UNIVERSITY OF NAIROBI

AN INVESTIGATION INTO THE MAINTENANCE OF HIGH-RISE BUILDINGS; POLICIES, PRACTICES AND CHALLENGES.

A CASE STUDY OF NAIROBI.

BY

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B04/0850/2010

A Research project submitted in part fulfillment for award of Bachelor of Real Estate Degree in the Department of Real Estate and Construction Management, School of Built Environment, University of Nairobi.

MAY 2014
DECLARATION

CANDIDATE’S DECLARATION

I, **NDUHIA NICHOLAS MBUTHA**, hereby declare that this research is my original work and has not been presented for a degree in any other university.

Signed……………………………… Date……………………

**NDUHIA NICHOLAS MBUTHA**

SUPERVISOR DECLARATION

This research has been submitted for examination with my approval as the University supervisor.

Signed……………………………… Date……………………

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I am grateful to the property managers and tenants who provided me with the data for this research.

To everyone else who made this possible and successful; thank you.
DEDICATION

This work is dedicated to my parents Mr. and Mrs. Nduhia. May the Almighty God always watch over you.
TABLE OF CONTENTS

DECLARATION..............................................................................................................i

ACKNOWLEDGEMENTS..............................................................................................ii

DEDICATION..................................................................................................................iii

TABLE OF CONTENTS....................................................................................................iv

LIST OF FIGURES..........................................................................................................ix

LIST OF MAPS................................................................................................................x

LIST OF TABLES.............................................................................................................xi

LIST OF CHARTS.............................................................................................................xii

LIST OF PLATES.............................................................................................................xiii

LIST OF ACRONYMS........................................................................................................xiv

ABSTRACT......................................................................................................................xv

CHAPTER ONE: INTRODUCTION....................................................................................1

1.0 Introduction..............................................................................................................1

1.1 Problem Statement..................................................................................................4

1.2 Study Hypothesis....................................................................................................5

1.3 Objectives of the study..........................................................................................6

1.4 Research Questions.................................................................................................6

1.5 Scope and Area of Study.........................................................................................6

1.6 Justification of the Study.........................................................................................8

1.7 Organization of the study.......................................................................................9
# CHAPTER TWO: LITERATURE REVIEW

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>Introduction</td>
<td>10</td>
</tr>
<tr>
<td>2.1</td>
<td>Maintenance</td>
<td>10</td>
</tr>
<tr>
<td>2.1.1</td>
<td>Need for Maintenance</td>
<td>11</td>
</tr>
<tr>
<td>2.1.2</td>
<td>Maintenance Operations</td>
<td>13</td>
</tr>
<tr>
<td>2.1.2.1</td>
<td>Servicing</td>
<td>13</td>
</tr>
<tr>
<td>2.1.2.2</td>
<td>Rectification</td>
<td>14</td>
</tr>
<tr>
<td>2.1.2.3</td>
<td>Replacement</td>
<td>14</td>
</tr>
<tr>
<td>2.1.2.4</td>
<td>Rehabilitation</td>
<td>14</td>
</tr>
<tr>
<td>2.1.2.5</td>
<td>Repair</td>
<td>15</td>
</tr>
<tr>
<td>2.1.2.6</td>
<td>Renovation</td>
<td>15</td>
</tr>
<tr>
<td>2.1.2.7</td>
<td>Refurbishment</td>
<td>15</td>
</tr>
<tr>
<td>2.2</td>
<td>Types of Maintenance</td>
<td>16</td>
</tr>
<tr>
<td>2.2.1</td>
<td>Planned Maintenance</td>
<td>16</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Unplanned Maintenance</td>
<td>16</td>
</tr>
<tr>
<td>2.3</td>
<td>Maintenance Management and Organization</td>
<td>18</td>
</tr>
<tr>
<td>2.3.1</td>
<td>Maintenance Labour Structures</td>
<td>20</td>
</tr>
<tr>
<td>2.3.2</td>
<td>Factors affecting Maintenance Decisions</td>
<td>21</td>
</tr>
<tr>
<td>2.4</td>
<td>Maintenance Planning</td>
<td>23</td>
</tr>
<tr>
<td>2.4.1</td>
<td>Maintenance planning system</td>
<td>24</td>
</tr>
<tr>
<td>2.5</td>
<td>Maintenance Policy</td>
<td>26</td>
</tr>
</tbody>
</table>
2.6 Maintenance Challenges

2.6.1 Legislative and policy constraints

2.6.2 Institutional challenges

2.6.3 Financial problems

2.6.4 Management problems

2.6.5 General personnel and equipment problems

2.6.6 Design, construction and user generated problems

2.7 Legislation governing maintenance in Kenya

2.7.1 Public Health Act (Cap 242)

2.7.2 Rent Restriction Act cap 296

2.7.3 Sectional Properties Act

2.7.4 The Landlord and Tenant (Shops and Catering Establishments) Act Cap 301

2.7.5 Occupiers Liability Act Cap 34

2.7.6 Environmental Management and Co-ordination Act

2.7.7 Factories Act Cap 514

2.8 Building Elements and Possible Defects

2.9 Summary

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

3.1 Study Area

3.2 Population
3.3 Sample and Sampling Techniques. ..............................................................40
3.4 Variables of the Study.............................................................................40
3.5 Data Collection.......................................................................................42
3.6 Difficulties Encountered in Collecting Data............................................43
3.7 Data Analysis and Presentation..............................................................44

CHAPTER FOUR: DATA ANALYSIS AND PRESENTATION......................46
4.0 Introduction............................................................................................46
4.1 The Buildings Studied...........................................................................46
4.2 Maintenance Policy and Maintenance Practices......................................47
4.2.1 Undertaking Corrective Maintenance Activities.................................53
4.2.2 Maintenance Planning and Prioritization of Maintenance Work...........55
4.3 Funding for Maintenance......................................................................56
4.4 Labour Structure and Selection.............................................................58
4.5 General Condition of the Buildings in Nairobi CBD..............................61
4.6 Condition Rating of the building elements.............................................66
4.7 Maintenance challenges/ Problems.......................................................69

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS...............73
5.0 Introduction ...........................................................................................73
5.1 Summary of Findings............................................................................73
5.2 Test of the Study Hypothesis.................................................................75
5.3 Conclusions..........................................................................................75
5.4 Recommendations ........................................................................................................... 77
5.5 Areas of Further Study ........................................................................................................ 79

BIBLIOGRAPHY ...................................................................................................................... 80

APPENDICES .......................................................................................................................... 84
APPENDIX A: Questionnaire for Maintenance Managers .............................................. 84
APPENDIX B: Questionnaire for Tenants ........................................................................ 90
APPENDIX C: Introduction letter ...................................................................................... 93
LIST OF FIGURES

Figure 3.1: Framework for Data Analysis and presentation..........................45
LIST OF MAPS

Map 3.1 Showing the Study Area..........................................................39
LIST OF TABLES

Table 3.1 Indicators for Measuring Building Maintenance……………………………….42
Table 4.1 Policy Provision for Various Elements…………………………………………49
Table 4.2 Enforcement of the maintenance policy…………………………………………50
Table 4.3 Maintenance Activities……………………………………………………………52
Table 4.4 Response Time……………………………………………………………………54
Table 4.5 Prioritisation of Maintenance work……………………………………………56
Table 4.6 Methods of Financing……………………………………………………………..57
Table 4.7 Factors Considered in Selecting Labour………………………………………58
Table 4.8 Labour Selected……………………………………………………………………60
Table 4.9 Condition Rating of the building Elements……………………………………67
Table 4.10 Building Rating……………………………………………………………………68
Table 4.11 Maintenance Challenges…………………………………………………………72
LIST OF CHARTS

Chart 4.1 Policy Provision for Various Elements.................................50
Chart 4.2 Maintenance Activities. ..........................................................53
Chart 4.3 Prioritisation of Maintenance Work........................................56
Chart 4.4 Methods of Financing.............................................................57
Chart 4.5 Factors Considered in Selecting Labour...................................59
Chart 4.6 Labour Selected......................................................................60
Chart 4.7 Condition Rating in Percentage.................................................69
Chart 4.8 Maintenance Challenges...........................................................72
LIST OF PLATES

Plate 4.1 Peeled off ceiling in Pano House.................................................................61

Plate 4.2 Stains and Cracks on wall surface in Ngao House........................................62

Plate 4.3 Discoloured ceramic tiles in Ngao House ......................................................63

Plate 4.4 Exposed electricity wires in Corner house....................................................64

Plate 4.5 Worn out pavement outside Common Wealth..............................................65

Plate 4.6 Littered drain at Pano House.......................................................................65
## LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADB</td>
<td>Africa Development Bank</td>
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<tr>
<td>BS</td>
<td>British Standards</td>
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<tr>
<td>CBD</td>
<td>Central Business District</td>
</tr>
<tr>
<td>CBR</td>
<td>Central Bureau of Statistics</td>
</tr>
<tr>
<td>CBTUH</td>
<td>Council of Tall Buildings and Urban Habitats</td>
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<tr>
<td>DLOs</td>
<td>Direct Labour Organizations</td>
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<tr>
<td>EMCA</td>
<td>Environmental Management Coordination Act</td>
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<tr>
<td>GCI</td>
<td>Galvanized Corrugated Iron</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>KICC</td>
<td>Kenyatta International Conference Centre</td>
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<td>KNBS</td>
<td>Kenya National Bureau of Statistics</td>
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<tr>
<td>MDU</td>
<td>Multi Dwelling Unit</td>
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<td>NEMA</td>
<td>National Environment Management Authority</td>
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<td>NSE</td>
<td>Nairobi Stock Exchange</td>
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<td>NSSF</td>
<td>National Social Security Fund</td>
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<tr>
<td>PVC</td>
<td>Polyvinyl Chloride</td>
</tr>
</tbody>
</table>
ABSTRACT

Buildings are very important to mankind due to their investment and social values. Maintenance of these buildings is critical for their preservation and ensuring that they continue to; serve the intended purpose, yielding optimum returns, meeting health and safety standards and providing comfort to the users. Properly maintained buildings attract higher returns thus maintenance should be seen as a viable investment.

Regular maintenance proves to be much more economical in the long run due to enhanced serviceability. Maintenance of serviceability of buildings is of universal importance and gigantic in nature as the cost of maintenance, repair and rehabilitation runs into many thousands if postponed. Enhancement of durability, longevity and serviceability of building structures depend upon careful design, sound construction, good workmanship and continuous maintenance.

This study was an investigation into the maintenance of high-rise buildings; policies, practices and challenges in Nairobi. The study objectives were to establish the maintenance policies, practices and challenges faced in undertaking maintenance activities and make recommendations on possible solutions.

The researcher established that most of the maintenance authorities had a policy that had provisions for the following elements; resource allocation, performance requirements, execution of work and administrative activities. It was found out that various types of maintenance activities are in place which include; planned maintenance, unplanned maintenance, emergency maintenance and predictive maintenance.

It was found out that different managers carry out various maintenance activities differently. The various divergent approaches arise from activities such as; funding for maintenance, planning and prioritization of maintenance works, factors considered in selecting labour for maintenance operatives, procedure adopted in undertaking emergency maintenance and factors considered. The study revealed that the different approaches used lead to the differences in the maintenance condition of different buildings.
The study also provided an assessment of the state of the selected buildings indicating their condition with regard to various elements and the overall building rating. The elements of consideration were; roofs, walls, floors, fixtures and fittings, foundations and building services. The study established that the problems ascribed to poor maintenance condition of the buildings was attributed to; the age of the buildings, inadequate funds and high cost of maintenance, lack of maintenance policy, lack of proper skills by maintenance staff, lack of commitment on the part of occupants and general wear and tear.

The study reveals that building maintenance is a real problem among most high-rise buildings in Nairobi. The research establishes that maintenance practices employed are the main cause of poor maintenance of high-rise buildings in Nairobi.

Various recommendations have been proposed by the researcher to help improve maintenance strategies aimed at addressing the problem of poor maintenance in high rise buildings in Nairobi as well, elsewhere within the country or the world. These include; proper financial planning and budgeting, employing qualified staff to oversee maintenance works, clear communication networks among others.
CHAPTER ONE

INTRODUCTION

1.0 Introduction.

Physical infrastructure constitutes a high proportion of a country's investment. It is therefore, of core importance that these facilities which include buildings be maintained in order that they can serve the various purposes for which they were intended. The physical appearance of buildings and other infrastructure partly constitutes the basis upon which the society makes their initial judgment of the quality of services to be offered.

Maintenance brings about improved utilization of buildings ensuring the highest safety standards. It must be emphasized that maintenance work is necessary if the value and amenity of the nation’s building stock is to be maintained. A good disaster mitigation system is more of a good maintenance system. A well operated maintenance system for buildings and equipment has the overall results of being an effective disaster management and mitigation measure in terms of facilities usage and cost saving. This ensures the most economical way to maintain the buildings and the equipment in best of form and condition for normal usage, given the original design and materials.

There are different types of buildings which range from simple structures to the complex modern structures. They include; huts, bungalows, flats, apartments, mansions, storied houses, high-rise buildings, skyscrapers, etc.

High-rise buildings form part of the key components of development in a city or a town. A high rise/tower block is a tall structure used as a residential or an office or commercial spatial accommodation. In some areas they may be referred to as "MDU" standing for "Multi Dwelling Unit". Revised standards on building techniques, building materials and modern technology indicates that building life can last for up to over a hundred years.
High-rise buildings became possible with the invention of the elevator (lift) and cheaper, more abundant building materials. The materials used for the structural system of high-rise buildings are reinforced concrete and steel (Wikipedia 2013).

Since land in the CBD is a very valuable commodity, tall buildings respond to the need of maximizing the income that can be derived from a piece of land in prime locations resulting to tall buildings. High-rise buildings are therefore a towering illustration of a city’s determination to beat the recession and spur economic growth, i.e. “a huge commercial magnet that pulls scores of new businesses and offering vital employment opportunities for thousands of people” (Johnson, 2012).

A high-rise building is generally defined as a building that is taller than the maximum height which people are willing to walk up. It thus requires mechanical transportation. This includes a rather limited range of building uses, primarily office uses, hotels, commercial, residential apartments, mixed users, retail and educational facilities (Wikipedia, 2013).

In the U.S, the National Fire Protection Association defines a high-rise as being higher than 75 feet (23 meters), or about 7 stories. The International Conference on Fire Safety in High-Rise Buildings also defined a high-rise as "any structure where the height can have a serious impact on evacuation".

High-rise buildings require special attention compared to low-rise buildings in several considerations such as unique designs, enormous foundation, and structural systems for wind loads and high-rise constructing technology etc.

Effective building maintenance entails comprehensive maintenance policies and practices adequately identified and addressed. These should be integrated into the management of the building for proper surveillance and overseeing the activities. There are institutions mandated to allocate and co-ordinate building upkeep responsibilities yet acceptable maintenance standards are poorly achieved. This is due to several challenges that are prevalent both at the administrative level and the management level.

High-rise buildings pose particular design challenges for geotechnical and structural engineers, especially where the underlying soils have geotechnical risk factors of high
compressibility. High rise buildings also pose serious challenges to firefighters in cases of emergencies. The building systems such as the building standpipe system, fire sprinkler system, HVAC systems (heating, ventilation and air conditioning), stair well and elevator evacuations brings about various problems.

High-rise building blocks have economic and technical advantages in areas of high population density, and are a distinctive feature of housing and office accommodation in virtually all densely populated urban areas in the world. In contrast to low-rise buildings, high-rise buildings accommodate more occupants per unit area of space and decrease the cost of municipal infrastructure.

