ENHANCE THE MECHANICAL STRENGTH OF BRICKS AND CONSTRUCTION MATERIALS

PROJECT REPORT SUBMITTED

BY

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to the

Board of Study in Earth Sciences of the

POSTGRADUATE INSTITUTE OF SCIENCE

In partial fulfillment of the requirement for the award of the degree of

MASTER OF SCIENCE IN ENGINEERING GEOLOGY & HYDROGEOLOGY

of the

UNIVERSITY OF PERADENIYA

SRI LANKA

February 2011

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The traditional societies developed earth materials as one of the most important construction materials by taking cognizance of the strength requirements and durability of resulting structures. Over the years, bricks are considered as versatile and durable building and construction earth material, with good load-bearing properties and high thermal mass. However, bricks prepared from traditional methods are not up to engineering standards due to improper usage of soil types and mixtures. The main objective of this project was to enhance the compressive strength and other engineering properties of bricks by introducing a suitable combination of low cost raw materials. An improved understanding of binding properties of acidic and alkaline soils with locally available clay types helps to enhance the compressive strengths of bricks.

The parameters such as ionic reactions, pH-value, grain size and raw materials were varied in compressive strength tests performed on the bricks. This study shows that a 1:1 mixture of weathered quartzite and dolomitic clay has attained the optimum pH value of 6.78 after 20 minutes of mixing. Mixture of weathered quartzite and dolomite with the ratio of 1:2 and 1:1 shows compressive strength of 0.98 N mm^{-2} and 0.95 N mm^{-2} respectively. These mixtures are suitable for dried clay bricks or mortars. The dried clay bricks or mortars made up of weathered quartzite-dolomite combination could only be recommended for sun dried temperatures.

A good commercial grade firing bricks with maximum mechanical strength of 3.0 – 3.3 N mm^{-2} could be obtained when a mixture of kaolinite clay and bentonite clay is burned at a temperature between 400° C and 800° C. The best firing bricks with mechanical strength of 4.8 N mm^{-2} in 800° C could be obtained for same quantities of quartzite clay and

kaolinite clay mixture. X-ray diffractometry studies revealed that the formation of low temperature minerals such talc, amesite, brucite, and portlandite, which may enhance the mechanical strength of the fire bricks.

The results obtained from this study can be extended to a commercial grade brick manufacturing by using the grain size of less than 0.5 mm. Compressive strengths (C.S) of cubic bricks are more viable for commercial grade bricks than cylindrical bricks (36 mm x 85 mm).

As a part of this study, agronomical filter has been designed, which can absorb essential nutrients from quartzite clay to water. When rain water is filtered through quartzite clay, it shows that concentration of cations are in a range of Na^{+} = 1.55 ppm, Mg^{2+} = 0.69 ppm, Ca^{2+} = 2.8 ppm, Fe^{2+} = 0.04 ppm and pH = 4.8. Since the acidity of water is low, it can effectively be used as drinking water with least bacteriological activity. This set up is more effective in the dry zone area in Sri Lanka. Hardness of water can also be removed by using the quartzite filter.