Maintenance of Institutional Buildings

A Management Perspective

By Björn Carlqvist

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1 Introduction

Problem

Stocks of institutional buildings such as schools, health clinics, etc. are valuable assets, normally built up with substantial investments over a long period.

These assets are not always managed with the care they deserve. In many developing countries, independent of culture and economic system, building maintenance is insufficient or non-existent. The resulting deterioration reduces the ability of buildings to perform intended functions and shortens their useful life. Total operating costs are also higher as the buildings will require costly renovation or replacement more frequently than would be necessary if they received regular maintenance.

Shortage of funds is often given as a reason for poor maintenance. Some funds are required, but impressive results can be achieved with very limited budgets if maintenance work is approached in a systematic way with well-defined priorities. Rather, poor maintenance usually results from lack of consciousness and knowledge among decision makers, planners, technical staff and the users of the buildings.

Method

This report was written as a desk study. It is based on the author's experience of establishing a maintenance system for rural health buildings in Kenya between 1988 and 1995.

Only *administrative* and *organizational* issues are discussed; available space does not allow addressing more technology-oriented matters as well.

Organization of the Report

The report consists of two parts. The first part, Chapters 1 to 3, gives a brief description of the issue and recommendations for planning and implementation of systematic maintenance activities. The second part, Chapter 4, is a case study from Kenya.

2 General Considerations

Why Maintain Buildings?

Buildings not maintained will cease to fulfil their intended functions. Wear and tear set in immediately after buildings are constructed. Individual components eventually fail, in turn causing damage to other components; for example, internal water damage due to a leak in a roof. Failing components have to be repaired or a building's ability to protect against foul weather, to keep safe equipment and furniture, etc. will eventually be lost.

Regular maintenance, attending to defects while they are still minor, is the most cost-effective strategy for providing well functioning buildings and will reduce operating costs.

Buildings not maintained have a limited life span. Maintenance can prolong their useful life almost indefinitely. Replacement will be required less often, resources will be conserved and the environment protected. Still, buildings might need to be replaced for reasons such as obsoleteness, changes in space requirements, etc.

Moderate inputs – in relation to replacement costs – into maintenance enable operators to extend the life of an existing building until a replacement is wanted.

A poorly maintained building is usually a poor working environment likely to reduce the staff's job motivation. Poor maintenance often also leads the public to question the quality of services delivered by an institution. Maintenance does not automatically provide a good working environment. Yet, *maintenance helps to create conditions* that are not uncomfortable or directly harmful to staff, other users and equipment – *essential for an efficient and satisfying working environment*. And, it *will boost* an institution's *public image*.

Awareness, Attitudes and Regulations

Awareness and Attitudes

Poor maintenance is usually a result of lack of consciousness and knowledge among one or more of the parties operating institutional buildings.

Decision makers and planners often do not pay much attention to building management. This may be because they are not fully aware of the financial implications of taking poor care of the institutional buildings they have been appointed to manage, among many other tasks.

For example, national managers of educational or health services are often also the custodians of their nation's largest and most valuable real estate assets. In spite of this, there is often no or only rudimentary competence in building management in their decision making structures. Building stocks are therefore not managed professionally and maintenance in particular is not given high enough priority – resulting in unnecessarily high operating costs and low building standards. Improvements in the management of such large building stocks can save huge amounts of money.

Elected officials and politicians sometimes are "short-sighted" and fail to give priority to activities not producing tangible benefits before the next election day.

Engineers and other technical staff, if available, are by training mainly oriented towards new construction. Maintenance is often perceived as an extension of the original construction that should be carried out by professional building staff. Therefore maintenance organizations are often centralized units with good competence and equipment but far away from the objects they should service.

Maintenance deals with existing, completed buildings, and many routine activities do not require technical skills, such as: general cleaning, clearing of storm water drains and gutters, pruning of bushes and trees.

Other maintenance tasks can be executed by semiskilled staff or local artisans using basic professional tools, such as: sealing of leaking roofs, adjusting and tightening locks and hinges, replacing water-tap gaskets, replacing broken window panes.

Maintenance can be made more cost-effective with decentralised organizations. Non-maintenance staff and other users can help with the simpler tasks and allow skilled staff to concentrate on duties requiring their skills.

Institutional staff, and members of the public using the institution, often think that maintenance is none of their business and that they cannot do anything even if it were a concern of theirs. This attitude often originates from the fact that institutions are owned by the government or another distant and diffuse body to whom they have no personal relation. Such attitudes make it easy not to exercise the kind of care people take of their own homes and possessions, and sometimes lead to direct abuse of and vandalism to institutional buildings and property.

If users can be made to perceive themselves as co-owners of their institutions, the user-induced deterioration can be substantially reduced. Further gains can be had from users actively participating in the upkeep of their institutions.

Legislation and Regulations

National legislation or institutional regulations at times direct that a particular technical ministry or department should manage all construction-related work. Appointed organizations are not always organized and equipped to fulfil all the maintenance needs of their clients.

What is Maintenance?

Building maintenance can be defined as: *work done to keep an existing building in, or restore it to, a condition where it can perform its intended functions*. It can be divided into:

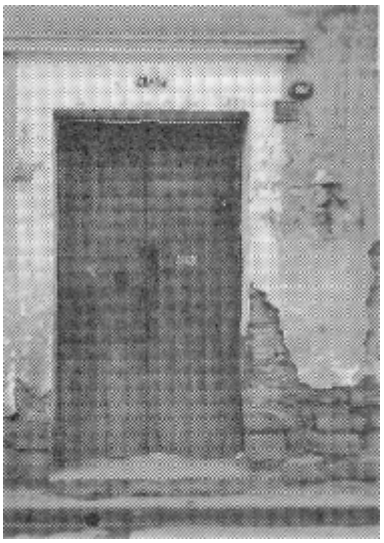
- Preventive maintenance – carried out to a predetermined plan to reduce the risk of failure. It can be done as:
  - scheduled maintenance, preventive maintenance done at regular intervals.
  - condition-based maintenance, preventive maintenance done when deemed necessary through regular inspections of the building.
- Corrective maintenance, carried out after failure has occurred.
- Emergency maintenance, necessary immediately to avoid serious consequences.

Causes of Deterioration

Buildings deteriorate from the moment they are constructed because of exposure to a variety of natural forces and wear and tear by the users.

The influence of natural forces varies with climate, design, building materials and standards of workmanship.

Water from leaks and floods is a major cause of deterioration and rapid wear and tear. Many items can be badly damaged immediately on contact with water, such as softboards, polished wooden surfaces, electrical apparatus. Other components absorb water and form ideal breeding grounds for micro-organisms – mould and rot – which will damage the host as they thrive. Some materials, such as low-quality concrete and mortar, get soft on contact with water and deteriorate rapidly.

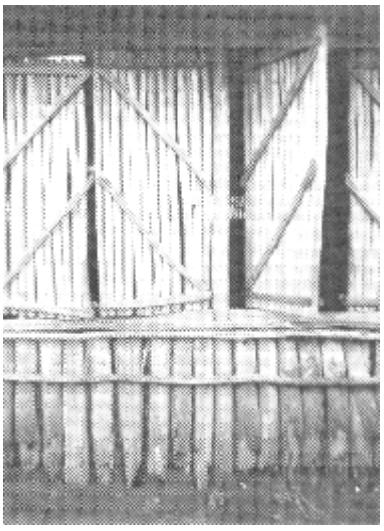


Render falling off the wall and moisture damaged door show lack of maintenance.

