

Material Considerations for Repairs and Rehabilitations of Structure: An effective factor in reshaping Architectural Character.

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Abstract: -- All the Buildings and structures constructed over a period of time have a certain lifespan, depending on the materials and technology adopted therein. There are large numbers of buildings which are to be cherished as important structures in various aspects which have stood well over a period of time. The aspects may vary from being heritage, civic or simply being a distinct masterpiece of a particular era. Many of these buildings in course of time exhibit a sign of distress. The reason for this distress may vary. It may be due to its age, exposure to the hostile natural environment, pollution or sheer negligence in its maintenance or misuse and overloading of the structure etc. Repair and Rehabilitation is defined as the process of achieving the original state of structure when it undergoes any sort of defects or deterioration or destruction. Repair and Rehabilitation is an Artwork, which not only extends the life of a structure but also ensures that the structure stays intact exhibiting the character of the construction and architecture of a particular era. Restoration of structure is an ultimate aim of Repair and Rehabilitation, Restoring the structural as well as design character of the building. Architectural identity of any structure is governed by the choice of materials and techniques adopted, which have been unique to that period. Hence it becomes obvious that due consideration shall be given in selecting not only suitable but relevant materials for Repair and Restoration works of such structures. However in due course of time, in the process of this restoration the focus remains on the strength of the material unconsciously neglecting the architectural character governed by that material. This paper throws light on the facts that due consideration to be given on this aspect of material selection, in the Repairs and Rehabilitation process. It put forth an urge that selection of Materials for Repairs and Rehabilitation of Structure plays an important role in reshaping the Architectural Character of a particular era.

Keywords: Materials, Repairs and Rehabilitations, Architectural Character.

I. INTRODUCTION

Buildings and Structures in any country are reflections of its glorious past. For every nation these buildings are resultant of a unique architecture of the period in which they are constructed. They are the live records of the development of architecture, design and construction of that time. This was the time when computers, code of practice, design guidelines, research institutions and modern construction techniques did not exist. Still they make us think on the wisdom and expertise of our forefathers. They are in themselves great illustration of technological and material advancement of the pertaining era and have stood well over a period of time of more than hundred years as compared to the modern constructions that need repairs more frequently. Many of these buildings in course of time exhibit a sign of

distress. The reason for this distress may vary. It may be due to its age, exposure to hostile natural environment, pollution or sheer negligence in its maintenance or misuse and overloading of the structure etc. Construction materials of an earlier time, that might have been state of the art at the time of construction, might have failed and now need replacement or repair with contemporary better functioning, but aesthetically similar materials. Architectural identity of any structure is governed by the choice of materials and techniques adopted, which have been unique to that period. Hence it becomes obvious that due consideration shall be given in selecting not only suitable but relevant materials for Repair and Restoration works of such structures.

II. NEED OF THE STUDY

It wouldn't be wrong to say India is a Country of Monuments. Mostly all old Indian cities have monuments which represent the religious, military, political or economic powers of the past. There are large numbers of buildings which are to be cherished as important structures in various aspects standing proudly over a period of time. The aspects may vary from being heritage, civic or simply being a distinct master piece of a particular era. "The value of architectural legacy is not only in its appearance, but also in the integrity of all its components as a unique product of the specific building technology of its time". [http://iscarsah.icomos.org/content/principles]. Architectural identity of any structure is governed by the choice of materials and techniques adopted, which have been unique to that period. Hence it becomes obvious that due consideration shall be given in selecting not only suitable but relevant materials and techniques for Repair and Restoration works of such structures.

III. THE RICH GLORY

India has a very rich momentous past which is evident from various buildings and structures, forts, temples, landscapes, and objects of historic era. Every city of the country has its own story told in its own language. Aurangabad had been no exception.



Fig 1 (a). The Ancient Marvels Source: [4] References

The horizon of splendor begins with the 52 gates of the historic city and includes many splendid structures in and around the city. It's abode to many structures of significant importance, ranging from world famous Ellora and Ajanta caves to the Taj of Deccan. There are many other structures and buildings, which may not appear on the world map but are important for its architectural character that they display. Structures such as the Khandoba Temple, Clock tower, The Masjid of Shahgunj, The Dr.BAM University Building, University Library Building, have its own significance, and the present state of these structures offers challenges for its repair and rehabilitation on not only the structural front, but also on its Architectural identity.



