

Grounds maintenance —

**Part 1: Recommendations for
establishing and managing grounds
maintenance organizations and for
design considerations related to
maintenance**

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Committees responsible for this British Standard

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- Anglian Water plc
- Association of County Councils
- Association of Playing Fields and Landscape Managers
- British Association of Landscape Industries
- British Waterways Board
- Commonwealth War Graves Commission
- Countryside Commission for Scotland
- Department of the Environment (Property Services Agency)
- Department of Transport
- Electricity Supply Industry in England and Wales
- Inner London Education Authority
- Institute of Groundsmanship
- Institute of Leisure and Amenity Management
- Institution of Water and Environmental Management
- National Farmers' Union
- Sports Turf Research Institute
- Water Services Association of England and Wales

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Foreword

This Part of BS 7370 has been prepared under the direction of the Environment and Pollution Standards Policy Committee.

BS 7370 has been prepared in order to provide those responsible for the upkeep of land that has a recreational or amenity use, or a functional purpose that is not solely for agriculture, commercial horticulture or forestry, fish-farming, land drainage, water supply or navigation, with a series of recommendations for the various aspects of maintenance.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people, for whose guidance it has been prepared.

This Part of BS 7370 gives general recommendations for establishing and managing grounds maintenance organizations of various sizes, and also guidance on design considerations that lead to reasonable technical and cost parameters in subsequent maintenance. Detailed recommendations for the maintenance of hard landscape, amenity and functional turf (other than sports turf), soft landscape (excluding turf) and water areas will be given in Parts 2 to 5 of BS 7370, respectively. BS 7370 will comprise the following Parts:

- *Part 1: Recommendations for establishing and managing grounds maintenance organizations and for design considerations related to maintenance;*
- *Part 2: Maintenance of hard areas¹⁾;*
- *Part 3: Recommendations for maintenance of amenity and functional turf (other than sports turf);*
- *Part 4: Maintenance of soft landscape (other than amenity turf)¹⁾;*
- *Part 5: Maintenance of water areas¹⁾.*

Further Parts may be prepared, as necessary.

NOTE The numbers given in square brackets throughout the text relate to the bibliographic references given in E.1.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 56, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ In preparation.

Section 1. General

0 Introduction

This Part of BS 7370 sets out the choices open to those responsible for managing a grounds maintenance organization in terms of use of land, planning objectives and priorities, staff resources, the range of tasks involved and costs.

1 Scope

This Part of BS 7370 gives general recommendations for establishing and managing grounds maintenance organizations that are suitable for undertaking tasks of varying size and complexity. It also gives guidance on design considerations that lead to reasonable technical and cost parameters in subsequent maintenance.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 7370, the following definitions apply.

2.1

grounds maintenance

upkeep of land that has a recreational or amenity use, or a functional purpose that is not solely for agriculture, commercial horticulture or forestry, fish-farming, land drainage, water supply or navigation

2.2

hazard

barrier or impediment intended as a means of controlling the users of an area

2.3

hard areas

all forms of surface that are composed of mineral materials of rigid, flexible or unit construction

2.4

boxed off

removal of grass clippings in the mower box

3 Basic considerations

3.1 User needs

Grounds maintenance should not only be concerned with routine maintenance of existing facilities. It also involves the continuing development of an estate, and the adaptation of techniques and resource use to meet the changing demands of the users. Recognition of the dynamic nature of the task is an essential part of good management practice.

Major factors which should determine the type and size of the grounds maintenance organization to be established are those of client/user needs, priorities and cost limitations. The type and scale of facilities required by some users is relatively easily established. A school, for instance, will require an optimum number of sports pitches of various kinds.

Operational areas such as airfields will have maintenance requirements specific to their function. The height to which grass may be allowed to grow may, for example, be restricted on some areas so that electronic flight-safety equipment can operate efficiently. On other areas, the grass will be grown to a different height as a deterrent to birds, as a flight-safety measure. Users of public gardens in major cities and coastal towns may expect to see attractive displays of colour in the summer. The cost of providing these is high and the extent of their provision will, therefore, need to be balanced, in relation to their value in attracting visitors, against other recreational facilities which have to be provided within defined cost limits.

3.2 Quality control

The importance of ensuring a high quality of work under whatever scheme of maintenance is used cannot be overemphasized. The criteria set out in this standard will help to ensure that the factors needed to achieve this high quality are available to landscape managers and others concerned with the control of parks and open spaces.

3.3 Multiple use

Increases in leisure time have led to demands for many activities to be allowed on land which has traditionally been reserved for a single purpose. Examples are nature and fitness trails, picnic areas in woodlands, fishing and sailing on water storage reservoirs, flying model aircraft on parts of military training areas, and orienteering in National Park Areas.

3.4 Joint use

Joint use of existing facilities such as school playing fields and other publicly owned sports grounds may, because of the shortage of suitable land and high development costs, have to become the rule rather than the exception. Increased use will require more intensive maintenance and will, therefore, involve higher costs. Hire fees to clubs making use of joint user facilities should be set at a level which realistically reflects these increased costs.

3.5 Nature conservation

The primary objective of nature conservation is to ensure that the natural resources of wild flora and fauna, and geological and physiographic features are conserved and, wherever possible, enhanced, so that society may appreciate and benefit from their value to the fullest extent.

The protection of sites specially for their nature interest has resulted in the establishment of a series of National Nature Reserves (NNRs). These are managed in such a way as to provide the maintenance of wildlife or physical features as their primary land use in perpetuity.

Complementing and extending the NNRs, Sites of Special Scientific Interest (SSSIs) add a larger number of areas worthy of protection for their nature conservation importance, including many in urban areas.

The responsibility of managing NNRs, and the identification and notification of SSSIs, rests with the Nature Conservancy Council (NCC). The NCC advises and co-operates with landowners on the management of SSSIs and has power under the Wildlife and Countryside Act 1981 to protect these sites and place constraints on harmful development.

