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DEPARTMENT OF COMMUNITY HEALTH

Msc HEALTH SERVICES PLANNING AND MANAGEMENT

THE ASSESSMENT OF PLANNED PREVENTIVE MAINTENANCE OF RESIDENTIAL ESTATES OF THE DISTRICT HOSPITAL IN THE SEKYERE-WEST DISTRICT OF THE ASHANTI REGION

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FEBUARY 2001

THE ASSESSMENT OF PLANNED PREVENTIVE MAINTENANCE

OF

RESIDENTIAL ESTATES OF THE DISTRICT HOSPITAL

IN THE SEKYERE-WEST DISTRICT OF THE

ASHANTI REGION.

A thesis submitted to the board of post graduate studies of Kwame Nkrumah University of Science and Technology in partial fulfilment of the requirement for the award of the MSc. Degree in Health Services Planning and Management

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January 2001

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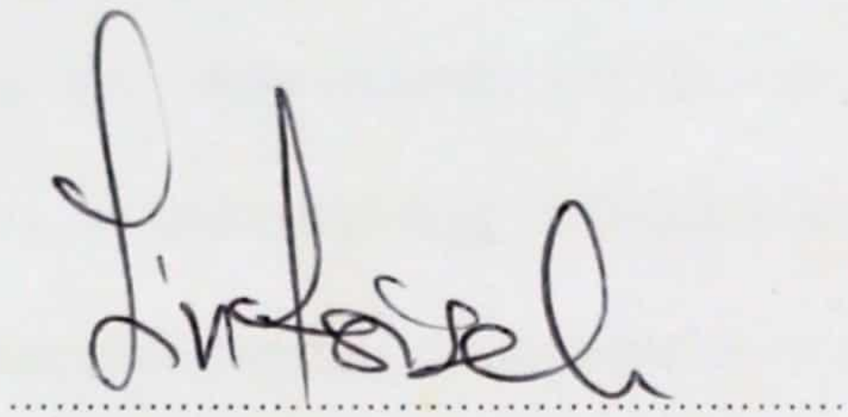
DECLARATION

I hereby declare that, except for references to other people's work which have been duly acknowledged, this work is the result of my own original research.

I hereby declare that, this work has neither in whole nor in part been presented for a degree elsewhere.



VINCENT KORSI ASISEH JNR

ABSTRACT

In the health ministry, physical infrastructure, whether new construction or rehabilitation represents a very high proportion of investment. However most of this physical infrastructure looks dilapidated. **MOH (1992).** This called for a critical review of how physical infrastructure is managed. The Ministry of Health therefore decided to put into practice planned preventive maintenance. This is evident in the 5-year Medium Term Strategic Framework. In this regard, workshops were organised for estate managers and estate officers of the ministry throughout the country.

Planned preventive maintenance (PPM), is maintenance carried out at predetermined intervals, or corresponding to prescribed criteria and intended to reduce the likelihood of an item not meeting an acceptable condition. **Lee (1984).** This work therefore assessed PPM by management of the Sekyere-West District of the Ashanti region on residential estates of the district hospital. In the assessment process, primary and secondary data were used. Records on the residential estates were reviewed together with the whole planning process for PPM. A checklist was used through observation to know the state of the residential estates. Management was interviewed to know their commitment to PPM.

Closed ended questionnaires were returned from 50 residents out of the 71 estates sampled for the study. PPM was measured in the district by knowing the planning process, the financial allocation, rate of inspection, the response to repair and commitment to PPM by residents. The study is a cross sectional observational one.

The findings of the assessment showed that out of a total of forty-two million, four hundred and ninety-three thousand, six hundred and sixty-two cedis and eighty-eight pesewas (¢42,493,662.88) allocated for a three year period for PPM by the Government of Ghana, twenty-nine million, six hundred and thirty-eight thousand, one hundred and

ninety-six thousand cedis (¢29,638,196) was used for maintenance leaving a balance of twelve-million, eight hundred and fifty-five thousand, four hundred and sixty-six cedis eighty-eight pesewas(¢12,855,466.88). Budget was not initiated for PPM but instead management only made use of what was provided by G.O.G. Findings further showed that management knew about PPM.

The research also revealed that out of a total of 71 estates under the hospital 26, i.e. 34% have gone through some form of maintenance leaving 45 i.e. 66% of the estates not having undergone any maintenance for the past 10 years. Out of the 34% of the maintained estates 31.6% have had maintenance just once and 2.41% more than once for the past 10 years.

Client satisfaction was used as the measure for good work done. Findings showed that 18% of the study population claimed they were satisfied with the work done on their residence. Those who were not satisfied constituted 15.9%. A total of 30% of those who had some work done on the residence still claim there is still some work to be done on their apartments. On residents' contribution to PPM, all the respondents claim they do general cleaning on the average once a week which observational study proved otherwise. The observational study showed that 30% of residents did not keep their homes tidy. A total of 55.9% of the sampled population have done some amount of repair works on their residences from their own resources though it was strongly discouraged by management.

From these findings, the researcher concluded that planned preventive maintenance system at the hospital is weak. The researcher therefore strongly recommends that management should put in place an Estate management unit or a PPM system. Management should also put in place a policy to formulate a long-term maintenance strategy. Tenants should however be encouraged to take interest in their residences and be allowed to make improvements on their homes.

ACKNOWLEDGEMENT

I would like to show my appreciation to my siblings and parents especially Mr. Vincent Asiseh my father. Daddy I still cannot erase from memory you handing me over to my class one teacher. Your profound love is what has brought me this far. My sincere gratitude goes to Miss Theodosia Sintim, my mum for her continuous prayers. I still remember vividly how you wept in my presence pleading with me to take education to the top. Thanks Mrs. Kate Asiseh and Miss Salamatu Bawumia for the care and sacrifice.

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Most of all I would like to go on my knees in veneration for the blessing that the Lord has bestowed on me. Lord, You have always been by my side and anytime I think of You I am filled with tears of thanks. Lord thanks so much for Your strengthening and love, without You I cease to exist.

DEDICATION

With Love to Mr Vincent Asiseh and Miss Theodosia Sintim. My Dad and Mum.

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ABBREVIATIONS

M.T.H.S.	-	Medium Term Health Strategy
P.P.M.	-	Planned Preventive Maintenance
E.M.U	-	Estate Management Unit
M.O.H.	-	Ministry of Health
M.O.E	-	Ministry of Education
I.G.F.	-	Internally Generated Fund
W.I.F.A.	-	Women In Fertile Age
O.P.D.	-	Out Patient Department
M.C.H.	-	Maternal and Child Health
C.W.C.	-	Child Welfare Clinic
A.N.C.	-	Antenatal Care
P.N.C.	-	Post-Natal Care
J.S.S.	-	Junior Secondary School
G.O.G.	-	Government of Ghana
E.A.C.	-	External Aid Co-ordinator
H.A.S.S.	-	Health Administration and Support Services (Division)
I.E.R.D.	-	International Economic Relations Division (MOF)
P.I.P.	-	Public Investment Programme
D.C.E.	-	District Chief Executive
D.D.H.S.	-	District Director of Health Services
D.H.A.	-	District Health Administration
P.W.D.	-	Public Works Department

CHAPTER 1

1.1 INTRODUCTION

A meeting on industrial growth and the demands of society held in 1973 by the British Institute of Management (BIM) was announced as follows, quoting just a part;“ The last decades have seen a remarkable growth of the economies of the industrialised areas of the world, but resulting affluence has brought its own problems. Social demand in relation to education, health, urban renewal, transportation, housing and environment, are becoming the major claimant for public investment in most of the “developed” countries. **Calvert et. al (1995).**

This pronouncement comes at a time when much attention needs to be paid to the preservation of physical infrastructure. The prime duty of management within the context of its general obligations to society is to enact legislation which must be used to deploy and operate the assets under its control to their maximum economic advantage in the interest of us all’. **Calvert et. al (1995).** This statement emphasises the importance of management taking the necessary steps to ensure that whatever investment is made would last so as to derive the maximum benefit from such an investment.

Planned Preventive Maintenance (PPM), which is a managerial function, is maintenance carried out at predetermined intervals or corresponding to other prescribed criteria and intended to reduce the likelihood of an item not meeting an acceptable condition. **Lee (1984)**.

Unfortunately, due to lack of maintenance, most of the structures under the Ministry of Health are dilapidated. This prompted the ministry to give prominence to PPM in the “Medium Term Health Strategy Toward Vision 2020. **M.O.H. (1999)**. The study therefore assessed PPM of the residential estates of the Sekyere-West District hospital, Ashanti.

1.2 PROBLEM STATEMENT

In 1999, a summary of the capital programme revealed an estimate of $450,000 for the rehabilitation of 11district hospitals and $550,000 for upgrading ongoing projects on 11 district hospitals. Three new district hospitals were to be built at the cost of $940,000 with funding coming from G.O.G/HF. It also indicated a total of $3,300,000 from SFD, OPEC GOG/HF for 38 new health centres and the rehabilitation of 70 health centres. The rehabilitation alone of the health centres it was expected to cost $170,000. **M.O.H (1998).**

These figures show that physical infrastructure, whether new construction or rehabilitation, now represents a very high proportion of investment in the health sector. Unfortunately most of the infrastructure has had little or no maintenance for the past years therefore leaving these structures in a poor state. **M.O.H. (1999).** Furthermore management of most health institutions pays little attention to the maintenance of such structures resulting in frequent breakdowns and high cost of repairs and thereby disrupting the flow of work

1.3 HYPOTHESIS

The planned preventive management system at the Sekyere-West District hospital is weak.

1.4 RESEARCH QUESTIONS

1. What has been the budget allocation for PPM for residential estates for the past 3 years and how much of this money actually went into it?
2. Does management understand PPM and what is their commitment to it?
3. What are the PPM systems put in place?
4. Are there any estates that have seen maintenance for the past three years?

5. Are the staff of the district hospital pleased with the PPM done on their residences?

6. What are residents' contributions to PPM?

1.5 GENERAL OBJECTIVE

To assess Planned Preventive Maintenance of residential estates at Mampong Hospital of the Sekyere-West District, Ashanti region.

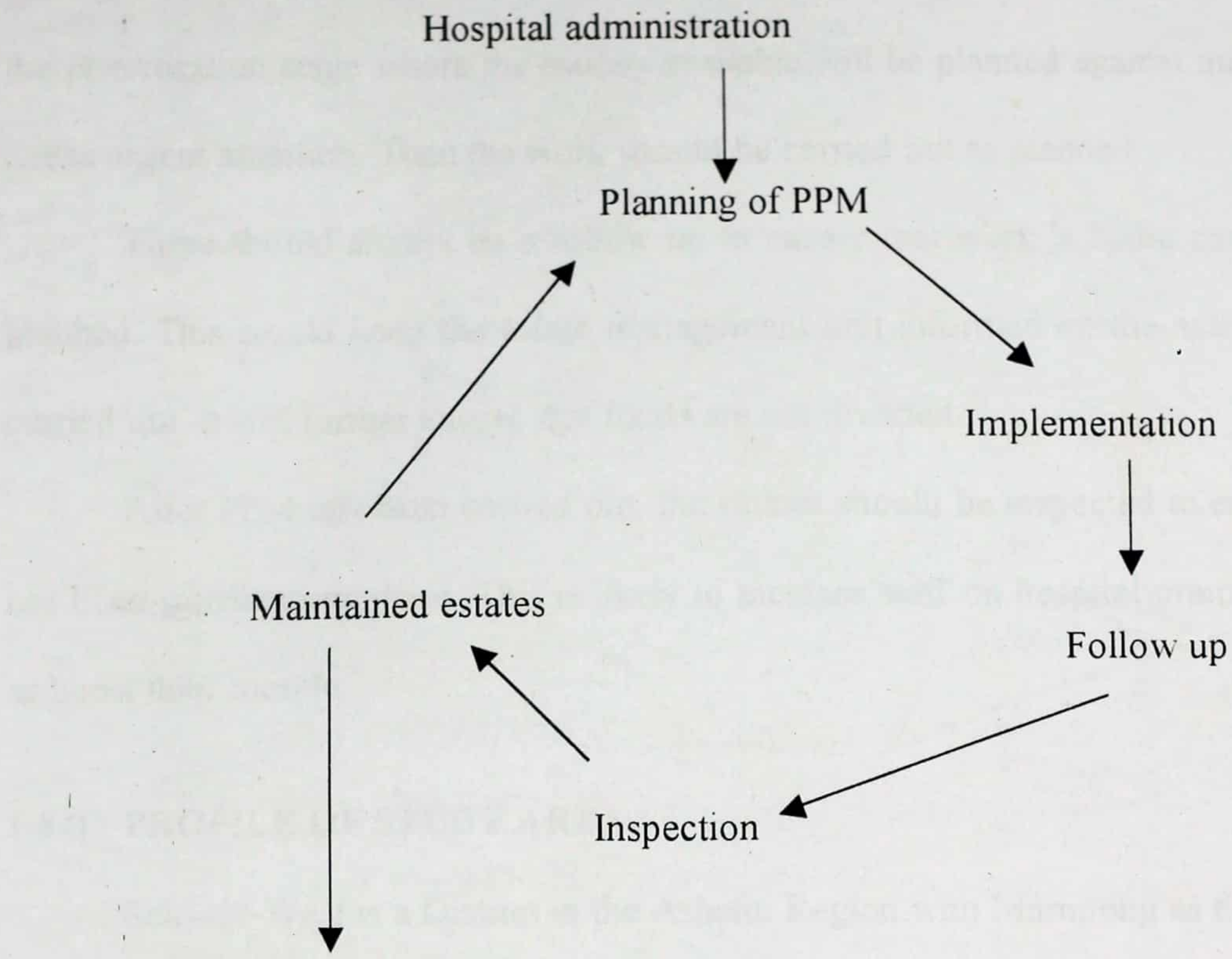
1.5.1 SPECIFIC OBJECTIVES

1. To determine the financial allocation for PPM for the past three years and whether the allocation actually went into maintenance.
2. To find out if management understood PPM and their commitment to it.
3. To determine if there is any PPM system in place.
4. To find out if residential estates have been maintained for the past three years.
5. To find out if staff is pleased with the PPM done.
6. To determine residents' contribution to PPM.

