UNIVERSITY OF EDUCATION, WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

MAINTENANCE OF GOVERNMENT BUNGALOWS IN BIRIM CENTRAL MUNICIPALITY: CHALLENGES

SAMPSON KOFI HADJOR

JULY, 2014

UNIVERSITY OF EDUCATION, WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION-KUMASI

MAINTENANCE OF GOVERNMENT BUNGALOWS IN BIRIM CENTRAL MUNICIPALITY: CHALLENGES

SAMPSON KOFI HADJOR

(7111193054)

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 fulfillment of the requirements for the award of Master of Technology (Construction) degree.

JULY, 2014

DECLARATION

STUDENT'S DECLARATION

I Sampson Kofi Hadjor, declare that this Dissertation, with the exception of quotations and references contained in 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 guidelines for supervision of Dissertation as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: Mr. M. K. Tsorgali

SIGNATURE: ……

DATE: ……

ACKNOWLEDGEMENT

I wish to acknowledge my indebtedness to the Almighty God for His abundant grace, love and care which has seen me through the course. I am particularly grateful and thankful to Mr. M.K. Tsorgali, The Vice Dean of Students of UEW- College of Technology Education, Kumasi for his valuable time spent in supervising this work.

I render my sincere thanks to my wife Mrs. Olivia Mawuena Hadjor and my children Manasseh Hadjor, Joshua Selassie Hadjor, Caleb Elikplim Hadjor and Joyce Awukudzie for their prayers, encouragement and support which propelled _daddy' towards the successful completion of my course and this work.

I am grateful to Mr. Alex Young Asilevi of Development Office, K.N.U.S.T for his direction and pieces of advice in getting this work completed. I am also thankful to Mr. Philip Darko and Mr. Emmanuel Dzeameshie, tutors of Akrososo Senior High School, The Headmistress, Madam Ablata M. Ansah of Akroso Senior High School, Mr. Wisdom Adu , the Assistant Metropolitan Engineer of Birim Central Municipal Assembly for the diverse ways they contributed towards the completion of my course.

Finally, my sincere thanks go to my siblings, Levi Kwadzo Hadjor, Ojukwu Hadjor, John Tate Hadjor, Ame, Dzitorwogbloe, Afine, Dr. Vincent Ativor, Major William Azadda for their prayers, love and support. Your efforts have not been in vain.

DEDICATION

I dedicate this thesis to my dear brother, Mr. Napoleon Kwao Francis Hadjor who nurtured in me the unwavering interest in the value of education. Also to my Lovely wife Mrs Olivia Mawuena Hadjor who provided the support and encouragement that, enabled me to complete my M'Tech programme.

Thank you all.

TABLE OF CONTENTS

CHAPTER TWO

2.0 LITERATURE REVIEW

CHAPTER THREE

3.0 METHODOLOGY

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

LIST OF TABLE

LIST OF FIGURES

ABSTRACT

The study examined existing maintenance policy for government bungalows, the current condition of the government bungalows; identify the challenges confronting maintenance departments of public institutions and make recommendations for effective maintenance policy and innovations that would curtail the building maintenance problems in public institutions in Birim Central Municipality. The field investigations focused on government bungalows of GHS nurses quarters, GPS, and Akroso SHS. Three different housing types were defined for data collection and discussion including: bungalows, tenement (flats) and single unit houses. Through the application of multi-stage cluster sampling and random sampling techniques, 65 buildings were covered in the survey. The research revealed that on the whole, 93.3 percent of all government bungalows of public institutions surveyed have problems with maintenance. The age of the buildings, Lack of maintenance culture, Inadequate funds and high maintenance cost, Pressure on building facilities by large number of users and Poor construction work and maintenance work done by maintenance personnel of the institution were identified as causes of maintenance problems. Stakeholders in the housing sector also added to the problem as a result of lack of preventive maintenance plan, low capacity of maintenance personnel in terms of staffing and training, absence of an effective national maintenance policy, apathy and lack of patriotism on the part of some public employees occupying government bungalows. Recommendations made include the need for public institutions to embrace preventive maintenance practices, periodic inspections of buildings' conditions, adequately staffed maintenance departments, effective national policy on maintenance to protect buildings, establishment of a maintenance awards scheme and maintenance fund.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Physical infrastructure constitutes a high proportion of the country's investment. It is therefore of primary importance that, these facilities which include government bungalows are maintained in order that, they can serve both the architectural and aesthetical functions for which they are built. The physical appearance of buildings housing public institutions in part constitutes the basis upon which the society makes their initial judgment of the quality of services to be offered.

All elements of buildings tend to deteriorate but at a greater or lesser rate depending upon function and location. Buildings will rapidly decay and degrade when building maintenance has been neglected. This can, of course lead to other harmful effects and threaten safety of both occupants and building finishes. It is very important for property owners to provide and programme appropriate maintenance work for their historic buildings (Ghafa Ahmad, 1994).

One of the critical problems confronting the housing industry in Ghana is the poor maintenance practice (Afranie and Osei Tutu, 1999). The role of Public Institutions in National development cannot be over-emphasized. However, in spite of the heavy investment in government bungalows buildings, Public institutions allow their structures to care for themselves without any sustainable maintenance plan to preserve the quality of the buildings. The continued efficient and effective performance of public institutions depends on the nature of their buildings in addition to other factors such as enhanced conditions of service, provision of the requisite tools etc.

Government bungalows buildings are meant for dwelling (residential accommodation) and these residential buildings are prone to defects due to their permanent and lengthy usage. All elements of buildings deteriorate at a greater or lesser rate dependent on materials and methods of construction, environmental conditions and the use of the buildings. Her Majesty Statutory Office (HMSO 1972).

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 effects on the contents and occupants. Therefore, buildings are too valuable assets to be neglected in this way. In his hierarchy of needs theory Maslow (1954) identifies five basic needs which are organized into successive level of importance in an ascending order. He identified physiological needs as the most basic needs of human beings which include air, food, water, shelter (housing), sex and sleep.

BS 3811(1993) 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 function."

Maintenance brings about improved utilization of buildings ensuring the highest safety standards. It must be emphasized that more rather than less maintenance work is necessary if the value and amenity of the nation's building stock was to be maintained. A good maintenance system is also a good disaster mitigation system. Moreover, a well operated system of maintenance for buildings and equipment has the effect of being a very effective disaster mitigation measure in terms of cost and facility usage. It ensures the most economic way to keep the building and equipment in the best of form for normal use, given the original design and materials (http\\www.oas.org\en\cdmp).

Lee, (1995) stated that, maintenance, which can also be explained as the continuous protective care of the fabric, contents and settings of a place can be categorized according to why and when it happens, as corrective maintenance, which is necessary to bring a building to an accepted standard. Planned maintenance is work to prevent failure, which recurs predictably within the life of a building such as cleaning gutters or painting. Emergency Corrective Maintenance deals with work that must be initiated immediately for health, safety, security reasons or that may result in the rapid deterioration of the structure or fabric if not undertaken (for example, roof repairs after storm damage, graffiti removal, or repairing broken glasses).

According to Seeley (1987), when buildings are neglected, defects can occur which may result in extensive and avoidable damage to the building fabric or equipment. Poor maintenance has resulted in damage and deterioration to some public buildings in Ghana. Neglect of maintenance especially in relation to replacing electricity cables after thirty years of use can also give rise to fire and safety hazards, which could result in the Institution owning the buildings being found liable for any injuries and damages. Building maintenance is actually a process by which a building is kept usable at a pre-determined standard for the use and benefit of its occupants or users. The standard may vary according to the function of a building. Building maintenance has become a major part of the work in the building industry and absorbs millions of Ringgit each year. According to Mills (1996), maintenance practically begins the day a builder leaves the building site. Design, materials, workmanship, function, use and their interrelationships, will determine the amount the maintenance required during the lifetime of a building. The prime aim of the building maintenance is to preserve a building in its initial state, as far

as practicable while retaining, where appropriate, its investment values and presenting a good appearance; so that it effectively serves its purpose.

According to Ahmad R.B.H (2006) and Lee (1995), it is impossible to produce buildings which are maintenance-free, but maintenance work can be minimized by good design and proper workmanship carried out by skilled experts or competent craftsmen using suitable codes of installation, requisite building materials and methods. The importance of maintenance is such that it requires a properly educated and trained workforce involving good management as well as suitably trained craftsmen.

A case in point is the Meridian Hotel at Tema built by first President Dr. Kwame Nkrumah as Tema Development Corporation's chain of hot hotels in the first Republic has become one of the defunct state hotels and a Drugs den http:/www.ModernGhana.com. The present 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 structures are often inadequately maintained; windows and doors and other building elements and facilities frequently show evidence of lack of maintenance and repairs. Most government bungalows and office buildings of public institutions in Birim Central Municipality have not seen any significant maintenance or show little signs of maintenance since they were constructed, some dating back to the colonial era. This has resulted in such buildings being in a dilapidated state with some being abandoned. This lack of maintenance by the authorities and occupants of these facilities often leads to reduced lifespan of these buildings (Melvin, 1992), which

invariably defeat the purpose for which they are put up i.e. to ensure that the nation's stock of buildings, both as a factor of production and accommodation, was used effectively as possible. The problem of ownership of these buildings, where occupants do not regard them as their own property but a state property and handle them without due care largely have resulted in the state in which most of these government bungalow find themselves.

Most offices are dilapidated and lacked the basic necessities and facilities such as toilet due to its state of deterioration of a functioning office. However new buildings are being put up every now and then without giving a thought to the maintenance of the old structures which have been neglected. The researcher's visit to the Ministries area of the Akim Oda in Birim Central Municipality showed the abhorring situations in some public institutions with the buildings showing cracks on the walls, rotten wooden members, leaking roofs and missing louver blades, faded and discoloured surface coating (painting). Lack of maintenance of buildings in some educational institutions, especially some basic schools resulted in some of them holding classes under trees and in the open air at the mercy of the weather. The problem of leaking roofs, rotten wooden members, cracks on walls of the bungalows lowers morale of the labour force and goes a long way to reduce the efficiency of the personnel in the Birim Central Municipality.

In view of these, it has been considered necessary to study the maintenance of government bungalows in Birim Central Municipality to identify the factors contributing to the current state of bungalows and to devise a strategy to address the problems.

1.3 Purpose of the Study

The purpose of the study is to develop effective policy to enhance the building maintenance of government bungalows in Birim Central Municipality.

Specific Objectives of the study are to:

1. Examine existing maintenance policy for government bungalows.
2. Identify the challenges confronting maintenance department of government institutions.
3. Devise a strategy to address the building maintenance problems in government institutions in Birim Central Municipality.

1.4 Research Questions

The following are the research questions;

1. What are the reasons or factors that have accounted for the poor maintenance of government bungalows in Birim Central Municipality?
2. What maintenance policies and practices are in place as far as government bungalows are concerned and the capacity of human resource of their maintenance department?
3. What are the challenges being faced by management?
4. How can management ensure continued maintenance of their buildings in order to retain their current stock of buildings as well as improve on their condition?

1.5 Significance of the Study

The significance of the study is as follows:

- This study is essential in the sense that it would not only contribute to knowledge and theory, but also contribute to good maintenance practice in the public institutions in Birim Central Municipality and Ghana in general.
- The study will also assists management of public institutions to become aware of the current state of their building infrastructure and its effect on the safety and health of personnel and also to put in place adequate innovative measures to prevent new buildings put up to suffer deterioration which ultimately lead to increased cost in restoring these buildings to their original state.
- The study results will provide a critical and analytical perspective for appreciating the factors affecting the decisions to carry out maintenance.
- In addition, the study will bring to the fore, the major inhibiting factors in the maintenance of government bungalows in Birim Central and Ghana in general.

1.6 Scope of the Study

The study was limited to government bungalows of selected public institutions in the Birim Central Municipality of Ghana. It has examined the maintenance of government bungalows of the Ghana Police Service, the Ghana Health Service Nurses quarters and Akroso Senior High School (SHS). The study examined existing maintenance policy for government bungalows, the current condition of the government

bungalows; identify the challenges confronting maintenance departments of public institutions and make recommendations for effective maintenance policy and innovations that would curtail the building maintenance problems in public institutions in Birim Central Municipality.

1.7 Limitations of the Study

Data gathering suffered due to delay in getting responses due to the schedule of work, especially personnel of the GHS and GPS. In addition, records keeping was a problem for all the institutions surveyed such that in some situations researcher had to collate the number of buildings himself. Notwithstanding the limitations afore - mentioned, the study results have not been affected and thus are reliable, credible and useful for any purposes of evaluation and feedback.

1.8 Organisation of the Report

The study was organized under five chapters. Chapter one, covered the introductory part and it includes the problem statement, objectives, research questions, significance of the study, the scope and the limitations. The second chapter dealt with the review of relevant literature on the subject. Thus, ideas of some researchers and authors have been reviewed.

Chapter three focused on the methodology that has been adopted in undertaking the research. The results and discussions of the data gathered have also been dealt with in chapter four, while chapter five presented summary of the findings, conclusion and recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

The second chapter of the research reviews literature on the issues of the concept of building and nature of maintenance of buildings. It covers conceptual issues affecting maintenance of buildings.

2.2 The Concept and Nature 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 so fixed (Wikipedia). The lives of existing buildings are difficult to assess as all properties from the date 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 (Seeley, 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 adapt the building to meet changed requirements, because of physical or technical obsolescence.

The life of a building can be categorized into _structural 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 economic life is concerned with

earning power and it is that period of effective life before replacement; replacement taking 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 changed requirement (Seely, 1983)

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 effective life.

2.2.1 Types of Residential Bungalows in Ghana

The following are the types of residential bungalows found in Ghana (Cobbinah, 2010)

i. Detached Bungalows: These are bungalows designed or built to be occupied by a single household. They stand alone or stand detached on individual plots of varying sizes. The dwelling unit is organized into specific rooms for receiving visitors and relaxation (living rooms), eating, carrying out other indoor family activities, cooking (kitchen), ablutions (bathroom and toilet) and sleeping (bedrooms). In addition to these basic rooms, one finds spaces such as garages, store rooms, terraces etc in some of these house types.

ii. Semi-Detached Bungalows: It is basically two bungalows put together with a common partition wall. Similar to the bungalow type, the dwellings are self-contained.

iii. Blocks of Flats: This type of houses provides self-contained dwelling units of different sizes for single-households placed on multi-levels without any defined

private courtyard space. Balconies are provided on the ground floor for the occupying households. In some cases, lockable garages and storerooms are provided on the ground floor for the occupying households.

2.3 Definition of Maintenance

Maintenance has no universal definition; it is defined from different perspectives. British Standard (BS 3811: 1964) defines maintenance as _a combination of any actions carried out to retain an item in or to restore it to, an acceptable condition‘.

The actions referred to are those associated with initiation, organization, and implementation. There are two processes envisaged: _retaining‘, i.e. work carried out in anticipation of failure, referred to as _preventive maintenance‘ and _restoring‘, i.e. work carried out after failure, referred to as _corrective maintenance‘. There is also the concept of an _acceptable standard‘ which may be construed as acceptability to the person paying for the work, to the person receiving the benefit or to some outside body with the responsibility for enforcing minimum standards. Additionally it can also be construed more widely as acceptability to the public at large or to specific sections of the public. Clearly however there are no absolute standards which would be equally acceptable to everybody or which would remain acceptable to the same group of people over a period of time.

The standards acceptable at the time of undertaking the work may be higher or lower than the initial design standards. In many cases, the standards deemed acceptable would be higher than that originally provided and the work would include an element of improvement. Buildings, however with the passage of time are modified to accommodate

new uses and it becomes increasingly unrealistic to think in terms of keeping or restoring the initial standards. Clearly, the standards would be related to safety and efficiency, and determined by the amount of money allocated rather than as a result of assessing the benefits obtained from maintaining the building to a particular state.

According to the British Standard (B. S. (3811) 1974), as cited in (Afranie 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 means that defects are prevented from developing
- To restore means that minor defects, if they are allowed to occur, are then corrected;
- Acceptable standard and acceptable cost indicate that maintenance work is tailed to suit individual needs and conditions.

BS 3811, 1984 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. Hawson (1993), agrees with the statement but was quick to add that to retain implies that defects are prevented from developing by carrying out work in anticipation of failure. He further explains that to _restore' means that minor defects are allowed to occur before they corrected.

Maintenance has also been defined as _All actions taken to retain material in or to restore it to a specified condition. It includes inspection, testing, servicing, and

classification as to serviceability, repair, rebuilding, and reclamation‘ (Collins English Dictionary, 2003).