Beyond these very special sites, the wider environment comprises a larger part of the total natural resource than the protected areas, and although more thinly dispersed, it is vital that it is preserved.

There is a need to recognize nature conservation as a land use alongside other activities such as forestry, amenity, recreation and farming.

The grounds maintenance manager has the opportunity to develop the interests of nature conservation on the estate for which he is responsible. The first step is to make contact with the nearest office of the NCC to establish whether or not within his estate there are particularly valuable sites that are already designated. Links may then be established through the NCC with local conservation specialists who will advise on the wildlife resources and valuable physical features that exist on the estate. These should be surveyed, protected and managed sympathetically. The NCC will provide advice on how best to do this.

In addition, on every estate there are always opportunities to create and develop wildlife habitats by consciously changing land use and maintenance techniques. One simple example is to change from an intensive close mown grass management system, including fertilizing and selective weedkilling, to one where the grass is cut and collected once a year, as a hay crop. The reduction in fertility caused by the removal of nutrients by the hay, the cessation of the use of selective weedkillers, and the enablement of wild flowers to set seed will encourage a gradual increase in species diversity. This will attract a wider variety of invertebrates, which will in turn attract a greater range of insect-feeding birds and mammals.

An awareness of the wildlife features of an estate, a positive approach to their management and the development of additional habitats will not only serve an end in itself, but will add to a greater understanding of the environment by the community at large.

3.6 Grass cropping or grazing

Grass cropping or grazing should be considered for large areas of functional grassland as a means of reducing maintenance costs. Where the taking of a crop is compatible with the operational use of an area, and a local demand for the product is identified, hay, silage, or grass drying are worthwhile possibilities.

3.7 Public relations

The involvement of interested parties in the forming of the landscape policy for an estate has been mentioned. Many of the groups who are likely to be consulted will be independent of the grounds maintenance manager's employing organization, e.g. local ratepayers' associations, conservation groups, a range of clubs and societies concerned with recreation, and the general public. They are likely to react quickly to anything which appears to be an intrusion or interference with their interests and rights. Work on trees, however essential, is highly emotive. Damage to a valuable habitat, whether through ignorance or carelessness, quite rightly provokes a reaction from conservationists. In designating particular areas for special uses, publicity should be arranged through articles in the local press, by household circulars and by holding meetings so that as many people as can be reached are informed about development.

On the sites themselves, noticeboards should be erected which explain the land use to the public. In the case of the woodland mentioned in 8.2, noticeboards showing the use of the various sections, e.g. conservation areas, forestry areas, trim trails, exercise walks and bridle ways should be displayed at each car park and at pedestrian and equestrian access points. The trim trails and exercise walks should be clearly marked along their route; areas from which the general public has to be excluded should be fenced off and notices explaining why should be erected at suitable intervals. Such notices might well include a contact telephone number for those who would like further information on the reasons for the need for fencing off and management of the excluded area.

By effective publicity and communications, the interests of specialist groups will be better served, and people generally will be able to have a better understanding of how to use and enjoy the areas to which they have access.

It is good practice to provide a focal point in the organization by appointing one member of the staff to have special responsibility for public relations. This officer should not only have detailed professional knowledge of the estate but should also be given training in public relations techniques so that an effective marketing operation is maintained.

Section 2. Organization and management

4 Organization of a grounds maintenance department

4.1 Introduction

A number of interrelated factors will determine the type of organization that is required. These include the size and complexity of the task, the extent and level of skills required to fulfil that task and, most importantly, the amount of money available.

4.2 Structure of a grounds maintenance organization

4.2.1 Although the recommendations given in this Part of BS 7370 are not intended to deal with sports surfaces, a golf course provides an example that is likely to include a wide range of grounds maintenance tasks which will need a straightforward organization to cope with them.

Administration and control of funds is usually the responsibility of the club secretary or captain, who is accountable to the club committee, and who may have some clerical assistance. The club will employ a number of skilled greenkeepers, with a head greenkeeper in charge, who in turn is answerable to the club secretary/captain.

The greenkeeping staff are employed to undertake the maintenance of the greens, fairways, etc., so that the course is playable for as many days as possible during the year. They will require mechanical equipment of specialist and general kinds as appropriate to the various grades of turf, and a range of materials such as fertilizers and pesticides.

The extent of mechanization will be related to available funds but, with a general shortage of skilled craftsmen, the higher the degree of mechanization the better will be the use of those skills. The nature of the work and the need for it to be carried out while the course is in use will normally mean that directly employed labour (DEL) is the only practicable management solution.

NOTE Directly employed labour (DEL) is also known as direct service organizations (DSO).

The golf course may have a range of other landscape features such as natural woodlands, designed tree and shrub planting, possibly ornamental planting with annuals and bulbs near the club house, lakes, ponds and watercourses, and in many cases dunes, all of which will require managing. Directly employed labour could be employed for these tasks, but many of these tasks, particularly the specialist work such as tree surgery, dredging, hydraseeding, fencing repairs or extension to hard surfaces like car parks, can be carried out by the use of contractors. A consultant golf course architect may also need to be brought in if alterations to the course such as a new irrigation system are contemplated.

4.2.2 The management of the golf course example described in **4.2.1** illustrates most of the factors which to a greater or lesser degree require basic decisions when deciding the structure of a grounds maintenance organization.

These factors are summarized as follows.

- a) What is the level of skill required to achieve the desired standards? Is the task one which requires DEL or can the work be carried out by contract?
- b) To what degree can the task be mechanized?
- c) Are specialist contractors, with equipment and skills not normally available in a DEL force, to be employed for a particular task?
- d) Does the present situation fulfil the needs of the user, or are modifications or developments needed?
- e) Can development be met by in-house resources or should a consultant be employed?
- f) Can the task be met within existing fund levels? If not, can more funds be made available, or does the task need to be modified?

All these questions require answers before a grounds maintenance organization is established.