1.6 RATIONALE FOR STUDY

The rationale for the study of PPM is to give the necessary information to the hospital's management to enable it improve its management of the hospital's residential estates.

1.7 CONCEPTUAL FRAMEWORK



Source: Author

1.8 THEORETICAL FRAMEWORK

Planned Preventive Maintenance management means planning with emphasis on budgeting, monitoring, evaluation and feedback. This entails projecting into the future to be able to check deterioration. This places the responsibility to plan and budget for maintenance of structures on the estate management unit. There is a maintenance form, which would have to be filled to indicate the major and minor works to be done. These consist of the building's interior, exterior and compound. There are also the objectives for rehabilitation and maintenance repairs form and a maintenance funds form, which is the balance sheet that will indicate the budget for projected work to be done. There are forms for work already done as well as budget reservation forms for unforeseen expenditures. All these would have to be filled and appropriate planning made.

The filling of these forms will establish a database for PPM from which reference could be made regarding PPM carried out and what is left to be done. The next stage is the prioritisation stage where the money available will be planned against the work that needs urgent attention. Then the work should be carried out as planned.

There should always be a follow up to ensure that work is being carried out as planned. This would keep the estate management unit informed on the activities being carried out. It will further ensure that funds are not diverted.

After PPM has been carried out, the estates should be inspected to ensure that it has been satisfactorily done. This is likely to increase staff on hospital premises as well as boost their morale.

1.8 PROFILE OF STUDY AREA

Sekyere-West is a District in the Ashanti Region with Mampong as the capital. It is about45 minutes drive (56Km) from the Ashanti Region Capital, Kumasi. The land area is about 2346 sq. Km, 5.2% of Ashanti region land area. The 1998 population of the District was 175183 projected from 1984 census. The inhabitants are mostly Ashantis. The District is made up of six Sub-Districts, one hundred and twenty six communities and about sixty hamlets. **District's Annual Report (1999).**

AGE DISTRIBUTION OF THE POPULATION OF SEKYERE-WEST DISTRICT

AGE GROUP	NUMBER	PERCENTAGE
UNDER 5 YEARS	37243	20%
5YRS-14YRS	50278	27%
15YRS-60YRS	89383	48%
ABOVE 60YRS	9311	5%
EXPECTED PREGNANCY	7448	4%
EXPECTED BIRTHS	7448	4%
WIFA	37243	20%
ANNUAL GROWTH RATE	-	3.1%

SOURCE: DHA SEKYERE-WEST. 1999 ANNUAL REPORT

FIG. 1

ROAD NETWORK

The road in the south, which has 3 of the sub-districts and a concentration of health facilities, is good and motorable throughout the year. All the major towns in the south are linked to Mampong with good motorable roads. However, roads in the Afram plains, which has 3 of the sub-districts, are very bad and unmotorable during the rainy season, and so for more than half of the year, they are cut off from the rest of the district.

DEMOGRAPHY

The south is densely populated with about 80% of the total population. The north is however sparsely populated with only about 20% of the population, who are mostly migrant farmers. The projection for the year 2000 for the district with an annual growth rate of 3.1%, is 186,215. The breakdown is given below.

HEALTH SERVICE

The district has 22 health facilities: 12 Government and 10 Private. There is a high concentration of health facilities in the south.

HEALTH FACILITIES

CATEGORY	NUMBER
DISTRICT HOSPITAL	1
HEALTH CENTRES	7
CLINICS	13 (MOH-3, Private-5, Mission-1, NGO-4
MIDWIFERY TRAINING SCHOOL	1
TRADITIONALBIRTHATTENDANTS (TBAs)	107 (functional-96, non-functional-11)
VILLAGE HEALTH COMMITTEES (VHCs)	75 (functional-37, non-functional-38)
NO. OF OUTREACH POINTS	113
NO. OF CHEMICAL SELLERS	53

SOURCE: DHA, SW 1999 ANNUAL REPORT

FIG. 2

MORBIDITY

TOP TEN DISEASES

DISEASE	NUMBER	PERCENTAGE
Malaria	19,802	43.9%
Pregnancy related complications	3,760	8.3%
URTI	3,422	7.6%
Diarrhoea	2,709	6%
Gynaecological disorders	2,188	4.8%
Accident and burns	1,853	4.1%
Skin disease/ulcer	1,550	3.4%
Anaemia	771	1.7%
Acute eye infection	634	1.4%
Rheumatism/joint pains	405	0.9%
SUB-TOTAL (TOP TEN)	**37,094**	**82%**

FIG 3

DOCTOR/PATIENT RATIO 1:12,772

NURSE/PATIENT RATIO 1:665

SOURCE: DHA. SW. 1999 ANNUAL REPORT

MORTALITY

TOP TEN CAUSES OF DEATH

DISEASE	NUMBER	PERCENTAGE
Malaria	36	16.1%
Anaemia	18	8.7%
Pneumonia	17	7.6%
Infectious hepatitis	17	7.6%
Cardiac failure	15	6.7%
HIV/AIDS	8	3.5%
Cerebro-vascular accidents	7	3.1%
Gastroenteritis	6	2.6%
Diabetes	4	1.7%
Septicaemia	1	0.8%
TOTAL	**129**	**57.8%**

TOTAL DEATH = 223

SOURCE: DHA. SW. 1999 ANNUAL REPORT

FIG. 4

MCH/FP SERVICES

MCH/FP COVERAGE

PERFORMANCE AREA	NUMBER	PERCENTAGE
SCHOOL HEALTH		57.1%
CWC REGISTRANTS	11,445	79.2%
BCG	5,911	82%
MEASLES	4,713	66%
DPT3	4,405	61%
YELLOW FEVER	7,560	53%
OPV3	1,146	63%
ANC REGISTRANTS	7,282	100%
SUPERVISED DELIVERY	4,338	60%
PNC	3,592	49.7%
CYP	1,488	4.1%
MATERNAL MORTALITY RATE	19	101/100,000 (Hospital Data)
REPORTED STILLBIRTH	**149**	**7.9%**

SOURCE: DHA, SW. 1999 ANNUAL REPORT

FIG. 5

EDUCATION

CATEGORY		NUMBER
NUMBER OF SCHOOLS	PRE SCHOOL	53
	PRIMARY	99
	J.S.S.	59
	TEACHER TRAINING	4
	UNIVERSITY	2
NUMBER OF SCHOOL CHILDREN		**14,136**

SOURCE: DHA, SW. 1999 ANNUAL REPORT

FIG. 6

TRANSPORT

NUMBER OF VEHICLES----------6

NUMBER OF MOTORBIKES----------8

STAFFING / MANPOWER

The broad categories of staff to be considered are medical officers/medical assistants, nurses (general and public health) and paramedics of all grades. The total staff strength as of 31st March 2000 is 330. The breakdown is as follows:

STAFFING

STAFF CATEGORY	NUMBER
DOCTORS	11 (GHANAIAN-7, CUBANS-4
MEDICAL ASSISSTANTS	5
GENERAL NURSES AND MIDWIVES	90
PUBLIC AND COMMUNITY HEALTH NURSES	15
WARD ASSISSTANTS/ WARD MAIDS	34
PARAMEDICALS	174
TOTAL STAFF AT POST	**330**

SOURCE: DHA. SW. NOMINAL ROLL MARCH 2000

FIG. 7

STATISTICAL DATA OF MAMPONG HOSPITAL

At the moment the hospital consists of the major building which is made up of the administration, out-patient department, male ward, female ward, maintenance department, accounts office, stores, theatre, x-ray, mortuary, laboratory, etc. There is an out-wing to the hospital which is the maternity department. This also consists of the laundry, theatre, dispensary, labour ward, antenatal ward, lying in ward, laboratory etc. The hospital also has 10 bungalows and 61 quarters. At the moment, the bungalows and quarters have been occupied by the staff of the hospital.

CHAPTER 2

METHODS AND MATERIALS

2.1 VARIABLES.

The dependent variable used for the assessment was the rate of maintenance. The independent variables were the rate of inspection, rate of response to replacement and repair of damaged items, management's knowledge and commitment to PPM and the planning process.

2.2 STATISTICAL METHODS

The statistical methods used were histogram and tables.

2.3 STUDY POPULATION

The study population were all staff resident in the residential estates of the district hospital. This consisted of 10 bungalows and 61 quarters.

2.4 SAMPLING TECHNIQUE AND PROCEDURES

The whole population was used.

2.5 SCOPE OF STUDY

The study covered all the 71 residential estates under the hospital. Areas covered were management's knowledge and commitment to PPM. The rate of inspection, rate of response and replacement of damaged items, the planning process and staff contribution to PPM.

2.6 ETHICAL CONSIDERATION

The objectives of the study were discussed in detail with the staff and management of the hospital before the work began.

2.7 DATA COLLECTION TECHNIQUES AND TOOLS

The data collection techniques used were the following:

Tools: Checklists.

Observation: Use of senses, pen, paper, and checklist.

Interviewing: Quantitative questionnaires and notebook to jot down important answers.

2.8 SAMPLING METHOD

The number of estates under the hospital was used as a sample size since it was possible to cover all the estates in the stipulated time given. At the moment the hospital has 10 bungalows and 61 quarters

2.9 PLAN FOR DATA COLLECTION

2.9.1 PERMISSION TO PROCEED

Letters were sent to the District Chief Executives of the District Assembly, the District Health Administration and the Medical Superintendent of the District Hospital. Subsequently the rationale of the study was discussed with the Medical superintendent of the hospital who gave the necessary assistance.

2.9.2 DATA COLLECTION

In the data collection a checklist was used to collect the information needed by observation. Coded quantitative questionnaires were distributed according to the staff resident in the estates. This was to enable the tracking questionnaires that had been distributed. The participants completed the forms in the researcher`s presence. This was done to ensure hundred percent retrieval of questionnaires. The data was collected in two weeks. It was done with the help of the estate management officer of the hospital.

2.10 METHODOLOGY

2.10.1.STUDY DESIGN

The study is a cross-sectional observational one.

2.10.2 METHOD

In the study both primary and secondary data were reviewed by taking a critical look at the planning process of the hospital concerning PPM on residential estates. Inventory was also taken of the residential estates under the hospital`s management. The budgetary allocation for PPM for the past three years was examined. The various sources of funding for PPM under the hospital were also looked at.

By the use of structured questionnaires the management and the senior staff of the hospital were interviewed to assess their knowledge on PPM. Close-ended structured questionnaires were used to collect information from the study population.

A participatory observation method with a corresponding checklist was utilised to determine the state of the residential estates. It was possible to cover all the residents. given the location of the residences and the time used to collect the data.

2.10.3 DATA HANDLING

The keeping, handling, printing of questionnaires and their storage were the responsibility of the researcher.

2.10.4 PLAN FOR DATA PROCESSING AND ANALYSIS

The questionnaires were sorted out and checked if they were complete. The various answers to the questionnaires were grouped, coded and keyed into a computer. By using Epi-info, the answers to the questionnaires were validated. The information was used to plot graphs using MS Excel from which conclusions were drawn and recommendations were made.

2.11 LIMITATIONS OF THE STUDY

1. Due to constraint of time and finance a more detailed work could not be carried out.
2. Lack of information from the community and shared responsibility by the District Assembly and other stakeholders made it impossible to study PPM on the hospital as a whole.
3. Since this topic is a fairly new area there wasn't much on literature on the subject.
4. The comparison with SSNIT PPM system was impossible because although SSNIT carries out maintenance, it does not have a laid down policy.

2.12 ASSUMPTIONS

The following assumptions were made while carrying out the project:

1. The sample size chosen represents the study population.
2. Responses from the participants represent the situation on the ground.
3. All selected participants will participate fully for a correct assessment to be made.

2.13 DISSEMINATION OF RESULTS

This work was done with the support of the Ministry of Health in terms of supervision and guidance. It was carried out to help improve the service delivery of the ministry. Therefore copies of this work will be given to the hospital, the district health administration and regional health administration. Copies would also be made available to the district assembly since PPM runs through the various sectors of the economy. This is to serve as a guide for a better-maintained physical infrastructure of the ministry.

Abstracts of this work will be published in the newsletter of the ministry as well as in the newspapers since the problem of PPM runs through the various sectors of the economy. A talk will be held at the district health administration for the administrative heads of the various departments of the district health administration and the hospital. This will enable a better explanation of the findings of this paper in order to establish the importance of PPM to the district and the Ministry of Health.

CHAPTER 3

LITERATURE REVIEW

3.1 INTRODUCTION

Buildings are expected to exist for a long time, regardless of whether or not they have actually been designed and constructed to do so. The standard and level of maintenance of buildings in a country is invariably directly related to the strength of its economy. As countries become more developed they are disposed to require higher standards from buildings or with other aspects of life. **Lee et al (1993)**. The need for proper maintenance of buildings within the health sector is no exception.

3.2 BACKGROUND INFORMATION

In the immediate past, other departments managed matters relating to physical infrastructure on behalf of the Ministry of Health. The Public Works Department (P.W.D.) now known as Public Works Co Ltd was responsible for PPM and other repair works. The Architectural and Engineering Services Corporation handled the management of rehabilitation and new construction. The budget for maintenance was drawn and managed by the P.W.D. on behalf of the ministry. In most cases, these were inadequate or more usually disbursement was not done to the satisfaction of the ministry. This led to the Ministry of health to take responsibility for the management of its physical infrastructure since 1988. **M.O.H (1999)**.

3.3 SITUATION ANALYSIS

Notwithstanding this initiative, most of the physical infrastructure of the Ministry is still fast deteriorating. If one takes a critical look at the policy of the ministry on estate maintenance the major reason for the situation is that of an almost non-existent culture of preventive maintenance. However other issues have also played an important role as listed below.

- The general planning process for new construction of facilities has not been comprehensive enough to consider very vital issues arising, including recurrent implications like maintenance.

- There has always been inadequate funding for the management of existing infrastructure partly because the consolidated fund is always unable to meet respective demands.

- Lack of planning of many health facilities all over the country has led to the severe deterioration of these facilities.

