



Compressive and Flexural Strengths of Mortar with Silica Aerogel Powder

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Abstract. Excessive usage of sand in construction industries has generated many environmental issues. Silica aerogel, is able to minimise environmental issues while providing thermal resistance for building materials. Silica aerogel has properties such as lightweight, nano-porous and very low thermal conductivity compared to sand in the mortar matrix. This paper studied the compression and flexural strengths of mortar with silica aerogel as a sand replacement. Cement to sand ratio of 1:3 was used and sand was replaced with silica aerogel in the volumes of 15%, 20% and 25%. 15% volume of sand replacement with silica aerogel powder was the optimum ratio as it possessed the highest strength during experimental work. All the specimens were able to achieve the minimum strength for Type N non load bearing wall with the optimum ratio of 15% volume silica aerogel powder. In conclusion, silica aerogel mortar achieved the minimum strength of type N mortar.

Keywords: Sand · Silica aerogel · Compression strength · Flexural strength · Mortar

1 Introduction

Excessive usage of sand in the construction industry has caused some environmental problems like river bank erosion, river bed degradation, river buffer zone encroachment and deterioration of river water quality (DID 2009). Depletion of natural resources is the current main issue in maintaining sustainability. Artificial aggregate may serve as one of the solutions for this environmental issue. There are some identified artificial lightweight coarse aggregates being applied in the construction industry, namely expanded clay, expanded shale, and processed volcanic rocks (Mohd et al. 2001). Waste pebble is also used to produce artificial sand and applied into concrete.

Mortar is a mixture of cement, sand and water with the purpose of binding masonry units into a single unit. Mortar also serves as plaster, multi-purpose repair and floor levelling. It is established that sand is an important construction material in the construction industry. However, due to the massive usage of sand, it has been depleted over the years. India is taking the necessary steps to combat this problem by restricting sand excavation due to the exhaustion of natural sand (Klangvijit and Sookramoon 2018).