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# Introduction

## 1.1 Introduction to the Book

Undertaking responsible and practical repairs and maintenance policies and strategies are becoming an ever-important factor in life cycle management of property assets from owner occupiers to large property portfolios. In this sense, building maintenance practices are needed in every development and is therein a very crucial part in every life of every building. This may be predicated on buildings requiring to be well maintained in order to retain the value of the property itself. Furthermore, the buildings will also continue to fulfil their functions if properly maintained and will give the convenience to the tenant and occupants in the buildings.

With the technological advancement in buildings over many years and the advent of more complex building elements and services, the area of building management is becoming a 'hot topic' and one that is worthy of a more profound and professional approach and address. There has become a need for more prescriptive and perhaps regimented maintenance programmes and procedures to ensure statutory compliance is maintained as legislation becomes more convoluted, and to ensure buildings do not develop defects and deteriorate.

Some earlier publications have successfully considered aspects of maintenance, including its dimensions, planning, organisation, procurement and post-contract management and finally the role of knowledge management within maintenance organisations. Despite the comprehensive coverage of the fundamental issues, most of these previous works have not considered the increasingly important areas of carbon resilience and information management, which the present book will address. This is an important and topical aspect, as it is now essential that clients need to consider the viability of retrofitting microgeneration and renewable technologies to existing structures during major maintenance activities. This book will seek to readdress the balance and will provide readers with a depth of knowledge around such areas in an attempt to improve best practice in maintenance management.

## 1.2 The Main Areas and Themes Covered in the Book

As an introduction to the book and to provide context for readers, an overview is provided below of all the main areas and themes covered alongside related discussion points.

*Introduction to Built Asset Management*, First Edition. Dr Anthony Higham, Dr Jason Challender, and Dr Greg Watts.

### 1.2.1 Chapter 2 Surveying Existing Buildings

This chapter will outline the background to conducting building surveys and identify the skills, steps and requirements for them to be completed successfully. It will describe the methodology by which defects are correctly diagnosed through collection of evidence and observing telltale signs. Notwithstanding this premise, it will provide instances when this can sometimes be challenging, and misdiagnosis may remain a real factor. To assist readers, it will describe circumstances and practical examples where there may be more than one force of nature at play and how these can lead to different forms of building deterioration. Furthermore, it will provide examples where certain defects have been misdiagnosed for others and where symptoms are similar, e.g., alternative forms of structural cracking and dampness.

The chapter will also highlight the importance of client engagement both before and after building surveys and will describe the type and form of background information that may be useful to them. In this regard the usefulness of desktop studies and reviewing previous technical reports will be discussed. Following on from this, the importance of understanding the clients' requirements in the type and nature of information to be captured in the survey will be articulated and explained.

The different types of building survey, ranging from full structural surveys to valuation surveys, will be outlined in the chapter together with the respective benefits and possible limitations of each. In addition, the range of different surveying equipment and tools will be identified. The use and application of each piece of equipment to assist surveyors in their inspections will be covered, especially where access and visibility difficulties are experienced. Photographs of different building surveying equipment and apparatus will be provided.

The modus operandi by which surveyors will conduct their inspections will be discussed, alongside factors such as health and safety and limitations which will need to be considered. In addition, the challenges and obstacles which sometimes confront building surveyors in the course of their inspection will be identified, especially where disruption to normal building operations remains an important factor. Examples of such factors will be given and an understanding of the difficulties that these constraints can impose on the building surveying process.

Following on from this, the importance of further investigation work will be outlined in circumstances that require opening up works or more specialist input. Finally, the various stages of managing the remedial work process will be described, alongside the importance of client consultation of the different options and preferred solutions. Examples of different scenarios leading up to the agreement of the agreed remedial works will be provided.