- There is generally lack of commitment on the part of health workers as well as management to issues of day-to-day maintenance in their respective work areas. Staff in official residential accommodation provide a very sound evidence of this attitude in the misuse of their premises for other purposes other than residential, leaving the premises dirty and untidy. **M.O.H (1999)**

- Design deficiencies - approach to design, selection of materials, environmental factors, building shape and form, orientation of building, design and maintainability.

- Construction faults - control of work in site, control of materials.

- Vandalism – subjecting building to unnecessary attacks.

- Weather agents – solar radiation, photochemical effects, thermal effects moisture, wind, driving rain, atmospheric gases, chemical agents, biological agents etc. **Son et al (1993)**.

3.4 THE CONCEPT OF RISK

There is no doubt that if estates are not maintained they present a risk to the occupants. Therefore risk is a concept that must be applied to the decision-making process of maintenance.

Risk is endemic to all investment decisions. The decision to invest in buildings also provides a risk/return profile, which is competitive with the best finance that the market can provide. An agent bidding for the relevant part of a building project is committing resources, labour and capital that have other potential uses. Money may have to be borrowed, or reserves used, to cover a gap between income and expenditure. Therefore risk management aims to ensure that all that can be done will be done to ensure that the project objectives are achieved.

Once a risk is identified and defined, it ceases to be a risk. It becomes a management problem. We need to be more aware of what happens by analysis and people should be encouraged to brainstorm through destructive thinking where wild ideas can be thrown up about things that might go wrong. The ideas need to be collected into a risk management system where analysis can be undertaken. Some of the risks to be expected with regards to estates includes: Latent defects occurring in the structure through poor workmanship, failure to meet the required technical standards for quality, function, fitness for purpose of safety and environment preservation and unexpected price rises for labour and materials. With all these risk factors, it behoves management to try to maintain its investment. **Flanagen and Norman (1993)**

REASONS FOR MAINTENANCE

The concept of risk as regards the lives of the occupants being in danger and the waste of resources make maintenance a necessity. There are however other reasons why maintenance is very necessary. Below are a number of reasons.

a) To maintain the value of an asset; normally a better maintained building has greater value.

b) To ensure optimum usage of building. Good maintenance should allow building to be used to full potential.

c) To create or maintain suitable appearance. This can create a positive contribution to social deprivation. Badly maintained services waste energy and can affect environment.

d) To maximise life of main materials and components.

e) To ensure best use of materials and components. This allows them to function more effectively e.g. lights are more effective if they are kept clean.

f) To increase staff morale. It is widely accepted that good working conditions reduce staff dissatisfaction.

g) To ensure suitable standard of safety, to keep the building in line with statutory requirement.

h) To provide the fine adjustment necessary to tune a new building in to user's requirement.

i) To satisfy statutory requirements and keep building in line with changing requirements e.g. providing means of escape.

j) To ensure building does not detract from surroundings that are to allow provision of facilities in line with needs of community. It is to also ensure that building is capable of being put to a suitable use for the area in which it is located.

To get a building to be maintained to an acceptable standard it is essential that consideration be given to the functions the building must satisfy in order to meet the client requirements and to conform to existing legislation. These include: strength and stability, dimension and stability, thermal movement, exclusion of water or moisture, thermal installation, sound installation, fire resistance, cleanliness, durability, and economics. **Hall (1984)**

All these reasons make maintenance imperative.

3.6 PLAN FOR PPM IN THE MINISTRY

The vision of the Ministry of Health is to improve the quality of life and health status of the people in Ghana. The mission is that through maintenance the ministry will improve the environment on health estates for staff, patients and visitors. Via well maintained buildings to provide and secure good working conditions thus better services for patients. **M.O.H (1999)**

3.7 MAINTENANCE OBJECTIVES OF THE MINISTRY

The objectives of the preventive maintenance programme are:

- To promote a maintenance culture in the health sector.
- To establish and secure a country wide maintenance system on all health facilities
- To prolong the life span for health estates' physical facilities. **M.O.H(1999)**
- To assist the health estates officers in setting up a preventive maintenance system to operate and carry out day-to-day activities in their institution. The support to the individual implementation will mainly be:

i Hands-on training for selected maintenance persons

ii Manuals and handbooks on administration of maintenance and repair tool kit support for artisans. **M.O.H(1999)**

3.8.1 PPM FROM MTEF PERSPECTIVE

3.8.1.1.OBJECTIVE

The main objective for the estates maintenance in the medium term is to accelerate rehabilitation of existing buildings, to halt the deterioration, to put in place a planned preventive maintenance system for estates and finally to implement a programme of new construction in support of primary health services.

3.8.1.2.STRATEGIES

To be able to achieve this, the ministry intends to improve the in-house capacity of estates and assets management by strengthening the HQ unit. This will be done by recruiting regional estates managers, by designating and training health staff as district estates managers. The maintenance budget will be used through these estates managers who will allocate the limited funds to priority jobs.

Handymen will be recruited, trained and equipped to carry out the simpler repairs on estates. For more complex works, the Equipment Management Unit (EMU) will be strengthened by the recruitment of technical staff who will technically specify, contract out and supervise works to ensure good quality. A physical planning framework to guide the siting of new facilities based on criteria which will include distance, utilisation, staff availability, and adjacent facilities will be developed.

Review of record keeping tools and instruments will be done frequently and PPM will be carried out quarterly on estates to check the deterioration of capital projects. Using these criteria, a bottom up approach will be used to determine sites for new facilities. This system will become the basis for infrastructure expansion in the medium term. **M.O.H.(1998)**

3.8.2 PROPOSED SYSTEM

To be able to achieve the above it was proposed that as far as possible direct payment of contractors by donors should be avoided and the funds administered by M.O.H. Initiation and selection of all major new construction will conform to an overall sector strategic plan and standard specifications. Standard design of health centres (type A and B) has been completed. Standard designs for hospitals will be completed in due course. Major extension or construction at Regional and Tertiary hospitals will be approved at the national level. The Central Tender Board will be used for projects that require substantial funding.

The Regional health administration will have strategic plans for the siting/extension of civil works; ie prioritise and approve new structures, major expansion or repairs. Ongoing projects should be completed before new ones are begun. The budget for minor rehabilitation and maintenance should be decentralised to management units who will initiate and manage (ceiling specified). **M.O.H (1996)**

3.8.3 PROCUREMENT OF CIVIL WORKS

Currently within the Ministry of Health, identification of projects may be done by different parts of the Ministry. Donor funded projects are also handled by various parts of the Ministry (e.g. Regions, EAC, HASS, Project Management Units etc.). Host regions and districts are often inadequately involved in project identification and planning. At M.O.F donor projects are handled through IERD while GOG projects are handled by PIP. These various factors have led to poor co-ordination, inadequate attention to recurrent cost requirements and insufficient ownership by beneficiary districts and regions. The absence of a strategic capital development plan has also hindered the co-ordination and prioritisation of capital works using objective criteria. **M.O.H (1996)**

These and other factors gave rise to the following concern:

1. The absence of a capital development plan based on explicit criteria has led to uncoordinated and inappropriate type, design, scale and siting of new construction.
2. Top-down project initiation (by government and donors) has undermined local ownership.
3. Lack of institutionalised mechanisms to take account of the recurrent cost manpower implications of new structures.
4. Lack of M.O.H. involvement at the tendering stage, particularly Regional Tender Boards.
5. Need to further strengthen in-house capacity to monitor (or to manage consultants to monitor) implementation of capital projects.
6. Need to streamline payment procedures, including inspection of supporting documentation for payment authorisation.

MOH(1996)

3.8.4 OPERATION OF EMU IN THE MINISTRY

The preventive maintenance programme is managed by the Estate Management Unit located in the Ministry of Health and headed by the Director of HASS. EMU takes care of the policy formulation, overall planning and implementation. This includes designing of training programmes, developing of training material and manuals. All regions will have 1 estate manager and 1 assistant based on the regional hospital to be responsible for the maintenance. The estate manager will be trained in preventive maintenance to become a master trainer.

In the district and sub-districts one selected person on all larger health institutions will become the daily maintenance person in charge. Smaller ones will be clustered. The regional master trainer will plan and conduct hands-on training at institutional level for the maintenance persons. Ten to twelve health estates will be clustered at a time and the

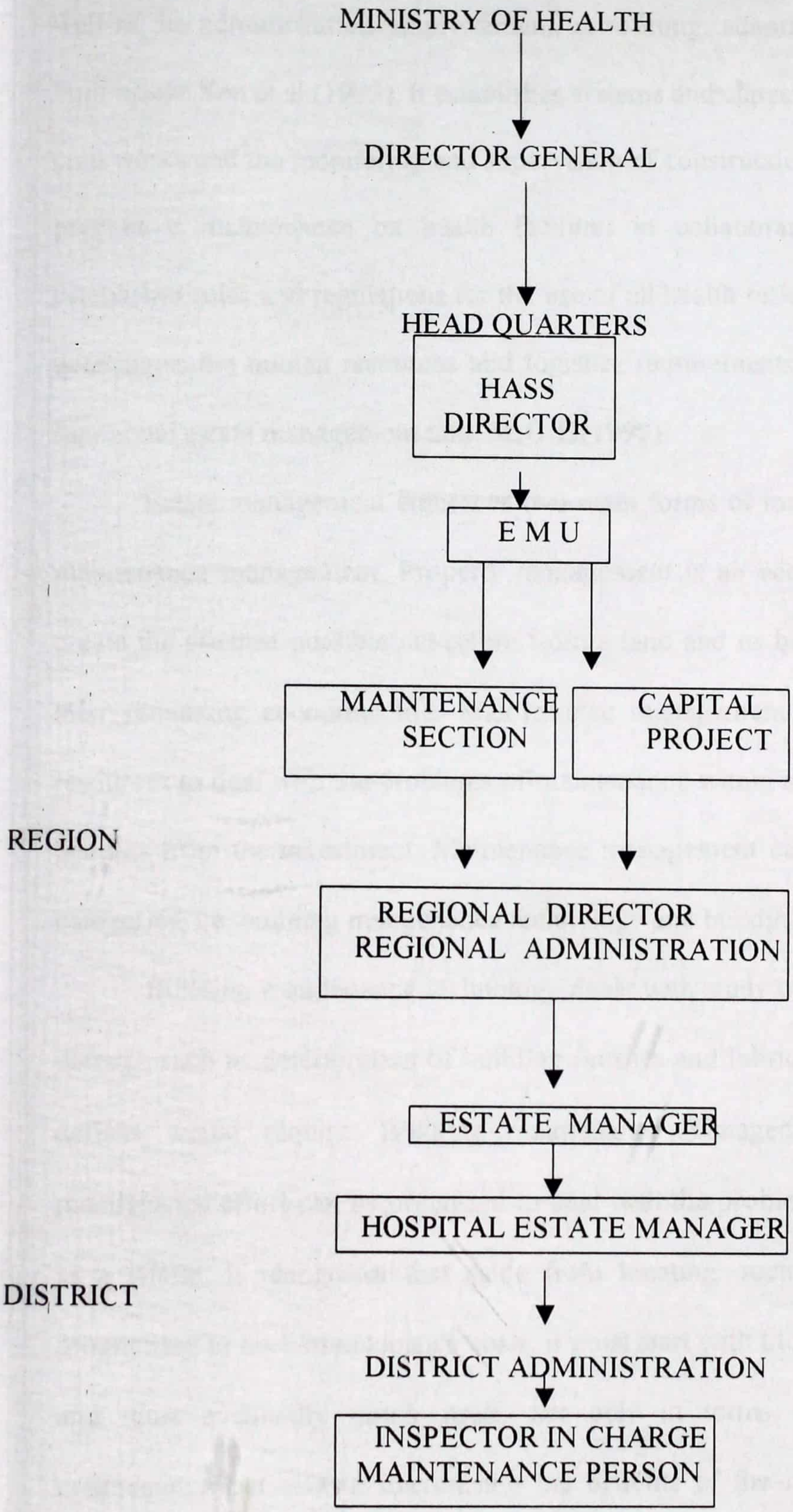
training conducted on one selected facility within the cluster. The training will consist of both theoretical and practical training.

M.O.H (1999)

3.8.5 ACHIEVEMENTS SO FAR

Considerable progress has been made in several areas. A strategic capital development plan based on objective service criteria is nearing completion. Standard facility designs are being developed. Capacity to manage and monitor capital projects has been strengthened. However, further efforts are necessary in other areas of concern highlighted above. M.O.H. (1996)

3.8.6 CHART SHOWING THE ORGANISATIONAL STRUCTURE FOR THE MANAGEMENT OF PHYSICAL INFRASTRUCTURE IN THE MINISTRY OF HEALTH.



3.9 ESTATE MANAGEMENT IN THE HEALTH SECTOR

Estate management involves the financial management of buildings and land as well as the administration, improvement, retrofitting, adaptation and expansion of the built assets. Son et al (1993). It establishes systems and capacities for the procurement of civil works and the monitoring and supervision of construction. It promotes a culture for preventive maintenance on health facilities in collaboration with communities. It establishes rules and regulations for the use of all health residential accommodation and determines the human resources and logistics requirements for the establishment of a functional estate management unit. **M.O.H(1999)**

Estate management embraces two main forms of management i.e. property and maintenance management. Property management is an economic service designed to create the greatest possible net return from a land and its buildings taken together over their remaining economic life. Maintenance management involves the organising of resources to deal with the problems of maintenance within an estate to obtain maximum benefits from the investment. Maintenance management can be divided into two main categories, i.e. building maintenance technology and building maintenance management.

Building maintenance technology deals with study of the occurrence of building defects, such as deterioration of building finishes and fabric and the remedies that such defects would require. Building maintenance management is how a system of maintenance effort can be organised to deal with the problems of building maintenance as a whole. It recognises that aside from locating, rectifying defects and effective programme to curb maintenance costs, it must start with the design of the building itself and must eventually justify itself, not only in terms of minimising the cost of maintenance bu also in maximising the benefits of the investment. This means that financial considerations and techniques play a vital role. **Son et al (1993)**

3.10 MAINTENANCE

Maintenance is defined 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. Son et al (1993). To retain implies that defects are prevented from developing by carrying out work in anticipation of failure. To restore means that minor defects are allowed to occur before they are corrected. In order that an item or facility can perform its required function, some degree of improvement is needed over the life of the building as standards of comfort and amenity rise.

