

風作用を受けるコンクリートの初期収縮 に関する研究

庄谷 征美*・杉田 修一**

Study on the Early Shrinkage of Concrete Due to Wind Action

Masami SHOYA and Shuichi SUGITA

Abstract

The early shrinkage and moisture loss characteristics of fresh concrete due to wind action under 20°C and 50% R.H. condition are examined for a variety of types of cement and mixes from the age of 3 hrs. to 24 hrs. after mixing. Test specimens are the prisms with cross section of 10 cm square and 40 cm in length, and the apparatus for measuring early shrinkage and the blower with wind tunnel are described briefly.

The conclusions of the present study are summarized as follows:

- (1) Early shrinkage of fresh concrete occurs immediately after the beginning of drying regardless the wind condition, however, the faster the wind velocity, the larger the magnitude of shrinkage and the shorter the time to reach the stage asymptotic to a certain value.
- (2) The lower the water cement ratio and the less the water content, the greater the influence of wind to increase shrinkage.
- (3) Early shrinkage is affected by the type of cement and the mix conditions. Then, the lower the water cement ratio and the larger the slump value and the more the paste content, the greater the 24 hrs. shrinkage. The similar expression with Pickett equation estimating drying shrinkage of hardened concrete also seems applicable to explain early shrinkage of fresh concrete.
- (4) Drying shrinkage of hardened concrete in calm air after the severe drying due to wind in early age tends to decrease, and its reduction rate becomes larger as the increase of wind velocity. For example, the shrinkage value becomes smaller by about $1-2 \times 10^{-4}$ under the wind velocity of 8 m/s in comparison with that obtained in the windless condition.

1. まえがき

舗装版などの打設直後のフレッシュコンクリートには、初期乾燥に伴って表面にひびわれを生じることが多い。このひびわれは、いわゆる沈下収縮に起因する沈みひびわれとは異質のものであり、Lerch¹⁾によれば乾燥速度がブリージング速度より大きい場合に発生するといわれる。最近の研究では、戸川²⁾は水分蒸発速度とひ

びわれ発生の関係を確認しているが、初期収縮が拘束され引張強度を上回る応力状態に達してひびわれ発生に到るとする Ravina & Shalon³⁾の見解が説得力に富んでいると考えられる。いずれにせよ、ひびわれの直接的要因となる初期収縮現象については、Shacklock⁴⁾、先述の Ravina らの他、我国では笠井⁵⁾⁻⁷⁾の研究がある。笠井らは、試料をコンクリートとした多くの実験から、初期収縮に影響する因子として、型枠存置期間、乾燥面積、環境の温湿度、風速レベルならびに材料、特に細骨材中の微粒分の存在を指摘している。しかしながら、笠井ら

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* 土木工学科助教授

** 同 教授