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EXTENDED ABSTRACT

Introducing an efficient repair mortar containing silica fume and combined fibers in terms of compressive and flexural strengths

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Keywords:
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1. Introduction

In this study, three types of steel, glass, and polyester fibers along with silica fume and latex polymer was used in the new kind of repair mortar. The effects of water to binder ratio, binder to sand ratio, and volume of different fibers on compressive and flexural strength were investigated. At last, using Taguchi method, the efficiency mix design of the new mortar was presented.

2. Methodology

2.1. Experimental study

Eighteen mixes were proportioned according to Taguchi method to investigate the mechanical properties of mortars. Natural fine aggregates with bulk specific gravity of 2.67 and water absorption of 1.2% were used in mixtures. ASTM Type II general purpose cement, a high-efficiency polycarboxylate ether type super plasticizer, three types of fibers, latex polymer, and silica fume were also used in design of mortar specimens.

2.2. Test procedure

To determine the effects of water to binder ratio, binder to sand ratio, volume of steel, glass and polyester fibers and silica fume content on strength of mortar axial compressive and flexural tests were implemented according to ASTM C109 and ASTM C348, respectively. Prior to testing all specimens were cured in water for 28 days.

3. Results and discussion

3.1. Compressive strength results

Fig. 1 shows the compressive strength of cubic mortars. As can be seen in Fig. 1 M6 and M7 mixes have the highest and M17 has the lowest compressive strength. Also it is deduced that using latex polymer has a negligible effect on compressive strength of mortar.

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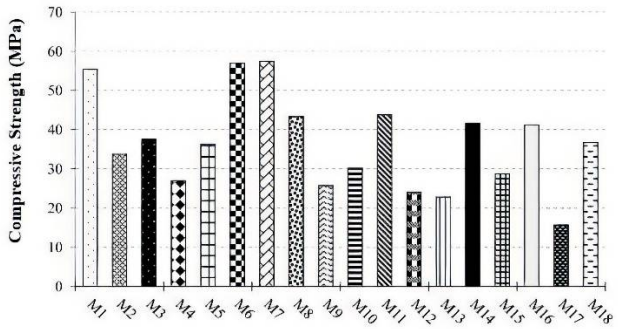

Fig. 1. Compressive strength of mortars.

3.2. Flexural strength results

Fig. 2 shows the flexural strength of prismatic mortars. As can be seen in Fig. 2, M7 mix has the highest and M13 and M17 have the lowest compressive strength. Also it is deduced that using polyester or glass fiber along with steel fiber has a significant effect on flexural strength of mortar.

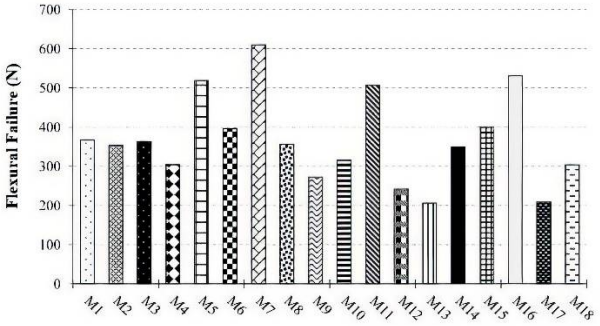

Fig. 2. Flexural strength of mortars.

4. Conclusions

By comparing the compressive and flexural strength of the mortar samples, it was observed that the samples containing two types of fibers showed better and more acceptable performance. The results of the flexural test clearly showed that the presence of the maximum amount of steel fibers and the addition of non-steel fibers such as glass fibers or polyester caused a considerable resistance to crack distribution.

5. References

ASTM C 109/C 109M – 02, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens), ASTM International, West Conshohocken, PA 19428-2959.

ASTM C 348, Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars, ASTM International, West Conshohocken, PA 19428-2959.