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Landscape Maintenance Operations in Property Maintenance/Management in Nigeria

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Abstract:
The primary aims of property maintenance are to retain the value of investment; to maintain the property in a condition in which it continues to fulfill its function(s) and to present pleasing appearance as well as improve the quality of life and environment. Towards achieving these aims, landscape maintenance operations comprises mainly of servicing, rectification and replacement actions. These have to be performed periodically in accordance with formulated maintenance schedule. This paper discusses these maintenance actions, their schedule, measures for maintaining hard and soft landscape elements as well as factors which contribute to low maintenance.

1. Introduction

> "The maintenance of the built environment affects everyone continually, for it is on the state of our homes, offices and factories that we depend not only for our comfort but for our economic survival".
>
> - Ivor H. Seeley.

If it is at all practicable in our country Nigeria, we would wish to design and construct buildings and landscapes that are maintenance-free. While this is desirable, it is not feasible. Unlike the buildings, landscape elements are dynamic. They age and grow, often achieving the intended appearance over time with a bit of encouragement from human management/maintenance.

Maintenance has been referred to as the "stepchild of landscaping" (Carpenter et al., 1975). Lamentably, maintenance in Nigeria is an after-though, often neither a major consideration in design nor in construction. The correct situation is that long-term maintenance, ability of the client to maintain the landscape, coupled with a satisfactory maintenance budget for future years, ought to be a prime consideration by both the landscape architect and the client. The primary aims of maintaining buildings and their grounds are to: retain the value of investment; maintain the property/building in a condition in which it continues to fulfill its function(s) as well as present a good appearance, improve the quality of life and environment (Seeley, 1976). If landscape around building are to be effectively maintained to fulfill these aims and effects intended in the design, technical knowledge and experience are crucial in identifying both the maintenance needs and appropriate maintenance remedies applicable.

Similar to building maintenance, landscape, maintenance comprises of servicing, rectification and replacement actions. Servicing is a cleaning operation undertaken at regular intervals of varying frequency; which is sometimes day-to-day,

Rectification work occurs usually within the liability period or early in the life of the development. It may arise from faulty design, unsuitability of components/materials, damage of materials in transit or incorrect installation. Typical examples are pavement failure, failure of retaining walls and death of plant materials. Often, works of this nature are covered in the landscape construction specifications.

On the other hand, maintenance may involve replacement. This occurs when materials or elements complete their active life span. This would occur with serious wear on pavement after considerable years or death of plant materials after their active life span.

Identifying the maintenance action required and programming the practices requires a skillful and well-trained maintenance supervisor/manager.

2. Landscape Maintenance Schedule: Ideally, this schedule and budget duly drawn up by the designer as part of the design package. But the crucial issue which arises is how many organizations or establishments have ever consulted qualified landscape designers for the design and maintenance of their grounds? Undoubtedly, very few! Even in the few cases, instances seem to suggest that clients are hardly willing to pay for the formulation of a landscape maintenance programme. Consequently, no schedule is done. The landscape thus either suffers benign neglect or enjoys haphazard maintenance. Armed with the relevant information and experience, though, the landscape supervisor/ manager can prepare a schedule where one is not done by the consultant.

A maintenance schedule is a guide or time-table for executing maintenance practices at the correct time (Carpenter et al., 1975). Well-developed schedule permits the landscape maintenance supervisor to use men and equipment efficiently and effectively and to perform required maintenance when it is of uttermost benefit to the owner, the site and landscape elements. More importantly, the schedule allows a sound maintenance budget to be developed for the site as the cost of specific operations is determinable. Knowing the cost of each operation, priorities can be established and the supervisor is in a better position to make decisions when questions of cost arise.

2.1 Procedure for Formulating a Schedule

One alternative in drawing up a schedule is to first classify areas of the landscape based on the degree of maintenance required to achieve the design objectives. Areas can be classified based on their use as needing high, medium or low maintenance. High maintenance areas would be ones containing elements such as manicured turf or grass lawns, manicured shrubs, groundcover and annual/perennial flower beds. Also included are manicured trees and intensely used circulation areas, particularly of non-pavement.

Medium maintenance areas will include groundcover beds, shrub beds intended to grow into their natural habits; tree stands and other use areas requiring only moderate care, such as occasional pruning, pest control and trash pick-up; areas where the use of annual flowers and groundcovers are limited. Low maintenance areas will consists of use areas of mainly hard landscape elements – walks, roads, parking lots, and others as well as trees and shrubs needing little or no care.

