

# Building Restoration

Ar. Pallavi Sharma

Research Scholar, Amity School of Architecture and Planning, Amity University, Haryana, India

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## ABSTRACT

*Building restoration describes the process of the renewal and refurbishment of the fabric of a building. The phrase covers a wide span of activities, from the cleaning of the interior or exterior of a building. Buildings are structures which have, from time to time, particular purposes. They require ongoing maintenance to prevent them falling into disrepair as a result of the ravages of time and use. Building restoration can be thought of as that set of activities which are greater than year-to-year maintenance, but which by retaining the building are less than a demolition and the construction of a new building. Restoring a building can also be a much more cost effective method than demolishing a building and starting from scratch. Building conservation can be defined as the action to prevent decay, embracing all acts that prolong the life of historic buildings. Building conservation relates specifically to the process of preservation and restoration of building materials, which aims to prolong a building's life and function. Historical building should be conserved and preserved properly because of sensitivity towards the past including historical and aesthetics value, emotional ties, continuity and stability of physical surroundings, the absence of protection against economic pressure, and the importance of tourism to the country economy and lower estimated cost of development. That is why the conservation works are very important to be carried out properly. Heritage building should be conserved and preserved properly because of sensitivity towards the past including historical and aesthetics value, emotional ties, continuity and stability of physical surroundings, the absence of protection against economic pressure, and the importance of tourism to the country economy and lower estimated cost of development. That is why the conservation works are very important to be carried out properly. There are four phases included in conservation projects before the building is exposed to any repair work or refurbishment work which are documentation, building investigation, building diagnosis and conservation and repair techniques.*

**Keywords:** *Heritage Restoration, diagnosis, investigation, renovation, condition survey.*

## 1. INTRODUCTION

With the country's current rapid development in which the practice of demolishing old buildings has been a normal scenario, it is important to identify the old record, preserve and conserve the building of historic importance. Heritage building should be conserved and preserved properly because of sensitivity towards the past including historical and aesthetics value, emotional ties,

continuity and stability of physical surroundings, the absence of protection against economic pressure, and the importance of tourism to the country economy and lower estimated cost of development. That is why the conservation works are very important to be carried out properly. There are four phases included in conservation projects before the building is exposed to any repair work or refurbishment work which are **documentation, building investigation, building diagnosis and conservation and repair techniques.**

## 2. TYPES OF BUILDING RESTORATION

The scope of restoration depends upon the need, and other circumstances, such as the status of the building, and the affordability of the work required. There are three main types of restoration:

- **Building cleaning** - most especially cleaning the external facade of a building, and typically needed in cities that have suffered from smoke pollution. Many granite, sandstone, and limestone buildings in the UK, for example, have for most of their existence been black in colour owing to smoke and smog. Many, in turn, have been cleaned after air pollution legislation diminished the incidence of airborne particulate matter. Any building that has suffered from fire and/or water damage needs to be restored as well. Fire and water restoration specialists can help speed repairs, whether for individual homeowners or for the largest of institutions.
- **Major repair** - especially to stonework affected by acid rain and other pollutants, and which has weathered or decayed to a structurally unsound or aesthetically displeasing condition.
- **Rebuilding** to replace severely damaged or missing parts of a building. Here, in all cases, a balance is to be struck between recreation of the original building using materials and techniques similar to the original construction, as happened at very great expense at Windsor Castle; and the use of more modern techniques and materials.

Not all building restoration seeks to follow the original design of the building. It is reasonably commonplace for the shell of a building - its external walls - to be retained whilst an entirely new building is constructed within. This approach is also referred to as **adaptive reuse.**

Although techniques of restoration are improving, the action of cleaning or repairing buildings can, with hindsight, be seen to cause problems that at the time were unforeseen. A good example is the unrestrained use of sandblasting to clean smog deposits from soft-stoned buildings - a technique employed in the UK in the 1960s and 1970s - which has damaged the external faces of stonework to the extent that in some cases, later, the stonework has needed to be replaced. Contemporary building codes recognize such problems, and (it is to be hoped) mitigate poor outcomes.