*Fig 1 (b).The Ancient Marvels.- Gates
 Source: Authors*



*Fig 2 (a).The Dr. BAM University Buildings
 Source: [5] references.*



*Fig 2 (b). The Clock Tower, Shahgunj.
 Source: Authors.*

IV. ARCHITECTURAL CHARACTER AND ITS IDENTITY

Architectural Character refers to all those visual aspects and physical features that comprise the appearance of every building. As correctly stated by masters, architectural character is exemplified by the features that make a building or structure notable or identifiable. An architectural character is governed by elements such as form, method of construction, building materials, and regional quality as well as the various aspects of its site and environment. The buildings can be seen as an example of a specific building type related to a building's function, such as administrative, worship place, defense, or even recreational. They can be studied as illustrations of building materials and technology specific to the era. They can be looked upon as records of a particular historic period, which is often related to a very explicit architectural style. There are many other aspects of any building besides its functional type, its materials or construction or style that contribute to its character or significance.



Fig 3. Architectural Character Defining Elements.

Source: Authors.

Process to Identify the Visual Character: Identifying and understanding these visual aspects is an important link in preserving the architectural character of any building or structure. There are different ways to identify and understand the character of any building. A threefold approach is generally recommended to identify the Visual Character. This approach involves,

1. Examining the building from afar to understand its overall setting and architectural context - looking at its distinguishing physical aspects without focusing on its details – the shape of the building, the roof and roof features, the openings,

the projections and importantly the exterior materials which provide it a significant character.

2. Moving up to a closer range to appreciate its materials and the craftsmanship and surface finishes apparent in these materials - to study and understand all the surface qualities of the materials, such as their color and texture, or surface evidence of craftsmanship or age.
3. Going into and through the building to distinguish those spaces, rooms and details that comprise its interior visual character - Identifying and understanding the character of interior spaces can be somewhat more difficult than the exterior, still the importance of interior features and finishes to the character of the building should not be overlooked.

V. REPAIR AND REHABILITATION OF STRUCTURES:

Repair and Rehabilitation is defined as the process of achieving the original state of structure when it undergoes any sort of defects or deterioration or destruction. Repair and Rehabilitation is a work of Art, which not only extends the life of a structure but also ensures that the structure stays intact exhibiting the character of the architecture, aesthetics and construction of a particular era. Restoration of structure is an ultimate aim of Repair and Rehabilitation, Restoring the structural as well as design characters of the building. Extend of work varies from structure to structure depending on the deterioration of structure. The major considerations been, the existing Physical condition that is, behavior of materials and structural systems, deterioration causes and the enriching significance and value that is, why and for whom it is meaningful.

VI. MATERIAL CONSIDERATIONS- A SIGNIFICANT FACTOR:

Architectural design is a persistent process of selecting and congregating elements, to create a functional space. Material and structural systems are sub-systems in this configuration. Both elements have a major influence on the design process and subsequently on the resultant architectural space. Therefore, the character of the architectural space depends on how its structural symphony is composed using a particular building materials. It can be seen that, a hierarchal sequence of “form-structure-material”, is what has dominates the design process in the past as well as is in the present. It is necessary to understand the way materials have been used historically in architecture. This shall gives us a road way for the consideration that needs to be given to

material selection in the process of repairs and rehabilitation of a building.

As important is structural system restoration, in the process of repairs and rehabilitation of a building, the construction material restoration is equally significant. Particular consideration should be paid to the performance parameters of the built-in materials, the nature of construction technology and possible interactions. Each building material has its unique physical and inherent properties which provide the distinct feature of color, texture and appearance to the building, in short governs or defines the Architectural character of the building. Building materials are broadly classified as, traditional construction materials and advanced construction materials.



Fig. 4. Building material Considerations

Source: Authors.

In general traditional materials and techniques are used for repair and rehabilitation work. Deterioration of building materials, in particular stone, wood and glass has always been a key issue in repair and rehabilitation process and with the ever growing threat of climate change and atmospheric pollution it has become more urgent as it has worsened the natural decay. New materials and techniques (including smart materials and nanotechnology) may offer additional and longer-lasting solutions, especially for preserving character defining elements and improve their physical condition.