In most societies organizations are set up to carry out a whole range of activities. In order that these activities are carried out efficiently, various forms of management have developed. Son et al (1993)

Source: Son et al (1993)

3.10.1 NATURE OF MAINTENANCE

Proper maintenance of buildings covers many aspects of work divided into 4 categories.

1. Planning and execution of day-to-day maintenance, which includes activities as servicing and cleaning, and the inspection of facilities and components.
2. Rectification work may be needed quite early in the life of the building because of design shortcomings, inherent faults in the use of materials or faulty construction.
3. Need to consider the replacement of costly items in the building.
4. Retrofitting or modernisation. This sector of the market is concerned with alteration, addition and enhancement to existing buildings on both a small and large scale. Retrofitting work includes all work designed either to expand the capacity of a facility to some new function.

Son et al (1993)

3.10.2 PLANNED PREVENTIVE MAINTENANCE

Planned Preventive Maintenance is maintenance carried out at predetermined intervals, or corresponding to prescribed criteria and intended to reduce the likelihood of an item not meeting an acceptable condition. **Lee (1984)**. PPM is carried out with forethought, control, and records. It is carried out under 6 major criteria ie planning, budgeting, inspection, feedback, execution and record keeping. In order to introduce such a system it is first necessary to produce an inventory of every building, area, service etc. which has to be maintained. Then it is necessary to determine which items should be included in the PPM programme and the frequencies at which they will require attention e.g. weekly, monthly, quarterly or annually. The selection would be based on the consequences of failure in regard to such factors as safety, and productivity e.g. fire doors would obviously be included and the frequency of analysis of past records. Finally, job cards are prepared for the various tasks and an appropriate manual or computer brings forward the system devised. Performance of PPM should be monitored continuously to

check that the work is being carried out in accordance with the programme and that the costs are commensurate with the benefits. **Lee (1984)**

Additionally one could add that the very act of performance in order to predict the future leads to a more enlightened approach to the management of maintenance operations**. Lee (1984)**. Planning, budgeting, controlling and the cost of maintenance work are essential operations if buildings are to be maintained effectively within available funds. This leads automatically to regular inspections and the implementation of programmes of planned maintenance. These activities need to be backed up with adequate data and particularly a full awareness of maintenance and operating costs.

Planning and budgeting are related and must proceed simultaneously. It is not possible to plan maintenance in the absence of an effective programme. Nevertheless, effective building maintenance is dependent upon making the correct decisions and satisfactorily implementing them. Building maintenance should be regarded by management as part of the total operating strategy; that far from being a 'make do' and mend service, it should be viewed as a property conserving activity contributing to the success and well-being of the operations and occupants within it.

Seeley (1987)

3.10.3 POLICY FORMULATION

The ability to formulate a long term-term maintenance strategy and prepare budgetary forecasts is one of the benefits of having a maintenance policy. **Seeley (1987)**

A maintenance policy is a strategy within which decisions on maintenance are made. Alternatively it may be defined as the ground rules for the allocation of resources (men, materials, and money), between the alternative types of main action that are available to management. In order to make a rational allocation of resources the benefits of those actions to the organisation as a whole must be identified and related to the cost involved. It is necessary therefore to consider the questions of policy under the following heads:

3.10.3.1OBJECTIVES

What does maintenance have to achieve? This should be viewed in the context of the organisations overall building needs. Maintenance is an important part of the terotechnology approach, which has been defined as a combination of management, financial and other practices applied to physical assets in pursuit of economic life-cycle costs. It requires all departments in an organisation to co-operate in ensuring that the assets of the organisation are planned, provided, maintained, operated and disposed of at the lowest cost to the organisation. **Lee (1984)**

3.10.3.2 BENEFITS

What is to be gained? The benefits may be either short-term or long term and may be classified as financial, technical or human. The financial benefits spring from a more effective use of the building and are reflected in higher productivity, less wastage of materials, improved sales figures etc. The technical factors are related to the preservation of the physical characteristics of the building and its services and are reflected in fewer breakdowns with a reduction in calls for emergency repairs, less accidents, lower future maintenance costs etc. **Lee (1984)**

The human factors are related to the psychological effect of the condition of the building of the user and are reflected in such things as a lower rate of staff turnover with reduced recruiting and training costs, better customer relations and an improved public image. Clearly some of the benefits are difficult to quantify but some attempt should be made to express them in money terms so that the analysis can be as complete as possible.

Lee (1984)

3.10.3.3 POLICIES

How shall we proceed? This involves laying down operational and cost objectives for the main department starting with the identification of main tasks, the standards to be achieved and the limits of cost. This will lead to policies concerning the proper balance between preventive and corrective maintenance. How far should work be programmed rather than relying on user requests? How should different types of work be prioritised (is the work better carried out by direct labour or contract)? Where the properties are dispersed over a wide area, to what extent should decision making be decentralised?

These policies still determine the structure of the maintenance organisation and the roles and duties of the supervisory staff. **Lee (1984)**

For policy formulation the following approach is recommended.

1. Analysis of present condition of buildings, their nature and use, and estimated life cycle.

2. Outline programme of work necessary to put and keep the buildings in satisfactory condition.

3. Determine the method of implementing the programme.

4. Calculate the approximate annual total cost.

In most cases, two assessments will be needed first for the period while the buildings are put in repair including routine repair and then the assessment of the cost of keeping them in that state. A quick arrest of buildings is recommended by putting the building in shape. Periodic inspection preferably annually is the best method of ensuring that the right policy has been devised and is being implemented and adapted if necessary to meet changing conditions.

The department of Health and Social Security Nottingham has emphasised the need for maintenance managers to prepare cost long-term and annual programmes of work for maintenance which distinguishes between work of a periodical nature, work of an irregular nature, planned preventive type requisitions and emergencies.

Provision must also be made for minor improvements. It is intended that long-term programmes should be on a rolling basis, being reviewed and moved forward as each annual programme is prepared.

In assessing maintenance priorities in the National Health Service Nottingham, the following approximate order of priority is recommended: safety; essential service; statutory requirement; security; initial cost; revenue saving; spares availability; alternative source of supply; delivery time; manpower; and public relations.

Seeley (1987)

3.10.4 STANDARDS OF MAINTENANCE

If maintenance of buildings is not carried out, the fabric of buildings first become unattractive, then unacceptable to the occupants and finally dangerous and uninhabitable. The maintenance manager has to decide the optimum level of maintenance work required on the fabric to preserve an acceptable environment in the buildings under his care. He has for instance to decide whether a building should be patched temporarily and replaced later or be replaced immediately. To determine the best course of action he needs to consider the use and condition of the building, the comparative cost and effectiveness of different types of repair, the accepted future life of the building, acceptable standards of maintenance and similar matters.

The first step is to determine reasonable standards of maintenance for the various building elements, such as paintwork, rainwater, goods, and windows and paths. These usually fall into two categories.

1. Where standards can be related directly to cost. e.g. it is evident that a roof should not be permitted to deteriorate until it leaks as this will give rise to higher future maintenance cost.
2. Where maintenance costs do not increase appreciably as the condition deteriorates e.g. for instance it costs little more to repaint internal wall surfaces after 7 years than

after 5, years although the appearance would have worsened. Hence discussions are needed with management and occupants to agree to appropriate standards.

After establishing reasonable standards, it is necessary to estimate the deterioration rate of each element, so that changes in its condition can be related to its age. This rate is influenced by a number of factors such as aspect, age and location. The maintenance manager should supplement published data with his own information on the history of elements.

Next step is to decide the main policy to be implemented for each element, determining also the method and materials to be used. The cost of maintaining each element can then be estimated over a period of time. Over this time scale, most elements will need replacing or repairing and average annual maintenance costs can be computed.

Finally, the average annual costs of implementing the maintenance policy can be assessed by summing the average annual costs of all the elements. If the total cost can be met from available resources, the maintenance manager can prepare a programme of work, but if the resources are insufficient then lower standards of fabric maintenance will have to be set which are consistent with available funds.

Seeley (1987)

3.10.5 BUDGETING

This is a financial and/or quantitative statement prepared prior to a definite period of time of the policy to be pursued during that period for the purpose of obtaining a given objective. The budget limits will be established after inspections, critical analyses and estimates have provided the essential supporting data. Budgetary control is an important management function aimed at planning and controlling the use of its resources in order to achieve its objectives. All too frequently a main budget is based on previous year's allocation and a percentage added to it. Admittedly there is no standard method of

budgeting, but the skills and empiricism of building surveyors with their wide-ranging experience of the construction, use, performance and cost of repair of buildings can help to provide a sound base for budgeting. Building as a plan stipulates the use of the organisation's available funds over the projected time span towards the various objectives and opportunities within the total plan. It is thus the basis of control, monitoring, evaluation and the provision of a basis for decision taking upon ensuring operations and future plans. **Seeley (1987)**

3.10.5.1BUDGET AND BUILDING MAINTENANCE

In a research study carried out on building maintenance in Ghana, it was revealed that all hospitals have yearly budgetary allocations for maintenance. The research revealed mismatches with respect to budgeting and planning. It showed that while all hospitals had budgetary allocations, only 67% have plans for maintenance. **M.O.E (1999)**

There are often technical difficulties in assessing the quantity, problems in execution and costs of building maintenance work. Overruns and underestimates frequently result from failure by management to recognise the value and need for realistic budgets. In most cases, cost of expenditure is such a small proportion of the total expenditure that it is not accorded a very high priority.

Few organisations regard building maintenance as the preservation of the value of the asset as a functioning property. Normally there is a tendency to pay for renewals and replacements by reducing expenditure on routine maintenance. Delayed expenditure however in these areas means higher future costs, owing to increased prices and possibly higher operating costs. To overcome these difficulties, it is good practice for financial authorisation for new assets to include the capital cost of the project, depreciation and

running costs so that it is considered as a whole from initial conception. With existing assets, the condition should be assessed and funds set aside for planned renewal and replacement. Therefore it is appropriate to prepare a budget on minor repairs and also budget reservation for unseen expenditure as well as prepare a balance sheet for the funds available for PPM. All these must be done on planning forms (see appendix for sample of forms), as part of the planning process.

Planned preventive maintenance is subdivided into 3:

1. Preventive running maintenance - work which can be done while the facility is in service.
2. Corrective shut-down maintenance - work that can be done when the facility is taken out of service.
3. Corrective breakdown maintenance – work, which is carried out after a failure, but for which advance provision, has been made, in the form of spares, materials, labour and equipment. **Seeley (1987).**

All these forms of PPM must be organised with forethought, control and records. Each item of work is identified some time before failure or a diminution from an acceptable standard of the facility. In practice the most common approach to building maintenance is to wait until occupants report a defect to the maintenance organisation. Often a better approach would be to adopt a policy of periodic inspection of the property and subsequent rectification of observed defects. Observing and rectifying a defect at an early stage is likely to reduce repair costs. Furthermore a large proportion of maintenance work is identified and grouped at discrete points in time. The maintenance organisation is able to allocate its resources and rectify the defects in the most efficient manner.

Maintenance programming should ideally be preventive as far as practicable based on regular inspection at intervals designed to prevent trouble from developing or accumulating. Admittedly not all building defects can be prevented but many can and

others will be rectified before they become more expensive. The frequency of inspection is the crux of the matter so that the right balance is struck between the cost of inspection and prevention on one hand and expenditure on repairs on the other. **Seeley (1987)**

Having decided a maintenance policy the next step is to prepare a maintenance program. There may be the need to deal with a back log of general disrepair, to plan major restoration works some years ahead, to deal with year to year painting, decorations and associated repairs, and to operate a system of regular inspection and minor repairs. Very often it entails programmed maintenance within a restricted budget and scarce resources to satisfy many demands. This entailing a professional assessment of the overall situation, inspection of specific problem areas, formulation of general strategy for containing or removing critical problems and for reducing the breakdown aspect of maintenance to an acceptable level.

It must be emphasized that for effective maintenance there is the need to establish an inspection cycle, which ensures that no building is left without being inspected for 5 years. Interim examinations should be carried out at intervals of not less than 12 months. These should be done on inspection forms (see appendix for samples of inspection forms). The aim of the intermediate inspection should be to detect defects, which would result in progressive deterioration if left unattended until the next cyclic inspection. **Seeley (1987)**

A study of hospital maintenance (U.K.) examined a variety of approaches ranging from ad-hoc inspections to annual inspections and different inspection frequencies for different elements, having regard to the dispersed locations of hospitals. The study recommended 2-yearly regular inspections together with interim inspections where necessary. On inspection it was suggested that the following information should be recorded on standard inspection forms and this information used to provide the starting point for the next inspection.

1. Locality and identity of elements.

2. Type of work (for e.g. patch or replace).

3. Extent of work (such as area involved).

4. Estimated year of treatment.

Seeley (1987)

There is a need to devise a classification system for assessing building condition to secure uniformity of approach. Seeley recommends five categories of condition ranging from class 1 (very good) to class 5(dangerous). In like manner the levels of maintenance to be achieved will be influenced by the type of building and the use of the part under consideration and these can also be assessed on a five-point system ranging from level 1(very high) to level 5(very low, prior to demolition.).

Seeley (1987)

3.10.6 PROGRAMMING MAINTENANCE

The next step is to prepare a program of maintenance. It is necessary to assess the general condition of the buildings, services and external works and to consider these against the criteria adopted.

Painting: Choosing the correct paint for the project is vitally important. The difference in initial cost between a satisfactory material and a cheap paint is insignificant compared with the additional labour and disruption costs in having to repair one year later, together with possible deterioration of the base material in the meantime.

Cleaning: Cleaning can in fact be regarded as part of maintenance in that in part it is a preventive and protective activity eg regular washing down of painted wall surfaces reduces subsequent painting costs. Programming of cleaning work should be preceded by a survey of the various floor and wall finishes with their respective areas and uses. Uses have a bearing on cleaning frequency (eg windows, dinning rooms, etc). Work sheets are to be compiled for daily, weekly, monthly, quarterly and annual operations and these will

provide the basis for estimating labour requirements (see appendix for maintenance schedule)

Supervision and inspection of cleaning work is vitally important. These programs can be based on manuals drawn up for each building recording all relevant data such as painting specifications, superficial cost in a particular year. A program of preventive maintenance such as drain clearing, gutter clearing, tap re-watering and oiling and adjusting door furniture can be prepared for each item.