It includes the routine recurring work required to keep a facility (plant, building, structure, ground facility, utility system, or other real property) in such condition that it may be continuously utilized, as its original or designed capacity and efficiency, and for its intended purpose (Dictionary of Military and Associated Terms, US Department of Defense 2005).

Seely (1983) defines maintenance as seeking to preserve a building in its initial state so that it continuous to serve its purpose". In other words, it is maintaining a building to retain the value of investment; thus to maintain the building in condition in which it continuous to satisfactorily fulfill its initial function and to present a good appearance to public.

This definition emphasizes on preventive measures that need to be taken to prevent major defects. The word initial in the definition also seeks to find an answer to when a maintenance work should be carried or start.

One school of thought recommends that maintenance should start from the day the contractor leaves the site. The contractor is required to carry out maintenance and repair works on the building during the defect liability period, which depends upon the conditions of the contract, environment or the country, after the period, before the maintenance responsibility is passed onto the client.

The other school thought, however, maintains that the maintenance work must start with or commence right from inception stage of the project. This implies a team work of architects, structured engineers, quantity surveyors and service engineers.

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 so that its pattern lies within specified regions‘. The word _control‘ suggests a positive activity which is planned so as to achieve a defined end result while the term _specified regions‘ presumably has a similar meaning to _acceptable standards‘. His definition envisages 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 serves as it did when it was first built(S. Afranie and E. Osei-Tutu, 1999). It includes the expenditure necessary to maintain the rental value of the property and involves:

- Day to day repairs such as leaking taps and electrical effects;
- Periodic up-keep such as painting; and
- Major repair requiring heavy expenditure and the services of technical experts, for example foundation works and re-roofing.

2.4 Importance of Maintenance.

The maintenance of a building environment affect everyone continually for it is on the sate of our homes, offices, and factories that we depend not only for our comfort but for economic survival as well. According to Wainwright and Wood (1991), at the present times, it is an established economic fact that existing buildings must be maintained and repaired where possible in preference to demolition and rebuilding. This

type of work is now very common and is important part of the workload of the building industry.

The main purposes of maintaining building according to Seely (1993) are

- Maintaining value of investment
- Maintaining the building in a condition in which it continues to fulfill its function
- Presenting good appearance

Other purposes of maintenance are to:

- ❖ Minimize difficulties encountered by the users of the building
- ❖ Reduce cost
- ❖ Reduce down time
- ❖ Maintain job satisfaction
- ❖ Give adequate security

From the above discussion, it could be seen that without maintenance the aim of the investor will end on dead rocks, for quite a heavy sum of money is invested in putting up these building and if this buildings do not last the estimated life, then the developer cannot retrieve the amount invested let alone gain some profit.

Types of Maintenance

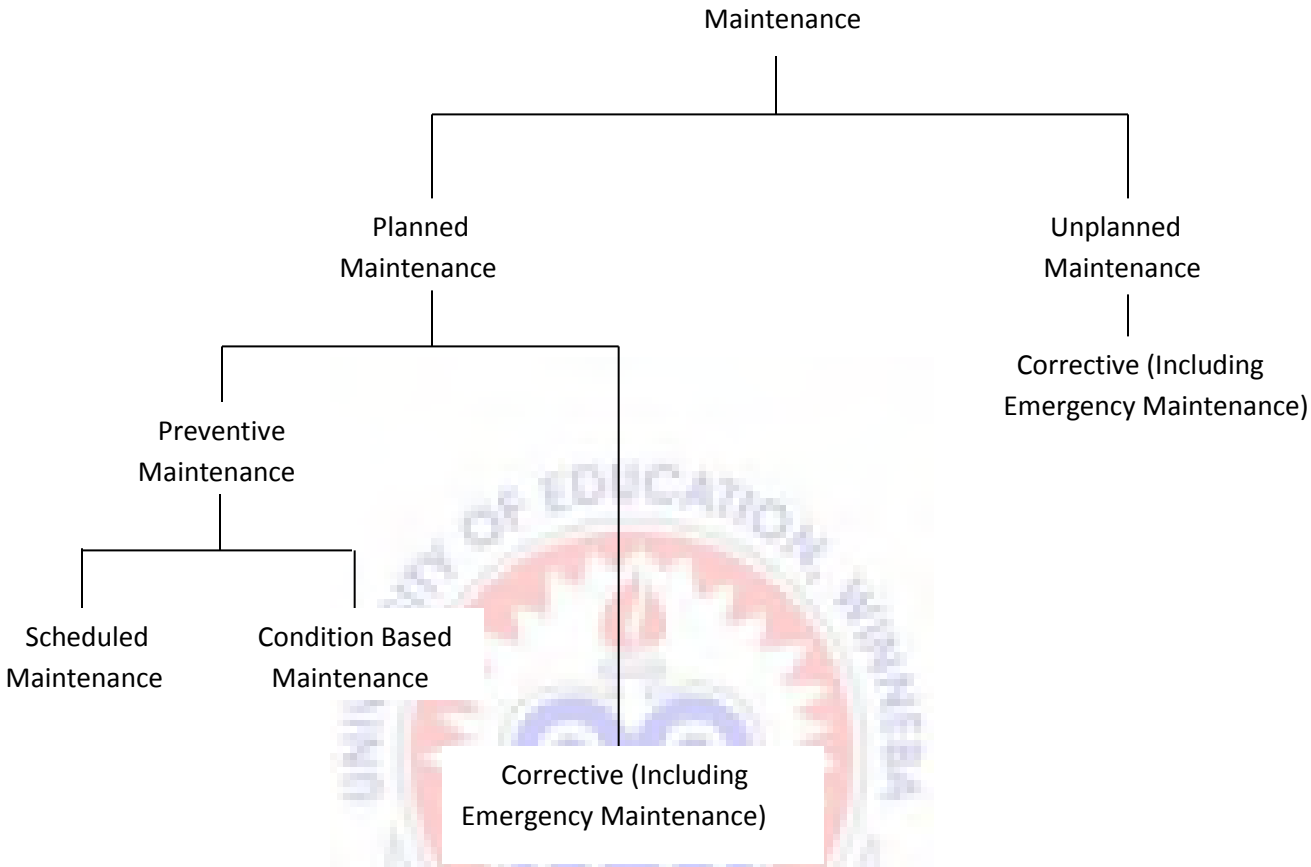


Figure 2.1 Types of maintenance (source: BS 3811: 1984)

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

i. Planned maintenance: ―This type of maintenance is organized and carried out with forethought, control and the use of records to a predetermined plan."

ii. Unplanned maintenance: ―The plan carried out to no predetermined plan." It refers to work necessitated by unforeseen breakdown 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 unavoidable maintenance.

iii. Preventive maintenance: ―The maintenance carried out at predetermined intervals or corresponding to prescribed criteria and intended to reduce the probability of failure or the performance degradation of an item."

iv. 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." The procedures are similar to the preventive maintenance except they are less systematic. Components are replaced only during full inspection and servicing period or when a breakdown occurs or is anticipated.

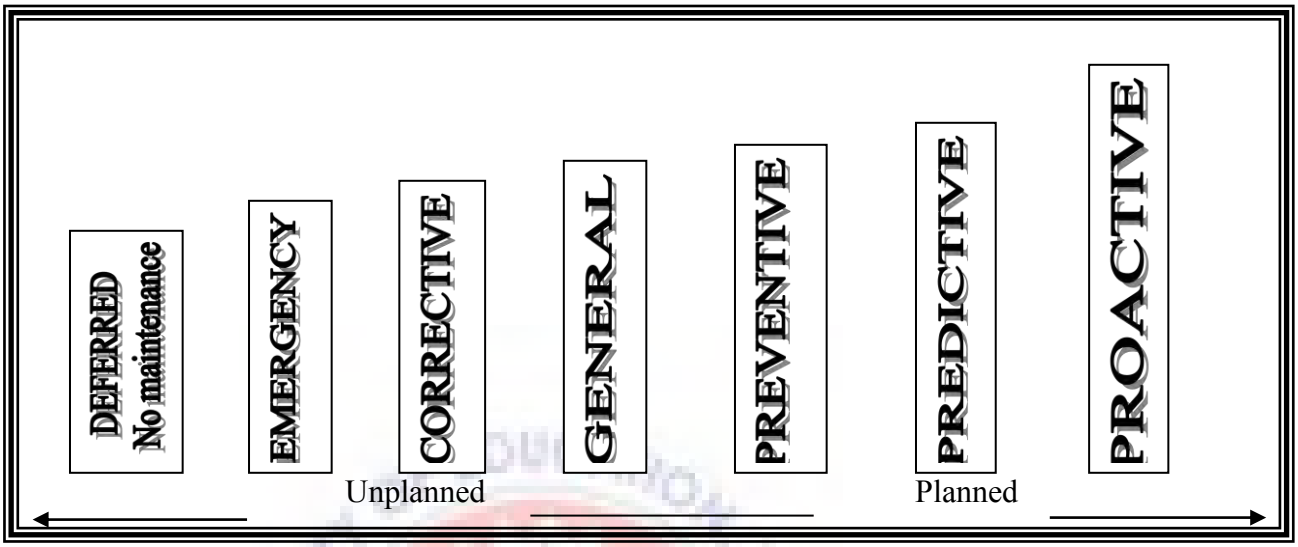
v. Emergency maintenance: ―The maintenance which it is necessary to put in hand immediately to avoid serious consequences." This is referred to as day-to-day maintenance, resulting from such incidents as gas leaks and gale damage.

vi. Condition-based maintenance: ―The preventive maintenance initiated as a result of knowledge of the condition of an item from routine or continuous monitoring."

vii. Scheduled maintenance: ―The preventive maintenance carried out to a predetermined interval of time, number of operations, mileage, etc."

viii. Running maintenance: ―Maintenance which can be carried out whilst an item is in service."

The Office of the Legislative Auditor, Minnesota, U.S.A. as cited in Cobbinah (2010), identifies a continuum of building Figure 2.2 Continuum of Maintenance for Buildings



Source: Office of the Legislative Auditor, Minnesota, U.S.A (2000)

Figure 2.2: Continuum of Maintenance for Buildings

According to a report on a best practice review by Jody Haur (2000), continuum of maintenance for buildings showed in figure 2 above, at the left end is deferred maintenance, which occurs when projects are identified as necessary but put off due to lack of resources. Next along the continuum are unplanned activities including emergency maintenance, such as restoring lost electrical power, and corrective maintenance, such as fixing a broken window. Emergency and corrective maintenance occur as the need arises; neither is planned far in advance.

Planned maintenance follows on the continuum, although the maintenance categories are not mutually exclusive. General maintenance is the upkeep of building components to restore them to their original conditions or to keep them in good working condition. Preventive maintenance follows on the continuum.

Preventive maintenance is a planned program of periodic inspections, adjustments, and replacements. Preventive maintenance means the regularly scheduled repair and maintenance needed to keep a building component operating at peak efficiency and extend its useful life. It includes scheduled activities intended to prevent breakdowns, such as periodic inspections, lubrication, calibrations, and replacement of equipment. Replacing filters in an air-handling unit on a regularly scheduled basis is an example of preventive maintenance. Because prolonging the life of major building systems requires periodic replacement of equipment, preventive maintenance typically requires both capital and operating expenditures. Preserving these assets—including the buildings' roofing, plumbing, heating, ventilation, air - conditioning, electrical systems, exteriors, and interiors—is a primary objective behind preventive maintenance.

Predictive maintenance presents another degree of planned maintenance. It uses techniques, such as vibration analysis of moving parts while equipment is operating, to detect trends that indicate excessive wear. This allows repairs to be made before equipment fails, but only when conditions warrant the repair, not on a regularly scheduled basis as with preventive maintenance. Predictive maintenance helps avoid unnecessary overhauls when analysis indicates the equipment is in good condition and does not need work. One example is analyzing the vibration frequencies of fans or gears to detect changes in amplitude that may signal bearing damage or other degradation.

A step beyond that is proactive maintenance, a highly structured practice that uses information from analyzing equipment to identify origins, not just symptoms, of equipment problems. Proactive maintenance would, for example, identify whether excessive wear resulted from defective installation, unsuitable design, or some other

cause. Because it addresses the root sources of equipment problems, 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 is regular periodic work that may be necessary to retain the performance characteristics 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 required to rectify failures caused by poor design, incorrect installation or the use of faulty materials (http:/www.auditor.leg.state.mn.us/ped/2000/pe006.htm).

With building services, minimal neglect can result in potential danger. _Appropriate condition' could be interpreted as the maintenance of building in a state, which allows them to be used for the purpose for which they were provided for the minimum capital expenditure. The appropriate condition will be influenced by many factors, including the function of the building, its public image, or even national prestige. The prime aim of building maintenance should be to obtain good value for money spent on maintenance.

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

1. Major repair or restoration: such as re-roofing or rebuilding defective walls and often incorporating an element of improvement.
2. Periodic maintenance a typical example being annual contracts for decorations and the like.

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

2.4.1 The Value of Preventive Maintenance

Cobbinah (2010), asserted that a well-planned preventive maintenance is advocated for its effects on improving equipment‘s operating efficiency, preventing premature replacement of components, and avoiding interruptions for building occupants. Preventive maintenance is widely thought to reduce long-term costs by maximizing the operating capacities of equipment, minimizing downtime, and avoiding breakdowns that would otherwise lead to higher repair costs later.

Preventive maintenance may indirectly affect occupants‘ productivity and health. For example, a study of public school conditions in the District of Columbia found that, while controlling for other factors, students in schools with excellent building conditions had higher standardized achievement scores than students in schools with fair building conditions and even higher scores than students in schools with poor conditions. Certain preventive maintenance can improve the quality of indoor air, and insufficient preventive maintenance can be detrimental to it. For instance, lack of preventive maintenance may result in roof leaks, creating conditions for mold growth and potentially affecting some users‘ respiratory systems. The costs of poor indoor air are potentially dramatic, as exemplified recently by the Capitol Square building in St. Paul, which had problems that forced the relocation of its occupants and led to its demolition in early 2000 (office of Legislative Auditor, Minnesota U.S.A).

Maintaining good indoor air can have direct, positive effects on building occupants. As an example, one study-quantified savings from improved worker productivity and health associated with making indoor air quality improvements in government, school, and other non-industrial buildings. The study in the District of Columbia, estimated that a one-time upgrade of HVAC systems, including the preventive maintenance required to sustain the upgrade over 20 years would provide net benefits of $13.31 per square foot and $11,227 per worker (Seeley, 1987).

2.5 Components of maintenance

Maintenance involves a considerable amount of work which Harper (1969) as cited in (Afranie S. and Osei-Tutu, E. 1999) has been categorized into three components namely; Servicing, Rectification and Replacement.

2.5.1 Servicing

Harper (1969), further explain servicing is essentially a clearing operation undertaken at regular intervals of varying frequency and is sometimes termed day-to-day maintenance. Daily sweeping of floors, monthly washing and cleaning of windows and regular painting for decoration and protection every four years are some examples of servicing. However, as more equipment that are sophisticated are introduced so more complicated service schedules become necessary. Servicing becomes necessary because of constant use of facilities, the effect of the weather and atmospheric conditions on the components of the building.

2.5.2 Rectification

Rectification work usually occurs fairly early 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 in 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 P. 23). Rectification is the response to inherent defects in design, construction or installation stages of the building process. This provides an opportunity to ~~–t~~rade off" current capital expenditure against future maintenance costs.

2.5.3 Replacement

Replacements occur at all costs 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 materials or element as from deterioration of the appearance (Seeley, 1987). This is because the extent of exposure of materials to the vagaries of the weather varies, and the weather in specific locations also varies while 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. Physical breakdown of materials or elements as well as deterioration appearance may necessitate replacements. However, this brings the

problem of distinguishing between maintenance and improvement, which has not been resolved satisfactorily by many definitions. It is however, generally conceded that maintenance should include reasonable elements of improvement, for example, the replacement of worn out component with up-to-date version. Where the intention of work done is to increase efficiency in the use of the building by adding facilities, which were not previous present, the work should be classify as improvement. However, it is logical therefore to extend the meaning of maintenance to cover some localized improvement (Lee, 1987).

Maintenance can also embrace renovations, which consist of 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. This may include limited additions and extensions to the original building.

2.6 Other Maintenance-Related Concepts and Definitions as related to Housing

2.6.1 Renovation

Lee (1987), asserted that renovation consists of work done to restore a structure, services and equipment by a major overhaul to the original design and specification or to improve on the original design. This may include substantial additions and extensions to the original structure and in the extreme re-building. Renovation constitutes the interface with improvement and refurbishment. Renovation to some extent is unavoidable, since in replacing a fitting, such as a bath, the replacement will be of a new design.