The state of built environment and physical infrastructure reflects complex social economic factors and the level of prosperity of a nation. Maintenance then becomes necessary to keep, restore or improve the building and its surroundings to accepted standards for several reasons which include; maintain public image, protect the physical asset, maintain rental values, retain residents, meet statutory requirements etc.

The layout of the building and its upkeep have a strong influence on the productivity of its occupants and their well being, at the same time the asset value of the building is affected by its maintenance (Wood, 2009).

Maintenance is based on three concepts; duty of care, present value concept and obsolescence. First is the concept of duty of care which endorses the provision that a building requires some level of attention in the course of its life, the basic level of activities being the day to day cleaning and servicing of various building parts. The intermediate level entails small repairs and renovations, while the intensive level concerns replacements (Gahlot, 2006).

Secondly, there is the present value concept which integrates the life cycle costing. This concept is used in making important decisions relevant to the management of buildings. It attempts to equate the initial costs, present value of the estimated maintenance costs, future value and the salvage value by discounting the initial cost of acquisition, replacement costs and running costs of alternatives to their present value where the most economical life-cycle cost is preferred (Peter Barrett, 2007).
Lastly there is obsolescence which endorses the three types of a building’s life: functional, economic and physical life and that, buildings lose their value as a result of wear and tear.

The physical life of a building is defined as the period during which the property and its constituent elements will remain physically possible for habitation and is related to the speed of wear and tear from regular use and impact of elements. It is determined by the composite elements of the building which tend to have different life cycles and thus at some point may require replacement.

The Economic life of a building is the period during which it is expected to remain useful while giving returns to the owner. For example it is the period over which tenants are willing to occupy the premises and derive their satisfaction.

This study investigates the maintenance policies, practices and challenges in high-rise buildings and recommends ways of improving the current state.

1.1 Problem Statement

Maintenance is a facet of property management that ensures buildings are always in sound structural condition, good state of repair, functional level of utilities and good decorative state. In most buildings within Nairobi maintenance is not convened the priority it deserves, this can be ascribed to the fact that the effect of poor maintenance may not be felt promptly. However, persistent levels of neglecting maintenance have a cumulative effect which could aggravate building defects. These accumulating building defects lead to raising the cost of repair and rectification in the long run (Obadiah, 2010)

Some buildings both public and private have not received any significant maintenance or show little signs of maintenance since they were constructed. This lack of maintenance by the authorities and occupants of these facilities often leads to reduced lifespan of these buildings (Melvin, 1992). This invariably defeats the purpose for which they were intended i.e. to maintain the nation's stock of buildings and infrastructure, both as a factor of production and accommodation.
The usage of a building result in wear and tear and exposure to natural forces cause deterioration of buildings. Human activities responsible for the deterioration/decay of building include: failure to clean and carry out planned maintenance, ignorance of the causes of deterioration and decay, failure to promote awareness of maintenance needs by all who use the building and adopting an ignorant attitude of waiting until emergency measures are required. Other factors that are responsible for the deterioration of building are; fire, faulty design, construction, materials and systems as well as vandalism.

Several observations show that poor maintenance levels are still rampant within Nairobi. The researcher depicts the abhorring situations in some buildings showing cracks on the walls, rotten wooden members, leaking roofs, missing louver blades, faded and disintegrated surface coating (painting), dilapidated nature of structures, poor elevator services, poor sanitary services(poor drainage), poor aeration, poor firefighting mechanisms, poor garbage collection etc. This is more prevalent in the downtown part of the Nairobi City Centre.

These defects and poor maintenance standards jeopardize the health and safety of the building users. Human life is exposed to diseases, injuries and other risks. Examples include where body cuts are inflicted by rusty exposed steel reinforcements, stagnant water in wash rooms provides breeding ground for disease causing micro-organisms, power failure during lift usage risks human life, poor general hygiene within a building endangers human life etc.

Poorly maintained buildings compel tenants who instead seek accommodation elsewhere. This leads to low demand of space in such buildings and consequently low rents, thus low profits. This leads to low value to the buildings, the neighboring buildings and investments. A badly maintained property not only depreciates in value but also has a depressant effect on neighboring properties (Syagga and Aligula, 1995).

Several cases of poor maintenance levels have led to loss of life in Nairobi, for example on 20th June 2013 in Interfina House along Tom Mboya Street, a 21 year old man plunged to his death when the lift doors opened only for him to fall in the lift well as there was no sign to indicate that the lift was faulty. Another similar incident occurred on 16th August 2012 at the NSSF Building where one person died and three others injured after a lift plunged from the seventh floor of the building. It was later established that the lift had mechanical problems.
Many other cases of poor levels of maintenance and habitability standards are rampant in the buildings within Nairobi.

Having made these observations, the researcher undertook research into the maintenance of high-rise buildings in Nairobi CBD to establish the current policies, practices and challenges. The research facilitates an analysis of the prevailing maintenance conditions and identifies several ways of sustaining and adhering to the same and the recommended possible solutions that may be employed in enhancing maintenance of buildings.

1.2 Study Hypothesis

Lack of planned maintenance activities is the main cause of poor maintenance in high-rise buildings in Nairobi.

1.3 Objectives of the study

The study objectives are:

1) To examine the maintenance policies in high-rise buildings.
2) To identify the maintenance practices in high-rise buildings.
3) To identify the challenges faced in undertaking the maintenance practices.
4) To propose possible solutions that may be employed in enhancement of maintenance of buildings.

1.4 Research Questions

1) What are the maintenance polices and legislations that are employed in maintenance of high rise buildings in Nairobi?
2) What are the various maintenance practices that are employed in maintenance of high rise buildings in Nairobi?
3) What are the challenges faced in executing maintenance work in high-rise buildings?
4) What are the possible ways of dealing with these challenges faced?
5) What are the recommended ways that may be employed in ensuring effective maintenance of high-rise buildings?

1.5 Scope and Area of Study

The area of study is Nairobi CBD where several high-rise buildings were taken as the case studies. Nairobi is the capital city of Kenya. It forms the largest urban centre in the country, occupying approximately 696 square kilometers and has the highest population compared to other Kenyan cities with a population of 3,375,396 people as well as the highest population density of 4,849 persons per square kilometer (Kenya Demographic Profile, 2013).

This study is confined to the maintenance of high-rise buildings in the CBD of Nairobi. Key areas of interest in this research are; maintenance polices, maintenance practices as well as the challenges faced in these buildings. The study is limited to high-rise buildings located in Nairobi CBD. As at the date of the study, there were approximately sixty five (65) high-rise buildings above ten (10) floors and approximately thirty five (35) high-rise buildings with floors between seven and nine floors. Buildings with less than seven floors are the majority within the CBD. High-rise commercial buildings were selected since they depict more maintenance activities compared to other types of buildings since they require higher due care and expertise in executing such maintenance activities.

The researcher felt that because of the underlying social, economic and political interests, Nairobi was selected for this study since it has more high-rise buildings than any other urban center in Kenya which therefore, suggests a relevant account of the study phenomena.

Most high-rise buildings in the CBD of Nairobi are under high demand for businesses, offices and hotels. Most high-rise building owners record significant success in renting out for such spaces in the buildings with most having an occupancy rate of over 90% as revealed by the study.

Some of the features of Nairobi are;

- Several high-rise buildings in Nairobi are headquarters to; business corporations, international companies and organizations.
Nairobi is home to NSE which is Africa's fourth largest stock exchange in terms of volumes of trading and fifth in terms of market capitalization as a percentage of GDP. The growing Kenyan economy at 4.7% as at 2014 according to Kenya National Bureau of Statistics (2014) and expected to grow at 5.2% by end of 2014 as projected by ADB; is as a result of enormous business and economic activities in the country. The CBD being the hub of businesses and capital centre of the country hosts and houses most of these businesses. This translates to high demand for space within the city centre and high rents per square metre. The high demand for space within the city led to the construction of high-rise buildings to maximize on the usage of space and higher returns in the form of rent.

This research concentrates on ten buildings selected randomly to give each high rise building an equal probability of inclusion in the sample. The researcher visited these high-rise buildings on a routine field work during the time of this research to check on the condition of the buildings. This helped in identifying the existing practices, policies and the challenges faced.

1.6 Justification of the Study

Nairobi embraces virtually all the important urban functions which include: international affairs, top administrative functions, educational and cultural institutions, transport and industries, it’s therefore the nerve center of Kenya and effective control, whether economically or politically, is tantamount to the control of the nation (Murigu, 2005).

An assessment of buildings in Nairobi CBD reveals that a number of buildings are under-maintained and substantial part of the building stock is in danger of deterioration below the point of economic repair.

Poor maintenance measures and practices adversely affect the condition of the building. Health and safety hazards in high-rise buildings can be minimized and indeed be eliminated through proper maintenance. Proper maintenance entails thorough daily cleanliness, timely and effective repairs, rectifications and replacements. Examples of occurrences that through
proper maintenance can be mitigated and or prevented include: blocked drains, electrocution caused by naked electric wires, fires caused by gas leaks, deaths caused by lift failure, etc.

The loss of human life due to irresponsibility in maintenance of buildings is unjustifiable. Human life is not recoverable; therefore employing preventive maintenance, corrective maintenance and predictive maintenance practices and integrating them will greatly minimize accidents, catastrophes and loss of life. The market trends in occupancy and demand of space are being inclined to buildings that are believed to be secure, safe, in good structural state, good state of repair and in good decorative state.

Proper maintenance of high-rise buildings lower the total costs incurred in the long run. It also prolongs economic life of a building as a capital investment, thus generating profits long into the future. The government also stands a chance to reap from the tax paid over the years thus raising revenue to finance its operations.

The findings and recommendations from the study are intended to add new knowledge to the field of maintenance of high-rise buildings. This knowledge shall facilitate proper maintenance of high-rise buildings not only in Nairobi but also the entire Republic of Kenya and across the world.

1.7 Organization of the study

This study is organized into five chapters.

Chapter one covers the introductory sections of the study. These are the introduction, the problem statement, the research hypothesis, the study objectives, research questions, the scope and area of study, justification of the study and the organization of the study.

Chapter two covers literature review. This chapter reviews literature on the issues of the concept of maintenance, maintenance management organizations, labour types, maintenance planning, maintenance policy and legislations governing maintenance in Kenya and nature of maintenance of buildings. It covers secondary materials related to the conceptual issues as
well as definitional and other factors affecting maintenance of buildings, policies, practices and challenges faced and legislations governing maintenance activities.

Chapter three covers the research methodology. It gives a background of the study area, population, sample and sampling techniques used to collect data, the instruments and the procedure used has been discussed. Data collection, analysis and presentation have also been covered.

Chapter four covers the data presentation and analysis. The chapter explains the integrated research techniques used to present the data. Qualitative and quantitative analysis were used to make comparisons, noting similarities and differences, making summaries and finally establishing patterns and relationships by use of percentages and tables.

Chapter five gives a summary of findings from the study and conclusions drawn. Recommendations and suggestions have been made based on the results of the findings, and testing of the hypothesis. Appendices are attached at the end of the study and the recommended further study.
CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews literature on the issues of the concept of building and nature of maintenance of buildings. Literature was reviewed from various secondary sources to give insights on various concepts on; maintenance, maintenance management organizations, labour types, maintenance planning, maintenance policy and legislations governing maintenance in Kenya. Possible challenges prevalent were also identified. Literature has also been reviewed on high rise buildings and the building elements and defects that arise during their use.

2.1 Maintenance

The term maintenance comes from the French verb “maintenir” which connotes to hold. It means to hold, keep, sustain, or preserve equipment, building or structure to an acceptable standard of serviceability.

British standards BS3811 (1964) defines building maintenance as ‘work undertaken to keep, improve, restore every facility of a site, building and its contents to an acceptable standard.’

Other definitions;

- Seeley (1993) defines maintenance as the combination of all technical and associated administrative actions intended to retain an item in or restore it to a state in which it can perform its required functions to an acceptable standard.

- A more functional definition proposed by White (1969) as cited in Lee (1986) is that ‘maintenance is synonymous with controlling the condition of a building including service so that the serviceability remains within specific region of acceptability including keeping machines and building assets in a condition that facilitates minimal interruption of services and maximize their potential.'
Maintenance may therefore be defined as the work undertaken to keep and or restore every part of a building and the associated infrastructure to an acceptable standard and to sustain its value. Maintenance work include; inspection, testing, planning, organizing, servicing, reclamation, rehabilitation, repair, refurbishment, re-building, renewal adaptation and setting standards.

The act of maintaining may require repair or replacement but the primary objective would be to avoid the need to repair or replacement of structural elements, fittings, services, equipment or finishes which collectively make up the building and its environment. This may include some upgrading to improve the original standards, where appropriate; to contemporary norms and the ratification of design faults.

2.1.1 Need for Maintenance

The condition and quality of buildings is a fundamental component of the quality of human life. The vast majority of people worldwide spend most of their time in or next to a building. This indicates that the built environment is turning out to be our ‘natural environment' (Wordswith and Lee, 2007). The condition and quality of buildings is a reflection of the public pride or indifference on the level of prosperity in an area.

The quality of a building is the totality of its attributes that enable it to perform and fulfill the need satisfactorily for an acceptable period of time. These attributes include; physical, external, performance, aesthetic and amenities.

In buildings; defects and failures arise from inadequacies and inequalities in treatment of products in design and construction and shortcomings in the products. The quality of a building is derived from quality of design process, construction, building care, products quality, equipment installed, building management and maintenance (George, 1998)

Dilapidated and unhealthy buildings tend to depress the quality of life and lead in some measure to anti-social behavior, poor health and low productivity. Desired level of maintenance cannot be considered in isolation, clearly construction resources are limited and the object should be to achieve the optimum allocation of manpower, materials and capital
between the maintenance and improvement of existing buildings and construction of new buildings.

Maintenance by arresting decay extends the physical life of a building and thereby delays replacement and defers expenditure on new construction i.e. substitutes for new construction if the building remains functionally satisfactory. This may require modifying internal layout to accommodate changing user requirements. The relationship between adaptability of design, building life, maintenance cost and new cost of construction is prevalent. The more adaptable the building, the longer the period of use, resulting in higher total maintenance costs but lower new construction costs.

Lack of repair or maintenance of buildings would further entail a huge cost on replacement at a later stage. Deteriorated buildings create unhealthy environment and unforeseen health to occupants which results in loss of productivity of people. Premature loss of buildings occurs due to ignorance, negligence or abuse of buildings. Neglect of maintenance has accumulative results and increasing deterioration of the building fabric and finishes accompanied by harmful effects on the contents and occupants (Seeley, 1987).

A building’s maintenance if well planned and executed has the potential of contributing sustainably towards the national economy. Estimates suggests that this account to over 5% of Kenya’s GDP, however, records available indicate that repair and maintenance only contribute to only less than 1% of the GDP. This is due to unsatisfactory performance attributed to maintenance challenges (Kenya Economic Review, 2011)

In Kenya, maintenance and management of buildings and related infrastructure which are the measure of national wealth and capital formation is not taken seriously and is a neglected field of practice and technology. Consequent to this, maintenance activities are undertaken in an ad hoc manner characterized by; few or no records being kept, low budgetary allocation and prioritization.

Regular maintenance proves to be much more economical in the long run due to enhanced serviceability. Maintenance of serviceability of buildings is of universal importance and gigantic in nature as the cost of maintenance, repair and rehabilitation runs into many thousands if postponed. Enhancement of durability, longevity and serviceability of building
structures depend upon careful design, sound construction, good workmanship and continuous maintenance.

