Construction Management: A Study On Challenges And Best Practices In Public Construction And Maintenance

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Abstract- *Maintenance management of aging civil infrastructure is a complex and challenging task. The goal of maintenance is to extend the lifespan of a building by delaying deterioration, decay, and failure. However, this can be difficult to achieve, as aging infrastructure is often exposed to a variety of factors that can accelerate its decline, such as environmental degradation, wear and tear, and overloading.This paper provides a comprehensive overview of maintenance management systems for aging civil infrastructure. It begins by outlining the key components of these systems, such as planning, scheduling, and budgeting. It then reviews best practices in Chennai, India, a city with a large and aging infrastructure portfolio. Finally, it presents case studies that demonstrate the benefits of integrating structural strength monitoring into maintenance management systems. The case studies show that structural strength monitoring can help decision-makers make better use of scarce resources by identifying potential problems before they lead to a failure. This can help to prevent costly repairs and ensure the safety and functionality of aging civil infrastructure.*

Keywords- Maintenance management, Associated costs, Structural strength

I. INTRODUCTION

Maintenance is a critical part of keeping civil engineering structures in good working condition. It can help to prevent failures, extend the lifespan of a structure, improve safety, and reduce costs. There are two main types of maintenance: preventive maintenance and corrective maintenance. Preventive maintenance is carried out to prevent problems from occurring, while corrective maintenance is carried out to fix problems that have already occurred.To ensure that civil engineering structures are properly maintained, a maintenance plan should be created. The maintenance plan should identify the critical components of a structure and the frequency with which they should be inspected and maintained. Staff should be trained on how to inspect and maintain structures, and the right tools should be used. All maintenance work should be documented so that it can be tracked and reviewed.It is also important to regularly inspect structures, use the right tools, keep records, delegate tasks, and be proactive. By following these tips, you can help to ensure that your civil engineering structures are properly maintained and that they continue to perform their intended function safely and reliably.

II. OBJECTIVE

- Prevent damage: Inspect the structure for damage, repair any damage found, and apply protective coatings.
- Repair defects: Repair cracks, reinforce weak areas, and replace damaged components.
- Extend life: Perform regular maintenance, identify and address problems early, and make necessary repairs.
- Comply with codes: Comply with safety and buildingcodes, maintain the structure in good condition, andprevent deterioration of physical assets. prevent deterioration of physical assets..
- Maximize value: Improve appearance, make the structure more energy-efficient, and create a healthier and safer environment.

III. SCOPE

- Study the management techniques and repair methods used in rehabilitation of concrete structures.
- Analyse the defects in the existing building.
- Understand the latest repair methods and materials used for repair and rehabilitation of the structures.
- Find out the ways to repair and increase the durability of the building.

IV. METHODOLOGY

A. General

This project focused on preventive maintenance of a canteen building at a factory in Tondiarpet, Chennai. The building was 30 years old and had cracks and spalling of concrete in columns. Five of the columns were badly damaged, so repair and rehabilitation work was carried out to stabilize the building.

The experimental study was divided into a definite sequence of work:

- Inspection of the building for damage
- Repair of any damage found
- Application of protective coatings to the building
- Rehabilitation of the damaged columns

The project was successful in stabilizing the building and preventing further damage.

B. Detailed Investigation:

- Visual examination: Identify defects and damage.
- Observations: Take note of defects and damage, and other details.
- Planning: Make a schedule for the work, including tasks, order, time, and resources.
- Execution: Implement the schedule and complete the work on time and within budget.

C. Tests: Assess the condition of the building and identify problems.

- Ultrasonic: Non-destructive tests (NDT) were conducted to assess the condition of concrete in the building. These tests are used to evaluate the properties of concrete without damaging the structure. The tests that were conducted included ultrasonic pulse velocity (UPV), rebound hammer, Profoscope, chloride and carbonation tests, half-cell potential survey, and core sampling.
- Ultrasonic pulse velocity (UPV) measures the speed of sound waves through concrete. The speed of sound is related to the strength of the concrete, so this test can be used to estimate the compressive strength of the concrete.
- Rebound hammer measures the hardness of concrete. The hardness of concrete is related to its strength, so this test can also be used to estimate the compressive strength of the concrete.

Based on the results of the NDT tests, a repair methodology was suggested and the work was executed. The repair methodology included repairing cracks, spalling, and corrosion damage. The work was executed successfully, and the building was stabilized.

