

Special Technique for Rehabilitation of forts.

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Abstract—Forts have been created for thousands of years and they are often the most durable and famous symbols of ancient civilizations. These are the icons of the nation having their own cultural and historic values therefore, it is very essential to conserve them. Forts which have no further utilization tend to decay rapidly, while which are still in use have a better chance of being maintained. Rehabilitation involves contribution of high end technology, advanced skills and calculations. This is a very responsible job of saving hazardous failure of structures due to deterioration. The success in rehabilitating the structure totally depends on gaining expertise in the field and day to day advancements. Rehabilitation is highly recommended for age-old buildings showing signs of decay and save human lives from failures.

Keywords—rehabilitation, forts, structure.

I. INTRODUCTION

The term 'Fort' is often applied to buildings or structures that are considered examples of important architectural or cultural heritage. Forts are the very basis of a kingdom. Forts themselves are the kingdom, forts are the origin of the kingdom, forts are the real treasure of the kingdom, forts are the basis of an army, forts are the wealth of the kingdom, and forts are our best form of defense. The English word Fort is derived from the Latin word 'Fortis' meaning strong. Forts were a primary defense mechanism in Maharashtra against enemy invasions since the ancient times and are known in the local language as 'killa'. They were naturally and artificially protected human settlements, guarded by elements like the hills, the forests, the desert, the sea, and the man made stone structures that formed a amour around them.

II. OBJECTIVES OF THE WORK

Following are the objectives of the proposed work.

- To study the various forts in Maharashtra.
- To study the design and construction history of forts.
- To study the necessity of rehabilitation.
- To suggest and discuss alternative technique and materials for their rehabilitation.
- To compare various techniques of fort rehabilitation.

III. FORTS IN MAHARASHTRA

Chhatrapati Shivaji Maharaj, the founder of Maratha Empire in western India in 1664, was well known for his forts; he was in possession of around 370 at the time of his death. Many, like Panhala Fort and Rajgad existed before him but others, like Sindhudurg and Pratapgad, were built by him from scratch. Shivaji attached great importance to his forts. It has been observed, not a pass was left undefended, not a peak was left unfortified and every sub-division of a district was provided with one or more strongholds, and the whole country was secured by a net-work of forts. The territory old and new under Shivaji contained 240 forts, both land and naval forts, out of which 111 were built by him and 79 were situated in eastern Karnataka and Tamilnadu. The sites of the forts were carefully selected. Often a narrow and steep path that zigzagged along an inaccessible precipice would be the only way leading to the fort. The fortifications were simple but effective a massive wall defended by a few resolute men, even with primitive arms and crude missiles, could defy for months the utmost efforts of the strongest besieging force. All that was needed therefore was a good site, a strong rampart, sufficient provisions and plenty of military stores. The value of these forts was amply demonstrated during Aurangzeb's invasion of Maharashtra in 1682 and continued warfare there lasting for almost quarter of a century.

IV. DECAY OF FORTS

The existence of heritage in our environment has indeed provoked the belief that people came from somewhere and this offers

the people the self-confidence to face the future. Heritage largely defines the identity of a society and it is passed down from one generation to another. In order to pass on to future generations what is currently identified as being of cultural significance today, we must imbibe good conservation practices especially for the heritage buildings in order to prevent them from deterioration and extend the life and basic functions of these buildings. Heritage buildings were constructed in the past that have high historical, architectural, spiritual, social, political and economical values. Similarly heritage buildings are highly valuable and informative in terms of socio-cultural, socio-political, socio-economical and even technological activities of a specific society or group of individual Heritage buildings differ from modern buildings in the sense that they are anticipated to last permanently. Also heritage buildings are a building that for various factors society has decided that they shall be preserved for as long as possible. Heritage buildings are seriously threatened by environmental agencies such as moisture, intense solar radiation and prevailing winds which change their physical attributes. The major effects of these environmental agencies include discoloration, abrasion, cracks, stains and fungal growth. Apart from exposure to weather, biochemical agencies also hasten the deterioration of heritage buildings tremendously.

