

UNIVERSITY OF EDUCATION, WINNEBA
COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

**AN INVESTIGATION INTO THE EFFECT OF MAINTENANCE CULTURE
OF BUILDINGS IN GHANA.
A CASE STUDY OF AYAWASO SUB-METRO IN THE GREATER ACCRA**



GEORGE SEVOR

DECEMBER, 2014

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The logo of the University of Education, Winneba, is a circular emblem. It features a central lamp with a flame, surrounded by a sunburst pattern. The emblem is set against a red and white background. The text "UNIVERSITY OF EDUCATION, WINNEBA" is written around the perimeter of the circle, and "COMMITMENT FOR SERVICE" is written at the bottom.

**A Dissertation in the Department of CONSTRUCTION AND WOOD
TECHNOLOGY EDUCATION, Faculty of TECHNICAL EDUCATION,
submitted to the School of Graduate Studies, University of Education, Winneba
in partial fulfilment of the requirements for the award of Master of Technology
(Construction) degree.**

DECEMBER, 2014

DECLARATION

CANDIDATE'S DECLARATION

I George Sevor declare that this dissertation, with the exception of quotations and references contained in the published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE.....

DATE.....



SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Dissertation as laid down by the University of Education, Winneba.

NAME: MR. M.K. TSORGALI

SIGNATURE.....

DATE.....

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I write to acknowledge the contributions on many authorities and individuals whose ideas, suggestions and assistance have make this research possible.

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I also want to acknowledge my typist, friends, roommate and group study members who supported me in divers ways to make this project a success, to all, I say the father of all creation richly bless you.



DEDICATION

I dedicate this project to the Glory of God, without whom this project would not have been completed. I also dedicate it to my wife Judith whose appearance has brought hopes and blessing.



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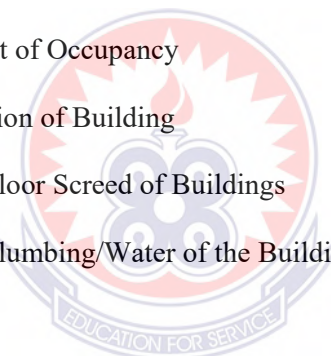


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ABSTRACT

A building fabric is referred to as an ‘environment envelope’ because it is the means by which the natural or external environment may be modified to produce a satisfactory internal environment for a person to live in. The deterioration of building hampers its ability to perform adequately, therefore it is important to ensure proper maintenance to prevent deterioration. Due to the neglect of the maintenance component of building in this country, a lot of residential and public buildings are in a state of disrepair. In view of the above, this study was designed to assess the current condition of residential and public buildings. Identify the major causes of poor maintenance to buildings, analyse the maintenance policy and practice of the maintenance department in residential and public institution in this country to make suggestion and recommendation towards the adoption of effective maintenance policy and practice. The field investigation focused on residential and public building in the Ayawaso sub metro in Accra metropolis. Three different housing types were defined for data collection and analyses including bungalows, tenant houses and single unit houses. Method of data collection was purposive and random sampling techniques. A number of houses were covered in the survey. The survey revealed that there is a real housing maintenance problem in the public and residential building sectors in Ghana particularly in the Ayawaso sub metro and also buildings have deteriorated and need to be repaired, the buildings was not properly designed and constructed, they lacked preventive or regular maintenance and that estate managers, occupants, personnel (expects) are to be blamed that maintenance work on buildings should start from the planning stage (design stage) to the life span of the building. The study also established the following factors as being responsible for the poor maintenance of public and residential buildings: the age of the building, lack of maintenance culture, inadequate funds and cost of maintenance, pressure on buildings facilities by number of users and poor construction work and maintenance work done by maintenance personnel of public institutions. Stake holders in the housing sector also add to the problem that has arisen as a result of lack of preventive maintenance plan, low capacity of maintenance personnel in terms of staffing and training, absence of a national maintenance policy, apathy and lack of patriotism on the part of some public employees occupying government bungalows.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Building materials decay eventually as a result of sunlight, rain, snow and wind and therefore they require much attention if buildings are to be maintained, the protection of the fabric of a building saves money in the long term. The sustainability of capital investment of any nation has been a major and global dialogue most especially in developing countries where infrastructural development is still at the infancy. This is because most government expenditures and investments focus attention on infrastructural development. One way of sustainability is to focus attention to maintenance of the existing stock of infrastructural facilities and services which the external environment may be modified, in order to produce a conducive internal environment for occupants to live in. Therefore it is very important to produce timely maintenance, repair and rehabilitation to facilities to maximize the life span of the facilities. Maintenance according to BS 3811(1984) is the construction of all technical and associated to retain an item in or restore it to a state in which it can perform its required function.

According to Seeley (1987) neglect of maintenance has accumulative results with rapidly increasing deterioration of the fabric and finishes of a building accompanied by harmful effect on the content and occupants.

Oladimeji (1996) described maintenance as the combination of any actions carried out to retain an item in or restore it to acceptable condition. Onwuka (1989), state that maintenance management is concerned with the planning and contract of construction resources to ensure that necessary repair and renewal are carried out with maximum efficiency and economy.

Kolawole (2002) advocates that maintenance culture requires correct diagnosis of defects, current remedial, sound technical knowledge of materials usage, management resources as well as the formation and implementation of integrated plan and policies to sustain entity. The absence of these qualities has led to the decay of the nation's physical, social, aesthetic and economic environment. Maintenance brings about improved utilization of buildings to ensure the highest health and safety standards.

Moreover, a well operated system of maintenance for building and equipment has the effect of being a very effective disaster mitigation measures in terms of cost and facility usages. It ensures that most economic ways to keep the building and equipment in the best form for normal use given the original design and material (<http://www.oas.org/endmp>). Maintenance can be explained as work undertaken in order to keep or restore every facility that is every part of the building and contents to an acceptable standard. Planned maintenance as the term implies is to prevent failure, which recurs predictably within the life of the building. Corrective maintenance is carried out after failure has occurred and intended to restore an item to a state where it performs its functions.

When buildings are not maintained to their required standard it causes extensive damage to the fabric of the building. Poor maintenance has ended up in damage and deterioration to some public and residential buildings in Ghana, elimination of maintenance especially in relation to the replacement of electrical cables can also give rise to fire outbreak and safety hazards.

Another case in point is the Ambassador Hotel in Accra which was Government owned Hotel in the 1970's, randown and has been reconstructed to a newly private

owned hotel called Moven Pick Hotel in Accra. The current state of this public building could be attributed to lack of maintenance and neglect after being put into use.

1.2 Statement of the Problem

Many Ghanaian public and residential buildings are inadequately maintained, windows and doors and other building element show evidence of poor maintenance and repair. This has resulted in such buildings being in dilapidated states with some being abandoned. The poor maintenance by authorities and occupants of these facilities often leads to reduced life span of these buildings. Generally Ghanaian perspective on maintenance culture is an open secret, almost every institution in Ghana has serious maintenance problem.

The problem of ownership of these facilities, are just because the occupants have in mind that the property does not belong to them, but rather to the state and building owners and so they handle it without due care. This has resulted in the state in which most residential and public buildings find themselves. Poor maintenance to residential and public building is causing a lot of damage to the people of this country. A clear example is most of the residential and public buildings in the Greater Accra Region especially in the Ayawaso Sub-Metro. However, new buildings are being constructed now and then without giving attention to the old structures which have been neglected. Frequent visits to the Ayawaso Sub-Metro in the Greater Accra Region by this research reveal the situation in which some public and residential buildings were found not to be conducive for occupants; some buildings develop cracks on walls, rotten or decay wooden members, leaking roofs, broken blades, faded and discoloured surface coating (painting) foundation of buildings were exposed due to erosion, old electrical

cables have been exposed which can result in fire outbreak and electrocution to occupants.

As a result of these, vital documents cannot be found for Audit purposes. These problems arise out of the present situations as far as maintenance of building is concerned. This goes a long way to reduce the efficiency of personnel.

In view of these, it must be considered necessary to study the maintenance policy of public and residential buildings in Ghana especially in the Ayawaso Sub-Metro in the Greater Accra Region to identify the main factors contributing to the poor maintenance culture in the public and residential buildings since property owners are increasingly beginning to accept the fact that it is not in their best interest to carry out maintenance in a purely reactive manner but rather should plan and manage as efficiently as any other corporate entity.

1.3 The purpose of the study

The purpose of the study was to ensure effective maintenance culture of buildings in Ghana.

Objectives of the study was to:

- Examine the maintenance culture of building.
- Identify the maintenance culture of public and residential building.
- Develop maintenance culture policy to ensure effective maintenance of public and residential building

1.4 Research Questions

- What are the maintenance culture of building issues in the Ayawaso sub metro?
- What effective maintenance culture policies can be developed?
- What are the causes of poor maintenance culture of residential and public buildings?

1.5 Scope of the Study

The study is to ensure effective maintenance culture of public and residential buildings and to inform the personnel, Estate managers and occupants on the effect of maintenance culture of buildings and to identify maintenance problems, the necessary maintenance arrangement and their policy in the Ayawaso sub-Metro in the Greater Accra Region.



CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter of the research work will review the literature on the concept of the effects of maintenance culture of residential public building.

2.1 The concept of Building Maintenance

2.1.1 Definition of Building

A building is an edifice erected by art, and fixed upon or over the soil, composed of stone, brick, wood or other proper substance connected together, and designed for use in which it is to fix. Derek Miles and Paul Syagga (1987).

2.1.2 Lives of Buildings

The lives of existing buildings are difficult to assess as all properties from the data of their erection, have been the subject of varying amounts and standards of maintenance, besides being constructed with the intention that they should last at least sixty (60) years and many exceed this period (Seely, 1987).

Stone (1983) in Seely (1987) asserts that even cheaper buildings generally have a substantial life in the order of fifty (50) to sixty (60) years. And that this possible physical life is often much greater but may be demolished before the end of this period to permit a more profitable use of the site, or because it is found more economical to clear and rebuild rather than to adopt the building to meet changed requirement, because of physical or technical obsolescence.

The life of a building can be categorized into structural or physical life, and economic life. The structural or physical life is the period which expires when it ceases

to be an economic proposition to maintain the building, while the economic life is concerned with earning power and it is that period of effective life before replacement. Replacement takes place when it will increase income absolutely. However, the actual physical life of a building is frequently much greater than its economic life, but buildings are often demolished before their physical life is expired in order to permit a more profitable use of the site, or because it is found cheaper to clear and rebuild rather than to adapt the building to the requirement (Seely, 1987).

As a general rule, the capital asset of a building is so valuable and is often appreciating so that in practice, maintenance is frequently directed to prolonging the serviceable and effective life.

2.2 Types of Residential and Public Buildings

- Residential Flat Buildings

The term residential flat building represents a group of particular residential and public building types.

- Big House Apartment is a Residential

Flat building which has the proportion and seal of a large detached dwelling. It is a freestanding building in a landscape setting. The big house can range in size from one to three dwelling units per floor and its typically two or three storeys high. The big house can be an existing large house. Internally subdivided into separate apartments. This building type is best used when the context is detached dwellings or similar architectural forms which are likely to remain.

- Raw Apartments are suited to a range of plot sizes because they can be limited to four units around central stair or can be extruded along a street to allow multiple

collective entries and longer street-edge development. This building type is best used when limited building height is a consideration.

- A courtyard apartment is a residential flat building, which wraps around and defines an open space (courtyard) or multiple open spaces on a site).
- Stepped apartment is a residential flat building characterized by building from which steps down the plot in relation to the natural ground slope. Stepped apartments often provide large outdoor terraces which can contribute to the landscape setting of the site. They are most successful when they become stepped courtyard apartment. Stepped buildings are often limited to four storeys in height.

This building type is best used when:

- the site is sloping
- the slope is facing a significant public, green open space
- Block apartment is a residential flat building with an elongated plan and a controlled building depth. Units are usually arranged along a corridor with a single or multiple cores depending on the building length.
- Tower apartment is a residential flat building, which is vertically proportioned and has limited number of dwelling units arranged around a central core. The floor plates are typically repetitive and the tower is free standing. This building type is best used when;

- The existing context is an urban area.
- Higher density housing is desired.
- Strongly urban forms are desired.
- Detached Bungalows House

These are buildings designed to be occupied by a single household. This is because they are built on individual plot of varying sizes. The dwellings are arranged into

specific rooms such as visitor's room, kitchen, living room, bedrooms, in order to carry out indoor family activities. In addition there are garages, store rooms and terraces in some of these house types.

- **Semi-Detached Bungalow House**

This type of dwelling is basically two houses built together with a common divisional wall or a partition wall on a plot. The dwellings are self-contained with bedrooms, living room, kitchen, dining etc.

2.3 Definition of Maintenance

British standard (BS 3811: 1964) defines maintenance as a combination of any action carried out to retain an item in, or to restore it to, an acceptable standard. The action here is referred to as those associated with initiation, organization and implementation, retaining that is work carried out in an anticipation of failure, referring to as the corrective maintenance.

There is also the concept of acceptable standard: These may be considered as acceptability to the one receiving the benefit or to other body with the responsibility to ensure minimum standards.

Additionally, it can be considered widely as acceptability to the general public or to a section of the public. However, there are no universally accepted standards which would be equally acceptable to everybody, in group of persons over a period of time.