Invention of new protective materials has made maintenance a highly controlled and scientific process. Well planned maintenance goes a long way in preserving our coveted structures and buildings (Gahlot, 2006)

The key concern of maintenance is to ensure a building and its services can perform its designed functions for the desired period of time with a high degree of reliability. Due regard should be paid to the overall economics of the maintenance operatives and safety of persons working in the building. According to Gahlot, 2006, the key objectives of maintenance include;

- To preserve buildings, its components and services in good condition.
- To restore buildings and its constituent services to original standards before deterioration occurred.
- To sustain the value and utility of the building.
- To prevent and slow down the rate of deterioration of the structures.
- To avoid crisis maintenance by regular and planned maintenance programmes.
- To meet statutory requirements for health and safety.

Maintenance makes the necessary impact only if the financial regulator of the building through correct diagnosis of defects ensures that funds are made available for such a purpose. Failure to undertake maintenance of a building will ultimately result in reducing the life span of the building and consequently result in demolition. Maintenance of the building will however ensure that the building is restored to its initial status and also increase the life span of the building.

2.1.2 Maintenance Operations

Maintenance operations can be classified into; servicing, repair, replacement, refurbishment, rehabilitation, renovation and rectification.
2.1.2.1 Servicing

Servicing is essentially a clearing action undertaken at regular intervals of changing frequency and is occasionally termed day-to-day maintenance. Daily sweeping of floors, cleaning of windows and regular painting are some examples of servicing. Servicing becomes necessary because of constant use of facilities, the effect of the weather and atmospheric conditions on the components of the building (Cobbinah, 2010).

2.1.2.2 Rectification

Rectification work usually occurs fairly early in the life of a building or sometime within the life span of the building. It deals with building components which if properly designed should last the entire life of the building without requiring attention e.g. foundation of a building which any necessary work would result from a faulty design or unforeseen change in ground conditions (Lee, 1987).

Rectification is the response to inherent defects in design, construction or installation stages of the building process. This provides an opportunity to “trade off” current capital expenditure against future maintenance costs.

Defect rectification requires a surveyor or a specialist to inspect carefully the cause of the defect and recommend the necessary action to be executed. The specifications for rectification of defects are normally prescriptive on how work should be done and any precautions or restrictions required (Wood, 2009).

2.1.2.3 Replacement

Replacement is unavoidable because service conditions cause materials to deteriorate at different rates. The replacement component is considered where, the functionality or aesthetically is unsatisfactory and where the repair and running costs is excessive (Lee, 2007).

Replacement work arises not so much from physical breakdown of the equipment or element but from deterioration of the appearance. This is because the extent of exposure of materials
to the vagaries of the weather varies, and the weather in specific locations also varies whilst the capacity of elements of buildings in withstanding changes and different intensities of the weather vary. This therefore becomes necessary as a result of material decay due to these differential rates of weather conditions.

2.1.2.4 Rehabilitation

It involves the upgrading of old buildings with or without adaptive modification for use. It involves the introduction of modern amenities into the building without altering its original use. This includes components which are prone to obsolescence as a result of technological advances or change in fashion. This applies to all types of surface finishes and fittings e.g. sanitary appliances. Rehabilitation arises in cases of lacking basic amenities, unfit dwellings, need of repair in dwellings etc. (Butterworth, 1992).

It is difficult to apply a time scale to changes. It is reasonable however to presume that the rate of alteration will increase and that there will be an increasing tendency to reject components which though still functional, will not measure to the standards of the time.

2.1.2.5 Repair

Repair is intended to revive a structure to its original state so that it operates as it was built for. It comprises of reactive responses to building elements’ deterioration and is essentially ad hoc in nature.

The evidence of wants of repair are; distortion or change of shape and degradation or change of physical properties. These manifest themselves in form of; cracks, discolouration, decomposing, collapses, alterations in structural geometry of components, chemical reactions, biological agents attack etc. (Lee, 2007).

2.1.2.6 Renovation

It consists of operations carried out to restore a structure, facilities and equipment by a major overhaul to the initial design and specification or towards improving on the original design. This may comprise substantial additions and extensions to the original structure or on the extreme re-building. Renovation constitutes the interface with improvement.
2.1.2.7 Refurbishment

Refurbishment involves replacement of missing parts or introduction of new decorative elements into a structure to restore it to its former good condition.

Work necessary to combat progressive deterioration take the following forms: patching which involves regular replacement of elements of the building components, preservation of protective coatings either for the purpose of extending the life of the protected material or maintain its appearance, and cleaning which has importance maintenance implications in arresting deterioration and preserving appearance.

2.2 Types of Maintenance

British standards BS3811 classify maintenance into two broad categories: Planned maintenance and unplanned maintenance.

2.2.1 Planned Maintenance

Planned maintenance is the maintenance carried out with the fore thought and control. It is as a result of an advance decision for action in the future in a predetermined plan and intended to reduce the possibility of an item not meeting a satisfactory condition. Planned maintenance follows on the continuum, though the maintenance categories are not mutually exclusive. Planned maintenance can be corrective or preventive.

a) Planned corrective maintenance is done to restore the building elements to functioning as originally intended or to suit a new design. It is the maintenance that warrants repair and rehabilitation when a building component fails or falls below the level of an acceptable standard.

b) Planned preventive maintenance is done before failure occurs in order to preserve the structure and its amenities at their present condition. It is a regularly programmed repair and upkeep required to keep a building element operating at peak proficiency
and extends its functional life. It includes scheduled activities and day to day maintenance work such as cleaning operations to maintain the appearance of a building, sweeping, refuse collection, loan mowing, periodic inspections and replacement of equipment such as replacing filters in an air-handling unit on a regularly scheduled basis.

2.2.2 Unplanned Maintenance

Unplanned maintenance is the maintenance carried out without a predetermined plan. In many cases, the precise actions of the reaction between the exposure, and use conditions and the resisting properties of the building elements cannot be known with certainty. Unplanned maintenance is closely related to corrective maintenance.

It helps rectify for faults that have already occurred. It involves all unscheduled actions performed as a result of system or product failure. Basically, it is an attempt to restore a system or product failure to a specified condition. Unplanned activities include; restoring lost electrical power, fixing a broken window, etc.

Other forms of maintenance include;

a) Corrective Maintenance. This is done to rectify the building to its original state of functioning before failure occurred. The works are executed on condition of building defects as revealed by the inspection or as reported by tenants. It deals with work that must be initiated for health, safety, and security reasons or that which may result in the rapid wear and tear of the structure or fabric if neglected, for example, repairing broken glass, roof repairs etc.

b) Emergency maintenance. This is the maintenance carried out with urgency to prevent adverse consequences. Even in the best worked out programmes there will be breakdowns and responses to these will be necessary. Such activities demanding emergency maintenance are; roof leaks, lift failure, door breakages, window breakages and flooding. Often therefore, the work carried out does not accord with that which may have been anticipated at the outset, when damage or defect was detected.
c) **Predictive maintenance.** Mather, (2008) defines predictive maintenance as measurements that detect the commencement of system degradation (lower useful state), thereby allowing fundamental stressors to be eliminated or controlled prior to any considerable deterioration in the components’ physical condition. Predictive maintenance helps evade unnecessary overhauls when analysis shows the equipment is in good condition.

d) **Deferred maintenance.** This is the maintenance that has been held back to a later time until finances are available. It is a frequent victim of budget cuts or pruning programmes. Maintenance is more usually seen as discretionary spending rather than an investment. Most misplaced arguments say that expenditure deferred is expenditure saved. Counter to this argument is that a ‘stitch in time saves nine’, therefore deterioration proceeds over time such that whereas at one time a minor repair or a mere redecoration, may suffice, at a later time a proportionately major repair or replacement (Wood, 2003).

Maintenance work has also been categorized as ‘predictable’ and ‘avoidable’. Predictable maintenance is regular periodic work that may be essential to preserve the performance characteristics of a component, as well as that necessary to replace or repair the element after it has achieved a useful lifespan. Avoidable maintenance is the work necessary to remedy failures caused by poor design, improper installation or the use of defective materials.

According to (Wordswith and Lee, 2007) maintenance can take the procedure outlined below:-

i) Building user or caretaker identifies the defect or damage.

ii) The problem is reported through the management line to the responsible officer.

iii) Equivalent communication to maintenance department is made.

iv) The maintenance clerk identifies the likely ‘trade required’ e.g. plumbing, electrician, carpenter, etc.

v) The clerk identifies contractor or staff.

vi) A repair order is placed on the respective premises.

vii) Maintenance operatives attend with regard to state reprogramming or purchase of correct materials.
viii) Repair is executed.
ix) Clerk attends for quality checks and identifies further problems if available.

With the various types of maintenance as indicated above, choice of maintenance options to partake is either condition based or schedule based.

2.3 Maintenance Management and Organization

The functions under maintenance management are mainly of a technical nature and concerned with the planning and control of construction resources to ensure that necessary repairs and renewals are carried out with utmost efficiency and economy. The major decisions relate to the following aspects; determining the standards to be achieved, planning inspections, identifying and specifying the work necessary, estimating the cost of work, planning of work, organizing the execution of the work and controlling the cost, performance and quality of work done (Wordswith and Lee, 2007).

Maintenance organization is used to describe the person(s) responsible for planning and control of maintenance operations. In a small firm the functions maybe undertaken by a member of staff in addition to his duties, while in a large corporation there should be a separate group of persons responsible for maintenance. The maintenance organization must oversee the generation of maintenance work, execution of the work, control of operations, provision of feedback, financial control and evaluation of performance.

The structure of an organization is usually represented by a hierarchical allocation of formal responsibilities and linking mechanisms between the various roles. This is usually backed up with a corporate plan that sets out the generation obligations and policies of the organization and job specifications which outline the duties of various members of staff and indicate to whom they are responsible and the limits of their authority.

The structure of maintenance organization could be centralized (functional) or decentralized (territorial/geographical). The size and structure of an organization will depend upon several factors which include;

i) The volume of workload which determines the staff and time required.
ii) The nature and complexity of work which determines desirable qualification.

iii) The location and dispersal of the work which influence travel time and number of supervisors required to maintain effective control.

iv) The timing of work which may require undertaking outside normal working hours and may demand duplicated supervisory staff to ensure continuous control.

v) Skill and reliability of operatives.

vi) Building owners’ or users’ or policies for different building types.

vii) Method of executing work.

In practice, there are a varied range of structures ranging from the extremely informal arrangements common in small private firms to the complex hierarchical systems adopted by large local authorities and government departments. Management at every level develops its own policies with its own sphere of responsibility and scope for decision making. Decisions at different levels in the organization must be compatible and clearly understood and implemented by all involved. Success is dependent on the capability to attain the management objectives.

In small organizations; the proprietor, manager and staff may work alongside each other and discuss job information, values and standards. In this, problems are roughly categorized and operatives have few loosely defined routines with intermingling roles. There are few levels of management that may not be clearly distinguished and coordinated. On the other hand, the organization with a large direct labour force, work is usually divided into smaller, clearly defined units that are managed by formalized routines with detailed job descriptions, rules and procedures for each individual. Coordination is achieved by a hierarchy of positions with powers of each unit defined. The management’s success is dependent on the ability to set objectives and means of achieving them.

People work more effectively together if their individual roles are parallel and do not diverge. A major part of labour relations is to do with keeping the objectives of all concerned sufficiently close to ensure that the objectives are achieved by joint efforts of all. Management by exception is an important concept in management organization since it deals with establishing objectives and the means of achieving them where attention is focused on deviations or ‘exception’ from the main plan. This involves providing adequate means for
monitoring performance against the set targets, so that exceptions can be identified sufficiently early and corrective action to be taken.

2.3.1 Maintenance Labour Structures.

Organizations have various ways of carrying out their maintenance works. The various labor structures that are employed to undertake maintenance work include; direct labour sourcing/in-house labour, specialist contracts and general contracting.

Direct labour sourcing deals with employing own staff to undertake maintenance work. This work may range from general, multi-skilled, or unskilled, handyman to a team of operatives with a range of skills. These individuals or teams are generally known as DLOs because the staff is directly employed as part of the client organization and exists for a long time.

Specialist contracts are considered in cases where specific works need to be executed. The works are normally emergency works and occurring in small bits. The specialist works are normally not enough to keep the specialist operative fully employed. Such works include; complicated brickworks, tiling, slating, marble floor finishes, gas, electrical and telecommunication systems, underpinning foundations etc.

General contractors undertake serious maintenance and construction works. They engage in finding the required personnel by subcontracting as and when required.

The choice between employing staff directly and engaging an independent contractor for that purpose should be decided according to which offers the greater advantage in terms of cost, quality and convenience, however, the choice is influenced by the overall company policy. The choice between direct labour sourcing and contracting is based on the following factors; nature of work, volume of work, quality expected, response time to urgency, location of the maintenance work, security precautions, market conditions, cash flow, total costs among others.

Potentially in-house labour is more economic than outsourced staff by at least the profit margin included by the contractor in his tender. Considering additional tax, payroll and redundancy obligations, decision making should rest in the analysis of the particular advantages and disadvantages in the context of the needs of the organization (Lee, 2007).
In respect to non-manual services in building maintenance management, the decision to use consultants for some type of administrative and professional work will be related to the nature of the organization and the business climate. Outsourcing strategies may be demanded at higher corporate levels due to the need to keep cost overheads low. Both direct labour and contracting maybe employed with the aim of minimizing the total costs of executing maintenance work.

2.3.2 Factors affecting Maintenance Decisions.

Maintenance decisions are based on expediency over a period of time. This represents a series of ad hoc and unrelated conciliations between the immediate physical needs of the building and the availability of finance. There are a number of considerations to be made in determining the most appropriate timing and scale of maintenance action and not limited to; costs, availability of finance, effects of service failure, availability of parts and spares, convenience, changing standards, acceptable performance, skills and staff availability, warranty and service agreements, value etc. (Wordswith and Lee, 2007).

Decision making focuses around the managerial task sensing problems and choosing between possible solutions. Problem solving involves implementation of the solution along with the solution follow-up and control. Decision making process begins with exploration of the nature of the problem, continues through the generation and evaluation of possible solutions, culminating in the choice of an option, the objective being that the manager considers the most relevant factors that will be considered for the necessary action to be taken (Peter Barrett, 2007).