Temperatures below 0°C cause water in pipes to freeze and pipes to burst. Water-saturated porous materials expand and crack if frozen. Ground frost may cause severe structural damage by uneven lifting and lowering of buildings.

Solar radiation and wind, particularly in a tropical climate, rapidly break down paint, bitumen and plastic components and cause unprotected timber to dry out and crack.

Insects such as termites and wood-borers feed on dead plant material and can cause severe damage to items such as wooden structures, doors, ceiling boards and furniture.



Wall attacked by termites.

In some areas pests such as rats and bats cause damage. Rats can damage insulation on electrical cables and cause fire hazards. Bats invade buildings in large numbers and their urine and droppings eventually make the buildings totally uninhabitable.

Institutional buildings often serve large numbers of users who generate wear and tear that contribute to the deterioration of the building. Normal activities such as foot traffic, opening and closing of doors and windows, use of electric and sanitary installations will gradually wear out surfaces, locks, switches, water-taps, flushing mechanisms, etc.

Cleaning procedures deserve a special mention. Excessive scrubbing, use of large quantities of water or inappropriate abrasives or solvents can cause serious deterioration in a short time. Still, if carried out regularly and systematically with appropriate methods, basic cleaning of the building and its surroundings will substantially *reduce* wear and tear, and at a very low cost.

Flat roof covered with scrap which hinders rain runoff and leads to water leakage.

Improper use or direct vandalism by staff or the public may cause instant destruction of just about any part of a building, but windows, locks and technical installations are particularly vulnerable.

Assessment of Deterioration

The condition of any building is thus in constant change. The ravages of rain, wind and sun; the wear and tear caused by users, all have their impacts. Operators with large stocks of uniform buildings in one climatic zone and with an equal user load could probably predict actual deterioration by statistical methods, if historical maintenance records are available. *In practice* few operators can develop satisfactory formulas for predicting the deterioration, and *appraisals of conditions have to be made through on-site inspections*.

Financial Aspects

Annual Amounts Required

The annual amount required for *maintenance and repair work* is determined by many factors, such as:

- basic design of the building, materials used and standards of workmanship,
- type and complexity of technical installations, such as plumbing, electrical, ventilation, heating and cooling, lifts, etc.,
- climatic load,
- user load,
- desired maintenance standards,
- organization of maintenance work.

In practice, most maintenance organizations achieve acceptable results with annual budgets equivalent to *0.5–3% of the replacement value for their building stock*.

Local conditions might necessitate additional funds. If the building stock is widely spread geographically, substantial funds might be required for transport of staff and materials.

Box 1

An example from Kenya

In Kenya, the Ministry of Health operates a maintenance system for approximately 1,500 rural health institutions with annual on-site budgets equivalent to approximately 0.2% of the buildings' replacement value. Most of the buildings are simple structures with few technical installations and part of the maintenance work is done by non-maintenance staff at no extra labour cost besides normal salaries. The system will, with current funding, keep most of the buildings operational almost indefinitely but does not allow any "cosmetic" work such as redecoration. Appearance is therefore deteriorating with time.

Availability of Funds

Deterioration of buildings is a continuous process and so must maintenance be to succeed. It is important, particularly when starting such activities, that involved staff and other participants also perceive their work as a permanent activity. A forceful motivating factor is to know that funds are available and will be available in the future! This can be achieved by *making maintenance an individual item in annual and long-term budgets for recurrent expenditure* and *making sure that the funds are spent on maintenance*. It is all to common to look to the maintenance funds when facing a budgetary pinch.

Distribution of Funds

Operators with long series of maintenance records know what proportions of their budgets to spend on individual objects. The rest face the problem of making a distribution of available funds that best caters for the whole stock of buildings.

Experience has shown that building stocks small enough to be inspected by one or a few inspectors, with uniform assessment standards, can efficiently use funds that are distributed on the basis of costed current inspection reports.

The distribution of funds for larger stocks, or stocks where uniform assessment cannot be assured, are better decided on the basis of other criteria. Funds in proportion to the size of a building is a good starting point, and size can very well be used as the only distribution key if no other data are available. Analysis of maintenance records over a longer period will give pointers towards appropriate

adjustment factors, to weigh in effects of differences in climate, design, construction materials, user load, etc.

Disbursement Methods

In larger organizations, the performance of maintenance activities in different localities can normally not be very closely monitored individually. Such organizations might find it productive not to disburse all annual funds at once, but to have a staggered disbursement where the issuing of additional funds is conditional on having achieved pre-set sub-targets.

Managing Maintenance

Inventory of Building Stock

Maintenance managers need to have good knowledge of the buildings, site installations and land making up their building stock. They need basic data on matters such as location, size, age, construction materials, etc. If not existing, such an inventory should be established as a matter of priority. Routines should also be established continuously to update and supplement these data whenever buildings or site installations are altered because of repair or construction work.

Monitoring of Condition

The monitoring of buildings' condition through on-site inspections is a time-consuming activity, and travel is often necessary. Therefore, the inspections should be carefully planned, to avoid any waste of time and money. *Inspection time schedules* which show when individual institutions will be inspected should be prepared and distributed to concerned parties, so that the inspector gets full access to all parts of the institution. Institutional staff often know exactly what is wrong in their place of work and should be requested to participate in inspections.

Inspections have to be carried out early enough to allow time for the analysis and the completion of all other planning work *before* the beginning of the new maintenance period. (A maintenance period can be a financial year or any other suitable period.)

It is an advantage to have one – or a few, well coordinated – inspectors to do inspections in an area or region, to make sure that the same standards are applied when assessing the seriousness of defects in different buildings.

When inspecting a building, the *condition of components should be classified systematically.* A *coding system should be devised and used* to classify the condition of all components. This is an example of a basic coding system:

1 Very serious defect which requires immediate repair/replacement.

2 Requires repair/replacement during next maintenance period.

3 No action required during next maintenance period, but should be attended to within the next 24 months.

4 No defect.

When assessing the condition of a particular component, not only that component should be considered, but also the other components that could be damaged as a result of the first one not being attended to.

For example: a leaking roof can result in damaged timber structures, ceiling boards and interior fittings. The roofing material would not itself deteriorate much further

Box 2

MINISTRY OF HEALTH, Internal Inspection Form Date: *13.1.98*

Rural Health Facility Name: *ABC Dispensary* Building: *Disp. block*

Room: *Examination*

CC	Component	Description/Remarks	Dimensions L / W / H	No.
2	Door	Replace faulty mortice lock with 3-lever "Union"	standard	1
2	Windows	Replace missing brass fasteners		2
2	Shelf	Refix loose wall brackets screws (2" plastic plugs)		8
2	Floor	Repair screed cracks	2300 × 3	

Room: *Injection*

CC	Component	Description/Remarks	Dimensions L / W / H	No.
2	Door	Replace faulty mortice lock with 150 mm tower bolt		1
2	Windows	Replace broken louvre panes	400 × 150 × 4	2
2	Windows	Replace broken louvre panes	600 × 150 × 4	3

Room: *Drug store*

CC	Component	Description/Remarks	Dimensions L / W / H	No.
2	Floor	Replace loose screed	1400 × 900 × 40	1

CC = Condition Code

within another maintenance period, so it could be classified as code 2, but classifying it as code 1 would be necessary because of the risk of costly damage to other components.

To guide inspectors and to simplify the taking of notes, checklists and inspection forms can be useful. See examples in the appendices.

Specification of Maintenance Work

When a component is classified during inspection as in need of attention during the next maintenance period, the information required for the planning and execution of remedial work should also be recorded:

- exact type of component and the required action,
- dimensions of the component,
- number of components requiring attention.