According to the British Standard (B.S, 3811, 1984) as cited in (Afrani and Osei-Tutu, 1999) maintenance is defined as work undertaken in order to keep or restore every facility (i.e. every part of the site, building, and content) to an acceptable standard and cost.

- To keep here implies that, the defects are eventually prevented from occurring or developing.
- To restore here implies that, the minor defects are corrected if they are allowed to occur.

Acceptable standard and acceptable cost imply that, maintenance work is carried out to suit the condition and individual needs. As defined by the standards and guideline for the conservation of historic places in Canada (2004). Maintenance is a routine, cyclical, non-destructive action necessary to slow the deterioration of a historic place. It entails periodic inspection, routine, cyclical, non-destructive cleaning; minor repair and refreshing, operations; replacement of damaged or deteriorated materials that is impractical to save.

Seely (1987), defined 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.

Maintenance has also been defined as all actions taken to retain material in or to restore it to a specific condition. It includes inspection, testing, servicing, and classification as to serviceability, repair, rebuilding, and reclamation (Collins English Dictionary, 2003).

A more functional definition proposed by white (1969) as cited in Lee (1987) is that maintenance is synonymous with controlling the condition of a building so that its pattern lies within specified regions. The word control means a positive activity which is planned so as to achieve a perfect and result while the term specific regions implies a range of acceptability with upper and lower limits between which the conditions of the building must be maintained.

Maintenance therefore is all the necessary work done to preserve a building with its furnishes and fittings, so that it continues to provide the same or almost the same facilities, amenities and services as it did when it was first built . It includes the expenditure necessary to maintain the rental value of the property and involves:

- a. Day to day repairs such as leaking taps and electric effects
- b. Periodic up-keep such as painting and
- c. Major repair requiring heavy expenditure and services of the technical experts, for example foundation work and re-roofing (Afranie and Osei-Tutu, 1999).



Types of Maintenance

- Planned maintenance
- Unplanned maintenance
- Preventive maintenance
- Corrective (including emergency maintenance)
- Condition based maintenance
- Scheduled maintenance
- Corrective (including emergency)

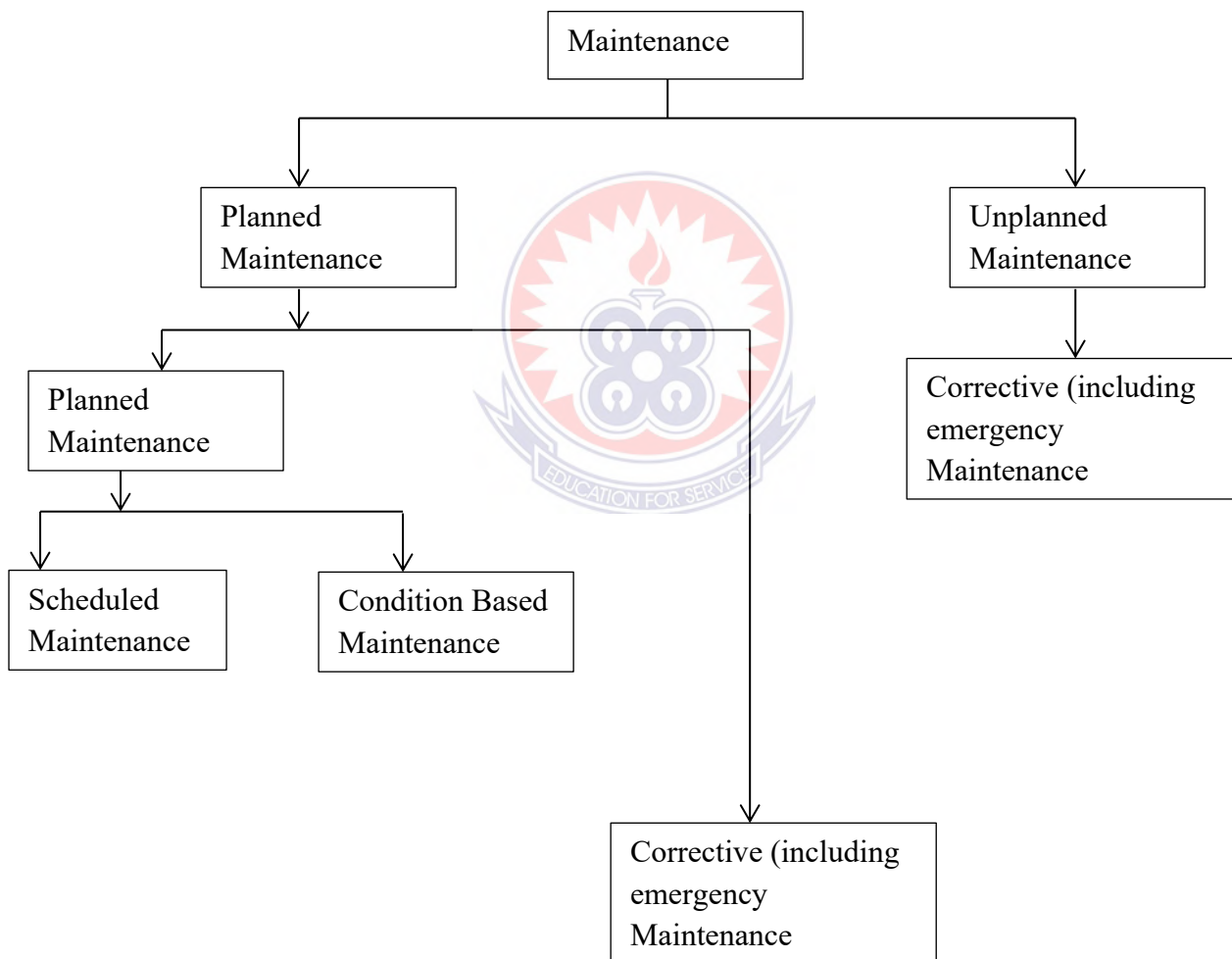
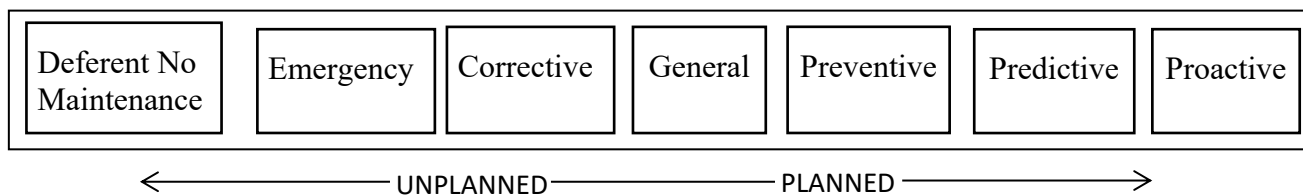


Figure 2. 1: Type of Maintenance (Source BS 3811:1984)

BS 3811 categorizes building maintenance by means of the following terms and definitions.

- Planned maintenance: The maintenance organized and carried out with forethought, control and the use of records to a predetermined plan.
- Unplanned maintenance: The maintenance carried out to no predetermined plan. It refers to work necessitated by unforeseen break down or damages. For example the ripping-off of a building, through the action of a storm, and its remedial action constitute unforeseen damages. It can also be termed unexpected and unavailable maintenance.
- Preventive maintenance: The maintenance carried out at predetermined intervals or corresponding to prescribed criteria and intended to reduce probability of failure or the performance degradation of an item.
- Corrective maintenance: The maintenance carried out after a failure has occurred and intended to restore an item to a state in which it can perform its required function.
- Emergency maintenance: “The maintenance which is necessary to put in hand immediately to avoid serious consequences”. This is referred to as day-to-day maintenance, resulting from such incidents as gas leaks and gale damage.
- Scheduled maintenance: “The preventive maintenance carried out to a predetermined interval of time, number of operations, mileage etc”.
- Running maintenance: “Maintenance which can be carried out whilst an item is in service”.
- Condition maintenance: The preventive maintenance initiated as a result of knowledge of the condition of an item from routine or continuous monitoring”.

The effective of the legislative Author, Minnesota, USA also identifies a continuum of building maintenance as illustrated in figure 2.2.



Source: Office of the Legislative Auditor, Minnesota, USA.

Figure 2. 2: Continuum of Maintenance for Buildings

Deferred maintenance, normally occurs when projects are identified as very necessary but cannot be executed due to lack of funds or resources. Continuum are considered as unplanned activities including emergency maintenance, emergency and corrective maintenance occurs when the need arises; neither is planned for in advance. Planned maintenance is next to continuum, although the maintenance categories are not mutually exclusive.

General maintenance is the process of the up keep of building component in order to restore them to their original conditions or to keep them in their good condition. Preventive maintenance is next to continuum.

Preventive maintenance is a well-planned programme of periodic inspections, adjustments, and replacement. Preventive maintenance is a regularly scheduled repair and maintenance need to keep a building component operating at a peak efficiently and prolong the serviceable life. These include scheduled activities intended to prevent breakdowns, such as periodic inspections, lubrication, calibrations, and replacement of equipment. An example of preventive maintenance is when a filter in an air-handling unit is changed regularly as scheduled. To prolong the life of buildings, periodic replacement of components parts of the unit is important. Preventive maintenance typically needs both the capital and operating expenditures, preserving these assets including the buildings roofing, plumbing, heating, ventilation, air-condition electrical systems, exteriors, and interiors is a primary objectives behind preventive maintenance.

With Predictive maintenance, techniques are used such as vibration analysis of moving part of an equipment while the equipment is in operation, to detect trends that indicate excessive wear. This allows for frequent repairs to be made before equipment fails to function. Preventive maintenance is carried out to ensure that unnecessary overhauling is avoided, when analysis indicates that the equipment is in a very good condition.

A step beyond that is proactive maintenance; it is a highly structured practice that uses information from analyzing equipment to identify the origins, not just symptoms of equipment problem. Proactive maintenance, would identify whether excessive wear resulted from defective installation, unsuitable design, or some other cause. These address the root sources of equipment problem. Proactive maintenance eliminates recurring problems and the downtime and other costs associated with those recurrences.

Maintenance work has also been categorized as predictable and avoidable. Predictable maintenance implies regular periodic work done that may be necessary to retain the performance characteristic of a product as well as that required to replace or repair the product after it has achieved a useful lifespan. Avoidable maintenance is the work carried out to rectify failures caused by poor design, incorrect installation or the use of faulty materials.

Another approach to maintenance classification has been adopted by Speight (1982) as cited in Seely (1987), subdivided maintenance into three categories.

- Major repair or restoration, such as re-roofing or rebuilding defective walls and often incorporating an element of improvement.

- Routine or day-to-day maintenance, this is largely of the preventive type, such as checking rainwater gutters and servicing mechanical and clerical installations.

2.7 Component of Maintenance

Maintenance involves a considerable amount of work Harper (1969) as cited in (Afranie and Osei-Tutu 1999) has been categorized into three components.

Namely, services, rectification and replacement.

- **Servicing**

Servicing is essentially a clearing operation undertaken at regular intervals of varying frequency and is sometimes termed as day-to-day maintenance. Daily sweeping of floor, monthly washing and cleaning of windows and regular painting for decoration and protection every four years are some examples of servicing.

- **Rectification**

Rectification work usually occurs fairly in the life of a building, but it can also occur sometime within the life span of the building. It arises from shortcoming in design, inherent fault or unsuitability of component, damage of goods in transit or installation and incorrect assembly. Rectification represents a fruitful point at which to reduce the costs of maintenance because it is available. All that is necessary at any rate in theory is to ensure that components and materials are suitable for their purpose and are correctly installed. Rectification work could be reduced by the development and use of performance specifications and codes of installation (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 cost.

- **Replacement**

Replacement occurs at all cost in buildings. It is inevitable because service conditions cause materials to decay at different rates. Much replacement work stems not so much from physical breakdown of the material or elements as from deterioration of the appearance (Seely, 1987). This is because the extent of exposure of materials to the vagaries of the weather varies and the weather is specific location changes and different intensities of the weather vary. This therefore becomes necessary as a result of materials decay due to these differential rates of weather conditions. Physical breakdown of materials or elements as well as deterioration appearance may necessitate replacement.

2.4 Other Maintenance Related Concept and definitions on Residential and Public Buildings

- Prevention
- Consolidation
- Rehabilitation
- Repair
- Renovation
- Refurbishment
- Extension



- **Prevention**

It involves protecting housing by controlling its external envelope, thus preventing ages of decay and damage from becoming active. It involves clearing schedule, good housekeeping and proper housing management.

- **Consolidation**

Consolidation is the physical addition or application of adhesive or supportive material unto the actual fabric of building in order to ensure its contributed durability or structure integrity.

- **Rehabilitation**

It entails modernization of aged building with or without adaptive alteration for use. It implies the introduction of modern services into the building without changing its original uses.

- **Repair**

Repair is to receive the building to the original state so that it functions as it was first built. It involves reactive response to building deterioration.

- **Renovation**

This involves work done to restore a structure, service and equipment by a major overhaul to the original design and specification, or to improve on the original design of the structure. This may include substantial additions and extension to the original structure and in the extreme re-building.

- **Refurbishment**

Refurbishment in architectural sense means the replacement of missing part or introduction of new decorative element into a structure. In addition, it involves work on building to make it more attractive.

- **Extension**

This involves the addition of parts to make the building wider or larger in order to respond to the purpose of which it was designed.