2.6.2 Refurbishment

Refurbishment means in architectural sense, as involving replacement of missing parts or introduction of new decorative elements into a structure. In addition, it involves working on a housing to make it bright, clean and fresh again.

2.6.3 Extension

With respect to housing, it involves addition of parts to make housing wider or larger in response to what is required of it.

2.7 Technology of Maintenance

Seeley (1991), stated that the technology of maintenance is concerned with all the factors that influence and cause the need for maintenance work. The occurrence of defects in the fabric of a building can result from many unrelated design decisions-unsuitable material, incorrect assessment of loads, inadequate appreciation of conditions of use and inadequate assessment of exposure. Exposure is influenced by rainfall, direction of prevailing winds, microclimate, atmospheric pollution and aspect and height of building. The durability of the building material also influenced by frost action, crystallization of salts, sunlight, biological agents, abrasions and impact, chemical action and corrosion and incompatibility of modern building material.

Cracks in building normally result from failure or defective construction and are invariably uninsightful and unacceptable to occupants. If severe, they may result in loss of stability. Furthermore, cracks frequently give rise to air infiltration, heat loss and reduced sound insulation all of which cause reduced efficiency in buildings. Cracking is

generally caused by tensile stresses in excess of the tensile strength of the material, produced by externally applied loads or internal movements arising from temperature or moisture changes.

Seeley (1991), further explain that other important concept of the maintenance can be illustrated by reference to roof construction. A good roof which is well maintained should last the life of a building and it is false economy to save money on roof during construction, because if it ever requires replacement, it will cause serious dislocation of production, occupancy or other activities within the building. A leaking roof apart from causing considerable inconvenience to users can lead to accelerated deterioration of other parts of the building such as ceiling, floors and walls and can cause serious damage to decorations and electrical installation. Traffic over a roof should be kept to a minimum and where it is essential, appropriate walkways and access ladders must be provided. To ensure that roofs are adequately maintained, they should ideally be inspected every three (3) years or alternatively one-third each year.

2.8 Economic and Social Significance of Maintenance

Frequent maintenance of the built environment brings such benefits as comfort and satisfaction to its inhabitants. Maintaining the physical structures of a property ensures that investments made does not only yield the highest possible returns over the life of the property but also fulfills the ultimate responsibility of providing the needed human satisfaction and comfort.

A house according to Dave (2002) is regarded as an economic asset, which must be maintained to ensure that it appreciates in value and results in a return, either socially

or economically, to the owner. In effect the primary aim of maintaining a building is to preserve it in its original state as practicable as possible so that it effectively serves that purpose. As a rule, the capital asset of a building is so valuable and is often appreciating so that in practice, maintenance should frequently be directed to prolong effective life. Afrani and Osei-Tutu indicated the purpose for maintaining a building as retaining the value of investment, maintaining the building in a condition in which it continues to fulfill its function and presenting good appearance. No wonder many writers on the economic and social significance of maintenance contend that the built environment expresses in physical form, the complex social and economic factors, which give structure and life of the community. As a result, the condition and quality of buildings reflect public pride or indifference, the level of prosperity in the area, social values and behaviour and all the many influences both past and present, which combine to give a country its unique characteristics.

2.9 Aims of Maintenance

The primary aim of maintenance is to ensure that the building continues to serve the purpose for which it was put up. The purposes for which maintenances are undertaken include:

- 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 all play an important in the determination of value (Afranie, S. and Osei-Tutu, E. 1999).
- To ensure optimum use of buildings- good maintenance should allow buildings 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 of 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.

2.10 Factors Influencing Decision to Undertake Maintenance

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

- 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 result 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.

- Bad management- refers to the idleness and waste among maintenance personnel.
- 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.

Stapleton (1994), in Afranie, S. and Osei-Tutu, E. (1999), relates than 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 look at
    - 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 economies 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 S. Afranie and E. 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.

2.11 Maintenance Policy

BS 3811, Defines maintenance policies as a strategy within which decisions on maintenance are taken. Alternatively, it may be defined as the ground rules for the allocation of resources (men, materials and money) between the alternative types of maintenance actions 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 include; objectives, benefits and policies.

2.12 Physical Causes of Poor Maintenance in Residential 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 sense, of the rate of deterioration of a material or component (Afranie, S. and Osei Tutu, E. 1999). According to Afranie S. and Osei Tutu, E. 1999, the British Standard Institution (BSI) Code of Practice defines durability as the quality of maintaining a satisfactory appearance and performance of required functions. The code measures this parameter in terms of the minimum number of years of

satisfactory life. The three major causes of deterioration and hence maintenance problems are, age or period of construction, environmental and location factor.

Newly constructed houses are observed to be in relatively better condition as compared to older houses. Environmental factors such as extreme moisture content (too high and too low), high and fluctuating temperature and salt laden winds among others have effects on the building (Afranie S. and Osei Tutu, E. 1999). In areas of continuously high humidity, some materials retain more moisture sufficient to have deleterious effects while in drought zones, some materials may deteriorate or fail to develop their potential properties because of hydration. Fungal and insect attack of organic materials and the corrosion of metals are encouraged in very moist conditions. The components of buildings, which are found to be more affected are the wooden members, the cement based parts and the roofs, especially the corrugated iron sheets (Afranie S. and Osei Tutu, E. 1999).

The location of a building has a direct effect on the maintenance problem. The location refers to the exact loci of the building. Thus location is influenced by the terrain of the environment, soil, nature of social and seismic movement, salt laden winds and salty water effects as well as high temperatures and drastic temperature changes.

2.13 Organisation of Maintenance Department

The maintenance department in an organization is managed by a maintenance manager. The maintenance manager is responsible for the planning and control of maintenance operations. In a small firm, the functions may be undertaken by a member of

staff in addition to his other duties, while in a larger firm there would be a separate group of people solely responsible for maintenance.

2.13.1 The Functions of the Maintenance Department

According to Ahmad, R. (2006), the maintenance department among other things performs the following basic functions.

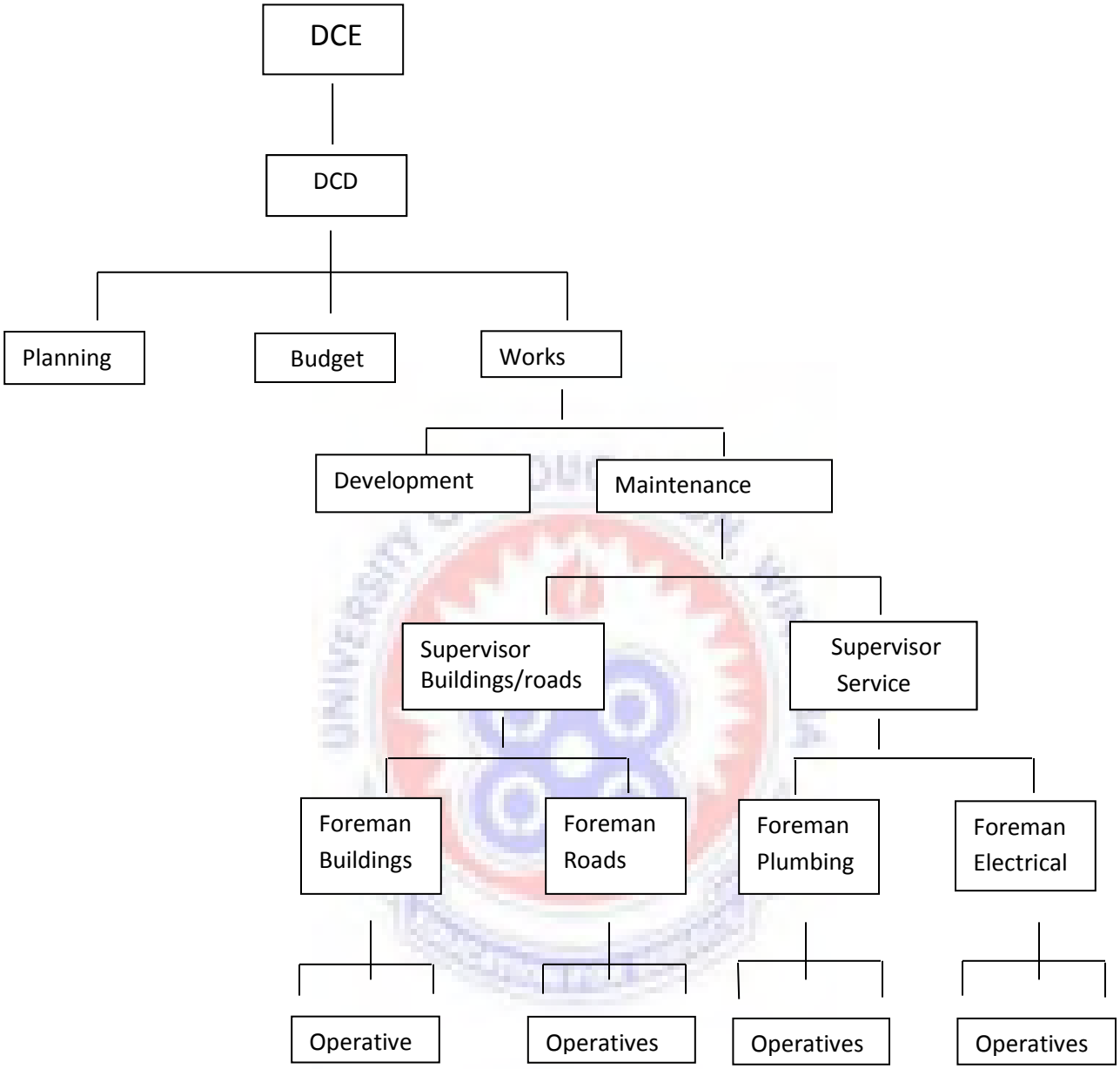
1. Advisory function: this involves liaison with occupants and users and consultation with upper management on such matters as;
    - The standards to be maintained and the effect on user activities of deviations from these standards.
    - The relative merits of alternative maintenance policies and the extent to which it would be advantageous to employ operatives directly for executing the work.
    - Clarification of any constraints in relation to limits of expenditure, desirable cash flow patterns, acceptable delay times or restrictions on time and method of carrying out work
    - Estimates of maintenance expenditure both long and short term, including, where appropriate, the cost of initially bringing up to the required standard and the possibility of phasing any such backlog over a period of years.
    - Provision of cost and other data to assist upper management in deciding whether to repair or renew.

- Technical requirements for minor works involving alterations or small additions to the building; although not strictly maintenance, it is usual for the maintenance organization to assume full responsibility for this type of work.
- Advice on the maintenance implications of designs for proposed new buildings.

2. Organizational function: this may be in relation to the central administrative and supervisory system or to the execution system whether by direct labour or contract.
3. 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 necessary to achieve the required standards within the constraints laid down. The processes involved would include planned inspections, appraisal of user requests and assignment of priorities.
   - **Time of execution:** Programming the workload so that the carrying out of the work is timed in accordance with the needs of the user and the available labour force
   - **Quality**: Supervision of work during execution and by subsequent control inspections to detect latent defects

- **Cost**: Budgetary control system including estimating resource requirements in cost and performance terms for later comparison with actual cost and performance achieved.
- **Feedback**: This is an inherent feature of all the control functions and involves keeping such records as are necessary for the proper control of the operations.

1. Miscellaneous functions: the maintenance organization may have responsibility for other matters such as: Safety and security, principally in relation to compliance with statutory fire precautions and the maintenance of firefighting equipment, Refuse disposal, cleaning, grounds etc.



Source: Author's Construct 2013

Figure 2.3: Organization of Maintenance Department

Property owners all too frequently endeavour to keep maintenance expenditure to a minimum, ignoring or misunderstanding the adverse long-term effects of such a policy. Neglect of maintenance has accumulative results with rapidly increasing deterioration of the fabric and finishes of a building accompanied by harmful effects on the contents and

occupants (Seeley 1987). Building maintenance depends on the materials used in the construction of the building and the type of building. Buildings however, can be categorized into public and private. Public buildings are buildings owned by the state whereas private buildings are owned by individuals other than the state. In addition, buildings can be used for residential (dwelling) and non-residential (non-dwelling) purposes.

According to Cobbinah, (2010), the usage of building results in wear and tear and exposure to natural forces cause deterioration of building. Human activities responsible for the deterioration/decay of building are: failure to clean and carry out routine maintenance, ignorance of the causes of deterioration and decay, failure to promote awareness of maintenance needs by all who use the building and adopting a negative attitude of waiting until emergency measures are required,. Other factors that are responsible for the deterioration of building are presence of chemical, fire, faulty design, construction, materials and systems as well as vandalism. This deterioration can however be avoided or rectified through maintenance of the building. Maintenance (planned and unplanned) can make 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.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

The methodology of the study is presented in this chapter. It involved research design, Population, Sampling Technique and sample size. It also included data collection Techniques like questionnaires, interviews and observation.

3.2 Research Design

The study used qualitative framework. The qualitative research technique enables the researcher to study variables in their natural settings and attempting to make a sense of or interpreting the phenomena in terms of the meanings people bring into them.

The responses from the questionnaire in the form of raw data, using numbers to represent values to measure the characteristics of the respondents and their responses had been analyzed and interpreted for discussion.

Using the above technique the researcher investigated the concept of building maintenance as applied in public institutions in Ghana and challenges confronting maintenance departments of government institutions with particular reference to the following public institutions in Birim Central Municipal: Ghana Health Service(Nurses Quarters), Ghana Police Service and Akroso Senior High School.

3.3 Population

The population of the study consisted of the Households occupying the bungalows of the selected public institutions in the Birim Central Municipality:

- Ghana Police Service in Akim Oda and Akim Akroso
- Ghana Health Service Nurses Quarters in Akim Oda and Akim Akroso
- Akroso Senior High School in Akim Akroso
- Maintenance officers
- Estate Managers
- Heads of the Public Institutions
- State Housing Company
- Works Department of the Municipal Assembly

3.4 Sampling Techniques and Sample Size

This research made use of both probability and non probability sampling techniques. Probability sampling methods adopted for the study are the stratified and simple random sampling. The Stratified sampling method was used to categorize the residential accommodation into the different managerial levels and the housing types within the surveyed institutions. The housing types identified in the institutions are: single-unit/ terrace storey types as the majority for the Ghana Police Service while the nurses‘ quarters of the Ghana Health Service and Akroso Senior High School have detached and semi- detached bungalows, tenements and single- unit storey types. This assisted the researcher to determine how maintenance is undertaken at the different levels and within the different housing types in the three public institutions and how it imparts on their residential accommodation. These are low level, middle level, and top level Management. Simple random sampling technique was then used to select the sample size for the study.

In the case of the Ghana Police Service, a two-stage cluster sampling method was used to select the households. The building of the institution was put into two clusters: Akim Oda, and Akim Akroso and households randomly selected from these clusters.

The number of households by housing types in the three institutions is shown in the Tab. 3.1 below.

Table 3.1: Households according to house types

Institutions	**House Types**			**Total**
	Single –Unit/Terrace	Bungalows	Tenement	
GHS-Nurses quarters	14	6	5	25
Ghana Police Service	50	5	5	60
Akroso SHS	15	2	3	20
Total	79	13	13	105

Source: Author's Field Survey, August 2013

The total number of households which represented the sample frame is 105 as shown in Table 3.1. The sample size was made up of about 60% of the sample frame i.e 65 shown in Table 3.2 below.

Table 3.2: Sample size for institutions

Institutions	**House Types**			**Total**
	Single –Unit/Terrace	Bungalows	Tenement	
GHS-Nurses quarters	7	5	3	15
Ghana Police Service	30	3	3	36
Akroso SHS	9	2	3	14
Total	46	10	9	65

Source: Author's Construct, August 2013

3.5 Data Collection Techniques

Data was collected from the population using the following data collecting techniques or instruments: questionnaire, interview guide and observation of the buildings under study.

3.5.1 Questionnaires

Preliminary contacts with potential respondents based on information from piloting preliminary questionnaires served as a basis for questionnaires design for the different respondents. The issues raised in questionnaire reflected on the following:

- Heads of households (personnel) occupying these buildings
- Estate and Maintenance officers of the institutions
- Housing conditions and the state of maintenance of public buildings

The questionnaire for the maintenance and estate departments was to enable the researcher to assess the capacity of these departments to maintain buildings of their respective institutions and the type of maintenance activities that go on in these institutions. The issues included the age of buildings, the state of building elements (foundations, walls, floor, roofs and painting) housing facilities (water, bathroom, kitchen, toilet and electricity), the components that decay (wooden members) and the design of the buildings and its effect on maintenance.

3.5.2 Interview

Interviews were conducted to collect views from Heads of selected public institutions like Estate Managers, Personnel of State Housing Company (SHC) and Public Works Department and Maintenance officers of the institutions.

