THE SIGNIFICANCE

OF

FACILITIES MANAGEMENT IN THE OPERATIONS OF THE NATIONAL HOSPITAL, ABUJA

BY

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A thesis Presented in Partial Fulfillment for the Award

Of

DOCTOR OF PHILOSOPHY

JULY, 2002

APPROVAL PAGE

This is to certify that this project was carried out under our strict supervision and has been approved for submission to the Department in partial fulfillment of the requirements for the award of Doctors of Management of St. Clements University, Turks & Caicos Islands, British West Indies.

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Project Supervisor **Academic Adviser**

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DEDICATION

This work is dedicated to my wife, Hannah and to my children –

Ojochenemi

Akor

Ojoma

Ejura

Unekwuojo

for their faith in my abilities.

ACKNOWLEDGMENT

My sincere thanks are due to the following persons:
God Almighty, for His grace and favour which saw me through this programme.

The President of the Federal Republic of Nigeria, Chief Olusegun Obasanjo GCFR and the Federal Government for giving me the opportunity to serve as the pioneer Director of Maintenance at the National Hospital, Abuja.

The Board of the National Hospital, Abuja under the esteemed Chairmanship of Professor Osato Frank Giwa-Osagie through whom I was appointed.

The Management of National Hospital, Abuja under the able leadership of Professor F. A. Durosinmi-Etti who gave me the opportunity to fashion out and implement this Maintenance Policy.

My Project Coordinator, Professor David Iornem whose encouragement, meticulous supervision and patience ensured the successful completion of this Project.

The following, HOD Mechanical Engineering, Engr. B. T. Iornum, Miss Rachael Ugye, both of Kaduna Polytechnic [College of Science and Technology] for their invaluable inputs in this work. Dr. Taofeeq Ige of the National Hospital Abuja for taking the time to read through the manuscripts.

My Engineering Assistant, Engr. P. E. Uduhirinwa and Engr. Abbas Moh'd Yakubu who alongside my Confidential Secretary, Mr. Peter S. Atakubi collated our ideas and the various relevant inputs.

The entire staff of the Directorate of Maintenance of the National Hospital, Abuja particularly the Engineering / Technical staff for their willingness to study and apply a new management technique.

Engr. S. A. Opaluwah,
July,2002

ABSTRACT

The National Hospital Abuja is the flagship of medical Institutions in Nigeria. The total value of the Hospital in operation was put at about Six and half Billion Naira in 2001.

The Government of Nigeria, having invested such enormous sum in one single facility had, through its Management Board, decided to implement a Maintenance Management Policy which shall not only ensure a maximum derivation of services from the investment but also the continuous derivation of such benefits which is contrary to what had been the experience with similar institutions which had failed to continuously provide needed services due to facility breakdown.

Maintenance agreements were entered into between the Hospital and the two major Construction contractors for the post construction / installation maintenance for Medical/Electronics Equipment and the infrastructure/utilities management. Other contractors were also engaged to execute horticulture and landscape maintenance, fumigation, waste disposal and cleaning services.

Pilot staff were also recruited as Hospital Maintenance staff under the researcher to understudy the contractors with the aim of taking over all maintenance functions fully after a time to be determined by the Management Board.

Facility Management concept was adopted as the Maintenance Management system for the Hospital. Under this concept planned preventive maintenance is given preference over corrective Maintenance of facilities.

However, a few problems were encountered in the implementation of the policy during the period of this study.

Inadequate resources, which resulted into under funding, lack of understanding of the requirement of Facility Management, inadequate budgetary releases, lack of qualified manpower, and incomplete infrastructure as in the non-implementation of the full power generation capacity.

As a result of the implementation of the Facility Management policy, some lessons became evident such as:-

- the fact that maintenance deferred does not only result in breakdown but also a higher repair cost later.
- that for maintenance to be efficient and effective, adequate communication skills must be exhibited to attune the users, operatives and even top Management to the demands and dictate of Facility Management.

The concept of Facility Management achieved for the National Hospital Abuja during the period of study, a significant deviation from the norm in the following areas

1 Continuous functioning of ninety-five percent of the Hospital equipment and facilities for over ninety – percent of the period without unplanned interruption.

2 Distribution of power for the period with only a maximum interruption of four minutes (for power source change over process) at time. This is significant deviation from the norm in Nigeria where prolong outages are the norm.

3 The Hospital maintained such an environment that Patients and visitors are made to feel homely.

The above assertions are confirmed by the comments of their Excellencies, the President of the Federal Republic of Nigeria, Chief Olusegun Obasanjo GCFR and the Vice President, Alhaji Atiku Abubakar GCON and other eminent personalities at various times during the period of this research:

1. The president of the Federal Republic of Nigeria, Chief Olusegun Obasanjo GCFR said

"I am here and I see and I am impressed"

on 13-08-2000.

He also said,

"Here again. I hope the standard of upkeep and management will continue to improve." On 18-12-2000.

2. Vice President, Alhaji Atiku Abubakar GCON said:

" I am impressed with cleanliness and equipment. Staff are well trained"

On 13-11-99 during a familiarisation visit.

He also said:

" I was impressed with upkeep of facilities since my last visit. Not seen any single broken down equipment yet!"

On 22-05-2000 during the Hospital's first year anniversary when he commissioned one of the Hospital's *state-of-the-art* facilities.

3. Chief (Mrs.) Stella Obasanjo said "*very impressed"*

On 27-08-99.

4. Mrs. Kate Mantsho Zuma said: *"impressed"* on 04-10-99.

5. Head of Service of the Federal Republic of Nigeria, Abu Obe CON, mni said:

"a very fantastic outfit of which this Nation should be very proud of. The MD, the Board Members and indeed the entire Management Staff were quite active and pleasant. The entire outfit is quite impressive. I urge the Management to keep this up! Congratulations!"

On 28-10-99 during a familiarisation visit to the Hospital.

6. The Governor of Benue State, George Akume said:
"Very impressed with the environment and the facilities. The standard of care is equally impressive. I commend the Management for the spectacular work of the Hospital in so short a time. Keep it up".

On 10-11-99.

7. During the British Trade Mission to the Hospital on 20-4-2000, the following comments were made:

Tina Fahm: *"very impressed".*

Peter Sheaves, Oscar Fubor, UK: *"Outstanding Facility"*

Karen Bell: *"I look forward to staying in touch".*

Steve Froggatt, Svayho Ltd, Oxford, UK: *"Most impressive"*

Hector Wanniaratchy, First City Agencies, UK:

"Very impressed with the state-of-the-art"

Noel Setters, Crown Agents : *"Fantastically well equipped Hospital".*

Idris A. Salisu CANL, Abuja: *"Very impressive"*.

Simon Stell, BDH Laboratory Supplies, UK: *"Extremely impressive*".

Kemi Obi, Triad Associates: *"More grease to your elbows".*

Dennis Robson, Johnson &Johnson: *"a very impressive hospital".*

Dorgen Priesc, Rotary –GSE-Team, Denmark: *"Impressive!".*

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INTRODUCTION

1.1 STATEMENT OF GENERAL PROBLEM

Effective maintenance has often been identified as a very critical factor necessary for the enhancement of effective use of resources including physical facilities. Regrettably, effective maintenance has continued to be a very big problem to managers in developing countries such as Nigeria. Well-conceived projects have often been abandoned or short lived largely as a result of poor maintenance. Governments and individual investors have often wasted hard earned funds and resources due to poor maintenance or lack of it.

Having identified this problem, professional managers have been making very frantic efforts over the years aimed at evolving practical concepts and tools that would provide a basic but scientific framework for systematically solving the problem. One of such concepts recently developed and introduced for the enhancement of effective maintenance is the **Facility Management Concept.**

Here in Nigeria, the National Hospital, Abuja, is one of the huge and strategic projects that government has not only given strategic attention to, but also invested considerable resources into. So much money and time has been spent to establish the Hospital, which is expected to provide a wide-range of medical services comparable to the ones

provided in the highly developed world. It is government's intention that facilities provided at the Hospital are always functional and workable. After all, as a developing nation, government may not have the funds necessary to replace facilities that are damaged as a result of poor handling and maintenance.

In pursuance of this objective or goal, Management of the National Hospital, Abuja in its wisdom decided to adopt the **Facilities Management Concept** as a major framework for its Maintenance Policy. However, how effective has this concept been?

In this project, the researcher has attempted to address this and related questions.

1.2 BACKGROUND OF THE CASE STUDY

When on the 23rd of September, 1981, at the formal opening of the Second International Congress of the Society of Gynaecology and Obstetrics of Nigeria (SOGON), the then president of the Federal Republic of Nigeria, His Excellency, Alhaji Usman Shehu Shagari G.C.F.R., declared his intention to set up an Institute of Maternal Health in Nigeria, little, perhaps, did he realize that he was laying a foundation that was going to revolutionize the state of health care delivery system in the country in the 21st century.

According to the then president, “the Institute, among other things would initiate and encourage, in association with similar institutions inside and outside Nigeria, research into the problems which make child bearing a little more hazardous than it should be. “The Institute” he said “ will also be mandated to initiate and encourage the training of all categories of health workers whose primary duty is to deal with the physical and mental well-being of our mothers”. The translation of these dreams of hope to reality is the story of the National Hospital Abuja which, until Wednesday, 10th May 2000, was known as the National Hospital for Women and Children. The Hospital was basically conceived out of the prevailing health care condition for women and children world over. It is universally accepted that the most

disadvantaged and most vulnerable human species are women and children. Statistics on the prevailing health conditions of these categories of human species in developing countries show that between three and ten women in every one thousand die in pregnancy or during childbirth.

In its declaration on the elimination of discrimination against women, the United Nations Organization provides that equal rights for women and their full participation in all spheres of social life are necessary for the full and complete development of a country, the welfare of the world and the course of peace. Yet, of all the violations of human rights, the most

pervasive, systematic and entrenched is the denial of equal opportunities to women. All through history of creation, women constitute a large percentage of humanity had often and their capability and privileges impeded by and prejudices based on social customs or sometimes on religion. In some areas, discriminatory laws which impose on women a disproportionate share of the responsibility for the care of the home in addition to work on the farm ensures that women carry more of the domestic responsibility than men.

Nature also makes it mandatory for women to carry the burden of pregnancy and childcare, without which the human race cannot survive.
The fundamental causes of the subordinate status of women in any society have nothing to do with their biological endowment and obligations. Rather, the causes are deeply rooted in social, economic and political structures as well as culturally determined attitudes of the society and solutions to them must be found in evolving far reaching changes within the society.

In Nigeria, the burden of high population growth of about 2.6% per annum was borne by women. The existing medical facilities were not only inadequate but also inaccessible and unaffordable to women, some of who also suffer from one of humanity's most excruciating and dehumanizing affliction known as Vesico Vagina Fistula (V.V.F.) usually

caused by certain cultural practices and poor obstetrics care. The little access to the inadequate healthcare facilities was further compounded by economic factors, cultural beliefs, lack of awareness and location of facilities.

Faced with the grim reality of the plight of women and children, President Shehu Shagari wasted no time in giving effect to his vision by setting up a Fifteen Member Committee of experts under the Chairmanship of Prof. T. Belo-Osagie who was at the time, President of the Society of Gynaecology and Obstetrics of Nigeria, (SOGON) to provide blue print for the setting up of an Institute of Maternal Health.

The Committee went to work in earnest and soon came up with far reaching recommendations for the setting up of a multipurpose "Institute of Maternal Health at Abuja" with a "National Hospital for Women and Children" as the arrow head of its clinical services. The National Hospital for Women and Children was conceived to be a 248 Bed Complex with teaching and residential facilities to serve as a model tertiary and referral center as well as a base for research activities of the proposed institute.

In accepting the report of the Committee in 1982, President Shehu Shagari promised to implement the laudable recommendation to bring about improved quality of life for the Nigerian mother and child.

However, this blueprint for the reform of health facilities for the women folk could not be implemented before President Shagari's regime was abruptly interrupted in December 1983.

The report remained unattended to during Gen. Muhammadu Buhari's regime that followed but the Military President, Gen. Badamasi Babangida, who succeeded the Buhari's administration, accepted the concept when the report was presented to him in 1987. Regrettably, no action was taken before the end of that government.

The increasing awareness of the subjugated position of women and children and the global concern about the alarming statistics on maternal and infant mortality and morbidity further highlighted the need for a center of excellence for women and children. To this end, the resolution of the International Conference on Population and Development (ICPD) to which Nigeria is a signatory, implored all nations to emphasize the care and empowerment of women and children. The participation of the then First Lady, Her Excellency, Mrs. Maryam Abacha, at the Beijing, China, International Conference on Population and Development in 1996 gave the needed impetus towards the building of the National Hospital for women and children.

The Family Support Programme (FSP) already established by the then First Lady had a fund raising programme (to raise funds) for the project. With the welfare of women and children as the central focus of its operation, the Family Support Programme (FSP) was seen as the most viable organ to midwife this Nigeria's answer to the global concern for the plight of women and children. Therefore, in keeping faith with the various resolutions, the First Lady through the Family Support Programme, organized the Family Support Trust Fund. Contributors to the fund included the Federal Government, State Governments, Corporate Bodies and Agencies such as private individuals, all of who were imbued with enthusiastic zeal to support this worthy course. Such was the interest shown in the project that the ministry of the Federal Capital Territory promptly allocated a vast area of land measuring 27.54 Hectares at the Central District Phase II, Garki-Abuja, to the project.

Planned to be built in phases, phase I of the project comprising 200 beds Hospital and its ancillary facilities was constructed within ten months by Messrs Julius Berger (Nigeria) Plc, whilst its sophisticated state-of-the-art medical equipment were supplied and installed by Messrs Philips Project B.V of Holland. The ancillary facilities in phase I included a residential estate, a restaurant and squash courts for the comfort of the staff. The center has facilities for future expansion of the Hospital to 500 beds. Completed under the watchful eyes of the former First Lady, the Honourable Justice Fati Lami Abubakar, and the National Hospital for women and children gained legal status with the promulgation of Decree 36 of 1991. The National Hospital for women and children is a center of Excellence not only for women and children for whom it was originally

meant, but for men as well as for whom 25 beds had been set aside with no limit to their out patient clinic attendances, before its change of status. His Excellency, General Abdulsalami Abubakar, the then Military Head of State, commissioned the Hospital for use on Saturday, 22nd May, 1999. The present Civilian President, Chief Olusegun Obasabjo, in May, 2000 approved that the name of the Hospital be changed to "National Hospital Abuja" to officially emphasise the availability of the Hospital's facilities to all sexes.

1.3 RATIONALE FOR THE STUDY

Apart from the initial objective of fulfilling the requirement for the award of a doctorate degree in **Maintenance Management**

this research work is aimed at assessing the concept and application of Facilities Management Concept. The aim is to determine how effective the concept is in terms of contribution to the solution of the maintenance problems faced by various organisations using the National Hospital as a case study. At the end of the study, it is hoped that the effectiveness or otherwise of the concept will be determined. Not only that, it is hoped that the result of the study will go a long way to assisting organisations and maintenance managers to make an effective decision regarding the adoption of the facilities management concept in managing their organisations.

Not only that, it is hoped that the report of the project will be an eye opener to management students and practitioners who are yet to grasp the Facilities Management Concept.

Furthermore, it is hoped that the project would provide a very good base for further research work with particular reference to Nigerian national economy.

Finally, it is the researcher's hope that the research report would be very beneficial to government policy makers. It is specifically hoped that it will inculcate into the policy makers the fact that facilities maintenance is as important (if not more) as establishing a project in the first place. What more, it is expected that any employee, both in the public and private sector that reads this report would appreciate the need for an effective maintenance.

1.4 THE SCOPE OF STUDY

This research work is confined to the concept and application of Facilities Management Concept. As earlier indicated, it is not specially directed to the facilities maintenance problem as such. The researcher assumes the fact that effective maintenance as a general recurrent management problem is known generally. Thus, his effort is not directed to identifying or defining the extent of the problem. Rather, it is directed to showing

how the Facilities Management Concept can assist in solving the problem.

In terms of coverage, the researcher has decided to adopt the case study approach in which a particular organisation, the National Hospital, Abuja, has been selected for close scrutiny and as a basis for generalisation. Thus, the focus of the researcher is on the practice or application of the Facilities Management Concept in the National Hospital, Abuja.

1.5 LIMITATION OF THE STUDY

It has earlier been indicated that effective maintenance is a global management problem that particularly greatly affects developing countries such as Nigeria. A research on the topic should, therefore, normally be broad based. It should cover a wide range of organisations in various countries. Unfortunately, this has not been so in the case of this research as a result of time and other constraints.

However, as earlier indicated, the researcher's focus is mainly on the effectiveness of the facilities management concept as a tool or framework for solving the maintenance problem. The researcher raises a specific question namely; how effective is the Facilities Management Concept to the solution of the perennial maintenance problem? Thus, the researcher considers the case study approach as most appropriate for the research.

Not only that, the researcher has been constrained by the limited adoption of the concept by organisations. Apparently, Facilities Management commonly abbreviated as FM, is a fairly new concept in the management discipline. The early conception and use of the term dates as late as 1979 with the creation of the Facility Management Institute by **Ann Arbor**, Michigan and the founding of the National (later International) Facility Management Association in 1980.

Thus, it is not very much expected that the concept will be adopted by many organisations. It must be cautioned here that the researcher is not implying here that basic facilities management was not in practice before evolving into a full-blown concept.

These limitations not withstanding, the researcher has made every possible effort to ensure that a wide range of available literature on the concept has been covered. He is therefore convinced that the content of the following chapters of this research report represents a comprehensive appraisal of the subject matter.

1.6 DEFINITION OF SPECIAL TERMS AND CONCEPTS

The following terms, for the purpose of this research work, shall have the respective meaning, thus:

FSTF: Family Support Trust Fund. A trust set up by Hajia Maryam Abacha the wife of the then Head of State of Nigeria to raise funds for Family based charity activities.

FSP: Family Support Programme.
The programmes of FSTF.

NHA: National Hospital Abuja.

NNPC: Nigerian National Petroleum Corporation.

CBN: Central Bank of Nigeria.

SGF: Secretary to the Federal Government of Nigeria.

FCDA: Federal Capital Development Authority

FM: Facility Management.

Facility Management: The practice of coordinating the physical workplace with the people and work of an organisation. It integrates the principles of Architecture, Business Administration, Engineering and Behavioural Sciences.

Facility Manager: The professional charged with the responsibility of managing the facilities.

Minor Repairs: Repairs for which the downtime required on the equipment is less than one day.

Major Repairs: Repairs for which the downtime required on the equipment is more than one day.

Under-funding: A funding arrangement in which the amount of funds available is insufficient for the works expected to be carried out.

Arbitration: The process by which parties agree to submit their disputes to the determination of a third, impartial party (referred to as the arbitrator), rather than pursuing their claims before a judge and jury in a court of law. Parties often agree in advance to binding arbitration of disputes, either as a clause in the contract or at the occurrence of a dispute. This method of

	avoiding litigation can save both time and money.
British Thermal Unit (Btu):	A standard measurement of the heat energy required to raise the temperature of one pound of water by one degree Fahrenheit.
Certificate of Occupancy:	A written document issued by the governing authority in accordance with the provisions of the building permit. The certificate of occupancy indicates that, in the opinion of the building official, the project has been completed in accordance with the building code. This document gives the owner permission from the authorities to occupy and use the premises for the intended purpose.
Certificate of Insurance:	A document prepared by an insurance company or its agent that states the period of time for which the policy is in effect, along with the types and amounts of coverage for the insured.
Outsourcing:	The process by which a user employs a separate company (the supplier), under a contract to perform a function which had previously been carried out in-house; and transfers to that supplier, assets, including people and management responsibility.
In-house:	Works directly carried out by staff of the National Hospital, Abuja.
Workplace:	Location of operative activity of the personnel in an organisation.
As-built:	The state at which the facility was during commissioning.
OPD:	Outpatient department of the National Hospital.
ENT:	Ear, Nose and Throat department of the National Hospital

1.7 NATIONAL HOSPITAL ABUJA

MISSION STATEMENT

"We are the flagship of the medical institutions in Nigeria and endowed with sophistication in men and materials.

Our corporate objective is to provide a friedndly atmosphere of the care for all discerning patients without discrimination.

We serve with empathy for the sick and devotion to duty. Our services are prompt, courteous, comprehensive, efficient and effective. Our strength lies in the use of the state-of-the-art technology in a clean, conducive and patient friendly environment, using highly skilled and motivated staff who see their employment here more as a vocation than a bread basket.

We exist to serve you."

In the quest for National Development, a large portion of Nigeria's Petrodollars in the last three decades has gone into infrastructural development.

This laudable policy direction was to provide the facilities and utilities, which will serve as the enabling environment for economic growth, which in turn will trigger prosperity and abundant life for all Nigerians.

How far these objectives have been achieved is already a matter of public discourse. Suffice it to say that there is a general admission of failure of implementation, of project execution in some cases and in many cases maintenance of successfully completed projects.

One of the major reasons adduced for the nation's inability to realize their objectives is the fact that they are "run down" due to poor or lack of maintenance – sometimes referred to derogatively as "poor maintenance culture."

The National Hospital, Abuja which is the flagship of the medical institutions in Nigeria is one of such petrodollar facilities endowed with sophistication in men and equipment and facilities. It is an investment of Six and half Billion Naira by the Federal Government of Nigeria.
It was initially conceived and commissioned as a Hospital for Women and Children but later changed to a National Hospital. It is equipped with the state-of-the-art equipment.

Maintenance Management at the National Hospital was given a very high priority in the consideration of a management policy for the Hospital by the Interim Management Board hence, the institution of a Directorate of Maintenance and a transfer of technology programme with the major project contractors of the Hospital.

The Management Board of the National Hospital decided to make a difference in the Maintenance Management of the Federal Government investment of over Six Billion Naira in the Hospital, through the application of **Facility Management Concept**. Although the objectives are yet to be fully realized, the successful management of maintenance in the first two and half (2½) years since inception is a pointer to the soundness of the decision. The Hospital is not only a *center of excellence* for clinical services but also a *center of excellence* in support services for which Maintenance Management constitutes a major aspect.

1.7.1 IMPLEMENTATION MODALITIES

In order to continuously actualize the laudable objectives of establishing the National Hospital, it was of crucial importance that the sophisticated equipment and infrastructure are maintained and kept at their optimal performance level at all times for the delivery of Healthcare services.

To realize this objective therefore a Maintenance Policy was put in place. The Policy is defined as:

> *The continuous availability of equipment, plants, machinery and infrastructure at optimal cost in an aesthetically pleasant environment ensuring the provision of excellent healthcare service to humanity by the utilization of both internal and external resources at the National Hospital, Abuja.*

This Policy is in line with the current trend in Maintenance Management the world over, whereby programmed, preventive maintenance is given preference over corrective maintenance of facilities. It also takes cognizance of the fact that the human component of production must be given comfortable and work-friendly environment for maximum productivity.

The Directorate of Maintenance also evolved a Mission Statement from the Maintenance Policy as follows:

1.7.2 MISSION STATEMENT:

> ***Efficient Facilities Management*** i.e., *coordinating the physical workplace with the people and work of our organization, ensuring optimal utilization of infrastructural facilities without failure or breakdown.*

To achieve this, the following were embarked upon; efficient medical equipment, building and infrastructure, space, vehicle fleet maintenance and management. Cleaning and environmental sanitation, energy and facilities-manpower management. Fire prevention and fighting systems, health and safety support systems, information technology system, laundry services, landscaping and project management were effectively handled.

This was coupled with the provision of essential and emergency support services all at minimal cost in furtherance of the goals and objectives of National Hospital, Abuja.

1.7.3 SERVICE PROVIDER

The Maintenance Directorate was the provider of maintenance service in National Hospital Abuja. It regards all other arms of the Hospital as customers whose satisfaction must be met promptly and efficiently.

The Directorate's performance was based on the following FM principles:

- Each individual in the directorate has a job to do in a defined way and at a definite time.
- We believe that the satisfaction of our customers is the foundation of our success. Thus, we realize that we need to produce a quality service defined not by us but by our customers.
- The optimum crew size is the smallest number that can perform job using a good representative method in a safe way.
- Scheduling of control points at frequently enough intervals so that detection of problems occurs in time to bring about timely completion of the job.
- Each supervisor is responsible for correct and complete usage of the system in his/her own area of control.

1.7.4 SERVICES PROVIDED

The Services provided are:

- Efficient maintenance of hospital buildings, utilities and infrastruture.
- Efficient facility management and maintenance of the Hospitals equipment and systems.
- Co-ordinating all engineering/technical activities of the hospital.
- Ensuring official application and maintenance of the hospital's properties.
- Provision of engineering/technical inputs to the management of the hospital.
- Liaison with all projects and engineering services contractors.
- Maintenance of the hospital environment, landscape and management of new development and infrastructures.
- Ensuring that all hospital equipment are functional and up-to-date.
- Maintenance of the Information Technology facilities of the Hospital.

Maintenance agreements were negotiated between the Management Board of the National Hospital, Abuja and Philips Projects BV for Maintenance Management, Electronics/medical equipment, Julius Berger Nigeria Plc for Electrical Power (Generation & Transmission), Building/Civil infrastructure etc. Local contractors were also contracted for Horticulture and Landscape Maintenance, Fumigation, Waste Disposal and Cleaning Services.

