

Subcommittee of Construction Placement related Performance Evaluation

Increased water in fresh concrete mixture (which is rooted in pump transport of fresh concrete), poor casting skills at sites, and the current heavy reinforcement brought about by the revision of the seismic design codes, have resulted in initial defects such as honeycomb and cold joints in structural concrete. As a matter of fact, these problems have been of concern to the engineering society in the past decades. Under this situation, JSCE concrete committee established an extensive task team on construction placement related performance evaluation of fresh concrete to tackle these problems, with strong support from the forum of construction companies, Japan Prestressed Concrete Constructors Association, Japan Concrete Admixture Association and Japan Ready Mixed Concrete Association. After rigorous and fruitful discussions, the concrete committee finally authorized and published a guideline that rationally evaluates workability and resistance against segregation of fresh concrete in each structural member. The guideline successfully shows suitable mix proportion for different members and construction conditions in March 2007.

Working Group

The subcommittee consisted of five working groups. Each group worked on different specific task missions as follows.

WG1 : Mix design

This task group discussed the method for selecting suitable mix proportion of ready mixed concrete as industrial materials. The method leads us to determine a particular mix proportion and/or to select a suitable category of ready mixed concrete that could satisfy the required performances such as consistency represented by the minimum slump and the segregation resistance in terms of cement content. The method is categorized according to the kind of structural members, structural details, and construction conditions. For the case where ready mixed concrete is not available, a general design method of mix proportion that guarantees the required performance was discussed as well.

WG2 : Construction Performance

This task group discussed construction performance. Actually, the evaluation method of workability, resistance against segregation, and pumpability were analyzed systematically and verified in practice as well as the design method of consistency. This evaluation system explicitly treats so called slump loss caused by transportation, pumping process, and time in the most transparent way.

WG3 : Ready mixed concrete and its production

In this working group, the draft on the selection of ready mixed concrete plants and concrete quality were

produced. Equipment, measurement and the mixing method were also investigated and codified.

WG4 : Construction method

For appropriate execution at site, the construction method was focused in detail on slab, column, beam, wall, and prestressed concrete members. At the same time, the particular points which require careful attention were mentioned.

WG5 : Documents

Investigation and research related to the mix design, fresh construction performance, production and construction methods (mainly placing and compaction of fresh concrete) were consistently documented.

Main contents of interest and points

(1) Slump

Although slump generally decreases during transportation and due to time (Figure 1), the slump loss has never been explicitly considered in purchasing and/or designing the required slump on construction site. In relevant Japan Industrial Standards, the slump of fresh concrete is referred to as the one when it reaches a construction site. On the other hand, in the JSCE specifications, the slump is based on the time just before casting into formworks. The difference of each conceptual slump values was made clear first, and the minimum slump required for casting was definitely defined.

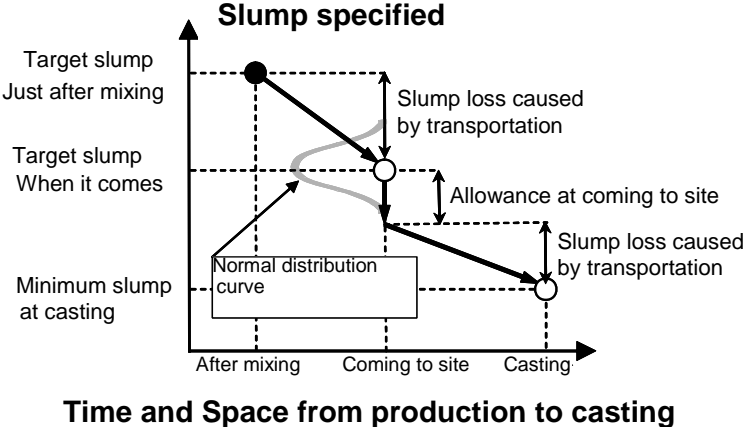


Fig. 1 Specified slump in time and space

(2) Mix proportion

The ready mixed concrete is prescribed by targeted compressive strength and the slump value when the fresh concrete product arrives at construction sites. In reality, even if the same standard option of ready mixed concrete was ordered as an industrial material, their overall performances related to workability are not always identical because of differences of segregation resistance in each plant. Therefore, the

committee proposed the engineering way to represent the fresh concrete performance with regard to consistency indicated by the slump value and the segregation resistance expressed by cement content (Figure 2).

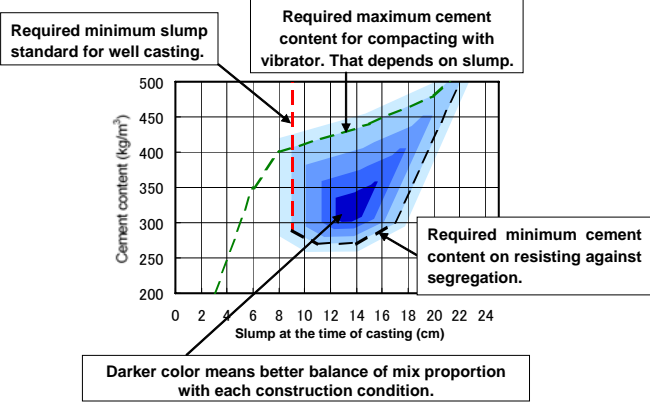


Fig. 2 Recommended mix design for consistency and segregation resistance

(3) Construction conditions

The required consistency and the resistance against segregation, which reflect on construction performance, depend substantially on structural details (the amount of reinforcement, minimum spacing, concrete cover, etc.) and construction conditions at sites. New indicators to represent the states of concrete placing and compaction are proposed (Figure 3) and the simple practical method for selecting suitable minimum slump for each work was specified as standard recommendation.

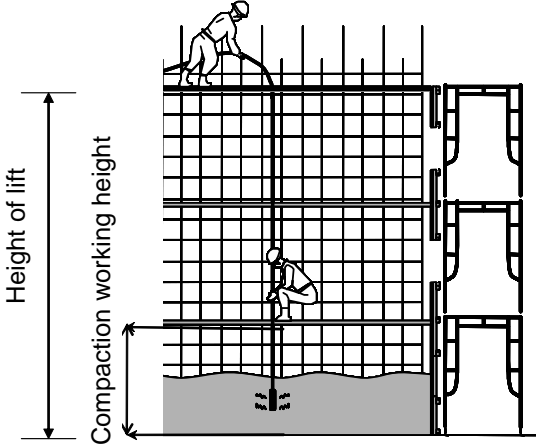


Fig. 3 Compaction working height, case of a worker inside a member (wall)