2.5 Economic and Social Significance of Maintenance

Maintenance of building brings benefits, comfort and satisfaction to its inhabitants. Maintaining buildings are to ensure that the investment made does not only yield the highest possible returns over the serviceable life of the building but rather fulfils the ultimate responsibilities of providing the needed satisfactory and comfort to human. A house is regarded as an economic asset, which must be and result in a return, either socially or economically to the owner (Afranie and E Osei-Tutu, 1999).

2.6 Aims of Maintenance

The primary aim of maintenance of a building is to ensure that the building continue to serve the purpose for which it was put up.

The purpose for which maintenance is undertaken includes:

- To maintain the value of a building, a better maintained building normally has greater value; however, increased value may be marginal as location and size of site are all important in the determination of value (Afranie and Osei-Tutu, 1999).
- To ensure optimum use of building, good maintenance should allow building to be used to their full potential.
- To create or maintain suitable appearance can make a positive contribution to external environment and social conditions. Dilapidated buildings can contribute to social deprivation and badly maintained services and facilities, waste energy and resources and can affect the environment.
- To maximize the life span of the main components and materials. Maintenance can reduce cost of subsequent maintenance by extending periods between repairs and replacements.

- To ensure that buildings do not detract from surroundings and also maintain a suitable appearance.

2.7 Causes of Poor Maintenance in Residential and Public Buildings

The physical causes of maintenance problem refer to all the natural/physical factors that negatively affect the durability of the building. The durability of a built facility is a measure in an inverse rate of deterioration of material components, (Afranie and Osei-Tutu, 1999).

Afranie and Osei-Tutu, (1999) and the British standard institution (BS1) code of practice define durability as the quality of maintaining a satisfactory appearance and performance of required functions. The code measures these parameters in terms of the minimum number of years of satisfactory life. The three major causes of deterioration and hence maintenance are age or period of construction, environment and location factors.

Newly constructed houses are observed to be in relatively better condition as compared to older houses. Environmental factors such as moisture content, high and fluctuating temperature and salt laden winds among others have effect on buildings, (Afranie and Osei-Tutu, 1999). The location of building has a direct effect on the maintenance problem. The location is the exact point of the building. The location is highly influenced by the terrain of the environment, soil, nature of social and seismic movement, soft laden winds and salty water as well as high temperature, and drastic temperature changes.

2.8 Factors Influencing Decision to Undertake Maintenance

Miles and Syagga (1987) identify the following factors as influencing the decision to carry out maintenance on a building:

- i. Inadequate finance-it is generally acknowledged that inadequate finance is a major constraint on effective property management, partly because maintenance budgets are the easiest to cut when money is scarce. According to him, maintenance expenditure can be absorbed more easily in commercial and industrial organizations where it may account for as little as 0.5% of turnover, but even in these cases maintenance is taken for granted except when it threatens production or profitability. However, the situation is more serious in the public sector where damaging effects of poor maintenance are less immediately obvious. Also in the case of housing estates, it is common for organizations to emphasize the provision of new houses, with little funding provided for maintaining existing stock. Not are day-to-day repairs neglected, but efforts at improvements and rehabilitation are considered lower priority than new construction. This problem of inadequate finance indeed results in rapid deterioration of existing stock resulting in increases in the demand for new houses because poorly maintained houses are not only unpopular, but they soon reach the stage where the structure itself deteriorates and rebuilding has to be considered.
- ii. Bad management- refers to the idleness and waste among maintenance personnel.
- iii. Poor building design- it is not uncommon to find that buildings are inherently expensive to maintain because of inappropriate priorities applied during the design phase. Poor detailing and the specification of unsuitable components and materials are common complaints. In addition, construction errors arising from inadequate drawings and specifications, coupled with poor workmanship because of contracts

awarded to incompetent contractors are frequent causes of rapid physical deterioration in buildings. Good design should allow accessibility and adequate working space for essential maintenance such as cleaning, and minor repairs to pipes, ducts and cables.

iv. Stapleton (1994), in Afranie and Osei-Tutu (1999), relates that the decision to carry out maintenance is affected by many factors, among which are:

a) Cost- investors would want to have the most economic method for carrying out maintenance work whether, corrective or preventive, thus they consider the following

- Actual cost of maintenance of the building to the cost of maintaining similar buildings;
- Consideration of money spent to achieve acceptable standard at present;
- Cost of maintaining same standard in future and economics of replacing facilities, and
- Amount of work available and priority of work to be executed.

b) Availability of physical resources- the availability or non-availability of physical resources affects decisions in that, when suitable materials for maintenance are not available, it becomes difficult to undertake maintenance. Again even if suitable materials are available but not in adequate quantities and the alternative materials are not available, it will deter people from undertaking maintenance activities. The level of craftsmanship in terms of both skills and efficient numbers can also affect decisions to carry out maintenance;

c) Urgency of work- this also affects decisions on maintenance in that investors consider whether delayed work in the short run will require more expensive

work at a later stage. This usually takes into account

- Safety of building users; and
- Possible damage to structure and finishes used in the building.

d) Interference with activities carried out in the building.

Seeley (1993) on the other hand according to Afranie and Osei-Tutu (1999), 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.

2.9 Maintenance Policy

Bs 3811(1984), defines maintenance policies as a strategy within which decisions on maintenance are taken. Alternatively, it may be defined as the rules for the allocation of resources (men, materials and money) 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 issues under consideration in a policy involved: objectives, benefits and policies.

2.10 Organization of Maintenance Department

Maintenance department is organized and managed by a maintenance manager. The duties of the maintenance manager are to plan and control all maintenance activities operations. In small organizations, maintenance activities or operations may be undertaken by a staff member in addition to his or her other duties. While in large organizations, there would be a separate group of people solely responsible for maintenance work.

2.11 Functions of Maintenance Department

The maintenance department performs the following functions:

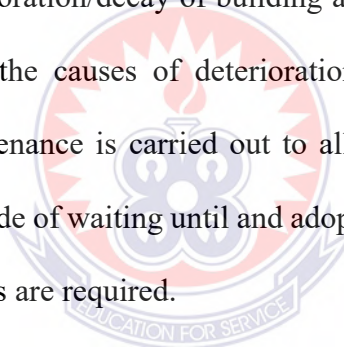
- **Advisory Functions:** This involves liaison with occupants and users and consultation with management on such issues as:
 - The standard to be maintained and the effect on user activities of deviations from the said standard.
 - The relative advantages of alternative maintenance policies and the extent to which it would be beneficial to employ operatives directly for executing the work.
 - Clarification on any constraints in relation to limits of expenditure, desirable cash flows patterns, acceptable delay times or restrictions on time and methods of executing the work.
 - Estimate of maintenance expenditure both short and long term, including where appropriate, standard and the possibility of taking away such back log over a period of years.
 - Provision of cost and other data to assist management in deciding whether to repair or to renew.
 - Technical requirements for minor work involving alterations or small additions to the building; although not strictly maintained, it is usual for the maintenance department to assume full responsibility for this type of work.
 - Advice on the maintenance implications of designs for proposed new building.

- Organization functions: These functions are related to the administrative and supervisory system or to the execution system by direct labour or contract.
- Control Functions: The control functions are dependent on the timely receipt of accurate information relating to the state of the system. The control functions operate in the following areas:
 - Work Input: Identifying the extent of work which is necessary to achieve the needed standards within the constraints laid down. The processes involved would include planned inspections, appraisal of requests and assignment of priorities.
 - Time of execution: It is about programming the workload so that the execution of the work is timed in accordance with the needs of the user and the available labour force.
 - Quality: This is the supervision of work during the execution and by subsequent control inspections to detect latent defects.
 - Cost: This is about budgetary control system including estimating resources requirements in comparison with actual cost and performance achieved.
 - Feedback: This is an inherent feature of all the control functions, and it involves the keeping of records for proper control of the operations.
- Miscellaneous functions: The maintenance department may have responsibility for other matters such as safety and security, especially in relation to compliance with fire precautions and the maintenance of fire fighting equipment, refuse disposal, cleaning etc. Property owners are advised to keep maintenance expenditure to a minimum, ignoring or misunderstanding the adverse long term effect of such a policy.

Neglect of maintenance has accumulative result with rapidly increasing deterioration of the fabric and finishes of a building accompanied by harmful effects on the contents and occupants (Seely, 1987).

Building maintenance usually depends on the type of material used in the construction of the building and the type of building. However, building can be categorized into residential and public buildings, where public buildings are owned by the state and residential buildings are owned by the individuals.

In addition, buildings can be used for residential (dwelling) and non-residential (non-dwelling) purposes. The usage of building will result in tear and wear and exposure to natural forces which cause deterioration of the building. Human activities responsible for the deterioration/decay of building are failure to clean and carry out a routine maintenance of the causes of deterioration and decay, failure to promote awareness of how maintenance is carried out to all those who use the building and adopting a negative attitude of waiting until and adopting a negative attitude of waiting until emergency measures are required.



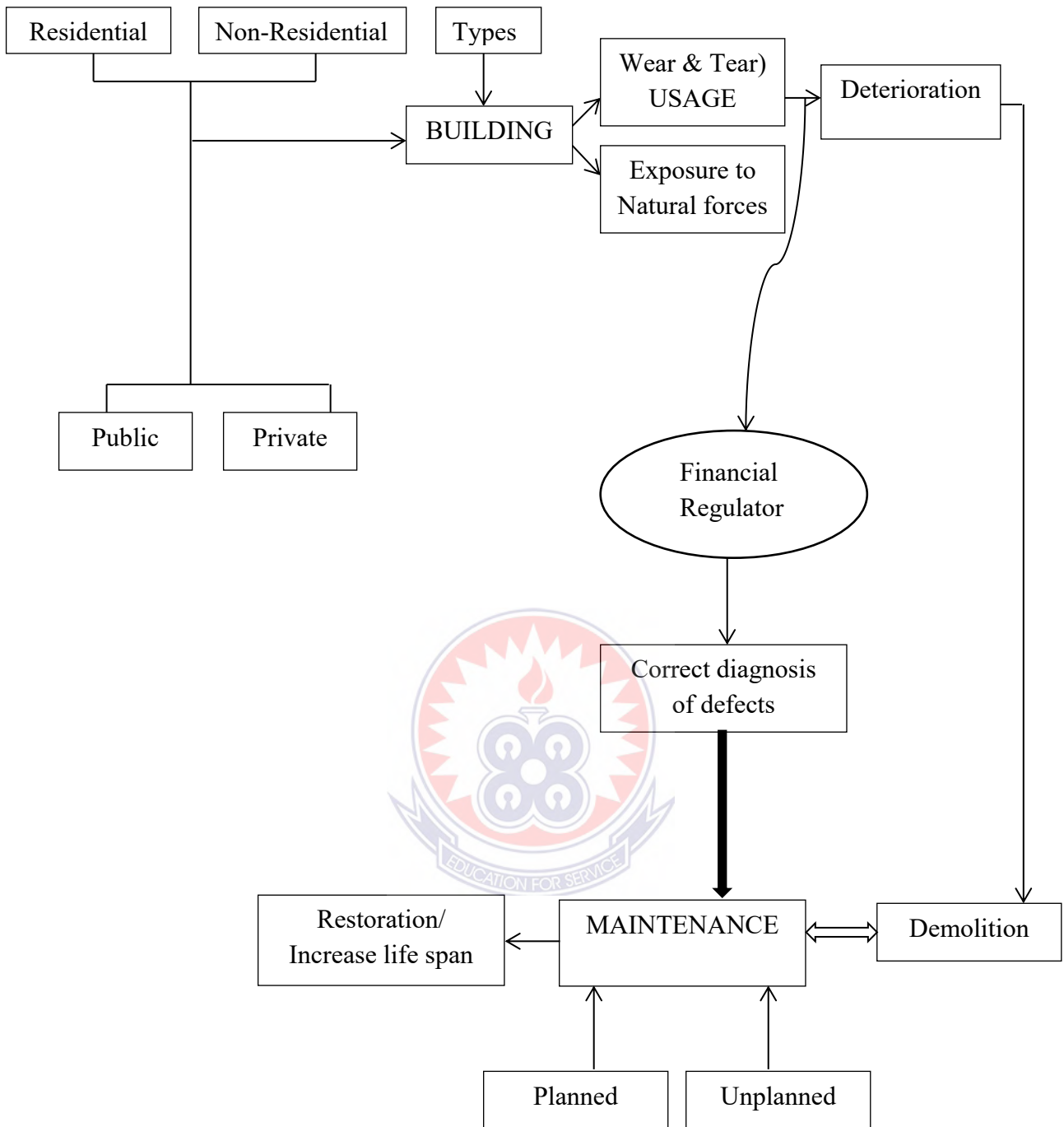


Figure 2. 3: Conceptual Framework for Maintenance of Buildings

Source: Author's Construct 2010.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods used for the study and a detail description of how the research was carried out.

3.2 Research Design

The study adopted qualitative research (survey) in order to enable the researcher to investigate into the concept of the effect of maintenance culture of residential and public buildings and to generalize from a sample to the population, so that understanding can be made about some characteristics, attitude or behaviour of this population.

3.3 Population

The population for the study consists of Estate managers and personnel and occupants of residential and public buildings in the Ayawaso Sub metro in the Greater Accra Region.

3.4 Sampling Techniques and Sample Size

The researcher adopted purposive and random sampling to determine the sample size for the study. The choice of the techniques was to enable the researchers to ensure that certain sub-groups of units represented in the sample are in the same proportion as they are represented in the population. The techniques used by selecting estate managers, personnel's and occupants occupying residential and public buildings.