A broad overview of the agreements indicate that Philips Projects was to:

(1) Install a Maintenance Management System

(2) Supply spares and consumables for medical / communication equipment and furniture

(3) Maintain and service the equipment for three years

(4) Train Nigerian staff for eventual takeover of the management of the maintenance in the Hospital:

M/s Julius Berger Nigeria Plc has similar contract but restricted to maintenance, supply of spares & consumables and training of Nigerians on:

(a) Electrical Power generation & transmission
(b) Electrical maintenance
(c) Fire fighting and alarm systems

(d) Plumbing, cold and hot water systems
(e) Lift systems
(f) Central gas system.
(g) Air-conditioning System
(h) Building / Civil Engineering Infrastructure.

The Local Contractors were to handle:

1. Cleaning Services
2. Laundry Services
3. Waste Disposal
4. Fumigation
5. Landscape Maintenance
6. Horticultural Services.

It was expected that all these shall be carried out on the Philips installed Maintenance Management System.

The intention of the Interim Management in recruiting staff for the Maintenance Directorate of the Hospital was to achieve a phased transfer of technology and maintenance management of the equipment and infrastructure by the multinationals hence the training component of the agreement.

On assumption of duties by the Director of Maintenance and a few staff on 1st September 1999, there was nothing in place to handle maintenance, as had been earlier intended by the two agreements.

By the time of compilation of this project, only M/s Julius Berger Nigeria Plc is fully operating their service contract while Philips Projects BV is yet to fully commence. However, the Hospital has been functioning fully since October 1999 when it commenced clinical services due to activities of the in-house National Hospital Maintenance Staff. The Maintenance Management System using the Maintenance Policy and Mission as guide is being prosecuted by the National Hospital Staff successfully.

1.7.5 The Concept Adopted

The Concept of maintenance adopted was that of **Facility Management,** which ensured optimum utilization of Hospital equipment and infrastructure.

Facility Management is defined as:

> "*The practice of coordinating the physical work-place with the people and work of the organisation, it integrates the Principles of Business Administration, Architecture and the behavioural and Engineering Sciences*".
>
> *USA Library of Congress.*

The strategy involves the determination of a maintenance plan, which was produced annually. The best regime of each item was determined by first identifying series of effective regime for the machinery and equipment in question and then deciding on which was most desirable and practicable. We may then replace the component before the end of its useful life span if necessary. The maintenance strategy was to keep the equipment, machinery and infrastructure in the Hospital in its *as–built* condition during its useful lifespan.

To achieve these aims and objectives we have had to bend over backwards sometimes to avoid frustration, since the likes of Philips BV and JBN Plc who are on site may not always implement the transfer of technology wholesale as agreed in the Maintenance Contract. The local contractors also exhibited signs of non-performance when not adequately supervised. Despite these and many other obstacles, the Hospital had thrived due to the doggedness of Maintenance Staff who at times called the bluff of the multinationals and contained the problems from the sophisticated medical equipment, information technology system, to the general infrastructure on ground. These at times involved procuring

solutions whenever located on the globe via the Internet, other linkages and international organisations.

Facility Management was administered by use of practical engineering standard tools such as the **internal maintenance requisition form** with which users of equipment and infrastructure identify or highlight their requirement to the Maintenance Staff of the Hospital, and another standard form – **work order** is used to facilitate the work by M/s Julius Berger Nigeria Plc or Philips Projects whenever necessary. Certification and receipt of inputs are all processed through the use of standard tools (*see appendices*).

1.7.6 National Hospital Maintenance Staff

The Maintenance Staff of National Hospital, Abuja had the sole responsibility of identifying the faults by:

- Daily inspection by Engineers/Officers
- Routine / spot checks on equipment
- Inspection and checklist on life span of equipment spare parts.
- Use of internal requisition form and then finding solutions to the faults by liaising with the service contractors or in some case, use of overseas contractors.

1.7.7 Functions Solely Performed by National Hospital Staff:

1. Maintenance management activities
2. Understudying of the multinational contractors on site
3. Fill-up the gaps where there are omissions or changes required on the whole Hospital Complex.
4. In-house consultancy services for both management and the Board
5. Co-ordination of the activities of the Hospital contractors for the purpose of cost effectiveness
6. Transport administration

7. Fleet maintenance [automobile]
8. Maintenance of residential quarters [including rented quarters]
9. Installation and maintenance of fire fighting equipment
10. Computerization and management of all computer related gadgets in the Hospital
11. Monitoring and supervision of all the activities of the local contractors.

The functions carried out by the National Hospital Maintenance staff can be grouped into six categories:

1.7.7.1. Maintenance Management

(i) Routine inspection & assessment of needs
(ii) Supervision & certification of maintenance works
(iii) Maintenance of staff quarters
(iv) Supervision of service contractors
(v) Execution of works by direct labour

1.7.7.2. Training

The training aspect of the Maintenance contract agreement was not fully implemented by the International Service Contractors. To cushion the effect of deficiency in training, all the junior staff in Maintenance Directorate were deployed to JBN since June 2000 and they have been working hand – in –hand with staff of the Hospital as a way of technology transfer. Senior Staff were on the other hand understudying them, filling the gap where professional services were required. The staff in Maintenance Directorate has various professionals of different cadre in place, to augment JBN PLc staff strength understudying them with the aim of taking over fully, when their contract expires.

1.7.7.3. Quality Assurance & Equipment Upgrading

There was continuous process of provision of necessary specialist tools, test equipment and items that ensure effective Facility Management Periodic training programme for the staff of the Directorate, Nurses and Doctors on management of basic and complex medical equipment forms part of the quality assurance procedures.

Also, we are in the business of upgrading equipment to meet with the current world standards and specifications – since technological advancement in Biomedical Engineering is moving at a very fast rate.

1.7.7.4. In-house Consultancy

Among the duties handled by the Maintenance Staff of National Hospital, Abuja is coordination of Hospital contractors to maintain assurance and quality control, as well as rendering consultancy services. The coordination and monitoring of maintenance / service contractors was solely being handled by Maintenance Staff.

Other silent activities that have to do with efficient and effective maintenance management service come under the Planning, Research, Statistics and Development Unit which was attached to the Office of the Director of Maintenance.

The day-to-day running of the operation of the Directorate was monitored by this Unit with the aim of ensuring effective Facility Management of the Hospital Complex, which was accomplished by planning, research and collation of maintenance statistics.

1.7.7.5. Research, Statistics & Documentation

By use of our installed information technology systems, there was a continuous research, statistics and documentation programme in place, which was instrumental to the success of our Facility Management System.

We compile and circulate progress, quarterly as well as annual reports of performance, problems, solutions and projections for Management.

1.7.7.6. Project Management

Coordination of both internal and external contractors and implementation of development projects of the Hospital were handled by staff of the Directorate of Maintenance.

For maintenance to be meaningful and cost effective it has to be monitored, procured and supervised efficiently.

All request for maintenance are ordered by users with the aid of work orders and requisition forms. These were processed by the Maintenance staff who direct and supervise the appropriate contractor in the procurement of the solution.

This has a dual advantage of garnering experience and monitoring the efficient execution of the assignment.

There are instances where the contractors' response time has been inadequate for Hospital requirement. This was promptly filled-in by the utilization of Maintenance staff

New works have been ordered through direct labour to save cost e.g. partitions, car parks, etc. In-house staff have effectively met these needs for the Hospital. Most of the fittings and fixtures used in the Hospital are custom built thus necessitating a close study of their maintenance procedure and spare parts acquisition channels. This knowledge is presently being effectively acquired by the staff of Maintenance Directorate.

1.7.8 PROBLEMS ENCOUNTERED IN IMPLEMENTATION

Even though the management of the Hospital had decided to improve on the generally accepted standard of maintenance in Nigeria and had

enacted an FM Policy for the Hospital, certain problems have been encountered in implementation. Some of the major problems are:

- Inadequate resources led to under funding and understaffing in some departments.

- There was lack of understanding of FM among top decision makers and operators. This problem resulted in inadequate budgeting and lack of management support.

- Maintenance budget was often not fully released. This complicated budget preparation for the next year, while programmed implementation of the current year was hampered.

- For instance, each category of the budget requires a different method of projection and justification, which complicated budgets preparation.

- The system has a culture overwhelmingly shaped by bureaucracy. Nearly every action is governed by a regulation. We were therefore often restricted by regulation.

- It is always very difficult to explain the need for expenditure on maintenance for new and functional items to bureaucrats.

- The procurement policy is thick with detail. The Maintenance Directorate was often at the mercy of a management whose priorities may not necessarily be coincident with immediate maintenance needs.

- Maintaining a quality workforce is a particular problem. Facility Management was not well understood by majority of the work force. And it was generally difficult to eliminate redundant offices

- especially if the office is filled, or to create a new office. Unfortunately, we were limited by a rigid human resources system.

- Computerized Maintenance Management System is most efficient and desirable but convincing Management on such investment was a herculean task.

- We have since inception carried out our planned, programmed and preventive maintenance on manual record basis. This is not only laborious and slow but cannot effectively cope with the thousands of items which records of maintenance must be routinely updated and kept.

- Incomplete implementation of design has reduced flexibility in operating some facilities and even in some cases result in abnormal practice.

  The Hospital was designed to run on four 1275KVA generators but presently only two are installed. The effect of this is that though the in-house generating capacity is adequate for the present load, the power station is persistently running on the "critical path" since any interruption can be disastrous.

- The Hospital is yet to be serviced by a sewage treatment plant. Thus Hospital effluent is discharged directly into the public sewer.

- We were always under special scrutiny by management, and that makes our job more difficult as every false step could be met with severe disciplinary measures.

- Users do not report faults promptly.

The following study was carried out to determine the extent if any, of deviation from the norm in the Nigerian Maintenance Culture, the implementation of Facility Management Concept has produced in the Management of the National Hospital, Abuja.

The research was based on actual practical activities and the experience of the researcher who introduced the concept and managed its implementation.

CHAPTER TWO

REVIEW OF LITERATURE ON FACILITY MANAGEMENT

2.0 NATURE OF FACILITY MANAGEMENT

Facility Management, commonly abbreviated as FM, is a fairly new concept in the management discipline. Widespread use of the term dates from the creation of the Facility Management Institute at
Ann Arbor, Michigan, in 1979 and the founding of the National (later International) Facility Management Association in 1980 (1).

However, Facility Management of large and diverse facilities has long been practiced by the military, government, and North American College and University campus officials, usually under the name of post engineering, public works, or plant administration.

Facility management as defined by **David G. Cotts,** (4) is "the practice of coordinating physical workplace with the people and work of the organization; integrates the principle of Business Administration, Architecture, and the Behavioural and Engineering Science" (4). It is often simplified to mean that facility managers integrate the people of an organization with its purpose (work) and place (facilities).

According to **David Cotts,** (4) the common functions of Facility Management are:

1. Management of the Organisation

a. Planning

b. Organizing

- By function, organization, or building
- Centralized verses user driven

c. Staffing

- Personnel management
- Evaluation of mix of staff, consultants, and contractors
- Training

d. Directing

- Work scheduling
- Work coordination
- Policy and procedure development

e. Controlling

- Work reception
- Standards establishment (money range, quality, quantity, time to deliver)
- Scheduling
- Use of management information system and basic computer literacy
- Contract administration
- Policy and procedure execution

f. Evaluating

- Design
- Punch list preparation and execution
- Post occupancy evaluation
- Programme analysis
- Contractor evaluation

2. Facility Planning and Forecasting

a. Five to ten year plan

b. Three – to five –year plan

c. Eighteen month to three – year plan

d. Space forecasting (macro level organization wide)

e. Macro level programming (organization wide)

f. Financial forecasting and macro level estimating organization wide)

g. Capital programme development

3. Lease Administration

a. Out-leasing (as owner)

b. Lease administration (as owner or lessee)

c. Property management (as lessee)

4. Space Planning, Allocation, and Management

a. Space allocation

b. Space inventory

c. Space forecasting (micro level, one location)

d. Space management

5. Architectural/Engineering Planning and Design

a. Macro level programming (one location)

b. Building planning

c. Architectural design

d. Engineering design of major systems

e. Macro level estimation (one location)

f. As built maintenance

g. Disaster – recovery planning

h. Design documents

i. Code compliance

j. Traffic engineering

k. Zoning compliance.

6. Work place planning, Allocation, and Management

a. Work place planning

b. Work place design

c. Furniture specification

d. Equipment specification

e. Furnishing specification

f. Estimating

g. As built maintenance

h. Code compliance

i. Art programme management.

7. Budgeting, Accounting, and Economic Justification

    a. Programming (2-3 years)

    b. Work plan preparation

    c. Types of budget (1-2 years)
        - Administrative
        - Capital
        - Operations and maintenance
        - Charge back.

    d. Economic justification

    e. Financial forecasting (1-2 years)

    f. Budget formulation

    g. Budget execution.

8. Real Estate Acquisition and Disposal

    a. Site selection and acquisition

    b. Building purchase

    c. Building lease

    d. Real estate disposal

9. Construction Project Management

    a. Project management

    b. Construction management

    c. Procurement management

    d. Procurement (to construct)

    e. Preparation of “as-builts”.

10. Alteration, Renovation, and Workplace installation

    a. Alteration management

    b. Renovation management

    c. Furniture installation

    d. Datacom installation

    e. Voice installation

    f. Provision of furnishings

    g. Equipping

    h. Relocation moving

    i. Procurement (to alter, renovate, and install)

    j. Preparation of “as-builts”

    k. Project management

11. Operations, maintenance, and Repair

    a. Exterior maintenance (roofs, shell, and window system)

    b. Preventive maintenance

    c. Breakdown maintenance

    d. Cyclic maintenance

    e. Grounds maintenance

    f. Road maintenance

    g. Custodial maintenance

    h. Pest and rodent control

    i. Trash removal

    j. Hazardous waste management

k. Energy management

l. Inventory

m. Maintenance projects

n. Repair projects

o. Correction of hazards (asbestos, bad air, radon, etc.)

p. Disaster recovery

q. Procurement (operations, maintenance, and repair supplier and services)

12. Telecommunication, data communications, Wire, and Network Management

a. Operations

b. Maintenance

c. Central voice operations

d. Data system configuration

e. Network management

f. “As built” maintenance

13. Security and life-safety management

a. Code compliance

b. Operations

c. Criminal investigation.

14. General Administrative services

    a. Food services

    b. Reprographics

    c. Mail and messenger management

    d. Transportation and vehicle maintenance

    e. Property disposal

    f. Moving services

    g. Procurement (as a function)

    h. Health and fitness programme management

    i. Day care center management

    Facility management embraces the concepts of cost-effectiveness, productivity improvement, efficiency, and employee quality of life.

2.01 ORGANIZING THE FACILITY MANAGEMENT DEPARTMENT

Good departmental organization aids accomplishing the facilities mission. In his book **"The Facility Management handbook",**

David G. Cotts (4) discussed five different organizational models that can serve as guides in organizing the facility department. These are reviewed below.

OFFICE MANAGER MODEL

The office manager model is applicable to companies that reside primarily in one leased building. It is heavily dependent on consultants and contractors, primarily because the company does not want to devote human resources for facility management; it prefers to buy the service. Only the following functions are actually performed by company staff:

a. Management of the organisation;

b. Lease administration;

c. Budgeting, accounting and economic justification and

d. Procurement

Control of facility management is executed primarily through administration of leases (building, vehicles, and office equipment), service contracts, and consulting contractors. Management ultimately rests with the office manager (and perhaps one assistant and a secretary). The model displays the day-to-day mechanics of each function.

The extent to which a certain contractor or consultant is used largely depends on two factors:

1. The frequency of the function and

2. The magnitude of the function.

A permanent arrangement for either staff or contractor should be established for functions that occur frequently or in high volume. See chart no 1 in Appendix I.

ONE-LOCATION, ONE-SITE MODEL

In many ways the one-location, one-site model is the simplest setup for a full-service facility department. It occurs in companies that are large enough to have a facility division or department, but are located at one location and one major site in a major building or buildings that are owned. See chart no 2 in Appendix I. It illustrates several of the following principles;

a. Presence of an organizational unit to coordinate and integrate work
b. Management of both ongoing work and project work
c. Integration of communications
d. Adequate engineering.
e. Balance between planning and design and operations and maintenance.

This model is heavily weighted towards the use of in-house human resources, both as a contrast to the office manager model and because research has shown that such is likely to be the case (13).

It displays more organizational units than most companies will fund, but alternative functional placements or contractual arrangements are noted. Consultants in particular, could be used to assist in staffing.

In this model, contractors or consultants are most frequently used to provide a unique skill or to handle peak loads.

ONE-LOCATION, MULTIPLE-SITES MODEL

This model, shown in chart no 3 in Appendix I, is typically a headquarters with major operational elements (branches, plants) located in the same country or metropolitan area. Homogeneous facilities at any one location fit the model in chart no 2 in Appendix I.

One of the concepts developed here is the gathering, consolidation, and evaluation (and possible decentralized execution) of requirements. This can be done in one of two ways:

a. Decentralize certain operational elements to operate within set limitations. Larger pre-screened requirements are passed upward.
b. Have an administrator at each location aggregate and screen requirements.

This model is between the first two in the number of consultations and contractors used, acknowledging that additional resources are needed to compensate for time-distance factors. The more decentralized the organization is, the more probable it is that consultants and contractors will be used. In any cases, the headquarters organization provides policy, oversight, budget control and technical assistance. Many combinations of staff, consultants, leases and contractors generally used to provide services to remote sites, but generally only facility operations and maintenance tasks are passed down for execution.

MULTIPLE-LOCATIONS, STRONG - REGIONAL OR DIVISIONAL-HEADQUARTERS MODEL

This model, shown in chart no 4 in appendix I, has to do with large organizations that operate in widely separated geographic regions, probably nationally. Subordinate regional or divisional headquarters have facility departments similar to those shown in chart no 2 or 3.

The principal functions are allocating resources, tactical and strategic planning, real estate acquisition and disposal, policy and standard setting, technical assistance, macrolevel space planning and management, and oversight. In this and the international model, headquarters performs primarily policy and oversight functions.

Consultants and contractors, especially those who operate nationwide, are used extensively, particularly for real estate, planning, design and construction.

FULLY INTERNATIONAL MODEL

The fifth model, shown in chart no 5 in Appendix I, is another way to reorganize a very large facility department and could be used (totally or in part) interchangeably with the model in chart no 4. In both models, the headquarters functions as overseer, policymaker, problem solver, and resource allocator. The work of the organization is done by the regional or national offices or directorate.

2.02 WORK COORDINATION

According to **David Cotts** (4) "good facility management can be promoted through what late Art Hahn, called pulse points or critical operations. One of these pulse points is the "Work Reception and Coordination Centre (WRC), the eyes and ears of the facility department. It is the single point where all, or nearly all, facility services are received, prioritized, tasked, coordinated, and evaluated".

No matter the size of the organization, the WRC can provide a full complement of services. In the smallest organizations, the WRC is often the assistant to the facility manager. In large organizations, the WRC may be a separate work unit.

Equipped with the proper automated system WRC can also be the center for the invoicing of all charge backs. Some facility mangers have made their WRC the charge back enforcers. By its nature, it is at the core of gathering information for calculating unit costs and benchmarks. If the department is so equipped, the service orders for all preventive and cyclic maintenance can be both generated and closed at the WRC. It should also be the hub of the department's service evaluation.

The contribution of **David R. Howard** (7) is considered here. David Howard says "The WRC must coordinate all work: preventive

maintenance, cyclical maintenance, maintenance and repairs projects, service orders, alteration projects, and capital projects.

It is a Facility Manager's nightmare, for example, for a wall to be painted under cyclic maintenance two days before it is demolished as part of an alteration project. Not only is this wasteful, but it destroys the department's credibility. Work should be coordinated with other service organizations. The WRC should be aware of all conference, parties, facility projects, and after hours activities so that proper support and no conflicting activities will be scheduled.

In a large organization, a particular individual should coordinate work, control the flow of paper work through the facilities department, and task all non-routine work. In a small organization, the amount of work can be small enough so that the facility manager can also function as work coordinator.

2.03 WORK PRIORITIZATION AND FLOW

The premise of a WRC is that the receptionists have the authority to task the routine work of the department. Priorities vary from organization to organization and from time to time.

However, **David Cotts** (4) says that most WRCs prioritize work by criticality, dollar value, and complexity.

Prioritization by criticality involves determining whether work requested is needed to protect life or property (priority 1), is detrimental to operations (priority 2), or is routine (priority 3). Typically, priority 1 requests are handled immediately by telephone. Priority 2 requests are tasked on a written service order and the work accomplished within one workday. Routine service orders (priority 30) are also tasked by a written request, with the work accomplished in three to five workdays.

Prioritization by dollar value is purely a policy matter, and recognize that above a certain level of funding, management and/or the design team scrutinizes the assignment before it is tasked. Another somewhat more complicated alternative is to limit the effort that can go into a service order.

Prioritization by complexity is also a matter of policy. Typically any task that changes the form or function of the facilities is not immediately tasked for implementation, even though the dollar cost may be small. It is first sent to the planning and design division. For instance, frequently all electrical service orders are passed through planning and design regardless of implementation cost, since outlet installation can have far-reaching effects.

It is extremely important that workflow be properly established. According to **David Cotts** (4)**,** proper workflow ensures 90 to 97 percent

(by volume) of the work of the facilities department is handled routinely. That allows the manager to concentrate on the 3 to 10 percent of work requiring managerial intervention. One of the signs of a facility department in trouble is that staff members call the facility manager directly to resolve routine work requests. Another sign is more than one point of entry for work coming into the facility department.

Below is figure 1 showing workflow within a typical facility department:

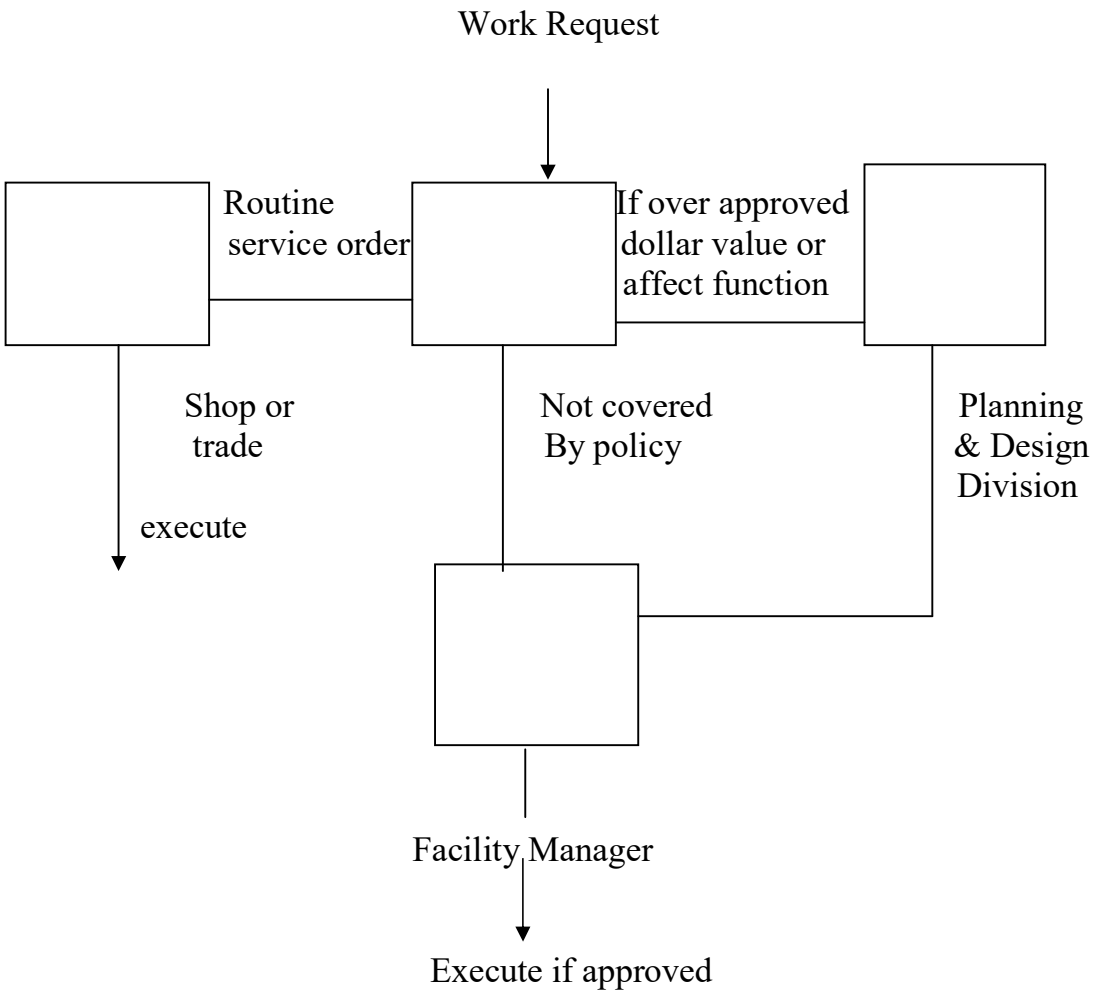


Figure 1: Work flow within a Typical Facility Department
Source: DAVID COTTS, 1999

2.04 SERVICE EVALUATION

David Cotts (4) has recommended the following quantitative evaluations for service orders each month:

1. By shop, evaluate
    - Service orders carried over
    - Service orders received
    - Service orders completed monthly and yearly to date
2. By shop, by priority category, evaluate
    - Number completed within time standard
    - Number not completed within time standard

To measure service order performance qualitatively, send questionnaires to approximately 30 percent of the service recipients. Another approach is to target one or two organizations each month. The results of these questionnaires can be compiled and reviewed monthly, quarterly, and annually along with quantitative results.