The classification into use areas would normally be marked on or with the aid of the site plan or the landscaping plant as shown

in Fig. 1. Once these areas have been delineated, the next step is to make a list of all the landscape materials in each area, whether hard or soft. Apart from categorizing plants under grasses, herbaceous plants, shrubs and trees, their grouping should be based on flowering time, foliage or use. It is from this list that the necessary maintenance practices can be determined (Table 1).

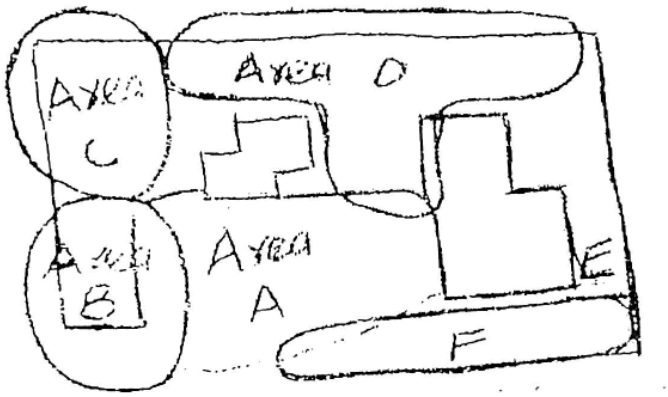

Fig. 1 – Classification of areas into levels of maintenance.

Table 1: Listing of Landscape Materials in Maintenance areas (source, Carpenter 1975).

Area A

- Parking lot.
- Walkway.

Area B

- Lawns/grasses.
- Harbaceous plants.
  Groups I Ground cover and vines.
  Group II Perennials and annuals.
- Shrubs
  Group I Deciduous – non-flowering or inconspicuous flower.
  Group II Deciduous – early flowering.
  Group III Deciduous – late flowering.
  Group IV Evergreens – broad leaf.
  Group V Evergreens – needle leaf.
- Trees
  Group I Deciduous shade trees.
  Group II Deciduous early flowering, etc.

The third phase of preparing the schedule is to determine practices needed to obtain the maintenance wanted. These practices will include sweeping/trash pick-up pavement/fence repair, fertilizing, watering, pest control (insect, disease and weed control), care of turf areas, maintaining irrigation systems, pools or fountains.

With all these information assembled, a monthly maintenance schedule for an entire year is drawn out. A typical result therefrom is shown in Table 2.

This approach, to me, is cumbersome, time-consuming and not amenable to quick referencing, requiring more in-depth knowledge of landscape design by the landscape maintenance supervisor.

(b) Alternatively, a schedule can be prepared by grouping areas in terms of landscape cover and function. In this, areas will be grouped as lawn areas, groundcover areas, parking area, drives, etc. Under each category, is a repetitive list of applicable maintenance practices. Matched against these practices is the frequency at which each practice is performed. The columns can be modified by adding the months of the year to indicate, where appropriate, when specific action can be executed (Table 2).

This schedule has the advantage of quick information retrieval because of its brevity. Further, it lends itself to easy computer storage and retrieval, especially when matched with the landscaping plan of the site. However, it subsumes the degree of maintenance whether low, medium, high in the frequency of maintenance action. Furthermore, additional specifications will have to be written to explain in detail each action. Specification however becomes necessary if maintenance is contracted out or entrusted to an improperly trained supervisor.

3. Maintenance

3.1 Maintenance of hard landscape elements:

Hard landscape areas which include gravel or paved walkways, drives, parking lots, curbs, edging, sculptures, drainage channels and landforms can be classified as low maintenance especially early in the life of the landscape. Maintenance operation at this time is largely servicing. This, you will recall as being regular day-to-day or weekly operations aimed at trash removal, sediment pick-up and general cleanliness. Gravel walkways and drives are raked and re-spread; drains both in fountains and channels are cleared at regular intervals. Rectification work will occur at this stage where design or construction error causes pavement failure or undue cracks.

A common problem in our humid tropical climate is the growth of fungus and molds on concrete and brick pavement, curbs and edging within a few years of landscape establishment. Traditional maintenance actions include application of appropriate fungicide, weed killers or steam cleaning with pressurized steam and detergent.

The latter technology may not be available here yet, but appropriate fungicides can be found and sprayed at the appropriate areas. Remarking and restriping of drives and parking areas will take place every 2-3 years, depending on the quality of marking paints used and overall usage.

3.2 Maintenance of soft landscape – Plants

Of all the landscape elements, plants are the most dynamic. They grow and age, achieving their intended design effects or functions many months or years after installation. Well-articulated and religiously executed maintenance programme is essential to plant life.

In maintaining plant materials, the following issues need to be noted:

- Maintenance operations are intensive in the growing season, about April – October.

- Semi-dormant season, November -- March – is a period for rectification and replacement work -- redesign, re-establishment, specialized turf management.