The issues reflected on maintenance policy, charges for occupancy of the buildings, types of maintenance arrangements put in place, those responsible for the maintenance of residential buildings and the responsibilities or roles of the occupants towards the maintenance of the buildings. Other issues involved maintenance funding , the role of SH/PWD in the provision of residential building or infrastructure for public institutions in Ghana, PWD's annual maintenance plan for public buildings as well as estimates for unscheduled repair and maintenance work orders. Finally, whether, PWD follows a quality assurance programme that includes the use of maintenance standards, monitoring, inspecting and evaluating completed works and developing corrective action plans.

3.5.3 Observation

The researcher undertook field observation of buildings in the following public institutions in the Birim Central Municipality:

- Ghana Health Service Nurses Quarters at Akim Oda
- Ghana Health Service Nurses Quarters at Akim Akroso
- Ghana Police Service Bungalows at Akim Oda
- Ghana Police Service Bungalows at Akim Akroso
- Akroso Senior High School at Akim Akroso

During the visit the researcher observed the following: The nature and conditions of the floors, walls, foundations and louvers. Others also included windows and doors, electrical wires and electrical fittings, sewerage and drains, damaged ceiling and roofs, concrete gutters and functional water storage reservoir.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and discussions of the data collected from questionnaire, interviews and observations.

4.2 Results from Questionnaires

This section discusses the results of the questionnaire from the heads of households

4.2.1 Results of Questionnaire from Heads of Households

- **Types of Houses Occupied by Personnel (Households)**

Personnel of the surveyed public institutions reside in three main house types, namely; bungalows (detached and semi-detached), tenement (block of flats), and one storey single unit (terrace). Table 4.1 and Fig 4.1 summarized the type of houses being occupied by personnel of the three institutions in surveyed area.

Table 4.1: Types of Bungalows of Public Institutions Surveyed

Institutions	Bungalows		Tenements		Single unit		Total	
	No	%	No	%	No	%	No	%
GHS	5	35.7	3	21.4	6	42.9	14	100.0
GPS	3	9.3	3	9.3	26	81.3	32	100.0
AKROSO SHS	2	14.3	3	21.4	9	64.3	14	100.0
Total	10	16.7	9	15.0	41	68.3	60	100.0

Source: Author's Field Survey, August, 2013

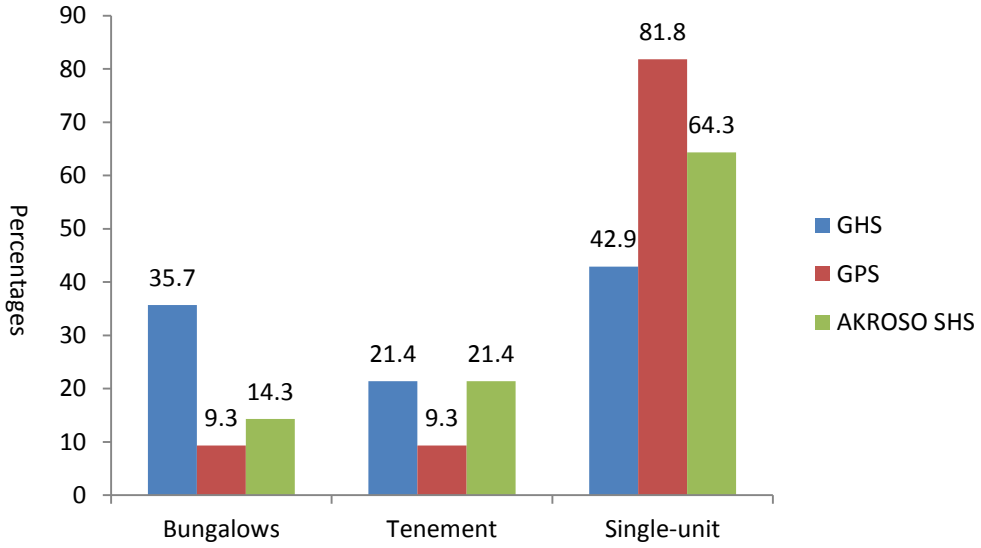


Figure 4.1: Type of Houses

❖ **Average Number of people occupying a building/room by house types**

Personnel of the surveyed public institutions have on the average, four, six and eight people occupying Bungalows, Tenements and Single Unit/terrace houses per house respectively as shown in Fig 4.2 below. The number of people occupying or living in a house is also seen to have a bearing on the maintenance conditions. Generally, the higher the number of people in a house, the more there is pressure on the use of facilities which are in common use such as water, bathrooms, toilet, and kitchen facilities. From the survey, it came out maintenance seems to suffer especially with single unit houses where the facilities are shared between two housing units.

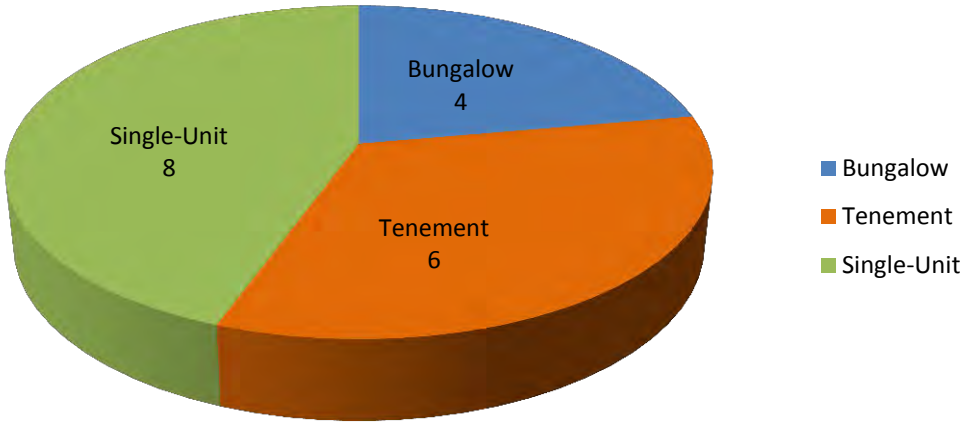


Figure 4.2 Average Number People per house by House Types

- **Rent Payment By Occupants of the Government Bungalows**

The personnel occupying the bungalows in GHS and GPS pay rent while those in Akroso SHS do not pay any rent at all. The rent payment ranges from GH₵14.00 to GH₵24.00 per month with single unit occupants paying the least rent while the bungalow occupants pay the highest rent.

- **Present Conditions of Building Elements**

This section examines the current general maintenance situation of the government bungalows of the three public institutions in the Birim Central Municipality in relation to the building elements. A building is made of several elements with each performing specific functions. The effective functioning of these elements determines the condition of a building. All the elements have well defined and distinct functions irrespective of the design of the building, its specifications and construction. The

maintenance condition of the buildings was observed by assessing the following elements: the foundation (substructure), the roof, the floor, the wall, painting, and wooden members (windows and doors).

- **Foundation of the buildings**

  The table 4.2 and figure4.3 revealed the result of foundation of the of the buildings

Table 4.2: Condition of Foundation by Institution and House Type

Institution	Develops Cracks		Exposed / Hanging		No Defect		Total	
	No	%	No	%	No	%	No	%
GHS	10	71.4	0	0.0	4	28.6	14	100.0
GPS	12	37.6	10	31.2	10	31.2	32	100.0
Akroso SHS	7	50.0	1	7.1	6	42.9	14	100.0
Total	29	48.3	11	18.3	20	33.4	60	100.0
			House Type					
Bungalows	1	10.0	1	10.0	8	80.0	10	100.0
Tenements	2	22.2	1	11.1	6	66.7	8	100.0
Single - Units	26	63.4	5	12.2	10	24.4	41	100.0
Total	29	48.3	7	11.7	24	40.0	60	100.0

Source: Author's Field Survey, August 2013

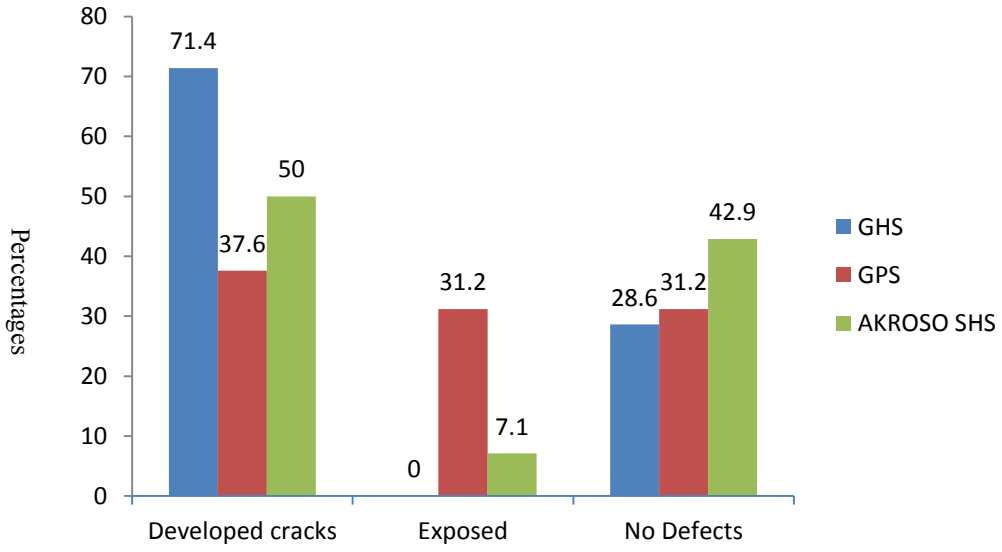


Figure 4.3: Conditions of foundation elements

Table 4.2 reveals that about 48 % of all bungalows surveyed had problems with their foundation. The survey however revealed in Tab 4.2 and Fig 4.3 above that about 71 %, 38 % and 50 % of buildings of the GHS, GPS and Akroso SHS respectively surveyed have developed cracks, GHS has no problem, but GPS and Akroso SHS have respectively 31 %, and 7 % of their foundation exposed or hanging.

From Table 4.2, a look at the house type revealed that single unit houses have the greatest defect in their foundation, with 63.4 % and 12.2 % of their foundation having developed cracks and being exposed respectively .It was observed that the problem of exposed foundation is as a result of intensive erosion resulting from heavy and torrential rainfall experienced in this part of the country. Again most of the surroundings of the building have no vegetation cover to reduce the rate of erosion

❖ **Roofing Element of the Building**

The result of the roofing elements of the building is indicated in Table 4.3 and figure 4.4 below.

Table 4.3: Conditions of Roofing Elements by Institution and House Type

Institution	Leaking		Rusty		Partly Ripped off		No Defects		Total	
	No	%	No	%	No	%	No	%	No	%
GHS	7	50	2	14.3	0	0.0	5	36.7	14	100.0
GPS	20	62.5	6	18.7	2	6.3	4	12.5	32	100.0
AKROSO SHS	8	57.1	1	7.1	0	0.0	5	35.8	14	100.0
Total	35	58.4	9	15	2	3.3	14	23.3	60	100.0
					House Type					
Bungalows	3	30.0	1	10.0	1	10.0	5	50.0	10	100.0
Tenements	5	55.0	1	11,1	0	0.0	3	33.3	9	100.0
Single - Units	32	78.0	5	12.2	0	0.0	4	9.8	41	100.0
Total	40	66.7	7	11.7	1	1.7	12	20.0	60	100.0

Source: Author's Field Survey, August, 2013

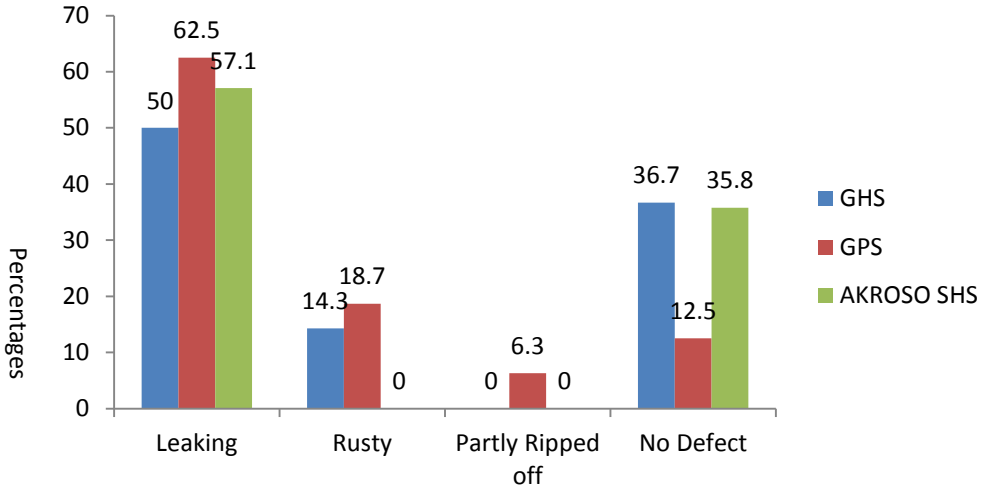


Figure 4.4: Conditions of roofing elements

From the data in table 4.3 and Fig. 4.4, about 77 % of all buildings surveyed had problems with their roofs. It was shown that, about 58 % of all the houses had their roofs leaking. The problem of roof leakage was more pronounced in buildings of GPS where about 63 % of buildings surveyed had leaking roofs. About 19 % of the houses of GPS had rusty roof because about 70 % of buildings of this institution was roofed with iron sheet.

A look at the house type indicated that roofing problem was more pronounced in the single units, with about 78 % and 12 % of roofs of all bungalows surveyed leaking and rusty respectively. In the case of bungalows about 50 % of respondents had problems with their roof, while about 67 % of all tenement houses surveyed had problems with their roof.

❖ Flooring Elements of the Buildings

Table 4.4 and figure 4.5 displayed the results of the flooring elements of the buildings.

Table 4.4: State of Flooring Elements and House Type

Institution	Develops Cracks		Peeled-off		No Defect		Total	
	No	%	No	%	No	%	No	%
GHS	7	50.0	2	14.3	5	35.7	14	100.0
GPS	14	43.8	2	6.2	16	50.0	32	100.0
Akroso SHS	7	50.0	1	7.1	6	42.9	14	100.0
Total	28	46.7	5	8.3	27	45.0	60	100.0
				House Type				
Bungalows	5	50.0	0	0.0	5	50.0	10	100.0
Tenements	2	22.2	2	22.2	5	55.6	9	100.0
Single - Units	12	29.3	7	17.1	22	53.6	41	100.0
Total	19	31.7	9	15.0	32	53.3	60	100.0

Source: Author's Field Survey, August, 2013

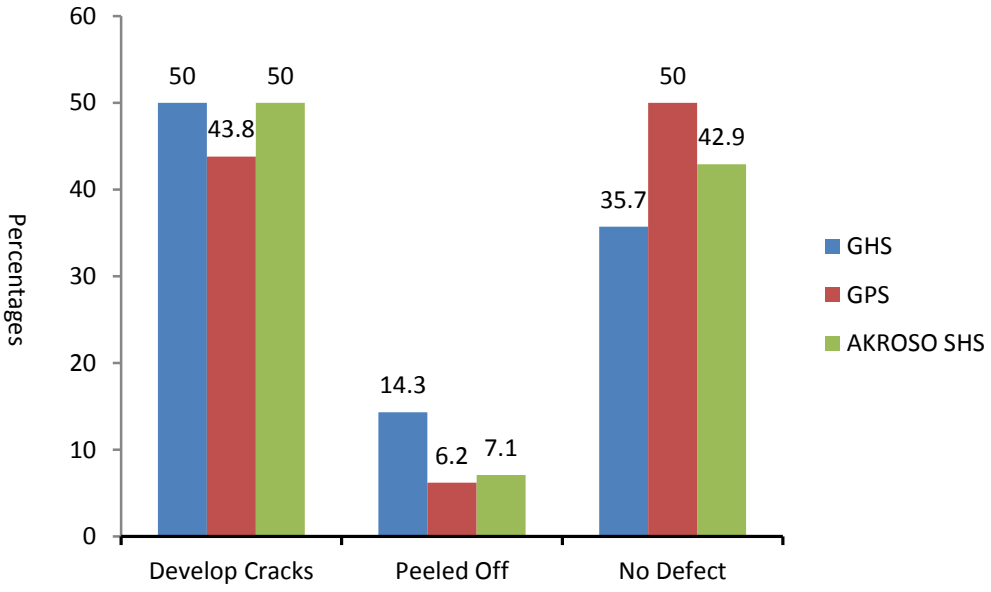


Figure 4.5: Conditions of flooring elements

Majority of the buildings surveyed had problems with their floor. Only 45 % of the houses surveyed had their floors in good condition. The situation from the data in Table 4.4 revealed that about 56 % of all tenements surveyed had their floors in good condition. The situation was however bad in the case of bungalows where only 50 % of

surveyed bungalows had their floors in good condition. In addition to the floors developing cracks and peeling off, there were sections of some floor exhibiting indentation and others dusty due to the peeling off with respect to the concrete floor.