An example of an Inspection Form is shown in Box 2.

Inspectors should make it a rule to make too many notes rather than too few during inspections. Few people can remember details two days, or even one day, after a building inspection. Therefore, they have to rely on the notes they made on the site. A few extra minutes spent taking notes can sometimes save a lot of time wasted on a re-inspection.

Box 3

Example of a priority list

*An example of a priority list for maintenance of medical institutions in Kenya. In a district's annual maintenance plan, budgetary reservations have to be made for the execution of **all** category A work in **all** clinics before any category B work can be considered. Thereafter all B before any C and so on.*

A Basic Cleaning.
- Inside and out-of-doors cleaning.
- Removal of debris in storm-water drains and gutters.
- Pruning of trees and bushes growing in towards the buildings and threatening damage to surfaces – or simply dropping leaves on the roofs.
- Cutting of grass and hedges.

B Prevention of Water Damage.
- Ensuring the evacuation of rainwater from buildings and the site.
- Keeping roofs and associated components waterproof.
- Keeping plumbing installations waterproof.
- Securing foundations against erosion.

C Bat, Insect and Micro-organism Control.

D Security.
- Ensuring safe and easy locking of cupboards, doors, windows and burglar-proofing devices.

E Water Supply.
- Providing safe water for both consumption and cleaning.

F Sewage and Waste Disposal.

G Internal Surfaces.
- Providing smooth and easy to clean surfaces.

H External Surfaces.

Prioritization of Work

In spite of the screening made during inspections there is often a need for further ranking to decide what work should be executed. A *list of priorities*, adapted to local conditions and reflecting the preferences of involved parties should be drawn up. The preferences may differ among the parties; managers might be interested mainly in long-term ability to operate while institution users are more interested in appearance and comfort. If funds are limited, such interests might conflict, but efforts must be made to establish priorities acceptable to all involved. Priorities seen not at all to cater to a particular group's interest can cause them to dissociate themselves from all maintenance work.

Box 3 shows an example of a priority list for medical institutions in Kenya designed to secure buildings' long-term ability to operate and safe keeping of equipment and furniture.

Ways of Doing the Work "On-site"

Normally several "implementing agents" are available to carry out on-site maintenance work. By selecting suitable agents both good quality of work and a timely completion of it can be achieved. Also, the selection will have a bearing on the total cost and on the workload of the maintenance management.

Review the advantages and disadvantages of the possible agents for different kinds of work. What are the effects on quality, cost, etc. of using:

- Technical departments' skilled staff,
- Private contractors,
- Local artisans,
- Non-maintenance on-site staff,
- Members of the public using the institution.

This kind of review is often instructive also in established maintenance organizations.

Procurement of External Services

Purchase of services and goods from external artisans, contractors and suppliers should be governed by detailed procurement regulations to ensure fair and sound practices.

Financial Control

Construction and maintenance work involve resources that are valuable and useful to many people. Control routines should be established to assure that maintenance resources are used only for the intended purposes.

Quality Control

Quality standards for materials and workmanship have to be set. Technical specifications, drawings, specimen and references to completed work can be used, sometimes combined, to describe the minimum standards maintenance works must achieve.

3 Recommendations

This chapter will briefly discuss some practical issues to be considered when setting up a maintenance organization. The process is divided into four phases: analysis, planning, implementation and follow-up.

It is assumed that there is an existing stock of buildings and some kind of organization responsible for it. Should there be no such buildings or organization, a golden opportunity exists to include maintenance from scratch in the process of creating them. It is believed that these recommendations could also be of use in such a situation.

Objectives
Set objectives already at the outset. The ultimate objective of the exercise should be clarified; "to improve primary school education in the xx area by providing a better learning environment through better maintenance of existing school buildings."

Also formulate – at least for the first phase – more immediate and verifiable objectives against which progress can be measured: "to, before 30 June, analyse current maintenance status in primary schools in the xx area," "to, before 20 December, present to the board a proposal for the maintenance of primary schools in the xx area."

Task Force
Several competencies are required to prepare a maintenance concept. Obviously, knowledge of building technology, economy and administration will be needed. Maybe less obvious, but still *essential*, is to have the capability to assess and influence mental processes such as attitudes. A sociologist or person with similar competence should be a member of any maintenance task force from the start.

Involve also representatives for the categories of staff that will be affected by the maintenance activities. They may not have any expertise in maintenance matters but can contribute invaluable general knowledge about the mother organization and its institutions.

Ensure that the task force can regularly present and discuss its work with the decision makers that will eventually decide whether to start proposed activities or not.

Definition of Acceptable Standards
Define the minimum acceptable building standards.

Is it enough to have a building shell to protect against adverse weather and theft or must there also be comfort or an aesthetically pleasing appearance? Are there special demands on hygiene?

The answers to this kind of questions are an important part in determining the scope, and cost, of a maintenance effort.

Analysis

Analysis of Current Maintenance Status
Determine current building standards and compare with the minimum acceptable standards.

At the start of a maintenance exercise, there is often a backlog of accumulated defects. How large is this backlog? Can a maintenance organization designed for normal upkeep also clear the accumulated defects within a reasonable time? A seemingly endless amount of "old" defects can be very demoralizing for a new maintenance set-up. Consider if there is a need for a temporary organization for renovation work to bring buildings quickly to more easily maintained standards.

Survey existing maintenance resources, get information about:

- Location, number and main competencies of all staff. Consider all staff with relevant competence, not only those formally attached to technical departments.
- Location and capacity of workshops, service depots, spare parts stores, etc.
- Location, number and type of all major equipment and plant.
- Established contacts with contractors, artisans, suppliers, etc.
- Available transport resources.

Analysis of Attitudes to Maintenance
Probably the most difficult part of maintenance work is to make the parties involved aware of its benefits, and the drawbacks of no maintenance.

Find out what the various groups know and think about maintenance. Interview the decision makers, planners, technical staff, employed and non-employed users of the institutions. Ask questions referring to the specific building(s) the interviewed individual is in charge of/works in/goes to school in, such as:

- Is your building in a good condition?
- Can anything be done to improve your building?
- Who owns your building?
- Who is responsible for the upkeep of your building? What routines are there? How does it work in practice?
- What is your own role in the maintenance of your building?
- Could you do more? What is stopping you from doing so?
- What is the value – cost of replacing with a new building?
- What are the current operating costs?

Analysis of Legal and Regulatory Frameworks
Analyse the legal framework governing construction activities in the area. National and local building codes have to be observed. Often laws and bylaws on labour, environmental protection, public health, workmen's safety, etc. also affect construction and maintenance work.

Review also the organization's internal administrative regulations:

- Who is formally responsible for building maintenance and new construction? Do the rules exclude others from doing this kind of work?
- Who is responsible for issues such as budgeting, employment of staff, procurement of goods and services? What are the practical procedures?
- What are the procedures when introducing another, or altering an existing, activity?

· What are the employment conditions for existing staff? Are there restrictions in current job descriptions about what work existing staff can do?

Planning

Formulation of a Strategy

Based on results from the analyses, a strategy is formulated. The strategy should describe what must be done to achieve the set objectives.

Objectives

Review existing objectives in the light of findings from the analysis phase. Set objectives for the current phase of work.

Outline of Maintenance Procedures

Make an outline of the proposed maintenance procedures. Maintenance is a continuous process, with several necessary activities that follow each other in a logical sequence – a sequence that is repeated. Describing these activities in a chronological order is often instructive, see Box 4.

