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Superiority of Makrana (Rajasthan) Marbles*

The Indian marbles from Makrana (Rajasthan) were considered to be of the best quality for a long time.

The world famous Taj Mahal monument was built from the Makrana marbles. There have been several other buildings and monuments of national importance, which were built from this marble. One such important example is the Victoria Memorial in Kolkata. In the present short note, the literary evidence for the superiority of Makrana marbles as found by Sir Thomas Henry Holland in the beginning of the twentieth century is discussed.

Lord Curzon, the then viceroy of India (1899-1905) proposed to build a worthy memorial in memory of popular British monarch, Queen Victoria in 1901 after her death. He raised a large sum of money from the princes and citizens of India for this purpose. Curzon sought advice from various quarters regarding the probable site and the nature of the construction. Finally it was decided to construct a grand monument in her memory in the centre of a garden in Kolkata. He also proposed a museum in the same complex, which would have artifacts pertaining to the British rule in India. It was also decided to build it from white marble. The construction began in 1906 and took fifteen years for completion. The building (Fig. 1) was formally inaugurated on December 28. Lord Curzon was extremely impressed by the beauties of Greek and Italian marbles and proposed that the Victoria Memorial should be built from such classic European marbles. Sir Thomas Henry Holland, K.C.I.E., K.C.S.I., the then Director, Geological Survey of India, Kolkata, suggested to Lord Curzon that the Indian marble could be as beautiful as Eropean one, as evident from the Taj Mahal and other noted buildings. Curzon was not very sure of the quality of the Indian marbles, in particular in the moist climate of Kolkata. Curzon asked Holland to conduct experiments at the Geological Survey of India Office to ascertain the quality of the Indian marbles vis-à-vis the European marbles. The task of carrying out the experiments fell on L.L. Fermor, who was the then Curator, Geological

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Fig. 1. Victoria Memorial, Kolkata

Survey of India and in-charge of the Museum and Laboratory. Fermor has narrated the summary of the findings of this test in the obituary notice of Sir Thomas[1], published in the "Obituary Notices of Fellows of the Royal Society" in 1948, as he considered this work to be one of the important contributions of Sir Thomas. It is to be noted that Sir Thomas was elected a Fellow of the Royal Society in 1904.

About thirty small test pieces of different European and Indian marbles were prepared. In the first instance, these pieces were characterized for their specific gravity and most importantly for porosity. The surface structure was also observed under microscope. For porosity determination, the test pieces were suspended for twenty four hours in distilled water and the weight loss was measured. It was found that the Indian marbles, which were coarse grained, lost less weight than the European marbles, which were generally fine grained. Clearly the Indian marbles had very little porosity. It must be noted that for endurance in exterior use marble should be non porous or should have very little porosity to prevent the entrance of water that might discolour the marble.

Subsequently, these marble test pieces were placed on the flat roof of the Geological Survey of India office to weather through the Indian monsoon. The test pieces were kept resting on glass rods in a specially designed cage. All precautions were taken to prevent the pieces from the disturbing effects of the monsoon storms and the malpractices of birds. The test pieces were kept on the roof for three months. Fermor found that all the Indian and Burmese marble test pieces lost less weight than the Italian and Greek marbles. Holland and Fermor proposed that this behaviour was due to the fact that the Indian marbles were of coarse grain than the European marbles and thus the grain boundary area per unit volume was smaller for the penetration of water.

The experimental study conducted under the guidance of Holland suggested that the Indian marbles from Makrana (Rajasthan) were the best ones and finally it was selected for the building of Victoria Memorial. The whole credit for the selection of Makrana marbles from India for building the Victoria Memorial must be regarded, rightly expressed by Fermor, as "entirely due to Sir Thomas Holland". The marble was obtained from the same quarries of Makrana, from where Shah Jehan had obtained marbles for the construction of the Taj Mahal. Due to heavy rains in 1917, there was a flood in Makrana region and some new quarries were opened in the adjoining area.

In the last decade of the twentieth century, some visible deterioration was detected on the Victoria Memorial marble façade and also on the inner sandstone blocks. A detailed scientific study of the marble, sandstone and mortar of the Victoria Memorial monument was conducted by Sarkar et al[2]. It was found that the massive blocks of the façade have suffered only mild surface etching. On the other hand, the mortar used for joining the marble pieces which was about a few millimeters thick, has been damaged and shows signs of cracking and blisterig at several locations. The interior sandstone blocks exhibit characteristic symptoms of localized efflorescence. The marble, sandstone and mortar samples from the Victorial Memorial were tested for porosity. The most important finding in the present context was that there is no open pores in the marble sample of the Victoria Memorial; a fact which corroborates the findings of Fermor and Holland. On the other hand, the apparent porosity of mortar was found to be in the range 10-12%.

Clearly the deterioration in the structure was due to mortar and not marble. The major recommendation of the study was to apply for advanced type of new mortar at the required places, which would produce a dense and impermeable joint.

The scientific study of Indian marbles by Sir Thomas Henry Holland may be considered historically important.

References

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