Comparative Study of RCC & Prestressed Retaining Wall

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Abstract- *Retaining walls are critical structures used to resist lateral earth pressure and maintain ground stability in civil engineering projects. Traditionally, Reinforced Cement Concrete (RCC) retaining walls have been widely used due to their simplicity and reliability. However, prestressed retaining walls have emerged as a modern alternative offering improved structural efficiency. This paper presents a comparative study between RCC and prestressed retaining walls based on parameters such as structural performance, economy, material efficiency, construction time, and durability. The study concludes that prestressed retaining walls provide superior performance in terms of reduced deflection, improved load-carrying capacity, and material savings, though initial costs and complexity are higher*

Keywords: RCC, Prestressed Retaining Wall, Comparative study ,SDG

I. INTRODUCTION

Retaining walls are designed to resist lateral soil pressure when there is a difference in ground elevation. RCC retaining walls are commonly used due to their ease of construction and adaptability. However, with advancements in construction technology, prestressed retaining walls are increasingly being adopted.

RCC combines concrete (strong in compression) with steel reinforcement (strong in tension), making it suitable for general construction . Prestressed concrete introduces internal stresses to counteract external loads, improving structural performance.

II. OBJECTIVES

- To compare RCC and prestressed retaining walls
- To analyze structural behavior under similar loading conditions
- To evaluate cost, time, and material efficiency
- To determine suitability for different site conditions

III. TYPES OF RETAINING WALL

3.1 RCC Retaining Wall

- Cantilever retaining wall
- Counterfort retaining wall
- Gravity retaining wall

RCC retaining walls are widely used in highways, bridges, and building basements.

3.2 Prestressed Retaining Wall

- Pre-tensioned retaining wall
- Post-tensioned retaining wall
- Anchored prestressed wall

Prestressing introduces compressive stress to improve resistance against tensile forces.

IV. MECHANISM OF GROUNDWATER CONTAMINATION

The comparative study is based on:

- **Analytical design using standard codes (IS 456, IS 875)**
- **Structural analysis (bending moment, shear force, deflection)**
- **Cost estimation and material quantity comparison**
- **Review of published research**

VI. MATERIAL EFFICIENCY

- RCC walls require more steel reinforcement
- Prestressed walls reduce reinforcement by 28–40% due to internal stress distribution
- Smaller cross-sections are possible in prestressed structures

VII. CONSTRUCTION COMPARISON

RCC Retaining Wall:

- Simple construction process
- Requires formwork and curing time
- Suitable for small to medium heights

Prestressed Retaining Wall:

- Requires skilled labor and equipment
- Faster construction due to precasting options
- Suitable for large-scale and high wallss

IX. PERFORMANCE & STABILITY

Prestressed retaining walls:

- Reduce horizontal displacement
- Improve bearing capacity
- Enhance overall stability

RCC walls:

- Reliable but prone to cracking under high loads
- Heavier and less efficient for tall structures

Recent findings highlight emerging threats like PFAS, which persist in groundwater and pose serious health risks.

X. ADVANTAGES & DISADVANTAGES

RCC Retaining Wall

Advantages:

- Simple design and construction
- Low initial cost
- Widely used and understood

Disadvantages:

- Higher material consumption
- Cracking issues
- Less efficient for large spans

XI. CONCLUSION

The study shows that prestressed retaining walls outperform RCC retaining walls in structural efficiency, durability, and long-term cost effectiveness. While RCC walls remain suitable for small-scale projects due to simplicity and lower initial cost, prestressed retaining walls are more advantageous for large-scale and high-load applications. The choice between the two depends on project requirements, budget, and technical expertise.

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