The main part of any maintenance program is usually a series of pre-planned inspections. A checklist ensures effective inspection at suitable intervals. (see appendix for a sample of a checklist).One effective method is to operate a planned maintenance system based on a 5-year painting cycle. Alongside this is work urgently needed for reasons of safety or hygiene such as rewiring, replacement of sanitaryware or making good defective structural work. A more comprehensive improvement can be classified under 3 main headings as internal improvements, external improvements and site improvements.

Seeley(1987)

3.10.7 RECORDING AND DISSEMINATION OF MAINTENANCE DATA

This will be needed for decision making and the action which has to be initiated. To be effective, information has to be collected, collated, presented and be easily retrieved and capable of direct application in problem solving and decision-making.

Seeley (1987)

3.10.8 BUILDING RECORDS

The maintenance manager must know what he is managing. He/She must know the geographical location of the property, the constructional details by elements, age condition, and details of services. The manager must know the accommodation available,

the current user, and any proposals for the area by the local authority which might affect the property etc. Management can choose whichever method to record such information. **Seeley (1987).**

3.10.9 MAINTENANCE RECORDS

There is the need for cost information for both overall budgetary controls for making day-to-day management decisions. There is the need for more information on the consequences of design as they affect maintenance costs and insufficient feedback of maintenance cost data. Maintenance cost may be kept to fulfill criteria below:

1. Budgetary control- to provide the annual or other periodic sum, which needs to be set aside to provide for maintenance and operating services.
2. Design Cost Control – to provide full information concerning causes of failure, design faults and similar particulars. Records of roof repair showing type of tile, quality of tile, method of laying, etc.

Some have advocated a hierarchical system of grouping or classification of items for recording maintenance work and costs. The grouping may not necessarily be a detailed one. eg 1.external painting 2.internal decorations 3. main structure. 4. internal structure 5. finishes and fittings(including kitchen equipment) 6. plumbing and sanitary services 7. mechanical services, including heating, ventilation and gas installation 8.electrical services 9.external works 10. miscellaneous and ancillary works.

A coding system for building maintenance is necessary during costing. There should be a process code, which should have items as renew, remove, refix, ease and adjust. There is also the descriptive code, which could be used to identify materials and components; a block code and a location code to identify locations and different levels and a reason code to encompass the type of maintenance and the nature and/or cause of the defect. This coding system allows for comparative, analytical and monitoring purposes. A further breakdown of expenditure into elements will isolate expenditure

items. which can be investigated. Where expenditure reveals the failure or short-life of an item, an alternative replacement should be considered. The analysis of expenditure may also be subdivided according to use and cause of failure under such heading as vandalism, boisterous use, fair wear and tear, design failure and poor workmanship. A further policy variation, which will affect maintenance costs, is the extent of self-help maintenance, whereby tenants often undertake small repairs themselves. Additionally, tenants of some local authorities are permitted to make certain improvements for their homes.

Seeley (1987)

3.10.10 MAINTENANCE FEEDBACK

Maintenance Feedback should be an essential part of any maintenance administration; Feedback may be in two ways:

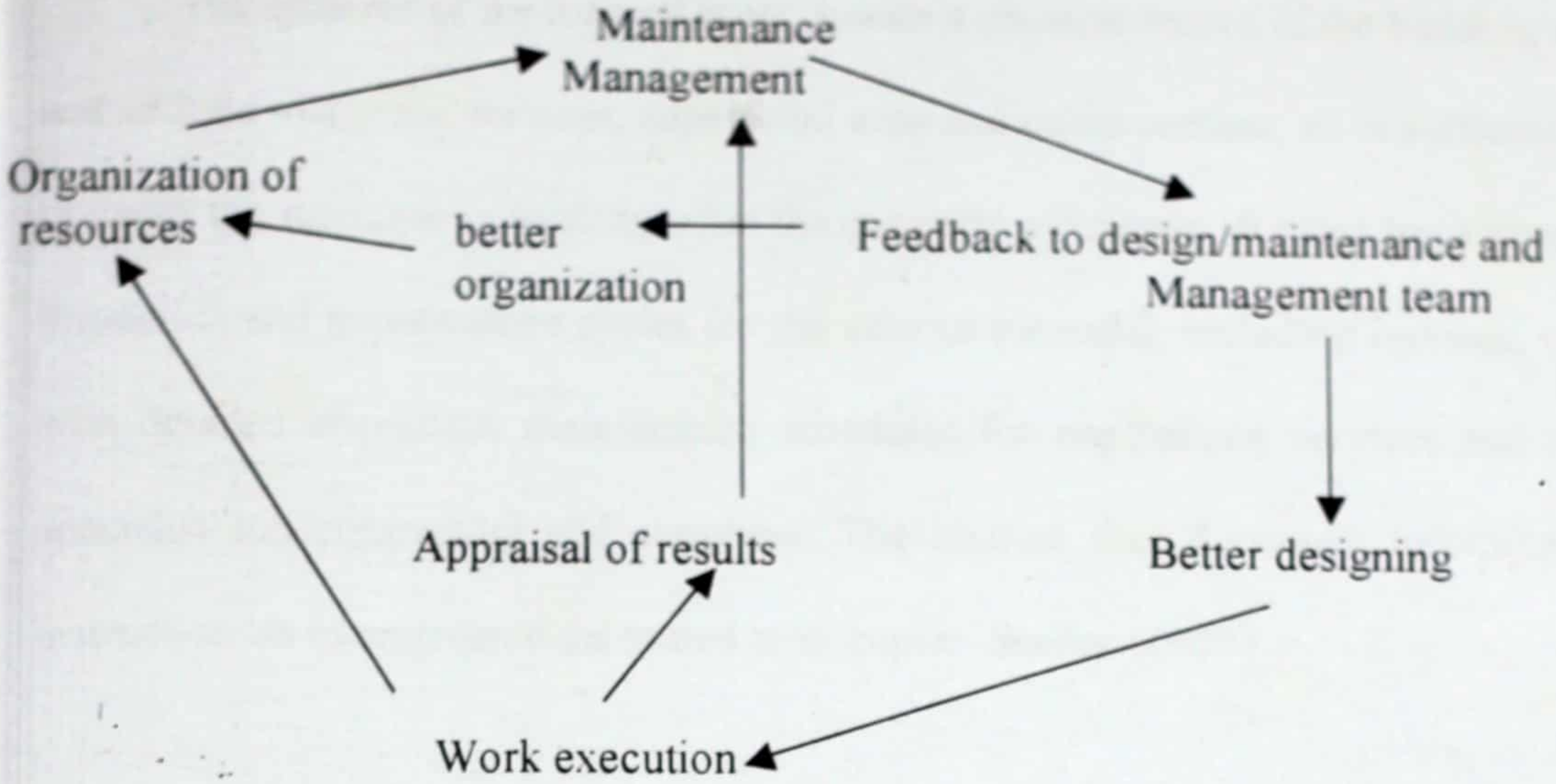
1. Direct to the maintenance team: particularly information on design faults, faulty workmanship and material failure.
2. By general discussion within the maintenance team when solutions to problems should be documented and passed on to all appropriate personnel.

Maintenance feedback should be organized on the following criteria.

- management organization of resources.
- work execution.
- appraisal of results.
- corrective action through feedback to design and management teams.

To assist in the feedback of information, site defects are suitably recorded showing the symptoms, diagnosis, prognosis (projection of defects performance in time) and the agreed remedy. For maintenance budgeting on particular elements the authorities have to depend on site feedback.

Seeley(1987)



Seeley (1987) Feedback in Maintenance Supervision

3.10.11 MAINTENANCE MANUALS

To ensure proper maintenance there should be a maintenance manual. which should provide clearly and concisely all the information needed to maintain and operate the building satisfactorily. The maintenance manual will facilitate building maintenance. There is however a growing awareness of the need for manuals to be prepared for new buildings by the design team as part of the building contract.

A maintenance manual will serve three principal functions.

1. It will allow property managers to organise the repair and maintenance of the buildings, its services and surrounds effectively and economically.
2. It will enable occupiers to clean the building and operate its services efficiently thus reducing loss of time and production.
3. It will establish a link between the project design team and the client and his maintenance organisation to their mutual benefit.

Seeley (1987)

3.10.11.1 CONTENTS OF MANUAL

The contents of the manual must contain a physical record of the building and site and include materials, services, superficial area and cubic content, all in sufficient detail to assist the manager in looking after the property efficiently. It must have time-based inspection and maintenance cycles for the various elements, including services, together with detailed checklists, maintenance schedules for engineering services and a list of specialist sub-contractors and suppliers. The manual should contain information and instruction on maintenance delegated to occupier. **Seeley (1987)**

3.10.12EXECUTION OF MAINTENANCE WORK

The maintenance policy will decide whether directly employed labour or contractors or both will be the most advantageous. Management should therefore compare cost and services by contractors with its own direct labour force taking into account availability of labour type and location of buildings to be maintained.

Seeley (1987)

3.10.13BUILDING MAINTENANCE DEPARTMENT

This takes up the responsibility for directing and undertaking repairs and maintenance. The primary function will consist of determining general maintenance policy, assessing finding requirements, preparing work programmes, executing maintenance work, progressing the work, monitoring costs and implementation feedback procedures. **Seeley (1987)**

3.10.16NOTIFICATION OF DEFECTS

Defects are notified in a variety of different ways that are now listed roughly in descending order of use:

- Telephone call from tenants.
- Tenants returning pre-paid complaint card.
- Letter from tenant.
- Officer of local authority finding defect.
- Tenant notifying defect in person at department or housing office.

It is better for complaints to pass through maintenance control where a maintenance card can be completed and property card index system established.

Seeley (1987)

TENANT REQUEST CARD

HOUSING MAINTENANCE REQUEST
(BLOOCK LETTERS PLEASE)

NAME.....TEL NO.....

HOUSE NUMBER.....

KEYSAT.....AT HOME AM/PM (NOT SATURDAY)

DATE.....

PLEASE GIVE PRECISE NATURE OF FAULT, WHERE POSSIBLE LOCATION(INDICATE BY TICK IN BOX)

LOCATION			NATURE OF FAULT
EXTERNAL	☐	INTERNAL ☐	
ROOM		KITCHEN ☐	
		LIVING ☐	
		DINING ☐	
		BEDROOM ☐	
		BATHROOM ☐	
		WATER CLOSET ☐	

FIG 8 Seeley (1987)

NOTE: Please use this card to request repairs, if urgent state it. Unless otherwise, repairs may normally be expected to be carried out within 7 days.

Housing Maintenance Request Form

<table>
<tr><td colspan="2">HOUSING REPAIR REQUEST/ACKNOWLEDGEMENT

HOUSE NO
HOUSING REPAIR REQUEST ACKNOWLEDGEMENT</td><td colspan="2">DATE

POST CODE</td></tr>
<tr><td colspan="4">ADDRESS</td></tr>
<tr><td>ITEM

SINATURE</td><td>WORK DESCRIPTION</td><td>PRIORITY CODE</td><td>ACCESS DETAIL

CONTRACTOR ITEM

CONTACTED

INSPECTION REQUIRED/ ADDITIONAL DETAIL</td></tr>
</table>

FIG 9 Seeley (1987)

3.10.17 EXECUTION OF MAINTENANCE WORK BY MAINTENANCE DEPARTMENT

The maintenance department is to decide on the urgency of the job and the response time to tenants request for non-emergency work. The department must operate according to what are on the jobs card so that it can prepare a job form for the building.

Seeley (1987)

Component Maintenance Procedure

Element or Component Part (roof-pitched, roof covering)

↓

Detailed Component Breakdown (clay, plain tiles)

↙ ↘

Evidence of Defect (laminated and slipped tiles
Corroded, galvanised nails)

Evidence of failed functional performance (direct rain penetration)

↘ ↙

Suggested remedial Action (strip tiling and replace with new clay tiles, etc)

↓

Maintenance Documentation Preparation (specification)

↓

Maintenance Execution (tiling stripped and replaced, etc.)

↓

Feedback on effectiveness of Action (check to ensure properly laid and effective barrier to rain achieved)

FIG 10

Seeley (1987)

Maintenance Feedback Report form

Item: floor finish; clay tiles	Area Address Type: C22 semi-detached
Defects	
Symptoms Diagnosis Prognosis	Approximately 1/3 of clay floor tiles in kitchen arching and lifting (approximately 1 year after laying). Shrinking of cement, sand screed, resulting in breaking of bond between tiles and screed. Progressive damage occurring, recommend immediate action to prevent injury to elderly tenants
Remedy/recommendation	Take up tiles, remove bedding grout, lay polythene sheet over screed and relay tiles to whole floor, with expansion joint around the perimeter of the room.
Authorisation:	Date Survey: Compiled By:

FIG 11

Seeley (1987)

Job Order Form

Name of Hospital			
Name		Address	
Keys at		At Home am/pm	Date
Trade	**location**	**Repair**	**Craft Operative**
Carpenter Electrician General Painter Plumber Glazier Mason	Internal External Kitchen Living Dining Bedroom Bathroom W.C.		Material Used: Time Taken:
Special Instructions: Comment:			
Other Trades Necessary:	Signature : Craft Operative: Foreman:		Date:

FIG 12 Seeley (1987)

The PPM and operation system used by one government department embraces:

- Providing operatives with information and work to be done (job sheets).
- Overall planning of work (planning chart).
- Issuing orders for work to be done (work dockets, contractors orders).
- Keeping records of work done (by books).

Seeley (1987)

3.10.18 SPECIAL POLICIES

All significant repairs, except those resulting from deliberate maltreatment by the tenant should be the responsibility of the housing authority. Most non-urgent repairs can wait for execution under a PM cycle if the delay does not exceed one year.