The most important decision to make based on the life (physical, functional and economical) of the building is to carry out building work, adaptation work, or maintenance work based on the cost of the building work. From the initial stages of construction, discounting is used to calculate the present value of the sum of all costs due in the future for different methods of construction, materials and their maintenance based on their economic life. The appraisal of all the proposals is then made and a decision made in regard to adoption of a particular proposal, based on most economical solutions (Peter Barrett, 2007).
According to Gahlot, (2006), the decision to carry out maintenance work is affected by a number of factors which include:-

a) Age of the building

Buildings and structures consist of materials and components linked together to form a devised unit of accommodation. All such components and materials will start aging from the time they are affixed in the structure. A building thus has a certain life expectancy due to the wearing out of its components which has different lives. The wearing out thus reduces the serviceability of the building and this affects the remaining useful life. A planned programme of inspections is thus necessary to obtain maximum life out of materials, components, services and equipment in the building.

b) Cost

The cost of maintenance comprises of direct and indirect costs. The direct cost includes maintenance materials which vary to a great extent and thus costs, labour, transportation costs, etc. The direct cost in maintenance operations ranges from 70-90% of the total costs (Sharma, 2006). Indirect costs are the hidden costs that emerge later in the maintenance stages, they include; safety aspects, hazardous control, storage costs and other overhead costs.

c) Urgency

Urgency outplays the other factors in decision making in maintenance work. Some tasks may be required urgently otherwise, render components unserviceable thus causing inconvenience. Based on how urgent is ‘urgency’, decisions are made accordingly either immediately within hours or days.

d) Availability of resources

Availability of resources such as finances, time, labour, physical resources is key in determining how maintenance work will be carried out. The physical resources include the materials, components, equipment which is necessary for maintenance. These resources should be incorporated in the maintenance plan.

e) Social and environmental considerations
Most agencies carrying out maintenance work creating disturbance such as noise, dust, smells, temporary interruption of services etc. The maintenance work should thus observe these social responsibilities. Little or no harm to the environment is important to consideration. A pleasant environment that is clean and safe should be created by regular and planned maintenance of the building components and structures.

f) Future use

The future use of a building is paramount to consideration in deciding when and how much maintenance to carry out at any given time. For example if the lease is for a short period and change in occupancy is expected, then the maintenance must be accordingly planned especially if carried out by the tenant.

Seeley (1993) on the other hand summarizes the principal criteria which could influence the decision to carry out maintenance briefly as, cost, age and condition of property, availability of adequate resources, urgency, future use and sociological considerations.

2.4 Maintenance Planning

Maintenance planning involves determining systems and sequence of operations necessarily involving a level of prediction which relates to both the state of the building stock and its degree and manner of deterioration, and future policy of the owners or users of the buildings. It makes economic predictions about the cost, interest rates, contingencies and predicting unusual events, disaster planning, economic statutory and social change’s impacts on maintenance operations.

Maintenance planning goes hand in hand with what needs to be achieved, goals, the desired end point and means of achieving it. The development of a strategy is a high level activity which gives the designed plan the long term objective of functioning.

A SWOT analysis captures initial thoughts on strengths, weaknesses, opportunities and threats, enabling discussion and preliminary determination of where priorities and preferences for future directions may lie. It gives the need for more formal options appraisal,
based on more thorough market analysis, market testing and assessment of capability and risk (Brian Wood, 2009)

There is need to differentiate between planning and programming. Planning entails process of management under; determining maintenance policy, preparing maintenance programmes, getting the work done, controlling progress of work, budgeting and monitoring the effectiveness of the programme. Programming entails a series of activities scheduled as they should occur along a certain timeline.

All work that must be done or recommended is identified over the period to which it relates and its limitations on applicability. The long term prognosis of building’s future may change over time rendering the proposed activity no longer appropriate. To this effect, surveys are integrated in the planning to give the predictions as they may occur. The maintenance planning preparation and approval starts at the point of determination of the strategy and execution lies with the facilities manager.

2.4.1 Maintenance Planning System

The essential feature of a planned maintenance system is that failures are anticipated and appropriate procedures devised for their prevention or rectification. It involves having a planned course of action for dealing with the inevitable consequences of deterioration. The plan should be all embracing and laydown measures for dealing with even remote possibilities. Though not all jobs or cause for action can be predicted with sufficient certainty for inclusion in a long term programme, the objective should be to obtain the most economic balance between day-to-day and programmed work. This can be determined by a statistical analysis of the rate with which particular defects occur and whether to renew all suspect components at some time.

Based on the functionality of each of the various components; a schedule that will oversee the performance of the maintenance tasks can be prepared. It may take the structure of a planned maintenance system. The maintenance plan system must therefore strike an economic and socially acceptable balance between the operations of two complementary and interacting systems; scheduled or programmed systems and contingency systems (Wordswith and Lee, 2007).
i) **Schedule system**

This covers items which tend to deteriorate at a uniform rate and which do not have a high degree of urgency. It gives the following provisions:

- Scheduling work to be carried out at predetermined times and intervals. This includes planned preventive maintenance and applies where the incidence of failure can be predicted with some accuracy or periods are fixed by statute or contract.
- Scheduling inspections to be carried out at predetermined times to detect failures or the imminence of failure. The time of failure is unknown and inspections are essential to establish whether or not work is necessary.
- Scheduling work and inspections carried out that involves predicting when certain work will be necessary and extent of further work if need be.

ii) **Contingency system**

This entails a policy waiting until a compliant is received from the user before taking action. Even though the timing is unknown and uncertain, procedures with such work can be planned. It involves allocating resources to deal with the workload.

The contingency system provides for a sum which gives a mechanism that serves to monitor the extent to which the fund is being depleted as work continues, thus enabling the maintenance manager to test his predictions over time, or to amend the contract execution or sum if the amount of work is running higher than what the contingency sum allows for, before the situation becomes critical.

A necessary feature of this system is the need to introduce delay period between the receipt of the request and the actual execution of the work. This permits the regulation of the flow of work to the contractor and the grouping of similar items of work in space and time. The lead time to the contingency maintenance time is less between notification and execution thus there is little preparatory work and delays are likely as a result of precise instructions or unavailability of materials.

The choice of the system when deciding whether to work under scheduled system or contingency depends on several factors which include;
a) The predictability of failure – components that deteriorate at a known and fairly uniform rate can be scheduled either for inspection or for repairs before the actual failure. On the other hand, components that are susceptible to sudden failure e.g. burst pipes, glass breakages can be dealt with by a contingency system.

b) The reporting delay time – this is the time that would elapse between when the defect would be noticed by a qualified inspector and time when the occupier/building user would report the defect to the maintenance department. If the delay is less, the economic period for carrying out inspections, the work must be dealt with on a contingency basis.

c) Rate of deterioration of the components and the corresponding increase in the cost of rectification. This is considered in conjunction with the reporting delay time and the possibility of prompt response from the user.

d) Extent to which the user can be relied upon to report significant defects.

2.5 Maintenance Policy

BS 3811 defines maintenance policy as a strategy within which decisions on maintenance are taken. It is defined as the ground rules for the allocation of resources (materials, workers, finances) between the alternative types of maintenance action that are available to management. In order to make a rational allocation of resources, the benefits of those actions to the organization as a whole must be identified and related to the costs involved. Policies mostly on maintenance directly or indirectly affect the extent to which maintenance work is accorded priority in an organization. Policies deal with setting objectives and means of achieving them.

This involves laying down operational and cost objectives for maintenance department starting with identification of maintenance tasks, standards to be achieved and the limits of cost. This helps in; proper balance between preventive and corrective types of maintenance, how far work should be programmed rather than relying on requests, priority to accord different types of works, type of labor sourcing, the extent to which decisions should be
decentralized where there is wide coverage. These policies determine the structure of the maintenance organization and the roles and duties of the stakeholders.

According to Wordswith and Reginald, (2007), the question of policy is considered under the following:-

- **Objectives**

What does maintenance have to achieve? This should be viewed in the context of the organization’s overall building needs. It combines management, financial, engineering and other practices applied to the physical assets in pursuit of economic life cycle costs. It requires all departments in the organization to co-operate in ensuring that assets of the organization are planned, provided, maintained and disposed of at the total cost to the organization.

- **Benefits**

What is to be gained? The benefits may be short term or long term, classified under financial, technical or human. Financial benefits spring from more effective use of the building and reflected in higher productivity, less wastage of materials and improved sales figures, etc. Technical benefits related to the preservation of physical characteristics of the building and its services and reflected in fewer breakdowns, less repairs, less accidents, lower future maintenance etc. Human factors are related to psychological effects of the of the building on the user and reflected in such things as lower rate of staff turnover, reduced training costs, better customer relations, improved public image etc.

Chanter, (2007) identifies the common areas requiring policy provision to include the following:-

a) **Resource allocation**

The proportion of resources to be allocated to building maintenance will have to be determined in a competitive environment. The various resources include; finances, staffing, time etc. The distribution mechanism of the resources is also factored in. The process may have nothing to do with building performance consideration and be beyond influence of staff.
Resource allocation as a result of an outsourced operation that will have contractual implications is also considered.

b) Performance requirements
From inception there exists a detailed performance model on a building’s expected performance. This relates to technical, operational and financial standards, response time and budgets. All this is defined clearly in the maintenance policy.

c) Execution of work
A policy will need to be formulated to indicate how maintenance work is to be executed. This involves consideration of; who executes the work, when the work is to be executed, how it is to be executed, supervision control and the relationship of the work with other activities in the organization.

d) Administrative activities
This requires an assessment of the procedures necessary to administer maintenance operations and this strike at the heart of the maintenance management. The type of maintenance department may be a result of a carefully formulated policy which is a reflection of the original attitude to maintenance of buildings.

e) Position of maintenance department within the organization
The degree of importance attached to the maintenance management department in relation to other departments and functions is shown by its position in the organization. A carefully integrated maintenance department indicates a positive policy stance, where building maintenance department has been considered as an important part to achieve the organizational objectives.

2.6 Maintenance Challenges.
Buildings are very important to mankind in that they represent a high level of investment in terms of capital, materials, labor, land and time (Draft National Building Maintenance Policy,
Human beings spend a substantial part of their time in buildings. The following are some of the challenges faced in the built environment:

2.6.1 Legislative and policy constraints.

Governments may lack the policy making apparatus to analyze existing policies and legislations and to develop on new ones. The legislators may lack the necessary experience and skills to assess the maintenance policy framework, evaluate impacts of policies and implement on policies. There are also inadequate maintenance resources such as national building stock, human, financial and tools to carry out, monitor and evaluate maintenance works (Draft National Building Maintenance Policy, 2011). Maintenance is prioritized low in the agendas of political decision maker due to limited understanding of financial and economic implications of poor maintenance.

In Kenya the legislative framework is provided for by uncoordinated Acts of Parliament and subsidiary legislation. This scenario is bound to get worse with the introduction of county governments. The scattered legislation makes it hard to have a codified standard of maintenance. The legislative framework sets maintenance standards that are not affordable and unachievable within the local setting that are beyond the reach of typical residents.

The main contributors to the dilapidation and decaying environment are; lack of building maintenance policy, existence of outdated multiple legislations and regulations, lack of a single institution to enforce and police compliance, lack of quantifiable and measurable standards, inadequate documented inventory of building stock, lack of resources both financial, human and tools, carrying out maintenance works in ad hoc basis with inadequate records being kept.

2.6.2 Institutional challenges

The organs of government that are mandated to oversee maintenance of buildings are many with inadequate legislations and administrative capacity to execute the various works. There is lack of integration or inter-departmental communication, coordination and collaboration of
maintenance functions. In such cases there is lack of clear institutional responsibilities owing to a multiplicity of intervening institutions and weak policy directives.

Maintenance is always accorded the lowest priority compared to departments of new construction and design this leads to poor allocation of resources. Many public institutions that have been charged with enforcing maintenance standards are not put to account for the negligence of their duties. This leads to lack of commitment in enforcing the various standards. It is characterized by lack of maintenance culture, inadequate education and training opportunities for human resource on maintenance work (Draft National Building Maintenance Policy, 2011).

The records kept are maintained manually making their analysis, storage and retrieval for feedback difficult, time consuming and costly.

2.6.3 Financial problems

Financial resources are the key determinants of the extent to which maintenance work will be carried out. Materials used for the repairs and maintenance have to be purchased. Lack of finances and inadequate budgetary allocation mean the maintenance work will not be undertaken as required. Mismanagement of funds and lack of a workable maintenance plan results to such problems.

2.6.4 Management problems

The Draft National Building Maintenance Policy, (2011) identifies that maintenance agencies lack qualified and experienced management staff, lack of documented national building stock, human and financial capacity to carry out the maintenance, lack of a comprehensive maintenance management framework, maintenance standards, poor knowledge on the benefits of carrying out maintenance works, inadequate budgetary provisions for carrying out maintenance works and tools to monitor and evaluate the effectiveness of maintenance works to ensure health and safety of the users. The management functions are therefore carried out below the expected standards.

Failure of the management to develop an effective maintenance plan, such as; defining project goals and objectives, specifying tasks or how goals will be achieved, what resources
are needed, and associating budgets and timelines for completion, results in poor execution of the maintenance work. Ineffective communication within the organization results to breakdown of the flow of information making it hard to undertake maintenance work as expected.

Maintenance management in most organizations spend little time in monitoring the progress of work, evaluating performance of staff and equipment and establishing plans for maintenance works.

2.6.5 General personnel and equipment problems

This constraint manifests itself in various ways which include; - inadequate number of staff, staff lacking relevant skills, lack of training of staff involved in maintenance work, inadequate equipment for the various works and lack of maintaining the equipment. These combined aspects pose serious problems to the safety of the building and its users.

2.6.6 Design, construction and user generated problems.

The design process is mostly undertaken without involving the end user of the buildings or the property managers. Therefore understanding various maintenance works by both the manager and the tenants becomes unfounded and sometimes lacking. Lack of training of the end users on usage of various facilities and how to maintain them also leads to problems. Faulty and incomplete designs on the part of the architects and designers are a common occurrence in many projects. This result in buildings and facilities having serious maintenance challenges.

Other problems and challenges include; high maintenance costs, age of the building, changing technology, defective building elements, shortage of materials, weather elements, wear and tear, defective building elements vandalism, lack of proper planned maintenance actions, poor enforcement of maintenance practices in place and slow response to emergency works.
2.7 Legislation governing maintenance in Kenya.

In Kenya there exist scattered legislations and regulations that require owners and building users to maintain property and the surrounding to a habitable condition and good state of repair. The various legislations include; - Public Health Act, The Sectional Property Act, Factories Act, Rent restriction Act, Landlord and Tenant Act, Occupiers Liability Act, EMCA etc.

2.7.1 The Public Health Act Cap 242

This Act provides for various requirements which include; requires for the inspection of land, dwellings, buildings, factories and trade premises, and for securing and keeping of the same, clean and free from nuisance so as not to endanger the health of the occupiers or the public. Buildings are required during construction, to meet provision of proper lighting and ventilation and the prevention of over-crowding. The Act also provides for the periodical cleansing and whitewashing or other treatment of dwellings, and the cleansing of land attached thereto, and the removal of rubbish from the building.

The local authority is empowered to carry out inspections with a view to ascertain whether the lands and buildings thereon are in a state to be injurious or dangerous to health, and the preparation, keeping and publication of such records as may be required.

Health authorities are required to prevent or remedy danger to public health from unsuitable dwellings. The law stipulates that it is the duty of every health authority to take all lawful, necessary and reasonably practicable measures for preventing or causing to be prevented or remedied all conditions liable to be injurious or dangerous to health arising from the erection or occupation of unhealthy dwellings or premises.

2.7.2 The Rent Restriction Act Cap 296

Section 26 of this Act requires in the absence of any provision to the contrary in the contract of tenancy, that it shall be deemed to be the obligation of the landlord of any premises to maintain and keep the premises in a state of good structural repair and in a condition suitable for human habitation, and it shall be the obligation of the tenant of any premises, other than a tenement house, to maintain the premises in the same state as that in which the premises were
at the commencement of the tenancy, fair wear and tear, damage arising from irresistible force and structural repairs for which the landlord is liable. The Act requires the Rent Tribunal to consider the state of the repair and maintenance in the determination of any matter brought before it for determination.

2.7.3 The Sectional Properties Act No. 21 of 1987

This Act requires the selected corporation to establish and maintain a fund for administrative expenses sufficient, in the opinion of the corporation, for the control, management, and administration of the common property, and for the payment of any insurance premiums, rent, and the discharge of any other obligation of the corporation.