3.2.1 Turf or Lawn Areas:

Establishment: The technique and equipment for turf management has become so specialized that in overseas, some firms deal exclusively on management of large turf areas. Nevertheless, turf establishment is relatively simple and can be achieved in one of three ways, namely; seeding, sodding and sprigging. Economics (cost), amount of rainfall or availability of irrigation and soil conditions influence the selecting of the grass and installation method. Simple seeding for small areas involves the spreading of harvested grass seeds either manually with hand, gravity feed distributors or with broadcast, rotary spreaders. More complex seeding for large areas and steep slopes will involve self-propelled hydro seeder operated by pumps or large seeder operated by tractors. Sodding involves the laying of pre-cut strips (strip size of about 300 x 600mm with minimum 75mm soil/root thickness) of already established grass.

While the sodding juices instant lawns, it is the most costly of all being about 5 – 7 times more than seeding and 3 -4 times that of sprigging, especially for large areas. For small to medium areas, the overall cost may not be greater than for seeding and sprigging as initial maintenance and weed control are less.

Sprigging is the sowing of live sprigs, stolons or small sod pieces (plugs of 20 – 100mm) in furrows dug every 100 – 150mm centers. It is this method that enjoys the most common use here. The former two are not largely in use either due to lack of awareness of matching technology for execution or both.

- Maintenance and management of plants consumes the greatest proportion of maintenances time and is labour-intensive.

If properly installed, sodding will provide 'instant' and usable cover from about two to three weeks. Seeding will provide cover from about two weeks but becomes usable from about eight weeks. Sprigging is the slowest, providing complete cover in no less than eight weeks, but requires up to four months to be usable.

Site Preparation for Establishment: Despite the establishment technique selected, preparation is the same for all grasses and consists generally of the following (Carpenter, 1975): Cleaning and trash removal; stockpiling of topsoil and rough grading; installation of drainage and irrigation systems; subgrade filling; placing of topsoil; application of lime and soil modification materials; deep tillage and preliminary smoothing; application of starter fertilizer/dry animal manure; final grading, smoothing and planting as well as firming of seedbed, rolling, applying sprigs or sod.

In executing the above steps, the salient points to note are:

- Site modification steps from cleaning to placing of topsoil are the same for grass, shrub or tree installation.
- On executing item 5, soil test should be made to carbonate – limestone.
- Best pH is 6.5; if below 6.3, lime should be added because the soil is acidic – highly organic soils. High pH above 8.0 (soils of limestone base) should be added to lower below or to 7.5.
- Easier to raise pH with lime.
- Add nutrients according to soil-test results; dry, pulverized animal manure is good.

- Modifying materials should be deep-tilled to a depth of 150mm with hoe, rototiller or disc-cultivator.
- Starter fertilizer low in nitrogen -5-10-15, 6-12-12 or 5-10-10 for grass, are better if available. Low phosphorous fertilizer 16-4-8 or 12-4-8 (i.e., 4-1-2 or 3-1-2 ratio) good for ornamental shrubs. If these are available, 10-10-10 or 15-15-15 can be used with care.
- Final grading, raking and watering – for small areas with hand rakes; large areas – mechanical graders and rakes.
- Smoothing and firming after planting manually with flat board mounted on a vertical handle, or with wooden or light-weight metal roller, or with mechanical rollers and water to wet 75-150mm deep.

3.2.2 Turf or Lawn Maintenance: The appearance of lawn after establishment depends on a sound maintenance programme. Major components of this programe include mowing, fertilizing, watering, cultivation, renovation and pest control (Table 2). Generally, in sites with large lawns, turf maintenance consumes the greatest amount of maintenance time during the growing season

Given the availability of water, the best time for turf establishment and renovation in this country is towards the beginning of the growing season with March-April-May as the optimum period. In this period, sprigs or plugs will become firmly established before the onset of heavy rains with attendant weed competition and erosion.

There is a variety of grasses in use in the country for lawn or turf areas, depending on use. Among the common ones for cut or mown lawns or fields are Bahama grass (Cynodon dactylon) and Carpet grass (Axonopus compressus). Port-Harcourt grass (Festuca glauca) is however becoming quite popular for mowed lawns, especially in the southern parts. Also, Kikuyu grass (Pennisetum clandestimum) is increasingly gaining popularity for small lawns needing no mowing. Its main drawback is its hunching habit.