More time should be devoted to routine inspections to ensure that attention is paid to repairs not reported by tenants. Tenants should be encouraged to take more interest on the maintenance of their dwellings. **Seeley (1987)**

Property Maintenance Record Card.

Maintenance		**Address**				**District Code**	
Work						**Property Code**	
Date	**Work Docket No.**	**Work**	**Direct Labour or Contract**	**Cost Estimate**	**Cost Accrued**	**Invoice**	**Account code**
17/09/00	5347	Repair to front guttering	Hospital	45,000	45,000	19732	2

FIG 13

Source: **Seeley (1987)**

Programming a Progressive Maintenance Work

To maintain regular progress of building maintenance work, a progress chart should be prepared before the work is commenced, usually in the form of a bar chart, with bar line representing the time period allocated to each operation. There should also be regular training for managers, supervisors, officers etc. **Seeley (1987)**

3.10.19SUPERVISION

Adequate supervision on repair work is needed to ensure that the materials and workmanship comply with the relevant statutory requirement (client satisfaction). In the absence of such supervision, inferior materials, poor workmanship, and the omission of important details can occur resulting in subsequent trouble and expense to the hospital. Therefore there is the need to check for concrete work, brickwork, masonry, roofing, carpentry, joinery, plasterwork, paintwork, plumbing, drainage etc the organisation of work on specific tasks and to see that the work done meets maintenance objectives.

Seeley (1987)

3.11 PPM FROM PWD PERSPECTIVE

The public works company has two forms of maintenance i.e. periodic and routine. The periodic maintenance entails major rehabilitation and routine maintenance are small jobs done on routine bases on various estates to prevent them from fast deteriorating. PPM under PWD is planned in that a committee sits to forecast and budget for the maintenance to be carried out the whole year.

The budgeting is done by experience gathered over the years and by looking at the inflation rate and the cost of items on the open market. Most of the time the budget allocated to them quarterly is not enough so they prioritise. Before then, proposal on work to be done in a particular year is prepared. This is done by the filling of forms by the sectional heads. Prior to this there would have been inspection on buildings to know which need urgent attention. This and reports made by tenants through the use of request books gives a fair knowledge about the building to be tackled in a particular year.

At the end of every year, sectional heads submit items that they need for maintenance work to be carried out by their departments. This is also made possible by

the grouping of jobs to be done into their various units then after submitted to the relevant department.

After routine maintenance job cards are prepared and the work inspected and certified that it has been well done. Then a report is written quarterly on jobs done and submitted to the headquarters in Accra as a progress report. There are records on all jobs done by the departments, i.e. cost, items used, when job was carried out etc. It must be said that materials are kept in stores for emergency jobs or future jobs.

Periodic maintenance takes a different form in that P.W.D. no longer carries out jobs that fall in this category. A critical review of this type of maintenance has shown that it was not cost effective. Therefore it was changed during the P.N.D.C. era to public investment programme. Under P.I.P, buildings that need major rehabilitation are contracted out and all that PWD has to do is to supervise, monitor and inspect to ensure value for money. In completion a payment certificate is prepared before payment is effected. **Tetteh (2001)**

CHAPTER 4

FINDINGS

Out of the 71 estates sampled, 4 houses were uninhabitable, 7 residents not met at home, 6 were on leave and 3 on transfer and one (1) refused to respond, therefore, reducing the study population to 50.

4.1 MANAGEMENT'S KNOWLEDGE

MAMPONG DISTRICT HOSPITAL
MAINTENANCE PLAN FOR THE YEAR 2000

PERIOD: 1ST QUARTER-JANUARY-MARCH.

NO	NO. WITH TYPE OF BUILDING	LOCATION	TYPE OF REPAIRS	SOURCE OF FUNDIG	AMOUNT	REMARKS
1.	Qtrs. No.2	Gen. Wing	Painting. Windows, Doors, Netting	I. G. F		Executed
2.	Bung. No.11	Gen. Wing	Painting. Patching. Reinstallation of water, kitchen cabinet	I. G. F		
3.	Bung No.16	Gen. Wing	Roof leakage, and Netting, painting and others	F. E.		

SOURCE: **DISTRICT HOSPITAL, SEKYERE – WEST DISTRICT**

FIG 14

Management knows what PPM is as this is evident by posters in all areas of the hospital. The estate officer who happens to be a national service person was even sent on a workshop on PPM. There is also a maintenance manual at the hospital showing how maintenance works are to be planned. The hospital administrator had prepared a repair work plan for the year 2000 but it was incompletely filled (see fig 14). There is a

workshop, which is in bad shape. The hospital administrator was the person to whom all faults were reported. Furthermore, he was the man in charge of facilitating maintenance at the hospital.

4.2 PPM SYSTEMS IN PLACE

Table showing PPM System inspection, maintenance and feedback

Inspection due to report	40%
Inspection without report	10%
Maintained Estates	34%
Non-maintained Estates	66%
Request Maintenance	18%
Non requested	16%
Complaint due to non-maintenance	51.5%
No-Feedback due to complaint of Non-maintenance	43.6%
Feedback due to complaint of non-maintenance	7.9%

Fig 15

The system of maintenance at the hospital is that tenants report faults on their residence to the administrator who in turn asks maintenance persons to go and inspect and draw a budget. After this, a requisition is prepared for the job to be done which is taken to the medical superintendent for approval. If budget is approved, the work is done. The work is then inspected and if work is satisfactory, it is paid for. The maintenance persons of the hospital carry out mostly the work. If the work to be done cannot be done by these persons, it is contracted out.

There was no plan for the maintenance when the researcher took inventory of the estates. The inventory further revealed that the planning was done on repair forms that were incompletely filled. There was no exclusive budgeting for PPM, but there was budgetary allocation for residential estates from the Government of Ghana.

As to the question of routine inspection 40% said they have had some visits but these were not routine and this was done when faults were reported. 10% said they have had visits which were unsolicited. 34% claim have had some maintenance done on their residence, 18% requested for it and 16% did not. 66% claimed nothing has been done on their residence. 43.6% have had no feedback and 7.9% had some feedback in that they

were visited but nothing was done. There are records on how many estates the hospital has with their numbers and occupants. Unfortunately these are on sheets of paper and in ink. The numbering is not sequential. There are no records on jobs done on estates. The administrator had to recall work done on estates from memory.

4.3 MAINTAINED ESTATES

* Total number of Estates maintained = 26
* Total number of non-maintained estates = 45

Breakdown

Maintained Estates = 17 quarters, 9 bungalows
Non-maintained Estates = 44 quarters, 1 bungalow

Percentage of Maintained Estates = 34%

Table showing maintenance

Maintained Estates	34%
Non-maintained Estates	66%
Estates maintained once	31.6%
Estates maintained more than once	2.4%
Hospital source of maintenance	30%
No knowledge of source of maintenance	4%
Percentage paid for maintenance	0%

Fig 16

The administrator in charge of maintenance gave these figures; 17 quarters and 9 bungalows have had some maintenance with 44 quarters and 1 bungalow not maintained for the past three years.

Using a questionnaire, the findings revealed that the average age of occupancy is approximately 11 years. Findings further revealed that 34% of the residents have had maintenance done on their estates. Out of those who have had maintenance, 16% i.e. 8 people had their maintenance years ago with 6people i.e. 12% having theirs months ago.

It must be said that out of this figure, only 2 had their maintenance this year. The 4 had theirs in 1999. Those who had theirs years ago i.e. two years and beyond had one person's maintenance going as far back as ten years ago. Residents benefited from the

work done on their estates as follows: 14 people had some work done in the interior. 9 had some work done on the exterior and 7 people had some painting done.

15 people i.e. 30% of the sampled population claimed that they has some maintenance work done by the hospital with 2 people saying they didn't know who did the work because it was done before they occupied it. None of those who have had some maintenance paid for the job. Out of the 34% of those who said that PPM had been done on their residence 26% have had maintenance done only once with 1 person i.e. 2% having had maintenance done twice. Out of the participants 33 i.e. 66% said no maintenance has been done on their residential estates. Out of the 50 people interviewed 90% of them said there were estates that needed major rehabilitation.

This was actually confirmed when an observational study was conducted. It showed that out of the 71 estates 12 estates needed minor maintenance, 11 need major rehabilitation and 4 estates have been rendered uninhabitable. The rest however needed a few things to be done. As to whether the deterioration could have been avoided 90% of them said it could have been if both management and residents had carried out regular maintenance.

Out of the 33 people i.e. 66% who have not had any maintenance done on their residence 15 i.e. 30% said the reason could be financial with 18 of them i.e. 36% felt it could be any other reason.

4.4 CLIENT SATISFACTION

Client Satisfaction	
Satisfaction due to maintenance	18.1%
Non-Satisfaction due to maintenance	15.9%
Work still to be done on maintained Estates	30%
Supervised and passed maintenance	20.4%

Fig 17

From the sampled population 15.9% of residents claim they were not satisfied with the work that was done because in no time what was done deteriorated. 8 said they were satisfied which is 18.1%. Out of the 17 people who said they have had some maintenance 15 of them i.e. 30% claim there is still work to be done on their houses ie interior, exterior, compound and painting. Interviewing key informants, 60% claim that work was supervised and passed as satisfactory.

4.5 RESIDENTS CONTRIBUTION TO PPM

Residents Contribution	
Initiative to maintenance by residents	55.9%
Non-initiative	44.1%
No-Refund	55.8%
Follow up	8.6%
No Follow Up	47.3%
General cleaning	100% out of sample population
General cleaning due to checklist	70% out of sample population

Fig 18

As to the question of taking initiative to do some maintenance, 55.9% i.e. 19 people said they did nothing. When asked why 10 of them claimed they were advised against it, because it was a state property and a refund would be a problem. 15 people i.e. 44.1% said they did something. 9 said they did some interior work with 4 doing exterior work, 3 got some private hands to weed their compound and 6 people did some painting. Out of those who did something only 7 could remember how much they put in it. This ranged from 25,000 cedis to 100,000 cedis. Out of the 15 people who did some work

only one person claimed his money was refunded. 15.4% said they followed up but nothing was done and 84.6% knew it was worthless so they didn't follow up.

On the issue of general cleaning all the participants claimed they do general cleaning at least once a week. However, a checklist revealed that 30% were not doing proper general cleaning in that cobwebs were found here and there. The kitchens of some residents left a lot to be desired. Some even had writing on the walls. 3 people expressed their desire to rehabilitate some of the buildings that were in bad shape so that they could occupy them but this opportunity was denied.

4.6 BUDGET

There is a budget for the maintenance of residential estates of the hospital, which is a quarterly allocation. The money used for maintenance is that allocated to the hospital by the Government of Ghana. Other sources of funding are hardly used. In 1998, the hospital was given six million, eight hundred and thirty-five thousand, five hundred and eight-two cedis (¢6,835,582). Out of this, five million, three hundred and ninety-four thousand, four hundred and fourteen cedis (¢5,394,414) was used for maintenance, leaving a balance of one million, four hundred and forty-one thousand, three hundred and eighteen cedis and five pesewas (¢1,441,318.5).

In 1999 nineteen million, two hundred and six thousand, three hundred cedis (¢19,206,300) was given for maintenance, out of this, nineteen million, one hundred and forty-seven thousand, three hundred cedis (¢19,147,300) was used, leaving a balance of two hundred thousand cedis (¢200,000.00). In 2000, sixteen million, four hundred and fifty-one thousand, seven hundred and eighty cedis and eighty-eight pesewas (¢16,451,780.88) was given for maintenance, five million and ninety-six thousand, four hundred and eighty-two cedis (¢5,096,482) was used for maintenance, leaving a balance

BUDGET FOR RESIDENTIAL ESTATES OF MAMPONG HOSPITAL

Q'TER	SOURCE	1998 INCOME	1998 EXP'TURE	1998 BALANCE	1999 INCOME	1999 EXP'TURE	1999 BALANCE	2000 INCOME	2000 EXP'TURE	2000 BALANCE
1	G.O.G	1,091,038	1,091,038	292242	9,603,000	8,573,500	1029500	4,334,834.88		4,334,834.88
		292,242.00(G.H)								
2	G.O.G	1,434,458.50	1,434,458.50	383,025.50	9,603,000	10,573,500	970500	4,038,982	4,038,982	
		383,025.50(G.H)								
	D.P.F				300,000	300,000				
3	G.O.G	383,025.50(G.H	1,434,458.50	383,025.50				4,038,982	1,057,500	2981482
		1,434,458.50								
4	G.O.G	1,434,408.50	1,434,408.50	383,025.50				4,038,982		4,038,982
		383,025.50(G.H)								
TOTAL		6,835,582	5,394,414	1441318.5	19206300	19147300	2000000	16451780.88	5096482	11355298.88

FIG 19

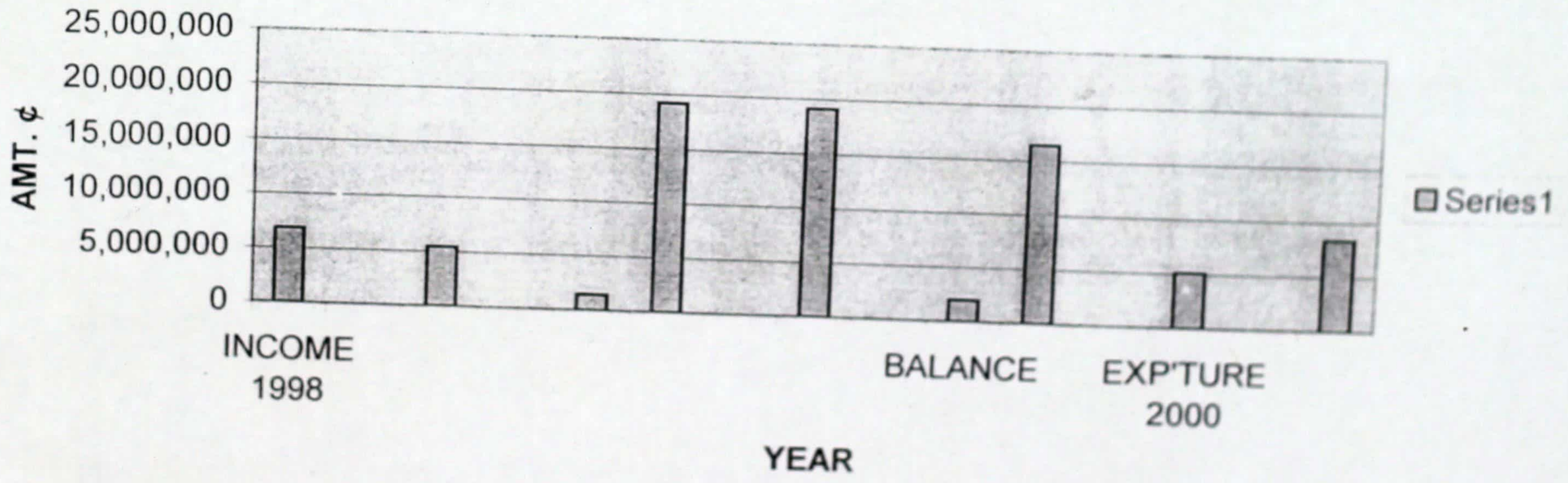


FIG 20

SOURCE :ACCOUNTS OFFICE, MAMPONG HOSPITAL

of eleven million, three hundred and fifty-five thousand, two hundred and ninety-eight cedis and eighty-eight pesewas (¢11,355,298.88)