### 1.2.2 Chapter 3 Common Maintenance Issues and Managing Defects

This chapter of the book is focused on the pathology of buildings with particular emphasis on building degradation and will describe the ways and means of identifying and addressing potential defective elements and defects within buildings. In this pursuit, it

will examine the different methodologies for diagnosis of defects and their root cause (rather than just the symptoms of defects) to assist in identifying the most appropriate type of repair.

An analysis of the underlying conditions and mechanisms that lead to defects and building failures resulting from poor design and quality of build during the construction stage or refurbishment will be covered, from dampness to structural movement, corrosion and timber decay. Furthermore, the role of maintenance across the life cycles of buildings will then be discussed and the influence that this has on their preservation and deterioration. The debate around this important area will then extend into the examination of planned and reactive policies for maintenance management of buildings estates.

The challenges associated with identifying the underlying causes of building failures will be presented where one or more possible different diagnoses may be initially debated. In this context the requirements for further investigation will be examined in correctly determining the underlying root cause of problems more accurately and confidently. The different categories of building failures which lead to the emergence of defects will then be discussed and the mitigation measures that should be undertaken to reduce the risk of such failures. In addition, the individual forces at work leading to different types of defects and how these can vary depending on climate and the geographical locations around the world will be articulated. Furthermore, the difficulties and challenges of correctly identifying faults and defects to building services such as heating, lighting, fire alarms, cooling and other forms of gas and electrical installation will be explained, and practical examples provided.

The importance of understanding the nature and effect of agents that can lead to building defects will be examined in detail, including human misuse of buildings and deliberate vandalism, coupled with electromagnetic, mechanical, chemical, building user, thermal and biological related forces and effects at work. The wrong use of materials and components and design defects will be discussed and how these can develop into latent construction defects in the future, therein introducing maintenance liabilities for building owners. Thereafter, the magnitude of managing remedial works and the associated disruption that this can bring for building users will then be investigated with reference to different examples in practice. Dilemmas associated with repair or renewal decisions will be introduced and debated in detail and the overall effects that decision making can have on future maintenance and lifecycle costings analysis. This will entail a discussion around capital cost (CAPEX) versus operational cost (OPEX) perspectives. Following on from this, the various influences of different factors on the repair or renewal decision making will be covered, including capital funding, building longevity and potential disruption from proposed remedial works.

Managing the remedial works processes to address maintenance issues and defects will be examined, with a focus on best practice and achieving the correct level of supervision and quality control throughout the contract period. This will introduce quality control and best practices in selecting the right design, a team and contractors from the perspective of attaining the necessary skills, experience and competency levels required to undertake projects successfully. Finally, measures to mitigate and prevent defects will be

covered and the importance of allowing access provisions in building to enable and carry out regular maintenance inspections as part of planned preventative maintenance programmes.

### 1.2.3 Chapter 4 Maintenance Management and Performance Measurement as Part of Private Financing Initiative (PFI) Schemes

The chapter will start with a background to the discussion on performance measurement (PM) of maintenance and other facilities management services in the healthcare sector. In this sense it will articulate some of the problems that PM initiatives have experienced in the past. Furthermore, it will also provide justification for highlighting the issue of performance measurement linked to PFI initiatives and explain the reasons why it is widely regarded as a 'hot topic'. Thereafter it will explore the definitions and concepts of facilities management, the application of performance measurement in a healthcare PFI setting and the impact of performance measurement on service and quality improvements. The significance, importance and challenges for PM around facilities management on a PFI scheme will then be discussed. This will include such issues as financial dilemmas facing the healthcare sector in the UK and how it has been tasked to achieve more with less, and targets to improve the quality of the health service whilst reducing cost. Other challenges for maintenance and facilities management will be covered, including the need to increase accountability, drive up quality, meet increasing demands on maintenance and facilities outcomes, make efficient savings and re-energise value-for-money approaches. In the context of such challenges further explanation will be presented on why these factors have all led to renewed interest in the direction of performance measurement. In addition, it will also explore payment mechanisms as one of the underlying reasons for measuring performance in a PFI healthcare project as a gain share/pain share initiative. In this sense, it will explain the issues around deduction of payments for poor performance and conversely financial incentives for exceeding targets. Various performance measurements for improving maintenance and facility management outcomes tools are then explored alongside the role of key performance indicators (KPIs). The benefits of performance measurement will be articulated from a position of presenting a clear picture of where improvements are actually happening.