2.05 MAINTENANCE AND REPAIR MANAGEMENT SYSTEM

It is important to define certain key terms before reviewing Maintenance and Repair (M & R).

- Maintenance – It is the work necessary to maintain the original anticipated useful life of a fixed asset. It is the upkeep of property

and equipment. Maintenance includes periodic or occasional inspection, adjustment, lubrication, cleaning, painting, replacement of parts, minor repairs, and other actions to prolong the life of the property or equipment or add to its value.

. Repair – Work to restore damaged or worn-out property to a normal operating condition. As a basic distinction, repair are curative, and maintenance is preventive. Repairs are be classified as minor or major. Minor repairs are those associated with maintenance activities that do not exceed one or two workdays per task. Minor repairs do not appreciably prolong the life of the property or equipment or add to its value. Major repairs are those that exceed two workdays per tasks, or are beyond the capability of existing maintenance personnel.

Major repairs often are defined as those that can prolong the life of property or equipment, but should not increase its value.

They usually require contracting for repair service.

Replacement – The act of replacing an item of permanent investment or plant equipment. It is the exchange or substitution of one fixed asset for another having the capacity to perform the same function. The replacement may arise from obsolescence, wear and tear, or destruction. In general, as distinguished from repair, replacement involves a complete identifiable item.

To be effective, an M & R programme must operate in the context of a complete facility management system. Maintenance like all other functions needs to be goal oriented.

Gregory H. Magee, (9) recommends the following approach to establishing goals and objectives for an M & R programme:

Overall maintenance goal – Provide economical maintenance and housekeeping services to allow the facility to be used for its intended purpose.

Specific maintenance objectives:

1. Perform daily housekeeping and cleaning to maintain a property presentable facility.
2. Promptly respond and repair minor discrepancies in the facility.
3. Develop and execute a system of regularly scheduled maintenance actions to prevent premature failure of facility and its systems and components.
4. Complete major repairs based upon lowest life-cycle cost.
5. Identify design and complete improvement projects to reduce and minimize total operating and maintenance costs.
6. Operate the facility utilities in the most economical manner while providing necessary reliability.
7. provide for easy and complete reporting and identification of necessary repair and maintenance work.
8. Perform accurate cost estimating to ensure lowest-cost solutions to maintenance problems.
9. Maintain a proper level of material and spare parts to support timely repairs.

10. Accurately track the costs of all maintenance work.
11. Schedule all planned work in advance and allocate and anticipate staff requirements to meet planned and unplanned events.
12. Monitor the progress of all maintenance work.
13. Maintain complete historical data concerning the facility in general and equipment and components in particular.
14. Continually seek workable engineering solutions to maintenance problems.

It is difficult to present one M & R management system equally applicable to all organizations; no two maintenance organizations are organized identically. However, the model in Appendix II recommended by **David Cotts** (4) is as comprehensive and applicable as possible. It starts as a classic management model: planning, organizing, staffing, directing, controlling, and evaluating. However, the next level of detail is a checklist for good M & R management. Automated facility management (such as computer – assisted facility management) is often a possibility.

The elements in the M & R model are closely interrelated.

There are, however, a number of feedback loops:

. Planning – programming – budget – execution – evaluation.

. Budget – accounting – work plan – management information system (MIS).

. Capital budget – maintenance and repair budget.

. Condition assessment – level of annual funding

. Work management – staffing – work standards – output

Managers should establish policies and procedures to monitor each of these periodically and regularly.

2.06 PLANNING AND PROGRAMMING

A good M&R management system starts with the basic data, plans, policies, procedures, and standards to set proper priorities, describe the facilities and their condition, define the work, establish standards, and organize the work into a plan that is both responsive and do-able. The inventory of facilities describes the category of facility, states its condition, then assesses the critical nature of any deficiency. New elements, whether capital additions or correction errors, are entered at least annually.

Exact categories, priorities and definitions of work are developed. Preventive maintenance, for example, is differentiated from repair.

The annual departmental M&R work plan contains major M&R projects in priority order, a lump sum to fund preventive maintenance, and a lump sum to fund routine service – order M&R work. A prioritized list of underfunded requirements, in priority order, is also attached.

Generally, M&R is planned and funded annually; however, it should operate with a midterm plan that sets priorities on major and cyclical M&R and that provides three – to five – years guidance on the thrust of the M&R programme.

2.07 BUDGETING

Of all the functions of a good M&R programme, budgeting usually requires the most management attention; it is after all, the lifeblood of M&R, an annually controlled function with multiple review points. Each company identifies its requirements in its own unique way, but often all sources of requirements are not considered. There needs to be a comprehensive scheme to collect requirements.

In the model, requirements are examined and prioritized before being submitted in the budget. If funds are likely to be available beyond the critical requirements, they are rank-ordered by priorities established in the mid year plan. Alteration and minor construction funds are not mingled with M&R funds.

When the budget is assembled, the manager conducts several analyses, including historical comparisons, units cost comparisons, comparisons to a target percentage of current replacement value, comparisons to current year's budget, and trend analyses. Variances then become a principal part of the narrative of the budget along with new issues. If the funding guidance is lower than the accumulated requirements, statements of the impact of the funding constraint, by category, are submitted.

The cost accounting and MIS are responsive to proper M&R management requirements. A proper system is able to produce current cost data to assess requirements for preventive maintenance, minor maintenance and repair, cyclic maintenance projects, and repair projects. It is capable of

doing so by time period and facility. If cost comparators are used, the MIS is able to calculate them.

2.08 ORGANIZING

In organizing an M&R management programme, certain features should be in place.

1. A manager is clearly in charge of M&R, from policy through evaluation
2. The M&R programme is placed where it is not subjected to competition for new construction funds.
3. A clearly defined channel of gathering, categorizing, and executing M&R is in place to ensure coordination with operations, alterations, and capital constructions.

The M&R manager should have an analysis capability and a good information system. Well developed material management and purchasing functions – knowledgeable of and responsive to the M&R manager – are essential for a well-run programme.

2.09 STAFFING

David Cotts (4) recommends the following principles:

1. The M&R programme staff is as technically competent as the capital programme staff. The M&R staff is involved in reviewing all capital projects.
2. Only when necessary is M&R a part-time staff function.

3. The M&R programme is to be staffed to inspect for deficiencies, as well as to inspect the M&R work done.
4. Training should be available to improve management and technical skills.
5. Leadership qualities in a manager should be emphasized, so that the M&R programme is proactive.

The correct mix of contract and in-house staff is an important item for consideration, particularly during the programme-execution phase.

Donn W. Brown, (2) recommends that before trying to calculate a head count maintenance staff, one must clearly understand the physical plant mission and goal. The man-hour data calculated as necessary to accomplish every maintenance task must all be reduced to full-time equivalent positions by trade skills.

There are various ways to determine full-time equivalent requirements.

John Heintzelman; author of The Complete Handbook of Maintenance Management, (5) proposed three levels of manpower requirements: informal, planned, and formal.

The formal method is usually applied to small operations of ten craftsmen or less when the maintenance manager assigns work on a day – to – day basis. The maintenance manager is in fact his own foremam. The planned method is in the middle-level of sophistication determining man-power requirements. Heintzelman describes two methods of calculating

manpower needs: the historical basis, which assumes that this year's maintenance needs will be just like those of last year, and the adjusted historical basis, which starts with last year's situation and then adjust those requirements based on internal and external changes.

Neither of these methods addresses what really needs to be done, only what has always been done. It is well known that many tasks have seldom been addressed and some never. They will not get attention through either the informal or planned methods.

The formal method is a matter of determining manpower requirements based upon a planned level effort. Heintzelman's formal system requires consideration of five key factors:

1. What is to be done and why?
2. Where is it to be done?
3. How is it to be done?
4. When is it to be done?
5. Who is going to do it?

This formal method is a difficult and time consuming procedure but also a powerful method that permits M&R department to become proactive.

2.10 DIRECTING

The function of directing is almost synonymous with implementing. The common threads at any level, according to **David Cotts** (4) are:

1. An appropriate level of design and documentation
2. The ability to respond rapidly to a crisis.

3. A recognition that a substantial portion of the workload is reactive.

Over time, experienced managers can predict the last two items reasonably accurately despite their apparent unpredictable nature.

The quality of direction in an M&R programme normally reflects the information available to the manager. For example, how can limited fund be properly prioritized unless the manager has determined the most critical needs?

Proper direction is based on a number of factors, including established priorities, condition assessment, criticality of needs and the work plan.

In many large companies, a major function is allocating M&R funds among executing activities. This allocation often dictates how the activities will execute their work plan. Factors to be considered include the following:

1. Budget guidance
2. Priorities
3. The ability to execute the work plan
4. Criticality of facilities
5. Quality of the submitted requirements
6. Past performance history
7. Condition assessment

2.11 CONTROLLING

David Cotts (4) concludes that the principles of M&R control are consistent for all types and sizes of companies. Control devices include policy, procedures, standards, work plan, budget, approval levels, management information systems and documentation. The manager given whatever level of resources, balances and manipulates the following:

1. Control of budget
2. Control of expenditure
3. New crises
4. New priorities
5. Possible windfalls

To do so, it is absolutely essential that a real-time management information system be available. Above all, someone should be accountable for all aspects of the M&R programme.

2.12 EVALUATING

With the emphasis on benchmarking, M & R evaluation has taken on an entirely different character from early in the 1990s. Traditionally, facility managers evaluated their M&R programme according to factors such as these:

1. Comparison of the year completed with prior year or an average year.
2. Whether priorities were met
3. What critical facilities were accommodated

4. Trends such as total backlog or against a target percentage of replacement value
5. Leakage of M&R money
6. Comparison by activities; category or building, leakage and percentage of work plan executed
7. Whether the right skills were employed

Benchmarking has become prevalent. That has been driven by the quality management movement and is largely concerned with matters of efficiency. The benchmarking process involves identifying specific areas of study, measuring performance in these areas, identifying other companies against which to benchmark, comparing the department's performance against its benchmark partners and then figuring out who has the best practices and how to implement those best practices in the department. The professional associations have assisted in this regard. The Building Owners and Managers Association (BOMA) publishes the Experience Report annually. The International Facility Management Association (IFMA) publishes Benchmark Report triannually. Some possible M&R benchmarks as recommended by **David Cotts** (4) are given below:

Table 1: **TYPICAL BENCHMARKS FOR MAINTENANCE AND REPAIR**

EFFICIENCY BENCHMARKS	EFFECTIVENESS BENCHMARKS
Total and work time per work order	Percentage of customer service for which customer satisfaction is measured
Cost per work-order-total and by category	Percentage of positive comments received-total and by category
Total maintenance and repair costs-total and by category	Backlog of deferred maintenance
Costs as a percentage of replacement costs	Hours available vs hours worked
Number of work orders completed on time for preventive and routine work	Ratio of preventive maintenance hours to routine maintenance hours
Funding of maintenance and repair as a percentage of the total facilities and capital budget by time period	Equipment failures Number of work orders by time period by category Number of positive comments received per time period

- David G. Cotts (4)

If the benchmarks generated by the professional associations are inadequate, the facility manager can hire a benchmarking consultant to help gather the data and find data against which to compare. Once the benchmarks have been established and implementation procedures are in place and functioning, then the manager should set goals and objectives to improve M&R. This process involves allocating resources. However, once the facility manager has decided to emphasize a certain area and has implemented procedures to do so, the benchmarking process should be able to track progress so that responsibility can be fixed, success can be reinforced, and failure can be recognized early.

2.13 MAINTENANCE PLAN

There are almost an infinite number of approaches to maintenance and repair, but according to **David Cotts** (4), they tend to fall into one of six categories:

1. Inspect And Repair Only As Necessary (IROAN)
2. Cyclical repair – repair performed on a specific cycle (e.g. replace roofs every seventeen years)
3. Preventive maintenance – maintain equipment according to established checklist and cycle (e.g. change generator oil every 100 hours or semi annually, whichever occurs first)
4. Predictive maintenance (the use of sophisticated non-destructive testing to avert the breakdown of critical equipment)
5. Breakdown maintenance most of which can be repaired on a service order (e.g. a burned-out light bulb)
6. Repair projects (e.g., replace all window assemblies in a factory).

A comprehensive maintenance programme uses each of these techniques to ensure that every facility component is maintained and repaired in a cost-effective manner consistent with the factory standards.

The maintenance plan should include user input. Users can play both active and passive roles. For example, they can:

1. Use trash receptacles
2. Report spills quickly

3. Use equipment, particularly elevators, properly
4. Report deficiencies
5. Place signs only on authorized bulletin boards
6. Refrain from using water fountains as slop sinks
7. Turn off lights when not in use
8. Turn off water faucets
9. Use walk-off mats to clean feet
10. Report unsafe conditions.

It is estimated that this level of staff involvement can reduce building maintenance costs by 10 percent. The actions can occur through a number of stimuli such as managerial emphasis, pride in the organization and its facilities, and an education or internal relations programme.

In addition, a Preventive Maintenance PM System should permit maximum maintenance at minimum cost – a constant trade –off situation – but one in which the emphasis should be placed on minimizing the administrative costs of the system while maximizing the maintenance time available.

David Cotts (4) has been most successful operating a PM programme with three teams:

1. Plant
2. Exteriors, interiors, security, fire and life safe systems and furnishings

3. Electrical switchboards, floor panels and devices

Cotts (4) advises that maintenance of specialty equipment is best contracted through the manufacturer. All told, these teams report all items beyond their capability to the work reception center so that a service order can be processed. All three PM teams need to understand the limits of their maintenance work and when a service order must be written. The PM cycle is largely determined by each manufacturer's recommended maintenance frequencies.

Increasingly facility departments, but particularly their vendors, are using sophisticated, non-destructive methods to predict equipment failure before it happens, among them, thermography, wear-particles analysis, ultrasound, oil analysis and vibrations analysis. Often these technologies are used in tandem or as a second opinion before a critical piece of equipment is pulled off-line. Some of these technologies require expensive equipment and extensive training; others can be brought in-house at a reasonable cost if the demand for predictive maintenance exists. Predictive maintenance, not surprisingly, is most often used in maintaining industrial facilities because the technology and expertise already exist to maintain the production equipment.

2.14 PRINCIPLES OF MAINTENANCE

The Logical Approaches to Maintenance are as Follows:

1. Get plant management involved. Get their help in establishment as an integrated part of the production strategy. Clarify the maintenance objective, establish a proper concept and outline the principles under which maintenance will operate.

2. Establish an effective maintenance organization. Make sure that it ensures flexible use of personnel, provides supervisors clear supervisory responsibilities, make use of control and analytical procedures, and is capable of uncovering and correcting its own problems. Staff it with talented, innovative and competent people.

3. Use of work order system. the work order system is the basis for requesting and controlling work. It is also the basis for all cost and equipment performance information.

4. Record and use equipment repair listing. An occasional surprise or unexpected emergency is expected in maintenance. However, the maintenance department that fall in the same hole repeatedly is in real trouble. Good use of repair listing can spell the difference.

5. Plan jobs to make job execution smoothly. Savings of up to 15% in manpower are possible when jobs are well planned before being executed. The maintenance department that does no planning lose this important advantage.

6. Prepare a weekly schedule. Coordinate it fully. Inform every one concerned. Take a longer-range look at jobs further into the future; anticipate the way these jobs are handled.

7. Have foremen prepare daily schedules. The first element of good "throng leading" is for the "throng leader" (the foremen) to have a good idea of what he will do … and how he will accomplish it through his crew members.

8. Establish and use labour control techniques.

9. Set up a preventive maintenance programme. A good preventive maintenance gives the initiative in finding and correcting problems before needless emergencies and downtime occur.

10. Develop and use a budget. Cost control is the vital barometer of the success of the maintenance programme. All the elements of the maintenance programme fall into it.

11. Provide good material control. A temporary shortage of labour will delay a job. But lack of material will prevent the job from being done at all. Thus material control is essential at every job level in the maintenance.

12. Make a fully co-coordinated plan for plant shut downs. The plant shut down is the single opportunity for maintenance to catch up on all critical jobs when production needs do not conflict for use of the equipment.

13. Establish an overhaul programme. All equipment gets to the point where ordinary repair or maintenance activity cannot help. Hence, the need for overhaul. Yet to be effective, the overhaul must be well organized.

14. Use standards. Establish a yardstick of maintenance performance for both individual jobs and overall department activities.

15. Employ work measurement techniques. Activity evaluate how maintenance is doing in managing its own resources.

16. Improve equipment performance. Update repair techniques. Introduce testing procedures. Upgrade equipment reliability.

17. Train supervisor. The success of the maintenance programme depends on the capability of its supervisors, especially the foremen.

18. Train maintenance personnel. These are men who repair and maintain the equipment. Their knowledge, judgment and skills greatly tell how well the equipment performs.

19. Analyse cost and performance continually. A good maintenance department always knows how it is doing – and it acts promptly to correct its deficiencies.

20. Take the initiative in controlling maintenance resources. Unless maintenance is under control of the resources it must convert to profits, its regular maintenance programme could be determined seriously.

2.15 TYPES OF MAINTENANCE

Maintenance activities could be classified in many ways – most are briefly discussed below. It includes nearly every type of maintenance:

PREVENTIVE MAINTENANCE

Preventive maintenance is any action that can be taken to prolong the life of equipment and prevent premature failure. These actions include adjustments, cleaning, non-destructive testing and periodic maintenance.

PLANNED MAINTENANCE

Planned maintenance implies the examination of all means of repairing, lubricating, servicing and overhauling machinery so that in the long run, the machinery has a minimum of downtime due to failure. Planned maintenance will include activities carried out:

a. when the machine is running, such as planned lubrication

b. when machine is shut down for a planned service

c. when machine is shut down for a pre-recognised breakdown

d. as modifications to the design of the machine in order to increase its reliability.

CORRECTIVE MAINTENANCE

This is the work undertaken to restore a facility to an acceptable standard.

BREAKDOWN MAINTENANCE

This entails maintenance work carried out after a failure. It costs more and is more cumbersome to manage.

RUNNING MAINTENANCE

This is carried out when the facility or component is still in use. This happens mostly where the facility has no spare or standby equipment.

FUNCTIONAL MAINTENANCE

This is a type of maintenance organization in which the first line maintenance foreman is responsible for conducting a specific kind of maintenance, e.g., pump work, for the entire plant.

AREA MAINTENANCE

This is a type of maintenance organization in which the first-line maintenance foreman is responsible for all maintenance within a specific geographical area.

DEFERRED MAINTENANCE

This is a maintenance work, which can be postponed to some future date without further deterioration of equipment.

ENGINEERING MAINTENANCE

This is a staff effort aimed at ensuring that maintenance techniques are effective, that equipment is engineered for maximum maintainability, that persistent and chronic problems are discovered and corrective actions or modifications made. Determinations of critical parts and adequacy of repair or replacement part. Monitoring of the utilization of the maintenance work force.

MAJOR MAINTENANCE

This is an extensive, non-routine scheduled maintenance requiring a deliberate shutdown of equipment, the use of maintenance crew, several elapsed shifts and significant materials and occasionally, the use of supporting mobile equipment.

NON-ROUTINE MAINTENANCE

This is a maintenance performed at a non-regular intervals with each job unique.

MINOR MAINTENANCE

These are repairs usually performed by one man using hand-tools, few spare parts and completed in less than two hours.

PERIODIC MAINTENANCE

These are cyclic maintenance actions or component replacements carried out at regular intervals.

PREDICTIVE MAINTENANCE

These are non-destructive testing techniques intended to predict wear or equipment failure. These include vibration analysis, sonic testing, dye testing.

PRIORITY MAINTENANCE

The maintenance indicates the relative importance of a single maintenance work in relation to other works, operational needs, safety, equipment condition, etc and the time when the job should be done.

PROJECT MAINTENANCE

This maintenance involves the capital funded actions such as construction, equipment modification or installation to gain economic advantage, replace worn out, damaged or obsolete equipment, satisfy requirement, attain additional operating capacity or meet a basic need.

OVERHAULING MAINTENANCE

This type of maintenance include the inspection, teardown and repair of a total unit of equipment to restore it to effective operating condition in accordance with original design specifications.

A detailed review of preventive maintenance is necessary since this forms the backbone of every maintenance organization.

PREVENTIVE MAINTENANCE

Preventive maintenance is any action that can be taken to prolong the life of equipment and prevent premature failures. It includes equipment inspection, adjustment, cleaning, non-destructive testing and periodic maintenance.

Preventive maintenance has the objective of avoiding breakdown maintenance and achieving more planned work. Essentially, preventive maintenance is a better way to use maintenance labour resources and it embraces nearly every type of maintenance.

THE OBJECTIVES OF PREVENTIVE MAINTENANCE

The objective of preventive maintenance is to have a well planned and coordinated system of checking and verifying of all essential parts of an installation or equipment with regard to performance and reliability in order to:

1. reduce production losses due to frequent equipment breakdown.
2. plan for repairs systematically in relation to personnel and parts availability and to maintain a balanced workload for maintenance department.
3. permit the ordering of the necessary parts in advance, (particularly the parts difficult to obtain due to long lead-times).

4. control the stock of parts in the stores and hence reduce the cost of inventory and parts obsolescence.
5. enable a better training of personnel to be obtained.
6. permit improved budgeting of parts replacement and cost control
7. increase the management ability to plan effectively in relation to production, scheduling and equipment utilization.

PREVENTIVE MAINTENANCE APPLICATION

Before the application of a preventive maintenance system is undertaken, the management of the organization should recognize the need for its application and hence give it the necessary resources to make it achieve the desired results.

This should be followed by the necessary information to all concerned, explaining the objectives and individual or sectional responsibilities. In addition, the following steps should be taken:

1. Verify all the important installations and equipment within the organization and their location and number.
2. Produce a layout drawing of this equipment, indicating their specific location on a common plan.
3. Number these equipment numerically or by location, in order to facilitate coding / identification
4. Draw up also the equipment within the respective sections

5. Draw up a checklist of all possible defect points to be controlled and verified on each equipment
6. Produce a more detailed individual equipment drawing and indicate the parts and areas to be verified and controlled as per (5) above.
7. Determine the frequency of visit for each type of equipment (this can be done by experience, based on the time and performance for each type of equipment and by holding discussions between the maintenance department and users of the preventive system e.g., supervisors and superintendents of production).
    a. This initial estimate of time can be varied, depending on performance and wear and tear characteristics of the equipment
    b. Attention should be paid to the manufacturers recommendations.

8. Design the necessary forms for the application (too much paper work should be avoided)
9. Train the personnel to operate the system and provide the required resources for its application.
10. Apply the system and maintain it vigorously.

MATERIAL FOLLOW-UP

A material follow-up sheet should be kept for each installation or equipment and should include the following:

1. The equipment name and code number
2. The equipment drawings
3. The parts' nomenclature (if available)
4. The principal parts likely to be difficult to obtain and their numbers, including also the quantity of each part.
5. A periodic analysis of the cost of materials used for each equipment should be made in order to permit better decision as to repair or replace some parts.

The above system will reduce time loss due to searching for drawings and part numbers during breakdowns.

EFFECTIVE SURVEILLANCE OF PREVENTIVE MAINTENANCE

For the preventive maintenance system to work effectively, a well coordinated surveillance and follow-up of the system will be necessary. The following steps are necessary for effective surveillance:

1. Divide the installations into zones with defined responsibilities for each person.
2. Indicate the entire element and "security parts" to be checked in each zone to maintain the installation in good working order (security parts are parts of the installations / equipment which must

be checked everyday or periodically in order to maintain effective performance).

3. The person responsible for each zone should indicate all the problems and likely problems, including defects that have been identified in this section.
4. All requests for repairs should be properly controlled, as this would form part of the repair activities of the maintenance department.
5. Analyze the preventive checklist in order to identify any "repetitive defects".
6. Continually make frequent tours of the section in order to identify any like problems.
7. Make contact with the repairs sections of the maintenance department for the necessary information for machine repairs.

DAILY WORK PERFORMANCE

This programme should include the following:

1. Indicate a daily checklist.
2. Define the work activities (responsibilities) to be carried out at the beginning and before the end of the working shift. (This list is to be given to the supervisor or foreman in-charge and returned to the next immediate higher authority for checking and verification).

3. Define all the security or critical parts or sections of an installation or equipment that must be checked everyday or periodically in order to maintain the installation in good working order.

DAILY BREAKDOWN FOLLOW-UP

For all breakdowns, a "Breakdown Follow-up Sheet" must be used for the repairs. This sheet should be used to determine and analyse the following:

1. The frequency of breakdown
2. Identify the machine that breaks down often
3. Research to identify the cause(s) of the frequent breakdown
4. Separate repetitive from non-repetitive defects
5. Take the necessary action to effect an improvement.

REPETITIVE DEFECTS

For these defects, detailed and precise observations are necessary, to analyse and determine the reason(s) for the problem. An immediate and corrective action should be taken to reduce high cost of breakdown.

