Outline of "Activities of the Research Group for Promoting the Use of High-Fluidity Concrete in Buildings"

「建築分野における高流動性コンクリートの普及に関する研究会」の概要


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1. Introduction

As buildings grow in both scale and seismic performance, concrete that can be tested using a standard slump test to evaluate its workability is increasingly failing to meet the filling requirements. In JIS A 5308 "Ready-mixed concrete" revised in March 2019, slump flows of 45, 50, 55, and 60 cm were added in the normal-strength region. To improve productivity and quality and reduce defects in concrete work by promoting the use of high-fluidity concrete, the Japan Federation of Construction Contractors (JFCC) established the Research Group for Promoting the Use of High-Fluidity Concrete in Buildings. This paper was honored with the Outstanding Technical Award of JCI in 2021.

2. Outline of the Research Group

This group was established within the Material and Construction Expert Group under the Building Technology Development Committee of JFCC. The 20 participating companies are listed in **Table-1**, and the activities of the three working groups are listed in **Table-2**. The activity period was three years from FY2017 to FY2019, and the high-fluidity concrete that was studied was not high-strength but normal-strength concrete.

Table-1 Participating companies

◎ Obayashi Corporation	○ Kajima Corporation	Shimizu Corporation	Tokyu Construction	Haseko Corporation
Asanuma Corporation	Kumagaigumi Co., Ltd.	Taisei Corporation	○ Toda Corporation	Fujita Corporation
Hazama Ando Corporation	Penta-Ocean Construction	Takenaka Corporation	Tobishima Corporation	Maeda Corporation
○ Okumura Corporation	○ Satokogyo Co., Ltd.	Tekken Corporation	Nishimats Construction	Sumitomo Mitsui Construction

◎: Chair ○: Secretaries

3. Activities of the Research Group

(1) SWG1

To use high-fluidity concrete appropriately, it is important to evaluate its segregation resistance. Therefore, in SWG1, the relationship between the mixing conditions of high-fluidity concrete and its segregation resistance was examined using test methods that were judged to be capable of evaluating segregation resistance. The experimental results confirmed that the recently developed superplasticizer containing a viscosity-modifying agent offers more resistance to segregation than does an ordinary superplasticizer. The

Table-2 Activities of sub-working groups (SWGs)

SWG	Activities
SWG1	Investigate the physical properties (fresh properties, hardened properties, durability, etc.) of high-fluidity concrete and evaluation methods for resistance to segregation in fresh concrete.
SWG2	Verify the workability of high-fluidity concrete and clarify the scope of application. At the same time, verify the effects of improved productivity, reduced defects, and higher quality.
SWG3	Clarify the required performance (quality) for high-fluidity concrete through questionnaires to constructors, designers, and concrete manufacturers. In addition, create a usage guide based on the results of the above SWGs.

slump flow for nominal strength (unit cement content) is shown in **Fig. 1**.

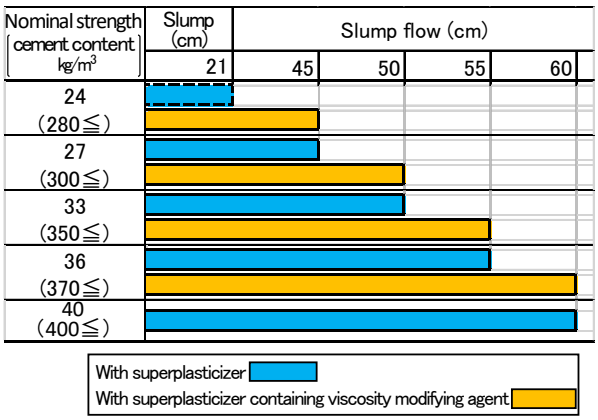

Fig. 1 Approximate slump flow for nominal strength

(2) SWG2

In SWG2, experiments were conducted to verify the effectiveness of high-fluidity concrete for improving workability. In the experiments, reinforced concrete specimens simulating columns and walls were used, and two types of concrete were placed: one with a slump of 18 cm and the other with a slump flow of 55 cm. The results are shown in **Fig. 2**. The slope of placing concrete was smaller for the high-fluidity concrete, and the time required for placement was reduced by 23% overall.

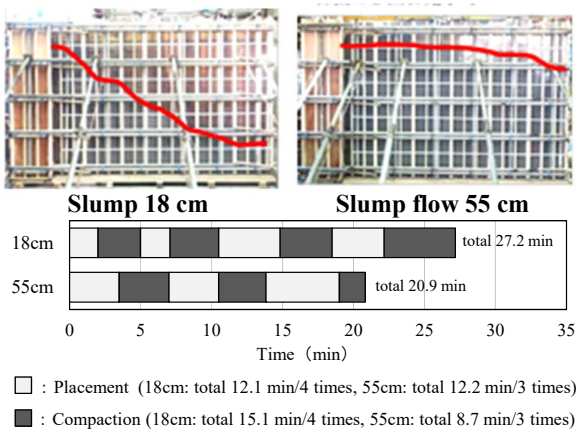

Fig. 2 Construction status of the mock-up

(3) SWG3

In SWG3, a questionnaire survey was conducted to determine the actual use of high-fluidity concrete. As a result, it was found that more than 70% of the constructors who had experience using high-fluidity concrete realized a decrease in defects in concrete work, and 45% realized labor saving.

(4) Outcomes of the Research Group

As a result of this study group, the Guidelines for the Use of High-Fluidity Concrete[1] were developed to enable the use of high-fluidity concrete to be considered at the design stage. The guidelines give the recommended slump flow for each casting member as shown in **Table-3**.

Also, a leaflet as shown in **Fig. 3** was prepared and posted on the JFCC website[2] to publicize the information to clients and designers. In addition, a procedure for producing high-fluidity concrete by adding admixture to a truck agitator at the construction site was also prepared and posted on the JFCC website[3].

Table-3 Recommended slump flow for each casting member[2]

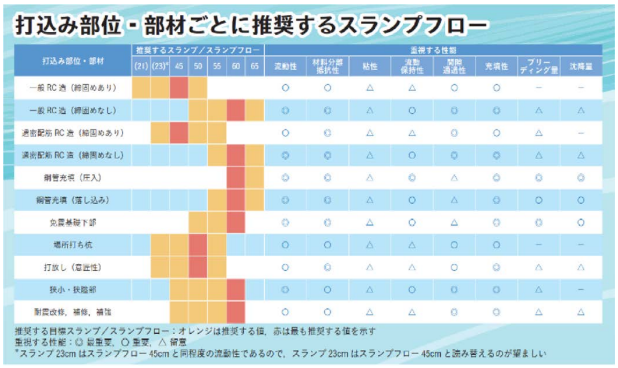

Fig. 3 Leaflet[2]

4. Conclusion

The activities of the Research Group for Promoting the Use of High-Fluidity Concrete in Buildings were summarized. The results of this group are reflected in the Recommendation for Mix Design and Construction Practice of High Fluidity Concrete[4] of the Architectural Institute of Japan, revised in 2021. The authors hope that this effort will be useful for the promotion of high-fluidity concrete.

References

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