❖ Wall Elements of the Buildings

The wall elements of the buildings are shown in Tab 4.5 and Figure 4.6 below.

Table 4.5: Maintenance Conditions of Wall by Institution and House Type

Institution	Develop cracks		Peeled -Off		Tilted		No Defect		Total	
	No	%	No	%	No	%	No	%	No	%
GHS	5	35.7	3	21.4	0	0.0	6	42.9	14	100.0
GPS	26	81.2	2	6.3	0	0.0	4	12.5	32	100.0
Akroso SHS	7	50.0	3	21.4	0	0.0	4	28.6	14	100.0
Total	38	63.3	8	13.3	o	0.0	14	23.3	60	100.0
				House Type						
Bungalows	2	20.0	1	10.0	1	10.0	6	60.0	10	100.0
Tenements	4	44.4	2	22.2	0	0.0	3	21.4	9	100.0
Single - Units	30	73.2	7	17.1	0	0.0	4	9.7	41	100.0
Total	36	60.0	10	16.7	1	1.7	13	21.6	60	100.0

Source: Author's Field Survey, August, 2013

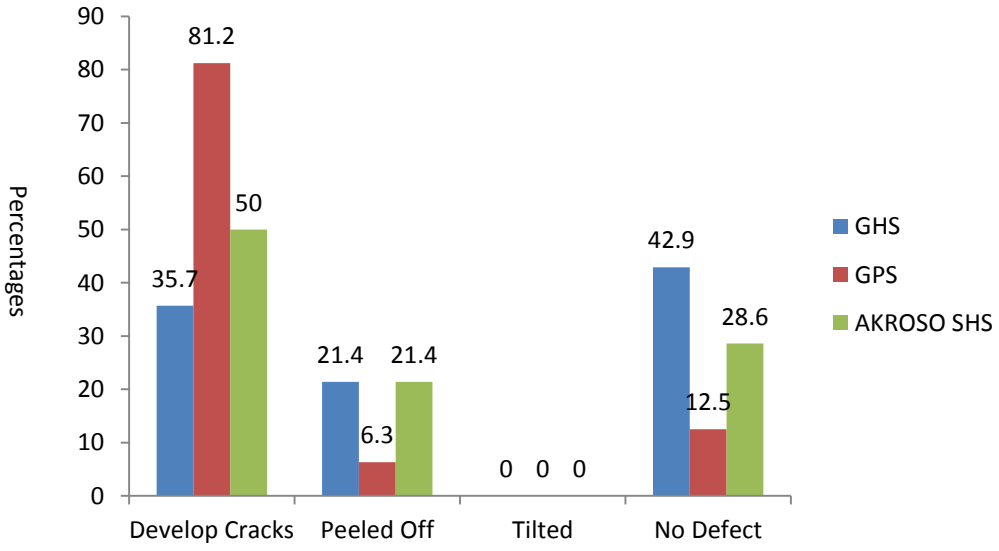


Figure 4.6: Maintenance Conditions of Walls

The survey indicated that the commonest problem with the wall is the development of cracks. From Table 4.5, 63.3 % and 13.3 % of the walls of all public buildings surveyed have either developed cracks or peeled off respectively. According to the surveyed institutions, GPS had the development of cracks of the wall as the most pronounced problem accounting for 81.2 % (Fig. 4.6) of the walling problem. However, none of the institutions had problem in terms of tilted walls.

The survey according to house type from Table 4.6 depicts that single unit houses have about 74 % of their walls developing cracks. Whereas all bungalows surveyed had 40 % of their walls with problems, the single-unit houses had as high as 90 % of their walls defective. The situation is similar to that of the tenements where 67 % of their walls were defective and needed maintenance. This shows that there is low maintenance awareness and maintenance practice among occupants in these two types of bungalows.

❖ Painting of the Buildings

Table 4.6 and figure 4.7 showed the data in terms of painting by institution and house type.

Table 4.6: Condition of Building with respect to Painting

Institution	No Painting		Faded Paint		Dirty Painting		Well Painted		Total	
	No	%	No	%	No	%	No	%	No	%
GHS	0	0.0	6	42.9	3	21.4	5	35.7	14	100.0
GPS	0	0.0	20	62.4	6	18.8	6	18.8	32	100.0
Akroso SHS	0	0.0	7	50.0	3	21.4	4	28.6	14	100.0
Total	0	0.0	33	55.0	12	20.0	15	25.0	60	100.0
				House Type						
Bungalows	1	10.0	4	40.0	1	10.0	4	40.0	10	100.0
Tenements	0	0.0	5	55.6	2	22.2	2	22.2	9	100.0
Single - Units	0	0.0	22	53.7	9	21.9	10	24.4	41	100.0
Total	1	1.7	31	51.7	12	20.0	16	26.6	60	100.0

Source: Author's Field Survey, August, 2013

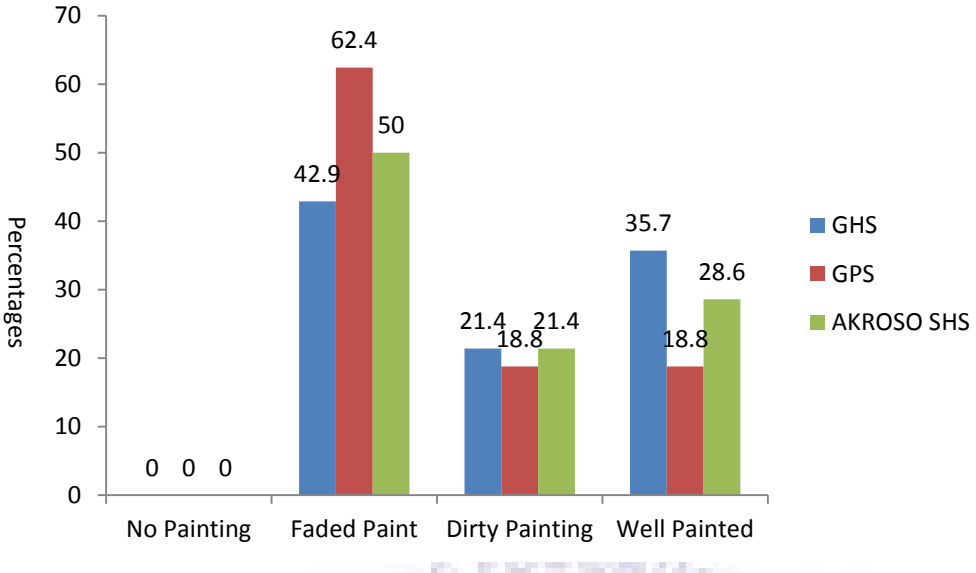


Figure 4.7: Conditions of painting

From Table 4.6, about 25 % of all buildings surveyed were well painted. However about 75 % had various forms of painting-related problems as follows: 55 % had their paint faded and 20 % has dirty painting. The survey results by institutions indicated that all the buildings of the GHS, GPS and Akroso SHS have ever been painted. From Tab 4.6 and Fig 4.7 above, relatively the GHS had the highest well painted number of buildings 35.7 %, while the GPS had the highest number of faded paint buildings 62.3 %. On the other hand, 21.4 %, 18.8 % and 21.4 % of buildings of GHS, GPS and Akroso SHS respectively surveyed had dirty paint.

From Table 4.6, about 24 % of single unit houses are well painted, with 76 % having painting – related problem. The survey also indicated that about 60 % and 78 % of all bungalows and tenements surveyed respectively have painting-related problems..

❖ Maintenance Condition of Windows and Doors (Wooden Members)

Table 4.7 and Fig 4.8 below displayed data on the general maintenance condition of windows and doors with respect to institution and house type.

Table 4.7: State of Windows and Doors by Institution and House Type

Institution	Partly Broken down		Completely Broken down		No Defect		Total	
	No	%	No	%	No	%	No	%
GHS	7	50.0	1	7.1	6	42.9	14	100.0
GPS	26	81.3	0	0.0	6	18.7	32	100.0
Akroso SHS	2	14.2	3	21.4	9	64.3	14	100.0
Total	35	58.3	4	6.7	21	35.6	60	100.0
				House Type				
Bungalows	5	50.0	0	0.0	5	50.0	10	100.0
Tenements	4	44.4	0	0.0	5	56.6	8	100.0
Single - Units	33	80.5	3	7.3	5	12.2	41	100.0
Total	42	70.0	3	5.0	15	25.0	60	100.0

Source: Author's Field Survey, August, 2014

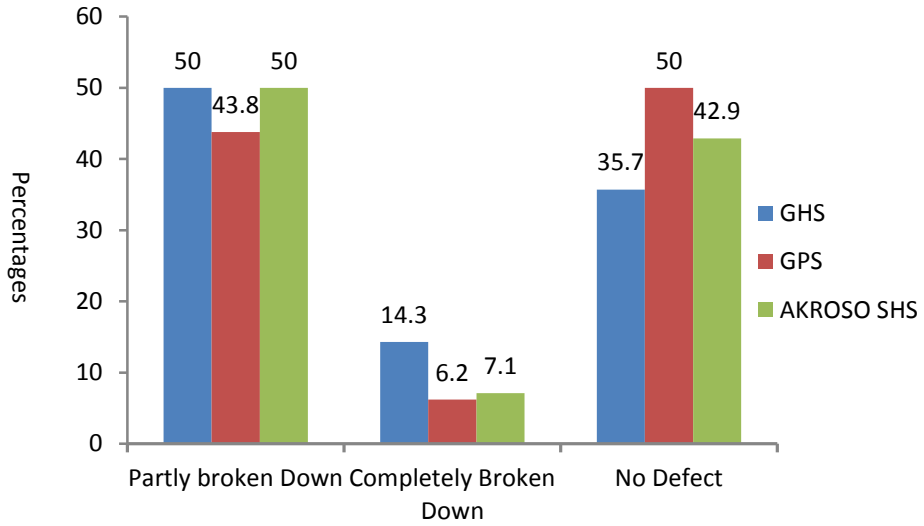


Figure 4.8 Conditions of windows and doors

From Table 4.7, about 65 % of buildings surveyed had defective wooden members. The survey also indicated that Akroso SHS had the least defective wooden members of 36 %. That of the GPS and GHS were 81.3 % and 57.1 % respectively. Assessing the situation by house type indicates that about 88% and 50% of all singe-unit and bungalows surveyed respectively have defective wooden members. The partly broken wooden members had some doors with their hinges defective as well as part of the door especially the bathroom doors rotten due to lack of coating or painting to prevent the doors from absorbing water. The major problem with the windows was broken louver blades which impacts negatively on day and night room temperatures and indoor air quality.

The Present Condition of the Buildings

- **The Availability of Domestic Facilities and Services in Public Buildings.**

Domestic facilities and services in the building namely toilet, kitchen, water, electricity and bath among others are basic and necessary requirement to make the building habitable and ensure the comfort and safety of occupants. They form an integral part of housing design and construction and are therefore required to be incorporated in the design of buildings before approval will be given by city authorities upon application. These facilities have been described as being in good condition, fairly good condition and bad condition. Facilities described as being in good condition are those that are well maintained and operational in most of the times. Those that have served many years of useful life and are fairly maintained but have some problems with its functionality, and yet operational are described as being in a fairly good condition while facilities that are

not well maintained and are either not operational or operational for limited periods of time due to maintenance problems are said to be in bad condition. The study therefore sought to assess the conditions of these facilities in government bungalows of Ghana Health Service Nurses quarters, Ghana Police Service and Akroso Senior High School.

- **Condition of Domestic Facilities and Services**

All the institutions surveyed had the full complement of the following domestic facilities and services: toilet, kitchen, water, electricity and bathroom. The single unit buildings (terrace) however, have their toilet, kitchen, water and bath separated from the main buildings. In addition each of these domestic facilities and services are shared by two households or housing units. Pipe borne water is the main source of water supply to the households and the toilet facility used was water closet.

Table 4.8 below shows the details of the condition of this domestic facilities and services in the various surveyed institutions, while Table 4.9 also details the results of the survey of the conditions of the domestic facilities by house types.

Table 4.8: State of Domestic Facilities and Services by Institution

Institution	Good		Fairly Good		Bad		Total	
	No	%	No	%	No	%	No	%
Water								
GHS	5	35.7	2	14.3	7	50.0	14	100.0
GPS	10	31.2	6	18.3	16	50.0	32	100.0
Akroso SHS	10	71.4	4	28.6	0	0.0	14	100.0
Total	25	41.7	12	20.0	23	38.3	60	100.0
Bathroom								
GHS	5	35.7	7	50.0	2	14.3	14	100.0
GPS	0	0.0	12	38.0	20	62.0	32	100.0
Akroso SHS	8	57.1	6	42.9	0	0.0	14	100.0
Total	13	21.7	25	41.7	22	36.6	60	100.0
Toilet								
GHS	5	35.7	7	50.0	2	14.3	14	100.0
GPS	0	0.0	8	25.0	24	75.0	32	100.0
Akroso SHS	8	57.1	5	35.7	1	7,2	14	100.0
Total	13	21.7	20	33.3	27	45.0	60	100.0
Kitchen								
GHS	5	35.7.4	4	28.6	5	36.7	14	100.0
GPS	0	0.0	20	63.0	12	37.0	32	100.0
Akroso SHS	3	21.4	4	28.6	7	50.0	14	100.0
Total	8	13.3	28	46.7	24	40.0	60	100.0
Electricity								
GHS	4	28.5	6	57.1	2	14.3	14	100.0
GPS	4	12.5	20	62.5	8	25.0	32	100.0
Akroso SHS	4	28.6	6	42.8	4	28.6	14	100.0
Total	12	20.0	34	56.7	14	23.3	60	100.0

Source: Author's Field Survey, August, 2013

Table 4.9: State of Domestic Facilities and Services by House Types

House Types	Good		Fairly Good		Bad		Total	
	No	%	No	%	No	%	No	%
Water								
Bungalows	4	40.0	2	20.0	4	40.0	10	100.0
Tenements	5	55.6	2	22.2	2	22.2	9	100.0
Single-units	28	68.3	7	17.1	6	14.6	41	100.0
Total	37	61.7	11	18.3	12	20	60	100.0
Bathroom								
Bungalows	4	40.0	3	30.0	3	30.0	10	100.0
Tenements	4	44.4	3	33.3	2	22.3	9	100.0
Single-units	7	17.0	17	41.5	17	41.5	41	100.0
Total	15	25.0	23	38.3	22	36.7	60	100.0
Toilet								
Bungalows	5	50.0	4	40.0	1	10.0	10	100.0
Tenements	3	33.3	4	44.4	2	22.3	9	100.0
Single-units	6	14.6	11	26.8	24	58.6	41	100.0
Total	14	23.3	19	31.7	27	45.0	60	100.0
Kitchen								
Bungalows	3	30.0	7	70.0	0	0.0	10	100.0
Tenements	3	33.3	4	44.4	2	22.3	9	100.0
Single-units	1	2.4	28	68.3	12	29.3	41	100.0
Total	7	11.7	39	65.0	14	23.7	60	100.0
Electricity								
Bungalows	4	40.0	6	60.0	0	0.0	10	100.0
Tenements	2	22.2	7	77.8	0	0.0	9	100.0
Single-units	5	12.2	30	73.2	6	14.6	41	100.0
Total	11	18.3	43	71.7	6	10.0	60	100.0

Source: Author's Field Survey, August, 2013

The condition of water, bathroom, toilet, kitchen, and electricity shown by table 4.8 depicts that 41.7 %, 20.0 % and 38.3 % of the water facility among households of public institutions surveyed were in good, fairly good and bad condition respectively. This means that about 58.3 % of the water facility of the public buildings surveyed have problem of maintenance.

The survey results of Table 4.9 indicate that about 60 %, 44 % and 32 % of bungalows, tenements (flats) and single unit buildings surveyed had their water facility in fairly good and bad condition respectively.

The condition of the facility has been associated with the following problems according to the various institutions. Akroso SHS has its water facility broken down and as such water has not flowed through the taps for the past 4 months especially for the single units residence located off - campus. In the case of the GPS and GHS, there is irregular flow of water and frequent breakdown of the taps especially with the single unit building of the GPS where pressure on the facility is high due to the large number of users.