V. DESIGN AND CONSTRUCTION OF FORTS

The expertise to build a fort was by no means an easy task but ancient Indians had achieved mastery over this art. In early India forts were built as per the instructions laid down by sages like Manu and Chanakya. Excavations of a few really ancient fortifications reveal a great degree of perfection in their making. Stone was the most important material for building fortifications in medieval India. Walls were erected by one of the following three construction methods. A wall could be an earthen rampart faced with stone on both sides. The rampart was built using the earth excavated while digging the ditch, with three-quarters of it used for building a rampart and one-quarter for leveling out the surface inside the fortress and in front of the ditch. Facing the rampart with stone allowed for the erection of higher and steeper walls than those possible with a purely earthen rampart. The structure had a substantial shortcoming, however: earthen core accumulated water, which could destroy the stone shell. Drainage channels were therefore installed along the length of the wall from top to bottom. The second method consisted of filling the space between the outer layers with earth mixed with rubble. This core was considerably harder than simply using rammed earth. The third and most advanced method involved the use of mortar. A rubble-built wall fastened with mortar was strong and long lasting.

Construction methods depended; however, on the materials available. The gates of medieval Indian forts were highly decorated. Two distinct styles are seen. The Hindu style was a lintel and the Mughal style with an arch. Gates in Indian forts were often high and wide to allow elephants to pass. Often they had rows of sharp, stout iron spikes to dissuade an attacking army from using elephants to break down the gates. Such a gate with spikes can be seen on the Shaniwarwada fort, Pune. The walls of the forts were often looked higher from the outside than the inside as the forts made use of the natural rock formations on hills. This not only gave an illusion of greater height but also led to the lower walls of the fort to be entirely made up of natural rock providing almost a perfect defense against the use of a battering ram or elephants to tear down the walls. Besides the barracks for men and officers, every fort had a powder house, a granary, and a store room for oil and ghi. Due care was taken as to the water-supply. While forts like Raigad had a number of tanks, even a small fort like Satara had more than one tank. If you have visited any one of the forts built, you will come to notice that they used to build them with stones or rocks that are big enough in the structure. The whole rock is used to be carved to build the fort. Instead of cement, they used a certain type of sand which sticks with then rocks and provides certain coolness.

VI. NEW TECHNIQUE AND MATERIALS

There are new materials and techniques which can be used for rehabilitation work. By this new technique the work can be done in a perfect way. Some of the techniques and material are as follows:

- Epoxy injection
- Guniting or Shotcrete
- Mortar repair for cracks
- Foamed concrete
- Mortar and dry pack
- Vacuum Concrete

- Shoring and underpinning
- Repointing
- Grouting Techniques

VII. CONCLUSION

This dissertation work effectively conveys that forts were constructed thousands of years ago and they are still durable. These are the icons of the nation it our responsibility to maintain them by using special material and rehabilitation techniques. By doing a regular maintenance it will help us to increase the durability of fort. For the monument, only rehabilitation is not sufficient to protect its own cultural and historic values, but regular maintenance is very important for its longer life. Maintenance is the routine work which is necessary to protect the monument's unique fabric, its design etc. All building materials decay eventually due to sunlight, rain and wind, and therefore they require continued attention if a building's condition is to be maintained. Periodic inspection is very essential which helps to find out any damage to the members or components of the structure and therefore the structure can be protected longer by adopting time to time repair works. Archaeological Survey of India (ASI), State/Central bodies protect monuments that are of national importance.

- Lime mortar should be used for rehabilitation of fort because it is Permeable, Flexible, Soft, Weatherproof, Do not attract moisture, Reduces Green house gas effect.
- From the above list of properties it becomes clear why lime would be used preference to cement. In terms of sustainability, lime allows us to use low-impact foundations that do not intrude into the earth too much because we do not need to dig 450mm or deeper trenches simply to protect cement from frost.
- The materials which is suggested are generally having more durability as compared to other types of materials
- These materials can achieve greater strength in a short period of time.
- The technique which is suggested requires less labour as compared to other techniques.
- The various techniques presented in this report to restore a Fort to its original state prove to be very beneficial.

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