Box 4

An example from Kenya

Maintenance activities for medical institutions, arranged in a chronological order

Jan – Mar	Inspection of buildings – classifying conditions – specifying maintenance work.
Mar – Apr	Costing of maintenance work.
Mar – Apr	Preparation of Work Plan and Budget – making overall estimates for detected defects – prioritising work – preparing work sheets and time schedules – preparing a summary of estimated costs per institution; budgeting.
May – Jul	Preparations for the implementation of planned work – preparing Bills of Quantities and tender documents – obtaining quotations and tenders – evaluating quotations and tenders.
Jul – Dec	Implementation of planned work – awarding work to artisans and contractors – procuring and distributing materials.
Aug – Jun*	Supervision of work – controlling both quantity and quality.
Aug – Jul*	Documentation of completed work – recording executed work – updating inventory.

** Following year*

In the example in Box 4 external influences, such as the release of annual funds in July and the effects of weather, require a work cycle that is completed over a period of 16–18 months. Certain activities, particularly those at the beginning and end of the cycle, overlap and have to be carried out simultaneously.

Local weather conditions often provide a natural "time schedule" for maintenance activities. The start of rainy seasons determines latest dates for attending to roofs, gutters, downpipes, gullies, storm water drains, when transport along certain roads should be completed, etc.

Describe briefly the activities in the proposed maintenance work cycle:

· Inspections;
  – system for classification of condition
  – how to specify required work
  – checklists, forms, etc.?
· Analysis and prioritisation;
  – how to estimate costs of work – price lists, cost handbook?
  – priority list for selection of work.
· Work plan and budget;
  – content, level of detail
  – format
  – timing
  – approval procedures.
· Supply of materials and services;
  – procurement regulations
  – stores organization, central/local?
  – stores management procedures
  – transport.
· Quality and quantity control – materials and workmanship;
  – standards – specifications, drawings, specimen
  – procedures.
· Financial control;
  – authorities to incur expenditure
  – accounts procedures
  – audit procedures.
· Documentation of completed work;
  – recording of executed work
  – analysis of actual cost
  – analysis of performance of staff, contractors, suppliers
  – updating of local and central inventories.

Consider:

· How and by whom repairs and other works on-site should be carried out.
· How monitoring and supervision of maintenance activities should be done.

Organization

The organization of resources and functions to accomplish set tasks can be done in many different ways. There are many schools of thought on this subject but these will not be discussed here.

Draw up an organization chart for the proposed maintenance activities (see Box 5). Show the set-up of, and internal relationships between, units for:

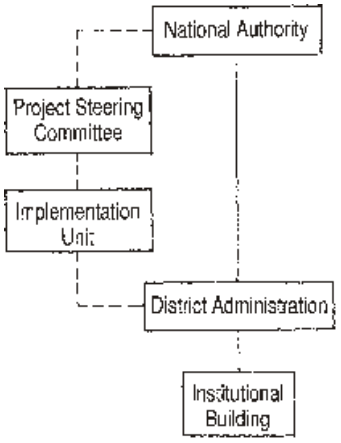
· Central and regional administration
· Administration at the institution level
· On-site work requiring technically skilled staff
· On-site work not requiring technically skilled staff.

Clarify if there is any need for a special temporary organization to establish the proposed activities.

Prepare job descriptions for all posts showing duties and the competencies required.

Box 5

An example of an organizational chart



Staffing

Compare required competencies with what is available among existing staff. Consider also categories of staff whose competence do not exactly match requirements but who could otherwise make a valuable contribution. Skills-upgrading courses are often a cost-efficient way of adding needed competence.

Identify ways of getting competence not available with existing staff: permanent or temporary employees, consultants, contractors, etc.

Training

Assess the training needs of staff in the proposed organization. Outline type and extent of training activities and identify appropriate training staff and facilities.

Awareness-promoting Activities

The creation of positive attitudes to maintenance – through an awareness of the benefits and importance of such activities – is essential to ensure that all involved parties are motivated to participate actively.

Prepare campaigns that address lack of knowledge and misconceptions about maintenance detected in the analysis phase. Include repeated impact studies to ensure that desired changes in attitudes are achieved. *Leave this work to professionals such as behavioural scientists, maybe in cooperation with an advertising agency!*

Logistics

Analyse the needs of transporting personnel and materials and make provisions for appropriate means of transport.

Communications System

Devise reliable means of communication, internally within the maintenance organization and to the served institutions.

Budget

Prepare budgets, both:

- Short term: including costs for regular maintenance work and also starting-up costs, such as staff training, renovation of buildings, etc.
- Long term: including costs for regular maintenance work and also recurring costs such as retraining of staff, major replacements of worn-out building components and equipment, etc.

Outputs

Describe the benefits generated by the proposed maintenance system, such as improved working environment, increased building life expectancy, reduced operating costs, etc.

"Pre-testing" of Strategy

Present the proposed maintenance system to a wider selection of the concerned parties and describe how it will affect their work situation. Invite and consider seriously comments and suggestions on how to improve the system.

Small scale testing, a pilot project in a single institution, of parts of the system is usually useful.

Approval of Strategy

Ensure that the proposed strategy is approved by the relevant decision making body or bodies, meaning those with the ultimate authority to decide the matters involved.

Choose a realistic timing for implementation, one that allows sufficient time for preparatory activities such as setting up administrative procedures, making budgetary provisions, hiring, transferring and training of staff, etc.

Have all approvals documented and communicated to the administrative bodies concerned.

Plan of Action

Translate the approved strategy into an *action plan* that shows in detail how the strategy will be carried into operation. Show in the plan:

- Who does what with whom.
- Where and when they do it.
- What resources they will need.

Some decisions have already been made about what should be accomplished by what kind of staff. Recruit representatives for key groups to help from the start of preparing the action plan. Again, involve in the planning work, in appropriate ways, as wide a selection as possible of those whose work situation will be affected by maintenance activities.

Implementation

Launch of Activities

The action plan will detail the kind and amount of resources required to carry it out, resources such as funds, staff, equipment, materials, etc.

Mobilize enough of these resources for an early, small-scale start of activities in a single institution or a limited geographical area. Monitor closely the performance of the various operators and procedures. Do not hesitate to make alterations if performance is not up to expected standards.

Once workable routines and procedures are established, activities can gradually be expanded. Keep monitoring performance, what works on a smaller scale does not automatically do so when activities expand.

Follow-up and Evaluation

Regularly, more frequently at the beginning, follow up progress in relation to plans:

- Are planned activities on schedule?
- Are activities producing the expected output?
- Are costs of activities as expected?

Assess if the anticipated benefits are generated:

- Are learning environments improving?
- Are users taking better care of the institutions?
- Have operating costs been reduced?

Analyse any deviations and modify procedures as necessary.

4 Case Study – The Maintenance Project for Rural Health Facilities, Kenya

Box 6

Kenya, general data

Location	Eastern Africa, bordering the Indian Ocean, between Somalia and Tanzania.
Area	582,650 m^2.
Climate	Varies from tropical along coast to arid in interior.
Population	28,180,000; growth rate: 2.3% (1996 est.).
Life expectancy at birth, total population	56 years.
Languages	English and Swahili (official), numerous indigenous languages.
Labour force by occupation	agriculture 75 – 80%, non-agriculture 20 – 25% (1993 est.).
Government type	Republic.
Administrative divisions	7 provinces and 1 area (Nairobi); subdivisions: 62 districts, number of districts is approximate due to ongoing subdivision of existing districts.
Gross domestic product	GDP – purchasing power parity – US$ 36.8 billion (1995 est.).
GDP per capita	US$ 1,300 (1995 est.).
GDP real growth rate	5% (1994 est.).