The corporation and its members are liable to maintain, repair and replace the common areas and building parts and elements serving more than one unit to an acceptable standard as maybe provided by law.

2.7.4 The Landlord and Tenant (Shops, Hotels and Catering Establishments) Act Cap 301.

Under the section on schedule terms and conditions to be implied in tenancies, the lessor is responsible for all repairs to roofs, main walls, main drains, main electric wiring and structure, and shall be responsible for all necessary renewals to the premises. On the other hand, the lessee is responsible for all internal repairs and decorations, fair wear and tear exempted. The lessee shall keep the fixtures and fittings in good and tenantable repair. The lessee is obliged to permit the lessor or his agent and his work-men to enter the premises and to examine or repair the same at all reasonable times after giving reasonable notice thereof.

The Act requires the Business Premises Rent Tribunal to consider the state of the repair and maintenance in the determination of any matter brought before it for determination.

2.7.5 The Occupiers Liability Act Cap 34

The Act reserves the burden of property maintenance and repairs on the occupiers of the premises and protects lawful visitors from injury arising from defective premises and components. Sub-section 5. (1) states that where premises are occupied by any person under
a tenancy which puts on the landlord an obligation to that person for the maintenance or repair of the premises, the landlord shall owe to all persons who or whose goods may from time to time be lawfully on the premises the same duty, in respect of dangers arising from any default by him in carrying out that obligation, as if he were an occupier of the premises and those persons or their goods were there by his invitation or permission.


This Act empowers the Director of NEMA to cause the property to be inspected to ascertain if the property is maintained to the standards that enhance environmental protection. It concerns solid waste management systems, noise protection, electrical and heating systems. It is a requirement under this law these systems be properly maintained to ensure that the subsequent emissions are not hazardous to the environment.

2.7.7 The Factories Act Cap 514

Various sections oblige the proprietors and contractors of premises where manufacturing is taking place to maintain the structure or structure members and all equipment embedded therein to serviceable condition and make sure that they are in good working order. Factory inspectors are empowered by the Act to prosecute those failing to observe health and safety standards.

2.8 Building Elements and Possible Defects.

Generally, the building elements are the components that determine the condition of the building. Each element has its own characteristic feature such as different construction materials, different deterioration cycles etc. These distinct features warrants for difference in execution of maintenance works. These elements include; roofs, ceilings, walls, floors, staircases, finishes, fixtures and fittings, building services and site works (Wood, 2009).

i. Floors

There are different types of floors which include; earthen floors, timber floors and concrete floors. Earthen floor was mostly the ground floor to traditional houses. They are normally
affected by elements of weather such as flood and cracking. Timber joist floors are liable to rot, due to dampness and poor ventilation. Concrete floors have a wide range of problems; ground floor slab may suffer subsidence caused by ground movement, unevenness caused by poor initial construction. Cracking and warping are common defects in concrete floors.

ii. **Floor finishes**
Various forms of floor finishes include; cement screeds, panel boards, wooden parquet, ceramic floor finishes and tiles. Each of these types has their defects and problems that occur with time.

iii. **Stairs**
Stairs can be very complicated and are a rich source of problems which include; uneven treads, nosing wearing out, squeaks on timber stairs, inadequate fixed balustrade and handrails.

iv. **Walls**
Walls maybe load bearing to structures and floors above or non-load bearing which may be of timber, masonry metal studs, or plasterboards. The walls may be finished with plaster, fair-faced brick work, tiles or any alternative. Problems on internal walls generally relate to physical damage such as cracking, adhesion problems with finishes and movement. Defects on external walls could be attributed to weather elements and include; cracks or crazing of surfaces, surface discolouration, staining, bulging, dampness, warping, and breaking down of cladding.

v. **Doors and Windows**
The different materials for windows are; wood, metal and glass. Typical problems associated with windows and doors include; glazing problems, wear and tear, security and vandalism, poor design specification, twists, rust, etc.

vi. **Roofs and Ceilings**
The different types of roofing are; concrete tiles, clay tiles, concrete slab, GCI sheets, slate, asbestos, fibre-cement slate, metal sheet roofing, thatch, PVC sheets, etc. with each type having its distinct problems. The general ones include the following; sagging, cracking,
breaking of hips and nubs in clay tiles, rust, dampness, delamination, corrosion, solar degradation, incomplete bituminous felt, fire and electrical problems. The eaves on pitched roofs may be associated with problems of; breaking gutter, rotting fascia boards, breaking tiles, dampness in brick work, and bulging. Trusses and rafters may be prone to sagging, water ingress or dampness and rotting.

The various types of ceiling are; suspended timber panels, soft board panel, rendered and colour washed concrete. The possible defects and failures would be breakage, cracking, discoloured paint etc.

**vii. Building Services**

These are the services that make a building to be habitable. These are services such as; provision of water, electricity, provision of lifts and escalators, solid waste disposal provision, drainage, ventilation and air conditioning, fire safety and security provision. Various associated problems include; leaking water pipes, blocking waste pipes, lift failure and breakdown, leaking gas pipes, air conditioner breakdown etc.

**viii. Foundation, Basement and External Areas.**

The following may show or signal presence of problems or defects in the foundation or basement; surface spalling, dampness, distortion, movement, water ingress, discolouration etc.

The external areas are areas outside the building between the external wall and the boundary of the site. These areas include; common areas, paths, parking, boundaries, retaining walls, fences, steps and ramps, landscaping, gardens, disposal areas and play areas. They can be extensive and are a source of problems such as; litter, rubbish, vandalism, breaking boundary walls, uneven dangerous paths.

**2.9 Summary**

Maintenance is crucial in keeping, restoring and improving a building, its services and the surroundings to an acceptable standard. Maintenance by arresting decay extends the physical
life of a building and thereby delays replacement and defers expenditure on new construction.

The structure of an organization is usually represented by a hierarchical allocation of formal responsibilities and linking mechanisms between the various roles. In a small firm the functions maybe undertaken by a member of staff in addition to his duties, while in a large corporation there should be a separate group of persons responsible for maintenance. The maintenance organization must oversee the generation of maintenance work, execution of the work, control of operations, provision of feedback, financial control and evaluation of performance.

A maintenance policy provides the ground rules for the allocation of resources (materials, workers, finances) between the alternative types of maintenance action that are available to the management. In order to make a rational allocation of resources, the benefits of those actions to the organization as a whole must be identified and related to the costs involved. This involves laying down operational and cost objectives for maintenance department starting with identification of maintenance tasks, standards to be achieved and the limits of cost.

There are a number of considerations to be made in determining the most appropriate timing and scale of maintenance action and not limited to; costs, availability of finance, effects of service failure, availability of parts and spares, convenience, changing standards, acceptable performance, skills and staff availability, warranty and service agreements, value etc.

Despite the various challenges faced while undertaking maintenance work, its execution is important in order to protect the buildings since they form part of the physical components of development in a country. It’s thus important to emphasize on proper maintenance of the building stock. In Kenya there exist legislations and regulations that require owners and building users to maintain property and the surrounding to a habitable condition and good state of repair.
CHAPTER THREE

RESEARCH METHODOLOGY
3.0 Introduction

This chapter covers the research methodology of the study. It describes and justifies the approaches and procedures that were used towards collecting data that aided in answering the research questions.

This study adopts a case study design approach that combines both quantitative and qualitative approaches. Case study research method can be defined as the in-depth study of one or a few events or cases in order to understand the phenomenon being examined. It is thus a critical and methodical investigation into the conditions and factors that ensued in a particular occurrence or situation.

The purpose of this selected method is to probe deeply and to analyze intensively the complex phenomena that constitute the building maintenance polices, practices and challenges of the sampled buildings with a view to establishing generalizations about the wider population to which it belongs as applied in high-rise buildings in Nairobi CBD.

3.1 Study Area

The area of study is Nairobi CBD from which several high-rise buildings are taken as the case studies. Nairobi is the capital city of Kenya and it forms the largest urban centre in the country, occupying approximately 696 square kilometers. Compared to other urban centres in the country, Nairobi has the highest concentration of high-rise buildings thus it forms the best representation of other urban centres in the country. The researcher found out that Nairobi CBD has approximately sixty five (65) high-rise buildings above ten (10) floors and approximately thirty five (35) high-rise buildings with floors between seven and nine floors. The researcher narrowed down to buildings between Uhuru high way, University way, Haille Sellasie Avenue and River Road. The study area was selected due to a higher concentration of high-rise buildings than any other area within the City of Nairobi. This gave a wide scope of analysis within a small area. Map 3.1 is a Google extract of the study area.
3.2 Population

A population can be defined as the complete set of subjects that can be studied: people, objects, animals, plants, organizations from which a sample may be obtained (Shao, 1999). A population is also defined as a complete set of elements (persons or objects) that possess some common characteristic defined by the sampling criteria established by the researcher (Wikipedia, 2013).
For the purpose of this research, the population consists of the high-rise buildings in Nairobi CBD which comprise of approximately sixty five (65) high-rise buildings above ten (10) floors and approximately thirty five (35) high-rise buildings with floors between seven and nine floors.

3.3 Sample and Sampling Techniques.

Sampling is that part of statistical practice concerned with the selection of an unbiased or random subset of individual observation within a population of individuals intended to yield some knowledge about the population of concern, especially for the purpose of making predictions based on statistical inference (Jude, 2010). Mugenda and Mugenda, (1999) defines sampling as the process of selecting a number of individuals for a study to represent a larger group/ population from which the sample were selected. Simple random sampling technique was used to select the sample size for the study. This method of selection was chosen because it gave each high rise building an equal probability of inclusion in the sample.

Simple random sampling was used for the selection since it minimized bias and simplifies analysis of data. Each building was selected randomly and entirely by chance, such that each building had the same chance of inclusion. The researcher listed the various high-rise buildings within the study area. Numbers were assigned to each building and a set of random numbers which identified the buildings were sampled leading to the resultant selected buildings. The buildings that were selected for the sample are identified below;

i.  Common Wealth House  
ii.  Mount Kenya University Towers  
iii.  Post Bank House  
iv.   Pano House  
v.    Ngao House  
vi.   Corner House  
vii.  Maendeleo House  
viii. Rural Urban Credit Finance House
3.4 Variables of the Study

A variable is a quantity or quality that varies across a collection of cases (Wikipedia 2013). In this study, the main variables to be investigated include; polices that are in place on maintenance, maintenance practices on buildings, specific building elements’ condition such as roofs, walls, floors, ceiling, finishes, fittings and fixtures. Other elements of consideration were; driveways, lifts, drainage system, lawns, garbage collection, age of the buildings and the facilities and services of the building.

A set of indicators have been developed to measure building maintenance. The researcher assessed the building elements’ condition and rated them on the basis of a scale as shown below.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very poor</td>
</tr>
<tr>
<td>2</td>
<td>Poor</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>5</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

The general rating was based on the assessment of the buildings’ elements as at the date of fieldwork. A building was classified as being in an excellent condition if it was recently built and had no indications of physical deterioration.

A building was classified as being in good condition if; it were in a good state of structural condition (with no cracks on walls or floors), good state of finishes (non-worn out paint, no ripped off tiles), good state of building services (no leaking, non-faulty lifts, good solid waste
management), requiring minimal or no repair, allowing uninterrupted daily use of the building and its facilities such as water, electricity, washrooms, and effective lift usage.

A building was classified under fair condition if it exhibited the following features; experienced slight deterioration to the components, required major repairs and replacements to various building elements, occasional failure of building systems and services such as water, lift and drainage and causing slight interruption in daily use of the facilities.

Those classified under poor condition had various components showing signs of severe deterioration and required emergency repairs and corrective maintenance. Those classified under very poor condition required replacement.

The elements used to assess the condition of the buildings are as indicated in the Table 3.1;

**Table 3.1: Indicators for Measuring Building Maintenance.**

<table>
<thead>
<tr>
<th>Housing Elements and Facilities</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Very Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roofs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor and Staircase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixtures and Fittings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundation, Basement and External Areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Construct, 2013.

**3.5 Data Collection**

Data was collected using the following data collecting techniques or instruments; secondary data from published and unpublished sources and primary data such as; questionnaires filled by the managers and tenants, unstructured interviews with the tenant and managers and
physical observation of the buildings under study. Furthermore, photographs of some of the buildings sampled were taken.

Secondary data was gathered from various sources which include; published sources as indicated on the Bibliography, Acts of Parliament of Kenya, The National Draft Maintenance Policy, and Laws of Kenya. These provided for the existing legislations and policies governing maintenance of buildings, maintenance practices prevalent, challenges faced in maintenance among other issues.

A series of objective questions were formulated into a questionnaire. The researcher prepared two sets of questionnaires, one for the maintenance manager in the management company and the other to tenants of the respective buildings. The questions were both open ended and close ended. The questionnaires were intended to provide for various data which include; policies formulated by the management on maintenance, practices undertaken for maintenance of the buildings, challenges faced while undertaking such maintenance and recommended ways of dealing with maintenance.

The questionnaire administered to the maintenance manager was intended to gather information on the maintenance policy and the type of maintenance activities and practices that are undertaken in these buildings, while the questionnaire to the tenants were intended to collect data on maintenance practices and responsibilities that they are assigned to undertake in the building. Challenges faced and recommendations on their possible solutions featured in both questionnaires. The two sets of questionnaires are attached at the end of this report in appendices A and B.

Unstructured interviews were conducted to enhance clarity and to provide the missing data in certain questions. These interviews were conducted on the day of collecting the questionnaires after examining the responses in the questionnaires.

The researcher undertook field observation of the condition of the buildings’ elements and components such as; walls, to determine the nature or state of the coated surface-check for cracks and fungi infestation, floor screed, functionality of lifts and escalators, garbage collection, general cleanliness, windows and doors, electrical fittings, drains, ceilings and roofs etc.
Photographs were taken to capture the maintenance condition on various building elements.

3.6 Difficulties Encountered in Collecting Data.

In carrying out the research, several difficulties were encountered. They are as listed below;

i) Several respondents took too long to complete the questionnaires citing busy schedules.

ii) Some respondents lost the questionnaires.

iii) There were restrictions to taking photographs of various buildings; this made it difficult to provide photographic evidence on the condition of such buildings.

iv) Some respondents were uncooperative and complained the researcher was consuming their time for his own benefit.

3.7 Data Analysis and Presentation

Analysis of data was done by both qualitative and quantitative analytical methods. Tables, charts and percentages of the data collected among others were used in the case of quantitative technique, while descriptions and photographs were used in the case of qualitative analysis to present the information clearly. The basic assumption was that the variables score distribution in the sample represented what would be expected in the population distribution.

A diagrammatic illustration of data analysis and reporting mechanism adapted from Waugh (1995) gives a summary of the key steps of the analytical framework as indicated in Figure 3.1.
Figure 3.1: Framework for Data Analysis and presentation.

Conceptual

Design Survey: Case Study → Selected high-rise buildings

Data Collection:
2. Primary data from interviews and questionnaires.
CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.0 Introduction

This chapter presents the analysis of the data collected. Analysis of responses was done according to the research objectives. It examined the present state and condition of the high-rise buildings of the various selected buildings, the maintenance policies and practices undertaken in the buildings and the challenges faced while undertaking maintenance. This study also examines the best practices in managing maintenance for high-rise buildings.
The collected data was subjected to exploratory data analysis and descriptive statistics that include; simple percentages, graphs, tables and pie-charts. Both qualitative and quantitative methods were adopted for the analysis of data; qualitative method facilitated the analysis of non-discrete data while quantitative method was used to analyze and interpret discrete and numerically measurable data.

