Evaluating the Properties of Flowable Fills

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Abstract

Foundry sand is a potential candidate for use in flowable fill. A literature review was undertaken to investigate the use of foundry sand in flowable fills. Foundry sand (FS)-fly ash mixture and FS-clay mixture have been recently studied in the CIGMAT laboratory. It was reported that using the superplasticizer (Sulfonated Naphthalene-Formaldehyde, SNF) in the FS-clay mixture decreased the water demand and increased flowablity and compressive strength. There was a liner relationship between compressive strength and pulse velocity.

1. Introduction

Soil fills when used as a backfill material are likely to produce non-uniform side support to the structure, volume changes in soil due to moisture levels, soil compaction, non-uniform soil density and surface settlement. There are several advantages of using flowable fill in place of soil backfill. The most important advantage is that there is no need to compact. The objective of this study is to review recently published literature on two different flowable materials (FS+fly ash, FS+clay).

2. Sand-clay mix

Several different constituents and proportion mixtures were investigated to evaluate the optimum mixing condition. The cement content was 5 % for all the mixes. Suggested mixture proportion is shown in Fig.1. Compressive strength was increased by 400% when the SNF was added.

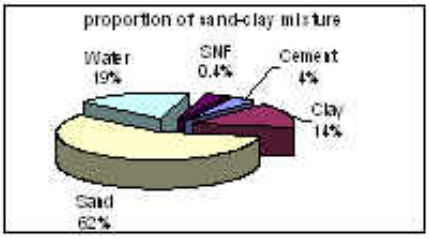

Fig.1 Sand-clay mixture

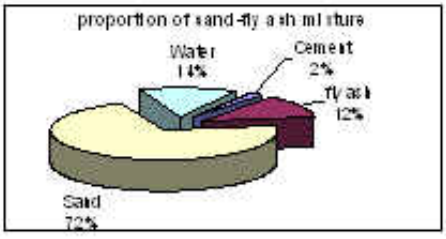

Fig.2 Sand-fly ash mixture

3. Sand-fly ash mix

Several mixtures were investigated and the optimum mix proportion is shown in Fig.2. Limited tests were done in this study to verify the flowability, compressive strength and pulse velocity.

4. Results

The flowability is quantified as a percentage. Suggested mixtures had 100% flowability. The results

of compressive strength test is shown in Fig 3. Pulse velocity is liner with compressive strength as shown in Fig.4

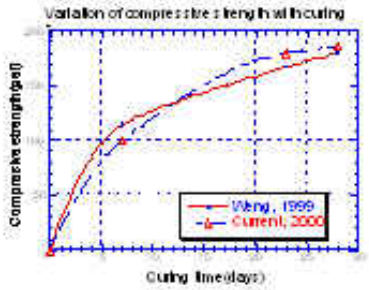

Fig.3 Variation of compressive strength with curing time

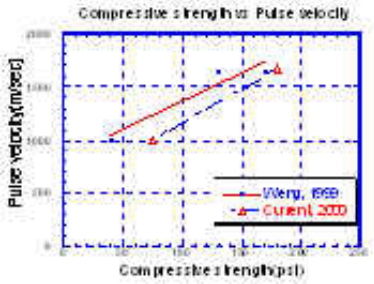

Fig.4 Variation of compressive with curing time with pulse velocity

5. Conclusions

Two different cementitious flowable mixtures with foundry sand were reviewed. Based on the literature review and limited test results, following observations are made:
1. Superplasticizer in the FS-clay mixture is very effective in decreased water demand and increase flowablity and compressive strength by 400%.
2. There is a linear relationship between compressive strength and pulse velocity.
3. The compressive strength increased with curing time.

6. Acknowledgments

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7. References

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