4.2.3 The most important issue is whether the work should be carried out by DEL or by contractor. In making the decision due regard may have to be taken of the Local Government Act 1988. There are always circumstances where a clear choice can be made, particularly with regard to cost effectiveness, between one and the other.

Generally, however, there are reasons why both systems will have their place in achieving the desired result. The staff structure of the organization will depend on whether DEL or contractors are employed to carry out the majority of the work.

4.2.4 A DEL-oriented department of any size will require a professionally qualified officer of long experience as its head. He or she will need subordinate administrative and technical support, including a headquarters planning unit, and a small number of technical officers who deal with day-to-day management and quality control within their sections. They will also have responsibility for maintaining and improving DEL efficiency, including the development of work study, productivity schemes and their implementation.

4.2.5 The organization required to manage grounds maintenance by contract is rather different to that described in 4.2.4. The principal officer should again be professionally qualified and widely experienced in the management of the type of organization concerned, will have overall control of the functions of his or her department, and will be accountable to the appropriate governing body.

4.2.6 In local authority work, with the advent of competitive tendering, many amenity and recreation departments have been divided into client and contract sides. The client side will specify the work required to go to tender. The tender document will be issued to the contract side of the local authority (the former DEL or DSO team) and also to private contractors. After receipt of tenders the client side decides who will be awarded the contract. Subsequently the client side will need to monitor the work very carefully to ensure that it is carried out in accordance with the specification. This could result in the requirement for more high grade supervisory staff than was required under the old system of direct labour management.

4.2.7 The administrative branch will be concerned not so much with internal staff matters as with the detailed organization of contracts. Headquarters technical staff will be required not only to have exceptionally wide technical knowledge and experience, but should also have an in depth understanding of contracts procedures and management.

4.2.8 Executive control of day-to-day work including decisions on work programmes, preparation of works orders, monitoring of quality, measurement of completed work and certifying accounts on completion is normally delegated to more junior but still technically qualified and experienced officers.

4.2.9 The number of technical staff required for executive control of work will be related to the total cost of the work. A precise relationship between staff costs and workload is made difficult by varying technical complexity and therefore a varying need for supervision time between different sites. In general, however, the cost of employing an executive technical officer should be between 3 % and 5 % of the contract workload, the higher figure relating to situations where higher quality work and/or more complex sites are involved.

4.2.10 Whether work is to be carried out by DEL or by contract, it is essential that record drawings of the estate are prepared and kept up to date. These should be to a convenient scale (normally 1/1 250 or 1/500) and should show the maintenance required on every area. This may be done either by using different colours to show different categories, e.g. grass cutting to the various categories described in BS 7370-3, beds containing annual flowers or shrubs, areas of amenity woodland, ditches and water courses, or by using one of the adhesive hatching systems available from drawing office suppliers.

In addition, computer systems are available that will digitally reproduce drawings with overlays that show the maintenance categories.

Ordnance Survey drawings to suitable scales are available for the whole of the UK, and these provide an accurate base from which to start.

4.2.11 For measured term contracts, bills of quantities, the calculation of costs and for working out standard times for DEL management, measurements of all areas to be maintained are necessary. If the maintenance organization is large enough, it may employ specialist quantity surveyors (QSs). Alternatively, the measurements can be calculated from digitized drawings by computer. Managers should consider the degree of error produced by measuring from digitized drawings, and decide whether or not this is acceptable as a cost effective method compared with measurement on the ground.

Measurements are not generally required for contracts let on a single lump sum or lump sum price per occasion basis. Nevertheless, a knowledge of the sizes of areas and therefore the cost of the various operations assists the tenderer to price more accurately, and gives the employing organization sound guidance on whether or not tender prices are fair and reasonable.

5 Organization of directly employed labour

5.1 Small organizations

A small grounds maintenance organization, employing up to eight staff, will not require a direct labour planning and control system of management. Provided that a clear understanding of maintenance priorities, standards and funds available is established between the management and the head of the DEL team, the latter should be made entirely responsible for the efficient running of the day-to-day work of his staff and the management of machinery, transport, supplies and stores.

5.2 Organizations with more than eight staff

5.2.1 The number of DEL staff employed will depend on the range, scale and frequency of the maintenance cycle for each operation forming part of the maintenance task.

The first need, therefore, is to make a detailed schedule of all operations and their frequency. Secondly, measurements of all ground areas (areas of grass, shrub and ground cover, flower beds, woodlands, etc.) and lengths of hedges, ditches, pathways, etc. which are involved in the maintenance task should be made. Scale outline plans may be obtained through Ordnance Survey²⁾ and measurements relating to record drawings may be undertaken by consultant QSs if the maintenance organization is not large enough to justify the employment of an in-house surveyor.

Thirdly, a detailed estimate is needed of the man-hours required to carry out the complete task by the aggregation of the hours required for each individual operation. A basic unit of measurement for each operation is decided upon, e.g. hectare for large grass areas, are (100 m²) for smaller areas of grass and shrub areas, 100 linear metres for hedges, edges of grass, ditches, and work study methods are employed to arrive at a standard time for completing each unit of work.

The formula for estimating the number of hours to complete each operation is, therefore:

$$\frac{\text{total measurement of operation}}{\text{basic unit of measurement}} \times \text{time taken per basic unit}$$

For example, a 100 m run of hornbeam hedge, 1.5 m high, is found by work study to take 20 h to cut on both sides and top including the collection and disposal of arisings. If the total length of hedge is 7 460 m, the time (in h) required is as follows:

$$\frac{7460}{100} \times 20 = 1492$$

Totals for each operation, multiplied by the number of occasions they are carried out each year, are combined to give the man-hours per year required for the whole task.

The number of working weeks a year will vary from one organization to another, but it is generally between 46 and 49. Gross hours of work in each week also vary, but are generally about 40.