Table 2: Turf or grass lawn maintenance calendar

ACTIVITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG.	SEPT	OCT.	NOV.	DEC.
Mowing					o	o	o	o	o	o		
Drainage		o	o							o	o	
Cultivation – Aeration			o	o	o			o	o			
-Dethatching or verti-mowing			o	o	o			o	o			
- Topdressing			o	o	o			o	o			
Renovation			o	o	o			o				
Sprigging, sodding			o	o	o			o	o			
Seeding			o	o	o			o	o			
Fertilizing			o	o	o			o	o			
Manuring			o	o	o							
Rolling – Soccer Field			o	o	o							
Soil Testing			o	o	o			o				

Weed Control			o	o	o			o	o			
Insect Control				o	o	o	o	o	o			
Disease Control		o	o	o				o	o	o		
Irrigation	o	o	o								o	o
General												

Mowing: Proper mowing is critical to the appearance of the lawn. Important facts to note in mowing are:

- Turf areas to be mowed at least once a week during growing season.
- Mowing height shall be no less than 50mm or according to height of specific grass. Never allow it become more than 85mm between mowing.
- Initial cutting for newly established grass be done after a height of 100mm is attained.
- Mowing machines produce more even lawn appearance than with cutlass. Choice of machine suitable for specific turf and size of area is important. Varieties of mowing machines range from hand-pushed, power driven reel or rotary mowers, to medium-sized riding mowers of rotary type to large sized tractor-driven reel type gang mowers. Rotary mower is thought to be faster while reel-type gives more even surface.
- Riding mowers give smoother finish than hand-driven ones.

Fertilizing:

- Soil test is very imperative before application.
- Two applications, one early in the growing season and the other in August or October, will suffice unless indicated otherwise by soil test.
- In absence of soil test, fertilizer used can range from 16-4-8, 5-10-15 to the all-purpose type 10-10-10 or 15-15-15 readily available here.
- Avoid injury to turf by observing specified application rate.

Watering:

- Very critical for newly established turf, frequent watering to the depth of 150mm for about 4-6 weeks of planting.
- Best time for watering –early morning before 9.00a.m late afternoon – fair in humid south. Late evening and night in dry north – prevents evaporation.
- For established grass, good soil type, type of grass, frequency of rain, temperature and humidity affect amount of water needed.
- If not regular schedule, best time to apply water is just before wilting occurs. Water

is hardly needed in June and July.

- Be sure to use appropriate sprinklers – impact, rotor-up and po[away sprinklers – many varieties.

Cultivation: Cultivation of turf grass includes vertical mowing or dethatching, aeration and topdressing. These operations reduce thatch accumulation, surface compaction, improve soil aeration, water infiltration and hence promote root growth. All three can be done at the same time.

- Vertical mowing or detaching – removal of dead and non-decomposed vegetation from the thatch layer. Thatch is lifted by blades of vertical mower. Operation need be done in two directions, at right angles to each other. Best if done before green-up occurs or when grass is growing rapidly in the season.
- Aeration or coring relieves soil compaction and stimulates thatch decomposition; best accomplished by power aerator with spoons which removes a soil core 50 – 75mm deep and 10-18mm in diameter; best accomplished in periods of active plant growth when soil is moist for deep penetration. Should be used only to correct soil problems and not as a routine practice.
- Topdressing involves spreading a thin layer of topsoil or other soil mix over the turf to produce a layer 3mm – 16mm thick; usually worked in by dragging, raking or brushing.

Pest Control: Pest control includes control of weed, insects and disease. A handful of herbicides and insecticides are available in the market to control these. Their use must be based on absolute care and close consultation with agricultural extension agents or with experts. While very effective, some of them are non-biodegradable and hence can poison the food chain.

3.2.3 Maintenance of shrubs and trees

Techniques for managing groundcover beds, shrubs and trees differ a bit from that of turf. These, for most part include pruning, watering, manuring/fertilizing, cultivation and weed control.

Pruning: Pruning which include cutting-out old and weak shoots, thinning and shortening of growths is performed for the following purposes (Table 3 and Appendix A Guidelines on Pruning):

- Increase the longevity and usefulness of plants for many years.
- To achieve and maintain forms intended by the designer in choosing such plants by preventing overgrowth.
- Reduce or maintain size of tree or shrubs.
- Permits vigorous development of new growth
- Ensures health through removal of dead, broken and diseased branches, and weak branches.
- Prevents overcrowding through removal of numerous or weak branches.

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- To shape plants into unnatural forms (usually round) as in sheared hedges and screens.
- To remove limbs overhanging low on walkways, roads, utility lines or constitute danger to health and safety.

Below is a pruning schedule for shrubs and groundcovers.