In each group 20 occupants, 20 personnel and 10 Estate managers were selected using the same random sampling to ensure the desired representation of each group in order to get information about the effect maintenance culture of residential and public building, in the Ayawaso sub metro, of the Greater Accra Region.

3.5 Data Collection Techniques

The data collection techniques for the study involved questionnaires, interviews and observations.

3.5.1 Questionnaires

Questionnaires were developed and administered to two (2) selected groups of which 20 structured questionnaires were circulated to occupants of public and residential buildings and 10 estate managers.

The issues in the questionnaire are as follows:

- Years of stay in the building to determine when maintenance work should be carried out.
- Maintenance policies: policies are carried out to ensure periodic maintenance.
- Funding of maintenance: by management and occupants.
- Inspection of building: by management and maintenance supervisors.

3.5.2 Interviews

Structured interviews were developed and conducted for twenty (20) occupants of residential and public building. The issues in the interview are as follows;

- Years stay in the building: to determine the life span of building.
- Maintenance schedules: the day-to-day maintenance work on building.

- Funding of maintenance: by management and occupants.
- Regular Inspection: by maintenance supervisors.

3.5.3 Observation

Some observations were made in same selected areas in the Ayawaso sub metro in the Greater Accra Region to gather additional information about the study. The observations were made at:

- Kokomlemle
- Asylum Down
- Accra New town
- North Industrial Area

At kokomlemle the researcher observe the paint on building and the condition of walls and how maintenance was carried out.

The researcher continued to Asylum down to observe the condition of foundation and plumbing works.

At Accra New town the researcher observed roof and toilet facilities in the area and listed the major problems on the facilities.

At the industrial Area the researcher observed the electrical work and the condition of doors and windows and took some photographs.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

The utmost purpose of the study, an investigation into the effect of maintenance culture of buildings in Ghana was to investigate the maintenance culture of buildings in the Ayawaso sub metro in the greater Accra region. This chapter therefore focuses on the results and discussion of responses of respondents using statistical charts and tables.

4.1 Results and Discussion of Questionnaire

4.2.1 Results and Discussion of questionnaires from personnel occupying residential and public buildings

In assessing the effects of maintenance culture of residential and public buildings in the Ayawaso sub-metro in the greater Accra region, the occupants of both residential and public buildings were surveyed. Their response is presented below.

- **Years Stayed In The Building**

The maintenance culture of occupants of both residential and public buildings in the Ayawaso sub metro was one of the priorities of the researcher. The researcher therefore assessed the maintenance culture of personnel. The outcome showed that 55% of the personnel had lived in their buildings for 1 to 5 years. Again 40% reported to have lived in the building for between 6 and 12 years as shown in Table 4.1.

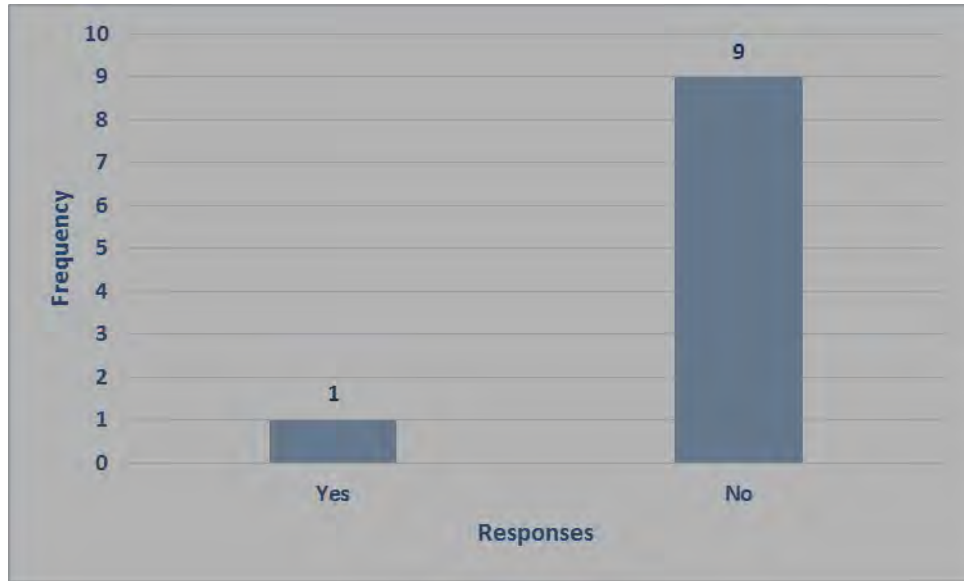
Table 4. 1: Period of Occupancy in Building

| | Frequency | Percent |
|--------------|------------------|----------------|
| 1-5 years | 11 | 55 |
| 6-12 years | 8 | 40 |
| 20-25 years | 1 | 5 |
| Total | 20 | 100 |

(Source: Field Survey, 2014)

The number of occupants in a building could determine the life span of the building. The researcher therefore assessed the number of occupants in individual buildings to the life span of the building. The results showed that half representing (50%) of the buildings accommodate more than 10 occupants. Furthermore it was evident that 25% of the buildings accommodate between 5-6 occupants whereas 25% had 1-4 occupants. Majority of the occupants (90%) however attested to the fact that the life span of buildings could prolong by regular maintenance. 55 percent of the reported that they did not take inventory before taking occupancy of the building. However, three-fourth (75%) of the personnel responded that they pay rent for the building occupancy. They again reported to pay between 300 and 500 Ghana Cedis as rent for occupancy of the building. The rent payable was determined by either the landlords or their organization.

The respondents were asked whether the technicians are trained to conduct assessment. The results as presented in figure 4.1 show majority (9) of the respondents reported that technicians are not trained to conduct assessments of the condition of the buildings. However, only 1 of the respondents responded positively to that effect.



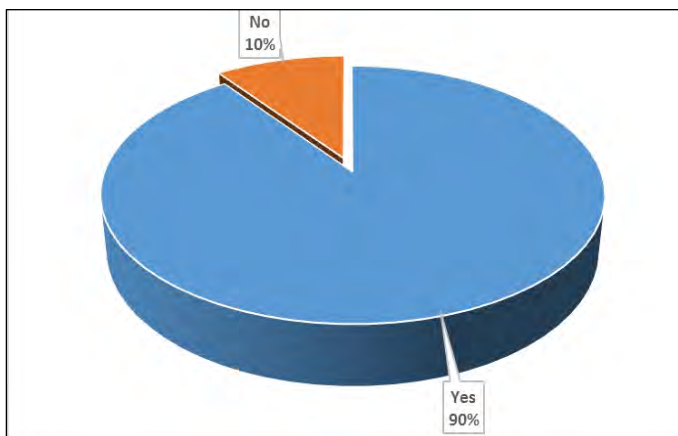
Yes: Technicians were to conduct assessment

No: No technicians were to conduct assessment

Figure 4. 1 : Training of Technicians to Conduct Assessment

The respondents were asked to indicate that whether their organizations plan to reduce deferred building maintenance. The results fig 4.2 show that almost all the respondents (90%) responded ‘Yes’ to having planned to reduce deferred building maintenance, while only (10%) of the respondents responded ‘No’ to that effect.

Plan to reduce deferred maintenance

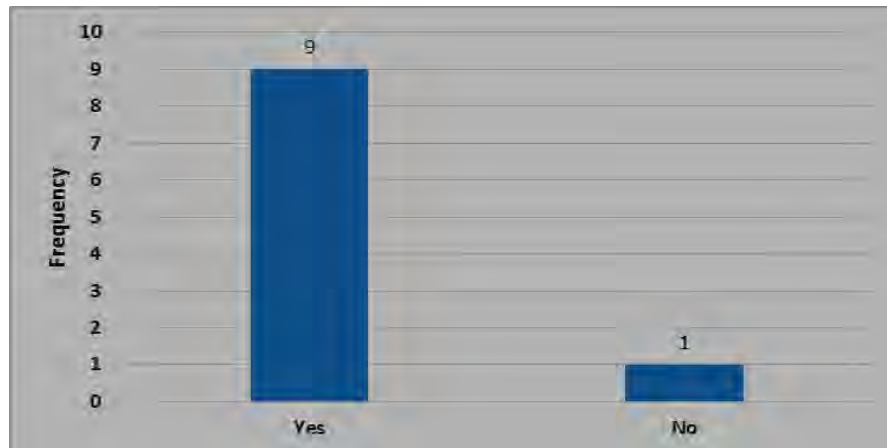


Yes: plans to reduce deferred

No: no plans to reduce deferred

Figure 4. 2: Reduction of deferred Maintenance

The respondents were asked to indicate whether their organizations have written long-range plans for building maintenance. The results in fig 4.3 show that almost all the 9 respondents responded 'Yes' to having a written long-range plan for building maintenance. However, there was only 1 respondent who responded 'No'



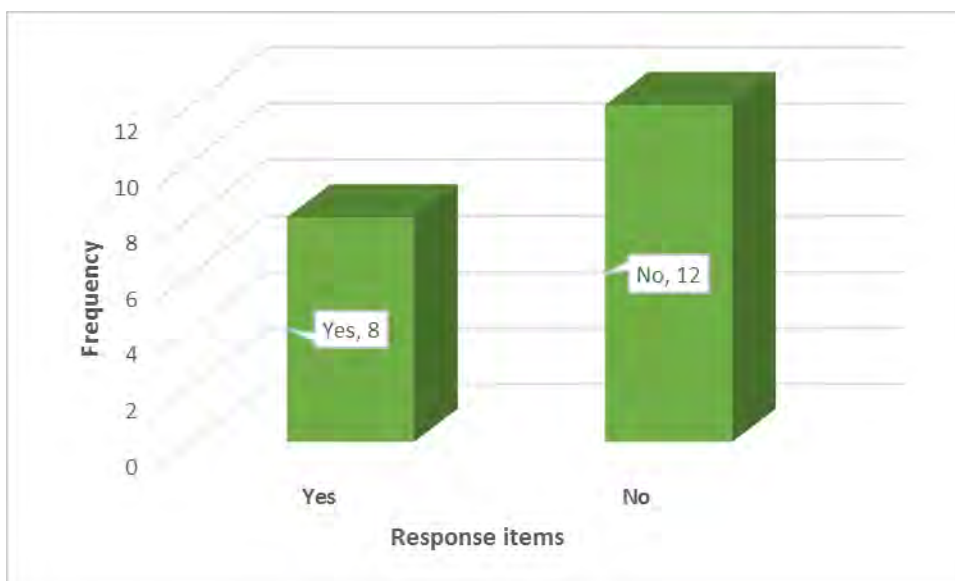
Yes: for long term plan for maintenance

No: for no long term plan for maintenance

Figure 4.3 : Organization have Written Long-Range Plan for Building Maintenance

4.3.1 Results of questionnaire from Estate Managers

The respondents were asked to indicate whether the organization have maintenance policy in place and the results shown in figure 4.4 indicate that twelve (60%) of the institutions surveyed do not have maintenance policies in place whereas only 8 have the policy in their organizations.



Yes: Have maintenance policy

No: No maintenance policy

Figure 4. 4: Availability of Maintenance Policy

From table 4.2 it could be seen that it is the estate department that develops maintenance policy for the institutions as 4 representing (50%) of the respondents suggested. Again, 3 respondents representing 37.5% of the respondents indicated it is the Principal who developed the policy whereas 1 representing (12.5%) reported it to be the landlord.

Table 4. 2 : Development of Maintenance Policy

| | Frequency | Percent |
|--------------|-----------|-------------|
| Principal | 3 | 37.5 |
| Landlord | 1 | 12.5 |
| Estate | 4 | 50.0 |
| Total | 8 | 100% |

(Source field survey 2014)

The respondents were asked of the type of maintenance arrangement in place. The responses as shown in table 4.3 suggest that there is periodic maintenance arrangement ongoing as 14 representing (70%) of the respondents stated. However, 5 representing (25%) of the respondents stated the maintenance arrangement is a preventive one whereas 1 representing (5%) stated it is a routine maintenance arrangement in place.

Table 4. 3 : Type of Maintenance Arrangement

| | Frequency | Percent |
|--------------|------------------|----------------|
| Periodic | 14 | 70.0% |
| Routine | 1 | 5.0% |
| Preventive | 5 | 25.0% |
| Total | 20 | 100.0% |

(Source field survey 2014)

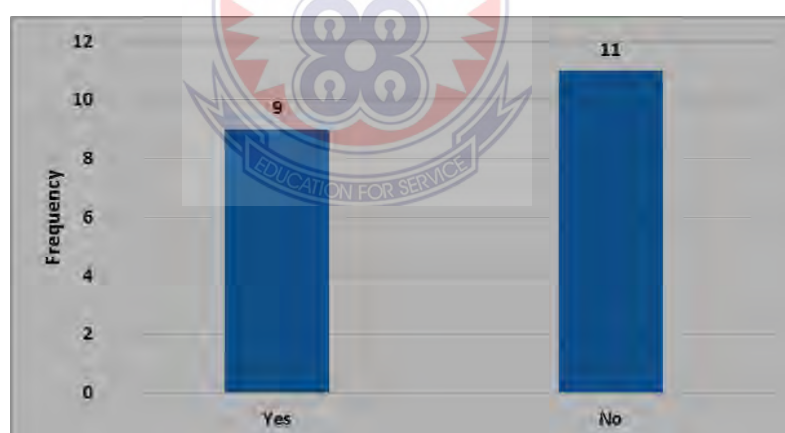
The respondents were asked to indicate the source of funding for maintenance activities. From table 4.3, it could be realised that eleven (11) representing (55%) of the respondents indicated that maintenance activities are funded through ‘rent payments’. Three representing (15%) of the respondents stated the activities are carried out through surcharging and Internally Generated Funds. Two representing (10%) of the respondents stated through government budgetary allocation.