Source The World Factbook, 1996.

Rural Health Services

Rural health services are provided by more than 2,300 clinics distributed over the country. About 1,500 of these are owned and operated by the Government of Kenya through the Ministry of Health. The rest belong to non-governmental organizations. There are also some hospitals in the rural areas but most such facilities are in urban areas.

Ministry of Health – Operated Rural Clinics

The Government's rural clinics are divided into *dispensaries* and *health centres*.

The approximately 1,100 dispensaries have five rooms on average, all normally in one building. Some dispensaries also have one or more staff houses. The head of an institution is normally a qualified nurse who in the smallest dispensaries can be the only staff. Larger dispensaries normally have additional nurses and other subordinate staff. Medical services include diagnoses and dispensing of drugs for common diseases, treatment of wounds and cuts, etc. Pre- and postnatal care of mothers and children is also a major activity. There are no laboratory or child delivery services.

Health centres, about 400 in number, have on the average 15 rooms in one or more buildings. Some 35 health centres also have staff training activities and are much larger. Staff houses are commonly available. The head of the institution is normally a clinical officer, assisted by nurses and subordinate staff. Besides the services provided in dispensaries, laboratory and child delivery services are available. Some health centres do minor surgery.

The Project

Background

In Kenya construction and maintenance of public buildings is the responsibility of the Ministry of Public Works. The building maintenance resources of the Ministry are normally located in administrative centres and are not always able to provide efficient service to health clinics spread out over a large area.

The Ministry of Health therefore saw a need for supplementary resources to maintain its stock of rural dispensaries and health centres. In 1987 the Maintenance Project for Rural Health Facilities (hereafter called the Project) was launched. It is supported by the Danish and Swedish Governments through Danish International Development Assistance (Danida) and the Swedish International Development Cooperation Agency (Sida).

Main Objectives

The Project's ultimate objective is to contribute to improved health services for the rural population.

The immediate objective is to establish, before July 1998, a preventive maintenance system for its dispensaries and health centres in all districts of the country as a regular activity within the Ministry of Health.

Strategy

To achieve the set objectives the Project will:

- Train cadres of Ministry staff who will be engaged in the management and execution of preventive maintenance.
- Establish a system for the preventive maintenance of rural clinics, which means instituting a regular cleaning and monitoring schedule and carrying out timely minor repairs.

To simplify the preventive maintenance work the Project will, in some districts:

- Renovate the existing stock of buildings by repairing all defects that have accumulated over the years.
- Repair or replace defective medical and non-medical equipment in all renovated clinics.

Initially, the Project ran as a five-year pilot project in four rural districts. In these districts, all the clinics in poor condition were renovated: all defects were remedied, all surfaces repainted, and the buildings were brought again to the functional standard intended in their original design. Also, a system for preventive maintenance of the buildings was developed. The key objectives of this first phase were to establish structures and processes within the Ministry of Health, and to gain experience in various aspects of Project implementation.

From 1990, the preventive maintenance system was gradually introduced also in clinics outside the pilot districts.

The current phase of the Project runs to 30th June 1998. The implementation of another five-year phase after 1998 depends on a positive evaluation of the current phase.

Once a functional preventive maintenance system is established, renovation work can start so that buildings and equipment are brought up to a more easily maintained standard. During the present phase of the Project, clinics in another fourteen districts will be renovated.

The Project supports family planning activities by incorporating service delivery points in the renovation work. It also supports the Government's District Focus policy by, whenever possible, using local labour and materials.

Note that the intention is not to create another Ministry of Public Works, but rather to establish within the Ministry of Health a capability for taking care of minor defects in rural clinics, or preventing them from occurring at all.

Activities

Four main activities, then, can be identified:

- Training,
- Preventive maintenance of buildings,
- Renovation of buildings,
- Repair and replacement of equipment.

Training

To create a permanent maintenance capability within the Ministry of Health, training programmes within the Project have been introduced for various cadres of health workers: those who plan, those who execute, and those who supervise maintenance activities.

- For Public Health Officers (PHOs), a course on the management of the maintenance system.
- For Public Health Technicians (PHTs), a course on inspecting RHFs and carrying out basic repairs.
- For Officers-in-Charge (OiCs) of clinics, a course on the supervision of subordinate staff engaged in maintenance tasks.

In addition, orientation seminars on the objectives and procedures of the Project are held for District Health Management Teams (the Ministry of Health's local administrative body responsible for all medical services in a rural district) and other Government officers. Also, basic information on maintenance is given to all subordinate and medical staff in the clinics by the trained PHTs and OiCs.

Note that training in the maintenance of medical equipment is not part of the Project. Such training takes place at four hospital training schools in Kenya. The Maintenance Artisans trained at these schools are posted to hospital maintenance workshops at district hospitals, where they are also expected to carry out equipment maintenance for the rural clinics in the districts.

Preventive Maintenance of Buildings

This activity is dependent on the creation of a self-sustaining system of preventive maintenance for the rural clinics administered by Ministry of Health staff. The system should be based on the improved awareness and daily care of the users, and on regular inspections of the buildings and

the timely repair of any defects. The processes and procedures by which such a system should be managed will be presented later in this chapter, see page 15 Preventive Maintenance System).

Renovation of Buildings

In the Project, to renovate a building means to correct major defects and make good any wear and tear, so that the building is restored to a good working condition without any additions to the original design.

Renovation work is confined to making good any damage to foundations, floor and walls, repair and/or replacement of roofs, gutters and ceilings. No improvements or extensions to existing buildings can be made with exception for minor alterations such as moving partition walls, doors and windows to improve functioning. Renovation work includes the redecoration of walls, woodwork and fixed furniture.

Where conditions merit it, the provision of water to health buildings and staff houses can also be included, for example, by providing new or repairing existing water tanks for collecting rain water. Water-borne sanitation cannot be provided; instead pit latrines are constructed.

Renovation also includes:

- Completing some unfinished self-help projects, which are in line with the overall rural health facility planning, and where such clinics are badly needed. However, there is a maximum of two such clinics per district.
- Remodelling some clinics to accommodate special mother and child health and family planning services, and building stores for maintenance equipment where these are missing and required.
- Constructing rural staff houses in places where the lack of such housing prohibits proper staffing. However, there is a maximum of one staff house for every five clinics. The houses provided are of a simple design, based on current experience of appropriate technology.

Repair and Replacement of Equipment

Equipment, in this context, means all medical and non-medical apparatus and furniture used in clinics.

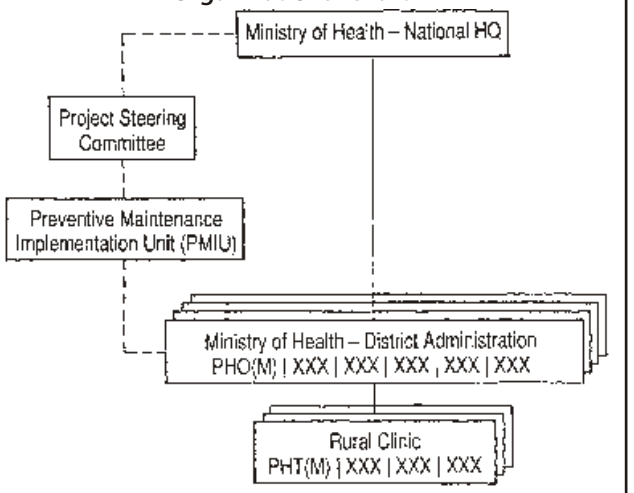
To ensure that the renovated clinics can operate efficiently, the repair/replacement of such equipment is closely coordinated with the renovation of buildings. It is, therefore, the responsibility of the Project.