Table 3. Pruning schedule for shrubs and groundcover

	Plant	Pruning	Season (Time)
1.	Evergreen shrubs	Reduce new growth by half of cut back to within a bud or two of old growth	Annually –March – April.
2.	Deciduous shrubs	Thin out branches 3 -4 years for rejuvenation	Dormant season
3.	Overgrown and leggy evergreens	Cut back into old mood	Feb – April.
4.	Narrow-leaf evergreens	Shapes to natural form but leave 30% foliage	March – April July- September
5.	Hedges; screens	Shape to desired form if not naturally so	Year-round as necessary
6.	Ground cover	Clip to encourage bushy growth	March - May

Watering: Water is critical in establishing shrubs and trees. At this stage, sufficient water should be applied to ensure penetration to soil depth of 150-200mm. The frequency varies from once to twice a week requiring at least 25 – 50mm of water depending on nature of soil and amount of rainfall. Crucial factors to observe in watering during and after establishment include:

- Ensure application of enough water to soak to a depth of 150-200mm.
- Apply water at a rate which minimizes runoff.
- Water newly-planted material regularly, at least, 250-50mm of water weekly.
- Moisture needs of established plant should not be ignored; take a soil sample from 150-200mm.
- But do not overwater established plants.

Manuring/Fertilizing: Appropriate soil nutrients are crucial to the establishment and growth of wood plant material as they are to turf. Organic fertilizers such as composted manures, animal dung or cotton seed meal have their special advantages to woody plants over inorganic fertilizers. Their addition to the soil before planting changes the soil structure. This results in the increase of fertilizer and water-holding capacity of sandy soils while increasing aeration in heavy compacted clay soils. Additionally, their slower release of nutrients reduces the possibility of fertilizer injury to plant roots. Chemical fertilizers have no positive effect on soil structure.

The drawbacks of organic fertilizers are their cost, availability and sometimes,

offensive smell. Dry, pulverized cow dung of $5m^3$ costs well over eight naira (₦80) while fresh animal dung is unsightly and smelly. Inorganic or chemical fertilizers such as the 15-15-15 are readily available and may be reasonably priced. Slow release fertilizers which are not common in the country may also be procured at higher cost.

In planting shrubs and trees, it is not necessary to add inorganic fertilizer. Organic fertilizer such as decomposed leaf, animal dung should be mixed thoroughly at the rate of 1/3 organic matter to 2/3 of soil removed from the planting hole.

For established plants, more frequent fertilizer applications are recommended than for mature ones. Soil analysis will determine rates of application. Otherwise, the derived rates of growth will guide application rates. Several light applications in the year instead of one heavy application are advisable. An application in March, May and July will be adequate for young shrubs. A general rule of thumb for inorganic fertilizers of 10-10-10 or 15-15-15 analysis is to apply a level table spoonful per 300mm of plant height in each application. For older plants beyond 5 years, one application in a year is adequate. Organic manure can be applied heavily once or moderately twice a year.

Two basic techniques are employed in fertilizing, namely: deep root feeding and surface application. The latter is more popular and less complex.

In surface placement, the fertilizer should be spread out evenly underneath the plant to a point slightly beyond the drip line of the shrub or tree ensuring the trunk is free of fertilizer (Fig. 2).

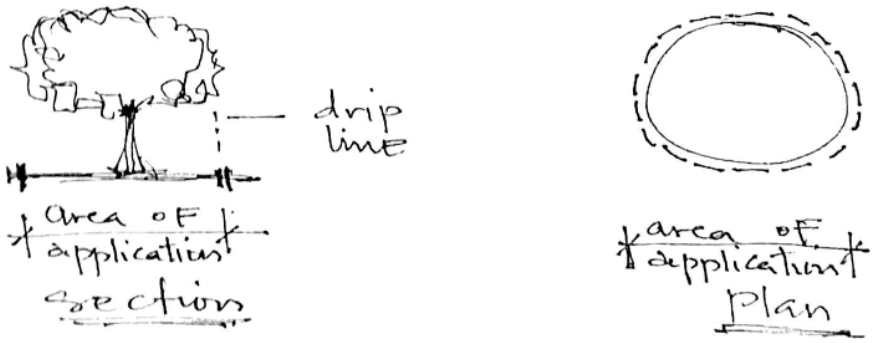

Fig. 2: Surface application of fertilizer to shrubs and trees.

Table 4: Plant nutrients and their effects on plants (Source: Scrivens & More, 1979)

	Item nutrient	Normal source	Effects of deficiency	Effects of Excess
1.	Nitrogen	Ammonium salts & nitrates in soil solution	Plants small, bright, tinted with pole older leaves	Soft flabby growth, risk of disease damage
2.	Phosphorous	Organic and inorganic	Poor roots, weak, bluish or purplish shoots, wearing	Encourages clover

		phosphorous in soil	badly	
3.	Potassium	Potash salts in soil solution, only scarce in peat, chalk or sands. Also in mineral	Growing points, fail, shoots die back, risk of disease	Seldom over-applied
4.	Calcium	Limestone, soil solution, plentiful except in very acidic soils-highly organic soils	Growing points fail. Leaf tip is yellow or stunted	Causes iron shortage favours weeds.