Table 4. 4: Funding of Maintenance

| | Frequency | Percent |
|----------------------|-----------|---------------|
| IGF | 3 | 15.0% |
| Rent payment | 11 | 55.0% |
| Surcharging | 3 | 15.0% |
| Government budgetary | 2 | 10.0% |
| Allocation | 1 | 5.0% |
| Total | 20 | 100.0% |

(Source field survey 2014)

On the issue of regular inspection by the institution, in figure 4.5, eleven (11) of the respondents responded 'No' implying the institution does not undertake regular inspection of the buildings. On the contrary, nine (9) of the respondents responded 'Yes' to that effect



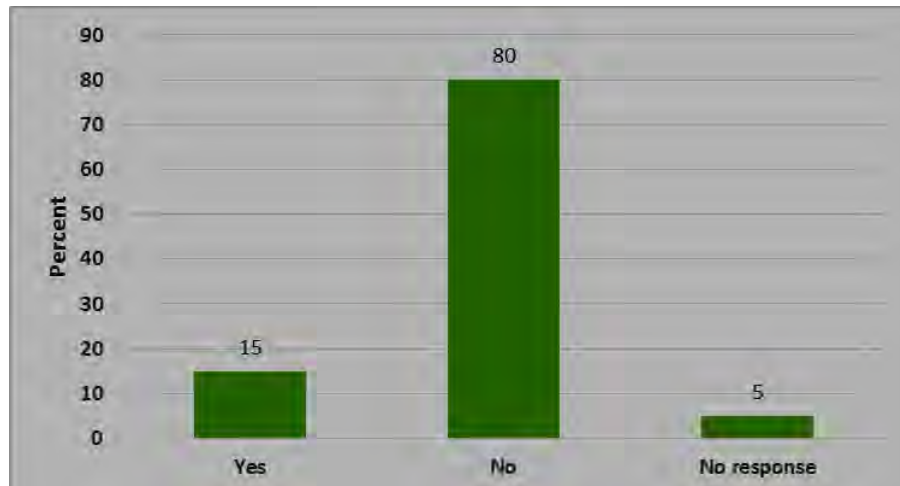
Yes: no regular inspection

No: undertake regular inspection

Figure 4. 5: Institution undertake regular inspection

Figure 4.6 gives views on maintenance carried out without request. The outcomes suggest that 80% of the respondents rejected the notion that maintenance activities in the institution are carried out without request. Meanwhile 15% of the

respondents accepted the notion that maintenance activities are undertaken without their request. Five percent of the respondents failed to respond to this question.



Yes: maintenance with request

No: maintenance with a request

Figure 4. 6 : Maintenance is done without request

4.2 Results and Discussion of Interview

4.2.1 Results of Interview from occupants of public and residential buildings

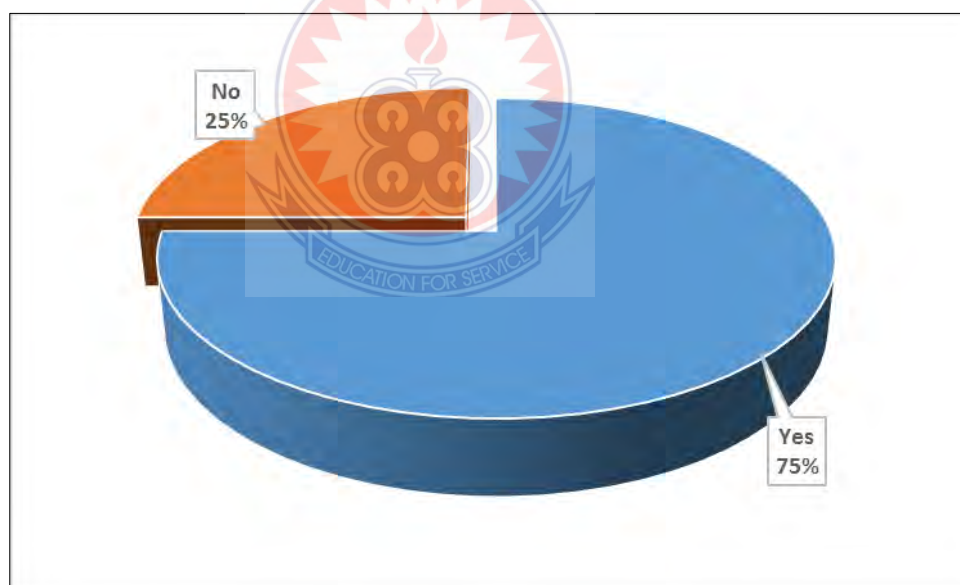
Table 4.5 gives account of the number of years occupants have lived in the buildings. It could be observed that 10 representing (50%) of the respondents reported that they had lived in the building for between 6-12 years. Seven respondents representing (35%) also reported that they had lived the building for between 1 and 5 years, whereas occupants who had lived in the buildings for between 13 and 19 years amounted to 15%.

Table 4. 5 : Years Occupants Have Stayed In Building

| Number of years | Frequency | Percent |
|-----------------|-----------|------------|
| 1-5 years | 7 | 35 |
| 6-12 years | 10 | 50 |
| 13-19 years | 3 | 15 |
| 20-25 years | 0 | 0 |
| Total | 20 | 100 |

(Source: field survey)

A further analysis revealed that most of the occupants (75%) took inventory of the state of the facilities before occupancy. However, 25% reported that they never took inventory before taking occupancy of the building as illustrated in figure 4.7.



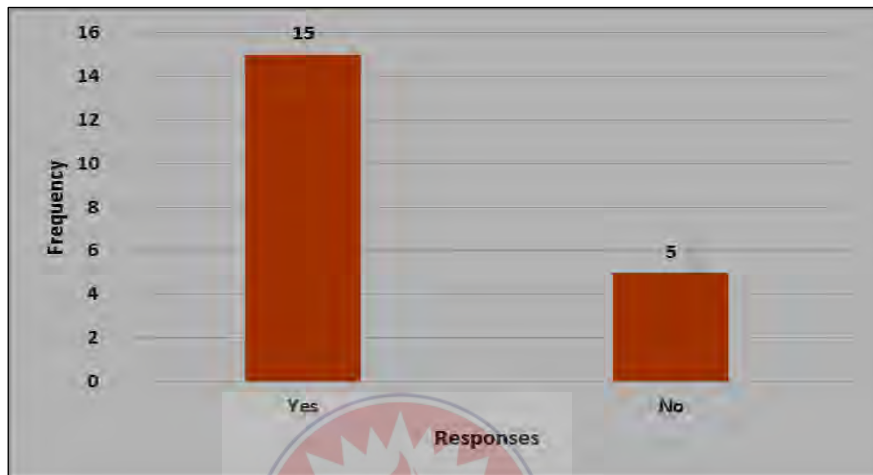
Yes: took inventory before occupying building

No: no inventory before occupying building

Figure 4. 7 : Taking of Inventory before Occupancy of Building

The researcher again examined if the occupants paid rent for their occupancy of the buildings. The results showed that 15 representing (75%) of respondents attested

that they pay rent for their occupancy of the public and residential buildings. However, 25% of the occupants claimed they do not pay rent for occupying public and residential building. This could be that their organization would take the responsibility of paying the rent figure 4.7.



Yes: payment of rent

No: non-payment of rent

Figure 4. 8 : Payment of Rent of Occupancy

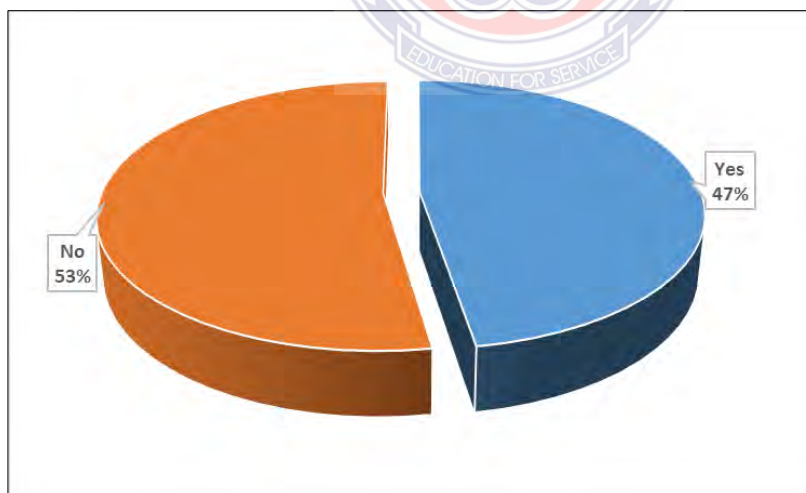
Table 4.6 shows that more than 8 representing 57.1% of the respondents paid a rent of GH¢100 – 300 whereas 4 (28.6%) paid less than GH¢ 100 as rent. Meanwhile one respondents (7.1%) each paid more than Gh¢ 600-1000 and more than Gh¢ 1000, respectively. This indicates that the rent payable by occupants for occupying public and residential buildings were cheaper compared to renting from other sources.

Table 4. 6 : Rent Payable

| | Frequency | Percent |
|----------------|-----------|-------------|
| < GH¢ 100 | 4 | 28.6 |
| GH¢ 100 – 300 | 8 | 57.1 |
| GH¢ 601 – 1000 | 1 | 7.1 |
| > GH¢ 1000 | 1 | 7.1 |
| Total | 14 | 100% |

(Source: field survey)

Figure 4.9 reports on the question on whether the institution of the respondents undertakes regular inspection of the building. The responses show that more than half representing 52.6% of the respondents responded ‘No’ meaning the institution does not undertake inspection of the building in which they live, whereas 47.4% responded ‘Yes’ to that effect.



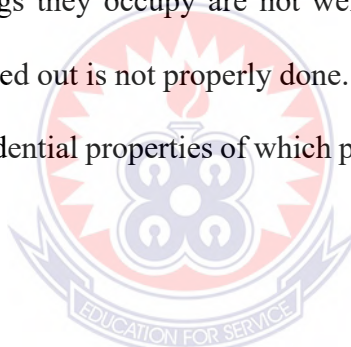
Yes: regular

inspection

No: no regular inspection

Figure 4. 9 : Regular Inspection of Building

The respondents whose buildings were maintained by their institution were asked to indicate when the maintenance work was undertaken. It was revealed that all the respondents (100%) reported that maintenance is carried out annually. Again 35% of respondents reported that the maintenance work is done by the estate officer of the organization without request. However, 65% attested that maintenance work though done annually, by the estate officer of their organization, it is by request. Furthermore it was revealed that some occupants do maintain the public and residential building they occupy by themselves. This could be that their institutions do not take responsibilities of their staff's rent. In cases where the occupant has to maintain the building by him or herself, maintenance is done between 4-12 months. However, 78% of respondents reported that the buildings they occupy are not well maintained. This indicates that maintenance even if carried out is not properly done. This shows the poor maintenance culture of public and residential properties of which public and residential buildings are no exception.



General condition of Building Element

Occupants of public and residential buildings were interviewed to find out the general maintenance of the individual buildings they occupy. The responses to the interview showed that more than half (55%) of the buildings had their foundations exposed hanging. Again, 35% of the occupants also reported of crack developed foundation (Table 4.7). This suggests that the maintenance nature of both public and residential buildings is poor. Neither the occupant nor the organization of the occupant takes maintenance seriously.

Table 4. 7 : Condition of Building Foundation

| Condition | Frequency | Percentages (%) |
|------------------|-----------|-----------------|
| Exposed hanging | 11 | 55 |
| Cracks developed | 7 | 35 |
| No problem | 2 | 10 |
| Total | 20 | 100 |

(Source: field survey)

On the condition of the roof, majority (70%) complained of leakages and rusty roofing sheets. Furthermore, 25% complained of partly ripped- off roofs. Moreover it was evident from the interview that most (80%) of the occupants reported of cracked floor screed. Only 10% admitted that their floors had no problem. The occupants again reported that their walls had developed cracks, partly broken down and also tilted.

(Table 4.8)

Table 4. 8 : Condition of Roof

| | Frequency | Percent |
|------------------|-----------|------------|
| Leakage | 9 | 45 |
| Rusty roofing | 5 | 25 |
| Ripped off roofs | 5 | 25 |
| No problem | 1 | 5 |
| Total | 20 | 100 |

(Source: field survey)

From figure 4.10 majority 50% of the respondents reported that there were 'No defects' in the buildings. On the contrary 40% reported of 'Cracks' in the floor screed of the building. Only 5% stated that there were 'Peeled-off defects'. It is worthy of note that 5 respondents failed to respond to the question.