From Table 4.8 about 22 %, 42 % and 37 % of respondents surveyed indicated that the facility was in good, fairly good and bad condition respectively. Therefore about 79 % of bungalows surveyed have problem of maintenance.

However a look at the facility according to institutions revealed that 35.7 %, 50.0 % and 14.3 % of buildings surveyed in the GHS have their bathroom in good, fairly good and bad condition respectively. While in the case of the GPS this was represented by 0.0 %, 38.0 % and 62.0 % respectively. Akroso SHS on the other hand had 57.1 % of its bathrooms being in good condition, with 42.9 % in fairly good condition.

A look at the condition of the bathroom facility according to house type from table 4.3 indicated that 30.0 % of bungalows, 22.3 % of tenements, and 41.5 % of single unit houses have their facility in a bad condition. While 40.0 % and 30.0 % of the bungalows, 44.4 % and 33.3 % of the tenement and 17.0 % and 41.5 % of the single unit houses were good and fairly good respectively. This shows that about 60 %, 56 % and 83 % of bungalows, tenements and single unit houses surveyed respectively need to be maintained to put them in a good condition.

The major maintenance problems with the bathrooms are: presence of cracks on the floor and wall, peeling off of the plastered walls, slippery floors and too many users particularly in the case of single unit houses.

The study revealed that the toilet facility used in all building types is the water closet. From Table 4.8 about 22 % of the toilet facility is in good condition, while 33 % and45 % are in fairly good and bad condition respectively. The state of the toilet facility in the GHS shows that about 64 % of households surveyed had their facility in fairly good and bad condition. The situation with GPS was worse, with 75 % of respondents having their facility in bad condition. This is in sharp contrast with the situation in Akroso SHS; about 57 % of the facility surveyed was in good condition

The state of the condition of the toilet facility for the three institutions emanates from the problem of leakages from the sewerage system, thus emitting very bad odour and cracks in the water closet due to the age of this facility and large number of users particularly with the single unit buildings. According to the residents the water closet has been in existence for decades dating back to the 1960s when the building was put up.

It can be observed from Table 4.9, that the condition of the toilet facility according to house type for the public institutions revealed that in the case of the bungalows 50.0 %, 40.0 % and 10.0 % of the households surveyed had the facility in good, fairly good and bad respectively, while in the case of tenements about 78 % of the facility was in good and fairly good condition and only 22 % in bad condition. However, the situation in the single unit houses showed a relatively greater number of respondents‘ that‘s about 59 % described it as being in bad condition.

The kitchen facility was analyzed by looking at the size of the kitchen, the nature of ventilation, and the number of users as well as its location in the building. The bungalows and tenements of the GHS, GPS and the Akroso SHS have their kitchens located within it, well ventilated and spacious and used by one occupant. The situation is different when it comes to the single unit houses of the Akroso SHS and the GPS, where the facility is located behind the building, poorly ventilated, small in size and shared by two households. The pressure on the kitchen facility for the single houses has resulted in deterioration of the floor, the wall, window, door and the electrical gadgets such as sockets, switches and plugs. This has been compounded by lack of maintenance of this facility.

Table 4.8 depicts that, about 13 %, 47 % and 40 % of kitchens in bungalows surveyed are in good, fairly good and bad condition respectively an indication that about 87 % of them needs maintenance works. 35.7 %, 28.6 % and 35.7 % of respondents from the GHS had their kitchen facility in good, fairly good and bad conditions respectively. The situation in Akroso SHS and GPS revealed that only about 21 % in Akroso SHS and none in GPS are in good condition. Considering house types, none of the bungalows had their kitchen in bad condition, but about 22% and 30 %s of the kitchens in the tenement and single unit houses respectively were in bad condition.

Electricity was available in all buildings surveyed. The electrical facilities in the buildings were also analyzed to establish the functionality of the entire wiring system of the building, the state of the fixtures (sockets, switches), fans/air-conditions if available and provided by the institution. Respondents complained of frequent power cuts due to

the wiring system which they intimated has not been changed since the building was put up. The fans and fluorescent fittings are faulty, rusty and non- functioning.

About 20 % of the respondents described electricity facility as being in good condition, while about 57 % and 23 % responded that the facility was fairly good and bad respectively. However, 28.6 %, 57.1 % and 14.3 % of respondents from the GHS nurses quarters indicated that the electrical facility was good, fairly good and bad respectively. The situation for GPS was 12.5 %, 62.5 % and 25.0 % respectively, with 28.6 % of surveyed buildings in Akroso SHS describing the electricity as good, 42.8 % as fairly good and 28.6 % as bad.

The survey results in table 4.3 indicate that, about 60 %, 78 % and 88 % of all bungalows, tenements and single unit houses respectively surveyed had problems with their electricity facility and therefore needed urgent maintenance to protect the building and property of occupants.

- **General Maintenance Condition of Buildings by Institution and House Type**

Having assessed the maintenance condition of some facilities in the buildings as well as individual elements, a general assessment of the buildings surveyed was carried out in order to establish an overall picture of the maintenance conditions of houses of public institutions in the Birim Central municipality. The buildings were classified into good, fair and bad. Houses were classified as being in good condition if, components are structurally sound with no defects (no cracks, peel-off, tilted, broken down, leakages etc.) and require only general maintenance and minor repair; little or no deferred maintenance

exists. Few building systems fail, and they allow uninterrupted daily use of the facilities .e.g. water, toilet, bathroom, electricity, kitchen etc.

Those in fair condition had the following characteristics:

Components show signs of slight deterioration and require some corrective maintenance and major repairs; some deferred maintenance exists. Building systems fail occasionally, causing some interruptions in daily use of the facilities.

Those in bad condition had the following characteristics:

Components show signs of severe deterioration and require corrective maintenance and emergency repairs; deferred maintenance is extensive. Building systems fail frequently, causing ongoing interruptions in daily use of facilities.

The survey results of the general maintenance condition of buildings by institutions and house types are presented in Tab 4.10 and Fig 4.9

Table 4.10: General Maintenance Condition of Bungalows

Institution	**Good**		**Fairly Good**		**Bad**		**Total**	
	No	%	No	%	No	%	No	%
GHS	2	14.3	5	35.7	7	50.0	14	100.0
GPS	0	0.0	22	68.7	10	31.3	32	100.0
Akroso SHS	2	14.3	9	64.3	3	21.4	14	100.0
Total	4	6.7	36	60.0	20	33.3	60	100.0
			House Type					
Bungalows	4	40.0	6	60.0	0	0.0	10	100.0
Tenements	1	11.1	6	66.7	2	14.2	8	100.0
Single - Units	1	2.4	27	65.9	13	31.7	41	100.0
Total	6	10.0	39	65.0	15	25.0	60	100.0

Source: Author's Field Survey, August 2014

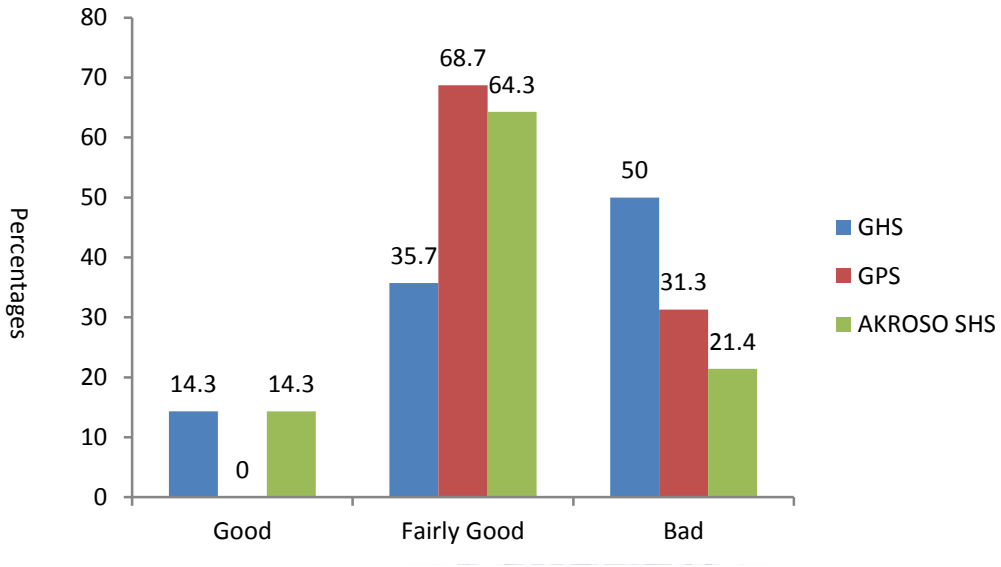


Figure 4.9: General Maintenance conditions of Bungalows

The survey revealed that, only 6.7 % of all buildings of public institutions surveyed are in good condition and well maintained, 60.0 % are in fairly good condition while 33.3 % are in a bad state due to poor maintenance. Institutional wise, Akroso SHS had a good maintenance practice compared to the GHS and GPS since only about 21 % of its building was in bad condition. The GHS was worse in terms of maintenance with about 50 % of its buildings in bad condition. The institution with the most well maintained building was the Akroso SHS, 14.3 %.

An assessment of the maintenance conditions of the various house types revealed that bungalows are well maintained 40.0 % compared to tenements 11.1 % and single-unit houses 2.4 %. Maintenance was very poor among single-unit houses with 31.7 % of them in bad condition. While 14.2 % of tenements are in a bad state, none of bungalows are in bad condition. However, in terms of maintenance needs 81 % of all tenements and 98 % of single-unit buildings respectively need some form of maintenance to bring them into a good condition.

In sum, the assessment of maintenance conditions of the government bungalows of public institutions surveyed has revealed that the houses are not well maintained. The most poorly maintained elements of the building are the foundations (33.4 %), floor (45.0 %), wall (23.3 %), painting (25.0 %) and wooden members (35.0 %) where only the attached percentages were well maintained and in good condition. Major defects identified on the buildings include the following: cracked and exposed foundation, rusty and leaking roof, cracked wall, peel-off and dusty floors, faded and dirty painting of buildings, broken down windows and doors, torn mosquito net, broken louver blades, damaged door locks, missing keys, missing hinges, as well as loose screws and bolts on doors.

- **Causes of Maintenance Problems in Government Bungalows**

Since independence, Governments have put up bungalows for use by public institutions. Some of these properties even date back to the colonial administration. Public institutions are therefore expected to have the natural tendency to protect, preserve and maintain these properties. This is however not the case as revealed by this study. Respondents listed five factors as having combined to create the maintenance problems in public institutions:

a. The age of the buildings,
b. Lack of maintenance culture,
c. Inadequate funds and high maintenance cost,
d. Pressure on building facilities by number of users and

e. Poor construction work and maintenance work done by maintenance personnel of the institution.

- **Age of the buildings**

From the survey, only 22.2 % of bungalows of the GPS are below 20 years. All the other house types of tenement and single-units are over 50 years, indicating that approximately 97 % of all GPS buildings are over 50 years. The Akroso SHS has 100 % of bungalows and tenement respectively surveyed below 20years, while all its single-unit buildings are above 25 years. While the ages of all buildings of the GHS nurses quarters surveyed are between 6 years and 55 years.

Houses deteriorate with age, since the lifespan of most buildings are constructed to last at least sixty (60) years, but may exceed this period if the building is well maintained over time. Above 60 years most houses exhibit serious maintenance problems which will demand at least major renovation, rehabilitation, replacement or repair. The present state of the bungalows in fair and bad state surveyed has been attributed to the age of the buildings since they are over 50 years.

- **Lack of Maintenance Culture**

Respondents pointed out that the institutions after having acquired these properties, authorities or management do not show much eagerness towards the maintenance of them. According to them, Estate and Maintenance Managers do not undertake regular inspection of the bungalows to ascertain its condition neither do they undertake routine and periodic maintenance on the buildings. Respondents from the GHS

and GPS indicated that even though they pay rent as a company policy for the building they occupy, external maintenance work which are to be carried out by the institution is either not done or takes a long time for reported complains to be attended to thus creating a lot of inconvenience and safety problems for occupants. In the case of the GPS, external maintenance must be carried out even though personnel of ranks below Assistant Superintendent of Police do not pay rent. Expressing their views on lack of maintenance culture by the institutions, 6.4 % of the respondents from GHS had this to say; ―all that they do about our buildings is to bring in labourers to weed around the compound at regular intervals to the neglect of the building ‗proper'.

In situations when maintenance request are put in by occupants according to the policy of the institutions, 51.9 % of respondents responded that their request had not received any attention over 2 years after submitting them. However, 24.5 %, 14.2 % and 13.8 % responded that maintenance request takes between 1-3months, 6-12months and over 12months to receive attention. Ironically, maintenance request are prompt in the case of occupants of bungalows and tenement house types as against those of the single-unit occupants. In short, negligence on the part of public officers in maintaining buildings all point to the fact that maintenance culture is very poor.

- **Inadequate Funds and High Maintenance Cost**

Personnel occupying public buildings have contributed to the deterioration of the buildings citing lack or inadequate funds and high maintenance cost resulting from high cost of building materials as the main reason. Discussions with respondents in single-unit houses where poor maintenance has resulted in deterioration of facilities and elements of the buildings revealed that poor condition of service in terms of low salaries is the major

cause of their inability to play their role in the maintenance of the building. There was however people living in poorly maintained building with respect to bungalows and tenement whose income defies this logic.

In addition to low remuneration, the survey also revealed that occupants' inability to maintain their buildings is being attributed to high cost of maintenance in respect of cost of materials such as cement, wood, paint, nails etc and labour. As a result of this, respondents felt reluctant to sacrifice or increase spending towards the proper maintenance of their building which at the end of the day creates a lot of problems for the occupants in terms of their comfort and safety. Moreover, what is less considered is that maintenance problems become more expensive when not attended to in time.

In spite of the above, respondents maintained that they contribute substantially to the external maintenance of the building else the maintenance situation would have been different. 41.8 % of the respondents indicated that they spend less than GH¢ 100.00 annually on maintenance of their building. Those who spend GH¢101.00 – 200.00 and GH¢ 201.00 – 300.00 are 9.4 % and 16.8 % respectively. According to 31.2 % of the respondents they cannot cost the amount they spend on maintenance of their building, while 9.1 % revealed that they do not spend on the external maintenance of the building since it is the responsibility of the institution which allocated them the building to do that.

- **Pressure on building facilities by number of users**

The number of people occupying or living in a house is also seen to have a bearing on the maintenance conditions. Generally, the higher the number of people in a house, the more there is pressure on the use of facilities which are in common use such as

water, bathrooms, toilet, and kitchen facilities. From the survey, it came out maintenance seems to suffer especially with single unit houses where the above facilities are shared between two housing units. In some cases the large number of occupants living in this house type breeds apathy and competition which all go to affect maintenance practice.

4.2.2 Results of Questionnaire from Maintenance Officers of Institutions

This section discusses the questionnaire from maintenance officers of the surveyed institutions.

- **Maintenance Policy and Practices of Public Institutions**

Ghana at present has no National Maintenance Policy to regulate or control preventive maintenance of buildings of public institutions. However, the survey revealed that the Estate and Workshop departments of the institutions in consultation with the Building Management Committee (BMC) have developed maintenance policy to ensure that there is regular maintenance of buildings allocated to personnel. The maintenance policy of the institutions does not however take care of preventive maintenance which is a regularly scheduled inspection, testing, and repair of building components intended to prolong a building‘s life and restore components‘ efficiency.

The institutions adopt a centralized approach in handling preventive maintenance. This responsibility for building maintenance rests largely with one office i.e. the Estate and Maintenance office that oversees maintenance for most or all buildings owned by the institution.

The institutions are responsible for the external maintenance of the buildings including: painting, replacement of wooden members and net, roof, electricity, sewerage,

and plumbing. Occupants on the other hand are responsible for the internal maintenance of the building such as:

i. Replacement of all burnt-out bulbs, lost keys or locks and broken louver blades.

ii. Keeping service or institutional properties and the surrounding thereof in good sanitary condition, by weeding around and disposing off refuse regularly to avoid any nuisance.

iii. Fumigation of the internal portions of dwelling units to get rid of ants, mosquitoes, cockroaches, flies etc.

iv. Occupants not causing or permitting anything to be done to their dwelling units which will alter the external walls or allow any renovation to be done to any part of the premises without the written consent of the institution.

- **Mode of Access to the Building and its Maintenance**

The buildings are allocated to the personnel by the Estate Officer in consultation with the accommodation committee. The Estate department is to ensure that an inventory of the building is taken and signed by both the officer and the would-be occupant. Similarly this procedure must be followed before occupant vacates the building. The study revealed on the contrary that occupants take occupancy of the building without signing any inventory form. This has arisen largely because of the urgency with which personnel move in to take over the building on retirement or transfer of previous occupant without recourse to the laid down rules. In the case of the GPS respondents claimed they take over the accommodation of their relievers after service vehicle have brought them in without necessarily consulting the Estate Department. This development makes it difficult for the

institutions to surcharge occupants who refuse to undertake internal maintenance of their building for the period of their occupancy.

