Report from the revision subcommittee on recommendations for mix design and construction of concrete based on concrete construction performance (Subcommittee 268)

Introducing JSCE's "Recommendations for Mix Design and Construction of Concrete based on Concrete Construction Performance [2016 version]" (Concrete Library 145) and the main activities of the revision committee.

1. General

The current situation is that concrete casting is tending to become more difficult year by year due to poorer material quality, as exemplified by the shortage of high-quality aggregates, and excessive congestion in reinforcing bar arrangements caused by ever-stricter seismic design standards. Recently, actual cases have been reported where structural performance requirements have led to inappropriate workability or construction conditions, resulting in initial defects in structures such as insufficient compaction and honeycombing. In an earlier effort to alleviate these problems, Concrete Library 126 "Recommendations for Mix Design and Construction of Concrete based on Concrete Construction Performance (draft)" was published in 2007. These recommendations included the following proposals.

(1) Definition of a new technical term, "minimum slump for concrete placing" (Fig. 1).
(2) Varying the required slump according to structural element detailing and construction conditions.

Since this first edition of the recommendations was published, the environment surrounding concrete construction has changed and there has been development in construction technologies and concrete materials. Accordingly, a revision subcommittee (Chairman: Prof. Chikanori Hashimoto, Tokushima University) was set up within the JSCE concrete committee, beginning its research in 2014. Based on the committee's work, a revised edition of the recommendations was issued as Concrete Library 145 "Recommendations for Mix Design and Construction of Concrete based on Concrete Construction Performance [2016 version]" in June 2016.

2. Main contents of the revision

In the new recommendations, the concepts of workability and construction performance are summarized again and their significance explained in a clearer way. In addition, concrete filling performance and pumpability are discussed in the context of the overall process from fabrication to compaction with the aim of preventing initial defects such as insufficient filling

and honeycombing. Filling performance is addressed by proposing a minimum slump for the appropriate placement of concrete and a relationship governing the unit weight of binders and corresponding slump (Figs. 2 and 3), as well as by providing an explanation of the basic concept of filling performance. Furthermore, a test method for the quantitative assessment of concrete placement performance, "Test method for passability of concrete through obstacle in box-shaped container with vibration (draft)" (JSCE-F 701-2016), is suggested for use during trial mixing of concrete to determine the mix proportions (Fig. 4). As for pumpability, revised mix proportions were proposed to take into account slump loss during casting and the relationship between appropriate slump and unit weight of binders to prevent clogging in pipes.

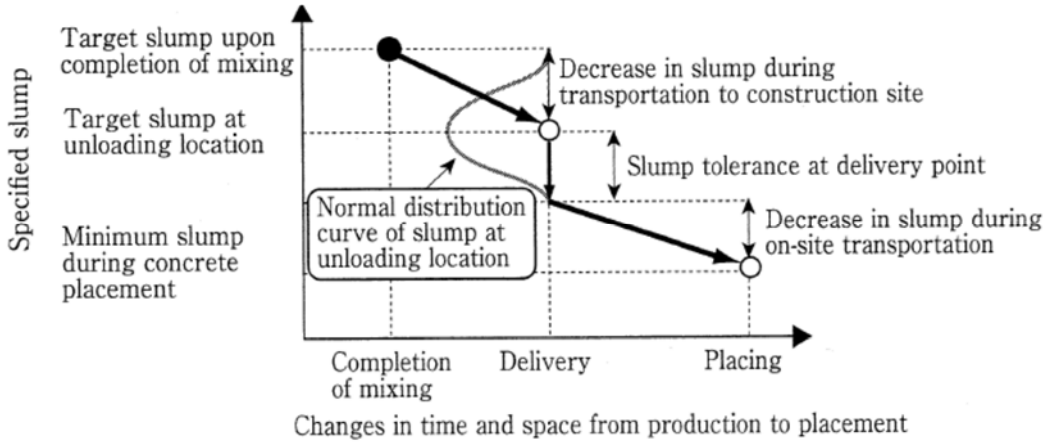

Fig. 1 Relationship between specified slump at each stage of construction and decrease in slump