Cultivation: Cultivation is used to control weeds around shrub and trees. It involves working the surface crust once or twice a year with a hoe or fork to remove. For larges shrubs and groundcover beds, this practice can be quite cumbersome.

Mulching as a cultivation practice is largely neglected in landscape management in this country. Apart from its use as a design feature, mulching has multiple benefits which include:

(a) Weed control: Mulching reduces germination and growth of weed seeds. Even when weeds do grow, they are easier to pull from mulched soil. Thus mulch helps to reduce the endless task of weeding around groundcover and shrubs.

(b) Soil temperature moderation: Mulching reduces soil temperature; reduces soil moisture evaporation and thus prevents crusting of soil surface and plant roots and thus conserves soil moisture.

3.3 Other key elements of landscape maintenance

While a maintenance schedule forms the base of an orderly maintenance program. Other elements contribute equally to an efficient programme. These include maintenance unit/facilities, personnel, equipment, records and budget.

(c) Reduces demand for watering.
Mulching materials include sawdust, pine bark, gravel, pine straw, wood chips grass clippings, palm kernel shells and straw (corn or wheat straw). It should be noted that regardless of type used, depth of mulch should be only 50-75mm often setting, to prevent excessive dampness. It is very desirable underneath new established plants and groundcover beds.

(d) Weed/Pest control: Weed control around shrubs and trees are generally less a problem than in lawn or grass areas. Competition from weeds after establishment can be combated with post-emergence herbicides such as Kleenup, Round-up or similar herbicides as are available. Experts need be consulted for specific weed and pest problem.

Landscape Maintenance Unit/Facilities: the nature and size of the landscape to be maintained will determine the nature and complexity of landscape maintenance organization and facilities required. While small areas and certain aspects of maintenance would more profitably be executed by contract, an in-house maintenance unit is highly advisable

especially for large institutional landscapes. Facilities required will vary but will include nursery, workshop, equipment/supplies, stores, staff offices and ancillary services.

Personnel: The most important aspect of landscape maintenance is the personnel who do the work. Best equipment, supplies or schedule cannot maintain a landscape. Only qualified and well-trained staff can. The person in charge of building maintenance, especially in our circumstance is rarely qualified to maintain the space around that building.

The Landscape maintenance supervisor/manager is the critical personnel in administering and efficient and successful unit. Where possible, he should be involved in the total development of the landscape. He should possess some knowledge of design and be aware of landscape construction techniques used in development. This is because, he ultimately will be the one involved in changing walkways, enlarging parking lots, reconstructing drainage, or replacing plant material. Without his knowledge of the design objectives, the intended effects of the landscape can be destroyed (or negatively attained) by improper changes made by him. Furthermore, the landscape maintenance manager along with his supervising staff should have a good knowledge of horticulture, plant material entomology, plant pathology, and weed control (Carpenter et al., 1975).

An equally key employee is the maintenance crew foreman. He controls to a large extent, the quality and quantity of work by his crew. He should therefore be well-trained, motivated and can lead men. Untrained or unskilled labour crew should not be assigned to maintain the landscape. Whenever a new or unskilled employee is assigned an unfamiliar task, the technique should first be demonstrated by a skilled staff.

Equipment/Supplies: Appropriate equipment compliments good personnel and administration in efficient landscape maintenance. Various equipment for maintaining the landscape has been pointed out earlier. Unfortunately, many of these are costly or are hard to come by (Appendix B – Suggestions on materials & equipment procurement) .

Responsibility for the procurement of the right equipment rests with the supervisor. A maintenance schedule will aid him in determining equipment needs as well as supplies. It will also aid in determining the frequency of equipment use and whether it will be more economical to lease equipment or contract out certain operations to organizations who already own specialized equipment for specific work.

Records: The importance of good record keeping to good maintenance programming and budgeting cannot be over-emphasized. Record-keeping should be simple; yet it should provide necessary info9rmation needed by the supervisor. Accurate records can inform the supervisor the duration of a particular task, who performed it, when the task was performed as well as equipment and supplies required for completion. The records can be summarized. With records of this nature, the supervisor would be able to compute not just the total cost of landscape maintenance but also extract the cost of each operation in terms of labour, supplies and overhead. This will aid the organization determine which practices should be continued at what degree and frequency.

