Proceedings IRF2018: 6th International Conference Integrity-Reliability-Failure
Lisbon/Portugal 22-26 July 2018. Editors J.F. Silva Gomes and S.A. Meguid
Publ. INEGI/FEUP (2018); ISBN: 978-989-20-8313-1

PAPER REF: 7108

PERFORMANCE OF AIR CURED CONCRETE TREATED WITH WATERPROOFING ADMIXTURES OR SURFACE TREATMENTS

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ABSTRACT

This paper reports the results of a study conducted to investigate strength, sorptivity and permeability under pressure of concrete specimens cured using a water based curing compound. The specimens are treated with waterproofing admixtures or surface treatments to enhance performance while exposed to water. Four types of concrete specimens were prepared in the laboratory: Portland cement (CEM I), Portland-fly ash (CEM II/A-V), Blast-furnace cement (CEM III) and Portland-silica fume (CEM II/A-D). Concrete cubes were de-molded three hours after casting, and sprayed with a curing compound. Admixtures were added to the mix during batching, whereas surface treatments were applied on concrete after 28 days. Compressive strength test was carried out to assess efficiency of curing compound to develop required strength. In addition, absorptivity and permeability tests were conducted to evaluate performance of treated specimens with respect to water ingress.

Keywords: curing compound, waterproofing admixtures, surface treatments, compressive strength, absorptivity, permeability.

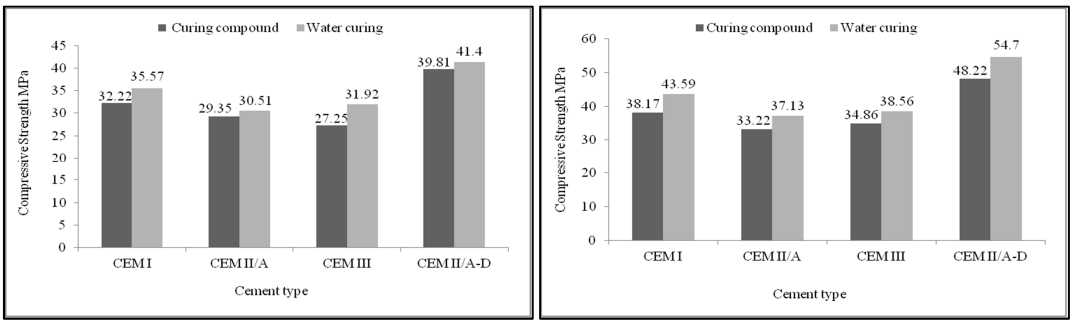
INTRODUCTION

According to Neville (2011), curing is the procedure used to promote the hydration of cement. It affects not only strength development but also durability. Generally, wet curing, membrane curing and curing compounds are the main curing methods used. Efficiency of curing methods on concrete strength and durability has been widely reported by researchers. In a study conducted by Al-Gahtani (2010), it was demonstrated that curing efficiency of curing compounds with respect to the compressive strength was in the range of 84-96%. In addition, the author has concluded that using water based acrylic curing compounds are effective in decreasing plastic and drying shrinkage strain. These findings were consistent with a study conducted by Xue *et al*. (2015). The authors have shown that curing compounds were effective in increasing compressive and flexural strength of concrete. They also reported improvement in permeability and a decrease in drying shrinkage of concrete. In this study, concrete specimens underwent compressive strength, absorptivity and permeability under pressure tests. Results were compared with two types of untreated control cubes. The first type was cured using a curing compound, whereas conventional water curing was used in the second type of control cubes.

RESULTS AND CONCLUSIONS

Figure 1 shows that, specimens cured using the curing compound, and conditioned in the laboratory developed 85-96%, and 87-90% compressive strength at 7 and 28 days

respectively, when compared to specimens cured in water. Furthermore, replacing 10% of Portland cement with silica fume in CEM II/A-D increased the strength by 25% in both curing conditions.



(a) 7 days (b) 28 days

Fig. 1 - Compressive strength test results

In terms of absorptivity and permeability tests, the results illustrated in Figures 2 and 3 show that concrete specimens (CEM I) cured with the curing compound, and treated with surface treatment (1) significantly reduced water penetration. On the other hand, specimens treated with admixture (1) did not improve performance against water penetration. In fact, the treatment was ineffective when compared to control cubes cured in water.

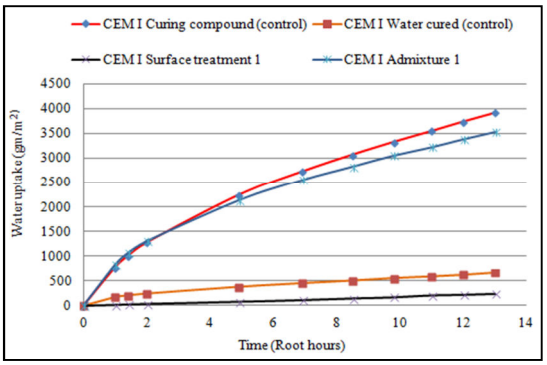


Fig. 2 - Absorptivity test results

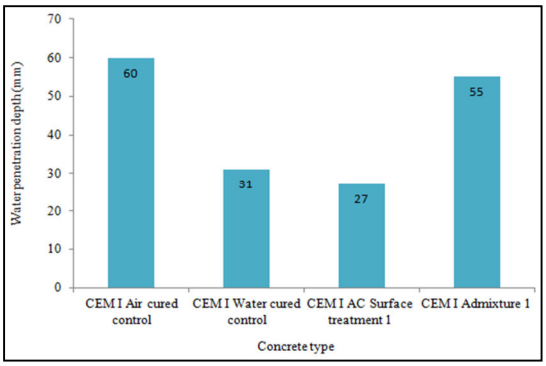


Fig. 3 - Permeability under pressure test results

ACKNOWLEDGMENTS

The author sincerely thanks Kingston University for providing a scholarship to conduct this study. Also, gratefully acknowledges the contribution of Wacker, Hycrete, Supershield, Elkem, Sika, Vandex and Hanson for providing materials used in this investigation.

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