Justification for introducing measure performance measures on PFI schemes and the need to assess progress against predetermined objectives will be covered. This will include measures to identify areas of strength and weakness and the need to align future initiatives with the aim of helping to improve the organisational performance. The chapter will then extend into performance measurement as applied to quality improvements in maintenance and facilities management practices. Financial and non-financial measurements, being the primary variables that can be used to research the construct of performance measurement in most organisations, will then be examined. The various forms of performance monitoring tools will be identified and analysed and how these relate to benchmarking and key performance indictors. Finally, key issues arising for performance management as part of a facilities management (FM) tool on PFI schemes will be articulated and discussed, alongside reflections for the future.

### 1.2.4 Chapter 5 Procurement and Contracting for Maintenance and Refurbishment Works

This chapter will look at the processes associated with the procurement and contracting of refurbishment and maintenance works. It will emphasise the importance of the way we buy from the construction industry and how this will ultimately decide the success or failure of projects. Furthermore, it will introduce strategic procurement as a tool to elicit project performance requirements and will make the case for businesslike approaches to procurement strategies. The chapter will then introduce the various procurement routes which can be adopted for refurbishment and maintenance projects before providing an overview of procurement governance requirements as projects are commissioned within the marketplace. The second section of the chapter will deal with contracts and contract selection. Given the dominance of the Joint Contract Tribunal (JCT) and New Engineering Contract (NEC) in the UK construction market, this chapter will conclude by introducing the JCT and NEC contract suites before exploring the various contract options with each suite suitable for the management of building maintenance and refurbishment projects.

### 1.2.5 Chapter 6 Financial Management: Capital Costs

This chapter will focus on the capital costs and financing arrangements of building work, including refurbishment and maintenance, which is a growing area with a predicted market value of total construction work in the UK alone of £66bn. The scope of this chapter will look at how the capital costs of such works can be managed and controlled from their inception until the point that the construction phase is completed. Furthermore, it will explain and discuss the trigger for these works from different perspectives, including from building surveys or alternatively from strategic reviews carried out on organisations' asset requirements.

This chapter of the textbook will show how pre-contract financial management develops through the option selection and design phases of projects. It will also articulate the phases of pre-contract financial management implemented by the cost consultant/quantity surveyor from the very outset of projects. As the design develops, the chapter will explain how the cost consultant/quantity surveyor will move forwards with their financial management of the pre-contract stages of the project, and how cost plans will be produced. Thereafter it will explain how cost plans provide statements of how the available budget will be allocated to the various elements of the building.

### 1.2.6 Chapter 7 Financial Management: Life Cycle Costing

This chapter will look at the growing importance of life cycle cost analysis with a major focus on predicting the costs of maintenance, occupancy and replacement of elements, sub-elements or components over many years. It will consider the longer-term interests that both clients and tier one contractors are now taking, and the paradigm shift in focus away from lowest price award mentality in favour of one led by a longer-term focus on value. It will stress the trade-off between the initial capital costs and longer-term operational costs of assets or components, especially in the public sector. As this balance

continues to play out in the marketplace, the chapter will stress the importance of how future maintenance costs can be forecast in an ever-changing facilities management environment. However, it will discuss how further effort is required if the deeply ingrained business culture that compartmentalises capital and maintenance funding is to be overcome on traditional projects. In addition, it will introduce TOTEX, CAPEX and OPEX costs related to buildings and discuss the way many organisations manage their asset budgets. Finally, the chapter will introduce the New Rules of Measurement (NRM) and the life cycle cost plan.