CHAPTER 5

DISCUSSION

5.1 MANAGEMENT'S KNOWLEDGE AND COMMITTMENT

Specific objective two showed that management knew about PPM. This is in accordance with literature where the Ministry organized workshops for estate officers in the various districts together with the distribution of handouts and manuals to institutions to increase their knowledge on PPM. **M.O.H. (1999)**. Findings showed that posters were put up at vantage areas of the hospital. There is no department responsible for the execution of PPM activities but there is a maintenance officer who is a national service person. Findings also showed that there is a workshop, which is in bad shape. It houses three maintenance persons who only take orders from the administrator who happens to be the head. He had prepared a maintenance plan for the year 2000. This does not conform to literature in that **Seeley (1987)** recommends a maintenance department with a head to be in charge of directing and undertaking repairs and maintenance. The primary function would be to generate a maintenance policy, assessing, finding requirements, preparing programmes of work, progressing the work, monitoring cost and implementing feedback procedures. The department is also to decide on the urgency of the job, as well as response time to tenants' request for non-emergency work. The department must proceed according to what is on the job cards so that it prepares a job form for the buildings.

Furthermore, **M.O.H (1999)** proposed to encourage the community to be involved in PPM by including it on the board of the maintenance committee. Findings showed that there is a maintenance committee of which some community heads are members, which is in accordance with literature but this committee hardly meets, therefore making it nonfunctional.

5.2 PPM SYSTEM IN PLACE

Findings showed that out of the 50 people sampled, 18% requested for the maintenance. This is done through the administrator who has to deal with the problem. This is done verbally. This is not in accordance with literature. **Seeley (1987)** charges the maintenance department to have regular inspection. Though there is nothing wrong if residents report faults on their residence but this is not supposed to be done verbally. **Seeley (1987)** encourages the use of report cards for record purposes and for decision-making. **Tetteh (2001)** also did recommend the same procedure. **Seeley (1987)** further encourages inspection cycles with checklists to enable detection of faults early enough to protect buildings from rapid deterioration. **Lee (1984)** also highly recommends inspection, as this is one of the basic requirements of PPM. This will make management aware of which buildings need urgent attention with regards to safety, hygiene, painting etc. If the budget is approved, proper prioritization can be made and if possible, funding from other sources may be sought.

Findings also showed that 66% of those sampled have had no maintenance since they moved into residence. Out of this 51.5% reported faults and 43.6% had no feedback. This is also against literature. **Seeley (1987)** highly recommends feedback. This he says is an essential part of any maintenance administration and could be done in two ways: either direct to the maintenance team or by general discussion within the maintenance team where solutions to problems will be documented and passed on to all appropriate personnel. Maintenance feedback should be organized according to the management of resources, work execution, appraisal of results and corrective action through feedback to the management team.

Findings further showed that there is no plan for PPM at the hospital. **Son et al (1993)** write that a plan is simply one of the basic requirements of PPM. It allows for the planning of the day-to-day maintenance, which includes activities as servicing and

cleaning, and the inspection of facilities and components. The planning process is to be done using planning forms. **Seeley (1987)** recommends a two-way planning system. This entails an annual plan showing expected workload for the coming year and how this can be matched effectively against resources. A completed plan translates into a weekly work schedule, with a rolling programme describing the workload for about 6 weeks ahead. Budgeting, which is part of the planning process, is not done exclusively for residential estates. This is in accordance with literature, which states that few organizations regard building maintenance as crucial to the asset`s value as a functioning property. In most cases, cost of expenditure is such a small proportion that it is not accorded a very high priority. Delayed expenditure however in these areas means higher future costs owing to increased prices and possibly higher operating costs.

Findings showed that there are records of the number of estates under the hospital with their location, the current occupier and available accommodation, but this record is incomplete and not in books but rather on sheets of paper. **Seeley (1987)** stipulates that the manager must know what he is managing as well as the geographical location of the property, its current occupier and available accommodation, but this should be recorded adequately. These records should be kept based on age, details of service, the state of the buildings etc and should be appropriately coded. There is the need to keep records of maintenance costs for the purpose of management control, budgetary control for making day-to-day management decisions and design cost control. Records and dissemination of maintenance data is very necessary under PPM in that there will be the need for decision-making and action to be initiated. Therefore information needs to be collected, collated, presented and be easily retrieved and capable of application in problem solving and decision-making.

5.3 MAINTAINED ESTATES

Findings revealed that some estates have been maintained for the past three years but a majority i.e. 66% of the estates has not seen any maintenance for more than five years. Not only have they not been left without maintenance but without inspection as well. **Seeley (1987)** states that no building should be left unattended to for 5 years and that an interim examination inspection should be carried out no less than every 12 months. The aim of intermediate inspection should be to detect defects, which would result in progressive deterioration if left unattended until the next inspection cycle. On inspection, Seeley suggests that the information should be recorded on standard inspection forms. This information provides the starting point for the next inspection i.e. locality and identity of elements, type of work (e.g. patch or replace), extent of work (such as area involved) and estimated year of treatment.

5.4 CLIENT SATISFACTION

Findings showed that out of the 34% of those who had maintenance on their residences 15.9% were not satisfied with the job done in that what was done deteriorated in no time. **Seeley (1987)** states that adequate supervision on repair work is needed to ensure that the materials and workmanship comply with the relevant statutory requirement i.e. client satisfaction. In the absence of such supervision, inferior materials, poor workmanship and the omission of important details can occur resulting in subsequent trouble and expense to the hospital. Key informants also claimed that work was considered satisfactory before it was passed. Therefore if supervision was done and yet the work deteriorated in no time it could be that work done was vandalized by residents or no proper supervision and inspection had been done.

5.5 RESIDENTS' CONTRIBUTION TO PPM

Seeley (1987) recommends that tenants should be encouraged to undertake small repairs themselves and that tenants of some local authorities should be allowed to make improvements for their homes. Findings showed otherwise in that most of the tenants were discouraged to do maintenance works on their residence. The reason for this position was that the residences were government property and that refunds will be difficult. Therefore the 55.9% who did some work on their residence did it for their own convenience. 44.1% did practically nothing due to the reason given above. **Seeley (1987)** further entreats managers to have special policies which should let occupiers do repair works on their residence from deliberate treatment. From the questionnaires, all the tenants claimed they do general cleaning weekly, which the observational study through the use of a checklist proved otherwise. It was evident that 30% of the tenants were not keeping their homes tidy.

On the average about 70% were doing PPM on their homes which is in accordance with literature. **Seeley (1987)** states that tenants must take more interest in their dwellings and also recommends a policy on how tenants can clean their homes effectively as stipulated in the maintenance manual.

5.6 BUDGET

Taking specific objective one, findings showed that there is a budget allocation for PPM on a quarterly basis. This is in accordance with literature in that the proposed system of the M.O.H stated that there would be a budget for minor maintenance and rehabilitation, which would be decentralised to management units who will initiate and manage their own budgets with specified ceilings. **MO.H. (1996).** However the research findings showed that management is not initiating their own budgets but were dependent on budgetary allocations from G.O.G. Finding also showed that out of a total of forty-

two million, four hundred and ninety-three thousand, six hundred and sixty-two cedis and eighty-eight pesewas (¢42,493,662.88) provided for the three year period by G.O.G, twenty-nine million, six hundred and thirty-eight thousand and one hundred and ninety-six cedis (¢29,638,196) were used for maintenance, leaving a balance of twelve million, eight hundred and fifty-five thousand, four hundred and sixty-six pesewas (¢12,855,466.88). This is not in accordance with literature. The Ministry of Health's policy on estate management, **M.O.H (1999)** identified inadequate funding for the management of existing infrastructure as one of the major problems facing the Ministry with regards to maintenance. In 2000 for instance, the balance was eleven million, three hundred and fifty-five thousand two hundred and ninety-eight cedis and eighty-eight pesewas (¢11,355,298.88). This is quite a substantial amount. Apparently other sources of funding were hardly made use of. An amount of three hundred thousand (¢300,000) was used in 1999. This was the only year in which internally generated funds were used.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The study aimed at assessing planned preventive maintenance of residential estates of the district Hospital in the Sekyere-West District of the Ashanti Region. Based on findings, the following conclusions were drawn.

It seems no PPM is being carried out on the residential estates at the hospital, because PPM means carrying out maintenance at predetermined intervals with forethought, control and records. It involves planning, budgeting, inspection, feedback and record keeping. **Lee (1984)**. These were not observed nor did interviews show otherwise. Instead, repair works are being carried out or some other form of maintenance. PPM does not wait for defects to occur but through inspection cycles, faults are detected earlier to prevent a major fault from developing and to replace faulty items before their prices go up to save the affected institution revenue.

Management did not seem to be committed to PPM even though management had the knowledge of it. They had not put any proper PPM system in place. Most of the money allocated for PPM on residential estates still remained unused. Most of the maintenance work that was carried out had deteriorated. One may conclude that jobs may not have been properly done or residences may have been vandalized

The researcher therefore concludes that PPM at the hospital is weak.

6.2 RECOMMENDATIONS

1. The objective of the Medium Term Health Strategy is first to rehabilitate existing buildings to halt deterioration. This is strongly recommend by the researcher in that majority of the buildings need major rehabilitation. There are 4 buildings, which have been rendered uninhabitable as a result of neglect, and more are likely to go the same way if immediate steps are not taken to save those buildings.

2. The researcher recommends that management should have a policy for the hospital regarding PPM. Furthermore a PPM system should be put in place and if possible a maintenance department taking the size of the hospital into consideration and the human resource under its management. Management is about the effective use of resources (man, money and materials) and a PPM system would ensure this, since PPM is about planning, budgeting, control feedback, execution and record keeping. Building maintenance is to be regarded as the preservation of the value of the asset as a functioning property. It should be also regarded by management as part of the total operating strategy. Far from being a **'make do'** and 'mend' service, PPM should be viewed as a property conserving activity contributing to the success and well-being of the operations, and occupants within it contributing to high productivity and increase in revenue generation for the hospital.

3. The health sector five-year programme of work proposes a database for all estates, which the researcher highly recommends. This should be coded and should contain records of estates under the hospital, location, age, occupier, accommodation etc. There should also be records on proposed and executed

works. This will be needed for decision-making and the action that has to be initiated. The information could either be kept in books or in a computer. Information should be easily retrievable and directly applicable to problem solving and decision-making.

4. Literature also recommends that in order to accord building maintenance the needed priority, it is good practice for financial authorization to include the capital cost of the project, depreciation and running costs so that PPM is considered from the onset. With existing assets, their condition should be assessed and funds set aside for planning, renewals and replacement. Furthermore, new buildings should have maintenance manuals, which should contain in detail maintenance procedures both for management and tenants. This the researcher strongly recommends.

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Tetteh. E 2001 Interview with PWD Estate Manager.

APPENDICES

DATA COLLECTING INSTRUMENTS

FORM A QUESTIONNAIRE FOR RESSIDENTIAL ACCOMMODATION

1. Name:.....
2. Rank:.....
3. Type of Residence:.....
4. House Number:.....
5. How long have you been staying in the house? Weeks.....Months.....Years.....
6. Since you moved in, has any PPM been done? Yes:.....No:.....
7. If yes, in Question 6, Did you request for it? Yes:..... No:.....
8. Who did you request through? Estate Management Unit.....Administrator...

   Any Other Person.....
9. Do you know of any Estate Management Unit? Yes:..... No:.....
10. Have you had any visit from Maintenance Persons from the hospital? Yes...No...
11. If yes in 6, how many times since you occupied the house?

    Once:..... Twice:..... More Than Twice:.....
12. If yes in 6, when was the last time? Weeks:..... Months:.....Years.....
13. If yes in 6, what work was done?

    Interior:..... Exterior:..... Compound:..... Painting:.....
14. Who carried out the work? Hospital..... Private Person.....
15. Did you pay anything? Yes:..... No:.....
16. If yes in 13, how much? Amount:..... Cannot Remember:.....
17. If yes in 14, has your money been refunded? Yes:..... No:.....
18. If no in 15, have you found out why? Yes:... No.... Not given it a thought.....
19. Were you satisfied with the work that was done? Yes:.....No:.....

20. If yes in 6, is there still any maintenance work to been done on the house?

Yes:..... No:.....

21. If yes in 10, what is to be done? Interior....Exterior.....Compound....Painting....

22. If no in 6, what do you think is the reason? Financial....Others....Don't know.....

23. If no in 6, have you drawn the attention of the hospital authorities? Yes... No....

24. If yes in 21, have you had any feedback? Yes:.....No:.....

25. If no, have you taken any steps to get some maintenance done yourself?

Yes:..... No:.....