EQUIPMENT RECORD

The equipment record should carry the following information:

1. Dates
2. Cost of all repairs and maintenance work
3. Cost of all replacement parts
4. Amount of downtime experienced because of machine failure
5. Hours in service
6. Other significant historical data.

This information will help in advising management on equipment replacement.

MATERIAL CONTROL

Spare machine parts, raw materials accessories and maintenance supplies must be kept at minimum quantities, yet be adequate for current demands. The stores items must be kept in an economical balance so that the company's capital is not needlessly tied up in excessive inventories. Protection against parts obsolesce must also be considered.

Reliable multiple supply sources must be maintained for the purchase of quality materials. Unnecessary machine downtime due to shortage of parts must be avoided. Careful planning to determine the parts and supplies to be kept in stock is an important requisite for effective maintenance management.

The stores and materials control functions should be closely coordinated with the operations of the purchasing, receiving and inspection department.

SCHEDULING AND WORK FORCE UTILIZATION

Prior to the beginning of each week, a weekly schedule should be prepared by reviewing and screening the work orders at hand. The following factors should be considered in doing this:

1. Assign open blanket order
2. Assign job crafts as required
3. Assign emergency orders

4. Assign group orders by location
5. Assign work so estimator can easily and quickly find any order in question
6. Give production supervisor demands every consideration
7. Work with the foremen and keep them advised on important orders in progress.
8. Question availability of materials
9. Decide whether special outside services are required
10. Question and assign minor or service orders
11. Make spreadsheet of orders assigned and scheduled
12. Assign required crafts skills to major overhauls of equipment
13. Assign helpers to craftsmen not on basis of custom but only when required
14. Assign preventive maintenance work with proper inspection checklist
15. Screen orders for necessity of work, completeness of information, emergency requirements and purchase of parts
16. Make up daily schedules from the weekly assignments
17. Check effect of absenteeism on progress of some orders, re-assign as required
18. Make up and assign time tickets daily
19. Check time tickets when turned in for accuracy and completeness

20. Design, make and hand a visual order control board for slotting daily orders for craftsmen. Also provide a bin for collecting completed orders.

PROCUREMENT OF FACILITY MANAGEMENT

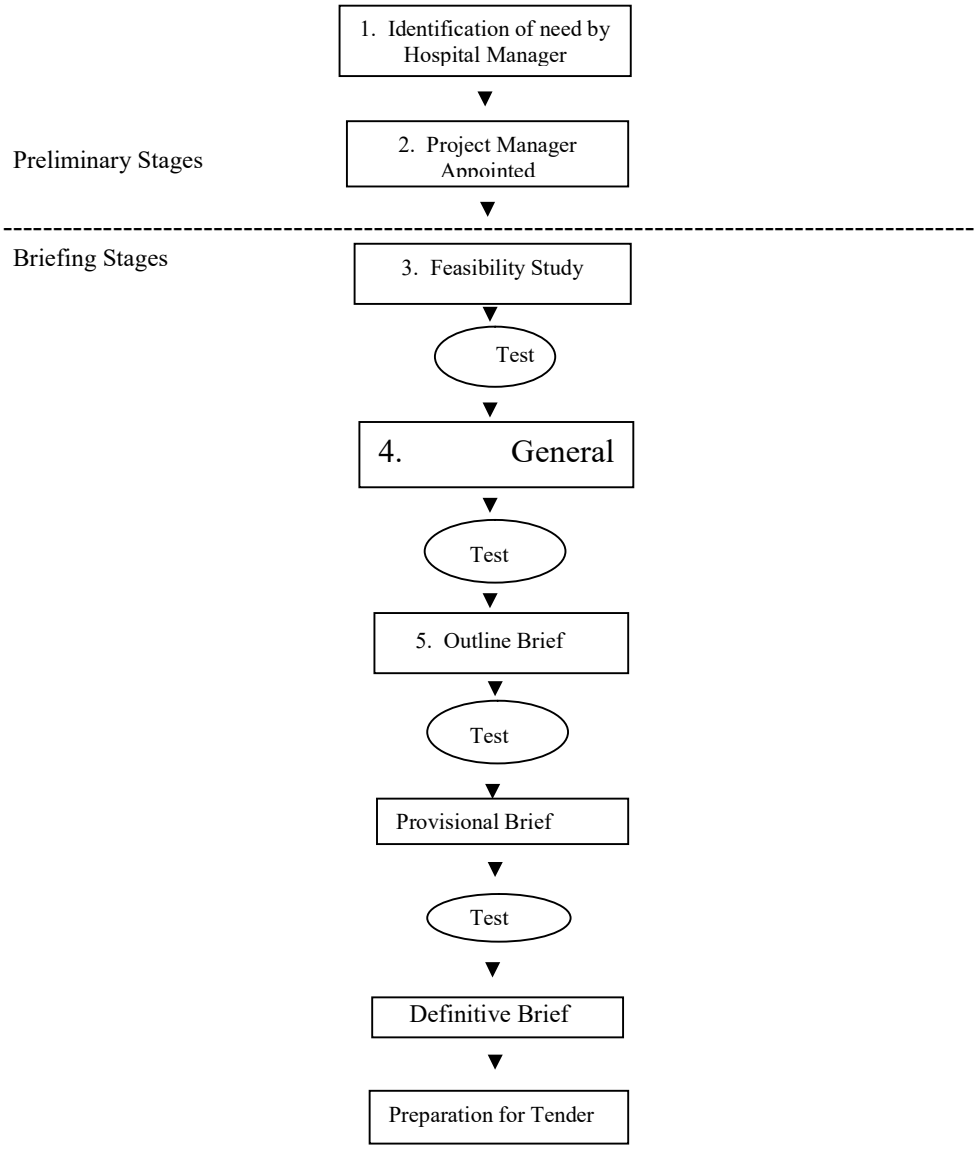
In order for an organization to procure Facilities Management, it is imperative that it first accurately determines her needs and methodologies.

USER NEEDS EVALUATION

One of the functions of an FM department is assessment of organisational needs as pertaining to facilities. **Peter Barrett** (1) states that: Logically, the department that is most suited to carrying out building appraisal is the one that is responsible for an organisation's buildings; namely the facilities management department. All service groups within organisations today are being asked to demonstrate how their activities are helping the organisation to achieve its business objectives. Facilities represent a substantial percentage of most organisations' asset and also to justify why and how money is being spent.

When the FM unit lacks reliable and comparable data on building performance and costs, its ability to make its most basic decisions is impaired, as is its ability to make a convincing case for its recommendations. The ability to demonstrate the FM unit's

organizational effectiveness is hampered without such information. Reporting to management is easier and more convincing when the consequences of decisions can be demonstrated. The FM unit should be able to show, for example, that the new planning processes, procedures, or space guidelines have lowered the cost or the number of renovations and have better enabled the building to accommodate organisational change, a new management style, or dramatic shift in group size.



Briefing method as discussed in case study.

Figure 2 *User Needs Evaluation (Diagram)*

The Implementation of FM in the National Hospital Abuja is majorly carried out by "contracting-out". The type of FM according to **Peter Barrett** (1) has its advantages and disadvantages.

CONCEPT

Terminology

'Contracting-out' is employed as the generic term to describe the process by which a user employs a separate organisation (the supplier), under a contract, to perform a function, which could, alternatively, have been performed by in-house staff.

Many people equally use the term 'outsourcing' to describe this process. However, 'outsourcing' according to **Peter Barrett** (1) denote one type of contracting-out; namely, the process by which a user employs a separate company (the supplier), under a contract, to perform a function which had *previously* been carried out in-house; and *transfers* to that supplier assets, including people and management responsibility. The various alternative terms, and in particular, 'outsourcing', do have tighter meanings, which have largely become lost due to common usage.

What is important to understand is the relevance of contracting-out as far as facilities management is concerned because, clearly, contracting-out applies to other management sectors of an organisation, not least to the core business activity. To achieve this understanding, the following reasons have been adduced as responsible for the popularity of contracting out.

What has caused this contracting-out fashion

For macro-economic reasons, organisations began a drastic downsizing transition during the 1980s. Large organisations contracted –out more and more functions to external suppliers. At about the same time, the facilities management function was emerging, and with its arrival the contracting-out exercise was extended from core business functions to this 'non-core' business activity.

Flexibility to meet changing market conditions became fundamental to business thinking. Facilities management – the management concept to co-ordinate many previously disparate support functions – tended to solve one problem, but create another. The internal bundling of services associated with facilities management spawned empire-building. An organisation's internal empires are not known for their flexibility, having a tendency to solve problems by recruiting more staff. To maximize the benefits of facilities management it was discovered, by some organisations, that the downside of inflexibility and empire-building could be overcome by the external procurement of services. Furthermore, intensifying competition, together with a global recession, placed increasing pressure on organisations to reduce total operating costs and concentrate on core business functions. Contracting-out apparently offered the solution to these demands, facilitating both efficiency gains and cost-effectiveness. For suppliers, the growth in acceptance of

contracting-out strategies by users has come as a major business opportunity.

CONTRACTING-OUT TRENDS

Most, if not all, facilities management services can be procured externally by an organisation. Further, most, if not all, companies will contract-out some facilities management functions, probably on a regular basis. This is without including the need to resource one-off project work, such as a major building scheme, or the search for new premises.

The trend is also toward increasing the scale of contracting-out undertaken. For instance, data from the Computer Services Corporation Index Survey (1992) of European information systems executives showed that 71% of these executives were planning to contract-out some information technology operations by 1995, compared with 36% in 1990/91. This will boost the value of contracted-out information technology from US$1.6bn in 1990 to approximately US$10bn by 1996.

Moreover, the scope of contracting-out is increasing. According to a commissioned report, 70% of facilities managers in the UK expanded their contracting-out operations in the period 1988-1990. The scope of contracting-out included:

‘A broad range of support services, mechanical / electrical and fabric maintenance, internal planting and landscaping, security, cleaning, catering, vending and the supply of general clerical staff, telephonists, receptionists, mailroom, messengers, chauffeurs – in fact all non-core business activity’.

In order to place this rapidly expanding phenomenon of contracting-out into focus, it is necessary to divide the facilities management ‘umbrella’ into its constituent parts of:

- User sector components
- Participant function.

USER SECTOR COMPONENTS

Examining the scope of facilities management by reference to user sectors first requires the principal components to be identified. The components can be described as:

- The premises
- The support services
- The information services / information technology.

These components are brought together under a co-ordinated facilities management system to provide support to the core business. Further, by including personnel in the model, as another support for the core, but not

(necessarily) as part of facilities management, the point is made that other functions may interrelate.

It is interesting to note that a fourth sector of the facilities management market is currently emerging, namely infrastructure. This is mainly relevant to local authorities and the like, and refers to such matters as street lighting. It remains to be seen whether this categorisation will be accepted by the practitioners; but this typifies the *dynamic* nature of facilities management.

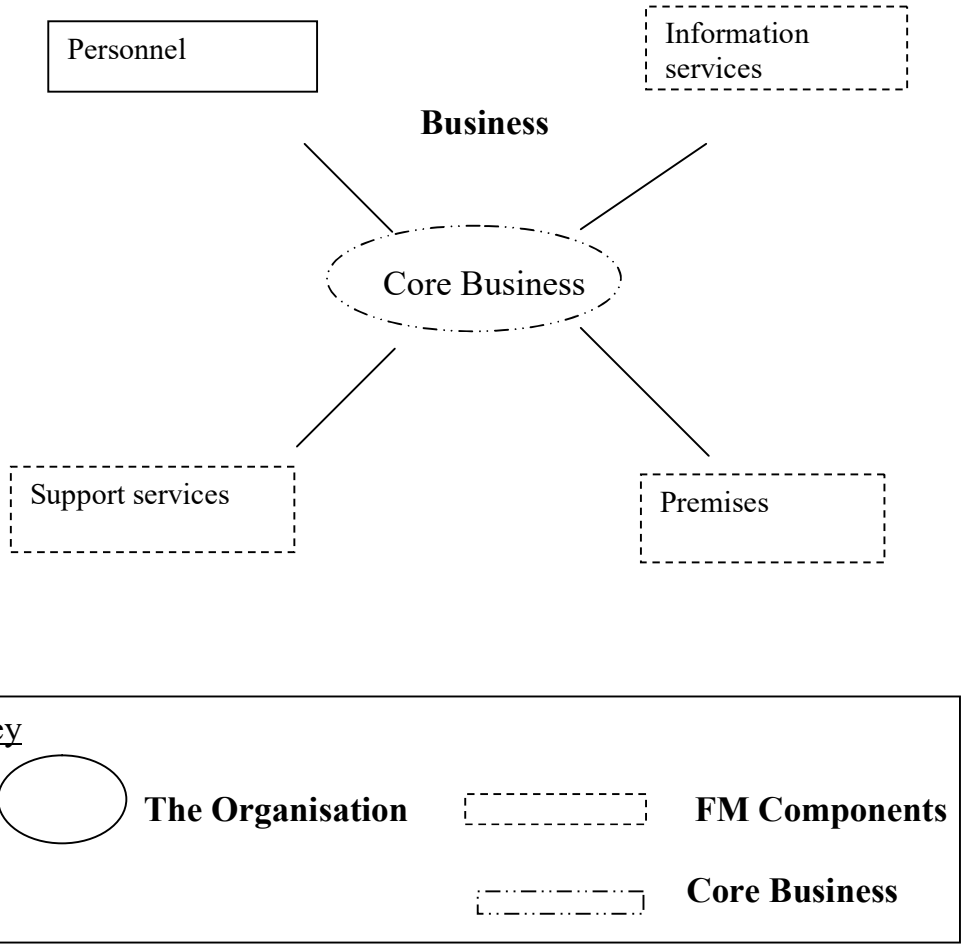


Figure 3 **Facilities management supporting the organization's core business**.

Table 2: Showing The Support Services Component Of Facilities Management

Support services	
• Mail services	• Refuse disposal
• Fleet car	• Reprographics
• Catering	• Security
• Reception	• Stationery
• House keeping	• Travel
• Office administration	• Vending
• Furniture	

According to **Peter Barrett** (1) management can be divided into strategic, tactical and supervision; and supervision ties with the

implementation aspects of 'operational'. There is no distinct boundary between the thinkers and doers, indeed the distinction can be particularly blurred where the supervision or monitoring of works, whilst for other services the contrary may apply. The split between management and operational in the facilities management context is a *particular* significance of contracting-out.

The division by function method allows a continuum to be developed between management and operational functions. In the Figure 3 showing *Facilities management supporting the organisation's core business,* the dotted indicates the variation of any one of the mix of management and operational skills in the provision of any one service. For example, pure consultancy advice concerning a space planning exercise would require no 'artisan', whilst implementation of furniture move would consist mainly of 'blue collar' involvement and a minimal degree of supervision.

USER'S CONTRACTING-OUT POTENTIAL

The potential for contracting-out from a user's point of view relates to the optimum balance between retained in-house facilities management services and those contracted-out. Following the method used above, this process can be discussed in terms of management and operational functions.

Taking the management function as an example, the minimum retained in-house component may equate to one member of staff acting in an 'unknowledgeable' capacity, as part of his or her job description. For example, a bursar of a private school, with a wide range of responsibilities peripheral to his or her primary role. In many organisations, property matters are, for instance, delegated to the company secretary; while the personnel manager frequently becomes responsible for janitorial management. On this basis, a user would always have at least a minimal management role in facilities management, even if it is only an interface with a Total Facility Management (TFM) contractor. The other extreme of the management continuum would be exemplified by a large and diverse team of managers, no doubt divided into departments. The large in-house teams employed by county councils in the 1970s would be an example but, again, it is improbable that the theoretical extreme of complete in-house resource could be reached, particularly if services such as audit are accepted as part of the facilities management role. A model of this continuum appears in the diagram showing the *Potential for contracting-out.*

It is important to recognise that this continuum model relates to *potential*. The larger the in-house resource, all other considerations being equal, the greater the potential the user displays for contracting-out.

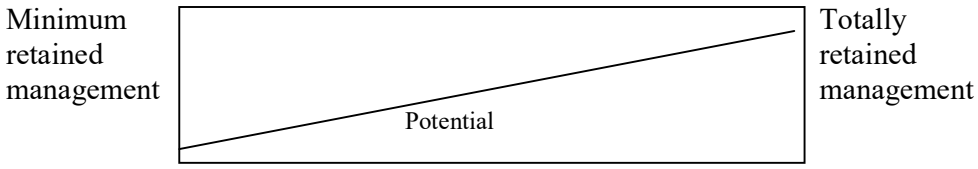


Figure 4: **Potential for Contracting-Out**

FM IN PUBLIC SECTOR

No facility manager handles as diverse a facility, with as consistently inadequate resources, as a municipal, state, or federal manager.

The public sector has a culture overwhelmingly shaped by bureaucracy. That is not a derogation; it is a fact. Nearly every action is governed by a regulation. Also, except for capital construction, public-sector programs are subject to the vagaries of short-term budgets. Change is difficult, particularly if it depends on another department, because there is little incentive for cooperation.

Two particularly difficult areas are procurement and personnel. Public-sector procurement policies are thick with detail. Thus, the facility manager often is at the mercy of a purchasing or contracting officer, whose priorities are not necessarily coincident. Other seemingly inevitable conflicts involve sole-sourcing vendors and products and contract negotiation. Though directed (sole-source) procurements are at the heart of standardization programs, they are

generally opposed or made bureaucratically difficult by public-sector purchasing departments. Similarly, many public-sector procurements, particularly extensions of existing contracts, are made more difficult because the purchasing department views negotiation as procurement with very limited applicability and to be avoided. Both of these situations arise because most public-sector purchasing departments (1) are over-regulated by their legislative body, (2) are overworked and truly underpaid, and (3) have a low-bid mentality. Competitive bidding has its place, but its effectiveness generally is overstated. Also, it almost inevitably ratchets down the quality of service provided with each re-bid.) These flexible procurement approaches greatly influence the climate in which the public sector facility manager must function.

There never seems to be enough money to accomplish the annual work plan in the public sector. Almost all North American public-sector facility managers face an ever-increasing backlog of work. When this backlog is presented to the appropriate legislative body, the reaction has been to shoot the messenger by attacking the credibility of the facility manager. Capital projects, though, tend to have long planning cycles and to fare better in legislatures because they bring pork to the legislative districts. Thus, managing shortages of resources is a fact of life for the public-sector facility managers.

The public-sector facility manager must also be a particular good reactor, since he may have been forced to backlog proactive programs to eliminate crises.

And he must be cost conscious, since funds in the public sector tend to come in specified pipelines. It means knowing the system so that funds can be shifted from one account to another at the right time – legally. Also, it is a challenge to ensure that all funds are used on meaningful work items, even though some might not be top departmental priorities. Finally, the facility manager must have *do-able* work that can soak up funds from other departments' excess money in the last thirty days of a fiscal year.

Public-sector facility management is framed in regulation. No one will remember who upgraded the electrical system, but everyone will remember who misallocated funds, even if done unwittingly. A public-sector facility manager needs to be legally smart and conscious of the do's and don'ts.

Finally, the public-sector facility manager needs to maintain a special relationship with the mayor, country manager, or governor. The facility department's budget is often the second largest administrative cost in the agency (only personnel is larger), so the chief executive needs to know that the facility manager is doing the best he can with limited resources. For his part, the facility manager needs to know that he's on the administration's wavelength. If such a climate does not exist, it's time to do some active job searching.

Legislators have so over-regulated the public sector that change is difficult. If this description seems bleak, it is not intended to be. A public-sector facility

department can be stable, dedicated, with a great sense of mission. On the plus side, public-sector facility managers often have better organised departments, more effective standards, excellent written procedures, and a more philosophical approach to their jobs than do private-sector facility managers.

The National Hospital Abuja decided on a combination of outsourcing and in-house maintenance to achieve an effective facilities management.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 STATEMENT OF THE RESEARCH QUESTION

Poor maintenance or lack of it has been identified as a clog in the development process of most developing countries including Nigeria. Huge investments and valuable facilities have always been wasted away as a result of poor maintenance.

Realising this fact, Managers in both the private and public sectors have been trying to find better ways or strategies for tackling the maintenance menace.

The Facilities Management Concept is one of the most recent strategies developed and introduced to managers with the view of providing them with a systematic and scientific way of approaching the maintenance problem.

The question is; how effective is this concept? To what extent has it assisted managers in addressing the maintenance problems?
In other words, to what extent has the Facility Management Concept helped in enhancing effective use of resources?

In this research work, attempts have been made to answer these and related questions. The aim is to determine the effectiveness of the Facility Management Concept in terms of effective maintenance.

3.2 STATEMENT OF THE RESEARCH HYPOTHESIS

In order to provide a proper focus for this research work, the following hypotheses have been framed as possible answers to the research:

Hypothesis One

H_0 (Null Hypothesis):	Facility Management Concept ensures optimum utilization of facilities.
H_1 (Alternative Hypothesis):	Facility Management Concept does not ensure optimum utilization of facilities.

Hypothesis Two

H_0 (Null Hypothesis)	Facility Management Concept is not significant for optimum utilization of facilities.
H_1 (Alternative Hypothesis)	Facility Management Concept is significant for optimum utilization of facilities.

3.3 RESEARCH APPROACHES

There are many research approaches that can be used for a research like this. For the purpose of this research, however, the case study approach has been considered the most appropriate. Thus, the National Hospital, Abuja and other Hospitals in Abuja were chosen as a case study, which will form the basis for meaningful generalization.

3.4 JUSTIFICATION FOR APPROACH

The case study approach was adopted for this research mainly because of the technical nature of the research topic. It is the humble opinion of this researcher that Facility Management is a technical and top-level management concept, which can better be understood if it is discussed in practical terms or context.

Not only that, as earlier indicated, the concept is relatively new to many organisation here in Nigeria. For example, preliminary enquiries made by the researcher revealed that even prominent organisations like the Central Bank of Nigeria (CBN), the Federal Capital Development Authority (FCDA), the Nigerian National Petroleum Corporation (NNPC), as well as the Federal Secretariat, Abuja, to mention a few, do not have a functional Facility Management Policy.

Furthermore, the National Hospital, Abuja is a priority Federal Government Project designed to provide a wide range of medical services comparable to the ones provided in the highly developed countries. To this end, the Hospital attaches a lot of importance to effective maintenance of facilities. Hence, its management decided to adopt the Facility Management Policy.

As it were, the researcher has the privilege of working in the National Hospital as the Head of the Maintenance Unit.

This and the foregoing, therefore, has made the National Hospital, Abuja a very good case study for this research.

3.5 RESEARCH POPULATION AND SAMPLE SIZE

As indicated above, the National Hospital, Abuja forms the focal point of the research work. The entire facilities of the Hospital, therefore, form the research population of this research. This comprises the entire infrastructure, utilities, and the pool of sophisticated state-or-the-art equipment.

More specifically, during the commissioning of the Hospital Complex, there was a *Room-to-Room-Equipment List*, handed over to the Management Board along with Maintenance Contract Agreements with the two (2) main Service Contractors of the National Hospital *viz*: **M/s Julius Berger Nigeria Plc** and **M/s Philips Projects B.V.** for maintenance of Buildings, Utilities, and Medical Equipment, respectively. These documents together form the basic sample of the research.

The two (2) contract documents were studied and analysed for possible streamlining into the Concept of Facility Management (FM). With the aid of the Room-to-Room Equipment List, the status, locations, categories and specific functions of the equipment were ascertained. The Service Manuals and Brochures of equipment together with Planned Maintenance Programmed / Routine Service of each equipment were also closely examined.

3.6. METHOD OF DATA COLLECTION

The method of data collection used for any research depends largely on the type of data and the likely sources from which the data is obtainable.

Generally, data can be collected from the primary or secondary sources. In the case of this research, the source of data is the primary sources except for the review of the literature where secondary sources were also used.

Thus, the data for this research was collected from primary sources which comprised mainly of maintenance records maintained by the Maintenance Department of the National Hospital and by a field survey using questionnaires as the main instrument. Prominent among such documents were:

a. Internal Maintenance Requisition Forms used for making request for repair works or order for new jobs.
b. Work Order Forms used for ordering specialist works from any of the service contractors; and
c. Vehicle Running Sheets used for monitoring the use of vehicles and planning service periods.
d. Responses from questionnaires.

Other forms include Inspection / Verification and Valuation Forms, which are used for the assessment of the quality of newly procured equipment, standard and or quality of works carried out or items of work supplied to the Hospital.

3.7 JUSTIFICATION OF DATA COLLECTION METHOD

The choice of data collection method was informed largely by the nature of the research i.e., an assessment of a management concept (the Facility Management Concept). The researcher is expected in this circumstance to use the data generated by the application of the concept to analyse the effectiveness or otherwise of the concept using such parameters as the frequency of breakdowns, etc. In other words, the research is aimed at confirming the efficacy of a concept through practical observation which can only be possible through the use of case study.

3.8 DATA ANALYSIS TECHNIQUE

One purpose of statistical analysis as stated by **(Dickinson, 1976)** is to reduce a mass of data into a more compact form, which shows general trends and relationships between variables. He maintained that the objective of statistical analysis is to provide a quantitative way of distilling the essential features from the data.

3.9 THE CHI-SQUARE (X^2) STATISTICS

Chi-square as a method for testing a hypothesis measures the reliability and significance of data to see whether the deviation of the actual observations (*observed frequency)* from the expected is significant so that it may lead to acceptance or rejection of the null hypothesis. Chi-square may be defined as the sum of the ratio of difference between observed and expected values **(Hoel, 1974)**. Its use involves the determination of the observed (actual) and the expected frequencies, the deviation squared, and the summation of the expected frequencies.