Percentages as provided within this chapter are an indication of the number of respondents to whichever query or element under consideration to the total number of respondents that were selected.

A total of 50 questionnaires were administered; ten to the maintenance managers of the selected buildings and forty to tenants, four tenants per the respective building. Questionnaires issued to the tenants were used for gathering additional information on the role played by tenants in the maintenance of the respective buildings. Eight of the questionnaires issued to the management were successfully filled, this translated to 80% response rate. However, interviews with the managers who lost the questionnaire helped gather the required information for the study. 30 of the questionnaires issued to the tenants were successfully filled, translating to 75% response rate. The overall response rate was thus 77.5%.

4.1 The Buildings Studied.

Ten buildings were selected randomly for the study. These are discussed below;

Common Wealth House is located at the intersection of Moi Avenue and Maragwa Lane. The building has seven floors which are mostly used for academic purposes.

Mount Kenya University Towers is located on Moi Avenue and has nine floors. Most of its accommodation space is used for academic purposes used by Mt Kenya University as the main tenant. Other spaces are used for businesses especially on the ground floor.
Post Bank House is located between Market Street and Banda Street. It has 16 floors and houses Post Bank headquarters. Other tenants are office spaces for private and public sectors and school institutions.

Pano House is located few meters off Latema Road and has seven floors. Most of its space is used as a hotel and the remaining space used for residential purposes.

Ngao House is located on Accra Road and has eight floors. The building is used for commercial purposes and houses various private businesses.

Corner House is located at the intersection of Kimathi Street and Mama Ngina Street and has 14 floors. The building is used for commercial purposes and houses various private businesses and government offices.

Maendeleo House is located at the intersection of Monrovia Street and Utalii Lane. The building has 10 floors. It is used for public and private offices and also houses a cultural centre.

Rural Urban Credit Finance House is located on the intersection of Tom Mboya Street and Accra road. The building has 10 floors where Rural Urban Credit Finance is the main tenant while the other space is mostly used for commercial purposes with shops and private offices.

Union Towers is located on the intersection of Moi Avenue and Mama Ngina Street. It has 14 floors used for commercial purposes as businesses or office spaces.

Transnational House is located between Mama Ngina Street and City Hall Way. The building has 10 floors which are used for public and private office spaces.

4.2 Maintenance Policy and Maintenance Practices

The survey indicated that all the buildings had a maintenance policy in place to oversee and guide maintenance decisions, operatives and practices. Generally, the policy had provisions for the following elements; resource allocation, performance requirements, execution of work and administrative activities.
The survey indicated that execution of works featured prominently in most management companies’ policy at 80% followed by resource allocation at 70% and performance requirement at 60%. Administration activities scored 50%, while hierarchical structure in terms of the position of the maintenance department within the organization scored the least at 40%. Table 4.1 shows the percentages.
Table 4.1 Policy Provision for Various Elements.

<table>
<thead>
<tr>
<th>Policy Provision for various Elements</th>
<th>Resource Allocation</th>
<th>Performance Requirement</th>
<th>Execution of Works</th>
<th>Administrative Activities</th>
<th>Position of Maintenance Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Wealth House</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Mount Kenya University Towers</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Post Bank House</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pano House</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Transnational House</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Corner House</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ngao House</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Rural Urban Credit Finance House</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Union Towers</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Maendeleo House</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7</strong></td>
<td><strong>6</strong></td>
<td><strong>8</strong></td>
<td><strong>5</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>
Table 4.1 Respondents Percentage

<table>
<thead>
<tr>
<th>Percentage</th>
<th>70%</th>
<th>60%</th>
<th>80%</th>
<th>50%</th>
<th>40%</th>
</tr>
</thead>
</table>

Source: Field Survey, 2014

Chart 4.1 Policy Provision for Various Elements

From the study, 60% of the respondents revealed that their respective policy was developed by the maintenance manager while 40% indicated that it was developed by the property developer or owner. 30% of the respondents indicated that the enforcement of the maintenance policy was by the maintenance manager and 30% indicated that it was enforced by the developer or owner, 40% indicated that the maintenance policy was not enforced but only acted as a tool to guide on maintenance activities.

Table 4.2 Enforcement of the maintenance policy
<table>
<thead>
<tr>
<th>No. Respondents</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager</td>
<td>3</td>
</tr>
<tr>
<td>Property developer</td>
<td>3</td>
</tr>
<tr>
<td>Not enforced</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2014

The study reveals that, irrespective of who is responsible for what maintenance activity, various types of maintenance activities are in place. They include; planned preventive maintenance, planned corrective maintenance, unplanned maintenance, emergency maintenance, deferred maintenance and predictive maintenance.

Planned preventive maintenance scored the highest at 100% which reflected that it was carried out in all the buildings. These are the activities carried out on a routine basis to ensure building components are in a continuous habitable nature. The activities under planned preventive maintenance recorded to be taking place periodically includes; daily cleaning of surfaces, garbage collection, regular checks on lifts, polishing of wooden surfaces, etc.

Planned corrective maintenance is carried to repair or rehabilitate a building component that has failed. The survey revealed that 80% of the respondents have this practice in place.

Unplanned maintenance was apportioned to both the landlord who was represented by the property manager and the tenant depending on the cause of the defect or the ultimate obligation. Such activities noted warranting corrective maintenance are; replacing the roof, replacing broken glass, repairs to broken wooden parts, etc. This had 60% turn out as indicated in the analysis.

Emergency maintenance is carried out to rectify sudden failure that requires immediate action. The survey indicated that 50% of the management had emergency maintenance activities in place.

Deferred maintenance comprise of maintenance activities that are remitted until resources are available. 40% of the respondents indicated to have deferred maintenance in place. Further interviews revealed that deferred maintenance was mostly on vast maintenance activities such as structural repairs, roof replacement, etc.
Predictive maintenance was accorded the lowest priority and had the lowest percentage at 30%. This was significantly low due to the complexity and expertise requirement.

Table 4.3 Maintenance Activities.

<table>
<thead>
<tr>
<th>Building</th>
<th>Planned Preventive Maintenance</th>
<th>Planned Corrective Maintenance</th>
<th>Unplanned Maintenance</th>
<th>Emergency Maintenance</th>
<th>Deferred Maintenance</th>
<th>Predictive Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Wealth House</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>MKU Towers</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Post Bank House</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Pano House</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Transnational House</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Corner House</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ngao House</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>RUCFH House</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Union Towers</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Maendeleo</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>House</td>
<td>Total Respondents</td>
<td>Percentage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>------------------</td>
<td>------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>80%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>50%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>40%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>30%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Survey, 2014

Chart 4.2 Maintenance Activities.
4.2.1 Undertaking Maintenance Activities

This was noted especially for corrective maintenance where the work is carried out to rectify for faults and defects resulting from system failure. Corrective maintenance restores or rebuilds or repairs defects as already arisen, as reported by the tenants or revealed by the inspection from the maintenance department or when the building services or parts fail or upon occupancy by a new tenant. From the study, circumstances warranting both unplanned maintenance and corrective maintenance include the following; damage caused by forces of nature, instances of failed lifts, blocking drainage systems, broken glass windows, breakdown of vital elements, requirement by the county council to undertake certain works, etc.

Upon such detection as have arisen, the study revealed that 70% of the respondents adopted a maintenance procedure as indicated below, while 30% had no specific procedure in place. The following is the procedure adopted;

i. The occupants or caretaker identifies the defect or damage.

ii. The problem is reported to the responsible officer via the management telephone line.

iii. Equivalent communication is made to the maintenance department.

iv. The maintenance clerk identifies the likely technician e.g. plumbing, electrician, carpenter, contractor or staff etc.

v. A repair order is placed on the respective premises.

vi. Maintenance operatives attend with regard to state reprogramming or purchase of correct materials.

vii. Repair is executed.

viii. Clerk attends for quality checks and identifies further problems if available.

After the defect has been reported to the maintenance department, 30% of the respondents indicated that it took less than a day to respond to such queries, 20% indicated that it took between one and three days, 30% indicated that it took between three and seven days and 20% more than seven days as shown in the table below.

Table 4.4 Response Time
<table>
<thead>
<tr>
<th>Response Time</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 24 hours</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>Between 1-3 days</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Between 3-7 days</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>Over 7 days</td>
<td>2</td>
<td>20%</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2014

Further interviews with the respondents indicated that the response time heavily relied on urgency of the need. More urgent and serious damages required immediate response while less urgent damages were responded to slowly and took a longer period.

The study revealed that 90% of the property managers issued their tenants with tenancy agreements which stipulated the responsibilities of the various parties involved, some of which are indicated below. According to the tenancy agreement; the landlord and the tenants have certain obligations that they are expected to oversee. Some of the responsibilities of the tenant include;

- a) Keeping the premises, fixtures and compound in good condition.
- b) Replacing or making good repair and restore all fixtures and fittings as broken, lost or damaged during the tenancy.
- c) Taking responsibility of all damage resulting from negligence or willful act on his part to the ceiling, wall, roof, floor, windows, and doors and repair them at his own expense.
- d) On expiry of the tenancy, repair and redecorate the house at the original colour and quality as at the commencement date of the tenancy. The deposit initially paid as security by the tenant is used to fund for any negligent or rectify any faults as identified upon expiry of the tenancy.
- e) Take responsibility to normal running and maintenance in connection with internal plumbing, fixtures, fittings, windows, door locks and handles.

On the part of the landlord, the responsibilities include;

- a) Keeping the demised premises insured against fire.
b) Keeping the structure and the external of the demised premises in a good state of repair.

**4.2.2 Maintenance Planning and Prioritization of Maintenance Work**

Due to the insufficient nature of resources, proper planning and prioritization of maintenance work has been established by the various management companies. This is dependent on a number of factors which include; urgency of maintenance work, condition of the element, risk associated with postponement of the work, nature of the work, quantity of work and frequency of failure.

The study revealed that urgency of work had a response rate of 100% where further interviews indicated that urgent works consisted of emergency cases of failure. Risk associated with postponement and the conditions of the asset were also highly regarded in priority to consideration at 80% and 70% respectively. The least considered factor was the quantity of work with a response rate of 30% as indicated in the Table 4.5.

**Table 4.5 Prioritisation of Maintenance Work**

<table>
<thead>
<tr>
<th>Factors Considered</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urgency of work</td>
<td>10</td>
<td>100%</td>
</tr>
<tr>
<td>Risk associated with Postponement</td>
<td>8</td>
<td>80%</td>
</tr>
<tr>
<td>Condition of Element/ Facility</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>Frequency of Failure</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Nature of the work</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Quantity of the work</td>
<td>3</td>
<td>30%</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2014
4.3 Funding for Maintenance

Maintenance funds are raised differently by the respective authorities. The different methods identified were; service charge at 40%, rent inclusive at 30%, sinking fund at 20% where money is set aside from the rent collected for future maintenance. Borrowing from financial institutions scored the lowest at 10% where the respondent claimed to use it in cases of emergency maintenance or where available funds were not enough to sustain maintenance. The various methods are indicated in Table 4.5 with the respective response rates.

Table 4.6: Methods of Financing

<table>
<thead>
<tr>
<th>Method of Raising Funds</th>
<th>Number of Respondents</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Charge</td>
<td>4</td>
<td>40%</td>
</tr>
<tr>
<td>Rent Inclusive</td>
<td>3</td>
<td>30%</td>
</tr>
</tbody>
</table>
The survey also revealed that 40% of the respondents (property managers) set aside 10-15% of the annual rent for maintenance.

4.4 Maintenance Organization Structure and Labour Selection and Structure.

Unstructured interviews revealed that 60% of the property management companies adopted a centralized organization structure while 40% had a decentralized organization structure. Organizations have different ways of carrying out their maintenance works, the various labor structures that are employed to undertake maintenance work include; labour on contract and direct labour/ in-house labour or a combination of both. The survey indicated that different
factors contribute to the type of labour to be selected. There also exist a scenario which required a choice between both types of labour; this depended on a number of factors.

From the analysis, the important factors considered necessary while choosing the labour type to employ include; nature of works (90%), volume of work (80%), cost of works (80%), urgency (80%), expected quality of work (70%), location (60%) and other factors (40%). Other factors include; availability of materials, social environment considerations, market and economic conditions and availability of support facilities as shown in Table 4.7.

**Table 4.7: Factors Considered in Selecting Labour**

<table>
<thead>
<tr>
<th>Factor Considered</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of the work</td>
<td>9</td>
<td>90%</td>
</tr>
<tr>
<td>Total Cost of the work</td>
<td>8</td>
<td>80%</td>
</tr>
<tr>
<td>Volume of the work</td>
<td>8</td>
<td>80%</td>
</tr>
<tr>
<td>Urgency</td>
<td>8</td>
<td>80%</td>
</tr>
<tr>
<td>Expected Quality of the work</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>Location of the work</td>
<td>6</td>
<td>60%</td>
</tr>
<tr>
<td>Other factors</td>
<td>4</td>
<td>40%</td>
</tr>
</tbody>
</table>


**Chart 4.5: Factors Considered in Selecting Labour.**
The survey indicated that 30% of the respondents use contracted labour to undertake maintenance, 30% use in-house labour and 40% of the respondents’ use both types of labour depending on several factors as indicated in table 4.7. Table 4.8 shows the response rate on labour structure adopted.
Table 4.8: Labour Selected

<table>
<thead>
<tr>
<th>Labour selection</th>
<th>Both (In-house and Contract)</th>
<th>In-House Labour</th>
<th>Contract Labour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Wealth House</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>MKU Towers</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Post Bank House</td>
<td>Yes</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Pano House</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Transnational House</td>
<td>Yes</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Corner House</td>
<td>Yes</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Ngao House</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Rural Urban Credit Finance House</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Union Towers</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Maendeleo House</td>
<td>Yes</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td><strong>Total Respondents</strong></td>
<td><strong>4</strong></td>
<td><strong>3</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td><strong>40%</strong></td>
<td><strong>30%</strong></td>
<td><strong>30%</strong></td>
</tr>
</tbody>
</table>


**Chart 4.6: Labour Selected.**
4.5 General Condition of the Buildings

This subsection examines the general condition of the high-rise buildings as at the date of the survey with regard to the various buildings’ elements. During the investigation period, the researcher used a checklist to help assess the condition of the various building elements of the different selected buildings. The assessed elements include the following; roofs, walls, floors, fixtures and fittings, foundation and building services.

- **Roofs and Ceilings**

All buildings had flat concrete roofing to all the floors. Each floor slab acts as the roof to a level below. Different ceiling types were observed in various buildings e.g. rendered and colour washed concrete, soft board panels, suspended timber panels among others. Various defects noted on roofs and ceilings include; - leaking roof, cracks and dampness. Transnational House has rendered and colour washed concrete to its ceiling and Postbank House has suspended timber panels. Pano House was noted to have an abandoned room that had deteriorated elements.

**Plate 4.1 Peeled off ceiling in Pano House**
Walls

The main walls to the external and internal were made of reinforced columns and beams in filled with either concrete blocks or natural stones and finished with plastering and colour washed. Internal room partitions were of timber panels or flashboard panels. Finishes to the external walls included; tiles, brick or concrete facing, glazing, plastering, painting. Defects that were noted on the main walls include; cracks, surface discolouration, staining and dampness especially to the basement walls. Defects to the internal walls include; ripping off, broken down wooden members. Pano House and Ngao House had their external walls showing the most deterioration.