Standard equipment lists issued by Ministry of Health for health centres and dispensaries are used as models. The repair of non-medical equipment (mainly furniture) is done either by mobile repair teams or at the maintenance workshops at the district hospitals. As for medical equipment, complete replacement packages are supplied.

Administration

Box 7

Organizational chart



National Level

A *Project Steering Committee* issues guidelines on how to implement the Project. Members of the Committee are:

- Deputy Secretary for Planning and Development, Ministry of Health (Chairman),
- Project Coordinator (Secretary),
- Deputy Secretary for Finance, Ministry of Finance,
- Chief Public Health Officer,
- Chief Clinical Officer,
- Chief Nursing Officer,
- Chief Hospital Secretary,
- Senior Project Adviser,
- Provincial Public Health Officers from provinces with Project activities,
- Five District Medical Officers of Health (heads of Ministry of Health district organization); rotating membership, from districts with Project renovation work,
- Danida representative(s),
- Ministry of Public Works representative.

The Steering Committee has appointed the *Preventive Maintenance Implementation Unit* (PMIU) within the Ministry of Health to carry out the day to day coordination of Project activities. Based on guidelines from the Steering Committee, the PMIU works out detailed procedures for the implementation of Project activities. The PMIU also manages the donor-funded activities. The PMIU is based in the Ministry of Health Headquarters (HQ), Nairobi.

The PMIU HQ staff has varied in size and composition during the Project's various phases. It currently comprises:

- Project Coordinator,
- Maintenance Officer,
- Two Training Officers,
- Monitoring Officer,
- Bookkeeper,
- Secretaries,

· Subordinate staff,

· Drivers.

Assisting in PMIU HQ work is a Senior Project Adviser employed by the Danida. During the current phase of the Project, renovation is planned to be done in fourteen districts. Two PMIU Building Advisers, employed by Danida, are responsible for the execution of this renovation work.

Earlier, the PMIU HQ staff also included a Maintenance Adviser, a Finance and Monitoring Adviser, a Training Adviser and a Senior Building Inspector.

District Level

The PMIU helps in establishing the maintenance system in the rural districts. The PMIU also supports and monitors progress of the maintenance work by regular visits of PMIU staff.

The *management and coordination* of maintenance work are, however, the responsibility of the *District Health Management Teams*, as for any other health activity.

The *Public Health Officers*, who have received the special maintenance training, advise the District Health Management Teams and administer the maintenance system: diagnosing defects, estimating costs, preparing Work Plans and District Preventive Maintenance Budgets, procuring materials, engaging artisans/contractors and supervising the district maintenance programmes.

Clinic Level

The *Public Health Technicians*, who have been trained and provided with the necessary tools, have responsibility for supervising the preventive maintenance work for one or a small cluster of clinics. They are also expected to carry out certain minor repairs themselves.

The *Officers-in-Charge* of the clinics, Clinical Officers or Nurses, ensure that their subordinate staff carry out the necessary cleaning and repair tasks that do not require special skills or equipment. All major work, beyond the capacity of the Ministry of Health's personnel or resources, is carried out by local artisans, building contractors, or the staff of the Ministry of Public Works.

Funding

To promote sustainability, it was agreed from the start that all *execution* of preventive maintenance and minor repair work in Rural Health Facilities is the responsibility of the Government of Kenya. All associated costs are funded by the Government of Kenya through the Ministry of Health. Annual amounts are gradually increased to allow expansion of the maintenance activities. In the fiscal year 1996/97 an amount approximately equal to US$ 210,000 (KSh 11 million) was allocated and work carried out in approximately 1,400 clinics. The amount is intended only to cover costs directly related to maintenance and repair works, such as building materials and the transport of it, contractors' fees, etc. Staff salaries, allowances and other administrative costs are additional.

Temporary activities such as initial staff training, renovation work, replacement of equipment and other administrative activities required to *establish* a system for preventive maintenance are to be carried out by the Project. These activities are funded by Danida and Sida through the Project. On average, the Project has spent annual amounts approximately equal to US$ 1 million on these kinds of activities.

Outcomes

By June 1997 some 135 district maintenance managers (PHOs), 1,225 clinic-based maintenance officers (PHTs) and 1,200 heads of clinics (OiCs) were trained. Fifty-nine districts with some 1,400 clinics had operative maintenance organizations. Some 275 clinics had been renovated and re-equipped.

In districts with ongoing maintenance activities, the deterioration of buildings was halted and a more efficient working environment created.

The long term effect of maintenance activities on buildings' lifespan or on operating costs have not yet been studied systematically. However, data gathered during the Project period give some indication of the costs of different approaches to keeping the 1,500 clinics operational. (All costs below are in 1994 prices.)

New buildings can be constructed, used until they are unsuitable for delivery of medical services and then replaced with new ones. Assuming that a new building can be used for 10 years, about 150 clinics would have to be replaced every year. This replacement would cost about KSh 600 million annually.[1]

Alternatively, new buildings can be constructed, used until they are unsuitable and then totally renovated to a good standard. If a 10-year life-span is assumed, then 150 clinics would be in need of renovation every year. Project experience show that this renovation would then cost about KSh 200 million annually.

The Preventive Maintenance system established by the Project would require approximately KSh 30 million annually to keep the 1,500 clinics operational almost indefinitely with an acceptable working environment.

The Preventive Maintenance System

Objectives

The Preventive Maintenance system is designed to ensure that:

· Staff in every clinic have the knowledge and means to do basic preventive maintenance work such as cleaning, garden clearing, pruning, clearing of gutters and drains.

· Each clinic has access to tools and a small stock of building materials for minor repairs.

· Each clinic has access to a person with the necessary skills to carry out minor repairs.

· Each clinic can activate a reporting system to seek assistance for maintenance and/or repair work beyond its own capabilities.

· Each clinic is regularly visited and inspected by staff from the district headquarters with overall responsibilities for building maintenance.

· Each clinic has a functioning Health Committee which ensures that the community participates in maintaining the facility.

1 1 Kenyan Shilling (KSh) was equal to approximately US$ 0.02 in 1994.

Organization

Preventive maintenance and repair work are managed and coordinated at the district level because, in this way, it is more likely that maintenance resources will be used effectively towards improving health services in the district.

The main components of the organizational model are:

- Each rural district has one Public Health Officer, PHO(M), who is in charge of all Preventive Maintenance activities in the district. Another trained PHO(M) is posted to each district as a backup. The PHO(M) reports to the District Public Health Officer.
- Public Health Technicians carry out regular inspections of the clinics to which they are posted (and of neighbouring clinics without PHTs) and carry out minor repairs themselves. The PHT(M) reports to the PHO(M) on building maintenance matters.
- Officers-in-Charge of clinics have a responsibility for the effective maintenance of their clinics, and, in particular, they deploy and supervise the subordinate staff engaged in maintenance activities that do not require special technical skills.
- Major work that is beyond the capacity of the Ministry of Health organization is carried out by local artisans, building contractors or staff from the Ministry of Public Works.

The above groups form the backbone of the Preventive Maintenance system and they carry out the bulk of the maintenance work. However, to operate the Preventive Maintenance system successfully, support is also required from some other Ministry of Health officials in a district. The Ministry has clarified in an administrative circular the general roles of various cadres of Ministry of Health staff in relation to Preventive Maintenance work.