Gross hours of work cannot be used directly for estimating staff numbers as deductions have to be made for annual leave, public holidays, allowance for sickness, time taken in travelling from base to site of work and back (probably twice a day), machine maintenance and/or collection of tools and materials from store, a daily allowance to attend to personal needs, allowances for time lost due to breakdowns and bad weather, and for unforeseen unmeasured work. The deducted time will vary with the circumstances such as distance from site to base, but on average it amounts to 30 % to 35 % of gross time. Time available for work is the reciprocal and in an 8 h day amounts to between 5 and 5½ h. The available work hours per year are divided into the task hours and the result is the number of staff required.

5.2.2 The maintenance task should be divided into summer and winter work and the number of staff calculated to meet the peak summer requirement of routine work. An efficient DEL manager will organize a programme of essential work during the winter. Variable working weeks could be considered. The programme could include landscape construction on planned development of the estate as well as work which requires only occasional attention at irregular intervals during the winter months. The winter programme will also include work resulting from items noted in preventive maintenance inspections.

The production of schedules of operations and the organization of DEL to carry them out should be the responsibility of an experienced technical officer.

5.2.3 Several DEL planning and control systems exist, one in use by an existing major grounds maintenance organization uses a technical officer as planning manager. The planning manager has overall control of planning the work pattern and will be responsible for work studies that are used to produce standard work times. The DEL foreman is directly responsible to the planning manager for the detailed organization of day-to-day work for DEL gangs. Job times are taken from a manual prepared by the planning manager.

For example, work is planned and organized for a fortnight ahead and the dockets distributed to the chargehands by means of a planning board at the planning office.

²⁾ Ordnance Survey, Romney Road, Maybush, Southampton SO9 4DH.

The planning board is made up of a series of pigeon holes or slots sufficient in number for one for each gang for each day for a fortnight, with two extra slots for each gang for outstanding work and work pending beyond the fortnight. The board is arranged so that the 12 day slots and extra work slots are marked across the top, and the gangs numbered in sequence down the side.

The planning foreman loads each day slot with sufficient dockets for a days work for each gang and the pending slot with extra work should this be needed.

The chargehand (the leader of a gang of workers) collects the day's dockets each morning and returns them to the foreman when his gang has completed the work. Dockets for uncompleted work are placed in the slot provided.

A computerized work planning and scheduling system could be considered.

The foreman records the completion of each task and notes also if the time taken is less than the standard job time as this will affect bonus payments. He keeps close control of the loading of the slots and adjusts the loading each day to suit changing conditions and requirements.

The chargehand is responsible for collecting the job dockets and organizes the gang, machines, materials and transport required to carry out the allocated work. The chargehand is also responsible for the quality and volume of work the gang produces, and for seeing that the dockets are returned to the planning office when the work is completed.

5.2.4 An organization employing DEL will require a section that deals with buying, servicing and storing all transport, machines, tools, protective clothing, fuel, fertilizers, herbicides and all other materials needed for the correct execution of the work.

The whole land area for which there is a grounds maintenance responsibility can be divided into sub-areas. A schedule of operations for each sub-area is prepared and costed by a work study specialist. The schedule includes allowances for the whole range of work from weedkilling to paved areas and kerb bases, grass maintenance, provision and care of bedding plants, care of shrub borders, tree pruning, etc. The schedules of work, costs and the standard completion of times are recorded on a computer, and form the basis of the instructions issued to the gangs.

The maintenance of each sub-area is the responsibility of a single group of workers led by a chargehand. The group has responsibility for carrying out the whole range of tasks set out for their sub-area and should therefore comprise individuals with a range of skills. The standard completion times are issued to the chargehands and, if the group as a whole exceeds the standard performance, bonuses are awarded. If sub-standard performance by an individual is seen to be affecting the group as a whole, his or her record is isolated and individually assessed.

6 Staff training

It is unlikely that DEL staff can be recruited with adequate training. Efficient management of a DEL organization should therefore include staff training. Staff should be given every opportunity of working in different departments so that they may acquire a wide range of practical skills. Time off and help with travelling and buying books should be given to those who wish to acquire technical qualifications of the City and Guilds of the London Institute and the Union of Educational Institutes.

The most able staff should be encouraged and sponsored to take full time courses to qualify through the higher grades of examinations for posts in the technical and professional ranks of grounds maintenance. Such courses are available at a number of horticultural training colleges and, for the highest qualifications, universities.

Responsibility for training should be given to a particular technical officer. Organizations of any size should consider the appointment of a full-time training officer.

7 Organization of work by contract

7.1 General

Work by contract has an important place in grounds maintenance. It is particularly suited to landscape construction, specialist work such as tree surgery, and to routine maintenance work generally.

The grounds maintenance manager should decide whether contract work is appropriate to the tasks to be carried out. If it is, he should decide the proportion of the total, and the particular operations which the contractor will be engaged to carry out.

7.2 Types of grounds maintenance contract

7.2.1 General

Forms of contract have been devised to meet requirements for work of varying degrees of complexity and cost, and the amount of staff time available for direct supervision of quality control by periodic monitoring. Contracts which place the onus on the contractor to perform work to meet defined standards over a period of time with minimum or no supervision, involving a single payment or payment by periodic equal lump sums, have worked well in many instances. Such contracts could, however, attract a degree of risk for both parties for a number of reasons, including differences between the weather from year to year. Managers accountable for funds should decide if the degree of speculation in such circumstances is acceptable, balancing the lower in-house staff levels needed for such contracts against the higher cost in overheads of setting up and running contracts which have closer control of work and funding.

7.2.2 Comprehensive landscape maintenance period contract

A comprehensive landscape maintenance period contract (CLMPC) aims to cover all aspects of landscape maintenance and attempts to anticipate variables such as frequency of mowing, litter collection, etc.