Thus:

$$\text{Chi-square } (X^2) = \frac{\sum (0-E)^2}{E}$$

Where: 0 = Observed values (frequency)
E = Expected Values (frequency)
$\sum$ = Summation.

Therefore, chi-square test is used to evaluate whether or not the frequencies which have been empirically obtained differ significantly from those which would be expected under a certain set of theoretical assumption **(Blaloca 1972).** Based on this, the researcher adopted the Chi-square technique of data analysis.

In summary, this research work adopted a survey approach with specific utilization of descriptive survey design.

The data gathered were analysed based on mathematical model and the statistical tool utilized in analysing the data was Chi-square (X^2) and percentages.

CHAPTER FOUR

4.0 FACILITY MANAGEMENT AT THE NATIONAL HOSPITAL, ABUJA

4.1 THE MAINTENANCE POLICY OF THE HOSPITAL

Putting policy into actualisation is the most crucial of maintenance management process at the National Hospital, Abuja.

First, the organizational structure was designed to make the implementation possible (see appendix III). Decision taking was hinged on the hierarchy of responsibility. Therefore a clear brief of terms of responsibility was made at the beginning.

Both the direct labour and indirect labour methods were employed for attaining the maintenance goal of effective Facility Management.

The direct labour method involves the use of the Hospital's Technical staff for the execution of work orders. The indirect labour method involves the use of external contractors to execute works on contract basis. Both are complimentary to each other and are applied in accordance with the complexities and nature of work.

4.2 INFORMATION FLOW AND ACTION PLAN

For effective and efficient facility management, there must be a good and free information flow and hierarchy of operations. In order words, sequencing of operations and job description comes into play as this is the duty of the maintenance officer.

- Requisition for maintenance job orders were sent to the Director of Maintenance
- The Director of Maintenance sends it to the appropriate department for action
- The Head of Department assigns the Officer in charge who carries out the work/repair, does the costing and gives a feedback
- All requests for maintenance works are to be on a standard form and even if it was verbal instructions, it has to be translated into writing for appropriate step at the end of the day
- All requests for materials had to be on requisition booklet with recommendation by the Head of Department before forwarding to Director of Maintenance
- The Director of Maintenance approves and sends to the appropriate department for placement of order
- Order is placed and on arrival forwarded to stores for issuance.

4.3 SAFETY MEASURES

All relevant safety measures in place were observed, such as:

- Wearing of protective wears.
- Informing some responsible persons both in your office and on the job location of the whereabouts. This is vital information in case of emergency
- Location of staff whereabouts. This is vital information in case of emergency.
- First-aid facilities were provided at strategic locations and when applicable, qualified personnel were be available to provide treatment and maintain required records.

4.4 DIRECTORATE OF MAINTENANCE ORGANISATION

The Directorate of Maintenance is headed by the Director of Maintenance who is also a member of the Management Board of the Hospital. He is assisted by three Assistant Directors and other administrative and executive staff. The Directorate is being run under three sections and four units, as follows:

1. Biomedical Engineering Section
2. Mechanical and Electrical Engineering Section
3 Building and Civil Engineering Section
4. Transport Unit
5. Information Technology Unit
6. Environmental Maintenance Unit
7. Maintenance Planning, Research and Statistics Unit.

Each of the sections is headed by an Assistant Director with other supportive staff while the units are attached to the sections and Director's Office.

This Directorate started its operations on 1st September 1999 with staff strength of Forty Six No. staff made up of the following:

1.	Director of Maintenance	1
2.	Assistant Directors	3
3.	Senior Staff	14
4.	Junior Staff	28 (including Drivers/Mechanics)

	TOTAL	46
		===

As at 30th September 2001, the Directorate had a total number of **44 Engineering/Technical Staff** in its work force made up of:

1.	Director of Maintenance	-	1 No.
2.	Assistant Directors	-	3 No.
3.	Senior Staff	-	22 No.
4.	Junior Staff	-	18 No.
	SUB-TOTAL		**44 No**.
-	Environmental Maintenance	-	**4**

Other Supportive Staff

1.	*Transport Unit:*		
	i. Principal Transport Officers:		2
	ii. Drivers:		27
	SUB-TOTAL		**29**
2.	Administrative Staff:		
	Senior	-	2 No.*[Confidential **Secretary**, Typist]*
	Junior	-	6 No. *and Office Assistants]*
	SUB-TOTAL:	-	8 No.
	GRAND TOTAL -	-	**85 No.**

4.5 PROCEDURE ADOPTED FOR MAINTENANCE

The procedure adopted was to adhered strictly to a regime of routine maintenance which is programmed for in advance such that all necessary resources are available leading a minimum downtime for maintenance.

High priority was given to ensuring that maintenance activity in whatever form does not result in suspending or stoppage of Hospital services.

4.6 PLANNED MAINTENANCE

Due to the newness of the Hospital, manufacturers' specification was adhered to while benchmarks for maintenance management were used for facilities and infrastructure.

4.7 ROUTINE MAINTENANCE OF FACILITIES AND UTILITIES

This entails the following:

a. A daily inspection was carried out by the inspection team of duty engineers, artisans and general workmen to assess
b. Yearly washing and cleaning out of the water storage tank to prevent contamination was carried out.
c. A weekly treatment of water was embarked upon
d. Monthly inspection of the sewage disposal system to check for any blockages and for odour control was done
e. Monthly servicing of the alternative power supply was carried out
f. Daily collection of refuse through the collection of collected waste by an outsourced contractor was carried out.
g. Quarterly servicing of all lifts by oiling, cleaning and repacking worn out parts was done
h. Periodic fire drills were carried out by the staff.

4.8 ROUTINE MAINTENANCE OF BUILDING STRUCTURES AND INFRASTRUCTURE

a. The buildings and roads were renovated annually but where the need arose renovations were carried out accordingly.
b. Trees and lawns were pruned and levelled weekly and when the former grew out of proportion and were dangerous or injurious to life, they were felled immediately
c. Flowers were trimmed and groomed on a seasonal basis depending on the type
d. Maintaining parking grid lines in properly painted conditions was effectively maintained.
e. Stop signs at all intersections and exits were maintained.
f. Burnt out light were routinely changed.
g. Lamps and fluorescent tubes were routinely changed.
h. Debris and broken fixtures were routinely removed from the parking lot.

Also where roads were damaged, they were immediately tarred and re-apportioned with grid lines. The roofs were checked monthly and the mechanical equipment on it were cleaned and serviced as well as the roof itself.

The external flooring at the outdoors and courtyards are daily swept, cleaned and the interior floors are mopped daily.

4.9 ROUTINE HOUSE KEEPING

The house keeping process was a basic daily schedule including:

a. The daily sweeping of rooms in the wards, corridors, offices and ancillary parts (stairs, public conveniences).
b. Daily cleaning of windows.
c. Cleaning of bathrooms and toilets after use.
d. Empty waste paper sacks and removal of all garbage.
e. Making of beds, dusting of furniture and changing of dirty room linen.
f. Inspection of all rooms fro any from of fixture removal or otherwise.
g. Redecoration of corridors and balconies by the upkeep of plants and flowerpots.

4.10 ROUTINE MAINTENANCE OF EQUIPMENT AND MACHINES

All equipment were maintained by servicing, repair or a major overhaul. The maintenance strategy also adopted were preventive in nature. All equipment were serviced by engineers who inspected the equipment daily and simultaneously filled in work orders drawn by the extracted information of each equipment manual. When these were filled, they were returned to the Directorate and then money was released for their repair. Some equipment needed bi-weekly maintenance so their servicing was done in the orders of odd and even weeks. Where there was a major

breakdown, equipment was immediately replaced by its spare, as there was standby for every equipment as with regards a number of equipment.

4.11 ROUTINE MAINTENANCE OF CHILLERS AND SPLIT A/C UNIT

The Chillers were inspected daily, serviced every two months, repaired when the need arose and the air filters were replaced every three months. Similar measures were carried out on the Split A/C units, except for the air filters, which had useful lifespan of nearly two years.

4.12 ROUTINE MAINTENANCE OF ELECTRICAL / ELECTRONIC FACILITIES

- Daily inspection of facilities was carried out.
- Daily service of telephone system (on request).
- Back up batteries were replaced every four years, but were tested every months to ascertain their strength.
- Electrical lighting, televisions, etc were repaired on request.

4.13 ROUTINE MAINTENANCE OF VEHICLES

The maintenance of vehicles was based on a periodic service programme. Two (2) types of vehicle service were carried out; complete and minor. The frequency of service varied based on type of vehicle and usage

Complete service was carried out on the Peugeot, Mazda and Nissan every three months on average, whereas minor service was carried out

every month. Complete service was carried out on the Mercedes series every four months whereas minor service was done every month.

4.14 ROUTINE MAINTENANCE OF BOILERS AND WATER SYSTEM

The following were routinely checked:

Water supply piping

Check for leakage every 3 months

Check insulation for damage every 3 months

Disinfection of hot water system for *leginella preumophila* every week.

- Valves: Check for leakage, damage and corrosion every 3 months.

Fire Hose Cabinet: Check for unobstructed accessibility and power labelling every year.

Executive leakage test at fire connection valve every year.

Check water supply, resting pressure and flow pressure at every last fire hose reel every year.

Executive leakage test at fire hose connection valve every year.

Check whether jet tube complies with standards every year.

Check for easy actuation and tightness of switching elements every year.

DRY CHEMICAL POWDER FIRE EXTINGUISHER

Checks for damage, correct identification label and proper fastening was carried out every month. Pressure testing was carried out every year.

SOIL, WATER AND VENTILATING PIPES

Checks on visible piping and connections as well as cleanouts and end caps were effected every year.

Visible check for leakage, proper condition and fixing was done every year. Appliances were checked for correct drainage and overflow every month.

FLOOR DRAINS

The following were checked with the stated regularity

Water level of seldom used traps and top up every 3 months.

Drains for dirt and soil as well as proper condition every 6 months.

Strainers and opening in covers every 6 months.

Roof gutters every 6 months.

SANITARY APPLIANCES

These were carried out:

Checks for leakage and function every month.

Roof Drains: Gaskets and sealing areas for proper condition, exchange insulation, if required every 6 months.

WATER STORAGE TANKS

Storage tank was checked for deposits and corrosion every year.

- **Oil fired boiler plant:**

  Safety valves were checked for proper function every year.

  Oil piping was checked for leakage and corrosion every year.

  Oil-filter was checked for proper function every 6 months.

- **Expansion Vessel:**

  Checked for correct pressure (1 bar) every year.

  Mixing Valve:

  Checked for cleanliness of internal parts every year.

  Temperature-regulating handle was moved to calcareous deposit every 3 months.

  Valves were checked for proper function every 6 months.

  Different Pressure Changes:

  Checked for pre-set valves every week

4.15 RULES FOR USING COMPUTER SYSTEM

1. Only the Hospital's Computer Analyst or persons was designated to install any new system.

2. Whenever problems arose in using the system, the Computer Analyst was to be contacted immediately.

3. Eating or drinking was prohibited when working on the computer system.

4. The computer systems were properly covered (with the dust cover) at the end of the day's work.

5. The computers were properly switched off from the mains following proper procedure at the end of the day's job.

7. Non-Hospital staff were not allowed to use the computer system

8. Use of external diskettes on the computer in the Hospital was prohibited.

9. No software was installed on any system without duly informing the Computer Analyst.

10. No peripheral Device was installed on any system without duly Informing the Computer Analyst.

4.16 ROUTINE MAINTENANCE OF MEDICAL EQUIPMENT AS CARRIED OUT DURING THIS STUDY

A. RADIOTHERAPY DEPARTMENT Preventive Maintenance / Year

1. Linear Accelerator SLi	3 times per year
2. Treatment Planning Unit Render Plan 3-D	2 times per year
3. Radiotherapy Simulator	2 times per year
4. Superficial Radiation Therapax 150	3 times per year

B. DENTAL DEPARTMENT

1. Treatment Unit (3 Nos.)	2 times per year
2. Dental Chair(3 No.)	2 times per year
3. Suction Machine	2 times per year.
4. Vacuum Mixer and bowl	1 time per year
5. Amalgamator	1 time per year
6. Vibrator	2 times per year
7. Pre-heating Unit	1 time per year

8.	Casting Machine	2 times per year
9.	Corundum Blaster	1 time per year
10.	Polishing Motor	2 times per year.

C. EAR NOSE THROAT (ENT) DEPARTMENT

1. Treatment Chair	1 time per year.
2. Otoprant Examination and Treatment	2 times per year.
3. Audiometer, clinical, diagnostic, 2 channel (2 Nos.) 2 times per year	
4. Audiometer, Electronic Response (Evoked Response) 2 times per year	

5.	Audiometer Impedance	2 times per year
6.	Audiometer Diagnostic, automatic (2 Nos.)	2 times per year
7.	Tone and Speech Audiometer	2 times per year
8.	Spiro meter recording portable	1 time per year.

D. RADIODIAGNOSTIC DEPARTMENT

1.	Practic – 100 (2 Nos.)	1 time per year
2.	Orthoralix SD-C	2 times per year
3.	Oralix AC (s Nos.)	2 times per year
4.	BV-25G6” (2 Nos.)	2 times per year
5.	BV-25G9”(Nos.)	2 times per year.
6.	Diagnost 15 Plus	2 times per year
7.	Diagnost 94	2 times per year
8.	Diagnost 94 with DSI	2 times per year

9.	SD-800 Ultrasound (2 Nos.)	2 times per year
10.	Mammo-Diagnost 400	1 time per year
11.	Bucky-Diagnost TS-Tomo	1 "
12.	Bucky – Diagnost TS	1"
13.	Trauma Diagnost	1"
14.	S.D. 250 (4 Nos.)	1 "
15.	C.T. Scanner with easy vision and laser printer	3 times per year
16.	MRI (Magnetic Resonance Imaging Equipment)	3 times per year
17.	Agfa Auto Film Processor (2 Nos.)	3 times per year.

E. PHYSIOTHERAPY DEPARTMENT Preventive Maintenance / Year

1.	Physiological measuring instrument	2 times per year
2.	Infrared lamp	1 time per year
3.	Exercise Bicycle (2 Nos.)	2 times per year
4.	Nerve Stimulator	1 time per year
5.	Arm contrast bath (2)	1 time per year
6.	Parafin bath arm and foot	2 times per year
7.	Ultrasound therapy apparatus for muscle train treatment	2 times per year.
8.	Short wave therapy unit	3 times
9.	Microwave therapy unit	3 times

F. HAEMATOLOGY LABORATORY

1.	Coulter Counter (2 Nos.)	3 times per year

2.	Heraus Christ Centrifuge	2”
3.	Microscope (2 Nos.)	2”
4.	Blood Sedimentation Unit ESR-Western	2”
5.	Refrigerator for Blood Specimen	2”
6.	Rotator for Blood Specimen	2”
7.	Centrifuge Blood Bank 4 Bags	2”
8.	Centrifuge Haematosis	2”
9.	Centrifuge Bench type General	2”
10.	Analytical Balance (2 Nos.)	1 time
11.	Coagulometer	1”
12.	Glass Washing Machine	3 times

G. MAIN THEATRE

1. Cryo surgery unit Gynaecology Procedures (5 Nos.) 2 times per year

2.	Electro surgery unit 400 watts mobile (7 Nos.)	2”
3.	Electro surgery unit 280 watts mobile (2 Nos.)	2”
4.	Electro surgery unit 50 watts (6 Nos.)	2”
5.	Suction machine electrical (13 Nos.)	2”
6.	Operating light, large copula ceiling mounted	1 time
7.	Operating light small copula mounted (16 Nos.)	1 time
8.	Operating light with satellite ceiling mounted (6 Nos.)	1”
9.	Operating table, 3 sections, minor surgery (3 Nos.) 2 times	

10.	Operating table 4 sections, hydraulic (7 Nos.)	2”
11.	Operating table, gynaecology	2”
12.	Operating microscope Ophthalmology	2”
13.	Operating microscope ENT	1 time
14.	Anaesthesia machine ventilator, 2 vaporiser (8 Nos.)	2 times
15.	Anaesthesia machine, small without ventilator, 1 vaporiser	2”
16.	Vacuum Extractor Electric (2 Nos.)	2”
17.	Vacuum Extractor Manual	2”.

H. HISTOLOGY DEPARTMENT

1.	Microtone rotating paraffin and oxygen freezing	2 times
2.	Automatic tissue processor	2”
3.	Tissue Embedding Equipment Manuals	1 time
4.	Slide warming table	1”
5.	Tissue cutting station	2 times
6.	Wax warmer	1 time

I. OPHTHALMOLOGY DEPARTMENT

1.	Eye magnet hand held	1 time
2.	Ophthalmometer (Keratometer) (3 Nos.)	1”
3.	Battery charger for Ophthalmoscope (4 Nos.)	1”
5.	Ophthalmometer indirect (4 Nos.)	1”
6.	Examination / Refraction Unit (4 Nos.)	2 times

7.	Eye test projector (4 Nos.)	1 time
8.	Streak etinoscope bioscopy (3 Nos.)	2 times
9.	Screen chart projector (3 Nos.)	2”
10.	Schotz tonometer (3 Nos.)	2”
11.	Application tonometer (3 Nos.)	2”
12.	Slit lamp (3 Nos.)	2”

J. C.S.SU.

1.	Autoclave Double Door 66 x 66 x 125cm (2 Nos.)	3 times
2.	Autoclave Double Door, with formaldehyde programme (2 Nos.)	3”
3.	Cleaning unit high pressure	1 time
4.	Washing machine for surgical instruments	3 times
5.	Ultrasonic cleaning 18, L table top (2 Nos.)	2”
6.	Heat sealer, electric	1 time
7.	Endoscope disinfector (2 Nos.)	3 times.

K. MICROBIOLOGY LABORATORY

1.	Microscope phase dark field	2 times
2.	Rotator VDRL	1 time
3.	Microscope Epi-fluorescent	2 times
4.	Centrifuge Cytology	3 times
5.	Analytical Balance (2 Nos.)	2”
6.	Water Bath Shaking 14 litres	2”

7.	Water Bath Shaking 100^{o}C	2”
8.	Incubator Microbiology 256 litres	1”
9.	Magnetic Stirrer	2 times
10.	Water still Apparatus 2 litre/hour	2”
11.	Oven drying cabinet 300^{o}C	2”
12.	Ph meter digital	1 time
13.	Autoclave porous load	3 times
14.	UV Sterilization lamp	2”
15.	Glass washing machine	3”

L. CHEMISTRY LABORATORY

1.	Glass washing machine	3”
2.	Microscope (2 Nos.)	2”
3.	Analytical Balance (2 Nos.)	2”
4.	Blood Analyser Clinical Chemistry	3”
5.	Colorimeter Digital	2”

If all the above are conserved coupled with management skills, the policy should be successful.

All maintenance work is finally filled into a maintenance register, which records facilities, their state and repairs and the actual repairs needed.

4.17 BUILDING AND CIVIL ENGINEERING SECTION

The Department comprises the following:

1. Environmental Maintenance Unit

2. Building Maintenance Unit

3. Civil Engineering Unit

4. Hospital Furniture / Carpentry & Joinery.

This section is in-charge of the maintenance of all Building & Civil Engineering infrastructure as well as furniture in the Hospital complex and rented quarters.

It is also in-charge of acquisition of maintenance of housing for all staff. It handles the development and maintenance of the Hospital housing estates and all estate management functions (i.e. valuations, rentals and furnishings). It handles the Civil Engineering operations such as the development and maintenance of water system (treatment and supply), roads, drains, environmental maintenance and public health matters of the Hospital as well as liaison with Public water supply and environmental bodies. Provision and allocation of office accommodation is also handled by this Section. This Section also maintains all civil works and furniture in the Hospital complex.

4.18 ***Table 3:*** **PLANNED AND EXECUTED PROGRAMME FOR YEAR 2000 BUILDING/CIVIL ENGINEERING SECTION**

S/NO	PROGRAMMES PLANNED	PROGRAMMES EXECUTED
1	CRACKS REPAIRS OF BLOCKS A. B, C, H, K, M, N, P, X	FULLY EXECUTED
2	PAINTING REPAIRS OF BLOCKS A, B, C, H, K, M, N, P, X	FULLY EXECUTED
3	RE-FLOORING RAMIFICATION	FULLY EXECUTED
4	ROOF REPAIRS OF BLOCKS G, X	FULLY EXECUTED
5	FURNITURE REPAIRS	

6	RE-TILING BLOCKS, A, C, E, G, H, L	FULLY EXECUTED
7	ORDER AND INSTALLATION OF KEY SYSTEM	DONE
8	INSTALLATION OF CONCERTINA WIRE (2625 M)	FULLY EXECUTED
9	CONSTRUCTION OF CONCRETE BENCH	DONE
10	CONSTRUCTION OF PACKING LOTS	FULLY EXECUTED
11	FUMIGATION (QUARTERLY)	FULLY EXECUTED
12	LANDSCAPE MAINTENANCE	FULLY EXECUTED
13	PARTITIONING OF BLOCKS H, E, AND V TO CREATE ADDITIONAL OFFICE ACCOMMODATION	FULLY EXECUTED
14	DEPLOYMENT OF STAFF TO JULIUS BERGER NIGERIA PLC FOR TRAINING	DONE

4.19 MECHANICAL / ELECTRICAL ENGINEERING SECTION

This Section is made up of the following units:

1. Electrical Engineering Unit
2. Mechanical Engineering Unit
3. Information Technology Unit
4. Transport Unit.

The Department is responsible for maintenance of the mechanical and electrical fittings and installations.

It handled the maintenance of instrumentations and communication facilities (i.e., telephone, fax, walkie-talkies, electronic systems including low voltage system) in the Hospital, estate and rented quarters. It was also in-charge of acquisition and maintenance of computer units, running of power generation, transmission of power within the Hospital and estates, liaison with NEPA, NITEL, M-TEL and Water Board. This

Section also undertakes the maintenance / repairs of all vehicles in the Hospital under the Transport Unit.

4.20 ELECTRICAL ENGINEERING UNIT

The function of this unit include the following:

1. Telephone and intercom installation and distribution
2. Television installation and monitoring
3. Operation of multiple address system.
4. Installation and repairs of external telephone lines
5. Operation of satellite TV programmes for offices, homes and Hospital premises.
6. Supervision of energisation and installation of Maximum Demand Meter from NEPA sub-station.
7. Monitoring of High Voltage electrical systems and distribution panels
9. Maintenance of general lighting of the premises including security and street lighting.

4.21 *Table 4* **PLANNED AND EXECUTED PROGRAMMES YEAR 2000 MECHANICAL / ELECTRICAL ENGINEERING SECTION**

A. ELECTRICAL UNIT

S/NO	PLANNED PROGRAMMES	EXECUTED PROGRAMMES
1	PROVISION AND INSTALLATION OF SECURITY LIGHTING ON HOSPITAL FENCE (PHASE I)	80%
2	INSTALLATION OF LIGHTENING ARRESTORS	70%
3	AWARD OF CONTRACT FOR SUPPLY AND INSTALLATION OF PAGERS	FULLY EXECUTED

4.	AWARD OF CONTRACT FOR PROVISION OF 10 ADDITIONAL TELEPHONE LINES	50%
5	EXTENSION OF THE SATELLITE TV PROGRAMME TO ALL NURSES CALL STATION IN 49 EXTENSIONS	FULLY EXECUTED
6	MAINTENANCE AND REPAIRS OF FAULTY TV SETS AND OTHER ELECTRICAL APPLIANCES IN THE HOSPITAL COMPLEX	FULLY EXECUTED

4.22 MECHANICAL ENGINEERING UNIT

The Unit is involved in the following activities:

1. Inspection of houses before acquisition for staff quarters.
2. Servicing of Air compressors
3. Maintenance of Vehicles
4. Maintenance of air-conditioners, refrigerators, cold rooms and lifts
5. Maintenance of plumbing work, sewage and gas systems
6. Repair and servicing of photocopiers.

