

# Subcommittee on Examination and Inspection Systems for the Design of Concrete Mix Proportions Based on the Construction Performance of Fresh Concrete (Subcommittee 341)

## 1. Introduction

Concrete construction work has been undergoing drastic change due to depletion of aggregate supplies, the growing size of structures, and the use of steel reinforcement bars at higher densities to improve earthquake resistance. Although concrete with smaller water-cement ratios and slump values has long been required for high-quality concrete structures, such structures also require concrete of sufficient workability that can be reliably placed into every crevice in the formwork and around all the reinforcing steel. Yet when concrete with extremely small slump values is used, honeycombing or cavities may result. To obtain concrete structures that perform as required, there is a need for proper structural design, proper mixing of concrete materials of suitable quality, and appropriate concrete usage.

Currently, the only method being used to examine and inspect the workability of concrete is the slump test, which evaluates deformation under the dead load of the material itself. However, the workability required for transportation, placement, compaction, finishing, and other work operations is difficult to determine from slump tests because the performance (consistency) of fresh concrete *per se* does not determine its workability. Rather, workability depends largely on the structural characteristics of the structure in which the concrete is cast and the work conditions. To determine workability, especially when concrete is poured into forms using vibration compaction, both the structure characteristics and concrete motion during vibration must be understood. However, because a variety of materials are used, the quantitative evaluations produced by the slump test are limited.

Against this background, Prof. Chikanori Hashimoto of the University of Tokushima took the chair of subcommittee 341 to oversee its ongoing work after its first term finished (2008-2010). The composition of the subcommittee is the same as in the first term and includes two working groups. The end goal is to develop both an inspection and verification system for performance of fresh concrete using during construction and a test method that is suitable for use on construction sites. A further aim is to develop supplementary technology for construction performance and to improve current systems for evaluating construction performance.

## 2. Activities of the Workability Examination System Working Group

During the subcommittee's first term, the activities of this working group included discussion and investigation of an ideal inspection system for construction performance as well as a tentative implementation plan as regards two JSCE publications: "Recommendation for Mix Design of Fresh Concrete and Construction Placement-related Performance Evaluation" and "Standard Specifications for Concrete Structures". Moreover, the interrelationships among design, construction, and materials were clarified in the form of an "interrelation diagram", while an advanced inspection system for construction performance was proposed.

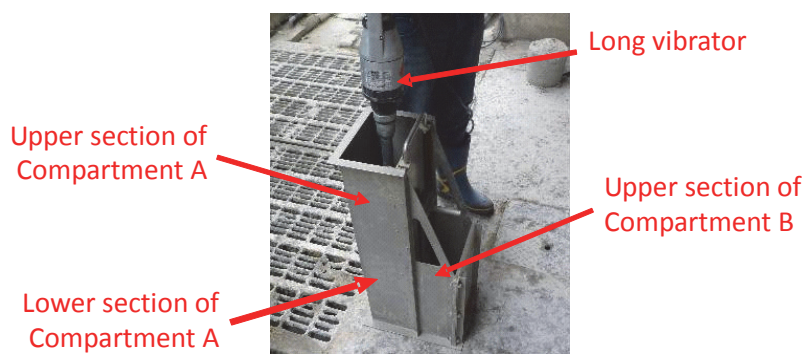
In the second term, based on these results, activities began with a nationwide questionnaire survey to determine, from the viewpoints of owner, designer, manufacturer and contractor, the understanding and use of the commonly implemented inspection system for construction performance being introduced into the present Construction chapter of "Standard Specifications for Concrete Structures". Based on this, proposals were made for revisions to "Recommendation for Mix Design of Fresh

Concrete and Construction Placement-related Performance Evaluation (Draft)".

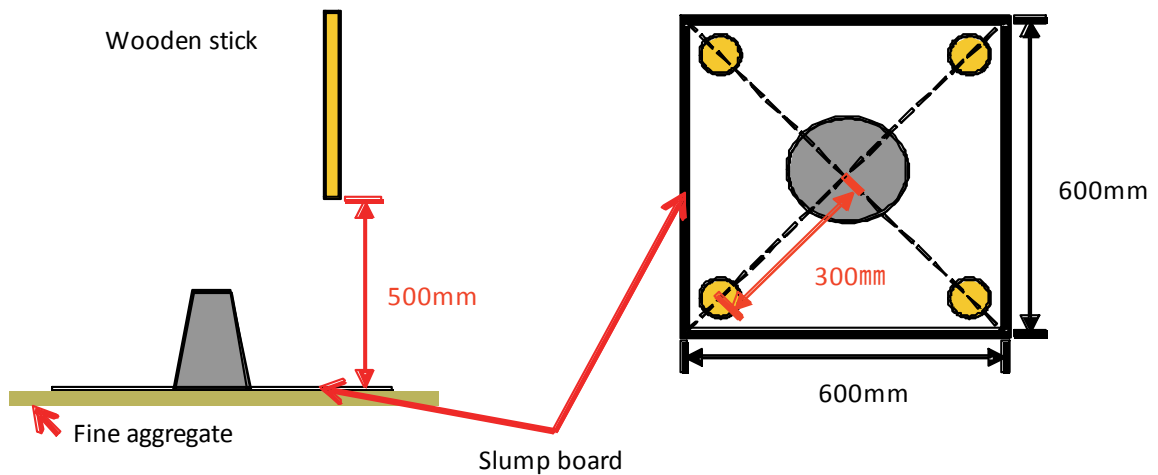
### 3. Activities of the Examination and Inspection Test Method Working Group

Slump, as evaluated by slump tests, indicates the final change in length. Only the dead load of the fresh concrete acts on the sample, so only one aspect of workability is evaluated. During the first term, this working group first summed up the present status of the slump test and related issues, then worked on documentation for a new evaluation and testing method and proposed a testing method. The test method uses existing testing equipment, consisting of a box-type container and a long internal vibrator (Figure 1), and involves implementing tamping tests (Figure 2).

In this term, activity has focused on verifying the relation between the test method proposed in the first term and the workability of actual concrete as used on construction sites, using unified experiments with a small-scale mockup.



**Figure 1** Box-shaped container of specified type and vibrator



**Figure 2** Tamping test