## 3. HERITAGE RESTORATION

In the field of historic preservation, building restoration can refer to the action or process of accurately revealing, recovering or representing the state of a historic building, as it appeared at a

particular period in its history, while protecting its heritage value. Work is often performed to reverse decay, or alterations made to the building after its initial construction. A part of heritage restoration can involve the replacement of outdated heating and cooling systems with newer ones, or the installation of climate controls that never existed at the time of building. TsarskoyeSelo, the complex of former royal palaces outside St. Petersburg in Russia are an example of this sort of work.

**Historic preservation** or **heritage conservation** is an endeavor that seeks to preserve, conserve and protect buildings, objects, landscapes or other artifacts of historic significance. Other names for the discipline include urban conservation, landscape preservation, built environment conservation, built heritage conservation, object conservation, and immovable object conservation; however, "historic preservation" is generally used in reference to activities in the United States and Canada.

#### **4. CONSTRUCTION TECHNIQUES AND DETAIL DURING BUILDING RESTORATION**

Reconstruction and repair defined as the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.

- Reconstruction and repair will be used to depict vanished or non-surviving portions of a property when documentary and physical evidence is available to permit accurate reconstruction with minimal conjecture, and such reconstruction is essential to the public understanding of the property.
- Reconstruction and repair of a landscape, building, structure, or object in its historic location will be preceded by a thorough archeological investigation to identify and evaluate those features and artifacts which are essential to an accurate reconstruction. If such resources must be disturbed, mitigation measures will be undertaken.
- Reconstruction and repair will include measures to preserve any remaining historic materials, features, and spatial relationships.
- Reconstruction and repair will be based on the accurate duplication of historic features and elements substantiated by documentary or physical evidence rather than on conjectural designs or the availability of different features from other historic properties. A reconstructed property will re-create the appearance of the non-surviving historic property in materials, design, color, and texture.

**Reconstruction as a Treatment:** When a contemporary depiction is required to understand and interpret a property's historic value (including the re-creation of missing components in a historic district or site); when no other property with the same associative value has survived; and when sufficient historical documentation exists to ensure an accurate reproduction, Reconstruction may be considered as a treatment.

### ***Renovation of Old Buildings***

Repairing, modernizing, converting or adding structural extensions to an old building requires a different approach to the design process than for new buildings. It should be remembered that old buildings are often protected by law. The first task in any renovation project is a thorough survey of the existing structure, in which every important component and detail has to be carefully inspected. The survey begins with a general description of the building.

The survey must also describe the building's condition, with details of specific areas (façade, roof, stairs, cellar, and individual rooms), and all significant defective areas should be noted. Typical problems include: cracked chimney tops, damaged and leaking roof structure, dry rot or woodworm in the timber, cracks in the masonry and plaster, structural damage, leaking facades and guttering, no heat insulation and underlay, and cellar walls in need of damp-proofing. If structural steelwork is in place it should be checked for rust. It is common to find that the existing heating and sanitation are unusable and that underground lines and house connections are damaged or possibly under designed.

The early half-timbered houses contained no metal and repairs are possible using only parts made from wood if the intention is to preserve the house in its original state. The filling material used within the framework was traditionally earth or exposed masonry. There is no modern material that can be recommended as a substitute so these panels should be maintained and damaged ones repaired. Infilling with brickwork will stiffen the house and this is contrary to the structural principles of half-timbered structures.

The main defects encountered in half-timbered buildings appear in verges, eaves and roof connections, gutters and downpipes, connections on window plinths and other timber joints, where dry rot, fungal growth, mould, insects and water penetration can also cause problems. The roof is the part of a building that is subjected to the worst effects of the weather and roof maintenance is therefore crucial. Small defects, which may go unnoticed, can result in significant damage if left for a period of time. For a renovation project to be successful it is vital to have the roof framework and cover in perfect condition.