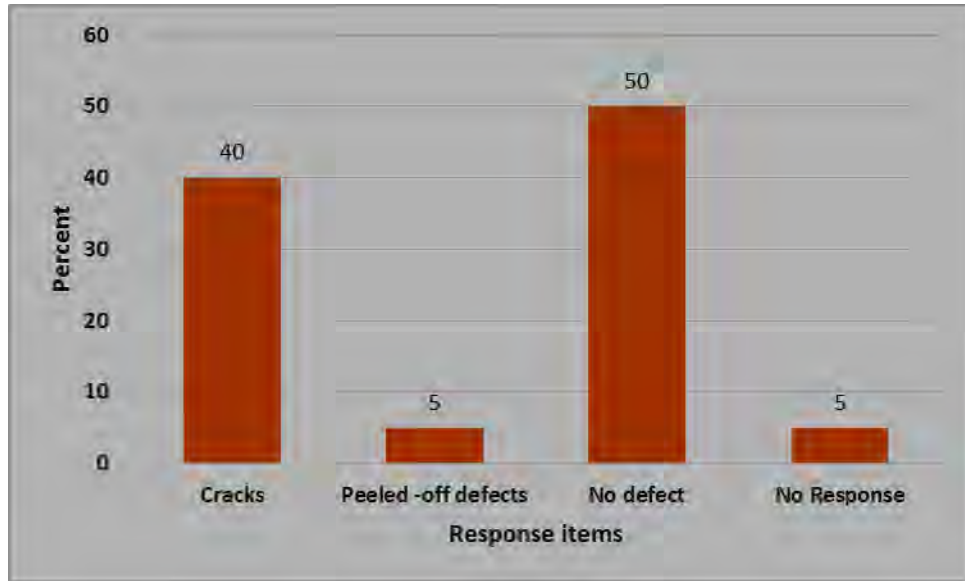


Figure 4. 10 : Condition of Floor Screed of Buildings

Table 4. 9 : Wall Years Stayed in Building

| | Frequency | Percent |
|--------------------|-----------|------------|
| Partly broken down | 2 | 11.1 |
| Developed cracks | 13 | 72.2 |
| Peel-off | 3 | 16.7 |
| Total | 18 | 100 |

(Source: field survey 2014)

Regarding the condition of walls, the results in table 4.9 show that representing (72.2%) of the respondents reported of 'Developed Cracks' in the wall whereas 3 representing (16.7%) reported 'Peel-offs'. Two representing 11.1% of the respondents reported their walls were 'Partly broken down'.

Table 4.10 concerns the condition of painting of the buildings occupied by the respondents. 17 representing (85%) of the respondents said the painting has faded whilst 2 representing (10%) stated it is well painted. Meanwhile only 1 representing (5%) stated the painting was dirty.

Table 4. 10 : Painting

| | Frequency | Percent |
|----------------|------------------|----------------|
| Faded painting | 17 | 85 |
| Dirty | 1 | 5 |
| Well painted | 2 | 10 |
| Total | 20 | 100 |

(Source: field survey 2014)

Regarding the condition of windows and doors responses as shown in table 4.11, indicate that 11 respondents representing (55%) suggested that there was ‘no problem’ with the ‘windows and doors’ in the building. Nine respondents representing (45%) of the respondents reported of ‘partly broken’ windows and doors in the building.

Table 4. 11 : The Condition of Windows and Doors

| | Frequency | Percent |
|---------------|------------------|----------------|
| No problem | 11 | 55 |
| Partly broken | 9 | 45 |
| Total | 20 | 100 |

(Source: field survey 2014)

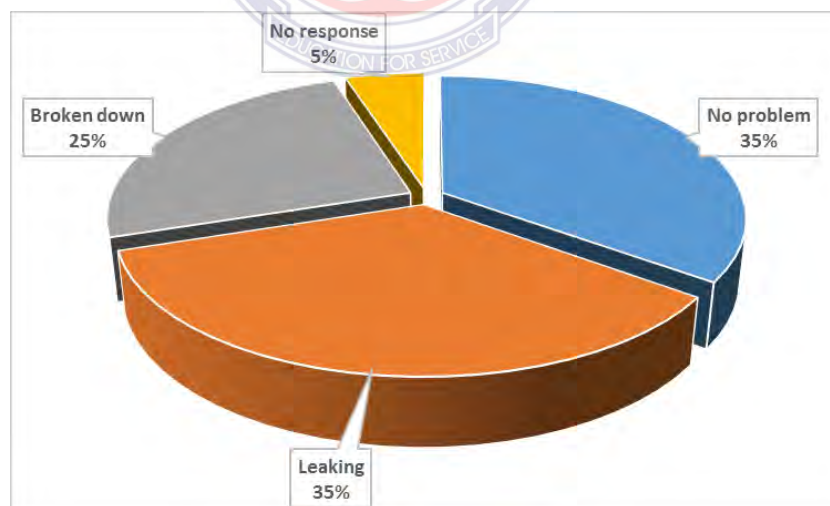
Questions were asked of the state of electrical installation in the building and the results shown in table 4.12 indicate that more than half (52.6%) of the respondents reported that there were faults with their electrical installations. Meanwhile 8 representing (42.1%) reported of ‘No problem’ with the installations. There was only 1 representing (5.3%) of a non-functioning installation

Table 4. 12 : Electrical Installation

| | Frequency | Percent |
|----------------------------|-----------|---------|
| No problem | 8 | 42.1 |
| Non- functioning faulty | 1 | 5.3 |
| Total | 10 | 52.6 |
| | 19 | 100 |

(Source: field survey 2014)

Figure 4.11 reports on the condition of plumbing/water in the building. The distribution of the responses showed that 35% of the respondents reported that the plumbing works had no problem whereas 35% also reported of leaks. Additionally, 25% reported of broken down plumbing/water works in the building. Five percent did not respond to the question

**Figure 4. 11 : Condition of Plumbing/Water of the Building**

In table 4.13 the respondents were asked to give a report on the type of toilet facility they use in their buildings. From the table it could be observed that almost all

the buildings have water closets installed as 18 representing (90%) of the respondents pointed out. There were only two instances where KVIP and Pan Latrine were used.

Table 4. 13 : Type of Toilet Facility

| | Frequency | Percent |
|--------------|------------------|----------------|
| Water closet | 18 | 90 |
| KVIP | 1 | 5 |
| Pan latrine | 1 | 5 |
| Total | 20 | 100 |

(Source: field survey 2014)

Table 4.14 presents on responses in table concerns the condition of sewage system in the buildings. In the majority of the buildings the sewage system had no problem as 14 representing (73.7%) of the respondents indicated. However, 4 representing (21.1%) of the respondents indicated the system was leaking whereas 1 representing (5.3%) reported of a non-functioning sewage system in the building.

Table 4. 14: Condition of Sewage System in the Building

| | Frequency | Percent |
|-----------------|------------------|----------------|
| No problem | 14 | 73.7 |
| Leaking | 4 | 21.1 |
| Non functioning | 1 | 5.3 |
| Total | 19 | 100 |

(Source: field survey 2014)

4.3 Results and Discussion from Observation

In view of additional information to the data needed for the research work, a number of visits were made to some residential and public buildings in the Ayawaso sub metro.

It was discovered at Kokomlemle that, paint on some of the residential and public buildings were faded, walls have developed cracks and some are partly broken down. Observation at Asylum down revealed that the foundations of some buildings were exposed and hanging, posing danger to the occupants, plumbing works were also not in good condition, some partly broken down and exposed to the environment.

Observation made at Accra New Town indicated that roofs were partly ripped-off and some were leaking causing dampness to roofing members, toilet facilities were also not in good condition.

Observation at the industrial area revealed that the electrical installation works were exposed, some completely lying on the ground, some of the doors were broken down, and locks are not functioning. Most of the louver frames have rusted, louver blades have broken, wooden frames have decayed and some are completely out of place.

Moreover, it was revealed that most people using residential and public building do not pay much attention to the maintenance of buildings. This is due to lack of maintenance culture.

Finally, upon further investigation carried out by the researcher, it was revealed that some Estate managers, maintenance supervisors and occupants do not pay much attention to maintenance of buildings.

This attitude on the part of these people has resulted in poor maintenance culture on buildings.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

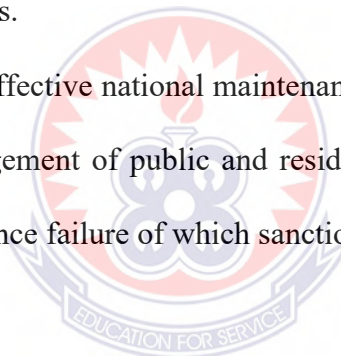
The chapter covers the summary of findings, conclusion and the necessary recommendations.

5.1 Summary of findings

The following are the summary of findings;

- The study revealed that there was general lack of maintenance culture on the part of both management and the occupants, thus resulting in deferred maintenance of buildings by public institutions. This situation is also evident in the lack of preventive maintenance plan by management for their buildings. Occupants also exhibit apathy towards maintaining their building holding the view that it is a government property and that whatever the state is no business of theirs.
- It revealed that, public and residential buildings deteriorate with age, with building between the ages of fifty and sixty and above exhibiting serious maintenance problem and thus requiring replacement of some buildings element or at least rehabilitation. Houses surveyed were classified into younger building (less than 20 years old), medium aged building (20 – 50 years old) and older buildings (above 50 years old).
- The study revealed that, there was a problem of over-centralisation of maintenance decisions, management decision and building management are taken at the management level. The channels through which decisions are brought to the local level are in most cases, too long resulting in the delay of release of funds for maintenance.

- Another obstacle to maintenance of public and residential buildings is funding. Inadequate funding and delay in the release of funds have contributed significantly to the present state of public and residential buildings. This has been worsened by the high cost of building materials. New constructions which often receive more attention than ongoing building maintenance project and high cost of maintenance resulting from work done by private firms due to the low capacity of maintenance staff to undertake such task.
- There was pressure on the building facilities by number of uses. There is inverse relations between population density and the quality of housing conditions. Houses with fewer people had better conditions as against those with large number of occupants.
- There was lack of effective national maintenance policy, laws and regulations to compel both management of public and residential buildings and occupants to undertake maintenance failure of which sanctions can be applied.



5.2 Conclusion

In addressing the pending constraint of maintenance culture to residential and public buildings in the Ayawaso Sub-Metro.

The study revealed that occupants do not take inventory of the facilities of the building before occupying the buildings and this has resulted in poor maintenance to building. The findings indicated that lack of funds is as a result of poor maintenance to building, as occupants pay for rent, they do not see the need to use their own money to maintain the building.

Finally due to lack of regular inspection of buildings on the part of the occupants, Estate managers and maintenance team, maintenance of building is not carried out as expected.

5.3 Recommendations

Recommendations are made to address the Finding;

- There is the need for public and residential managers to embrace preventive maintenance practice as a high priority. To gain optimum benefits from preventive maintenance, building managers should incorporate preventive maintenance task into a work-order system and keep systematic maintenance record.
- Public institutions should ensure that their maintenance department is adequately staffed with the requisite manpower and that employees have appropriate training to competently and safely undertake and complete the maintenance tasks expected of them.
- Estate and maintenance departments should oversee periodic inspections of buildings conditions and create an inventory of buildings components and equipment. They should plan building inspection, since proper planning inspection is a sure way to reduce cost of maintenance since doing so can provide insight into future maintenance need avoid unnecessary cost.
- There is the need for institutions of a maintenance awards scheme for public institutions at the National, Regional and District levels to award institutions that have effectively managed maintenance of their buildings. This will demand that task force form the ministry of water resources, works and housing periodically inspects the condition of building components of public buildings.

- Managers of public and residential buildings should be sure that, high quality and durable building materials are used to prolong its life span and minimise the rate of deterioration. Current building designs should also incorporate materials with least maintenance problem. For instance tiling of high rise buildings will solve the problem of painting due to height of the building. Aesthetic value of new building should be taken into consideration to serve as tourist attraction.
- Occupant of government buildings should also shed their apathy in terms of ownership and maintenance of such property and rather exhibit high sense of patriotism. This can be done through public education and sensitisation and strict application of sanctions such as surcharging occupants with cost of damage caused as well as eviction from the premises.
- Finally, there is the need for government to put up more public residential buildings in view of the present national deficit in housing which stand at one million (<http://www.ghanaweb.com>). This housing deficit has resulted in competition for rental housing. Landlords however prefer to rent out their premises to private individuals instead of public officials due to the high rent charged. There is however, the need for regular maintenance of public building put up to protect the huge investment put into it.

REFERENCES

- Afranie, S. and Osei. Tutu, E. (1999). *Analyzing of Problems, Practices and Policy*.
Accra: Unipress Limited.
- Adigun, T., Remi, O., David, O., Yinka, F., Banji, A., &Tunde, O. (1996). “NNPC
Dispels Fear over Fuel Scarcity Guardian, February 16.40
- Black, J. A. and Champion, D. J. (1976). *Methods and Issues in Social Research*. New
York, John.
- British Standards Institution.BS 3811: 1984 Glossary of Maintenance Management
Terms in Terotechnology. Chicago: APWA, 1992.
- Cohen, I. (1976). *Educational Research in Classrooms and Schools: A Manual of
Materials and Methods*. London Harper & Row
- Collins English dictionary, 2003
- Derrick Miles and Paul Syagga, (1987). *Building Maintenance, Intermediate
Technology*. London: Unimax Centre.
- Dictionary of Military and Associated Terms, US Department of Defense, 2005
- Flyvbjerg, B. (2004). Five Misunderstandings about Case-Study Research. In Seale. C.,
Frankfort-Nachmais, c. And Nachmais, d. (1996). *Research method in the social
sciences (5th ed.)*. Oxford university press, New York.
- <http://www.oas.org/en/cdmp> accessed on 12 February 2010
- <http://www.ghanaweb.com> accessed on 24 October 2010
- Gubrium G, J. F. & Silverman, D. [Eds], *Qualitative Research Practice*. London and
Thousand Oaks, CA: Sage p. 420-434.
- Kothari, C. R., (2003), *Research Methodology-Quantitative Techniques of Managerial
Decisions* Wiley Eastern Limited, U. K.