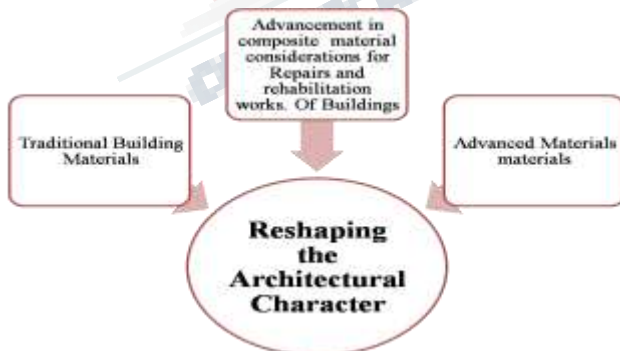


Fig. 5. Significance of Advancement in material Consideration

Source: Authors.

This calls for development of advanced compatible materials and techniques and their application for the repairs, conservation and restoration of character defining elements. So that the new developed materials can amalgamate the physical and visual properties of the traditional materials and at the same time address the concerns of sustainability. Use of advanced technology to understand the inherent properties of the built materials and its replacement for repair and rehabilitation can be considered as a new horizon for research. This will ensure that the architectural character of the building is kept intact and harmful effects of deterioration can be reduced.

VII. SYSTEMATIC APPROACH

Every structure is designed with a conscious thought and constructed very meticulously. Similarly a very thoughtful proficient and relevant strategy is required when it comes to repair and rehabilitation of a structure. It requires a multi-disciplinary approach.

1. Understanding of the historical character of the structure.
2. Each structure should be recognized as a physical record of its time, place, and use.
3. Studying and understanding the material and technological advancement of the pertaining era.
4. Respecting the original material and valid contribution of the pertaining technology to the building.
5. Identifying the elements that govern the architectural character.
6. Evaluating the existing conditions of these elements.
7. Retaining and preserving the architectural character of a structure.
8. Establishing the possible intervention of the traditional building material and technology and the appropriately selected material and construction technology.
9. Interventions should, as far as possible, respect the character, techniques and historical value of the original or earlier states of the structure.
10. Intervention should be the resultant of an integrated approach that gives due considerations to the different aspects of architecture - form, function and structure.

As far as possible traditional materials and techniques are to be adopted in this case, when advanced materials and techniques are used, durability and compatibility should be adequately confirmed. Compatible materials shall be used so that they appreciate the character value of the building elements. Choosing the most appropriate strategy for repair

and rehabilitation of structure requires, careful understanding about building's architectural significance, existing physical condition, and required innovations and technological advancements.

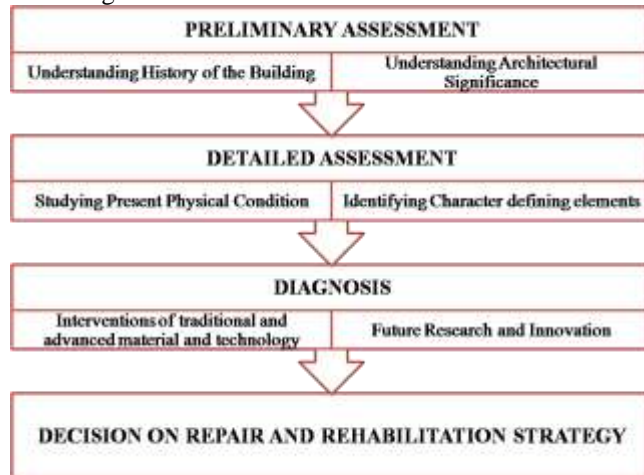


Fig. 6. Systematic Approach
Source: Authors.

VIII. CONCLUSION

Buildings and structures pass on a message coming through the ages. It is the responsibility of the present generation to carry it forward to the future. This precious gift may be lost if the integrity of the original structure is destroyed while meeting the present hassle. It's a legacy of design as well as construction and material technology which has to be presented to the next generation without destroying the essence or character of it. Structures are closely related to local, social and economic conditions; hence the methods which are adopted need to be developed to retain and preserve original fabric. There is tremendous educational, practical and research potential to be realized in this spectrum of work. Appropriate selection of Materials for Repairs and Rehabilitations of Structure plays an important role in reshaping the Architectural Character of a particular era. An architectural, engineering, management, Construction technology and material advancement or innovation approach is required for such type of endeavor. The potential of this field needs to be realized by integrating and contextualize these spectrums of work and not limiting it to any one of it.

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