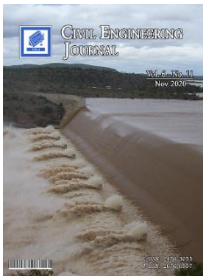
Available online at www.CivileJournal.org

Civil Engineering Journal

Vol. 6, No. 11, November, 2020



Mechanical and Thermal Performance of Cement Mortar Incorporating Super Absorbent Polymer (SAP)

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Received 04 August 2020; Accepted 11 October 2020

Abstract

Super Absorbent Polymer (SAP) is a favorable admixture which can influence various properties of cementitious materials. It mainly improves the water retaining properties of cement-based construction materials. In this paper, an experimental program was carried out to determine the mechanical and thermal performance of cement plaster containing SAP. Firstly, the absorption capacity of SAP was determined in different loading conditions and chloride solutions. Thereafter, the optimum dosage of SAP for cement plaster was also determined from five different proportions of SAP (0.05, 0.1, 0.3, 0.5 and 1% of cement mass) based on the compressive strength test results. The mortar incorporating 0.05% SAP of cement mass was selected as the optimum dosage, which yielded the highest compressive strength. Two slabs of 1×1×25 mm with 0.05% SAP and two slabs of 1×1×25 mm without SAP were cast to determine the thermal performance of the cement mortar with and without SAP. For this purpose, a wooden chamber of 2×1×1 m was constructed and the slab was placed in the middle of this chamber to carry out the thermal performance test of cement mortar. The slabs with 0.05% SAP showed promising results for acting as a thermal barrier in buildings compared to slabs without SAP.

Keywords: Absorption Capacity; Cement Mortar; Compressive Strength; Super Absorbent Polymer (SAP); Thermal Performance.

1. Introduction

Cement mortar has been extensively used for plastering works to provide a uniform surface on brick or concrete elements of various structures. The purposes of plastering are to provide a better appearance as well as a base for taking paints. However, mortar plaster can also be considered as moisture and thermal barrier between the outside and inside environment of a building.

Although cement plaster is not considered as a part of the structural elements, it is required to satisfy the strength and durability requirements according to ACI 524R in the United States. Water curing is therefore crucial to maximize the hydration reaction of cement in mortar and consequently, attain the strength and durability requirements. Either lack of moisture content or loss of excessive moisture from the cement mortar to the atmosphere will cause shrinkage and cracking in mortar and eventually, will deteriorate the growth of strength and durability of mortar. Moreover, plastering is done commonly on vertical walls of a building which makes it very challenging to ensure timely and adequate water curing.

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http://dx.doi.org/10.28991/cej-2020-03091614