

Preservation of heritage masonry structures: Assessing compatibility of consolidative treatments on Fired Clay Bricks

Tejyas D. Singh, Swathy Manohar

Indian Institute of Technology Bombay, Mumbai, Maharashtra, India

Contact: singhtejyas@gmail.com / swathym@iitb.ac.in

Abstract

Heritage structures are prone to deterioration due to aging and dynamic environmental conditions. Protection by "consolidative treatments" is one of the ways of by which we can extend its life. However, compatibility of a consolidant with the substrate is complicated and depends on the material properties and exposure conditions. Selecting the wrong consolidant can accelerate the deterioration instead of restoration of properties. This study aims to assess the performance and compatibility of acrylic-polymer and silane based consolidants on samples of fired clay bricks of various qualities used in heritage masonry structures. To evaluate the performance of the consolidants, the initial physical, mechanical and microstructural properties of the substrate samples were established through various test methods. These initial properties are then compared to the properties of treated and untreated samples that were subjected to accelerated salt weathering, thus analyzing the weathering resistance.

Keywords: Consolidant, Acrylic-based, silane-based, fired clay brick, Heritage bricks

1 Introduction

India is home to vast monumental brick structures, which are of great importance due to its architectural, cultural and historic values. A number these heritage structures are situated in an environment highly prone to deterioration.

Among the various degradation mechanisms, soluble salt crystallization within the pores of substrate materials of heritage structures is found to cause the greatest damage, especially to the structures in saline environment (1).

The chemical and hydrophilic characteristics of the substrates are what help us to pick the right treatments (2). The requirements of a protective treatment is to create a barrier layer between the substrate and external environment, as well as strengthen the degraded surface of the material.

Consolidative treatments are most preferred in restoration and preserving heritage structures, especially in cases where adhesion between the particles are also to be improved.

Consolidants are low viscous chemicals that penetrate through the surface of a substrate material and attempt to restore cohesion within and further improve its properties, thereby slowing down the rate of deterioration and extending the life of the structure. One major factor when dealing with consolidants are their compatibility with the substrate. An effective consolidant should be able to give desired results in reducing the rate of deterioration without altering the natural appearance of the monument. Consolidation is therefore intended to increase the resistivity and improve the coherent