Building Services Audit & Inspection for Beginners

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Abstract:
Building services such as heating, ventilation, air conditioning, lighting, plumbing and electrical systems are vital for a building's functionality, safety and efficiency. However, they require regular monitoring and maintenance to meet evolving standards. Auditing and inspecting building services is an opportunity to create positive change. By uncovering inefficiencies and enhancing occupant comfort, you contribute to sustainable, resilient and healthy built environments. Approach each chapter with curiosity and embrace the principles outlined in this book. Building services audit and inspection is a dynamic field, and this resource serves as a foundation for ongoing growth and profesional development.

Keywords: Building services, heating, ventilation, air conditioning, lighting, plumbing and electrical systems,monitoring and maintenan

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PREFACE

Welcome to the world of building services audit and inspection. This book is your comprehensive guide to understanding the principles and practices of auditing and inspecting building services.

This book demystifies the subject, providing a comprehensive introduction to auditing and inspecting building services. You'll learn how to assess performance and identify areas for improvement, from heating and cooling systems to electrical safety and energy consumption.

"While aimed at beginners, professionals in related fields can also benefit."

May this book inspire you to embark on a fulfilling career or deepen your knowledge, empowering you to make a difference, one building at a time.

Best wishes on your journey,

The AUTHORS.

Chapter ONE

Introduction to Building Services Audit & Inspection

Learning Objectives:

- Understand the concepts of building audit and inspection.
- Identify the key considerations in building services audit and inspection.

1.1 BUILDING AUDIT

1.1.1 Definition and purpose of building audit

Building audit is a systematic examination of building services and facilities to evaluate their compliance with relevant regulations and standards. It involves a comprehensive assessment of various aspects of a building's mechanical, electrical, and plumbing systems, as well as other building services. The purpose of a building audit is to identify potential issues, non-compliance, and areas for improvement in building services installations. It helps ensure that the building's systems are functioning effectively, efficiently and in accordance with established codes and regulations.

1.1.2 Importance of building audit in ensuring compliance and functionality

Building audits play a crucial role in ensuring compliance and functionality of building services. Here are some key reasons why building audits are important:

i. Compliance: Building audits verify whether the building services installations adhere to relevant local acts, regulations, and international standards. By conducting audits, potential non-

Chapter TWO
Audit & Inspection on Mechanical System

Learning Objectives:

- Understand the importance of audit and inspection in maintaining mechanical systems.
- Identify the key components and functions of mechanical systems in building.

2.1 INTRODUCTION

In the world of modern infrastructure, buildings house a wide array of complex mechanical systems that are crucial for their efficient operation and occupant comfort. These mechanical systems encompass various components, such as heating, ventilation, and air conditioning (HVAC), plumbing, electrical systems, and more. To ensure that these systems function optimally and meet the required safety standards, regular audits and inspections are essential.

An audit and inspection on mechanical systems in buildings involves a comprehensive assessment of the design, installation, operation, and maintenance of these systems. The primary objective is to identify any deficiencies, risks, or non-compliance issues that could affect the system's performance, energy efficiency, or safety.

During an audit, qualified professionals review the building's mechanical plans, specifications, and relevant documentation to assess compliance with local building codes, regulations, and industry standards. They inspect the physical components of the system, such as equipment, ductwork, piping, wiring, controls, and other relevant elements. The audit also includes a thorough examination of maintenance records, testing and inspection reports and any available performance data.

Chapter THREE
Audit & Inspection on Electrical System

Learning Objectives:

- Understand the importance of audit and inspection in maintaining electrical systems.
- Identify the key components and functions of electrical systems in building.

3.1 INTRODUCTION

Effective and reliable electrical systems are vital for the efficient functioning and safety of any building. Whether it is a commercial facility, residential complex, or industrial establishment, conducting regular audits and inspections of electrical systems is crucial to ensure their optimal performance, compliance with regulations, and mitigation of potential risks.

The audit and inspection of electrical systems in building services encompass a comprehensive evaluation of various components, including low voltage systems, high voltage systems, standby generator sets, transformers, lighting arrestors, and security systems. These audits and inspections are carried out by qualified professionals who possess expertise in electrical engineering, building codes, and safety standards.

The primary objective of conducting audits and inspections is to identify any deficiencies, vulnerabilities, or non-compliance issues within the electrical systems. By thoroughly examining the systems, inspectors can detect potential hazards, such as faulty wiring, inadequate grounding, improper equipment installation, or outdated protective devices. Identifying such issues helps in preventing electrical failures, minimizing the risk of electrical accidents, and ensuring the safety of building occupants.

