An Experimental Study to Address the Issues of Low Durability and Low Compressive Strength of Mud Plaster

PROF. RIYAZ AHMAD QASAB*, MOHD RAFIQ MIR*, AIMA ASHRAF*, AATIF MOHAMMAD DAR*, UBHAT ALI*, BISMA MANZOOR WANI*, FIRDOUS AHMAD PARRAY*.

[1]Assistant Professor Dept Of Civil Engineering Islamic University, [2]Student, [3]Student, [4]Student, [4]Student, [5]Student, [6]Student.

*Department of Civil Engineering. Islamic University Of Science And Technology, Awantipora 192122, J&K, India.

Abstract : Mud based plasters are completely compatible with traditional materials and building techniques. Today with low- cost mass housing as a priority, the need for plastering materials which are efficient and economical has awakened a new interest in green materials like mud**.** The only drawback is the limited durability of the material against the aggressive action exerted by external agents as a result of which the use of mud plasters has declined over the years. To improve the durability and strength characteristics of mud plaster, our team has proposed the use of certain additives like shellac, jute and white clay to be used in various percentages. Samples with and without a coating of shellac were prepared and subjected to jet impingement, sample disintegration and unconfined compressive strength tests. The addition of 5% jute and 5% shellac to modified mud plaster together yielded remarkable results and has thereby been proposed as an alternative to the conventional mud plaster reinforced with straw. A keen observation of results indicated that the rate of erosion of conventional straw plaster was much higher as compared to that of the improved plaster. Also, the compressive strength for the modified plaster was 13.08% higher than the conventional plaster. The straw plaster disintegrated at a much faster rate in comparison to the improved plaster. The coated samples reflected a marked improvement in comparison to their uncoated counterparts. So, we as a team also suggest that an application of a coating of shellac over existing mud plastered surfaces could serve as an effective measure in enhancing the durability characteristics.

I. INTRODUCTION

Buildings are large consumers of energy in all countries. In regions with harsh climatic conditions, a substantial share of energy goes to heating and cooling the buildings. This heating and air conditioning load can be reduced through many means; notable among them is the proper design and selection of building envelope and its building components.
Mud construction is economically beneficial. The use of excavated soil means greatly reduced costs in comparison with other building materials. Even if this soil is transported from other construction sites, it is usually much cheaper than industrial building materials. It saves energy. The preparation, transport and handling of soil on site require only about 1% of the energy needed for the production, transport and handling of reinforced concrete and other construction materials.

Mud, then produces virtually no environmental pollution.
Mud-based plasters often use mud in combination with other natural materials such as wheat straw or cow dung, or with mineral additives, to improve the basic qualities of the mud by acting as stabilizers, hardeners, and waterproofing agents. Even without additives, however, mud plasters and renders can give excellent results provided that they are made and applied with skill and care and maintained regularly.
Ever since the emergence of lime and cement-based plasters, the use of mud plasters has been shelved. Taking note of the usual scenario with due regard to the prevalence of cement plaster, this project was set up with the aim of showing that soil-based plasters can still be relevant in today's construction industry. The primary aim of the project was to improve the durability, impermeability and strength of the mud plaster.
Extensive analysis and scrutiny of the previously published research papers was done. Also, the traditionally trained and well experienced workmen were consulted to obtain a more detailed knowhow about the various additives that were traditionally incorporated in mud plasters, their method of applications and the problems encountered following application.

1.1 Literature Survey

It is known that plasterwork, and the decoration upon it, was applied more than 4,000 years ago. Mud architecture began in Egypt and developed to its full extent alongside the Nile[1] (Capaldi, 2011). The Pharaohs of Egypt used plaster surfaces in their palaces and pyramids, which still exists in a hard and durable state today. One of the earliest archaeological examples of both civilization and plaster is Çatalhöyük (7500 BC), located in present day Turkey. A densely populated town, Çatalhöyük's dwellings had mud brick walls and floors coated with a locally available clay marl that made a suitable plaster In the Earliest European settlers' plasterwork, a mud plaster was used or more usually a mud- lime mixture, Old Economy Village is one such German settlement. The early Nineteenth- Century utopian village in present-day Ambridge, Pennsylvania, used clay plaster substrate exclusively in the brick and wood frame high architecture of the Feast Hall, Great House and other large and commercial structures as well as in the brick, frame and log dwellings of the society members. At present, about 15% of UNESCO Heritage

Sites is represented by earthen architectures[2] (UNESCO(Accessed: 28 July2014). In the Marcheregion (Italy), a total of 245 earthen buildings are still present according to a recent official cataloguing.[3] (Recanati, Tecnostampa, 2005, pp. 45–284).
Numerous researches have been carried out on earth-based plasters. Studies have been conducted on the effects of various fibres like straw, sisal, banana and coconut fibres to increase properties of the mud plaster. (César Cardoso, Rute Eires and Guimarães)(A common traditional practice is the addition of cow dung as an additive to earthen plasters, which improves the cohesion and plasticity of soils of low clay content. (3) Another practice is the addition of horse urine, which acts as a hardener and improves impermeability and impact resistance.[4] (Appropriate Technology Magazine, Volume 26/Number 1th June of 1999).