Records of this nature will afford a weekly, monthly evaluation of the maintenance schedule to ascertain if specific operations were successfully completed within the stipulated time. Furthermore, it will enable a realistic modification of the schedules at the end of the year based on previous year's results. It will also enable realistic budget to

be made over the years for landscape maintenance. Above all, it will afford the opportunity for establishing the cost in use of the landscape at any given year.

Budget: Often landscape maintenance budget is the last thing considered in budgetary allocation and the first jettisoned during budgetary shortfalls. Proper maintenance over the year should be backed by satisfactory budget. Accurate records can establish a budget after a couple of years. Budget allocations should, however, increase towards the maturity of landscape plants and elements as replacement maintenance will become necessary.

3.4 Design consideration which engenders low maintenance

Maintenance time and cost will be reduced if landscape design, layout and construction take into consideration the following as tips (Tandy, 1984).

Grass Lawns or Turf/Areas:

- Shape or lawns should be simple and not broken up by plant bed or obstruction – aids mowing.
- Trees planted in turf areas should be wide apart, enough to enable mowing machines to pass unhindered.
- Mowing strips should be used against walls and plant beds.
- Manhole covers should be properly aligned with grass slope.
- Automatic sprinklers should be used if affordable.

Planted Areas:

- Plant beds should have simple shapes.
- Except for hedges, plants appropriate for situation should be chosen, i.e., plants not needing staking or pruning
- Allow plants to develop as in nature; reduces pruning.
- Suppress weeds by reducing area of bare soil or mulching.
- Allow space for trimming on both sides of hedges.
- Use groundcover instead of turf where possible to reduce maintenance.

Ecology:

- Choice of plants that are native or adapted (hardy) to the locality.

Pavement;

- Heavily used areas like those for circulation be covered with hard paving (high initial cost but low maintenance because low ear).
- Cut edging of walks and dinks same pavement wear and frequent grass edging.
- Proper dope into catch basins for change.
- Appropriate expansion joints be created in the case of concrete.

Fountains pools:

- Should be shallow for easy maintenance.
- Overhanging of trees should be minimized as falling leaves can block drains.
- Water in the pond must be circulated of only slightly.

Edging

- Durable edging which include timber, concrete, stone, brick, tiles metal or plastic strip be used between use areas-turf and plant beds and circulation ways.

- Should be clean cut line in vertical and horizontal flame.

Trash:

- Receptacle should be positioned at catchment areas.

3.5 Factors contributing to low landscape maintenance culture

The prevalent low maintenance situation in the country can be attributable to factors other than social malaise. These include status of landscape design, budgeting, lack of qualified personnel and general attitudes/awareness.

Status of landscape design: In most of our development projects, landscape design is not seen as a major component of design to be accorded its deserved status at the design stage. Instead, it is often consigned to merely external works or 'special services' to be provided by the architect or engineer or worst still, less to the whims of the contractor. The reality is that rarely are untrained designers well equipped or qualified to design let alone/maintain effectively the landscape around buildings especially in large developments. In cases where landscape design is contemplated, it lamentably comes as an after-thought. It is therefore performed after major site planning and decisions fostering low maintenance or improved function and aesthetic quality would have been taken and irreversibly implemented.

Budget: Because the role of landscape design is not duly recognized, appropriate budgetary allocations are not made for the design, construction, supervision and consequent maintenance. In the United States for example, the operational rule of thumb is to budget about 10% of the building cost for landscape design and construction. By the same token, landscape maintenance can be provisionally budgeted as 10% of annual maintenance budget.

Personnel/Manpower: The importance of relevant manpower to good landscape maintenance has already been discussed. Personnel skilled in several aspects of landscape maintenance are severely lacking. As at this time, no school in the country runs a programme in landscape architecture. Also, no school is yet known to run a programme in landscape maintenance. This year, Obafemi Awolowo University, Ile-Ife organized a 2-week course in landscape design and management for landscape managers and other professionals.

Attitude/Awareness: Societal attitudes and awareness play a crucial role. Well designed and managed landscape is generally thought in the society to be esoteric pursuits of the rich living in Ikoyi, Victoria Island and rich elite areas. Ordinarily, tree surgery and careful treatment of tree wound will be viewed as crazy pursuits of deranged minds. Furthermore, it is generally believed that plants grow anywhere without help or that pavements can last forever. This is reality! Added to this is the low awareness of both the tangible and intangible benefits of good landscapes in the urban centers. We are not generally aware of the already stated benefits of good and pleasing landscapes around buildings. This situation ought to and have to change.