The contract will present to the contractor: full information on sites with plans of the grounds showing landscape elements; a full specification of all works with indicated frequencies of operations; and a full bill of quantities. Estimated quantities based usually on the last 5 years actual work and costs for such variables as landscape response to weather, litter and fly-tipping clearance and pond cleaning, etc. should be included, so that the contractor is reimbursed for any extra expense, when work justifiably departs from historic norms, after measurement and certification. The contract usually covers a period starting at the beginning of a financial year and extends for 3 years to 5 years.

7.2.3 Measured term contract

The measured term contract (MTC) is a form of grounds maintenance contract suitable for some routine work within particular accounting systems. It is suitable where there will be work of a wide scope which is variable in quantity and type, and which therefore needs a more flexible contract.

The measured term contract is based on a detailed estimated value of work to be carried out (the result of historic records usually). The contractor submits a tender based on a percentage figure above or below the scheduled rates for each landscape element or aggregation of elements. Payment is based on measurement of work done, or on certified repeated cycles of premeasured work.

The work within a MTC is likely to be repetitive. Such repetitive work is managed by pre-measuring and pre-pricing the tasks concerned, and preparing standard works orders, which are either issued to the contractor on each occasion that the work is required, or issued as a multiple works order covering the likely number of cycles of repetitive operations for the whole growing season. Each cycle of work is controlled by a regulator sheet, which lists the separate cycles of work. When the superintending officer (SO) requires a cycle of work to begin, the officer calls in the contractor's representative on site and both sign and date the regulator sheet opposite the particular cycle to be started. When each cycle has been completed, the SO signs the work off and the contractor receives an interim payment.

If, at the end of the season, there is a need to make adjustments either because the number of cycles of work ordered differs from that on the original multiple works order, or for other reasons, such as a change in the size of the areas involved, a variation order is issued that adjusts the final payment for the work. Close control of funds is achieved by prescribing limits to the value of individual orders and by maintaining records of orders placed and bills paid.

NOTE Preparatory work for either CLMPCs or MTCs can be onerous. The SO will have to decide which best fits the grounds and the administrative methods and systems used by the employing organization. The CLMPC is favoured over the larger local authorities' MTC as it gives tight control of the work and has a smaller administrative burden. The above categories of contract are not of course exclusive. A CLMPC may include elements of MTC and vice versa.

7.2.4 Lump sum price per occasion contract

For small sites and for those where the development has stabilized and the type and quantity of work is simple in character and is not likely to change from year to year, a simpler form of contract is recommended.

The most satisfactory of these simpler contracts is the lump sum price per occasion type. In these, a schedule of the operations, their required frequencies and total number of occasions per season is provided, and the contractor tendering offers a lump sum price for each operation and its individual execution. Provision is made within the contract for the SO to be able to adjust the number of occasions at his discretion, giving some flexibility to allow for variations between seasons, and other circumstances which could not be foreseen.

Only one order is given to the contractor at the beginning of the contract, and any alterations are negotiated by a variation order. A simple docket is completed by the contractor at the end of each cycle of operations. This is signed by the SO on inspection of the work. The docket and contractor's invoice form the basis of payment. Work not described in the schedule may be undertaken either by negotiation with the contractor or by competitive tender if it is likely to be of substantial value.

7.2.5 Lump sum performance contract

A fourth type of contract used for grounds maintenance is the lump sum performance contract. With this, a specification describing the standards of maintenance for all the elements in the whole task is provided and the contractor offers a lump sum price to perform the work to meet the specified standards. Payments are made monthly. As the bulk of repetitive work is done in the summer, payments from April to September are likely to be twice those for the October to March period, giving a balanced payment system in relation to the contractor's labour and fuel costs and the seasonal volume of work. The lump sum performance type of contract has no built-in mechanism to allow for variations. Extra work may be undertaken at daywork labour rates, or by means of an additional negotiated lump sum price. As they lack flexibility, lump sum performance contracts are not recommended as a complete alternative to more elaborate contracts which can give detailed control, especially in the case of such variables as landscape response to weather, or to sites where there is a need for a substantial amount of one-off work, nor where the site will undergo major change or development during the course of the contract.

To reduce the staff effort and costs, it may nevertheless be worthwhile to introduce a lump sum element based on performance into a MTC, in order to deal with all work of a repetitive type. If the contract is for large areas, a performance-based element may weaken control of costs because of the risk factors mentioned in **7.2.1**

7.2.6 Lump sum specified works contract

For specialist work of low to moderate cost, such as sand slitting or tree surgery, contracts with a period of less than a year are appropriate. Tenders are invited on the basis of a technical specification and schedule of work, accompanied by contract drawings showing the location and extent of the work. Prices submitted are for a lump sum to carry out the specified work. Provision may be made within the contract for extra work to be carried out at pro-rata prices. Such lump sum contracts may be used for carrying out minor landscape construction works, and for work which falls outside the scope of the contracts described in **7.2.2**, **7.2.3** and **7.2.5**.

7.2.7 Contract documents: financial management

The conditions of contract, specification and schedule of work, with bill of quantities where applicable, together comprise the legal basis of the contract. It is recommended that a person who is qualified and competent in matters of contract law prepares or vets the contract documents before tender action, so as to ensure their legal standing and appropriateness.

A check list of components for contract documents for typical grounds maintenance contracts is given in Appendix A. Detailed advice on contract documents can be found in *Competitive tendering. Maintenance of grounds and open spaces — a guide to tender and contract documents* by the Institute of Leisure and Amenity Management (ILAM) [1].

A MTC is intended to be in operation for a period of years. Capital costs in setting up a contract are now such that the minimum term recommended is 3 years; a 5 year term may attract lower tenders because of the assurance of a longer continuity of work. Open ended contracts are not recommended. Accountability demands that periodic competitive tenders should be sought in the interests of seeing that value for money is obtained.

The rate of inflation may significantly affect the cost of labour, machines, materials and fuel during the course of a contract. It is usual for a contract to be at fixed rate for the first year and for a price adjustment system to be introduced for the remainder of the term. This involves the adjustment of contract rates on each anniversary of the contract start date. Calculation of the adjustment should be by reference to an agreed formula. PSA Services publishes a monthly Addendum based on its schedule of rates (see [2]), adjusted for cost of living each month.

