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INVESTIGATION OF CAUSES FOR WATER LEAKAGES IN BUILDINGS AND SUGGESTING REMEDIAL MEASURES

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Abstract

Water leakage in buildings is a critical issue affecting structural integrity, aesthetics, occupant safety, and long-term maintenance costs. This study identifies the causes of water leakage, evaluates waterproofing methods, and suggests remedial measures. The research involves literature review, case study analysis, and a survey of waterproofing materials. The findings highlight that improper construction techniques, poor waterproofing materials, plumbing failures, and environmental factors contribute significantly to water ingress. Advanced waterproofing solutions, including polymer-based coatings, integral waterproofing, and non-destructive testing methods, are recommended for effective prevention and mitigation.

1. Introduction

Water leakage in buildings leads to severe structural damage, mold growth, electrical hazards, and economic losses. The primary causes include poor construction quality, lack of waterproofing, plumbing failures, groundwater seepage, and aging materials. This study aims to identify key leakage sources, assess their impact, and propose effective waterproofing solutions.

2. Literature Review

Research highlights that high-rise buildings, basements, and inter-floor spaces are particularly vulnerable to water leakage due to poor waterproofing, construction defects, and climate conditions. Studies indicate that AI-based leak detection, smart building applications, and modern waterproofing materials enhance durability and efficiency in leakage prevention.

3. Causes of Water Leakage

- Rainwater Infiltration – Occurs due to poor drainage, weak joints, and inadequate roof slopes.
- Plumbing Failures – Leaking pipes, faulty drainage, and improper installations contribute to seepage.

- Poor Construction Practices – Use of substandard materials and lack of quality control lead to premature leakage issues.
- Groundwater Seepage – High water table levels cause moisture penetration in basements and foundations.
- Aging and Deterioration – Thermal expansion and material wear over time create cracks and leakage points.

4. Waterproofing Methods & Materials

This study evaluates traditional and modern waterproofing methods:

Traditional Methods:

- Mud Phuska – A natural waterproofing method using clay and lime.
- Lime Terracing – Involves applying a lime-based layer to prevent water ingress.
- Integral Waterproofing – Chemical admixtures mixed into concrete to enhance water resistance.

Modern Techniques:

- Cementitious Waterproofing – A slurry-based coating used for basements and water tanks.
- Polymer-Based Coatings – Includes epoxy, polyurethane, and acrylic coatings for enhanced flexibility and durability.
- Crystalline Waterproofing – Penetrates concrete and forms water-blocking crystals.
- Flexible Membranes (Bitumen, PVC, APP, SBS) – Used for large-scale waterproofing in roofs and tunnels.
- Liquid-Applied Membranes – Seamless coatings applied to complex surfaces for maximum protection.

5. Leakage Detection & Testing

- Flood Testing – Involves submerging areas to detect seepage.
- Infrared Thermography – Uses heat mapping to locate moisture intrusion.
- Electronic Vector Mapping – Detects leaks by analyzing electrical conductivity.
- Vacuum Box Testing – Identifies leaks in membranes and welded joints.
- Acoustic Leak Detection – Uses sound waves to pinpoint leaks in underground pipes.

6. Case Study: Building at Machavaram, Vijayawada

An old building experiencing severe leakage problems due to the absence of beams and columns, poor curing, and improper waterproofing was analyzed. The study revealed a lack of technical expertise in local waterproofing services. The research team recommended Dr. Fixit and Roff Bond, two polymer-modified solutions for enhanced

bonding and waterproofing. The application process involved pre-wetting surfaces, slurry coating with waterproofing compounds, and reinforcement with an 8mm bar grid for strength.

7. Conclusion

Water leakage in buildings poses significant risks, from structural deterioration to health hazards. This study identifies critical sources of leakage and evaluates waterproofing methods, recommending advanced solutions like crystalline coatings, polymer-based sealants, and AI-driven leak detection. The case study underscores the importance of professional intervention and the use of high-quality waterproofing materials to ensure long-term building durability.