Plate 4.2 Stains and Cracks on wall surface in Ngao House.
Source: Field Survey, 2014

- **Floors and Staircases**

In all the assessed buildings surveyed, the floors to all the levels are made of reinforced concrete finished with various finishes such as; ceramic tiles, parquet, smooth cement screeds, terrazzo, wooden blocks or panel boards. The construction to the staircase was similar to that of the respective floor. The balustrade and the handrails are either wooden or metallic. Various defects noted include; worn out tiles, cracks on floors, dampness to ground floors and discolouration on floor finishes.

**Plate 4.3 Discoloured ceramic tiles in Ngao House**
Fixtures and Fittings

These includes; windows, doors, electric fixtures, water piping, lifts and other installations. Most doors to the internal rooms are made of either glazed panels or wooden panels or match boards or flush boards. The main entrance doors are made of glazed panels or metal casements. Windows are mostly glazed casements. Defects noted include; broken glass windows, faulty lifts, exposed electric wires, leaking water pipes etc. Transnational House and Post Bank House had their fittings and fixtures well maintained with the least deterioration.

Plate 4.4 Exposed electricity wires in Corner house
Source: Field Survey, 2014

- **Foundation, Basement and External Areas.**

The foundation forms the basis to which the building rests its strength. Due to their nature, all the surveyed buildings had their foundation intact to the ground. The survey indicated that all the buildings had a well maintained foundation that was in good condition. A few cracks however were visible to the basement floor emanating from beneath. This could be as a result of defects in the foundation.

External areas observed were immediate areas surrounding the buildings to all the sides. They include; drainage, dumping sites, flower gardens and immediate pavements. Defects noted include; worn out pavement outside commonwealth House and cracks on pavements of Ngao House.

**Plate 4.5 Worn out pavement outside Common Wealth**
Source: Field Survey, 2014

- **Building Services**

These include; drainage, ventilation, solid waste disposal, security, firefighting, water supply system, electricity supply, and provision of parking. The noted associated problems include; litter, rubbish, non-functioning air conditioners, leaking water systems, naked electric wires etc.

**Plate 4.6 Littered drain at Pano House**
4.6 Condition Rating of the Building Elements.

Table 4.9 classifies the various building elements according to the condition as at the time of the fieldwork. They were classified into; excellent, good, fair, poor and very bad in a scale as shown below;

<table>
<thead>
<tr>
<th>Category</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>5</td>
</tr>
<tr>
<td>Good</td>
<td>4</td>
</tr>
<tr>
<td>Fair</td>
<td>3</td>
</tr>
<tr>
<td>Poor</td>
<td>2</td>
</tr>
<tr>
<td>Very Poor</td>
<td>1</td>
</tr>
</tbody>
</table>

The survey indicates that Transnational House and Post Bank House have their elements’ condition rated the highest at 4.17. This translates to good maintenance condition for the two buildings. Pano House and Ngao scored the lowest at 2.83 each; this translates to poor maintenance activities and standards.

From the survey, the foundation and the floors were rated highly at 4.3 and 4.3 respectively. This indicated a good structural state of the buildings. The lowest rated elements are fixtures and fittings and building services at 3.1 and 2.9 respectively. This indicates poor maintenance on those elements and facilities.

After a careful assessment of the various elements and facilities, the researcher classified the buildings into condition groupings; excellent, good, fair, poor and very poor condition, where
those classified to be in an excellent condition scored 5, those classified under good condition scored between 4.0 and 4.9, those classified under fair condition scored between 3.0 and 3.9, those classified under a poor condition scored between 2.0 and 2.9 while those scoring below 2.0 were classified to be in very poor condition as from the average condition rating under Table 4.9.

Table 4.9 Condition Rating of the Building Elements.

<table>
<thead>
<tr>
<th>Building Name</th>
<th>Roofs</th>
<th>Walls</th>
<th>Floor and Staircase</th>
<th>Fixtures and Fittings</th>
<th>Foundation, Basement and External Areas.</th>
<th>Building Services</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Wealth House</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3.83</td>
</tr>
<tr>
<td>MKU Towers</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3.67</td>
</tr>
<tr>
<td>Post Bank House</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4.17</td>
</tr>
<tr>
<td>Pano House</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2.83</td>
</tr>
<tr>
<td>Ngao House</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2.83</td>
</tr>
<tr>
<td>Corner House</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3.83</td>
</tr>
<tr>
<td>Maendeleo House</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3.83</td>
</tr>
<tr>
<td>RUCF House</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>Union Towers</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3.83</td>
</tr>
<tr>
<td>Transnational</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4.17</td>
</tr>
</tbody>
</table>
Based on this, buildings were rated into excellent, good, fair, poor and very bad where the general rating was based on the assessment of the buildings’ elements as classified under table 4.9. A building was classified as being in an excellent condition if it was recently built and had no indications of physical deterioration. A building was classified as being in good condition if; it were in a good state of structural condition (with no cracks on walls or floors), good state of finishes (non-worn out paint, no ripped off tiles), good state of building services (no leaking, non-faulty lifts, good solid waste management), requiring minimal or no repair, allowing uninterrupted daily use of the building and its facilities such as water, electricity, washrooms, and effective lift usage. Transnational House and Post Bank House fell under this category.

A building was classified under fair condition if it exhibited the following features; experienced slight deterioration to the components, required major repairs and replacements to various building elements, occasional failure of building systems and services such as water, lift and drainage and causing slight interruption in daily use of the facilities. The buildings under this category include; Common Wealth House, Mount Kenya University Towers, Corner House, Maendeleo House, Rural Urban Credit Finance House and Union Towers.

Those classified under poor condition had various components showing signs of severe deterioration and required emergency repairs and corrective maintenance. Building systems failure was prevalent causing interruptions to daily use of facilities. The buildings under this category are; Pano House and Ngao House.

**Table 4.10 Building Rating**

<table>
<thead>
<tr>
<th>Building Name</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Wealth House</td>
<td>Fair</td>
</tr>
<tr>
<td>Mount Kenya University Towers</td>
<td>Fair</td>
</tr>
</tbody>
</table>
The survey indicated that; 20% of the high-rise buildings in the CBD are in a good condition and well maintained, 60% were in a fair condition and 20% are in poor state due to poor maintenance levels. To improve the state of the buildings condition demands that those buildings in a fair condition be attended to prevent further deterioration, those in a poor condition to be renovated and repaired.

**Chart 4.7 Condition Rating in Percentage.**

<table>
<thead>
<tr>
<th>Building</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Bank House</td>
<td>Good</td>
</tr>
<tr>
<td>Pano House</td>
<td>Poor</td>
</tr>
<tr>
<td>Ngao House</td>
<td>Poor</td>
</tr>
<tr>
<td>Corner House</td>
<td>Fair</td>
</tr>
<tr>
<td>Maendeleo House</td>
<td>Fair</td>
</tr>
<tr>
<td>Rural Urban Credit Finance House</td>
<td>Fair</td>
</tr>
<tr>
<td>Union Towers</td>
<td>Fair</td>
</tr>
<tr>
<td>Transnational House</td>
<td>Good</td>
</tr>
</tbody>
</table>

4.7 Maintenance challenges/ Problems

Maintenance of a building always poses a number of challenges and problems. The respondents gave the following to be the challenges and problems they face while undertaking such work; lack of adequate funds, high maintenance costs, age of the building, changing technology, defective building elements, shortage of materials, weather elements, user generated problems, wear and tear, defective building elements vandalism, lack of proper planned maintenance actions, poor enforcement of maintenance practices in place and slow response to emergency works. The main challenges identified are discussed below.

i. The age of the building

Buildings deteriorate with age. Most of the buildings were found to be of 30 years of age and above. This age significantly exhibits serious maintenance problems demanding due care and attention to retain their expected standard of habitation. 30% of the respondents identified as having experienced challenges in maintaining such buildings due to the changed technology and lack of materials.

ii. Inadequate funds and high cost of maintenance

The high cost of maintenance results from the high cost of labour and raw materials. Both the management companies and the tenants, in cases of their responsibilities, cited lack of funds as a challenge in dealing with upkeep of the buildings; 60% of the tenants cited that raising funds for maintenance was quite a challenge while 30% of the managers said that the landlords were stringent and didn’t set aside funds for maintenance. Delayed service charge payment was also identified as a cause of lack of timely funds to execute maintenance works.

iii. Lack of proper planned maintenance actions.

There exists lack of properly planned maintenance activities in place for various elements. It was observed that planned maintenance activities was only done to the basic foreseeable works and ignorant of the unforeseen activities, it was noted that planned maintenance activities lacked in various components and were only rectified upon failure. These elements include structural components of the building, fixtures and fittings. 80% of the respondents indicated that this was a challenge.
iv. Poor enforcement of existing maintenance activities.

The survey indicated that only 60% of the respondents enforced the various maintenance activities in place. This was similar to the response on enforcement of the maintenance policy.

v. Use of cheap contractors/ personnel

Due to the high cost of maintenance, the property managers and tenants tend to opt for cheap labour/ contractors or personnel to undertake such work. These contractors tend to be dishonest and end up using poor quality materials, poor quality of work leading to poor installations, faulty workmanship and incorrect designs. This leads to failure of the components within a short period of time. Respondents also indicated that there is poor or no supervision of the maintenance operatives.

vi. Unclear Responsibilities/ Management Constraints

Provisions in the maintenance policy are not clear as to who is ultimately responsible to carry out certain maintenance activities. This included activities that constituted internal repair works and defects caused by non-negligence on the part of the tenant or caused by natural causes. The tenants claimed that the policy was unclear on such.

Failure of the management to develop an effective maintenance plan, which includes defining project goals and objectives, specifying tasks or how goals will be achieved, resources required and associating budgets and timelines for completion, results in the poor execution of the maintenance work. Bureaucracy and lengthy approvals and poor communication between the parties involved were also noted to be a management constraint.

vii. Change of Technology

The history of high-rise buildings in Nairobi dates back to late 1960s. These were built with the technology as at that time. This has changed over time and has been replaced by more advanced technology in the building technology industry especially on building equipment
and facilities. This is a source of problems as the archaic technology is no longer available due to its low demand thus has been replaced, thus it is difficult to repair and replace certain building components which requires specific technology and materials.

viii. User Generated Problems

Lack of training of the end users on usage of various facilities and how to maintain them also leads to problems. This results in buildings and facilities having serious maintenance challenges. Other challenges identified include; negligence by tenants, procrastination of works and unavailability of specific materials.

The study revealed that lack of proper planned maintenance activities was a major problem with 80% of the respondents indicating this as the major hindrance. Inadequate funds had a response rate of 70% where respondents indicated the difficulty in raising funds for maintenance; further interviews revealed that whenever such works arise, especially corrective maintenance or emergency maintenance, there were no funds available to execute the maintenance activities. This was as a result of poor planning and poor budgetary allocation on the various maintenance activities. The other challenges identified by the respondents are; management constraints (50%), user generated problems (40%), poor enforcement (40%), use of cheap labour (30%), technology change (20%) and age of the building (20%).

Table 4.11 Maintenance Challenges

<table>
<thead>
<tr>
<th>Maintenance Challenges/Problems</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of proper planned maintenance actions</td>
<td>8</td>
<td>80%</td>
</tr>
<tr>
<td>Inadequate Funds</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>Management Constraints</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>User Generated Problems</td>
<td>4</td>
<td>40%</td>
</tr>
<tr>
<td>Poor enforcement</td>
<td>4</td>
<td>40%</td>
</tr>
<tr>
<td>Cheap Contractors</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>Age of the building</td>
<td>2</td>
<td>20%</td>
</tr>
</tbody>
</table>
CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter identifies and discusses the key findings of the study. The various issues analyzed in the previous chapters have provided critical insights into the maintenance problems and challenges faced in high-rise buildings. These insights have informed the conclusions and recommendations of the study on how the maintenance problems could effectively be addressed.

The study objectives as identified were;

- To identify the maintenance policies in high-rise buildings.
- To establish the maintenance practices in high-rise buildings.
• To identify the challenges faced in undertaking the maintenance practices.

• To propose possible solutions that may be employed in maintenance of buildings.

These objectives have been addressed as revealed by the study. The study concludes by enumerating a number of recommendations aimed at addressing the problem of poor maintenance of high-rise buildings within Nairobi. It is hoped that these recommendations if implemented will contribute in reducing the maintenance problem besetting the built environment sector in the country as well elsewhere.

5.1 Summary of Findings

The study established that all buildings had policies on maintenance in place to guide and oversee maintenance activities which was either developed by the property owner or the maintenance manager. An overview of the different policies for the various buildings identified that various provisions featured prominently which include; resource allocation, performance requirements, execution of work and administrative activities. Only 60% of the respondents indicated the respective policies to be enforced. 90% of the respondents indicated that there was a tenancy agreement in place which identified the responsibilities and duties of the various parties involved in maintenance.

Various maintenance practices and activities are in place which include; planned preventive maintenance, planned corrective maintenance, unplanned maintenance, emergency maintenance, deferred maintenance and predictive maintenance. Planned preventive maintenance is the commonest in practice while predictive maintenance is the least common among the practices. This reveals that priority is given to the prevalent and the foreseeable maintenance activities while unforeseen activities have low priority and ignored by some maintenance managers/property owners.

Response time to maintenance requests was generally poor as the study revealed, 30% of the respondents indicated that it took less than a day to respond to such queries, 20% indicated that it took between one and three days, 30% indicated that it took between three and seven days and 20% more than seven days. Further investigation on this revealed that there were
lengthy bureaucratic approval processes and that the response was based on urgency, with emergency or urgent upkeep having the highest priority.

The survey revealed that raising funds for maintenance was a problem for various buildings. There are various methods used to raise funds for maintenance. Furthermore, 40% of the respondents (property managers) set aside 10-15% of the annual rent for maintenance. However, several maintenance managers indicated that this amount was not enough and extra funding for the remainder was necessary.

The study revealed that various factors are considered in selecting the labour type to employ for execution of maintenance activities. A majority of the buildings’ managers (90%) consider nature of works to be the biggest determinant of the type of labour to select, other factors considered include; volume of work (80%), cost of works (80%), urgency (80%), expected quality of work (70%), location (60%) and other factors at 40%.

Among all the building elements of the buildings surveyed; roofs, walls, fittings and fixtures, floors, foundation and building services; fittings, fixtures and building services had the most maintenance problems whilst the foundation and the floor had the least of problems. A further classification of the buildings based on their condition indicated that; 20% of the high-rise buildings in the CBD are in a good condition and well maintained, 60% were in a fair condition and 20% are in poor state.

Several challenges were identified to be experienced while undertaking maintenance as revealed by the respondents. These challenges include; lack of properly planned maintenance actions, lack of adequate funds, high maintenance costs, age of the building, changing technology, defective building elements, shortage of materials, weather elements, user generated problems, wear and tear, defective building elements vandalism, slow response to maintenance works, negligence by tenants, procrastination of works and unavailability of specific materials.

5.2 Test of the Study Hypothesis
The study hypothesized that “Lack of planned maintenance activities is the main cause of poor maintenance in high-rise buildings in Nairobi.”

The researcher determined that most of the challenges faced in maintenance of high rise buildings arise from lack of properly planned maintenance activities in dealing with maintenance of high-rise buildings.

Based on this conclusion therefore, the researcher upheld the study hypothesis to be true and thus acceptable.