Chapter FOUR

Common Building Services Defects Encountered in Buildings

Learning Objectives:

- Identify common building services defects encountered in buildings, including structural, electrical, plumbing, and mechanical issues.
- Analyze the causes and consequences of building services defects and develop strategies for their prevention and remediation to ensure the safety and functionality of buildings.

4.1 INTRODUCTION

Buildings serve as the cornerstone of human activities, providing shelter, workspaces, and recreational areas. To fulfil their intended purposes, buildings rely on a complex interplay of building services that encompass mechanical, electrical, plumbing, and other essential systems. These systems play a crucial role in ensuring the comfort, functionality, and safety of occupants. However, the intricate nature of these building services renders them vulnerable to defects and issues that can hamper their performance and jeopardize the well- being of occupants.

The occurrence of common building services defects can have far-reaching consequences. Inefficient heating or cooling systems can result in discomfort and compromised indoor air quality. Faulty electrical systems pose a significant risk of electrical surges, fires, or electrical shocks. Plumbing defects such as leaks or clogged drains can lead to water damage, unsanitary conditions, and the potential for mold growth. Inadequate fire safety systems and security vulnerabilities may expose occupants to unnecessary

Chapter FIVE

Operation & Maintenance of the Various M&E Services

Learning Objectives:

- Explore key strategies and considerations for achieving an effective O&M framework specifically focused on M&E services in buildings.
- Enhance the reliability, reduce operational costs and optimize the lifespan of the M&E systems.

5.1 INTRODUCTION

Building services, comprising diverse mechanical and electrical (M&E) systems and associated infrastructure elements, play a pivotal role in facilitating optimal building functionality and ensuring occupant comfort. Mechanical and electrical (M&E) services in buildings must operate without interruption and last for a long time, which is why operation and maintenance (O&M) is so important. Maximising the performance, energy efficiency, and safety of these systems requires effective O&M procedures. This chapter aims to explore key strategies and considerations for achieving an effective O&M framework specifically focused on M&E services in buildings.

By implementing these practices, building owners and facility managers can enhance the reliability, reduce operational costs, and optimize the lifespan of their M&E systems. Consequently, it becomes imperative to ensure the meticulous upkeep of all M&E services. Several compelling rationales underscore the necessity of attaining effective operation and maintenance of such systems. The subsequent Table 2 concisely encapsulates these justifications:

Chapter SIX
Planned Preventive Maintenance

Learning Objectives:

- Understand the essential components of Planned Preventive Maintenance (PPM) for building services systems, including scope of work, workmanship, supervision, and maintenance record-keeping.
- Recognize the significance of timely defect resolution, customized O&M practices, maintenance schedules, and FM performance reviews in optimizing PPM effectiveness and resource allocation.

6.1 INTRODUCTION

Planned Preventive Maintenance (PPM) is a proactive approach that focuses on regularly scheduled inspections, servicing, and repairs of building services systems. It aims to identify and address potential issues before they result in significant failures or disruptions. This chapter explores various aspects of PPM, including the scope of work, workmanship and material considerations, supervision and workforce

requirements, services and maintenance records, repair to defects, O&M for different M&E services, maintenance schedules, and FM performance review. By implementing effective PPM strategies, building owners and facility managers can enhance the performance, reliability, and lifespan of building services systems.

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BIOGRAPHY

Associate Professor Sr Ts. Dr. Mohammad Ashraf bin Abdul Rahman is a lecturer in the Department of Civil Engineering Technology, Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia (UTHM). He is also the Director for Conservation, Archaeological, Survey and Rehabilitation of Heritage Architecture (KASTURI). He obtained his PhD in Civil Engineering. His research focuses on heritage building management, particularly Building Condition Assessment (BCA), Dilapidation Studies, Indoor Air Quality (IAQ) Assessment, and Building Services. Professionally, he is a Professional Building Surveyor and a Professional Technologist. He is actively involved in various research activities and has published over 10 documents, including internationally and nationally indexed journals, proceedings, conference papers, technical reports, scientific books, book chapters and research-related bulletins/ magazines. His consultancy practice focuses on building condition inspection and assessment, including heritage buildings. Additionally, he is also actively engaged as an invited speaker in programs organized by technical agencies, both government and private, and serves as a facilitator in engineering-related workshops.

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Noteworthy contributions to academia include publications in reputable journals, books, and digital media, reflecting his dedication to knowledge advancement. A dynamic individual, he excels in academia, holds industry expertise, and demonstrates social responsibility, making him a valuable asset to both academic and industrial realms.

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