4.23 ***Table 5:*** **PLANNED AND EXECUTED PROGRAMMES FOR YEAR 2000 MECHANICAL ENGINEERING UNIT**

S/NO	PLANNED PROGRAMMES	EXECUTED PROGRAMMES
1	ROUTINE SERVICE OF VEHICLES	FULLY EXECUTED
2	ROUTINE SERVICE OF AIR-CONDITIONERS AND REFRIGERATORS	FULLY EXECUTED
3	PURCHASE OF NEW VEHICLES (13 NO)	FULLY EXECUTED
4	MAINTENANCE / REPAIRS OF PLUMBING AND SEWAGE SYSTEMS	FULLY EXECUTED
5	STRUCTURAL WELDING AND REPAIRS OF HOSPITAL BEDS, TROLLEYS AND CHAIRS IN VARIOUS WARDS AND UNITS	80%
6	MAINTENANCE OF BOILER HOUSE FOR HOT AND COLD WATER DISTRIBUTION	FULLY EXECUTED

7	MAINTENANCE OF KITCHEN, LAUNDRY AND MORTUARY EQUIPMENT	70%

4.24 *Table 6* **INFORMATION TECHNOLOGY UNIT PLANNED AND EXECUTED PROGRAMMES FOR YEAR 2000**

S/NO	PLANNED PROGRAMMES	EXECUTED PROGRAMMES
1	COMPUTERISATION OF THE HOSPITAL COMPLEX	45%
2	INSPECTION OF THE COMPUTER SYSTEMS DELIVERED TO THE HOSPITAL AND ENSURING THAT THEY CONFORM TO SPECIFICATIONS	FULLY EXECUTED
3	MAINTENANCE OF EXISTING COMPUTERS IN THE HOSPITAL	85%

4.25 *Table 7* **TRANSPORT UNIT PLANNED AND EXECUTED PROGRAMMED FOR YEAR 2000**

S/NO	PLANNED PROGRAMMES	EXECUTED PROGRAMMES
1	COORDINATING DAILY TRANSPORT NEEDS OF VARIOUS DEPARTMENT AND UNITS IN THE HOSPITAL	65%
2	DAILY CONVEYANCE OF STAFF TO AND FROM WORK	90%
3	MOBILIZATION OF AMBULANCE	90%

4.26 BIO-MEDICAL ENGINEERING SECTION

This Section was responsible for the acquisition, installation, maintenance and use of all medical equipment in the Hospital. It was also responsible for upgrading installed equipment, in consultation with the Clinical Services Directorate for increased capacity or to take advantage of new technological developments. This section conducted safety inspection in compliance with international standards, calibrate and provide equipment user instructions, trained Engineers and Technicians on the handling and maintenance of installed equipment and also periodic liaison with all necessary healthcare institutions on the status of medical equipment.

The Bio-medical Engineering Section has the responsibility of ensuring the proper functioning of all the medical equipment in the Hospital. The Section also ensured that true diagnosis using the complex equipment is achieved without error.

The Section has four units, namely:

1. Biomedical Electronics Unit
2. Chemical Engineering Unit
3. Radiodiagnostic/Radiotherapy Unit
4. Electromechanical / Mechanical Engineering Unit.

4.27 *Table* 8 BIOMEDICAL ENGINEERING SECTION PLANNED AND EXECUTED PROGRAMMES FOR YEAR 2000

S/NO	PLANNED PROGRAMMES	EXECUTED PROGRAMMES
1	FLUSHING GAS PIPELINES AND COMMISSIONING	FULLY EXECUTED
2	COMMISSIONING OF ALL HOSPITAL EQUIPMENT FOR CLINICAL SERVICES	90%
3	PROVISION OF EXTERNAL GAS SUPPLY FOR CLINICAL SERVICES	FULLY EXECUTED
4	UPGRADING OF MEDICAL EQUIPMENT AS WELL AS CALIBRATION OF X-RAY AND IMAGING EQUIPMENT	FULLY EXECUTED
5	TRAINING FOR USERS OF MEDICAL EQUIPMENT	55%
6	PROVISION OF TECHNICAL SUPPORT IN THE USE OF MEDICAL EQUIPMENT ESPECIALLY IN THE MAIN THEATRES, LABORATORIES, MATERNITY/LABOUR WARDS, ETC	90%
7	OVERSEAS TRAINING FOR BIOMEDICAL ENGINEERS	50%

4.28 MAINTENANCE PLANNING RESEARCH AND STATISTICS UNIT

This Unit is attached to the Office of the Director of Maintenance and is the engine room of the Directorate. The day-to-day running of the operations of the directorate is monitored by the Unit with the aim of ensuring effective **Facility Management** of the Hospital Complex which

is accomplished by planning, research and collation of maintenance statistics.

Some of the salient achievements of this unit include:

- Production of draft Facility Management Policy for the Hospital
- Establishment of Facility Management Standard Forms for running the complex
- Coordination of all the activities of the Directorate
- Preparation of quarterly and periodic reports of the Directorate
- Coordination of all engineering/technical activities and projects of the complex
- Liaison with all projects and engineering contractors
- Coordination of all technical meetings between service contractors and management
- Ensuring effective Facility Management and Maintenance of all Hospital equipment and systems
- Liaison between other directorates for effective Facility Management of the Hospital

- Enforcement and custodian of all Facility Management Standard Forms of the Hospital
- Ensuring official application and maintenance of all Hospital equipment and systems and coordination of the transport system.

Samples of monitoring forms are in Appendix IV. Also appended is *a Maintenance and Repair Program.*

4.29 *Table 9* **ANALYSIS OF MAINTENANCE ACTIVITIES DONE BY STAFF OF THE NATIONAL HOSPITAL, JULIUS BERGER NIGERIA PLC AND PHILIPS PROJECTS BV.**

BUILDING AND CIVIL ENGINEERING/INFRASTRUCTURE

ACTIVITY	% BY NHA & LOCAL CONTRACTORS	% BY JBN	% BY PPBV
BUILDING MAINTENANCE	20	80	0
CIVIL ENGINEERING WORKS	20	80	0
CARPENTRY WORKS	20	80%	
LANDSCAPE/FLOWERING *ENVIRONMENTAL MAINTENANCE	100	0	0
*WASTE COLLECTION/DISPOSAL	100	0	0
*FUMIGATION SERVICES	100	0	0
PLANNING, RESEARCH, STATISTICS AND DEVELOPMENT	100	0	0

NOTE (1) NHA: *National Hospital Abuja*

JBN: *Julius Berger Nigeria*

PPBV: *Philips Projects BV*

* *NHA Staff In Conjunction With Local Contractors*

(2) These Are Estimated Figures Based On Experience On Site.

4.30 *Table 10* **MECHANICAL & ELECTRICAL ENGINEERING ACTIVITIES**

ACTIVITY	% BY NHA	% BY JBN	% BY PPBV
POWER SUPPLY / ELECTRICAL	25	75	0
LIFT	30	70	0
PLUMBING	30	70	0
ALARM SYSTEM FIGHTING	40	60	0
BOILER SYSTEM	10	90	0
AIR CONDITIONERS	20	80	0
LOW VOLTAGE SYSTEMS	100	0	0
KITCHEN/LAUNDRY EQUIPMENT	100	0	0
TRANSPORT ADMINISTRATION	100	0	0
TRANSPORT MAINTENANCE	100	0	0
STAFF QUARTERS MAINTENANCE	100	0	0
INFORMATION TECHNOLOGY MANAGEMENT	100	0	0
INCINERATOR	100	0	0
DEVELOPMENT OF SEWAGE TREATMENT PLANT	100	0	0

NOTE:NHA: NATIONAL HOSPITAL ABUJA

JBN: JULIUS BERGER NIGERIA

PPBV: PHILIPS PROJECTS BV.

4.31. ***Table 11*** **BIOMEDICAL ENGINEERING ACTIVITIES**

ACTIVITIES	% BY NHA	% BY JBN	% BY PPBV
RADIODIAGNOSIS/RADIOTHERAPY (X-RAY MRI LINAC ETC)	0	0	100
BIOMEDICAL ELECTRONICS (ECG, PATIENT MONITOR AUDIOMETER, ETC)	70	0	30
CHEMICAL ENGINEERING (ANALYTICAL LABORATORY INSTRUMENTS, SPECTORPHOTOMETERS, AUTO ANALYSERS, ETC)	40	0	60
ELECTROMECHANICAL /MECHANICAL THEATRE EQUIPMENT, AUTOCLAVES, DENTAL, ENT, OPHTHALMOLOGY EQUIPMENT)	50	0	50

NOTE: NHA: NATIONAL HOSPITAL ABUJA

JBN: JULIUS BERGER NIGERIA

PPBV: PHILIPS PROJECTS BV.

4.32 DATA COLLECTED FROM QUESTIONNAIRE

A. POWER SUPPLY

1. Source of power supply: (All = NEPA, NHA = NEPA + Gen)
2. Alternative source of power supply: (All = Generators, NHA = Gen)
3. Generators Type: (Caterpillar = 4, Lister = 3, Dorman 1, NHA

Caterpillar Capacity = 100 – 2000 KVA, NHA 1270KVA).

4. Installed (1986 – 1993, NHA= 1999)

5. All the generators are still in good working condition.
NHA = Yes

6. Frequency of servicing of the generators: Others (breakdown = 1, monthly = 4, Quarterly = 3, NHA Quarterly.

7. Method of Maintenance Adopted: NHA = Facility Management
Others (when there is a fault / breakdown = 4
On demand = 1
Preventive Maintenance = 3

8. Basic Maintenance Policy: NHA = Facility Management,
Others (routine = 7, breakdown = 1

9. Constraints encountered in maintenance activities:
NHA = getting approvals
Others (lack of tools = 3
Finance = 4
Getting approvals = 1

10. Period of power outage: NHA (few minutes)

Others: few minutes = 1
Hours = 7

11 What happens during outage: NHA (standby)
Others (standby)

12. Knowledge of Facility Management: NHA (Yes)
Others (Yes = 7, No = 1)

13. Services to the Hospital for the past two years in provision of power: NHA (Very High)
Others (fair = 7, Above average = 1)

14. Suggestions made for improvement: NHA (funding) others (provide additional generators, steady power supply from NEPA, Workshop needed, supply of tools, staff).

B. WATER SUPPLY

1. Source of Water Supply: NHA (Water Board)

Others (Water Board)

2. Water Treatment Plant: NHA (Yes)
Others (No = 7, Yes = 1)

3. Water Reservoir: NHA (Yes)
Others (Yes = 7, No = 1)

4. Type of Reservoir: NHA (Ground Reservoir)
Others (Ground reservoir = 1, Elevated = 7).

5. If source of water is FCT Water Board, do you carry out additional treatment for the water before distribution?
NHA (Yes)
Others (Yes = 4, No = 3).

6. Maintenance of water reservoir: NHA (yearly event)
Others (routine flushing = 3
Monthly flushing = 3
Quarterly flushing = 2.

7. Do you face periods of erratic water supply:
NHA (No)
Others (Yes = 4, No = 4).

8. Alternative Sources: NHA (Boreholes on standby)
Others (reservoir =1)
Tanker = 2
Public Tap = 1
Nil = 4.

9. What problems do you encounter in maintaining your water supply? NHA (Human Factors)
Others (Finance = 4, Human Factors = 4).

10. Our services to our clients (patients) for the two years in provision of water: NHA (Very High)
Others (Very High = 4, Above Average = 2, Fair =2.

11. Suggestions for Improvement (constant supply from FCT Water Board, Provision of reservoir)

c. UTILITIES (KITCHEN, LAUNDRY AND MORTUARY)

1. Are these 3 utilities fully established?
   NHA (Yes)
   Others (Yes = 7, No = 1)

2. Are they functioning at full capacity?
   NHA (Yes),
   Others (Yes = 4, No = 4).

3. These utilities are maintained and managed by:
   NHA (combination of in-house contractor and direct labour)
   Others (in-house contractors = 1
   Use of services contractors = 4
   Combination of in-house contractors and direct labour = 3).

4. Our services in this area are:
   NHA (Kitchen)
   Others (Kitchen = 1, Mortuary services = 4, None = 3).

5. Which of these do you engage the external services:
   NHA (Kitchen)
   Others (Kitchen = 1, Mortuary services = 4, None = 3).

6. Method of maintaining the facilities above:
   NHA (the count of Facility Management)
   Others (the count of Facility Management = 4,
   Routing Maintenance = 1, Preventive Maintenance = 3).

D. EMERGENCY FACILITIES (AMBULANCE, ACCIDENT)

1. Are they operating at optimum level?
   NHA (Yes)
   Others (Yes = 8).

2. Response time to emergencies:
   NHA (efficient)
   Others (Very efficient = 1, Efficient = 5, Fair = 1, Good = 1).

3. Method of maintaining our emergency facilities:
   NHA (Routine)
   Others (Routine = 1, On request = 4, when there is breakdown = 1,
   preventive maintenance = 2).

4. How often do you have breakdown?
   NHA (seldom)
   Others (Not often = 4, seldom = 4)

5. Years in operation
   NHA (2 ½ Years)
   Others (up to 5 years = 1, between 6 and 10 years = 2, over 10 years = 5)

E. MEDICAL EQUIPMENT

1. What type of medical equipment do you have?
   NHA (state-of-the-art)
   Others state –of-the-art = 2, Normal medical equipment = 6).

2. Are they operating at optimal level?
   NHA (Yes)
   Others (Yes = 7, No = 1).

3. Servicing of medical equipment:
   NHA (In-house staff, service contractors, external contractors)
   Others (In-house staff = 5, service contractors = 1,
   In-house + contractors = 2).

4. Methods of maintenance:
   NHA (preventive maintenance)
   Others (routine service = 2, on request = 2, preventive = 4).

5. Percentage of medical equipment that have broken down
   NHA (None)
   Others (between 10-20% = 7, Between 30 – 50 % = 1).

6. Service to the Hospital is by:
   NHA (Works order)
   Others (Works order = 1, personal contact = 1,
   works order + telephone + personal contact = 6.

7. Years in Operation:
   NHA (2 ½ Years)
   Others Less than 5 years = 3, between 6 – 10 years = 2,
   more than 10 years = 4).

8. Any knowledge of Facility Management Concept in medical equipment maintenance:
NHA (Yes)
Others (Yes = 6, No = 2).

9. Have you tried Facility Management Concept? If Yes –
NHA (yes) Others (4 each)

10. If No. would you like to adopt it – Others Yes = 8, No = Nil).

F. PERSONNEL ANSWERING THESE QUESTIONNAIRE

1. Sex: NHA (Male)
Others (Male = 7, Female = 1).

2. Department: NHA (Maintenance
Others (Maintenance)

3. Designation: NHA (Management Staff)
Others (Manager = 1, Technicians = 3,
Senior Staff = 4).

4. Years in service: NHA (Over 10 years)
Others (below 5 years = 3, 6-10 years = 2,
above 10 years = 3).

5. Are you involved in maintenance? NHA (Yes)
Others (Yes = 8, No = Nil).

6. How old id the personnel:
NHA (above 46 years)
Others (below 25 years = 1,
26 – 30 years = 1
31 – 45 years = 2
above 46 years = 4).

7. Professional Membership: NHA (Yes)
Others (No = 3, Yes = 5).

8. Knowledge of Facility Management Concept:
NHA (Yes)
Others (Yes = 4, No = 4).

4.33 DATA PRESENTATION AND ANALYSIS

This section deals with the analysis of the data collected by testing the hypotheses earlier stated in section 3.2.

This section is organised in two parts. The first part is the analysis of responses with direct bearing on the hypotheses while the second part analysed other responses.

4.34 DATA ANALYSIS

4.34.1 In order to verify the quality of services provided at the National Hospital Abuja, a Hospital where Facility Management Concept is being implemented, questionnaires were distributed to a sample of the population of staff and patients. The following table shows the actual frequency of responses and the analysis in percentage:

Table 13: **OBSERVED FREQUENCY OF REPONSES**

FM Parameters	Optimum	Average	Poor	Very Poor	Total
Power Supply	30	0	0	0	30
Water Supply	25	0	0	0	25
Utilities: Kitchen, Laundry, Mortuary	24	2	0	0	26
Emergency Facilities	19	1	0	0	20
Medical Facilities	19	0	0	0	19
Total	117	3	0	0	120
Percentage (%)	97.50	2.50	0	0	100

The analysis in table 13 shows that facilities at National Hospital, Abuja are used at optimum level as a result of the implementation of Facility Management Concept.

For further proof, see section 5.4 for the Test of Hypotheses.

4.34.2 In order to verify the significance of Facility Management concept in Hospitals where were distributed to a sample of population of staff and patients and their actual responses in Four (4) Hospitals in Abuja are in the table below. The Table is analysed in percentages.

TABLE 14: **OBSERVED FREQUENCY OF RESPONSES**

FM Parameter	Optimum	Average	Poor	Very Poor	Total
Power Supply	0	32	28	0	60
Water Supply	0	28	44	0	72
Utilities	0	72	28	0	100
Emergency Facilities	0	60	8	0	68
Medical Facilities	0	64	12	0	76
Total	0	256	120	0	376
Percentage (%)	0	68.09	31.91	0	100

The analysis in Table 14 shows that none of the other Hospitals in Abuja, where FM Concept is not being implemented, utilized their facilities at optimum level. 68.09% utilize their facilities at average level while 31.91% do so at poor level.

For further proof that facilities in other hospitals are not being utilized at optimum level because they do not implement the Concept of Facility Management, *see 5.4*.

4.34.2 ANALYSIS OF OTHER RESPONSES

A. POWER SUPPLY

1. The source of power supply is NEPA for all Hospitals, except for National Hospital Abuja which incorporates the use of generators as an additional source.

2. The alternative source of power supply for all Hospitals is generator.

3. 50% of Hospitals use caterpillar of between 100-2000KVA; 37% use Lister, 12.5% use Dorman. National Hospital Abuja uses Caterpillar of 1270KVA

4. While the generators in other Hospitals were installed between 1986 and 1993, those in National Hospital were installed in 1999.

5. All the generators are still working in all Hospitals including National Hospital.

6. In terms of service, 12.5% of Hospitals service when there is breakdown, 50% monthly and 37% Quarterly. National Hospital services on a quarterly basis.

7. It is only National Hospital that implements the concept of Facility Management for the maintenance of their generators. 50% of Hospitals act when there is a fault or breakdown; 12.5% on demand and 37% based on preventive maintenance.

8. It is only National Hospital that has Maintenance Policy in operation. Over 80% on routine maintenance while 12.5% rely on breakdown.

9. 50% of Hospitals encounter constraints as a result of poor financing, 37% because of lack of tools, 12.5 because of delay or lack of approvals. National Hospital's most recurrent constraint is in getting approvals.

10. While periods of power outages last for few minutes in National Hospital, it lasts for hours in over 90% of Hospitals.

11. All Hospitals including National Hospital rely on standby source during outages.

12. While about 90% of Hospitals claim to have knowledge of Facility Management, only National Hospital implements it. In fact, 12.5% of Hospitals did not know of Facility Management Concept.

13. Power services provided in National Hospital has been rated very high; fair in about 90% and above average in 10%.

B. WATER SUPPLY

1. All Hospitals get their water from Water Board.
2. National Hospital has a water treatment plant, but only 12.5% of other Hospitals had the plant too.
3. nearly 90% of Hospitals have water reservoirs.
4. 12.5% of Hospitals use ground reservoir and the rest elevated ones. National Hospital uses the ground type.
5. National Hospital and 50% of others carry out additional treatment for water from Water Board before distribution.
6. Maintenance of water reservoir is carried out on a yearly basis at National Hospital. But 37% of Hospitals do it by routine flushing, 37% by monthly flushing and the rest on a quarterly basis.

7. While National Hospital has not faced any period of erratic water supply, over 50% of other Hospitals face it.

8. Alternative sources of water supply is boreholes in the National Hospital. 12.5% of other Hospitals rely on reservoir, 25% on tanker, 12% on public source and 50% have none.

9. The problems encountered by National Hospital in maintaining the water supply is mostly human factors. 50% of other Hospitals encounter poor financing and 50% human factors.

10. National Hospital is rated very high in water supply services to its customers, while others are rated fair and above average.

C. UTILITIES (KITCHEN, LAUNDRY AND MORTUARY)

1. Over 90% of Hospitals have fully established kitchen, laundry and mortuary.

2. 50% of these utilities do not function at full capacity in other hospitals. At National Hospital, all the utilities function at full capacity.

3. These utilities are maintained and managed in National Hospital by a combination of in-house contractors and direct labour. 12% of other hospitals use in-house contractors, 50% services contractors and about 38% the combination.

4. National Hospital is rated very satisfactory for utilities services, 60% of hospitals satisfactory and 40% fair.

5. National Hospital engages external services for kitchen only. 50% of others engage in mortuary services and over 30% carry out all their services in-house.

6. Only National Hospital uses the Facility Management Concept for maintaining these utilities.

D. EMERGENCY FACILITIES (AMBULANCE, ACCIDENT)

1. All hospitals are operating at optimum level in the provision of emergency facilities.

2. Only about 25% of hospitals are rated low in response time to emergencies.

3. While National Hospital applies the routine method of maintaining the emergency facilities, 50% of others do it on request and about 12% when there is breakdown.

4. National Hospital and 50% of others seldom have breakdown; while 50% have it occasionally.

E. MEDICAL EQUIPMENT

1. National Hospital and 20% of others have state -of -the -art medical equipment.

2. 90% of hospitals have medical equipment that are operating at optimal level.

3. Servicing of medical equipment is done by in-house staff, service and external contractors at National Hospital. Over 50% of other hospitals use in-house staff only.

4. Preventive maintenance as applied in Facility Management is applied in National Hospital. About 50% of others use the normal preventive method and 50% on request.

5. No equipment has broken down in National Hospital since commissioning. 90% of hospitals have about 20% broken down equipment, while the rest have 50% down.

6. National Hospital provides maintenance service by works order method. 80% of others use works order, telephone and personal contacts.

7. National Hospital is 2 ½ years old. 50% of others are over 10 years old while other are less.

F. PERSONNEL ANSWERING THESE QUESTIONNAIRE

1. 90% are males; 10% females.
2. All of them are from the maintenance department of their hospitals.
3. While the personnel that answered from National Hospital is a Management staff, others are 50% senior, 37% technicians and 13% managers.

4. National Hospital personnel is over 10 years in service; 25% of others between 6 and 10 years; 37% below 5 years and 37% above 10 years.

5. All the personnel are involved in maintenance.

6. National Hospital personnel is over 46 years; others are 12% below 25 years, between 26 – 30 years (12%); 25% (31-45 years) and 50% above 46 years.

7. 50% of the personnel who answered from other hospitals did not have knowledge of Facility Management concept.

8. 65% have professional membership.

CHAPTER FIVE

5.0 DISCUSSION OF RESULTS

5.1. INTERPRETATION OF RESULTS

From the data presentation and analysis in the last chapter, the following interpretation clan be drawn:

1. Implementation of Facility Management Concept at the National Hospital Abuja has ensured optimum utilization of power supply, water supply, utilities, emergency facilities and medical facilities.

2. Facility Management Concept is significant for optimum utilization of facilities.

3. While power outage in all other Hospitals in the survey lasted for hours, that of National Hospital was in minutes (maximum of four minutes at a time).

4. Maintenance of equipment in ninety percent Hospitals surveyed was based on breakdown while response time to emergencies was generally poor.

5. As at the time of study, while National Hospital had ninety-eight percent equipment operation, the others had an average of seventy percent functioning.

6. All the other Hospitals had low capacity and standby power generation, this resulted in the inability of the engines to work maximally for long periods.

7. The professional manpower in only twenty percent of the other Hospitals only heard about Facility Management. The Maintenance schemes were largely breakdown maintenance at best, routine preventive maintenance, which was scanty and far in-between.

8. The result at the National Hospital is consistent with the existing views about Facility Management. The implementation of the

policy was successful and the benefits glaring. While National Hospital Abuja attended to **54,770** patients in year 2000 and **79,409** patients in year 2001, the combined total patient attendance of all four other Hospitals were **69,081** for 2000 and **96,713** for 2001.

9. Indeed the difference in performance and realisation of objectives between the National Hospital where Facility Management is implemented and the other Hospitals where Facility Management is not implemented is significant.

5.2 PROBLEMS OF IMPLEMENTATION OF FACILITY MANAGEMENT AT THE NATIONAL HOSPITAL ABUJA

Implementation of the Facility Management Policy was hampered by lack of funding. Government could not pay fully for the main contract for the Hospital Project, neither could payment terms for the commencement of the maintenance contract be met. This resulted in one of the contractors (Philips Projects BV) only partially mobilising to site. Therefore, adequate spare parts and consumables could not be stocked, for medical equipment, electronics, communication systems, etc, thus immediate solutions to maintenance requests could not be achieved. Even the Contractor (M/s Julius Berger Nigeria Plc) that was mobilised on account of their not having demobilised since after the construction project were neither fully paid for the main contract nor was the payment terms for the maintenance contract met as and when due. It required a lot of persuasion and goodwill of the contractor to keep maintenance services going.

- Users (Hospital staff) were being exposed to their responsibilities in the Facility Management chain for the first time in their experience. They had all along been used only to breakdown maintenance thus, they were reluctant to report condition of equipment as a monitoring control. Even when breakdown occurs, there was noticeable laxity in reporting faults leading to a longer downtime than necessary.
- Low voltage electronic system, medical equipment and other service equipment such as laundry and kitchen were deployed to use without formal equipment commissioning by the manufacturers / suppliers.
- The Directorate of Maintenance had to carryout this function, which they did successfully but without back-up spare parts.
- The Hospital was designed to be serviced by 4 No. 1275 KVA Caterpillar Generators but in implementation only 2 No. were installed. The 2 No. outstanding is a serious drawback on the standby power supply capacity of the Hospital.
- Funding is a serious problem. Being a Government Hospital, funds are derived from Government through the budgets process, which involves appropriation by the National Assembly, which atimes may result in fund availability.
- The quality of staff recruited was not conversant with Facility Management procedures and practice. This required a lot of training for both maintenance and user staff members.

- Staff was recruited from various backgrounds and it was initially difficult to blend a working team because “old habits die hard”.
- Attitude of Nigerians to maintenance is not encouraging as they tend to see maintenance as only breakdown maintenance and do not think much of **Preventive Maintenance** and **Facility Management**, even at Top Management Levels.