- Kumar, R. (1999). *Research Methodology: A step by Step Guide for Beginners*.
Australia, Addison Wesley Longman, Australia Ply Limited.
- Kolawole , C.O.O. Publication (2002). Content and process in the English curriculum'.
in J.A. Ajala.
- Kumekpor, T.B.K. (2002) research Methods and Techniques of Social Research Sonlife
Press and Services, Accra, Ghana.
- Lee, H. S. and Yuen G. C. S. (1993) Building Maintenance Technology. Macmillan
Press.
- Lee, R. D .(1987); 'Building Maintenance Management' Oxford U. K.
- Miles D. and Syagga P., (1987), Building Maintenance, Intermediate Technology.
London.
- Melvin, Eric. Plan, Predict, Prevent: How to Reinvest in Public Buildings.
- Miller, R. L. and J. D. Brewer, (2003) A-Z of Social Research: SAGE Publication
Limited, London.
- Mills, E. D. (Ed) (1980). Building Maintenance and Preservation. Butter- Worths
Onwunka C.F.I Publication (1989): evaluation of the digestibility of browse using in
Sacco, in Vitro and in Vivo techniques
Office of the Legislative Auditor, Minnesota, USA.
- Sampling (statistics) www.wikipedia.org accessed on 27/3/2010
- Seely, I. H. (1987); 'Building Maintenance' Macmillan Press Limited.
- Shao, Allan. T (1999), marketing research: an aid to decision making
(www.sbaer.uca.edu accessed on 26/3/2010)
- Waugh, D. (1995): geography, an integrated approach (2nd edition): Nelson House,
Mayfield Road, UK
www.co.rando.lph.nc.us/departments/download.

Yin, R. K. (1994). *Case Study Research Design and Methods-Applied Social Research Methods*. Series 5, Sage Publication. Thousand Oaks.

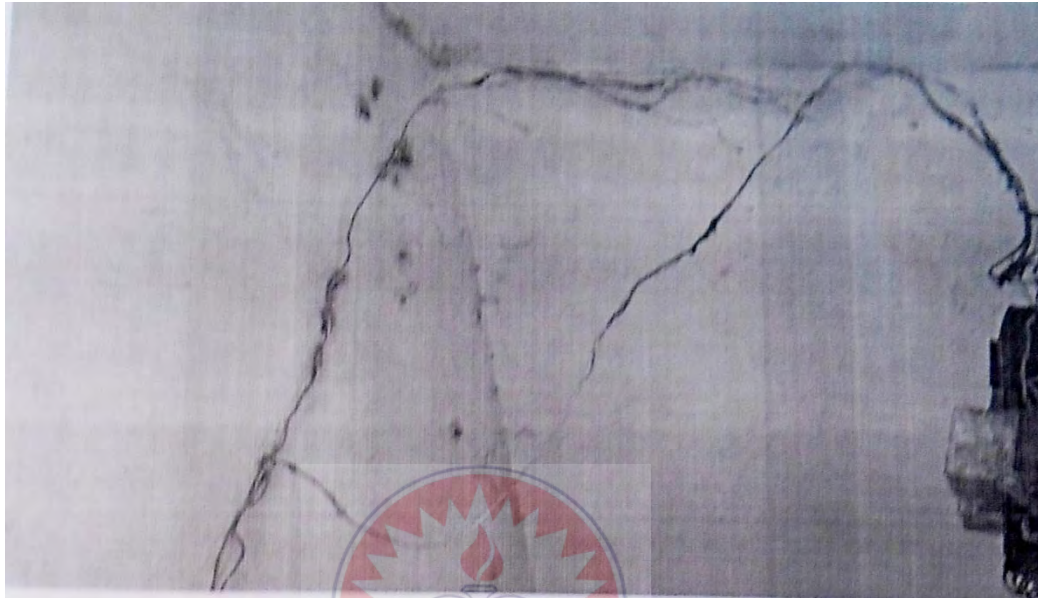
Yin, R. K. (2003). *Case Study Research: Design and Methods (3rd Ed.)*. Thousand Oaks, CA: Sage Publication.



