COMPARATIVE EVALUATION OF MAINTENANCE APPROACHES: FROM TRADITIONAL CONCEPTS TO RELIABILITY-CENTERED CONCEPTS FOR BUILDINGS

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Abstract: Building maintenance is a most important yet neglected application to increase building lifecycle and preventing unexpected sudden breakdown in building services by mitigating deterioration of building structural (shell and core) elements and nonstructural (non-shell) elements of the buildings. Historically buildings are considering as a structures used to provide shelter from extreme natural weather conditions and predators, however, this role is evolved with the science and technological evolvement of humankind to meet the growing demand of operational efficiency, safety and comfortable a sustainable environment within the buildings. The aim of this study is to assess and compare traditional maintenance concepts such as corrective maintenance (CM), preventive maintenance (PM), condition-based maintenance (CBM), and reliability-centered maintenance (RCM) approaches, emphasizing their advantages, disadvantages, and suitability for optimizing maintenance plans for increased dependability, effectiveness, and cost-effectiveness. A systematic literature review was conducted, analyzing academic papers, case study evaluations, book chapters, industry reports, and standards related to building maintenance strategies. The finding indicates that traditional maintenance approaches like CM and PM are initially cost effective, but they are fail to address the dynamic needs of modern building systems. However, CBM and RCM used data driven insights to enhance reliability, operational efficiency, cost-effectiveness and dependability. Among these maintenance strategies RCM stands out as the optimal strategy for complex building systems ensuring a 60% – 80% reduction of system failures and a reducing maintenance cost up to 16 % -50% and significant improvements in system uptime and occupant satisfaction. This study emphasis that transformative potential of transitioning traditional maintenance concepts to RCM. Adopting RCM, especially in Skyscrapers or technologically sophisticated buildings, can enhance building operations, ensur-

ing sustainability, reliability, and an optimized environment for occupants.

Keywords: Corrective Maintenance, Preventive Maintenance, Conditioned Based Maintenance, Reliability Centered Maintenance.