26. If yes what work was done? Interior.....Exterior....Compound.....Painting.....

27. Has your money been refunded? Yes:..... No:.....

28. If no why? Don't know..... Haven't Followed-Up:.....

29. Do you carry out general cleaning of your residence? Yes:.....No:.....

30. If yes, how regular? Weeks:..... Months:.....Yearly:.....

FORM B

INTERVIEW GUIDE

1. As part of management what is your understanding of PPM?
2. What system of PPM is in place at the hospital?
3. Does the PPM unit exist at the hospital?
4. Does the PPM unit go around for routine checks on the building?
5. If the unit goes around, does it respond quickly to faults?
6. Has any maintenance work been done recently on the residential accommodation?
7. In your view what is the performance of the estate management unit of the hospital?
8. What do you think can be done to strengthen the performance of the Estate Management Unit?

9. Are there any residential buildings that need major rehabilitation?

10. In your view what caused the deterioration?

11. Could the deterioration have been avoided?

12. Are you satisfied with the work that has been done so far on the residential buildings?

FORM C

A) **CHECKLIST FOR FINANCIAL ALLOCATION**

- F.E./GOG records on Financial Allocation for PPM.
- IGF records on financial allocation for PPM.
- Records of financial resource used for PPM by the Estate Management Unit.

B) **CHECKLIST FOR ESTATE MANAGEMENT UNIT**

- A Plan for PPM.
- PPM Forms for Planning.
- Completion of PPM Planning Forms.
- Organisational Structure of Estate Management Unit.

C) **CHECKLIST FOR RESIDENTIAL ESTATES**

INTERNAL BUILDING:

FLOORS

Materials: Concrete, Terrazzo, Tiles, Linoleum, & Others.

General Condition

Cracks and Holes

Rot / Infestation

Joints

Floor Wall Junction

Stability

Surface Finish

Damp / Water Penetration

WALLS

Materials: Bricks, Concrete, Concrete Blocks, & Others

Construction

General Condition

Surface Finish

Stability

Damp / Water Penetration

Condition of Floor / Wall Junction

Condition of Wall / Ceiling / Roof Junction

Joints to Doors and Window

Rot / Infestation

Cracks and Holes

CEILINGS

Materials: Timber, Plywood, Plaster, Sheeting & Others.

Construction

General Condition / Sign of Leaks

Ceiling Members / Support

Surface Finish

Stability

Damp / Water / Dust Penetration

Condition of Wall / Ceiling / Roof Junction

Fastening and Joints

Rot / Infestation

Cracks and Holes

Fittings

SANITATION AND SEWERAGE

Cracks and Holes in Wash Basins

Condition of Toilet Bowls and Seats

Support of Wash Basins and Cisterns

Flushing effect in Toilet Cisterns

Condition of Water Taps

Wall Mounted Fittings

Shower Heads / Water Pipes / Fastening and Joints

Joints from water pipe to floor, walls and ceilings

Gullies and Water Taps

Correct slope on floors in wet rooms

Drainage effect of disposed water and sewerage

DOORS AND WINDOWS

Materials: Wood / Metal

Construction

Operational Condition

Surface Treatment / Finish

Water / Wind / Dust Penetration

Joints and Stability

Door Locks

Hinges

Storm Hooks and Door Stoppers

Rot / Infestation

Cracks / Holes

Breakage

Ironmongery / Fitting

Mosquito Net

Security Locks / Fittings

FURNITURE

Description: chairs, tables, beds, desks, shelves, cupboards, etc.

Materials: Wood / Metal & others.

Operational Condition

Joints-stable / Not stable

Breakage

Surface Treatment and Finish

SOURCE: M.O.H. (1998)

BUILDING EXTERNAL

ROOF

Materials: concrete/cgi-sheets/asbestos/clay tiles/state/

Construction: Flat / Pitched / slope

General Condition

Specific damage, if any

Surface Finish

Roof Support

Fastening System

Stability

Damp / Water Penetration

Condition of Wall / Roof Junction

Access to Roof

Rot / Infestation

Cracks and Holes

Unwanted Growth of Vegetation

Hanging branches from trees

Water run-off and gutters

WALLS

Materials: Brick / Concrete / Concrete Blocks / Stone & others.

Construction

Anchoring of roof structure to wall

General Condition

Joint to foundation

Cracks and Holes

Stability

Surface and Finish

Damp / Water Penetration

Condition of Wall / Ceiling / Roof Junction

Bonding and Points

Finish of wall openings for doors and windows

Slope away under windows

Rot or fungi attack in Wall / Plaster

WATER SUPPLY AND SEWERAGE

Water Source: Town Supply, Bore Hole, Well & others.

Water Storage: Ground / Roof Tanks and Tower, if any.

Booster Pumps

Water Pipes and Joints

Tap stands and Washbasins

Drain pipes for water

Gullies / Drains

Manholes

Inspection Chambers

Septic Tanks

Soak-away Pits

Pit Latrines / Water Closets

FOUNDATIONS

Materials: Brick, Concrete – Stone

Surface Protection, Plaster and Finish

General Strength and Stability

Cracks and Holes

Erosion

Moisture and Fungi in Foundation

Growth of tree roots and vegetation in or close to the foundation.

APRON, DITCHES AND STORM-WATER CHANNELS

Water drainage from buildings.

Conditions of Aprons

Soil (absorbing / non-absorbing)

Joints between Apron and Foundation

Condition and strength of aprons, water ditches and storm water channels.

Type of disposal and proper use of the channels.

Free run and slope in ditches and water channels.

Catchments Area

SOURCE: M.O.H. (1998)

COMPOUND

Boundaries: Walls / Fencing / Gates / Trees and Bushes.

Public Entrances, Roads and Parking

Signboards and Pathways

Resting and Recreation Areas

Vegetation: condition of grass trees, gardens, flowerbeds, ponds etc.

Rubbish Bins

Wasting Dumps: organic / non-organic

SOURCE: M.O.H(1998)

SAMPLE OF INSPECTION FORM

INSPECTION: BUILDING INTERNAL YEAR: 2000.....

REGION: ASHANTI.....

DISTRICT: SEKYERE-WEST DISTRICT.....

INSTITUTION: HOSPITAL..... BUILDING YEAR: 1977.....

PREPAREDBY:.....QUARTER 1 2 3 4

DATE:.....

B'DING NO.	ROOM NO.	MINOR MAINTENANCE TO BE DONE ITEM	SHORT DESCRIPTION OF THE WORK TO BE DONE AND PRIORITY	HIGH	LOW
B	2	WALLS	REPAIR OF 3 CRACKED WALLS	X	
			PAINTING AFTER REPAIR		X
		CEILING			
		WINDOWS			
C	5	ELECTRICITY			
	8	FLOOR			

MAINTENANCE

SECTION-FORMAT A4

SOURCE: M.O.H. (1998)

SAMPLE OF INSPECTION FORM

INSPECTION: BUILDING EXTERNAL YEAR: 2000.....

REGION: ASHANTI.....

DISTRICT: SEKYERE-WEST DISTRICT.....

INSTITUTION: HOSPITAL..... BUILDING YEAR: 1977.....

PREPARED BY: JAMES..... QARTER 1 2 3 4
DATE:.....

B'DING NO.	ROOM NO.	MINOR MAINTENANCE TO BE DONE	SHORT DESCRIPTION OF THE WORK TO BE DONE AND PRIORITY	HIGH	LOW
		ITEM			
B	2	ROOF	REPAIR OF CRACKS IN CONCRETE	X	
			PAINTING AFTER REPAIR		X
		FACADE	REPAIR OF HOLES IN PLASTER	X	
		APRON			
		PILLON			

MAINTENANCE

SECTION-FORMAT A5

SOURCE :MOH(1998)

SAMPLE OF INSPECTION FORM

INSPECTION: COMPOUND YEAR: 2000.....

REGION: ASHANTI.....

DISTRICT: SEKYERE-WEST DISTRICT.....

INSTITUTION: HOSPITAL..... BUILDING YEAR: 1977.....

PREPARED BY: JAMES.....QUARTER 1 2 3 4

DATE:.....

	MINOR MAINTENANCE TO BE DONE ITEM	SHORT DESCRIPTION OF THE WORK TO BE DONE AND PRIORITY	HIGH	LOW
	FENCE		X	
	GATE	1 GATE NEEDS NEW HINGES	X	
	ROAD	REPAIR OF PORTHOLES	X	
	GARDEN			

MAINTENANCE

SECTION-FORMAT A6

SOURCE: M.O.H. (1998)

SAMPLES OF THE PLANNING FORMS

MAINTENANCE FUNDS – BALANCE SHEET

REGION:.....DISTRICT:.....INSTITUTION:.....

YEAR:.....

TOTAL ALLOCATED FUNDS THIS YEAR CEDIS				
QUARTER ALLOCATION			CEDIS	

QUARTER	DATE	TEXT	CREDIT	DEBIT BALANCE
STARTING	6 JAN	BALANCE FORWARDED (FROM FORMAT C1,C4)		
		FUNDS TRANSFER OF 1 QUARTER		
		OTHERS:		
	31MARCH	ACTUAL COST OF MINOR REPAIRS (FROM FORMAT C2)		
	31MARCH	ACTUAL COST OF UNFORESEEN EXPENDITURES (FROM FORMAT C3)		
CLOSING	31MARCH	TOTAL BALANCE (TO BE TRANSFERED TO SECOND QUARTER – FORMAT C1, C2)		

PREPARED BY:..... DATE:.....

CHECKED BY:..... DATE:.....

SOURCE: M.O.H. (1998)

SAMPLES OF PLANNING FORMS

PLAN AND BUDGET FOR MINOR REPAIRS QUARTER 1 2 3 4

REGION:.....DISTRICT:.....INSTITUTION:.....

DATE:.....

B'ING NO	ROOM NO	B'ING EXT	COMPOUND	ACTIVITY	PLAN AND COST ESTIMATE (MATERIALS AND LABOUR)			ACTUAL COST			CHECKED
B	2			REPAIR OF PLASTER ON 3 WALLS	MONTH JAN	MONTH FEB	MONTH MARCH	MATERIALS	LABOUR	TOTAL	
				TOTAL ESTIMATE							

MAINTENANCE SECTION

FORMAT C2

PREPARED: BY ..... DATE:.....

APPROVED: BY..... DATE:.....

SOURCE: M.O.H. (1998)

SAMPLES OF PLANNING FORMS

BUDGET RESERVATION FOR UNSEEN EXPENDITURES QUARTER 1 2 3 4

REGION:.....DISTRICT:.....INSTITUTION:.....
DATE:.....

B'ING NO	ROOM NO	B'INGEXT	COMPOUND	ACTIVITY	COST ESTIMATE			ACTUAL COST SETTLED ON DATE			CHECKED
5	2			2 NEW HINGES ON DOORS	MONTH JAN	MONTH FEB	MONTH MARCH	MATERIALS	LABOUR	TOTAL	
				TOTAL ESTIMATE							

MAINTENANCE SECTION

FORMAT C3

PREPARED BY: .....DATE.....

APPROVED BY:..... DATE:.....

SOURCE: M.O.H. (1998)

PREVENTIVE MAINTENANCE SCHEDULE FOR ESTATES

PREVENTIVE MAINTENANCE – INTERIOR

	COMPONENT	DESCRIPTION / ACTION
1	WALLS	Check for damages/cracks in wall plaster every 3 months and paint once a year. Clean the walls at least once a week. More frequently if required.
2	FLOORS	Sweep floors. Keep litterbins in every room. Empty them every day. Wash all paved floors. Check for cracks and damage every 3 months.
	CEILING	Dust ceiling with broom. Remove all cobwebs. Check for leaking spots and other damage quarterly.
	DOORS AND WINDOWS	Dust all doors and windows. Remove all cobwebs. Clean with water weekly. Oil door and window hinges every 3 months. Check also locking systems. Check for rust in security bars and paint with red oxide paint if required.
	SEWERAGE AND WATER	Make sure daily that all water outlets are working and not blocked. Check all water taps for leaks weekly. Check that washbasins are tightly secured to the walls.
	TOILETS	Make daily cleaning of the toilets. Check the flushing daily. Thoroughly clean toilets with disinfectant at least weekly. Check the fixing to the floor or wall quarterly.

SOURCE: M.O.H. (1998)

PREVENTIVE MAINTENANCE – EXTERIOR

COMPONENT	DESCRIPTION / ACTION
ROOF	Check roofing quarterly and before rainy seasons. Clean out water outlets and water channels before rainy seasons.
WALLS AND FOUNDATION	Keep the foundations clean from roots and other vegetation at all times. Check for damages, cracks and settlements every 6 months. Paint once a year.
FLOORS AND PATHWAYS	Keep all external floors and terraces clean, sweep daily. Wash tiled and concrete pathways weekly. Check for damage and cracks every 3 months.
WINDOWS AND DOORS	Check for rust in security bars and paint with red oxide paint if required. Check frames and door panes for rot or termite attacks.
ENTRANCE AND WAITING AREAS	Keep entrance and waiting areas clean. Wash floors and benches daily. Empty dust bins daily. Wash walls weekly.
APRON	Keep the aprons clean, free from vegetation, sweep weekly. Check for cracks and damages every 3 months. Check that water can flow away from the apron.

SOURCE: M.O.H. (1998)

PREVENTIVE MAINTENANCE – COMPOUND

	COMPONENT	DESCRIPTION / ACTION
	WATER AND SEWERAGE	Check all water taps for leaks weekly. Check the water tank every 3 months. Inspect all manholes, inspection chambers and gullies every 3 months. Check the sludge level in the septic tank every 3 months.
	WATER DRAINAGE	Check drainage channels for cracks every 3 months. Clean all drains before rainy seasons. Make sure that there are catchment areas or storm water channels to receive the drained water.
	ROADS AND PARKING	Inspect the surface of road and parking area every 3 months for cracks and holes.
	COMPOUND	Inspect and clean up litter daily. Check the dumping spots daily. Burn organic waste. Cover non-organic waste with soil. Empty dustbins weekly. Check drainage in grounds before rainy seasons. Prevent erosion.
	GREEN AND PLANTATION	Water plants as saplings-keep surroundings green. Remove all weeds. Protect all plant and saplings from cattle and other damage. Check vegetation for unwanted growth (tree roots and branches). Plan your garden seasonally for flowers and other plants.
	BOUNDERY AND GATE	Keep all moving parts oiled and greased. Check boundary walls for rust attack.

SOURCE: M.O.H. (1998)