5.3 DEVIATION FROM SET GOALS AND REASONS FOR THE DEVIATION

The theory of Facilities Management is continuous serviceability of equipment, machinery and infrastructure. This means breakdown or downtime are eliminated or minimised. However, in implementing, Facilities Management in the National Hospital Abuja, the goal was not fully achieved due to the following reasons:

a. Planned Jobs

Some planned / scheduled jobs could not be carried out at the scheduled times.

This was due to the following reasons:

1. Continuous usage of equipment even at the downtime.
14. Unavailability of spares at the time they are needed. This is due to poor funding of the Hospital by the Government.
15. Unavailability of equipment at the time of planned jobs due to exigencies of the period, e.g., an emergency case could come up

that would require the use of equipment at the time it should be maintained.

b. Shortage of Helium Gas

The Hospital imports the Helium Gas that is used at the Magnetic Resonance Imaging (MR) Equipment. This gas cannot be stocked. It is bought and used as required.

At some times, the Government's changing policy on importation affects the supply of Helium gas as order was delayed at seaport. This resulted to the MR equipment being down for about two (2) months.

c. DSI error code of Diagnost 94 caused down time of about two days. The fault was cleared after hardware reset.

d. Faulty Monitor of the Ultrasound Scanner in Antenatal Clinic caused some downtime also. This was fixed.

e. Improper Documentation

Control and supervision was made a little difficult due to improper documentation on the monitoring forms by staff. This is partly due to lack of training and partly due to poor attitudinal disposition.

Despite all the above stated difficulties, a very high percentage of the maintenance needs were attended to. This is due to the fact that the facility was young and apart from routine servicing, breakdowns were few and far in-between. The situation caused by lack of funding could

have been disastrous if the facilities were older and required a more vigorous maintenance regime.

5.4 PROOF (TEST) OF HYPOTHESIS

Hypothesis One *(Effect of Implementation)*

Ho: Facility Management Concept ensures optimum utilization of facilities.

Hi: Facility Management Concept does not ensure optimum utilization of facilities.

Table 15: **OBSERVED FREQUENCY OF RESPONSES**

FM Parameter	Optimum	Average	Poor	Very Poor	Total
Power Supply	30	0	0	0	30
Water Supply	25	0	0	0	25
Utilities (Kitchen/Laundry/Mortuary	24	2	0	0	26
Emergency Facilities	19	1	0	0	20
Medical Facilities	19	0	0	0	19
Total	117	3	0	0	120

Table 16: **COMPUTED EXPECTED FREQUENCY OF RESPONSES**

FM Parameter	Optimum	Average	Poor	Very Poor	Total
Power Supply	29.250	0.750	0	0	30
Water Supply	24.375	0.625	0	0	25
Utilities	25.350	0.650	0	0	26
Emergency Facilities	19.500	0.500	0	0	20
Medical Facilities	18.525	0.475	0	0	19
Total	**117**	**3**	**0**	**0**	**120**

Source: Computed from Table 15

Table 17: **COMPUTATION OF CHI-SQUARE (X^2)**

FM Parameter	**Responses**	**O**	**E**	**O-E**	**$(O-E)^2$**	**$(O-E)^2/E$**
Power Supply	Optimum	30	29.250	0.75	0.5625	0.0192
	Average	0	0.750	-0.75	0.5625	0.0192
	Poor	0	0	0	0	0
	Very Poor	0	0	0	0	0
Water Supply	Optimum	25	24.375	0.625	0.3906	0.0160
	Average	0	0.625	-0.625	0.3906	0.625
	Poor	0	0	0	0	0
	Very Poor	0	0	0	0	0
Utilities: (Kitchen, Laundry, Mortuary)	Optimum	24	25.350	-1.350	1.8225	0.0719
	Average	2	0.650	1.350	1.8906	3.025
	Poor	0	0	0	0	0
	Very Poor	0	0	0	0	0
Emergency Facilities	Optimum	19	19.500	-0.500	0.250	0.0128
	Average	1	0.500	0.500	0.250	0.500
	Poor	0	0	0	0	0
	Very Poor	0	0	0	0	0
Medical Facilities	Optimum	19	18.525	0.475	0.2256	0.0122
	Average	0	0.475	-0.475	0.2256	0.4750
	Poor	0	0	0	0	0
	Very Poor	0	0	0	0	0
Total						**4.7763**

X^2 Calculated = 4.78

Degree of Freedom = (R-1)(C-1)

Where: R = Row = (5-1) = 4

C = Column = (4-1) = 3

Degree of Freedom = 12.

X^2 Critical on a degree of freedom 12 at a 5% level of significance is 21.03.

Decision Rule:

If the *X^2 Calculated* is less than *X^2 Critical* i.e., the value from the table, you **ACCEPT** the Null Hypothesis and *reject* the Alternative Hypothesis. On the

other hand, if the X^2 *Calculated* is greater than X^2 *Critical*, you **REJECT** the Null Hypothesis and *accept* the Alternative Hypothesis.

Decision:

Since the X^2 calculated (4.78) is less than X^2 *Critical* (21.03),

the *Null Hypothesis* that *FM Concept Ensures Optimum Utilization of Facilities* is hereby *ACCEPTED.*

Hypothesis Two (Significance of FM Concept in other Hospitals)

Ho: Facility Management Concept is not Significant for Optimum Utilization of Facilities.

Hi. Facility Management Concept is significant for Optimum Utilization of Facilities.

Table 18: **OBSERVED FREQUENCY OF RESPONSES**

FM Parameter	**Optimum**	**Average**	**Poor**	**Very Poor**	**Total**
Power Supply	0	32	28	0	60
Water Supply	0	28	44	0	72
Utilities	0	72	28	0	100
Emergency Facilities	0	60	8	0	68
Medical Facilities	0	64	12	0	76
Total	**0**	**256**	**120**	**0**	**376**

Table 19: **COMPUTED EXPECTED FREQUENCY OF RESPONSES**

FM Parameters	Optimum	Average	Poor	Very Poor	Total
Power Supply	0	40.85	19.15	0	60
Water Supply	0	49.02	22.98	0	72
Utilities	0	68.09	31.91	0	100
Emergency Facilities	0	46.30	21.70	0	68
Medical Facilities	0	51.74	24.26	0	76
Total	**0**	**256**	**120**	**0**	**376**

Source: Computed From Table 16

Table 20: **COMPUTATION OF CHI-SQUARE (X^2)**

FM Parameter	**Responses**	**O**	**E**	**O-E**	**$(O-E)^2$**	**$(O-E)^2/E$**
Power Supply	Optimum	0	0	0	0	0
	Average	32	40.85	-8.85	78.32	1.92
	Poor	28	19.15	8.85	78.32	4.09
	Very Poor	0	0	0	0	0
Water Supply	Optimum	0	0	0	0	0
	Average	28	49.02	-21.02	441.84	9.01
	Poor	44	22.98	21.02	441.84	19.23
	Very Poor	0	0	0	0	0
Utilities: (Kitchen, Laundry, Mortuary)	Optimum	0	0	0	0	0
	Average	72	68.09	3.91	15.29	0.22
	Poor	28	31.91	-3.91	15.29	0.48
	Very Poor	0	0	0	0	0
Emergency Facilities	Optimum	0	0	0	0	0
	Average	60	46.30	13.70	187.69	4.05
	Poor	8	21.70	-13.70	187.69	8.65
	Very Poor	0	0	0	0	0
Medical Facilities	Optimum	0	0	0	0	0
	Average	64	51.74	12.26	150.31	2.91
	Poor	12	24.26	-12.26	150.31	6.20
	Very Poor	0	0	0	0	0
Total						**56.76**

X^2 *Calculated*	=	56.76
Degree of Freedom	=	(5-1)(4-1) = 12
X^2 *Critical*	=	21.03 at a 5% Level of Significance on a 12 Degree of Freedom.

Decision:

Since X^2 *Calculated (56.76)* *is greater than* X^2 Critical (21.03), the ***Null Hypothesis*** that *Facility Management Concept is not significant for optimum utilization of facilities* is hereby ***REJECTED*.**

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

This research work on the **Implementation of Facility Management (FM) Concept at the National Hospital Abuja**, is part of the efforts to arrest the all pervading decay in public utilities and infrastructure in the Third World countries (especially in Nigeria) due to none or inadequate maintenance.

The introduction of the concept at the National Hospital, Abuja is the first of its kind in a public institution in Nigeria. The concept is envisaged to take over from corrective maintenance by deliberate infusion of mechanisms of **good design**, **informed usage** and **predictive maintenance** as against **corrective** or **breakdown maintenance** which is not only more expensive in all ramifications but also more economically devastating.

The studies proved that the introduction of Facility Management Concept does ensure optimum utilization of facilities. This in turn ensures a high rate of return on the investment made in the installation / construction of the facilities.

Also, it proved that the implementation of the Concept was significant in ensuring the achievement of optimal performance. This is evident from the statistics and the fact that none of the other sample institutions come close in facility performance to the National Hospital.

Some of the hindrances in its implementation are seen in the negative attitude of people to the new concept, as is always the case with such novel introduction. Some of the Staff of the National Hospital, Abuja (NHA) who are supposed to be the operatives of the Facility Management Programme were recruited from different backgrounds, where emphasis may have been on corrective maintenance. They had to be re-oriented towards the implementation of Facility Management (FM) whose emphasis is on preventive maintenance. This is a herculean task as *"old habits die hard"*.

Another factor militating against effective implementation of Facility Management is that of inadequate funding. The process of budgeting in the public sector most often is carried out under two broad categories of *Capital* and *Recurrent* estimates. While the capital estimates are for new or continuing projects, the recurrent are mainly for salaries, wages and other overheads. However, as it often happens, maintenance of Facility Management are omitted or tucked under an obscure heading of renewals.

The same situation is prevalent in the private sector although to a lower extent. The release of the funds budgeted even though inadequate is as difficult to access as squeezing water from a stone. This is because the officers responsible for such releases of funds do not appreciate the importance of Facility Management. They would rather spend money when equipment breaks down and not before!

At the National level, Maintenance is not accorded the pride of place it deserves. Funds are sourced from overheads only when breakdown or failure occurs. When such funds are not forthcoming either due to bureaucracy or non-availability, prolonged or total disuse of the facility results. This has been the bane of many of Nigeria's public infrastructure and utilities.

In addition to the above-mentioned factors, the various professional bodies that have roles to play in Facility Management have not been creating the awareness necessary in the public. Bodies such as the Nigerian Society of engineers, the Nigerian Institute of Building, the Nigerian Institute of Architects, etc, must be in the vanguard for the creation of Facility Management awareness.

Our institutions of higher learning must also review their programmes to produce fully equipped graduates for the Facility Management industry.

6.2 AREAS FOR FURTHER STUDIES

In view of the results achieved in the Hospital, it shall be beneficial to study the effects of Facilities Management in an extensive area such as Nigerian Roads Maintenance Agency.

It may also be beneficial to study channels of funding Facility Management in the Public Sector devoid of constraints of budgetary hiccups. Implementation of Facilities Management in a key sector such as Power Supply (NEPA) may be studied for possible improvement in their performance rating.

Finally, government must realise that the continuous derivation of economic benefit from capital investment can only be sustained by an enduring and adequately funded Facility Management Policy. Government must give the needed political muscle for the agencies and even the private sector to take cue.

6.3 RECOMMENDATIONS

The Facility Management Concept being implemented and coordinated at the National Hospital, Abuja since its inception two and half (2½) years ago has proved to be a very good tool in **optimum utilization of Facilities**.

The concept aims at ensuring optimal utilization of technical facilities, infrastructure, human and material resources to achieve set goals and objectives. Irrespective of the shortcomings and teething problems, we have been able to achieve the objectives in the Hospital in terms of prompt maintenance of the *state-of-the-art* medical equipment, infrastructure and utilities.

Based on my findings (stated in the conclusion) the concept if given the necessary support and what it takes, will go a long way to solve the problems of large scale decay of infrastructure in developing countries.

Consequently, the following are recommended:

- Government of developing countries at all levels should make annual budgetary provisions for maintenance and easy access to such funds. In other words, the Federal, States and Local Governments should include in their annual budgets, specific provision for **Facility Management** of infrastructure.
- Government should also make policy decisions to influence all establishments to put in place, a maintenance policy to sustain capacity utilization as is the case in the National Hospital, Abuja.
- Measures of creating awareness should also be put in place as a way to promote the new concept. This could be by way of introducing Facility Management as a course of study in our institutions of higher learning.

- Other professional bodies should be encouraged to take part in the programmes tailored towards multidisciplinary Facility Management.
- Facility Management is a two-way arrangement between the **Equipment User** and the **Facility Manager**. It is important that the users of the equipment are properly trained on the use of the equipment as well as in Principles of Facility Management. This measure will reduce response time to the barest minimum.
- The use of standardised equipment and spares should be considered and pursued as a National Policy.
- A continuous statistical analysis of the concept, methods and cost of procuring maintenance should be embarked upon as a tool for Management decision making on optimising operational performance.

The above measures if adopted will re-awaken Nigeria and other developing countries to maintenance culture which shall be very beneficial.

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JOURNAL AND OTHER SOURCES

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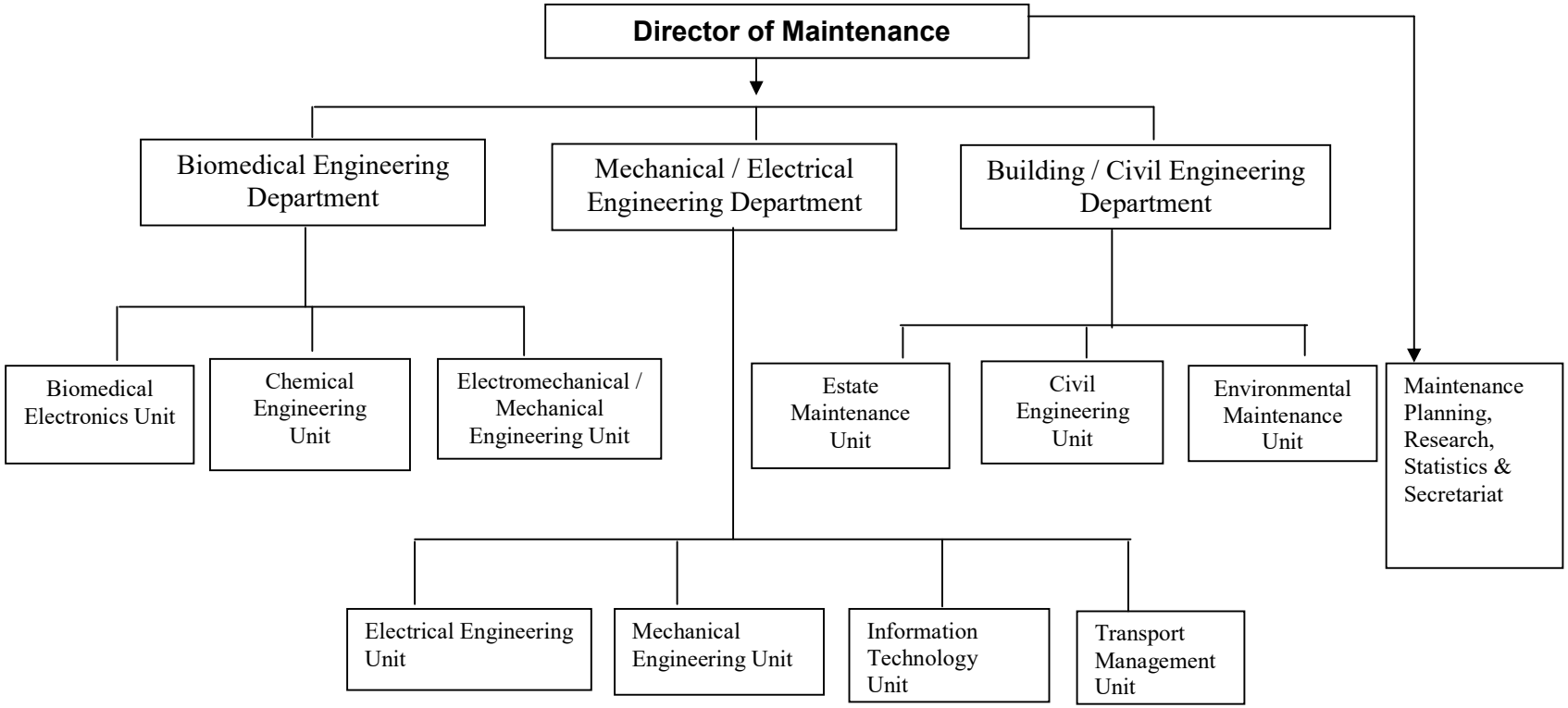
APPENDICES

APPENDIX I

- CHARTS

DIRECTORATE OF MAINTENANCE ORGANISATION CHART



APPENDIX II

Maintenance and Repair Model

Appendix II

(Maintenance & Repair Model)

A Maintenance and Repair Programme

Management Function	**Maintenance and Repair (M&R) Element**
Planning and Programming	* Inventory of facilities (input) - By category - By condition - Highlight critical deficiencies - Pickup "new finds" * Categorization of work (input) * Standards (input) - Timelines - Quality - Work * Condition assessment (input) - Trends - Critical deficiency trends - Adverse impacts * Priorities (input) - By activity - By class - By critical deficiency * Annual work plan (product) * Mid-term plan (product)
Budgeting	• Budget guidance sets the tone • Flows from the work plan • Budget process • Cost accounting must initially be considered • Impact of capital budget - Design of maintain - Life-cycle costs to be optimized; not simply capital cost.

Backup Documents

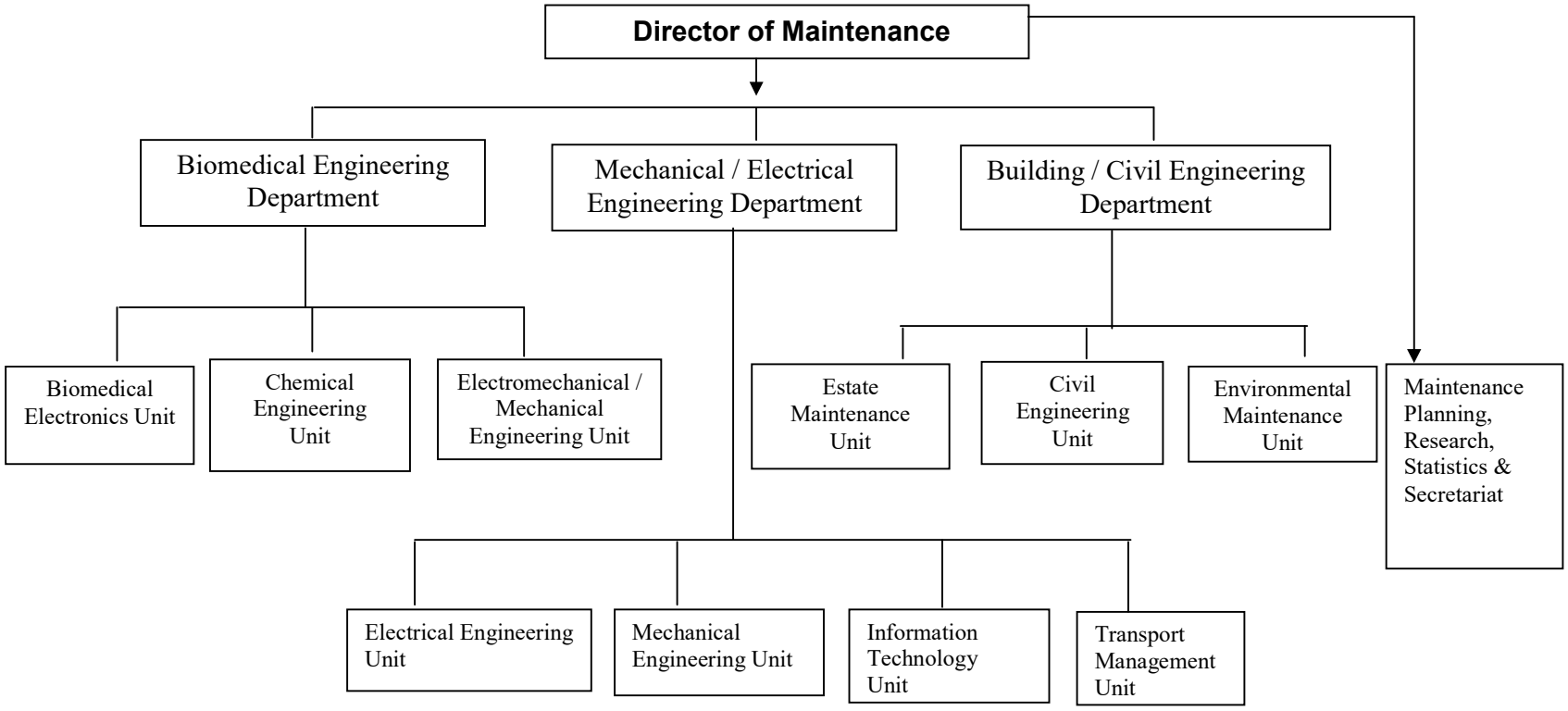
Management Function	**Maintenance and Repair (M&R) Element**
	* Comparison to target range of percentage of current replacement value (CPV) • Historical trend comparison • Comparison to current budget year • Impact statements if inadequate • Definition of requirements - By activity - By criticality • Eliminate leakage of funds - By definition - By migration * Submission often "banned" to meet multiple funding scenarios
Organizing	* Organizational models are available • Lines of responsibility must be clear • Placement of program is important • Material management has an impact • Analysis capacity needed in large organizations • "Submeter" facilities for comparison
Staffing	* Quality, technical competence • Quantity • Contract vs, in-house mix • Training • Leadership • Inspection

Management Function	**Maintenance and Repair (M&R) Element**
Directing	* Priorities set in budget cycle * Work management and coordination (the key) • Appropriate level of design needed • Rapid response to crises • Some provision for necessity to react • Allocation of budgets to subactitvities - Ability to execute - Criticality - Provide specific guidance • Contracting strategy • Condition assessment • Commissioning periods/procedures for new buildings to reduce maintenance • Automate diagnostics
Controlling	* Approval levels • Control of budget • Control of finances • Management information systems (MIS) • Accountability • Ability to react to crises, new priorities, or end-of-year windfalls • Documentation
Evaluating	* Comparators • Condition assessment - Critical deficiency trends - Total deficiency trends • Work management system • Comparison with historical data • Field assessment • Customer feedback

APPENDIX III

DIRECTORATE OF MAINTENANCE ORGANISATION CHART

DIRECTORATE OF MAINTENANCE ORGANISATION CHART



APPENDIX IV

Monitoring Forms

NATIONAL HOSPITAL ABUJA
PLOT 132 CENTRAL DISTRICT (PHASE II)
PMB 425 GARKI – ABUJA

ORIGINAL

LOCAL TRANSPORT REQUEST

TO THE DIRECTOR OF MAINTENANCE

0054

Type of vehicle required……..

Time required…….. Date required…….

Requested by…… Rank …….

Dept/Section ……

To: ……...

Official / Private …….

Signature…… Date……

Head Division / Unit Comment …….

Director of Maintenance: APPROVED / NOT APPROVED ……..

Signature…… Date ……..

FOR TRANSPORT OFFICER

Vehicle No. …….. Type…….

Driver's Name ……

Kilometre Out…… Kilometre in……

Time Out……. Time in……..

Driver's Signature …….. Date:……..

Drivers may not vary from this instructions or drive anyone without this authority

MAINTENANCE DEPARTMENT

National Hospital Abuja
Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

VALUATION REPORT

0951

Date……..

Contract Ref. No ……..
Date of Award …….
Name of Contractor / Supplier ……
Address of Contractor / Supplier ……
…….

Valuation Report No. ……..

Total Contract Sum …….

S/No	Work Measurement	Qty	Unit	Unit Cost	Total Cost	

…… ……... ……
Quantity Surveyor **Maintenance Officer**

…… ……... ……
Asst. Director of Maintenance **Director of Maintenance**

NATIONAL HOSPITAL ABUJA

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

MAINTENANCE DIRECTORATE

Vehicle Running Sheet

Vehicle No…….. Date……. Driver…….

Instructed By …….

From	To	Materials Carried	Time Out Departure	Time of Arrival	Kilometer Reading		Kilometer Covered	Sign
					Closing	Closing		

NATIONAL HOSPITAL ABUJA

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

MAINTENANCE DIRECTORATE

Internal Maintenance Requisition Form

From: ……. To: ……

Unit / Section / Dept.:……

Requisition by: ……. Date: …….

Approved by: Director / HOD ……Expected Completion Date: ……

A) Type of work - tick

Build/Civil ☐
Carpentry ☐
Electrical ☐
Electronics ☐
Equipment ☐
Mechanical ☐
Masonry ☐
Plumbing ☐
Painting ☐
Tele-system ☐
Air/Con. ☐
Alteration ☐

Please carry out repairs / Maintenance as follows
Location: …….

Details: ……

……

……..

Requirement (For completion by Maintenance Officer

Labour ……

Material ……..

Plant/Equip……...

N	K

Amount……..

……

Others …… ……

B) Completion Certificate

The above work / repairs have been satisfactorily completed
Or carried out……
Other Comments……..

Cost Code

Material: ……

Labour: ……

Plant/ Equip: ……..