Management of MTCs involves technical and professional staff, the cost of whom can only be justified if the work will be of substantial value. Individual contracts normally fall within the range of £30 000 to £300 000 a year (see also 4.2.6).

7.2.8 Contract and tender vetting

Almost all types of contract are arranged on the basis of competitive tenders. An essential requirement for this is to have a list of bona fide contractors who can be invited to offer tenders. Considerable care is needed selecting these contractors. Their suitability to undertake work to the estimated value of the contract should be established in terms of their financial soundness, adequacy of resources in machinery and equipment, management competence, skill of staff, and experience in the type of work. References should be sought and taken up, annual reports examined and a technical vetting of the resources and contracts completed should be carried out.

A fairly elaborate document may be prepared on behalf of the employer (the tenderer appraisal questionnaire) in which tenderers are required to provide full financial details of the company and its associates and proof of technical and financial soundness and of equivalent work successfully carried out by them.

7.2.9 Contract supervision

The day-to-day management of grounds maintenance contracts is normally best carried out by trained professional grounds maintenance officers (GMOs). It is their responsibility to decide on the programme of work that needs to be carried out by the contractor, and to see that the appropriate works orders are prepared and issued, allowing adequate prior notice to enable the contractor to marshal the resources needed. The GMOs supervise the work and authorize payment of contractor's bills when the work is satisfactorily completed.

The contractor should normally be represented on site by a foreman, who reports to the GMO each morning to receive instructions and discuss any problems. At a higher management level, contractors normally employ agents, who are responsible for a number of contracts and for organizing resources.

The GMO should arrange liaison meetings with the agent at intervals of not more than a month, to discuss future programmes of work and any problems that have arisen, and to look in detail at the bills currently being submitted for payment. Attendance at the liaison meetings by the employing organization's finance officer and quantity surveyor is advisable.

7.2.10 Typical staffing needs for DEL and for work undertaken by contract

Figure 1 and Figure 2 set out typical grounds maintenance staffing needs for medium to large sized organizations, dealing with work predominantly with DEL for the former, and predominantly by contract for the latter.

In Figure 1 the solid lines represent line management links back to the chief officer. Each of the two senior technical officers and the administrative officer are line managers for their sections and are directly responsible in turn to the chief officer for the work of their sections. Each section, nevertheless, has links which cross the line management function; the administration section will provide services to the other two sections in respect of finance, welfare and typing services, and senior technical officer (STO) I who has charge of training, drawing office, etc. will provide such services to senior technical officer II.

At a lower level, all chargehands in STO II section will require service from transport, stores and nursery during their day-to-day activities. In Figure 1, links crossing the line management function are represented by broken lines.

8 Management plans and objectives

8.1 General

The natural landscape is dynamic and ever changing. In temperate zones, the classical ecosystem for plants begins with colonization by annual herbs and grasses. These are replaced by perennial grasses and herbaceous species. When these have become well established, low growing shrubs start to develop among the grass and, as they extend their colonization to become dominant, seedling trees appear and are followed by larger forest trees that are the climax vegetation. As forest species develop they form a canopy that shades out the majority of the shrubby and herbaceous growth, until they themselves go into decline and collapse. The gaps this leaves in forests are unshaded and the ecological cycle is able to start again from the beginning. Development of such an ecosystem is never straight forward, however, and is affected by a range of other influences such as seasonal variations in weather, latitude, altitude, gradual subtle changes in climate, and the effects of grazing.