APPENDICES

APPENDIX A

**PHOTOGRAPHS OF MAINTENANCE PROBLEMS OF PUBLIC AND
RESIDENTIAL BUILDINGS**



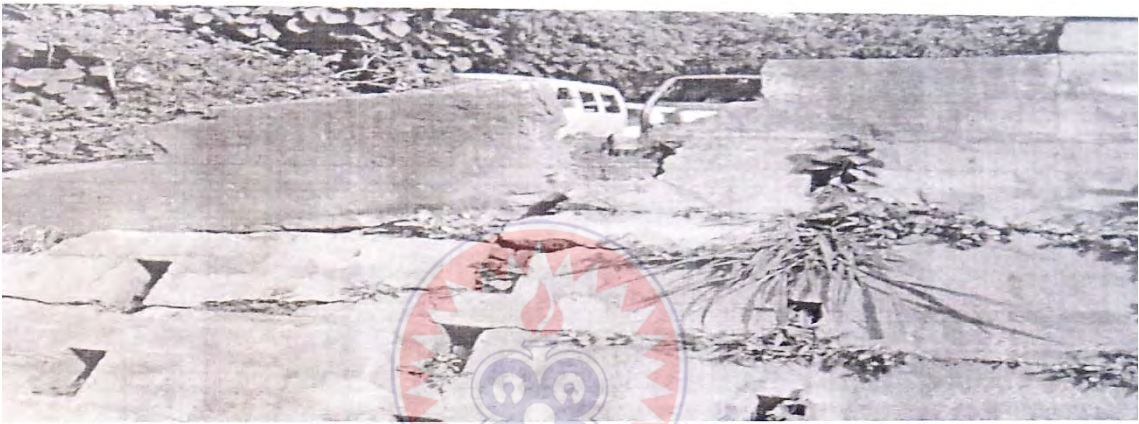
Electrical Cable Expose



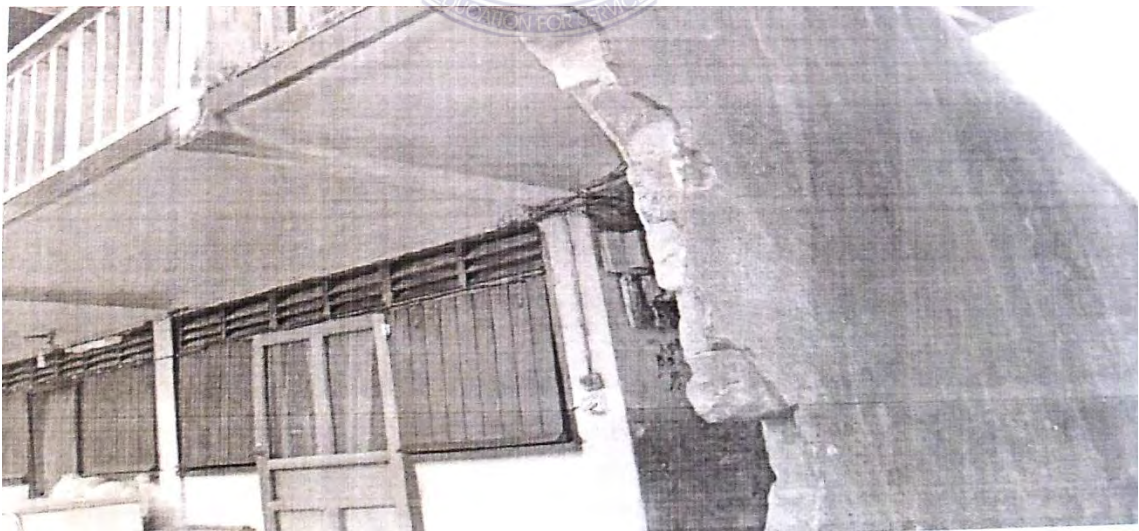
Electricity: Exposed Cables



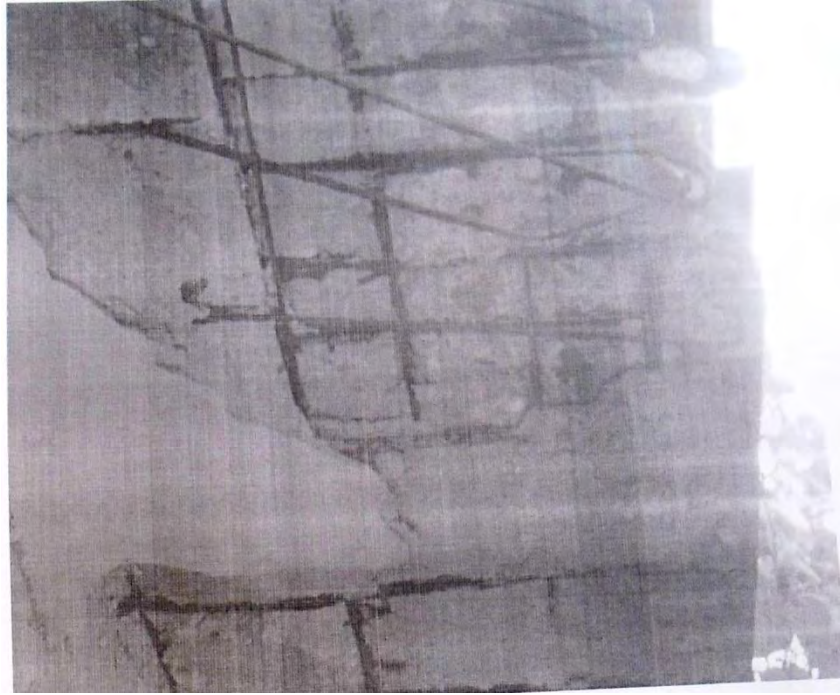
Cracked Wall



Collapsed Wall



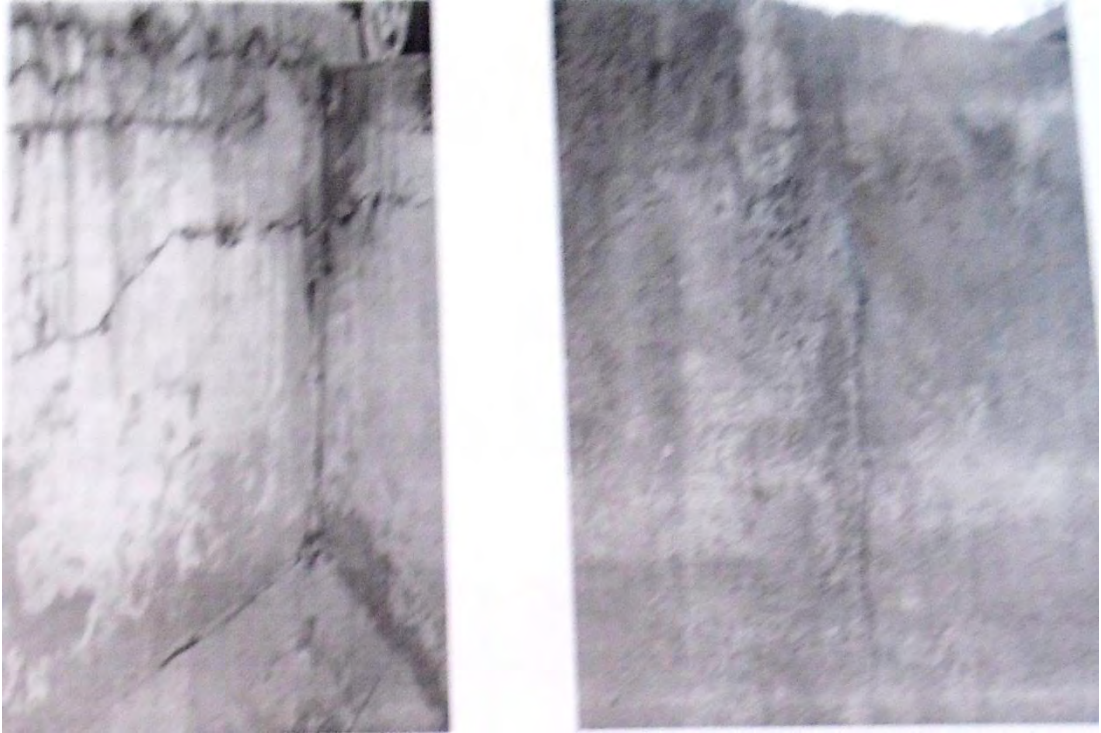
External Wall: Partly Broken Down



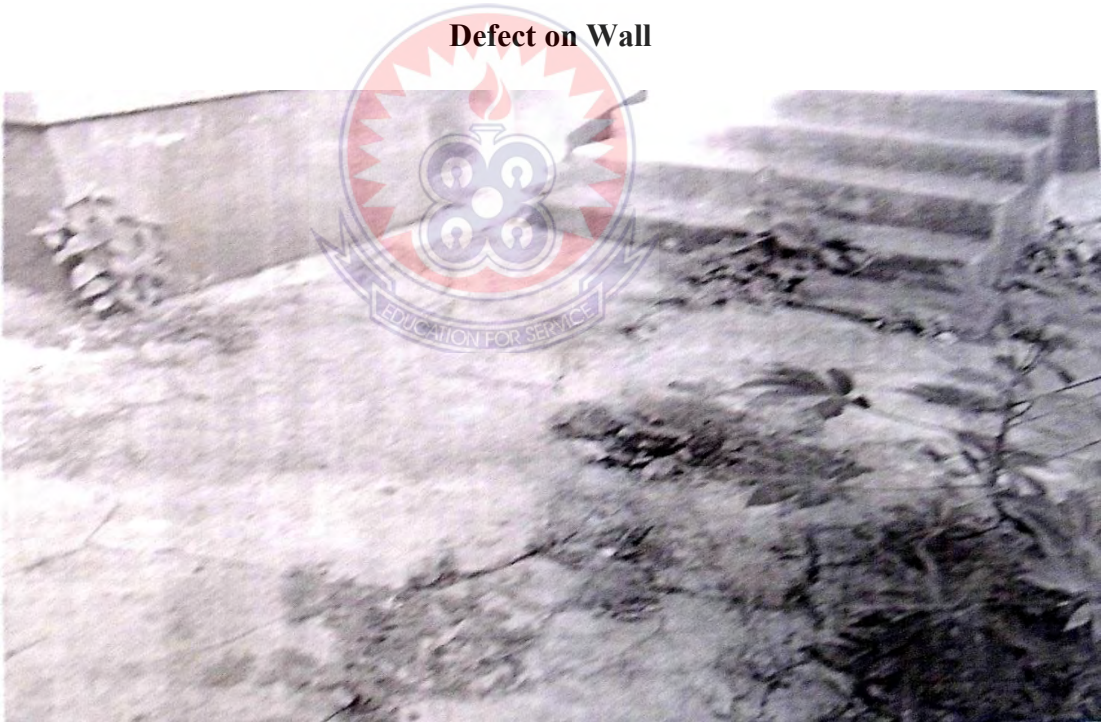
Concrete Floor Peel-off



Defect on Painted Wall



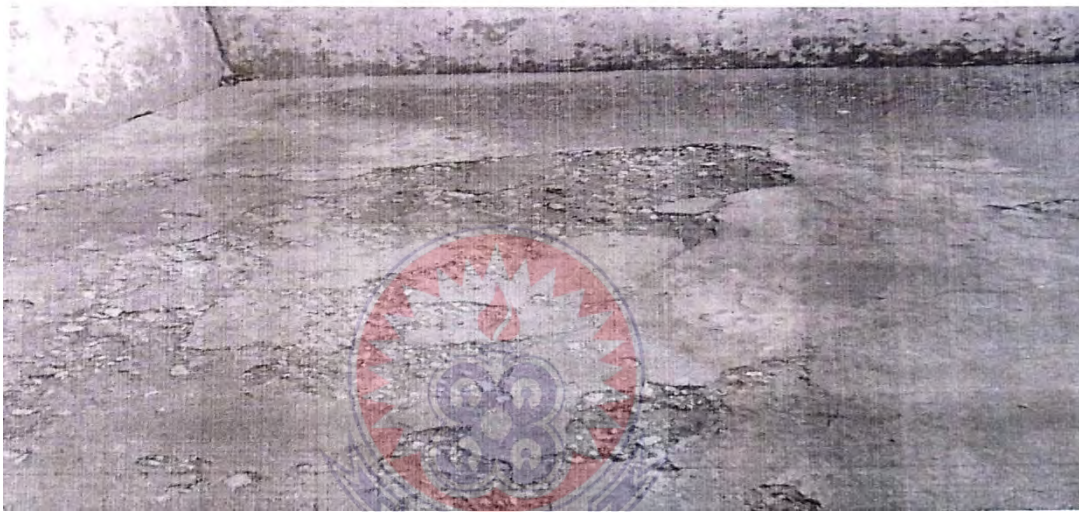
Defect on Wall



Cracks on Floor with grown weeds



Cracked developed on concrete ground floor



Ground Floor – Peeled-off

APPENDIX B

QUESTIONNAIRE FOR PERSONNEL OCCUPYING PUBLIC AND RESIDENTIAL BUILDING

The series of questions in this questionnaire are designed to obtain organizational response on maintenance of public and residential buildings.

Please, answer the questions that follow by ticking [] the appropriate option (if provided) or writing unrestrictedly for open-ended questions.

Please answer all questions freely but objectively. The information is for academic purposes only and will be treated with the strictest confidentiality.

Thank you

GEORGE SEVOR

Years Stayed in the Building

Building Type of Occupant (Bungalow/Single Unit)

1. How long have you stayed in the building?

1 – 5 years [] 6 – 12 years [] 13 – 19 years [] 20 – 25 years []

2. How can the life span of the facilities in the building be extended or prolong?.....

3. How many occupants occupy this type of building? Specify.....

4. Did you take an inventory of the state of facilities in the building before taking occupancy? Yes [] No []

Please assign reasons for your response.....
.....
.....

5. Do you pay any rent for occupying the building? Yes [] No []

6. If yes how much do you pay for rent?.....
7. If no, please attempt an explanation for non-payment of rent.....
.....
8. Who determines the rent payable?
.....

Maintenance Policy

9. Does your organisation have maintenance policy?
10. If yes, who developed the policy?.....
11. What type of arrangement do you have in place? Periodic [] Routine []
Preventive [] if order specify.....
12. How is maintenance funded? IGF [] Rent payment [] Surcharging []
government budgetary [] Allocation [].

Regular Inspection

13. Does your institution undertake regular inspection of buildings? Yes [] No []
Please give reasons for your answer.....
.....
14. Does the maintenance/estate department come in to do maintenance work on the building without request? Yes [] No []
15. If yes, when is it done?
Quarterly [] Annually [] Biannually []
16. Who is responsible for the maintenance work of the building?
Self [] Institution []

Funding of Maintenance

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

Less than a month [] 2 – 3 months []

4 – 12 months [] more than 12 months []

18. In your opinion, is the building well maintained? Yes []

No please give reasons for your answer

.....

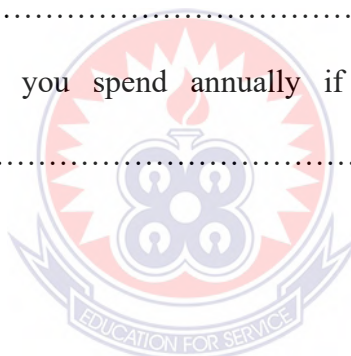
.....

19. What role do you play in the maintenance of your building?

.....

.....

20. How much do you spend annually if any on maintenance of your building?.....



General Condition of Building Element.

Please tick appropriately how you consider the state of the following elements of your building

21. Condition of the foundation

cracks developed Exposed/hanging no problem

22. Roof Leakage Rusty partly ripped off completely ripped off
 no problem

23. Floor screed cracks peeled-off defects no defect

24. Wall partly broken down developed cracks
 peel-off tilted

25. Painting No painting faded painting dirty
 well painted no problem

26. Window and doors no problem partly broken down completely broken down

27. Electrical installation no problem non-functioning faulty

28. Plumbing/water no problem leaking broken down

29. What type of toilet facility do you use?

Water closet KVIP Pan latrine

Other please specify

30. Toilet/sewage no problem leaking broken down
 non functioning

31. Kitchen well ventilated poorly ventilated non ventilation

APPENDIX C

QUESTIONNAIRES SCHEDULE FOR ESTATE MANAGERS

This series of questions in this questionnaire are designed to obtain organizational response on maintenance of public and residential buildings. Please, answer the question that follow by ticking [] the appropriate option (If provided) or written unrestrictedly for open-ended questions. Please answer all questions freely but objectively.

The information is for academic purposes only and will be treated with the strict test confidentiality.

Thank you.

GEORGE SEVOR

General Maintenance of Public and Residential Building

Type of Building/Duration

Name of institution:.....

1. What is your, job description/qualification please?.....

.....

2. What type of buildings do you put up?.....

3. How will you classify buildings according to the period of existence as to whether they are old (above 50 years) medium aged (20 – 25 years) or young building (below 20 years)?

.....

.....

Rent Payment

Are occupant charge for their occupancy of the building?.....

-
4. If yes, then how much rent is charged?.....
 5. Who determines the rent payable?.....
 6. How much do you spend annually if any on maintenance of your building?.....
 7. Does your organization have a maintenance policy?.....
 8. If yes, who developed the policy?.....
 9. What type of arrangement do you have in place? Periodic [] Routine []
Preventive [] If other specify.....
 -
 10. Who is responsible for the allocation of the buildings?.....
 -
 -

Regular Inspection



11. Does your institution undertake regular inspection of buildings? Yes [] No []
Please give reasons of your answer.....
12. Who is ultimately responsible for the maintenance of the buildings?
Personnel [] Organization [] SHC []
If other, please specify
-
13. How is maintenance funded? IGF [] Rent payment []
Surcharging [] Government budgetary [] allocation []
14. What necessitate the carrying out of the maintenance on the building?
Upon inspection [] upon request [] upon occupancy of new personnel []

If other (specify).....
.....

15. Do technicians and managers receive training to conduct the condition assessments of the buildings? Yes [] No []

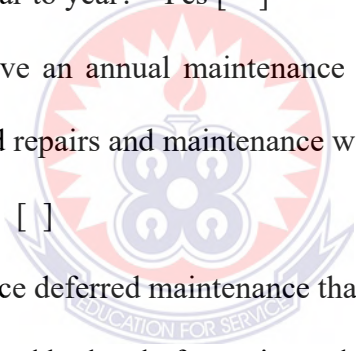
16. Does the organization have a written long-range plan for building maintenance and repairs that extends out a minimum of three to five years? Yes [] No []

17. Does the organization have a written long range plan for building maintenance that contains an inventory of all buildings component and estimates of their expected remaining useful life? Yes [] No []

18. Have building conditions in public and residential building improve or stayed at acceptable levels from year to year? Yes [] No []

19. Does government have an annual maintenance plan for the building as well as estimates for unscheduled repairs and maintenance works order?
Yes [] No []

20. Is there a plan to reduce deferred maintenance that includes a list of major deferred maintenance projects ranked by level of severity and urgency?
Yes [] No []



APPENDIX D

**INTERVIEW FOR OCCUPANTS OCCUPYING PUBLIC AND
RESIDENTIAL BUILDING**

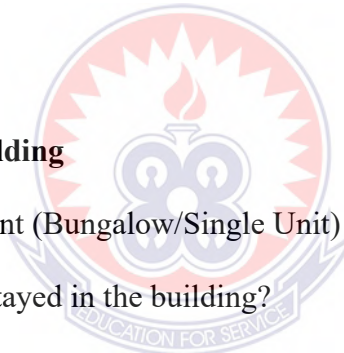
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Thank you

GEORGE SEVOR



Years Stayed in the Building

Building Type of Occupant (Bungalow/Single Unit)

5. How long have you stayed in the building?

1 – 5 years [] 6 – 12 years [] 13 – 19 years [] 20 – 25 years []

6. How can the life span of the facilities in the building be extended or prolong?.....

7. How many occupants occupy this type of building? Specify.....

8. Did you take an inventory of the state of facilities in the building before taking occupancy? Yes [] No []

Please assign reasons for your response.....
.....
.....

5. Do you pay any rent for occupying the building? Yes [] No []

6. If yes how much do you pay for rent?.....
7. If no, please attempt an explanation for non-payment of rent.....
.....
8. Who determines the rent payable?
.....

Maintenance Policy

9. Does your organisation have maintenance policy?
10. If yes, who developed the policy?.....
11. What type of arrangement do you have in place? Periodic [] Routine []
Preventive[] if order specify.....
12. How is maintenance funded? IGF [] Rent payment [] Surcharging []
government budgetary [] Allocation [].

Regular Inspection

13. Does your institution undertake regular inspection of buildings? Yes [] No []
Please give reasons for your answer.....
.....
14. Does the maintenance/estate department come in to do maintenance work on the building without request? Yes [] No []
15. If yes, when is it done?
Quarterly [] Annually [] Biannually []
16. Who is responsible for the maintenance work of the building?
Self [] Institution []

Funding of Maintenance

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

Less than a month [] 2 – 3 months []

4 – 12 months [] more than 12 months []

18. In your opinion, is the building well maintained? Yes []

No please give reasons for your answer

.....

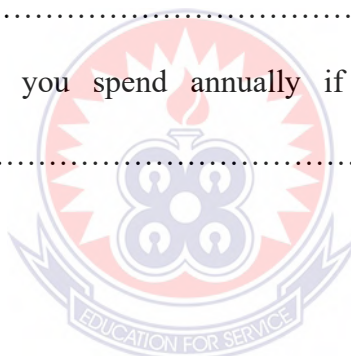
.....

19. What role do you play in the maintenance of your building?

.....

.....

20. How much do you spend annually if any on maintenance of your building?.....



General Condition of Building Element.

Please tick appropriately how you consider the state of the following elements of your building

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completely broken down

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28. Plumbing/water no problem leaking broken down

29. What type of toilet facility do you use?

Water closet KVIP Pan latrine

Other please specify

30. Toilet/sewage no problem leaking broken
down non functioning

31. Kitchen well ventilated poorly ventilated non
ventilation