4. Conclusion

Part of managing a properly or building is the maintenance of the grounds or landscape between and around such property. Proper maintenance of these landscape/grounds derives its inspiration from a good understanding of the design intent which informed or guided the design selection and placement of landscape elements. A good

landscape maintenance unit, skilled and dedicated personnel, articulated maintenance schedule, equipment, sympathetic budget and good record keeping altogether form the vehicle for effective landscape maintenance.

Landscape design and maintenance should not be valued strictly in terms of tangible benefits derived therefrom. Instead the real value of a well-designed and effectively planted and managed landscape lies in the beauty, health, comfort and general improvement of quality of life in and around our living and working places. This is a key factor which renders the determination of the actual cost-in use of such landscapes inconclusive.

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Appendix A: Guidelines to observe in pruning

(Adapted from Carpenter et al., 1975).

- Having proper tools and knowledge or their uses are keys to proper pruning.
- Small hand shears of 150-225mm length used to out branches not thicker than 10mm diameter.
- Larger hand shears or loppers of 500-600mm for limbs of 25-30mm. Hedge shears with 150-300mm blades for achieving sculptured appearance are of this category. Hedge shears be used for hedges only; all above for small trees and shrubs.
- Pruning saws of various sizes are for large shrubs and trees. Includes small folding saws, bow saw, speed saw and chain say for vary large limbs or trees.
- Shrubs and trees which flowers early in the rainy season be pruned immediately after flowering. This way, vigorous flowering in the following season is assured. Fruiting shrubs and trees be lightly pruned after fruiting e.g., Bixa orellana or Dye plant.
- Shrubs and trees flowering from June-October be pruned in the dry season.
- Severe pruning must be done before growing season starts in April.
- Improperly pruned hedge is wider at the top than bottom; creates leggy and thin bottom. Proper pruning is a narrow top and wide base, which actually gives the right screening effect.
- Best pruning is that which follows the natural growth shape of plants. Save for hedges, screens and accents, plants should be allowed to develop as in nature. 'Haircut' approach results in growth in external parts and leggy interior. All branches should not be reduced to same length.
- These techniques apply equally to both deciduous and evergreen shrubs and trees; evergreens be pruned annually by reducing new growth by half or more.
- Needle leaf or narrow leaf evergreens such as pines have few dormant buds beneath the bark of old wood. Pruning should remove overgrowth and ensure 30% foliage is left on the plant; else they will die.
- Large shade trees require little pruning such as limb removal from utility lines. Topping of mature trees is an undesirable rejuvenation practice. Results in death or permanent deformity in shape. Pruning large

trees require use of equipment such as ladder, bucket lifts. Pruning of large limbs should employ the double-cut technique to avoid splintering (see sketch). Commercial tree wound dressing should be applied to the wounds over 25mm in diameter.

Appendix B: Suggestions on procurement of landscape materials & equipment.

(a) **Paving materials**: Landscape materials include gravel, quarry dust, pre-cut stones, brick pavers, concrete pavers, insitu concrete, asphalt, bitumen and palm kernel shells. Most of these materials are available locally.

Quarry gravel and dust are readily available from suppliers in town or directly from Abeokuta. Recent estimates put a cost of $30m^3$ of 10-25mm quarry gravel at between ₦1,200 – ₦1,500.00 delivered in Lagos. River gravel (brown gravel) is also available in town. Precut stones are available from Abeokuta. However, modular stone pavers are not yet commonly available in the country; if they are, they invariably will be at a great cost.

Brick pavers are obtainable from Clay Industries at Oregun. A few asphalt and bitumen plants are available in Lagos such as the Berger plant near Alausa. While initial cost is quite high, asphalt pavements are durable if properly executed.

(b) **Plant materials and supplies**: Roadside plant nurseries have become common features in Lagos streets in recent years. Many of these stock a variety of container grown shrubs and trees. Prices of shrubs and trees may range from ₦20.00 to ₦100.00.

- Use of matched results in unsightly pruning, leaving ugly scars on the plant.

Prices for exotic trees may however, range from ₦200.00 upwards depending on the size and popularity. Grasses are priced in 50kg bags and can cost from ₦30.00 – ₦100.00 per bag.

A few organized nurseries run by horticulturists exist in town and stock even more varieties of plants. Lamentably, there are not yet general standards for nursery stock as is the practice elsewhere.

On the whole, it is generally prudent for establishments with large grounds to develop and in-house plant nursery and to supplement with purchases when possible. The long-term benefits cannot be over-emphasized.

Composted manure should be done in-house while fertilizer can be purchased easily.

(c) **Equipment:** Irrigation equipment are rather expensive but can be procured in the market or hardware stores like Dizengoff and SCOA Equip. Mowing equipment are likewise available at astronomical prices. Gardening tools can easily be procured in the market or department stores like CFAO, SCOA and Bertola Machine Tools Company.