Historically, the material used for roof construction in most parts of the world has been wood and all forms of roof truss are still based on triangular bracing in many different designs. To avoid later claims for damage, a thorough knowledge of the load distribution is required before carrying out roof renovation. Roof loads do not consist just of the dead weight of the roof and snow loading: rather, because roofs have a high surface area, loads are mainly imposed by wind. The condition and existence of wind bracing is therefore of great significance for the stability of the roof.

In early times the sizing of load-bearing floor beams in old buildings was calculated empirically by the carpenter. The loads are normally carried by cross-beams which are supported by one or more joists. An old building manual from 1900 gives a ratio 5:7 for the height and the width of a beam as a starting point for the determination of the required beam strength. Another rule of thumb held that the beam height in cm should be decimeters. Because of these methods, old wooden beam not endanger the structural stability as long as the permitted tensions are not exceeded.

## **5. CONDITION SURVEY**

Condition Survey is an examination of concrete for the purpose of identifying and defining area of distress. While it is referred in connection with survey of concrete and embedded reinforcement that is showing some degree of distress, its application is recommended for all buildings and structures. The system is designed to be used for recording the history of the project from its inception to completion and subsequent life.

**Objective:** The objective of Condition Survey of a building structure is

- i) To identify
  - Causes of distress
  - Their sources
- ii) To assess
  - To extent of distress occurred due to corrosion, fire, and earthquake or another reason.
  - The residual strength of the structure
  - The rehabilitability
- iii) To prioritize the distressed elements according to seriousness for repairs
- iv) To select and plan the effective remedy.

## **6. TYPES OF CRACKS AND THEIR PATTERN**

1. It is generally easy to differentiate various types of crack and relate them with the cause of distress. The location of cracks and their pattern, etc., give the first indications of the problem.
2. Cracking & spalling, cracking & rust staining or rust staining is the visual indication of the corrosion of steel in concrete structures.
3. Rust staining in freshly laid concrete is indicative of honeycombed concrete which could result in severe rusting and deterioration of concrete at a later date.
4. Cracks at right angle to main reinforcement are generally associated with structural deficiency.

5. A mesh pattern of crack suggests drying shrinkage, surface crazing, frost attack or alkali-aggregate reaction.

## **7. REHABILITATION AND RETROFITTING**

The decision to repair or replace a structure or its component can be taken only after consideration of likely service life of the structure is established based on the technical & economic evaluations. Once a decision, based on preliminary investigations, is taken to carry out the repairs, proper diagnosis, identification & extent of distress in structural members has to be correctly assessed. A detailed methodology should be developed which should include available

- Methods of repair
- Repair materials

Thus, a repair strategy can be adopted, keeping the objective in view. This shall be based on evaluation and available alternative methods of repair & material. Priority should be assigned to

- Repair of structural defects to ensure safety of the structure
- Protection of the structure from further deterioration.

The selected method of repair should achieve one or more of the following objectives:

- Reinstatement of the structural integrity of the member by restoring or increasing its strength & stiffness.
- Prevent the ingress of distress promoting agents such as moisture, chlorides and carbon dioxide to improve durability.
- Maintaining the aesthetics/appearance of concrete surface.

### ***Repair Option:***

Depending upon the specific condition of deteriorated structure, the option of the repair methods could be one or more of the following:

- Grouting & crack repair
- Patch repair
- Replacement of structurally weak concrete
- Replacement of spalled, and/or delaminated concrete
- Replacement of carbonated concrete surrounded steel reinforcement
- Cleaning and passivating the corroded steel reinforcement
- Concrete overlays with normal, low or highly fluid concrete, latex modified concrete & corrosion protection such as jacketing etc.

***Performance requirements of repair Systems***

- Strength, serviceability and durability
- Protection of steel
- Dimensional stability
- Resistance to environmentally induced damage
- Ease of application
- Appearance

***Important factors to be considered for selection of repair methods:***

- Type and extent of distress
- Location of distress
- Environmental exposure
- Availability of skill
- Availability of time and access for repairs
- Appearance
- Cost

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