### 1.2.7 Chapter 8 Sustainable Maintenance Management

This chapter will introduce the idea and concept of Sustainable Maintenance Management and will argue for a change in construction industry practices that embraces the role and importance of the building maintenance professional during the construction stage of works. It will explain the knowledge and experience during the capital expenditure stages that will ultimately lead to a more sustainable and efficient operational stage of a building's life. Thereafter the circular economy will be introduced and how it is challenging and changing the historically linear thinking of the built environment when it comes to the sourcing of materials.

Concepts such as carbon neutral and retrofitting will be outlined in the chapter and their importance to the role of the building maintenance professional discussed. Reporting frameworks, such as BREEAM, will also be highlighted and how they can be used for the maintenance of buildings. The corporate social responsibility (CSR) of building maintenance companies will then be discussed as well as the principles of the concept generally and how it can guide the sustainable and socially responsible behaviours of organisations. Finally, the Sustainable Development Goals (SDG) will be introduced as a method of bringing together the actions of nations, organisations and individuals to help navigate the different sustainable options that exist and attempt to focus behaviours for maximum positive impact.

### 1.2.8 Chapter 9 Risk Management

This chapter will describe and explore how building maintenance professionals encounter risk, both contractually and from the physical risks involved in the maintenance of buildings. It will introduce the concept of risk and explain the traditional view of risk which has always been somewhat pessimistic. Conversely, it will present the upside of risk and will explain how risk can provide potential opportunities rather than just threats. It will define and analyse the notion of risk and provide an exploration of how the correct actions be taken with regards to the retaining or transferring of risks. It will explain how consideration of risk in the round is essential in the current climate of the built environment when it comes to the maintenance of buildings and assets. Finally, the chapter will then discuss the tools and techniques that can be adopted by building maintenance professionals to help protect themselves (and the buildings they maintain) against excessive and unnecessary risk exposure.

### 1.2.9 Chapter 10 Managing the Maintenance Process

This chapter is focused on programming and planning, and reactive and proactive, maintenance. It will touch upon dealing with site constraints, and health and safety management when maintaining buildings and will include some elements on health and safety files and building information modelling (BIM).

It is important to have an appreciation of the maintenance process, and for the key management requirements to be understood. It is only through such an appreciation can any maintenance project be managed effectively and the intended targets achieved. The effective management of maintenance works can also lead to reduced health and safety accidents and increased building performance. Therefore, this chapter will give an overview of how to manage the maintenance process. Key areas of importance will be covered, including how to plan for maintenance works and the distinctions of proactive (scheduled) and reactive (corrective) maintenance. The importance of maintenance schedules and how they can form the basis of wider programmes of work will also be discussed, alongside the key benefits of programming and planning. In addition, the key attributes required from those collaborating in the creation and development of a building maintenance programme will be analysed.

The importance of inspecting works at the earliest opportunity and the key considerations to be made regarding site and task constraints will also be included. An overview of prevalent and successful health and safety initiatives will be provided and an introduction to, and discussion of, the benefits of adopting a soft-landing approach. Finally, the current and potentially future practices of the building maintenance professional's role will be discussed, and how by engaging them at an earlier stage in the construction process this can lead to more success in operating a building.

### 1.2.10 Chapter 11 Conclusion

The book will finish with an overall summary of the main points raised in each of the above chapters. It will provide conclusions to the themes and subject areas discussed and provide much needed reflection and recommendations in some cases for improvement in future practice.

## 1.3 Research Sources

The research for the book has been derived from a combination of sources which include the authors' own experiences, interviews with a wide range of construction professionals, and literature. The book is mainly intended for construction practitioners, including employers, design teams, contractors, subcontractors and lower levels of the supply chain. It could also be useful for teaching and learning and suit a wide target audience including under- and postgraduate students and academics. The authors are hopeful that it will make a constructive and useful contribution to the field.