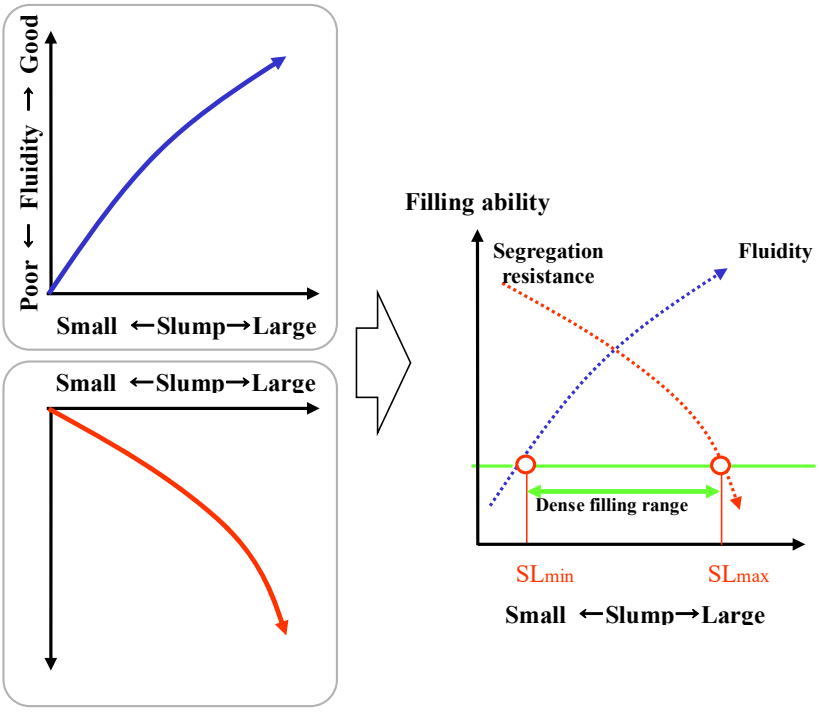

Fig. 2 Influence of the slump on filling ability

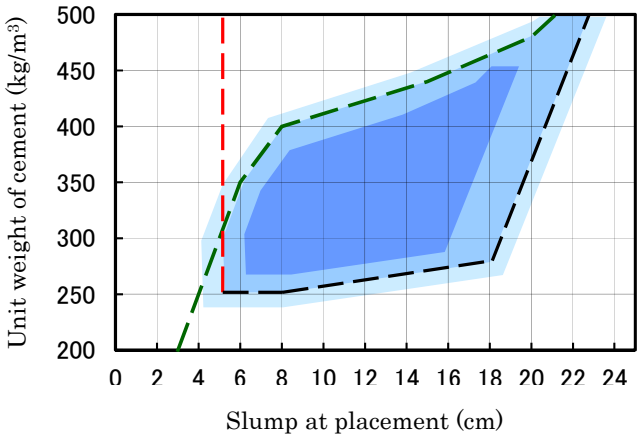

Fig. 3 Relationship between unit weight of cement and suitable slump

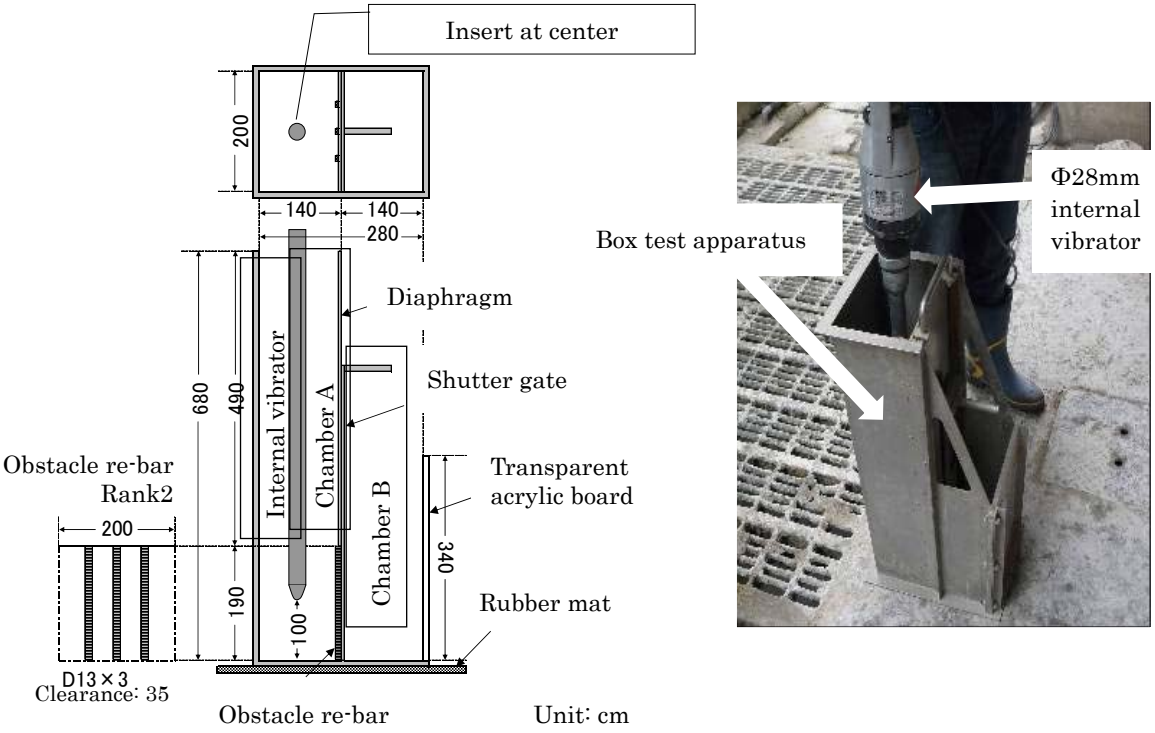

Fig. 4 Schematics of draft passability test method with vibration