# EFFECT OF SUPERPLASTICIZERS AND MINERAL ADMIXTURES ON FLUIDITY OF CONCRETE

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## 1. ABSTRACT

When cement paste is prepared by double mixing with superplasticizers in primary water, fluidity is different from that prepared by conventional mixing method and varies with the type of superplasticizers[1]. This suggests that different types of superplasticizers interact differently with hydration or their fluidization mechanism is different. The objective of this study is to investigate the effect of type of mineral admixtures, replacement ratio and dosing sequence of superplasticizers on fluidity of pastes and concrete prepared by single mixing and double mixing .

## 2. EXPERIMENTAL PROCEDURE

Cement used was normal portland cement of specific gravity of 3.13. and Blaine specific surface area of 3390cm²/g while, the type of mineral admixtures used were blast furnace slag of 2.9 specific gravity, 5930cm²/g of Blaine specific surface area and limestone powder of 2.7 specific gravity and 5030 cm²/g of Blaine

Table.1 Mix. Proportion of Paste and Concrete(Kg/m³)

| Material | W | C+P | S | A | s/a(%) | W/(C+P) |
|---|---|---|---|---|---|---|
| Paste | 449 | 1724 | ---------- | --------- | ---------- | 0.26 |
| Concrete | 175 | 500 | 50 | 838 | 50 | 0.35 |

P: Mineral admixture

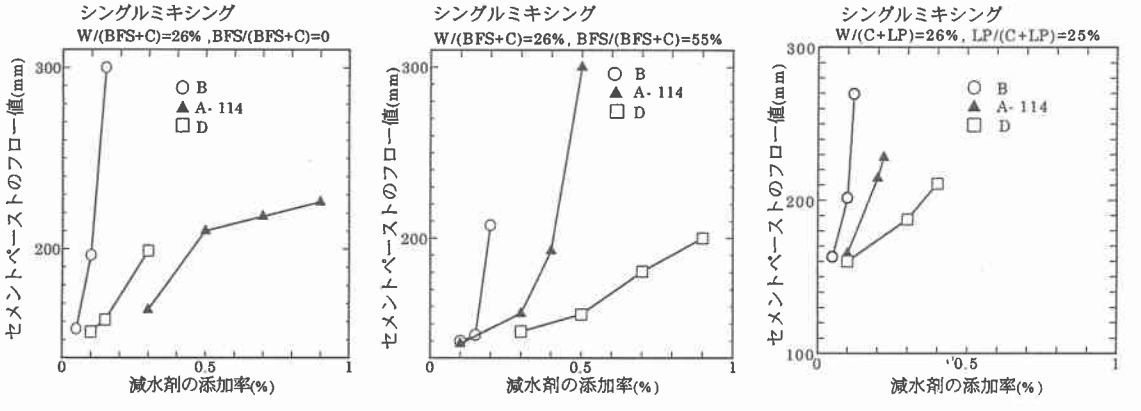


Fig.1 Relation between dosage of SP and flow of cement paste

specific surface area. The type of fine aggregate used was crushed quartzite trachyte having 2.54 of specific gravity, 1.9% of water absorption and 2.51 of fineness modulus. Coarse aggregate used was trachyte quartzite of 20mm maximum size, having 0.31% of water absorption, 2.67 of specific gravity and 6.55 of fineness modulus. Flow and flow loss of cement paste prepared by single mixing and that prepared by double mixing method were measured using dosages of superplasticizers which gave the flow value of 200±15mm. In double mixing, superplasticizers were added with primary water and with

secondary water . The total mixing time was 5 minutes for single mixing, 3 minutes for mixing primary water and 2 minutes after addition of secondary water for double mixing.

## 3. EXPERIMENTAL RESULTS AND DISCUSSION

When cement is replaced with blast furnace slag , the dosage of the superplasticizers B and D required to obtain the given flow increases while that of the superplasticizer A decreases( Fig.1). Cement paste with the superplasticizer B has higher tendency to flow loss than that with the superplasticizer A(Fig.2). This tendency is more remarkable when 55% of cement is replaced with blast furnce slag than when 25% of cement is replaced with limestone powder. From fig.2, the increase in flow of cement paste prepared by double mixing with superplasticizers added in $W_2$ compared to the other dosing methods is more remarkable in the case of blast-furnace slag than in the case of limestone powder. When superplasticizers were added in primary water, the values of flow of cement paste with blast furnace slag were almost same for different types of superplasticizers while for paste with limestone powder, the values were different. Differently to other mixing conditions, when superplasticizers were added in $W_2$, fluidity and loss of fluidity for the superplasticizer A was highest of all when 55% of cement was replaced with blast furnace slag as shown in Fig.3.

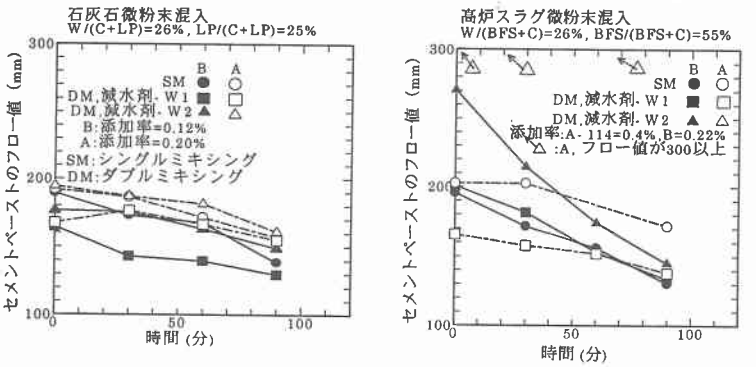


Fig.2 Relation between flow of cement paste and time elapsed

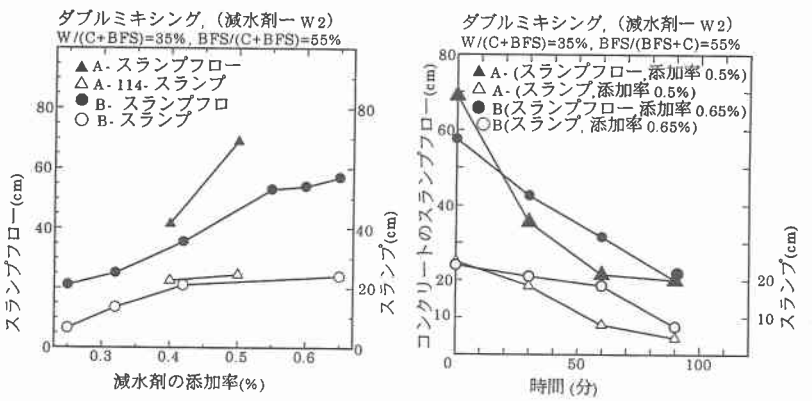


Fig.3 effect of addition of SP in $W_2$ on fluidity and loss of fluidity of concrete

## 4. CONCLUSION

Fluidity of concrete with the superplasticizer A changes significantly when mixing and dosing methods and type of mineral admixtures are changed. Differences on the effect of mixing methods on fluidity tendency of concrete between various types of superplasticizers and mineral admixtures are probably due to differences in the adsorbities of superplasticizers.

(REFERENCE:(1) B. Mtasiwa, E. Tazawa and A.Yonekura; Influence of the type of superplasticizers on double mixing effect: Cement. Concrete Journal (JCA) No.50,1996.pp 192-196