5.3 Conclusions

Maintenance is overseen by policies and adopted practices as developed by the maintenance manager or the property developer of the respective building as revealed by the survey. The policy has provisions for the following elements; resource allocation, performance requirements, execution of work, position of maintenance department and administrative activities. There is lack of clarity however on various responsibilities and procedures that should be adopted in executing maintenance, leading to ineffective maintenance policy, laws and regulations to compel both managers and occupants to undertake maintenance failure. Various factors are considered while deciding on the order of which to execute maintenance activities i.e. urgency of maintenance work, condition of the element, risk associated with postponement of the work, nature of the work, quantity of work and frequency of failure. From the analysis urgency of the maintenance work had a response rate of 100%, while quantity of the work had the least at 30%.

Funding for maintenance is done through various methods. This is a source of challenges in itself. The various problems associated with funding include; inadequate funds and delays in the release of funds by the maintenance manager or owner which contribute significantly to the condition of buildings. The cost of building materials and labour on maintenance directly reflects the amount of funds required for the various activities. The channels through which decisions on maintenance are made are long resulting in the delay of release of funds for
maintenance. These bureaucratic processes affect or delay the execution of maintenance works.

The results on the response time taken to execute certain activities was not pleasant as 50% of the respondents indicated that it took more than three days for such to be done. This indicated poor response to maintenance works, during which period the deterioration could worsen.

The buildings were rated based on a score which classified the various buildings’ elements into; excellent, good, fair and poor condition where those classified to be in an excellent condition scored 5, those classified under good condition scored between 4.0 and 4.9, those classified under fair condition scored between 3.0 and 3.9, those classified under a poor condition scored between 2.0 and 2.9 from the average condition rating as indicated in Table 4.9 where the score thus established that; 20% of the buildings fell under the category 4.0 and 4.9, 60% under 3.0 and 3.9 while the remaining 20% scored between 2.0 and 2.9.

This rating revealed that 20% of the high-rise buildings are in a good condition and well maintained, 60% were in a fair condition and 20% are in poor state. The percentage so inferred indicates that building maintenance is a real problem and a lot needs to be done to improve the current situation on the condition of the buildings in Nairobi.

The study indicates that the most widespread defects are; faded painting, partly broken glass windows, dusty components, leaking roofs, faulty building services and cracks in walls. These problems as revealed by the study are influenced by; lack of properly planned maintenance actions, the age of the buildings, inadequate funds and high cost of maintenance, lack of proper skills by maintenance staff, lack of commitment on the part of occupants and general wear and tear.

5.4 Recommendations

The following are the recommendations of the study which are a way of dealing with maintenance challenges;
Proper planning of maintenance actions should be put in place to help guide the whole process of maintenance. This embraces virtually all activities involved in maintenance activities which include; financial planning, sound policies, labour selection, clarity of responsibilities, procedure of execution of works among others as further discussed below;

Property management firms should ensure that maintenance department is adequately staffed with the essential staff and that they have appropriate training and skills to competently undertake and complete the maintenance tasks expected of them. Qualification of operatives rather than the cost of works should be used as the determining factor in selecting for the labour to employ.

Vetting of contractors and supervision of works should be embraced. Severe assessment of the progress of the works as undertaken by the respective operatives is paramount. This will ensure the entity carrying out the work exercise its mandate with due diligence and proficiency. Supervision ensures the correct designs and material ratios are used by the executing operatives. This gives the maintenance manager the chance to request for rectification or modification of certain parts for best results. The maintenance manager thus should supervise the works or appoint someone who will act on his behalf.

Regular inspections and assessment of a sample sufficient to give conditions of the building, and be able to determine a great deal about a structure and its components from visual and non-destructive inspections is important. The correct identification of types of building material for maintenance purposes as to be cleaned, refinished, renovated or restored is the important step in the process of identifying building defect. An investigation should be carried out to help determine the appropriate timing of works. Methodical inspections should be carried out e.g. externally starting at the top of the building’s roof structures, lift rooms, working down the building through external walls, windows, doors etc. Internally room by room or service e.g. electrical installations, sanitary appliances, water distribution are examined carefully. Maintenance priority is given based on a reasonable assessment of data; urgency and type of repairs together with an assessment of costs of work. This helps maintenance plan be made on a firm basis.

The maintenance managers should develop a multiple-level education strategy to address the differing information needs of the various stakeholders in terms of maintenance of buildings.
This should include safety, welfare and health implications about the importance of maintenance. This goes hand in hand with training the tenants on how to use the facilities of the building, tenant preoccupancy education, arranging for training of the maintenance personnel on the changing methods of maintenance, ensuring harmony and that everyone undertake their duties and responsibilities.

Financial planning and proper budgeting is elementary in maintenance management. There is the need to set up a Maintenance Fund or pool that gathers financial resources to mobilize adequate funds to meet maintenance needs of buildings as they arise. A minimum of 15% of the annual rent should be set aside to cater for maintenance of the respective buildings.

A Clear communication network from identification of defect to reporting and execution should be established. This will help increase efficiency and ensure maintenance needs are responded to effectively and promptly. There ought to be a direct line to the maintenance manager to ensure there are no delays in information transmission.

The channels through which decisions on maintenance are made should be cut down to minimum since lengthy processes result in delays in; release of funds for maintenance, slow decision making on urgent matters and slow response. These bureaucratic processes affect or delay the execution of maintenance works thus should be done away with.

The various maintenance activities should be encouraged in equal measure. Funds should be set aside for each activity, enforcement and follow up to ensure compliance to the maintenance plan. These are; planned preventive maintenance, planned corrective maintenance, emergency maintenance, unplanned maintenance and predictive maintenance.

Finally, there is need to improve maintenance strategies and establish sound policies to ensure clarity of the procedures to be undertaken on; work programme to be adopted, maintenance planning, resource allocation, labour selection, duties and responsibilities to tenants and managers, funding, execution of work and other key areas that are annexed to the upkeep, safety and habitability of buildings.

5.5 Areas of Further Study

The researcher recommends the following areas to be studied further;
i) The role the government plays to ensure private buildings are maintained.

ii) The role the building stock play in the economy of the country and why maintenance of such stock is important.

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APPENDICES

APPENDIX A

QUESTIONNAIRE FOR THE MAINTENANCE MANAGER

NDUHIA N MBUTHA,

SCHOOL OF THE BUILT ENVIRONMENT,

UNIVERSITY OF NAIROBI,

PO BOX 30197-00100,

NAIROBI.

To whom it may concern,

I am a fourth year student at the University of Nairobi pursuing a degree in Bachelor of Real Estate in the Department of Real Estate and Construction Management. I wish to request your assistance in data collection for my research on ‘Maintenance of High-rise Buildings; Policies, Practices and Challenges’.

The information is for academic purposes only and will be treated with the strictest confidentiality. Your assistance in the completion of the questionnaire will be highly appreciated.
Thank You

1. Name of the building

.................................................................

2. How can you classify your building according to the period of existence as to whether it is old (above 50 years), medium aged (20-50 years) or new buildings (below 20 years)?

   a. Old (50 years and above) [ ]
   b. Medium aged (20-50 years) [ ]
   c. New (below 20 years) [ ]

3 (a). Does your company have a maintenance policy?

   Yes [ ] No [ ]

   If yes, who develops the policy?

.................................................................

(b). Do the following elements have provision in your policy?

   a) Resource allocation [ ]
   b) Performance requirements [ ]
   c) Execution of works [ ]
   d) Administrative activities [ ]
   e) Position of maintenance department within the organization [ ]

(c). Is your maintenance policy enforced?

   Yes [ ] No [ ]

   If yes, who is responsible for the enforcement?

.................................................................

4. What type of maintenance arrangement do you have in place?
Planned [ ]  Unplanned [ ]  Preventive [ ]  Corrective [ ]  Predictive [ ]
Emergency [ ]

Other, please specify

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5. What are some of the maintenance practices that are employed in maintenance of your buildings?

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6. (a) How does your management undertake maintenance work?

   a) Upon reporting by tenants. [ ]
   b) Upon inspection by the maintenance department. [ ]
   c) When the building parts or services fail. [ ]
   d) Upon occupancy of new tenant. [ ]
   e) Other, please specify below.

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--------------------------------------------------------------------------------------------------------------------------

(b) Is there a maintenance procedure that is adopted in carrying out maintenance work?

Yes [ ]  No. [ ]

If yes, please indicate briefly the procedure, below.

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--------------------------------------------------------------------------------------------------------------------------
7. Do you inspect the building to determine its maintenance needs?

Yes [ ] No [ ]

If yes, how often and if no please assign reasons.

8 (a). Who is ultimately responsible for the maintenance activities of the building?

Labour on contract. [ ] In-house labor. [ ] Both. [ ]

Other, please specify

(b). What are the factors used to select the type of labour to be employed?

I. Nature of work [ ]
II. Volume of work [ ]
III. Expected quality of work. [ ]
IV. Urgency [ ]
V. Location of work [ ]
VI. Total cost of works [ ]
VII. Other factors, please indicate below

9 (a). Does the management issue a lease agreement to the tenants?
(b). What is the responsibility of the occupants towards the maintenance of the building as provided for under the lease agreement?

   a) Undertake all internal repairs [  ]
   b) Duty to maintenance of common areas. [  ]
   c) Responsible in undertaking external repairs. [  ]
   d) Charged extra amount to finance structural components [  ]
   e) Other, please specify.

......................................................................................................................

......................................................................................................................

......................................................................................................................

10. How long does it take to respond to maintenance requests by occupiers by the maintenance department?

   i. Response within 24 hours [  ]
   ii. Response between 1-3 days [  ]
   iii. Response between 3-7 days [  ]
   iv. Response over 7 days [  ]

11 (a). Does the management take inventory of the state of the building at the beginning of a new occupancy and at the end?

   Yes [  ] No [  ]

(b). How is the incidence of negligence in maintenance of the building when a tenant is moving out?

......................................................................................................................

......................................................................................................................

......................................................................................................................
12 (a). How is maintenance funded?

i) Rent payment. [ ] ii) Sinking fund. [ ] iii) Borrowing from banks. [ ] iv) Service charge payment. [ ] v) Other please specify below.

…………………………………………………………………………………………………………………………

(b). What percentage of rent collected is reserved for maintenance annually?

…………………………………………………………………………………………………………………………

(c). Is the amount allocated sufficient for carrying out the maintenance work?

…………………………………………………………………………………………………………………………

(d). If no, what actions does the management do to finance the deficit?

…………………………………………………………………………………………………………………………

13. How will you consider the current state of the building in terms of the following elements and facilities?

<table>
<thead>
<tr>
<th>Element/Facility</th>
<th>Current State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Excellent/Good/Average/Poor/Very bad)</td>
</tr>
<tr>
<td>1. Roofs and Ceilings</td>
<td></td>
</tr>
<tr>
<td>2. Walls</td>
<td></td>
</tr>
<tr>
<td>3. Floors and Staircases</td>
<td></td>
</tr>
<tr>
<td>4. Fixtures and Fittings</td>
<td></td>
</tr>
<tr>
<td>5. Foundation, Basement and External Areas</td>
<td></td>
</tr>
<tr>
<td>6. Building Services</td>
<td></td>
</tr>
</tbody>
</table>

14. In your own opinion what do you think are the causes of poor maintenance in your buildings?
15. What challenges do you face while undertaking maintenance of the building? Please list them below.

i) .................................................................

ii) .................................................................

iii) .................................................................

iv) .................................................................

v) .................................................................

16. What recommendations would you propose to counter the challenges that you have mentioned above?

i) .................................................................

ii) .................................................................

iii) .................................................................

iv) .................................................................

v) .................................................................

End of the Questionnaire.

Your assistance is greatly appreciated. Thanks a lot for your time.
APPENDIX B:

QUESTIONNAIRE FOR THE TENANT

NDUHIA N MBUTHA,

SCHOOL OF THE BUILT ENVIRONMENT,

UNIVERSITY OF NAIROBI,

PO BOX 30197-00100,

NAIROBI.

To whom it may concern,

I am a fourth year student at the University of Nairobi pursuing a degree in Bachelor of Real Estate in the Department of Real Estate and Construction Management. I wish to request your assistance in data collection for my research on ‘Maintenance of High-rise Buildings; Policies, Practices and Challenges’.

The information is for academic purposes only and will be treated with the strictest confidentiality. Your assistance in the completion of the questionnaire will be highly appreciated.

Thank You

1. Name of the building

........................................................................................................................................

88
2. Building Type of Occupant  Business [ ]  Office [ ]  Home [ ]

3. How long have you stayed in the building?

........................................................................................................................................

4. What motivated you to select this particular building?

   Low Rent [ ]  Convenience [ ]  Maintenance Condition [ ]  Lack of alternative [ ]

   Other................................................................................................................................

5. Did you take inventory of the state and facilities in the building before taking occupancy?

   Yes [ ]  No [ ]

6. Who is responsible for the maintenance of the building?

   a) Occupants [ ]  b) Management [ ]  c) Both [ ]

   Other, please specify...............................................................

7. Does the management undertake regular inspection of the building?

   Yes [ ]  No [ ]

8. Does the management come in to do maintenance work on the building without request?

   Yes [ ]  No [ ]

   If yes, when is it done?  Monthly [ ]  Quarterly [ ]  Annually [ ]  Biannually [ ]

   Other (please specify)

.................................................................................................................................

9. How long does it take for maintenance request to be responded to?

   i.  Response within 24 hours  [ ]

   ii. Response between 1-3 days  [ ]

   iii. Response between 3-7 days  [ ]
iv. Response over 7 days [ ]

10 (a). In your opinion is the building well maintained? Yes [ ] No [ ]

Please give reason(s) for your answer

........................................................................................................................................
........................................................................................................................................

(b). Are you satisfied with the current state of maintenance in the building?

Yes [ ] No [ ]

11 (a). What role do you play in the maintenance of your building?

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

(b). How much do you spend annually, if any, on maintenance of your building?
........................................................................................................................................
........................................................................................................................................

12. What challenges do you face while undertaking maintenance of the building as indicated in (11) above?

i) ........................................................................................................................................

ii) ........................................................................................................................................

iii) ........................................................................................................................................

iv) ........................................................................................................................................

13. How would you rate maintenance condition of the following elements in your building? Please indicate in the table below.

<table>
<thead>
<tr>
<th>Element/Facility</th>
<th>Current State (Excellent/Good/Average/Poor/Very bad)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Roofs and Ceilings</td>
<td></td>
</tr>
<tr>
<td>2. Walls</td>
<td></td>
</tr>
<tr>
<td>3. Floors and Staircases</td>
<td></td>
</tr>
<tr>
<td>4. Fixtures and Fittings</td>
<td></td>
</tr>
</tbody>
</table>
14. What can you recommend to be done to improve the current state of maintenance in the building?

i) ........................................................................................................

ii) ........................................................................................................

iii) ........................................................................................................

iv) ........................................................................................................

End of the Questionnaire.

Your assistance is greatly appreciated. Thanks a lot for your time.
To Whom It May Concern

B04/0850/2010 – NDHUHIA NICHOLAS MBUTHA

We confirm that the above named student is in the Department of Real Estate and Construction Management pursuing Bachelor of Real Estate Degree course.

He is carrying out his fourth year project entitled; "Maintenance Of Highrise Buildings in Nairobi CBD"

Any assistance accorded to him will be appreciated.

CHAIRMAN
DEPARTMENT OF REAL ESTATE
AND CONSTRUCTION MANAGEMENT
UNIVERSITY OF NAIROBI

Dr.-Ing. C. Mbatha
Ag.Chair &Senior Lecturer
Dept. of Real Estate and Construction Management