Maintenance Officer **Requesting Officer**

cc **DM, Accounts**

DIRECTORATE OF MAINTENANCE

NATIONAL HOSPITAL
Plot 132, Central District (Phase II) PMB 425, Garki - Abuja

Inspection / Verification Form

00100

Petroleum Products Only

Date: ……

Contract Ref. No: ……..
Date of Award: …….
Name of the Contractor / Supplier: ……..

Address of Contractor / Supplier: …….

List of Materials Supplied

1. ……
2. ……
3. ……
4. ……
5. ……
6. ……
7. ……
8. ……
9. ……
10. ……

Verification Team	Name	Rank	Comment	Signature of Verification Officer
Julius Berger Nig. Plc				
Directorate of Finance				
Internal Audit Unit				
Security Unit				
Directorate of Maintenance				

…….
Director of Maintenance

NATIONAL HOSPITAL ABUJA
Plot 132, Central District (Phase II) PMB 425 Garki - Abuja

WORKS ORDER

NO……

DATE:……..

From…….. To……
Unit/Section/Dept

Requisition by: …….. Approval to Execute…….
Date…….

DESCRIPTION OF WORKS

Capital (Value) ----------

Build/Civil ☐ New Job) ----------

Electrical ☐ Supply Only ----------

Electronics ☐ Major Repairs ----------

Equipment ☐ Minor Repairs ----------

Carpentry ☐ Alteration ----------

Mechanical ☐ ----------

Masonry ☐ **Approvals: ……** **Amount ----------**

Plumbing ☐ DM……... ----------

Painting ☐ CMD …… ----------

Tele-system ☐ **Sections** ----------

☐ **B/C** ☐ **M/E** ☐ **BME** ☐ OTHERS ----------
Contractor

This is to certify that the above job has been Satisfactorily completed

Completion Time----------

Completion Date: ----------

a.) **Contractor**---------- **Cost Code**:

b.) Requisitioning Officer ---------- Capital ----------

c.) HOD ---------- Maintenance ----------

Repairs ----------

d.) Supervising Officer---------- Supply Only ----------

Materials ----------

e.) HOD---------- Labour ----------

f.) Other Comments---------- Plant/Equip ----------

☐

Amount in words----------

NATIONAL HOSPITAL ABUJA
Plot 132 Central District (Phase II) PMB 425 Garki - Abuja
MAINTENANCE DIRECTORATE

PAYMENT CERTIFICATE (*) No……..

(For Building and Civil Engineering Works)

Contract Ref: ---------- Dated a----------

Works known as ---------- Situated at ----------

Payment as detailed below is **due to Contractor** Certificate NO

Messrs ----------Date of Issue

Of ----------Date of Valuation

---------- Initial Contract Sum

---------- Revised Contract Period

Initial Contract Period

Gross Amount

Less retention (Stated below) …. %

Less Materials Supplied on Credit

Add/Deduct ……...

Net Amount

Less Previous Payment

Amount due for payment in words

Certified Correct ---------- Date: ---------- Sign: ----------
Quantity Surveyor ***Supervising Maintenance Officer***

APPROVALS Date: ----------

Director of Maintenance ***Assistant Director***

Chief Medical Director

STATEMENT OF RETENTION

Gross Retention under the terms of the Contract…… N
Previous releases to nominated Sub-contractors…….. N
The Contractor having confirmed receipt of satisfactory indemnity final payment is to be made to nominated Sub-contractors listed below, the retention being adjusted according …… N
---------- N
a) ---------- N
b) ---------- N
c) ---------- N
Balance of Retention ……N
Partial Release of Retention ……N
Net Retention has shown in Certificate above ……N

*Note: 1. Indicate if interim or Final 2. All the amounts are exclusive of Tax.

NATIONAL HOSPITAL ABUJA

Plot 132 Central District (Phase II) PMB 425, Garki – Abuja

MAINTENANCE DIRECTORATE

PAYMENT CERTIFICATE FOR PERIODIC CONTRACT

Contract Ref---------- Date: ----------
Works known as ---------- Situated at: ----------

Payment as detailed is due to Contractor Payment No.

Messrs ----------
Of ----------

GROSS AMOUNT TO DATE: ……

ADD/DdT VARIATION ……

LESS OTHERS……..

LESS PREVIOUS PAYMENTS……

Amount due
For payment in words

Certified Correct: Quantity Surveyor ---------- Date: ----------

Supervising Maintenance Officer: ---------- Date: ----------

Assistant Director:---------- Date: ----------

Approved: Director of Maintenance: ---------- Date:----------
---

CHIEF MEDICAL DIRECTOR **DATE**

NATIONAL HOSPITAL ABUJA
MAINTENANCE DEPARTMENT

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

Inspection / Verification Forms

Contract Ref. No: ……

Date of award……..

Name of Contractor / Supplier ……

Address of Contractor / Supplier …….

……..……..

List of Materials Supplied

1. ……
2. ……
3. ……
4. ……
5. ……
6. ……
7. ……
8. ……
9. ……..
10. ……

Verification Team	Comment		Signature of Verification Officer
J. User's Comment			
Maintenance Officer's Comment (Quality Certification)			
Auditor's Comment			
Asst. Director's Comment			

……..
Director of Maintenance

NATIONAL HOSPITAL ABUJA
MAINTENANCE DEPARTMENT

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

EQUIPMENT SURVEY

Unit_____ Date_____

---

1. **AIR HANDLERS – PACKAGES UNITS**

Overall Appearance ☐ Good ☐ Improvement needed

Filters ☐ Clean ☐ Dirty

Cleaned / Replaced ☐ Monthly ☐ Bimonthly ☐ Quarterly
Semiannual ☐ Annual

Coils ☐ Clean ☐ Dirty
Date Last Cleaned

Cleaned ☐ Semiannual ☐ Annual
☐ Good ☐ Corroded
☐ Operational ☐ Nonoperational

Bearings / Belts / Motors ☐ Good ☐ Repairs Required

Remarks: _____

---

2. **PUMPS**

Overall Appearance ☐ Good ☐ Improvement Needed
Bearings /Packagings / Motors ☐ Good ☐ Repairs Required
Remarks: _____

---

3. **TEMPERATURE CONTROL SYSTEM**

Overall Appearance ☐ Good ☐ Improvement Needed
Compressor Bled and ☐ Weekly ☐ Monthly ☐ Automatic
Oil Changed ☐ Semiannual ☐ Annual
Dyer Maintained ☐ Yes ☐ No
Remarks:_____

---

4. **BOILER**

Overall Appearance ☐ Good ☐ Improvement Needed
Water Treatment Program ☐ Yes ☐ No Company:_____
Annual Maintenance
Performed ☐ Yes ☐ No
Remarks: _____

(*Contd)*

5. COOLING TOWER

Overall Appearance ☐ Good ☐ Improvement Needed
Water Treatment Program ☐ Yes ☐ No Company _____
Cleaned ☐ Bimonthly ☐ Quarterly
☐ Semiannual ☐ Annual

Belts / Gear Box / Motor ☐ Maintained ☐ Repairs Required
Remarks: _____
_____

6. UNIT HEATERS

Overall Appearance ☐ Good ☐ Improvement Needed
Operational ☐ Yes ☐ No
Annual Maintenance
Performed ☐ Yes ☐ No

Remarks: _____
_____

7. CHILLERS

Overall Appearance ☐ Good ☐ Improvement Needed
Logs Maintained ☐ Yes ☐ No
☐ Every 10 Hrs Operation ☐ Less Often
Annual Maintenance
Performed ☐ Yes ☐ No
Oil Analysed ☐ Yes ☐ No

Remarks: _____
_____

8. EXHAUST / RELIEF FANS

Overall Appearance ☐ Good ☐ Improvement Needed
Bearings / Belts / Motors ☐ Good ☐ Repairs Required
Remarks: _____
_____

9. AUTOMOTIVE SHOP EQUIPMENT

Overall Appearance ☐ Good ☐ Improvement Needed
Battery Testers / Chargers ☐ Good Date Calibrated _____
☐ Repairs Required
☐ Good
Brake Equipment ☐ Good ☐ Repairs Required
Front End Machine ☐ Good Date Calibrated _____
Repairs Required ☐
Lifts / Racks ☐ Good ☐ Repairs Required
Tire Changers ☐ Good ☐ Repairs Required
Wheel Balancer ☐ Good Date Calibrated

☐ Repairs Required

Air Compressor -

Oil Changed	☐ Monthly	☐ Quarterly
	☐ Semiannual	☐ Annual
Bled Daily	☐ Yes	☐ No
System Air Leaks	☐ Yes	☐ No

Remarks: _____

_____

10. ENERGY MANAGEMENT

Operating	☐ Yes	☐ No		
Type	☐ Boiler	☐ Chiller	☐ Fans	
	☐ HVAC	☐ Lighting	☐ HVAC / Lighting	

Energy Management Manual
Being Followed ☐ Yes ☐ No

Remarks: _____

_____

_____

11. MAJOR REPAIR - REPLACEMENT

Budgeted Next Year _____

_____

To Be Budgeted Next Year _____

_____

Key Use of Forms:

Used in the performance of an inspection of the equipment covered by the form.

Who Prepares:

Maintenance Inspector.

Who Uses:

Plant Engineering Personnel to evaluate existing maintenance activities and plan schedule future tasks.

How to Complete:

As the inspection is performed, check the appropriate boxes.

Alternative Forms:

Changes can be made to make this form more company-specific.

NATIONAL HOSPITAL ABUJA

MAINTENANCE DEPARTMENT

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

Annual Heating and Ventilating System Inspection Checklist

ANNUAL HEATING LAND VENTILATING SYSTEM INSPECTION CHECKLIST

Building_____ Date of Inspection _____

Maintenance Inspector's Name _____

EXTERIOR

The inspection of the exterior heating system consists of carefully noting the location and condition of the schedule items.

Items to look for are:

1) Vandalism.
2) Badly rusted equipment and supporting devices requiring complete cleaning, priming and painting.
3) Masonry (chimneys) that is missing or masonry requiring tuck pointing of joints. Also masonry that is badly deteriorated by weathering or other action.
4) Damaged oil filling stations – including pipe and fittings.
5) Damaged vent piping and fittings.
6) Equipment and / or supporting devices so badly rusted or broken requiring replacement of parts.
7) Oil tank corrosion.
8) Bent and otherwise damaged louvers, bird screens, exterior dampers, ventilation equipment intake or exhaust ducts.
9) Inoperable exterior dampers.
10) Roof or wall type fan operation.
    a. Fan running
    b. Damper operating
11. Relief dampers or relief vents condition.
12. Roof flashing condition at:
    a. Roof fan units
    b. Duct openings;
    c. Pipe openings.

13. Chimney condition including supports
14. Chimney weather cap conditions.

Exterior	**Remarks**	**Cost Est.**
1 Chimney and Gas Vents		
Masonry		
Metal		
Cap		
Roof flashing		
Roof Fan		
Fan operable		
Damper		

NATIONAL HOSPITAL ABUJA
MAINTENANCE DEPARTMENT

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

Portable Water Pumping Plant Inspection Checklist
PORTABLE WATER PUMPING PLANT INSPECTION CHECKLIST

Maintenance Inspector's Name _____
Designation and Location of Item Inspected _____

_____

Instructions: Perform the specified inspection and maintenance tasks. Insert the date when the activity is complete. Make any comments which are pertinent to future maintenance needs.

Items To Be Inspected	**Date**	**Comments**
Inspect valves for leaks and defects. Replace defective parts		
Check pump for proper operation, leaks, and damage. Repair or replace as required. Lubricate as required.		
Check pump coupling for alignment and damage. Adjust, repair, or replace as required.		
Lubricate motor as required. *Do not over lubricate*		
Check motor for excessive heat or vibration.		
Check support for rust and corrosion. Remove and corrosion and apply paint.		
Inspect wiring and electrical controls for loose connections; charring, broken, or wet insulation; evidence of short circuiting and other deficiencies. Tighten, repair, or replace as required.		

Provide any suggestions or recommendations for follow-up activities or any other comments related to the inspection and maintenance activities.

NATIONAL HOSPITAL ABUJA
MAINTENANCE DEPARTMENT

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

Fuel Receiving Facility Inspection Checklist

FUEL RECEIVING FACILITY INSPECTION CHECKLIST

Maintenance Inspector's Name _____
Designation and location _____
_____

Instructions: Perform the specified inspection and maintenance tasks. Insert the date when the activity is complete. Make any comments which are pertinent to future maintenance needs.

Item to be Inspected	Date	Comments
Check platforms and islands for loose, missing, worn, or rotted planks. Tighten, repair, or replace as required.		
Check all connections for rust and corrosion and missing, broken, or damaged parts. Clean, repair, or replace as required.		
Check farming, supports, guardrails, and stairs for deterioration and damage. Repair or replace as required		
Check hose racks and reels for rust and corrosion of metal components and for rotting and insect infestations of wood components. Clean, repair, or replace as required.		
Check signs and marking for accuracy or replace as required		
Check all grounding connections, repair or replace as required.		
Inspect all painted surfaces for cracking, scaling, peeling, wrinkling and alligatoring, and loss of paint.		

Provide any suggestions or recommendations for follow-up activities or any other comments related to the inspection and maintenance activities.

NATIONAL HOSPITAL ABUJA
MAINTENANCE DEPARTMENT

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

Fuel Storage Inspection Checklist

FUEL STORAGE FACILITY INSPECTION CHECKLIST

Maintenance Inspector's Name:_____

Designation and Location of Item Inspected_____
_____

Instructions: Perform the specified inspection and maintenance tasks. Insert the date with the activity is complete. Make any comments which are pertinent to future maintenance needs.

Item To Be Inspected	Date	Comments
Inspect foundations for settlement, cracking, and heaving		
Inspect exterior concrete surfaces for cracks, exposed reinforcing, leaks, and spalling		
Inspect exterior steel surfaces for rust, corrosion, and deteriorated paint		
Inspect roof surfaces		
Inspect floating and expansion – type roofs, seals, supports, and support guides for rust, corrosion, sealing, paint, and damage		
Inspect structural supports and connections for rust, corrosion, rot, broken, cracked, distorted, loose, missing, and deteriorated paint		
Inspect tank linings		
Inspect tank interior		
Inspect frames and covers on manholes and hatches for rust, corrosion, cracks, breaks, missing or damaged bolts, defective hinges and gaskets		
Inspect vents for rust, corrosion, and dirty screens		
Check pressure and vacuum relief valves for operation, leakage, and adjustment.		
Check manometers and thermometers for accuracy, damage, and level of fluid.		

NATIONAL HOSPITAL ABUJA
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Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

Walk-In Freezer Inspection Checklist

WALK – IN FREEZER INSPECTION CHECKLIST

Maintenance Inspector's Name_____

Designation and Location of item Inspected_____

_____

Instructions: Perform the specified inspection and maintenance tasks. Insert the date when the activity is complete. Make any comments which are pertinent to future maintenance needs.

Replace dirty throwaway-type filter; wash permanent filters and restore viscous coating per manufacturer's instructions.		
Inspect wiring and electrical controls for loose connections, charring, broken, or wet insulation; evidence of short-circuiting and other deficiencies. Tighten, repair, or replace as required		
Report or correct unsanitary conditions		
Lubricate electric motor as applicable		
Check motor for excessive heat and vibration		
Inspect for rust and corrosion. Remove rust and corrosion, and apply paint where applicable		
Check valves and pipes for leaks and loose connections. Repair, repair, replace, on tighten as required		
Check fans for freedom of rotation, bent blades, loose or missing parts, and repair, replace or tighten as required.		
Check for proper guards, hangers, and supports. Tighten, repair, or replace as required.		
Clean coils as required.		

Provide any suggestions or recommendations for follow-up activities or any other comments related to the inspection and maintenance activities.

NATIONAL HOSPITAL ABUJA
MAINTENANCE DEPARTMENT

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

Sewage Collection and Disposal System Inspection Checklist

SEWAGE COLLECTION AND DISPOSAL SYSTEM INSPECTION CHECKLIST

Maintenance Inspector's Name: _____

Designation and Location of Item Inspected: _____
_____

Instructions: Perform the specified inspection and maintenance tasks. Insert the date when the activity is complete. Make any comments which are pertinent to future maintenance needs.

Item to Be Inspected	Date	Comments
General Inspect grease traps, oil interceptors, and similar equipment for accumulations of scum and grit		
Inspect frame, cover, and ladder rungs for rust, corrosion, fit of cover, and damage.		
Inspect concrete and masonry for cracks, breaks, spalling, deteriorated mortar joints.		
Inspect piping for corrosion, open joints, cracked or crushed sections, obstructions.		
Inspect inverted siphons and depressed sewers for clogging, sluggish flow, accumulations of grit and debris.		
Check for leakage, rust, corrosion, deteriorated coatings. Remove rust, spot paint as required.		
Inspect supports and anchors.		
Check bar screen and raker for corrosion and damage		
Inspect cutters.		
Check cutters		
Check lubrication. *Do no over lubricate*		
CHLORINATOR Inspect housing for adequate ventilation		
Inspect assembly for rust, corrosion, or leaks, remove rust or corrosion and spot paint as required.		

(contd)

Item to be Inspected	Date	Comments
VEGETATION AND ADJACENT GROUND Inspect grass and ground cover plants.		
Inspect ground surfaces for indications of seepage from sewers		
TIDE GATE Check operation		
Inspect for blockage		
SPECIAL INSPECTION DURING OR AFTER PROLONGED RAIN OR SEVERE STORM Inspect manholes for infiltration, proper grading		
Inspect underground piping		
Inspect above-ground piping		
Inspect vegetation on slopes for stabilization.		

Provide any suggestions or recommendations for follow-up activities or any other comments related to the inspection and maintenance activities.

NATIONAL HOSPITAL ABUJA
MAINTENANCE DEPARTMENT

Plot 132, Central District (Phase II) PMB 425, Garki – Abuja

Laundry Equipment Inspection Checklist

LAUNDRY EQUIPMENT INSPECTION CHECKLIST

Maintenance Inspector's Name: _____

Designation and Location of Item Inspected _____

_____

Instructions: Perform the specified inspection and maintenance tasks. Insert the date when the activity is complete. Make any comments which are pertinent to future maintenance needs.

Item to be Inspected	Date	Comments
Inspect wiring and electrical controls for loose connections; charred, broken, or wet insulation; short circuits, wrong size fuses; other deficiencies, and tighten, correct, repair, or replace as required.		
Check condition of belts and / or chains and adjust or replace as required		
Check alignment of pulleys and adjust as required.		
Lubricate bearings as applicable. *Do not over lubricate.*		
Check motor(s) for excessive heat and vibration.		
Check and ensure proper installation lf guards, supports, and mounting bolts		
Check for leaking pipe connections, valves, steam traps and other mechanical defects, tighten, repair, or replace as required.		
Check gaskets / seals; repair, or replace as required.		
Inspect for rust and corrosion. Remove rust and corrosion and apply paint where applicable		
Check and clean lint filters and drains.		

Provide any suggestions and recommendations for follow-up activities or any other comments related to the inspection and maintenance activities.

APPENDIX V

SAMPLE OF QUESTIONNAIRES

1. **POWER SUPPLY**
2. **WATER SUPPLY**
3. **UTILITIES (KITCHEN, LAUNDRY, MORTUARY)**
4. **EMERGENCY FACILITIES**
5. **MEDICAL EQUIPMENT**
6. **INFRASTRUCTURE MAINTENANCE.**

QUESTIONNAIRE FOR MAINTENANCE SECTION

Please tick as appropriate or provide answer as per space provided

A **POWER SUPPLY**

1. What is your alternative Power Supply from NEPA

   a) Solar Energy ☐ (b) Generator ☐

   (c) None ☐ Others ☐ Specify

2. If generating set, what type, make and capacity

   (a) _____ (b)_____(c) _____

3. When was it installed? _____

4. Is it still in good working condition yes ☐ No ☐

5. If no state reason: _____

6. If yes, how often do you carry out service?

   (a) Monthly ☐ (b) quarterly ☐ (c) When there is breakdown ☐

7. What Method of Maintenance adopted (a) FM ☐ (b) Routine Maintenance? ☐ (c) When there is a developed faulty or breakdown ☐ (d) on demand ☐ (e) Preventive Maintenance ☐

8. Our Maintenance Policy is basically on (a) Facility Management ☐

   (b) Routine Maintenance ☐

9. Constraints encountered in Maintenance activities. (a) Lack of tools ☐

   (b) Manpower ☐ (c) Finance ☐ (d) Getting approvals ☐

10. Do you have Power Outages?

If so how long? Few Minutes. Hours, Days ☐ ☐ ☐

11. What happens during outages (a) Standby Supply, (b) Approach NEPA

(c) None of these

12 Have you heard about Facility Management as a tool of Maintenance

Management? Yes/No

13 Have you heard about the current of Facility Management in Maintenance

works (a) Yes/No

14. Services to our clients (Patients) for the past two years in provision of

water is (a) very high ☐ (b) About average ☐ (c) Fair ☐

(d) Poor ☐

15. Suggest areas of improvement:_____

WATER SUPPLY

(1) Source of water in the Hospital is (a) FCT Water Board ☐ (b) Borehole ☐

(2) Do you have water treatment Plant Yes /No

(3) Do you water reservoir? Yes /No

(4) What type?
(a) Ground Reservoir ☐ (b) Under ground ☐ (c) Elevated ☐

(5) If source of your water is from FCT water Board, do you carry out additional treatment for the water before distribution Yes/No?

(6) How do you maintain your water reservoir (a) Routine Flushing? ☐
(b) Monthly Flushing ☐ (c) Quarterly Flushing ☐
(d) Yearly Event ☐

(7) Are there period you encounter erratic water supply from water board Yes / No

(8) What alternative measures/sources _____

(9) What problems you do encounter in maintaining your water supply systems
(a) Manpower ☐ Finance ☐ (c) Material ☐ (d) Tools ☐
(e) Human Factors ☐

10. Our services to our clients (Patients) for the two years in previous of water is (a) Very high ☐ (b) above average ☐ (c) Fair ☐
(d) Poor ☐

(11) Suggest areas of Improvement _____

(C) UTILITIES (KITCHEN, LAUNDRY AND MORTUARY)

(1) These three utilities are fully established in our Hospital Yes / No

(2) Are they functioning at full capacity Yes / No

(3) These Utilities are maintained and managed by (a) in house ☐ contractors
(b) Direct Labour (c) Combination of both ☐
(d) Use of services Contractors ☐

(4) Our services in this area is (a) very satisfactory ☐ (b) Satisfactory ☐
(c) Fair ☐ (d) Poor ☐

(5) Which of these do you engage the external services (a) Laundry ☐
(b) Kitchen ☐ Services ☐ (c) Mortuary services? ☐

6. Our method of maintaining the facilities in these areas is by (a) the concept of FM ☐ (b) Routine Maintenance ☐ (c) ☐
Preventive Maintenance

(D) EMERGENCY FACILITIES (AMBULANCE, ACCIDENT EMERGENCY UNIT

(1) Are they operating at Optimum level Yes/No?

2. What is the Response time to emergencies (a) Very efficient? ☐

(b) Efficient ☐ (c) Fair ☐ (d) Good ☐ (e) Poor ☐

3. Method of maintenance our Emergency Facilities (a) Routine ☐
(b) On Request ☐ (c) When there is breakdown ☐
(d) Preventive Maintenance ☐

(4) How often do you have breakdown? (a Very frequent ☐
(b) Not often☐ (c) Seldom ☐

(5) How may years have you been in operation (a) 1 – 5 yrs ☐
(b) 6 – 10 yrs ☐ (c) More than 10 years ☐

E. <u>MEDICAL EQUIPMENT</u>

(1) What type of Medical equipment do you have? (a) State-of-the art
(b) Normal Medical Equipment ☐ (c) High tech ☐

(2) Are they operating at optimal level? Yes / No

(3) How do you service your medical equipment (a) In-house staff? ☐
(b) Use of service contractors ☐ (c) Use of external contractors☐
(d) All of the above ☐

(4) Methods of Maintenance is by:
(a) Routine service ☐(b) On request☐
(c) when there is breakdown (d) Preventive Maintenance ☐

5. What percentage of medical equipment that have broken down: ☐
(a) 10-20% ☐ (b) 30-50% ☐ (c) Above 60%6. ☐

6. Our service to the Hospital is by (a) works order (b) Telephone
(c) Personal contact ☐ (d) All of the above ☐

7. How many years have you been in operation (a) 1-5 yrs. ☐
(b) 6-10 yrs ☐ (c) More than 10 yrs ☐

8. Have you heard about Facility Management Concept in Medical Equipment Maintenance?Yes/ No.

9. If yes, have you tried the concept in your Hospital? Yes/No.

10. If no, would you like to adopt it in your hospital? Yes / No.

F. PERSONNEL ANSWERING THESE QUESTIONNAIRE

1. Sex: Male / Female

2. Department / Unit: State: ----------

3. Designation (a) Manager ☐ (b) Technician ☐ (c) Senior Staff ☐
(d) Junior Staff ☐ (e) Management Staff ☐

4. How many years have you been in the service? (a) 1-5 yrs ☐
(b) 6-10 yrs ☐ (c) Above 10 yrs. ☐

5. Are you involved in Maintenance? Yes / No

6. How old are you (a) 1-25 yrs ☐ (b) 26-30 yrs ☐ (c) 31-45 ☐
(d) 46 years and above ☐

7. Are you a member of any professional body? Yes / No.

8. Have you heard about the Concept of Facility Management? Yes / No.