All defects arising out of wear and tear are to be reported to the Estate Department which is responsible for making good such defects. The study revealed that the Estate Department does not plan building inspection but rely on report of maintenance needs by occupants to act. This process the survey observed has not been an effective way of drawing a maintenance program for the buildings since approximately 79% of respondent claimed that the bureaucratic reporting process prevents them from reporting maintenance needs of their building unless in emergency situations such ripping off of roof, emptying of septic tanks and major electrical faults.

- **Funding of Maintenance Activities in Public Institutions**

Because maintenance includes daily maintenance, minor repairs, and major system replacement requiring huge capital outlay, public institutions rely on central government funds to cover maintenance expenses. This is captured in General Maintenance and Repair Fund and included in their annual budget submitted to the government. But in the situation of Akroso SHS, the fund is supplemented with part of internally generated fund since money released into the fund by central government is woefully inadequate to meet maintenance needs of the building. This, from the survey, results in deferred maintenance on public buildings.

The survey revealed that personnel occupying public buildings are charged rent based on government rent policy which currently is 10 % of gross salary. The situation is however different in the case of the GPS where only senior officers from the rank of ASP

to Commissioner do pay rent on their bungalows. The rent paid on public buildings is not paid into the institutions account but rather to the Consolidated Accounts of the government.

- **Staffing Preventive Maintenance Programs**

To perform preventive maintenance, public institutions rely both on their own in-house public employees and on private maintenance services hired on a temporary, contract basis. For maintenance and repair that require special equipment or expertise, such as ultrasonic noise testing to identify arcing in electrical equipment, public institutions often turn to private firms instead of retaining those tools or skills on staff. They also contract for services when they find it inefficient to employ full-time personnel for infrequent tasks or when they need additional help for special projects or maintenance backlogs.

The maintenance staffs of the surveyed institution are shown in Tables 4.11, 4.12. and 4.13 for GHS, GPS and Akroso SHS respectively.

Table 4.11: Maintenance Staff of GHS – Akim Oda

Personnel	Qualification	No. of Persons
Estate manager	HND Building Technology	1
Carpenter	NVTI I	1
Electricians	NVTI II	2
Plumber	NVTI II	1
Seamstress	NVTI I –Proficiency"	1
Total		**6**

Source: Author's Field Survey. August 2013

Table 4.12: Maintenance Staff of GPS

Personnel	Qualification	No. of Persons
Estate Manager	NVT I I	1
Electricians	NVT I I	2
Plumber	NVTI II	2
Carpenter	NVTI II	1
Total		**6**

Source: Author's Field Survey. August 2013

Table 4.13: Maintenance Staff of Akroso Senior High School

Personnel	Qualification	No. of Persons
Estate Officer	M. Tech(Mechanical)	1
Carpenter	NVT I I	1
Electrician	NVTI I	1
Total		**3**

Source: Author's Field Survey. August 2013

4.3 Results from Interview

This section discusses the results of the Interview from the heads of Surveyed Public Institutions, Estate Managers and Personnel from State Housing and Company and Works Department of the Municipal Assembly.

4.3.1 Results of Interview from Heads of Public Institutions

The heads of the public institutions alluded to the fact that the bungalows are not being well maintained. The reasons assigned to the maintenance problems include: lack of funds, inadequate staffing, lack of training to enhance the skills of the artisans, high cost of maintenance, apathy on the part of occupants and non-payment of rent. Hence, most of the institutions depend on internally generated funds (IGF) for maintenance.. According to the interview conducted, it was revealed clearly that since the establishment of school, the nurses‘ quarters and the Police bungalows, there has never been any major maintenance in the respective institutions.

The Headmistress of Akroso Senior High School accepted that there are policies governing the maintenance work of public schools in the municipality. She said due to financial setback facing the schools, the policies are not being adhered to. That the school does not get enough funding therefore policies of maintenance are not made practicable. Furthermore, the school does not charge the occupants for rent.

The head of Ghana Health Service indicated that the rent that occupants of the bungalows pay is very meagre and cannot enable any meaningful maintenance. Also, internally generated funds (IGF) are inadequate since funds from government are not forth coming for maintenance.

4.3.2 Results of Interview from Estate Managers

Interview with Estate Officers revealed that staff capability is one of the major problems inhibiting effective maintenance of public buildings. In addition to inadequate staffing, lack of training to enhance the skills of the artisans was also cited.

4.3.3 Results of Interview from Personnel of State Housing Company and Works Department (former PWD) of the Municipal Assembly

Views of the key actors in housing i.e. State Housing Company, Works Department and Estate Officers were sought on the causes of the maintenance problem. Putting all their views together, the following key causes were identified as being responsible for poor maintenance of public buildings: lack of maintenance culture, apathy and ignorance of maintenance responsibility, lack of funds and high cost of maintenance and capacity of maintenance personnel.

Interviews and discussions with the above stakeholders point to the fact that government in a bid to see to the welfare of workers and enhance their efficiency provide accommodation for public institutions to avoid the situation where private landlords continuously charge exorbitant rents to the detriment of public workers whose salaries are nothing to write home about. However once these buildings are built, government desire to acquire or build more houses overshadows its role of maintaining these already existing ones thus, leading most of them, into a state of deterioration and in some instances disrepair, calling for outright demolition. Again because new construction often receives more attention than ongoing building maintenance, the government may find it difficult to draw adequate attention to maintenance needs. This they indicated is evident in the absence of a government policy on maintenance of public buildings in the country at the moment and that managers of public institutions have contributed to the situation by not advocating for preventive maintenance as a high priority.

Secondly, apathy and ignorance of maintenance responsibility on the part of occupants has also played a major part in the current maintenance problems of public

buildings. Occupants refuse to undertake internal maintenance as directed by the maintenance policy of the institutions holding the view that once the buildings are owned by the state, its deterioration is none of their business. Some respondents exhibited their ignorance of maintenance responsibility by the neglect of desilting choked gutters, cleaning dirty floors and clearing bushy surrounding. In this entire situation the study observed that the lack of enforcement of the policy has resulted in the present situation public buildings are in.

In addition, stakeholders also attributed poor maintenance to lack and inadequacy of funds for maintenance purposes as well as high maintenance cost. According to the actors government funding of activities of public institutions have been dwindling over the years thus making it difficult for managers of public institutions to set aside adequate funds for maintenance of their building. This has led to the situation of deferred preventive maintenance that can generate higher costs over the long term. ―The high cost of maintenance attributable to high cost of materials such as cement, paint, wood, nails etc is also not helping matters", one stakeholder added.

Finally, the capacity of the maintenance unit in terms of its personnel who are entrusted with the responsibility of carrying out maintenance works on public buildings is low in terms of expertise and number. This has led to most public institutions relying on private maintenance companies for their maintenance works which goes to increase the cost of maintenance due to the profit motive of these firms. This situation according to the Works Department (PWD) has arisen because it is no longer responsible for carrying out maintenance works and putting up of new buildings in most public institutions including those for the study. In the view of the Works Department (former PWD)

government will be making a lot of savings if it is given that responsibility with its level of expertise and non profit motive. Quality of work is also assured, they added.

In conclusion, stakeholders argued that government should take a second look at its rent policy to reflect current economic realities. They argued that the current rates which were set some thirty years ago cannot sustain the maintenance of the building. The management of the rent should also be left in the hands of managers of public institutions in addition to creating a maintenance budget. Presently rents are paid into the consolidated accounts but institutions are to undertake maintenance from their annual budgets which put pressure on them. There is also the need to improve the conditions of service of public officers in a bid to enhance the maintenance culture in public institutions so as to enhance the image of public buildings in the country.

4.4 Results from Observation of the bungalows.

This section discusses the results of the observation from the surveyed Institutions.

4.4.1 Results of observation of bungalows from Health Service Nurses Quarters at Akim Oda

At the above quarters two bungalow house types being occupied by senior nurses were observed. There were also three tenement types and ten single unit/terrace house types being occupied by the junior nurses.

Fig. 4.10 Exposed foundations and faded paint walls at GHS Nurses Quarters – Akim Oda

Hence, the house type of this institution is more of single unit/terrace structures and the bungalows have exposed foundations (as shown on figure 4.10), faulty electrical systems, dirty and faded paint walls, cracked and eroded gutters and peeled off floors. Roof leakage was a major maintenance problem here because of the dilapidated nature of the roofing material as a result of old age of the structure. Hence during the raining season the occupants become restless and as a result, productivity is affected.

Figure 4.11: cracked and eroded gutters at GHS Nurses Quarters - Akim Oda

Figure 4.12: Faulty electrical system at GHS Nurses Quarters - Akim Oda

4.4.2 Results of observation from Health Service Nurses Quarters at Akim Akroso

At this place five semi-detached bungalow house types were observed with one being used as transit. The tenement house types were only two and single units type was as well two.

The house type of this institution is more of semi-detached bungalows but the bungalows have hanging and exposed foundations (clearly shown in figure 4.13). There were broken windows and doors with leaking roofs. The water reservoir there was in a dilapidated state for so many years now. Hence they have water problem and mostly depend a well - water located some distance away from the nurses‘ quarters**.**

Figure 4.13: Foundation – Hanging and exposed at GHS Nurses Quarters – Akim Akroso

Fig 4.14: A Broken and tattered windows at GHS Nurses Quarters – Akim Akroso

Fig 4.14b: Broken and tattered windows at GHS Nurses Quarters – Akim Akroso

4.4.3 Results of observation of bungalows from Ghana Police Service at Akim Oda

Only three bungalow house types were observed here and they were being occupied by the high rank officers. There were five tenement house types as well. The single units/ terrace house type dominated the place with a whopping number of forty-two houses.

The bungalows here were very old and have a lot of elements not being well maintained. Walls have not been painted for a long time hence were infested with fungal, electrical systems faulty, foundation were exposed as a result of erosion, and there were deep cracks in walls (as shown in figure 4.15) and large number occupants per households. The number of people occupying or living in a house is also seen to have a bearing on the maintenance conditions. Generally, the higher the number of people in a house, the more

there is pressure on the use of facilities which are in common use such as water, bathrooms, toilet, and kitchen facilities. From the survey, it came out that maintenance seems to suffer especially with single unit houses where the facilities are shared between two housing units.

Fig. 4.15: Deep cracked walls at GPS bungalows – Akim Oda

Fig 4.16: Fungal- infested wall at GPS Bungalows – Akim Oda

Fig 4.17: Eroded foundations at GPS Bungalows- Akim Oda

4.4.4 Results of observation of bungalows from Ghana Police Service at Akim Akroso

In Akroso, there were only two tenement and eight single unit house types observed.

The observation from Akim Akroso is not different from that of Akim Oda. The walls were dirty and the paint on them were faded, there were signs of leaking roof, the ceiling materials were broken, the electrical systems were faulty and most of the floors were peeled off (as shown in figure 4.18). In addition the personnel here shared the single unit bungalows with some of the staff of Akroso Senior High School outside the School campus where water and toilet facilities are very poor.

Fig. 4.18: Peeled off floor at GPS bungalows – Akim Akroso

Fig. 4.19: Broken ceiling at GPS- Akim Akroso

4.4.5 Results of observation of Bungalows from Akroso Senior High School at Akim Akroso.

The above school has two bungalows with the Headmistress is occupying one and the Assistant Head (Academic) the other. Three tenements (flats) were observed with one which is one - storey building attached to the boys‘ dormitory while the other one, a two-

storey building attached to the girls‘ dormitory located on the campus. The structures were well maintained, since the walls were well painted, toilet facilities were very good and newly constructed fence wall around them. There was another fifteen unit single unit/terrace one located outside the campus which has a lot of maintenance problems. There was water problem, leaking roof (as shown in figure 4.20), faulty electrical system, faded and dirty painting, broken walls, broken windows and doors and poor toilet facilities. The staff shared these single unit/terrace house bungalows with some of the staff of Ghana police service.

Fig 4.20: Roof leakage at Akroso SHS Bungalows– Akim Akroso

Fig 4.21: Peeled off floor at Akroso SHS Bungalows – Akim Akroso

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter highlights and discusses the summary of findings, conclusion and recommendations of the study.

5.2 Summary of Findings

The following are the findings of the study:

- The study shows that, all the facilities needed for a bungalow are available within the building. However, single unit houses have detached and shared facilities for two households
- The study also revealed that condition of facilities namely water, toilet, bathroom, kitchen, and electricity were fairly good and usable. However, the condition of bathroom, kitchen, and electricity were very bad in single unit houses. This has been attributed to the pressure on the facilities due to the number of users. Water facility was poor in bungalows due to erratic nature of water flow in the taps.
- The most prevalent maintenance problems in the building elements surveyed are cracks in walls, faded painting, partly broken windows and doors, deep cracks in foundation and leaking roofs.

- The study also showed that institutions with the worst foundation problem were the GHS and GPS with their foundations having deep cracks, exposed and hanging as a result of soil erosion. This problem is more pronounced in Single Unit houses.
- Leaking roof was most pronounced in the GPS as compared to roofs of GHS and Akroso SHS. Leaking roof has resulted in damage to building materials or furnishings
- The study also showed that most floors surveyed developed deep cracks resulting in some situation, indentation of the floor and peel offs.
- The study also showed that painting is a major maintenance problem in bungalows of GPS and Akroso SHS where majority of their bungalows has dirty and faded paints because they have not been painted for long time.
- Again the study showed that most of the wooden members of the buildings were either partly or completely broken down as a result of the wooden members being rotten due to penetration of water resulting from lack of coating or poorly treated wood. The problem of rotten wooden members is most prominent in bungalows of GPS and least in Akroso SHS.
- From the study, it was revealed that most of the bungalows were old with buildings between the ages of fifty and sixty and above exhibiting serious maintenance problems. Houses surveyed were classified into younger buildings (less than 20 years), medium aged buildings (20-50 years) and older buildings (above 50 years old). About 80 % of all buildings surveyed were older buildings above 50 years.

- There is generally lack of maintenance culture on the part of both the institutions and the occupants. This situation is also evident in the lack of preventive maintenance plan by the surveyed institutions for their buildings.
- The study also revealed inadequate funds and delays in the release of the District Assemblies common funds buildings as causes maintenance problems. This has been worsened by the high cost of building materials, new constructions which often receives more attention than ongoing building maintenance projects and high cost of maintenance

5.3 Conclusion

The research has established that housing maintenance is a real problem among public institutions in Ghana, with all government bungalows of public institutions surveyed having maintenance problems. Maintenance problem is more prominent in GHS and GPS compared to Akroso SHS in the same situation. Building maintenance problems are more pronounced in single unit houses than tenement houses and bungalows. This has come about as a result of two main factors: Pressure on the single unit buildings due to large number of occupants and preference to the maintenance of bungalows and flats except in emergency situations because the bungalows and the flats are occupied by senior and middle level management respectively while that of the single units are occupied by the lower level personnel.

In addition maintenance culture is relatively higher among occupants of bungalows and tenement buildings than single unit occupant due the differential in income level.

The most widespread maintenance problem according to the study are cracks in walls, faded painting, partly broken windows and doors, exposed foundation and leaking roofs.

The maintenance problems the study observed have been influenced by the age of the buildings, lack or absence of a national maintenance policy, inadequate funds and high cost of maintenance, low capacity of maintenance staff, apathy and lack of patriotism on the part of occupants, pressure on buildings due to the number of users among others.

The study concludes by enumerating a number of recommendations aimed at addressing the problem of poor maintenance of public buildings in the country. It is hoped that these recommendations if implemented will contribute in no small way in reducing the maintenance problem plaguing the public sector in the country at the moment.

5.4 Recommendations

The following recommendations are made to address maintenance issues:

- The public institutions should embrace preventive maintenance practice as a high priority rather than adhoc maintenance. The building managers should incorporate preventive maintenance tasks into a work-order system and keep systematic maintenance records, either manually or by computer. Managers should monitor and evaluate the preventive maintenance programmes to improve them over time.
- Public institutions should ensure that their maintenance department is adequately staffed with the requisite manpower and that employees have appropriate training to competently complete the maintenance tasks expected of them.