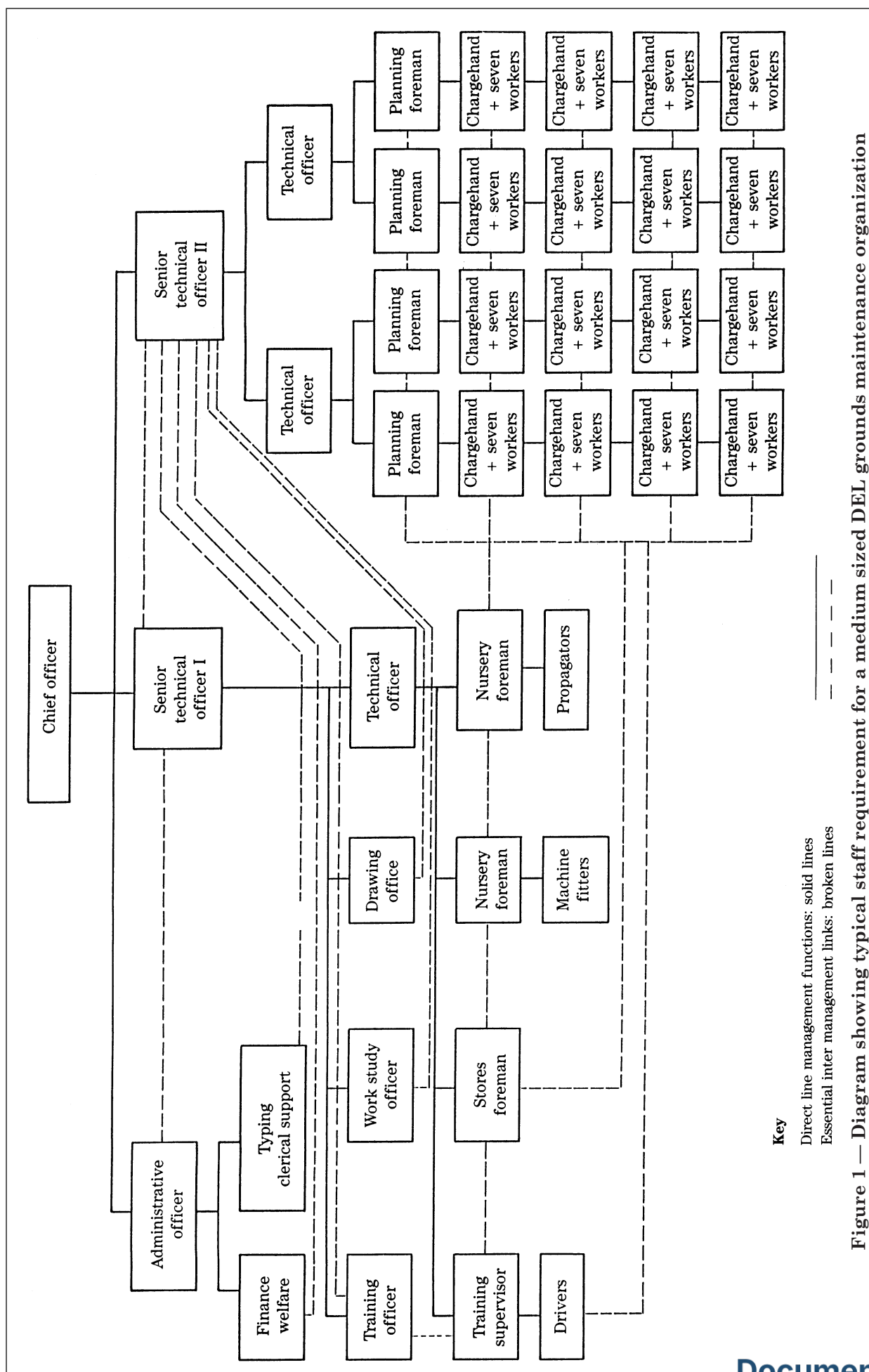


Figure 1 — Diagram showing typical staff requirement for a medium sized DEL grounds maintenance organization

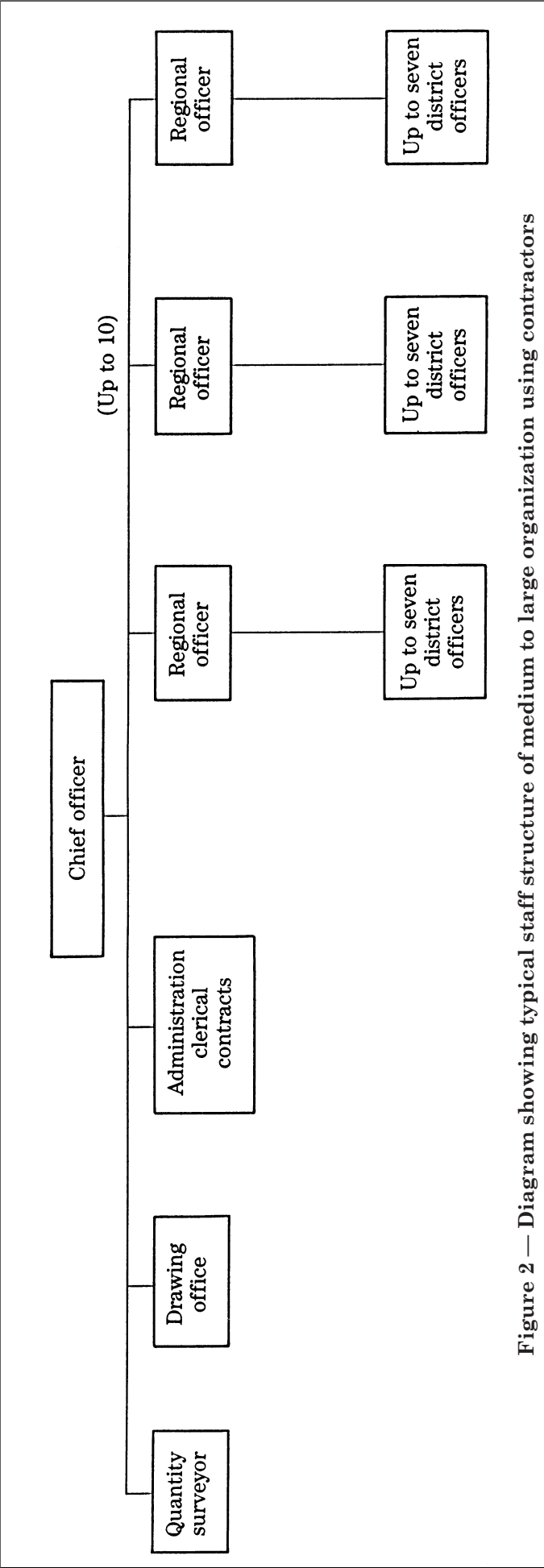


Figure 2 — Diagram showing typical staff structure of medium to large organization using contractors

Man has seen a need to interrupt the natural sequence of landscape ecology, principally for the following reasons:

- a) to clear and drain land for farming;
- b) to provide for his other needs, e.g. felling forest trees to provide fuel and building materials, and replanting with other species that provide a quicker renewal of resource;
- c) to provide himself with an artificially contrived landscape that is aesthetically pleasing, and which may also offer opportunities for recreation and amenity interest.

Cutting grass frequently to provide a smooth attractively striped lawn is, as an example, an act which consciously or otherwise, has the effect of arresting the development of the natural ecosystem at a particular stage. If such an area ceases to be maintained, it is not long before seedling trees develop among the coarsened grass and brambles.

8.2 Responsibilities of the grounds maintenance manager

The task of the grounds maintenance manager is to control the natural and/or contrived landscape in his care to ensure that the development of every facet is appropriate to meet its perceived use.

To ensure that the estate is developed in this way it will be necessary to set long term and short term objectives based on a clear land use policy. To establish such a policy will require liaison with all those who have an interest in the development, in order to ensure that a balance of these interests is achieved. For example, an area of mixed deciduous woodland on the outskirts of a town might be seen by a conservation group as a potential nature reserve, from which the public should be excluded, and in which management should be wholly in the interests of wildlife. A forester might see the potential for timber production and coppicing. Recreation officers might see the opportunity for establishing trim trails and for picnic areas. Local people might wish to be able to exercise themselves and their dogs, and would, in such instances, expect paths to be kept open. Reconciling all these interests and producing a long term policy is clearly essential.