Staffing

From the outset the Ministry of Health aimed at a maintenance organization that would not require the employing of additional staff.

Based on required competencies maintenance duties were divided into categories, such as:

- Administrative work, requiring besides general management skills:
  - knowledge of principles of building construction and maintenance and applicable codes, regulations and bylaws; properties of building materials etc.
  - skills in preparing and interpreting basic building plans and Bills of Quantities; costing of work; procurement of materials and services; supervision of staff, etc.
- Major on-site repair work, requiring the competencies of a fully qualified craftsman.
- Minor on-site repair and maintenance work, requiring only limited knowledge of building construction matters and some skills in handling basic hand tools.
- Basic cleaning and clearing work, requiring no particular skills.

A survey of existing staff found that:

- Two categories of staff, Public Health Officers and Public Health Technicians, have substantial competence in building matters as a result of their basic training. These cadres were chosen to receive additional training and administer maintenance work on district and clinic level respectively.
- Major work cannot be carried out by Ministry of Health staff but should be given to contractors or staff from the Ministry of Public Works.
- Minor on-site repairs and maintenance could be carried out by PHTs after a skills-upgrading course.
- Basic cleaning and clearing can be done by the users of the clinics, the staff and patients.

Funds and Budget

Preventive maintenance and minor repair work is funded fully by the Government of Kenya. Funds are provided under the Development Estimates on a Ministry of Health Headquarters (HQ) vote expressly for this purpose. These funds are distributed only to districts with at least one trained PHO(M) in post.

Funds for salaries, allowances and other administrative costs for the operation of the Preventive Maintenance system are provided for in the Recurrent Estimates under the general votes for these purposes.

The level of maintenance funding to individual districts – the district allocation – is calculated by PMIU HQ according to the number and size of clinics in each district. The amounts for a forthcoming financial year are communicated in early January.

The Permanent Secretary (PS) holds the Authority to Incur Expenditure (AIE) according to the vote for the Ministry of Health. The PS delegates, through sub-AIEs, authority to the districts to incur expenditure as per the district allocation for preventive maintenance of clinics. The sub-AIEs are issued to the District Public Health Officers who thus are the signatories to the vote. The PHO(M) is appointed as the implementing officer and is made an alternate signatory to the vote.

Annual Preventive Maintenance funds are sent out to districts in three instalments.

Preventive Maintenance funds are broken down by PMIU HQ into four major cost items serving as budget ceilings in district Preventive Maintenance budgets:

- Emergency repairs – 15% of the total district allocation, reserved for attending to emergencies occurring during the forthcoming financial year.
- Basic maintenance tools – 2% of the total, for providing necessary tools or implements that cannot be supplied from other sources.
- Transport and travel – 10% of the total, a topping-up of general district funds for this purpose.
- Planned Preventive Maintenance and minor repairs – the balance after deducting the above three items.

Funds not required for the first three items are used for planned Preventive Maintenance and minor repairs. No funds for planned Preventive Maintenance and minor repairs can be used for any of the other cost items.

Maintenance Cycle

The sequence of maintenance activities in the Project is presented in Chapter 3 under Outline of Maintenance Procedures, page 10.

Inventory
The basic physical data on clinics is collected in an Inventory of clinics, which is a computerised database – kept in the PMIU HQ – containing information about all known Government and non-government clinics in Kenya. The Inventory records for each clinic:

- Name, identity code, type and geographical location,
- Ownership and operational status,
- Size, expressed as square metres of floor area and number of rooms,
- Number and type of staff houses and water tanks,
- Construction year and renovation date(s),
- Availability and type of water, electricity and drainage system,
- Type of roof, walls, ceiling, doors, and windows,
- Number of PHOs and PHTs in post.

Each PHO(M) has an extract from the Inventory that covers his district. These extracts are amended whenever buildings or site installations are altered as a result of repair and maintenance work or when any missing or inaccurate information is detected. Copies of these amendments are forwarded to PMIU HQ, so that the computerised Inventory is kept up-to-date.

District Level Activities

Inspection
The clinics in a district are inspected once a year by the PHO(M). The goal is to inspect *all* clinics, but this is not always achieved in very large districts due to the high costs of transport for the inspecting officer.

Combined checklist and inspection forms are available, see Appendices 1 and 2.

Classification of condition: the following coding system is used to classify the condition of components.

1 Very serious defect which requires immediate repair/ replacement.

2 Requires repair/replacement during next 12 months.

3 Requires Basic Maintenance ("no-cost action") during next 12 months.

4 No action required during next 12 months, but should be attended to within 24 months.

5 No action required during next 24 months.

Specification of Work
Measuring, specifying and describing both the quantity and quality of building works is normally done by Quantity Surveyors. In the Project, no such assistance is available and a PHO(M) normally does the necessary measuring and specifying him/herself.

Costing of Work
To establish the total cost of work, the cost of one unit must be known. Unit costs are available from several sources.

- Priced Master Bill. The Project has produced a master bill of quantities containing the various activities encountered in maintenance work. The Priced Master Bill also contains information on quantities of materials required for various repairs.
- Cost Handbook from the Ministry of Public Works. The Handbook contains prices of most building materials and is available in all District Works Offices.
- District Works Office. Ministry of Public Works officers, particularly Quantity Surveyors, can advise on current rates based on experience from ongoing projects in the district.

Prioritization of Work
The Project priorities for maintenance are presented in Box 3 in Chapter 2 under Prioritization of Work, page 7.

Work Plan
An annual Work Plan for Preventive Maintenance consists of Work Sheets, a Time Schedule and a District Preventive Maintenance Budget. The Work Plan describes:

- Where Preventive Maintenance work will be carried out (names of clinics).
- The kinds of work to be carried out in individual clinics.
- The estimated cost of planned work in individual clinics and other activities.
- Who will do the work.
- When Preventive Maintenance work will be carried out in individual clinics.

Before any Preventive Maintenance expenditure is incurred, a Work Plan must be presented to and approved by the PMIU and the District Health Management Team.

A Work Sheet is prepared for each clinic on a pre-printed form. The Work Sheet describes all planned Preventive Maintenance work in that facility. Estimated labour and materials costs for each work item are entered and the total cost for the clinic is calculated. A Work Sheet also shows who will execute each activity. Appendix 3 shows a Work Sheet form.

Implementing Agents
A PHO(M) has at his/her disposal several agents to execute the maintenance work in a clinic: PHT(M), Local Artisans, Private Contractors or Ministry of Public Works staff.

Timing
The execution of all Preventive Maintenance work and the related supporting activities have to be organised within a time framework. Estimated starting and finishing dates for each activity are presented graphically in a Time Schedule. Pre-printed forms are available.

Budget
No strict formalities have to be observed when formulating a District Preventive Maintenance Budget. A PHO(M) just writes down the plans for the forthcoming financial year so that it is clear how (s)he intends to use the funds allocated. There is no form for the purpose.

Bills of Quantities, Tenders and Quotations
Building works estimated to cost the equivalent of about US$ 600 or more cannot, under Government of Kenya Procurement Regulations, be procured without reference to a Tender Board. Under these procedures, contractors submit their tenders to execute the work based on a Bill of Quantities (B/Q). The B/Q describes in detail the quality and quantity of the various items of work to be carried out, and the contractor gives a price for the execution of each item.

The B/Q is then included as one of the documents in a contract between the employer and the building contractor. B/Qs for such major works are prepared by Quantity Surveyors in the Ministry of Public Works. The Ministry of Public Works will also call for tenders for major work.

