrete engineering.

This paper is a comprehensive investigation of environmental effects on drying shrinkage behavior of concrete. Through exposure tests at four locations in Japan with different environmental conditions, the effects of time-varying temperature and humidity, rainfall and sunshine and their regional variations are evaluated. Numerical simulations to precisely replicate these environmental actions are also carried out. The results reveal that average values of relative humidity at a location are insufficient to calculate the shrinkage strain of a structure in the actual environment. A calculation method is proposed for shrinkage based on apparent relative humidity, corresponding to actual measurement values adjusted for the effect of rainfall and other factors. These achievements contribute to advancement of shrinkage predictions for concrete.

For the above reasons, this paper is recognized as being a worthy recipient of the Yoshida Award in the Research Paper Category.