- Estate and maintenance managers should oversee periodic inspections of buildings‘ conditions and create an inventory of buildings‘ components and equipment. They should plan building inspection to reduce cost of maintenance since doing so can provide insight into future maintenance needs and avoid unnecessary costs.
- There should be a state regulation to affect state maintenance of specific building systems. A state building and maintenance code should govern building construction and remodelling. The code should as well affect fire protection, accessibility, energy, electricity, plumbing and other mechanical components such as elevators. Also, new National Maintenance Policy should be formulated as part of the National Housing Policy to compel occupants to undertake maintenance on the bungalows they occupy to avoid huge sums of taxpayers‘ money going down the drain through deterioration of the bungalows due to lack of maintenance.
- Maintenance awards scheme for public institutions should be constituted at the National, Regional and District levels to award institutions that have effectively managed maintenance of their bungalows. There should be taskforce from the Ministry of Water Resources, Works and Housing to periodically inspects the conditions of the government bungalows.
- There is the need for Managers of public institutions to ensure that high quality and durable building materials are used to prolong the lifespan and minimize the rate of deterioration of the government bungalows. Current building designs should also incorporate materials with least maintenance problems, for instance

tiling of high rise buildings will solve the problem of painting due to the height of the building. Aesthetic value of new buildings should also be taken into consideration to serve as tourist attraction.

- The Works Department of the Metropolitan, District and Municipal Assemblies should be given the mandate to develop a systematic programme of maintaining the government bungalows since they have the necessary human resource capacity. This will reduce the total cost of maintenance as regard employing private contractors. The effectiveness of this recommendation depends on the level of supervision because of the history behind the attitude of employees of such institutions.
- Occupants of government bungalows should also shed off 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 sensitization and strict application of sanctions such surcharging occupants with cost of damage caused as well as eviction from the premises.
- There is the need for government to set up a maintenance budget from which all maintenance activities will be drawn. There is the need to set up a National Maintenance Fund similar to that of the Road Fund to mobilize adequate funds to meet maintenance needs of government bungalows. In addition, there is the need for the review of the current rents paid by tenant of government bungalows to reflect current economic trends and to generate enough funds to undertake maintenance works on these buildings. Conditions of service of public employees

be improved to ensure that tenants are able to do their own maintenance on the buildings.

- There is also 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. Building maintenance which is a shared responsibility must be the prime focus for both the occupant and the government (Managers of public institutions).

5.5 Recommendation for Further Studies

Finally, it is recommended that a further study be done on the topic to ascertain maintenance changes in other public sectors like Judicial Service, Ministries etc. in other municipalities.

REFERENCES

Afranie, S and Osei Tutu, E. (1999). Analyzing of Problems, Practices and Policy.

Ahmard R. (2006), Maintenance, management and services (case study: PERKESO. Building in Peninsular of Malaysia, Malaysia, unpublished Master's Thesis, University Technology.

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.

Cobbinah J. P. (2010), Maintenance of buildings in Public Institution in Ghana. Case study of selected institution in Ashanti Region-Ghana.

Cohen, L. (1976). Educational Research in Classrooms and Schools: A Manual of Materials and Methods. London: Harper & Row.

Collins English Dictionary, 2003.

Derek Miles and Paul Syagga, (1987), Building Maintenance, Intermediate Technology. London.

Dictionary of Military and Associated Terms, US Department of Defense, 2005

Flyvbjerg, B. (2004). Five Misunderstandings about Case-Study Research. In Seale C., Gobo.

Frankfort-Nachmias, C. and Nachmias, D. (1996). Research Methods in the Social Sciences (5th Edition). Oxford University Press, New York

http://www.oas.org\en\cdmp accessed on 10 October, 2013

http://www.ghanaweb.com accessed on 23 November, 2013

http://www.auditor.leg.state.mn.us/ped/2000/pe0006.htm

Kumar, R. (1999). Research Methodology: A Step by Step Guide for Beginners. Australia, Addison Wesley Longman, Australia Ply Limited.

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. (1987); Building Maintenance Management" Oxford U.K.

Lee, R. D. (1987) Building Maintenance Management, Oxford, U.K

Maslow, H. A (1954) Motivation and Personality. New York: Harper and Row Publishers.

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) (1986). Building Maintenance and Preservation. Butter-worths

Moser, C.A. and Kalton, G. (1971). Survey Methods in Social Investigation, (2nd Ed.). London: Heinemann

Sampling (Statistics) www.wikipedia..org accessed on 15 August, 2013

Seeley, I.H. (1987); Building Maintenance'. The Macmillan Press. London, U.K.

Seeley, I.H. (1993) Building Maintenance, Macmillan Press Limited

Shao, Allan. T (1999), Marketing Research: An Aid to Decision Making

Steward H.V.M. Guide to effective maintenance, Business Book Ltd London.

Wianwright and Wood (1991) Cost Estimate, Macmillan Education Press London.

(www.Sbaer.uca.edn accessed on 5 July, 2013)

www.co.randolph.nc.us/departments/download.

APPENDICES

APPENDIX I

QUESTIONNAIRE FOR PERSONNEL OCCUPYING BUNGALOWS IN AKROSO SENIOR HIGH SCHOOL, GHANA HEALTH NURSES QUARTERS AND GHANA POLICE SERVICE- AKIM ODA AND AKIM AKROSO

INTRODUCTION: Maintenance problems and challenges in our society have brought about a massive deterioration of facilities, the researcher is a Master's of Technology (Construction) student embarking on research on the topic **–Maintenance of Government Bungalows in Birim Central Municipality: Problems and Challenges"**

You are therefore kindly requested to contribute to this study by giving your independent opinion on the statements below.

Please, state your views on the statements by ticking (√) as appropriate or writing unrestrictedly for open – ended questions.

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

Sampson Kofi Hadjor

[M. Tech (Construction), UEW- Kumasi]

MAINTENANCE OF BUILDINGS

Name of Institution……

Building Type of Occupant (Bungalow/ /Tenement/Single Unit)

1. How long have you stayed in the building? ……
2. How many people occupy this building? ……

3. Did you take inventory of the state and facilities in the building before taking occupancy? Yes ( ) No ( ) Please assign reason(s) for your response ……
4. Do you pay any rent for occupying the building? Yes ( ) No ( )
5. If yes how much do you pay?
6. If no please attempt an explanation for non-payment of rent …….....
7. Does your institution undertake regular inspection of the building?

   Yes ( ) No ( ) Please give reason for your answer ….....
8. Does the maintenance/estate department come in to do maintenance work on the building without request? Yes ( ) No ( )
9. If yes, when is it done? Quarterly ( ) Annually( ) Biannually ( ) other (please specify) …….....
10. Who is responsible for the maintenance of the building? Self ( ) Institution ( ) PWD ( ) other please specify ….……
11. How long does it take for maintenance request to be responded to?

    ( ) less than a month ( ) 1-3 months ( ) 6-12 months ( ) More than 12 months ( ) other please specify ……
12. In your opinion, is the building well maintained? ( ) Yes ( ) No. please give reason(s) for your answer ……
13. Please indicate in your opinion the reasons/factors responsible for the present state of your building ……
14. How does the current state of your building affect your stay/life in the building?

    .....

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

    .....

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

    .....

General Maintenance of Building Elements

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

17. Condition of the foundation ( ) cracks developed ( ) exposed/ hanging ( )
    weak ( ) no problem ( )
18. Roof: leakage ( ) rusty ( ) partly ripped off ( ) completely ripped off ( )
    No problem ( )
19. Floor screed: cracks ( ) peeled-off defect ( ) no defect ( )
20. Wall: partly broken down ( ) develop cracks ( ) peel – off ( ) tilted ( )
    No problem ( )
21. Painting: no painting ( ) faded painting ( ) dirty ( )
    well painted/no problem ( )
22. Windows and Doors: completely broken down ( ) partly broken down ( )
    no problem ( )
23. Electrical installations: faulty ( ) non functioning ( ) no problem ( )
24. What type of toilet facility do you use? Water closet ( ) KVIP ( ) Pan Latrine ( )
    other please specify ( )
25. Conditions of the facilities:

Please, how do you consider the conditions of these facilities in the building? Tick appropriately.

Facility	Good	Fairly Good	Bad
Water			
Bath			
Toilet			
Kitchen			
Electricity			

26. How will you classify the general condition of your building?

( ) good ( ) fairly good ( ) bad ( ) very bad

Major Cause of Non-Maintenance of Government Bungalow

27. How will you rank the following as the major cause of non – maintenance of government bungalow if it is so? Please, rank from 1st to 7th with first being the major reason and seventh being least reason.

Causes of maintenance problem	**Rank**
Lack of maintenance practice	
Inadequate funds	
Bureaucratic reporting system	
Pressure on facility/building due to number of occupants	
Poor work done on building	
Non response to maintenance request	

APPENDIX II

QUESTIONNAIRE FOR HEADS OF SURVEYED PUBLIC INSTITUTIONS: AKROSO SENIOR HIGH SCHOOL, GHANA HEALTH SERVICE AND GHANA POLICE SERVICE- AKIM ODA AND AKIM AKROSO

INTRODUCTION: Maintenance problems and challenges in our society have brought about a massive deterioration of facilities, the researcher is a Master's of Technology (Construction) student embarking on research on the topic **–Maintenance of Government Bungalows in Birim Central Municipality: Problems and Challenges"**

You are therefore kindly requested to contribute to this study by giving your independent opinion on the statements below.

Please, state your views on the statements by ticking (√) as appropriate or writing unrestrictedly for open – ended questions.

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

Sampson Kofi Hadjor

[M. Tech (Construction), UEW- Kumasi]

MAINTENANCE OF BUNGALOWS OF PUBLIC INSTITUTIONS

Name of Institution…….

1. What is your position, job description/qualification, please? ……..
2. What are the ages of your buildings? ……

3. How will you classify your buildings according to the period of existence as to whether they are old (above 50 years), medium aged (20-50years) or young building (below 20years)?
4. Are occupants charged for their occupancy of the building? Yes ( ), No ( )
5. If yes, then how much rent is charged? …..……
6. With reference to the above, who determines the rent payable? ……
7. Does your institution have a maintenance policy? ……
8. If yes, who developed the policy? …….....
9. What type of maintenance arrangement do you have in place?

   ( ) Periodic ( ) Routine ( ) Preventive ( ) None

   Other please specify ……
10. Who is responsible for the allocation of buildings? …….....
11. Do you inspect the building to determine its maintenance needs? If yes, how often and if no, please assign reasons. .....
12. Who is ultimately responsible for the maintenance of the residential building?

    ( ) Personnel ( ) Institution ( ) PWD

    Other please specify ……
13. What is the responsibility/role of the occupants towards the maintenance of the building? …….....
14. How is request for maintenance by occupants on their building handled by your department? …….....
15. Does the estate/maintenance department undertake regular inspection of the building? Yes/ No

Please give reasons for your answer..……

16. Does the institution take inventory of the state of the building on occupancy of new tenant/personnel? .....……

17. How does the institution treat any incidence of negligence in maintenance of the building when a tenant is moving out? .....

18. How is maintenance funded? ( ) IGF ( ) Rent payment, ( ) Surcharging, ( ) Government budgetary allocation.

    Others please specify ……..……

19. What necessitates the carrying out of maintenance on the buildings?

    ( ) Upon inspection ( ) Upon request ( ) Upon occupancy of new personnel

    Other (Specify) ……

20. How long does it take to respond to maintenance request/needs of personnel?

    ……

21. Do technicians and managers receive training to conduct the condition of assessments of the buildings? Yes/ No

22. Does the institution have a written long-range plan for building maintenance and repairs that extends out a minimum of three to five years? Yes/ No

23. Does the institution have a written long-range plan for building maintenance that contains an inventory of all buildings‘ components and systems, their condition and estimates of their expected remaining useful life? Yes/ No

24. How well are you equipped in terms of personnel and equipment for the maintenance task confronting the institution?

25. 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
26. What factors in your opinion are impeding the effective maintenance of government bungalows in the institution?.....
27. Have building conditions in public institutions improved or stayed at acceptable levels from year to year? Yes/No
28. Does the government have an annual maintenance plan for buildings as well as estimates for unscheduled repairs and maintenance works order? Yes/No
29. How will you consider the current states of the buildings of the organization in terms of the following elements and facilities?

Facility/Element	**Current State**
Roof	
Wall	
Foundation	
Painting	
Doors/Windows	
Toilet	
Bathroom	
Kitchen	
Pipe/water	
Electricity	
Drains/gutter	

APPENDIX III

STRUCTURED INTERVIEW FOR ESTATE/ MAINTENANCE DEPARTMENTS IN BIRIM CENTRAL MUNICIPAL ASSEMBLY

Name of Institution……..

1. What is your position, job description/qualification, please? ……
2. What are the ages of your buildings? ……
3. How will you classify your buildings according to the period of existence as to whether they are old (above 50 years), medium aged (20-50years) or young building (below 20years)?
4. Are occupants charged for their occupancy of the building? ……
5. If yes, then how much rent is charged? ……..……
6. With reference to the above, who determines the rent payable? .....
7. Does your institution have a maintenance policy? ……
8. If yes, who developed the policy? …….....
9. What type of maintenance arrangement do you have in place? Periodic, Routine, Preventive, None

   Other please specify ……...……
10. Who is responsible for the allocation of buildings? …….....
11. Do you inspect the building to determine its maintenance needs? If yes, how often and if no, please assign reasons. …….....
12. Who is ultimately responsible for the maintenance of the residential building?

    Personnel ( ) Institution ( ) PWD ( )

    Other please specify ……

13. What is the responsibility/role of the occupants towards the maintenance of the building? .....
14. How is request for maintenance by occupants on their building handled by your department? .....
15. Does the estate/maintenance department undertake regular inspection of the building? Yes/ No

    Please give reasons for your answer ……..…….
16. Does the institution take inventory of the state of the building on occupancy of new tenant/personnel? .....…
17. How does the institution treat any incidence of negligence in maintenance of the building when a tenant is moving out? .....
18. How is maintenance funded?

    IGF, Rent payment, Surcharging, Government budgetary allocation.

    Others please specify ...…….
19. What necessitates the carrying out of maintenance on the buildings?

    Upon inspection ( ), Upon request ( ), Upon occupancy of new personnel ( ).

    Other (Specify) ..……
20. How long does it take to respond to maintenance request/needs of personnel?

    ……
21. Do technicians and managers receive training to conduct the condition assessments of the buildings? Yes/ No
22. Does the institution have a written long-range plan for building maintenance and repairs that extends out a minimum of three to five years? Yes/ No

23. Does the institution have a written long-range plan for building maintenance that contains an inventory of all buildings‘ components and systems, their condition and estimates of their expected remaining useful life? Yes/ No
24. How well are you equipped in terms of personnel and equipment for the maintenance task confronting the institution?

Artisans/personnel Eg. carpenters etc	Qualification	Number of Artisans

25. 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
26. What factors in your opinion are impeding the effective maintenance of government bungalows in the institution?
27. Have building conditions in public institutions improved or stayed at acceptable levels from year to year? Yes/No
28. Does the government have an annual maintenance plan for buildings as well as estimates for unscheduled repairs and maintenance works order? Yes/No
29. How will you consider the current states of the buildings of the organization in terms of the following elements and facilities?

APPENDIX IV

STRUCTURED INTERVIEW FOR STATE HOUSING COMPANY (SHC)/WORKS DEPARTMENT IN BIRIM CENTRAL MUNICIPAL ASSEMBLY - AKIM ODA

TOPIC: Maintenance of Government Bungalows in Birim Central Municipality: Problems and Challenges.

1. Name of your institution……
2. Position of the interviewee……
3. What is the role of SHC/PWD in the provision of residential buildings or infrastructure for public institutions in Ghana?
4. What building types do you put up for public institutions?
5. What minimum facilities are required to be provided for these residential buildings to make it habitable?
6. What is the lifespan of these buildings your institution put up?
7. How can the lifespan of the facility be extended or prolonged?
8. Please, do you have a maintenance policy in place for the buildings put up for the institutions?
9. Which components of a building need regular attention and maintenance, and why? Relate your response to the following elements and facilities: The roof, walls, windows/doors, courtyard, toilet, plumbing/water, kitchen, bathroom and electrical fittings.
10. What role does your institution play in fixing government rent?
11. How would you describe the current state of government bungalows?

12. What reasons can be adduced for the deterioration of government bungalows?
13. In what way(s) can the deterioration of government bungalows be prevented?
14. Does the government have a maintenance manual used when performing preventive maintenance, managing emergency situations etc?
15. Do you have an annual maintenance plan for government bungalows as well as estimates for unscheduled repair and maintenance work orders?
16. Does your institution keep acceptable levels of materials and spare parts to support timely repairs of government bungalows?
17. Do you follow a quality assurance programme that includes the use of maintenance standards, monitoring, inspecting and evaluating completed works and developing corrective action plans?