Building works estimated to cost less than the equivalent of $600 *can* be procured without reference to a Tender Board. However, there is still a need to describe what and how much a builder has to do and a Bill of Quantities must be prepared. Written quotations, with prices for the execution of each item, are then submitted by the contractors or artisans. The B/Q and the quotation are parts of the agreement for the execution of the works. B/Qs for such minor works are prepared by the PHO(M). The small contractors or artisans hired to carry out Preventive Maintenance repairs are normally not familiar with the vocabulary used by professional Quantity Surveyors. The language and technical terms used in these B/Qs is therefore adapted, so that it can be clearly understood by those the PHO(M) wants to employ for the execution of the works.

Awarding of Work

The evaluation of tenders and quotations, and the awarding of work, is done according to Government of Kenya Procurement Regulations.

Procurement and Distribution of Materials

Most maintenance repairs are carried out by local artisans or small contractors, using building materials supplied on the site by the PHO(M). Materials are supplied by appointed Term Contractors and the PHO(M) arranges for their transport to the site.

Term Contractors are appointed in each district after a tender process where several suppliers give their prices to supply some specified items to all Government departments. Often, all the materials required for maintenance work are not available from Term Contractors but must be obtained separately by the PHO(M), following the Government of Kenya procurement regulations.

Procurement and distribution of materials are time-consuming. A Shopping List form summarizing the materials required in each clinic and the total quantity required of each kind of material is available to simplify these tasks.

Government stores procedures are followed for Preventive Maintenance materials. All materials procured are entered into a stores ledger and issued to the individual clinic where it will be used.

Implementation and Monitoring of Planned Work

Execution of work in a Work Plan can start once the plan is approved and annual maintenance funds become available.

The PMIU HQ, as a part of the approval process, enters the Work Plan data into a computer. The computer programme helps in the process of approving Work Plans but also produces a number of documents that will help in the monitoring of progress of planned and other maintenance work. All PHOs(M) will receive pre-printed forms with actual planning data from Work Plans for their own monitoring of work progress at each clinic and for monthly progress reports.

Approval of Work Plans is one function of an integrated computerized monitoring system covering all Project activities. The system is designed to provide management and control information to district and headquarters staff and to track indicators of progress in relation to its goals. No computerized maintenance management system on the market met Project requirements.

Documentation

When planned maintenance work in a clinic is finished, the PHO(M) records completion date, a quality rating and actual cost for each work item. Any change to inventory data is also recorded. A copy of these data is sent to PMIU and entered into the computerized monitoring system.

Reporting and communications system

The PHO(M) submits monthly progress reports to the PMIU. The reports cover progress of planned and any emergency work in each clinic, status of work carried out by PHTs and Health Committees, and total expenditure. Pre-printed report forms are generated by the monitoring system.

General correspondence is sent by normal mail, accountable documents by courier services. The PMIU accepts reversed charges telephone calls from all field staff.

Forms and Supporting Documentation

Besides forms and lists mentioned above, each PHO(M) is issued with a manual with detailed guidelines on the management of maintenance activities. A complementary manual describing common maintenance problems and hands-on procedures for their repair is also available. It is intended for both PHOs and PHTS, or anyone involved in the maintenance of rural clinics.

Clinic Level Activities

Procedures and guidelines for the administration and execution of maintenance work in the clinics were developed by the Project.

Abbreviations

AIE	Authority to Incur Expenditure
B/Q	Bill of Quantities
Danida	Danish International Development Assistance
HQ	Headquarters
OiC	Officer in Charge
PHO	Public Health Officer
PHO(M)	Public Health Officer in charge of Maintenance
PHT	Public Health Technician
PHT(M)	Public Health Technician in charge of Maintenance
PMIU	Preventive Maintenance Implementation Unit
PS	Permanent Secretary
Sida	Swedish International Development Cooperation Agency

Recommended Reading

Åstrand, J. (Ed.)
1996 *Construction in Developing Countries – A Guide for the Planning and Implementation of Building Projects*.The Swedish Mission Council, Stockholm.

Smith, R.G.
1993 *Maintenance of Low-cost Buildings*, Overseas Building Note No. 200, Building Research Establishment, Garston, United Kingdom.

Syagga P.M. and E. Aligula
1993 *Nairobi Housing Condition Survey*. University of Nairobi.

Appendix 1 External Inspection form. Only the left half is filled out during the field inspection.

MINISTRY OF HEALTH, External Inspection Form Date: _____ District: _____

RHF* Name: _____ Building: _____ Insp. Form No: _____

CC	Component	Description/Remarks	Dimensions L / W / H	No.	Total Quantity	Unit	Unit Cost Materials	Unit Cost Labour	Materials Cost	Labour Cost	Total Cost
	Roof Cover										
	Ridgecap/Valley										
	Flashing										
	Gutter										
	Down-pipe										
	Supporting Structure										
	Bat Proofing										
	External Walls										
	Paving Slabs										
	Foundation										
	Water Well										
	Water Pump										
	Water Tank										
	Water Pipes										
	Latrine(s)										
	Septic Tank										
	Soak Pits										
	Sewer Pipes										
	Inspect. Chambers										
	Placenta Pit										
	Incinerator										
	Storm Drains										
	Access Road										
	Fence										
	Gate										
	Footpaths										
	Grass										
	Bushes/trees										

CC Condition Codes 1 = Requires Emergency Action 3 = Requires Basic Maintenance 5 = No Action within next 24 months
2 = Action within 12 months 4 = No Action within 12 months but likely to need attention within 24 months

* *Rural Health Facility.*

Appendix 2 Internal Inspection form. Only the left half is filled out during the field inspection.

MINISTRY OF HEALTH, Internal Inspection Form Date: ________ District: ________

RHF Name: ________ Building: ________ Insp. Form No. ________

Room: ________

CC	*Component*	*Description/Remarks*	*Dimensions L / W / H*	*No.*	*Total Quantity*	*Unit*	*Unit Cost Materials*	*Unit Cost Labour*	*Materials Cost*	*Labour Cost*	*Total Cost*

Room: ________

CC	*Component*	*Description/Remarks*	*Dimensions L / W / H*	*No.*	*Total Quantity*	*Unit*	*Unit Cost Materials*	*Unit Cost Labour*	*Materials Cost*	*Labour Cost*	*Total Cost*

Room: ________

CC	*Component*	*Description/Remarks*	*Dimensions L / W / H*	*No.*	*Total Quantity*	*Unit*	*Unit Cost Materials*	*Unit Cost Labour*	*Materials Cost*	*Labour Cost*	*Total Cost*

CC Condition Codes
1 = Requires Emergency Action
2 = Action within 12 months
3 = Requires Basic Maintenance
4 = No Action within 12 months but likely to need attention within 24 months
5 = No Action within next 24 months

Check List: Ceiling, Walls, Floor; Doors, Windows, Burglar/Proof., Mosquito Pr.; Workbench, Shelf, Notice Board; Ventilation Hood, Water Pipe, Water Tap(s), Wash Basin, Sink, Shower, Bath, Sluice Eq., W/C, Gulley(s), Sewage, Electr. Inst., Insects/Fungi.

Appendix 3 Work Sheet form.

District: _____ RHF Name: _____

PHO(M): _____ Maintenance work in F/Y: _____ Worksheet No: _____

Work Item No.	*Specification of work*	*Type/ Size*	*Quantity*	*Priority Code*	*Implementing Agent*					*Estimated Cost*	
					PHT(M)	*Other MoH Staff*	*Artisan*	*MoPW/ Others*	*Community*	*Materials*	*Labour*
									TOTAL		