D. Repair Methodology

Sequence of work carried out for the Repair and rehabilitations of the building

- Removal of brick work
- Removing Plastering and cover concrete
- Cleaning of bars
- Additional Reinforcement
- Shear connections
- Core cutting
- Application of chemicals
- Concreting
  a) Epoxy Jointing compound
  b) Form work or Shuttering
  c) Concreting
  d) De-shuttering
  e) Curing
- Redoing of B of Brick work
- Plastering

E. Sequence of Repair and Rehabilitation Methodology

The column was isolated by removing the brickwork around it (Fig 1). The plastering was then removed by mechanical means. The corroded rebar were cleaned using rust remover agents. Additional rebar were anchored in the column to increase its durability using shear connectors and specialized chemicals (Fig 2). The column was then made ready for concrete by applying an epoxy bonding agent(Fig.3). Concrete was poured using a repair-based material, micro concrete with a powder-aggregate ratio of 1:0.5 (Fig.4). After the concrete had cured, an AR compound was applied (Fig 5). The brickwork and plastering were then redone to finish the repairs (Fig 6).

Fig.1. Removing brick work

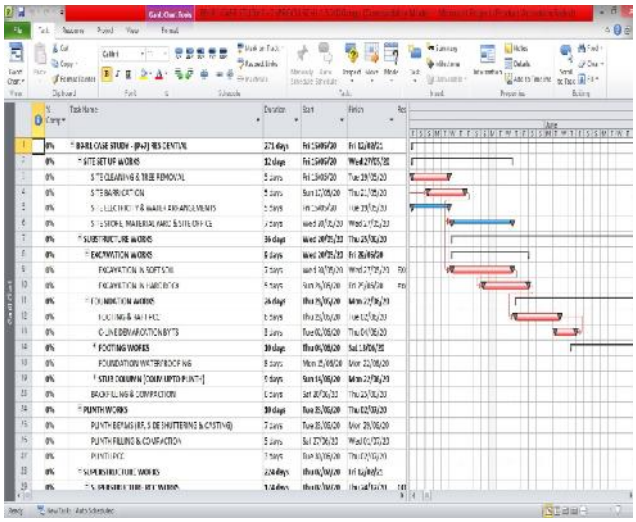
Fig.2. Additional Reinforcement

Fig.4. Concreting with micro concrete

Fig.3. Epoxy bonding agent

Fig.5.Applying AR compound

Fig.6. Redoing of brick work and plastering



V. PROJECT SCHEDULE

The project schedule as stated by the site was worked on Microsoft project. The detailed schedule for one column is as stated below

A. Microsoft Project

Microsoft Project (MSP) is a project management software program that helps project managers develop plans, assign resources to tasks, track progress, manage budgets, and analyze workloads. MSP is a powerful tool that can help you manage projects more efficiently and effectively.MSP uses a shared resource pool, which means that resources can be shared between projects. This can help you save time and money by avoiding the need to duplicate resources across multiple projects. MSP also allows you to create budgets based on assignment work and resource rates. This can help you track your spending and ensure that you are on track to stay within your budget. One limitation of MSP is that it assumes that additional physical raw materials are always available without limit. This can be a problem if you are working on a project that requires a lot of materials, such as a construction project. Overall, MSP is a powerful project management tool that can help you manage your projects more efficiently and effectively.

VI. CONCLUSION

Repair and rehabilitation of concrete structures is a challenging task, especially in India where this is a relatively new field. Concrete structures that have undergone major structural damage or deterioration are especially challenging to repair.

The challenges of repairing concrete structures include:

- Identifying the cause of deterioration. This is essential in order to select the right repair materials and methods.
- Accessing the damaged areas. This can be difficult, especially in large or complex structures.
- Removing the damaged materials. This can be time-consuming and expensive.
- Repairing the damaged areas. This can involve a variety of techniques, such as concrete patching, rebar replacement, and waterproofing.
- Protecting the repaired areas. This is important to prevent further deterioration.

Periodical/timely assessment and maintenance with latest available techniques and materials can help to arrest

deterioration and extend the life of concrete structures. This is especially important in India, where many concrete structures will need to be rehabilitated in the near future.

- The benefits of periodical/timely assessment and maintenance include:
- Early detection of damage. This allows for repairs to be made before the damage becomes more serious.
- Prevention of further damage. This can save money and time in the long run.
- Improved safety. Damaged concrete structures can be a safety hazard.
- Increased lifespan. Well-maintained concrete structures can last for many years.

The right repair material and protective coatings can save enormous money and time by reducing the frequent repair costs of already repaired concrete structures. It is important to select the right materials after ascertaining the cause of deterioration.

Proper maintenance by means of frequent visual inspections can help to improve the lifespan of concrete structures. This includes inspecting the structure for signs of damage, such as cracks, spalling, and corrosion. If damage is found, it is important to repair it promptly to prevent further deterioration.

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