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Rehabilitation of Jahangir’s Tomb

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Abstract

This research paper deals with the standardization of the Lime Mortar used in the rehabilitation of Jahangir’s Tomb of same composition (as constructed) to get maximum strength and cracks free surface. We worked for the standardization of the proportion, gradation of aggregate, water/lime ratio and determination of initial setting time for the mortar. Finally, the best standards were established for the lime mortar to use in rehabilitation of the said building with successful results. Now this material will not only be used in conservation of the said building but also for other heritage sites by Archaeological department of Pakistan.

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1. Introduction

Mughals ruled over the Indian Sub-Continent for more than 300 years (1526-1857). During their reign they constructed many magnificent structures. One of these buildings is the Tomb of Jahangir. The tomb of Emperor Jahangir, who ruled Indian sub-continent 1605-1627, is a jewel in the crown of Mughal architecture. The tomb is situated in Lahore, in Queen Noor Jahan's old pleasure garden known as Dilkusha Garden. The mausoleum is located at Shahdara on the bank of the Ravi, three miles northwest of the city. In the centre of which stands the magnificent sepulchre of Jahangir, considered by some to be the, "Finest ornament of Lahore" and by others, "The most magnificent edifice in the subcontinent after the Taj Mehal and the Qutub Minar". Unfortunately, this monument suffered badly, not only due to the vagaries of time but also due to extensive vandalism done by the Sikh rulers and later on due to improper use by British Administration of the Subcontinent. The natural climate also played their role in the destruction and dilapidation of the most beautiful complex of the Mughal period in this part of the world. The unprecedented flood of 1843 played havoc with the enclosure wall of the monuments. Various floods in the second half of the 20th century also contributed in the devastation of then gardens and these monuments. To bring this historical jewel back to its original state, Govt. of Pakistan is paying attention towards the rehabilitation of this master piece of Mughal architecture. Our research is based on the standardization of the special type of lime mortar which was used in the construction of this building. Now for the rehabilitation, the lime mortar with same constituents was required.

This special type of lime mortar used in these buildings (Mughal era) during construction is named as Kankar Lime Mortar. It consists of Hydraulic Lime, White Lime, and Coarse Kankar Lime. For the rehabilitation of destructed parts of the said building the mortar of same composition (Nature) was required (as used in construction). Before this research, kankar lime was prepared with random mixing of the constituents and was used in the destructed parts of the building. But this material did not serve the purpose as it should. So the standardization of this material was required, so that it could be used in rehabilitation of all the buildings of same era. For standardization the main target was, to find the mixing the material in such a way and in such circumstances, so as to get maximum compressive strength and crack free surface and to use this material to repair destructed walls, by methods of repair of walls. The techniques used in the rehabilitation of other lime based historical building were reviewed. The reason of standardization was that, the literature available on lime mortar was not directly applicable on the lime mortar which was to be used in rehabilitation (Conservation) of the said tomb.

2. Composition of lime mortar

As described before that this is a material which have been used in Mughal era (1625-1857) for the construction of buildings. It is comprised of following constituents as below.

- Natural Hydraulic Lime (NHL)
- White Lime
- Coarse kankar Lime

2.1 Natural Hydraulic Lime (NHL)

Natural hydraulic lime is made from limestone that contains impurities such as clay or silicates. Unlike lime putty which is non-hydraulic lime, NHL can set in damp conditions; indeed it requires water for a minimum period of around 72 hours to gain maximum strength. Hydraulicity is the property of a binder to harden in contact with water and it is produced by burning a lime stone containing silica, alumina and iron oxides which above certain temperature combine, totally or partially with calcium oxide. NHL works by setting in the presence of water and NHL mortars cured at high humidity level in natural and artificial environments present interesting results and some could be used in old masonries repair.

2.1.1. Properties of NHL mortars

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