Once the policy is established, management objectives and plans to meet these should be drawn up and it is the manager's responsibility to see that they are achieved. This will mean regular and systematic reviews of progress and continuous liaison with those who have an interest.

8.3 Management plans

Short term management plans can be developed as a logical extension of the work study exercise carried out to programme the numbers and workloads of DEL and contractors. Detailed schedules of work week by week for all maintenance tasks throughout the year should be prepared, not only for normal routine work, but also for such things as the selective thinning of trees in shelter belts, removing and replacing shrubs that are overgrown, silt removal from lakes and watercourses, renewal of litter bins, etc.

Records should be kept of these operations, and of any particular incidents such as the death of trees or hedgerows affected by diseases such as honey fungus (*Armillariella* spp.).

The tree population of the estate should be surveyed and records established, preferably on computer. Management plans should be drawn up, both short term for the more urgent work and long term with development and replacement strategy built in.

It is also necessary to prepare management plans for new landscape schemes. Designers should be required to discuss their proposals with grounds maintenance managers from preliminary sketch plan stage in order to establish the implications for future maintenance. It is only by such liaison that the design intentions will be realized.

It is also important that design proposals are costed for maintenance for a period of at least 10 years after completion, and that both these costs and the technical development objectives are included in management plans.

In a section dealing with management plans it should be finally emphasized that landscape maintenance is not a matter of precise routine. So many external factors can affect the way work is dealt with, e.g. malicious damage, freak weather, abnormal variations in seasons. A degree of flexibility is, therefore, a prerequisite of good management planning.

9 Preventive maintenance

9.1 General

Preventive maintenance is an essential part of good landscape management. The following are simple examples of situations where preventive maintenance is needed. Renewal and adjustment of stakes and ties for young trees, if done in good time, will prevent serious damage or loss. Repair of damage to play equipment, dealt with promptly, will help to avoid injury to children using it. Damage to a wooden balustrade of a bridge weakens the structure and renders it liable to further misuse: unless quickly repaired it could be both dangerous and costly to put right.

9.2 Minor repairs

In many cases it is possible to cope with minor repairs quickly by having the materials such as tree ties and stakes among the equipment carried by a mobile gang. Where an immediate repair is not possible, the damage should be reported and a simple system arranged for ensuring that the report is followed up by the necessary action. In cases where there is a risk of injury to persons or damage to property, immediate action should be taken to exclude them from the area and warning notices should be erected.

9.3 Systematic inspections

Beyond the "on the spot" action on a day-to-day basis, there is a need to carry out systematic inspection of the estate, to note damage and defects and to ensure that these are dealt with in an order of priority. Such inspections are also preventive in that they contribute to the lifespan of landscape features and reduce maintenance costs. They also, of course, lessen the likelihood of injury to workpeople and the public at large.

To meet obligations and liabilities in common law or under statute all landscape features on the estate should be inspected at regular intervals. In most cases this is likely to be once a year. In particular circumstances because of the possible danger to the public the period should be less. Managers are, in general, required to take all reasonable steps to ensure the health and safety of workpeople and of the public at large. Legal advice should be sought if there is any doubt about the proposed intervals between inspections.

The person carrying out the inspections should be an experienced technical officer. Preferably, he should carry with him a checklist of possible defects as an aide memoire. Defects observed should be noted on an inspection record sheet which should be carefully preserved, and an order of priority should be established for the necessary work to be carried out. Responsibility for the processing of the work should be that of one technical officer who should co-ordinate such activities, and who should ensure that adequate records are maintained.

If the organization is of sufficient size that several technical staff are employed, each with responsibility for a particular section of the estate, there is much to be said for arranging for the inspections to be carried out by officers from another section. A fresh eye often sees things that pass the notice of those used to an area.

A typical checklist for the soft landscape features of an estate is given in Appendix B. Similar checklists should be drawn up for the other features of the estate, e.g. a supplementary checklist for inspection of trees is given in Appendix C.

10 Maintenance costs

10.1 General

Establishing an accurate order of costs for a grounds maintenance organization will require a detailed assessment of the whole range of tasks to be carried out, and of the resources needed to complete them, in terms of manpower, machines, materials, supervision, clerical and administrative support and accommodation.

To assess the range of tasks a schedule of every aspect of the maintenance work for the whole estate should be drawn up. This should include both the repetitive items which are carried out during each year, and those which are necessary from time to time but at longer intervals, such as silt removal from ornamental lakes.

10.2 Categories of maintenance and frequencies of operations

Categories of maintenance should be established for all areas, and frequencies of operations should be related to these. Examples of categories of maintenance are as follows:

- a) very high quality ornamental lawns which should be cut at approximately half weekly intervals, and arisings removed;
- b) grass areas on housing estates which should be cut at intervals of about 10 days, and arisings not collected;
- c) grass managed for nature conservation which should be cut once a year, arisings baled and removed;

- d) high quality formal hedges which should be trimmed four times a year at monthly intervals, and arisings removed;
- e) average standard privet hedges which should be trimmed twice at intervals of about 12 weeks during the growing season, and arisings removed;
- f) areas of shrubberies and ground cover planting which will need to be pruned and cultivated on a seasonal basis;
- g) trees, whether planted as specimens in lawns or in groups among shrubs or in larger forest type plantations, need attention to staking, tying and irrigation in the initial stages and subsequently to cultivation and pruning on a regular basis;
- h) water areas will need to be cleaned annually and undesirable growth removed.

10.3 Occasions per year for tasks and calculation of man-hours

Once categories and frequencies are established the number of occasions a year for each task should be calculated. This will vary as the length of the growing season will be different in various parts of the UK because of the influences of climate and latitude. Figure 3 illustrates the number of days a year when grass is actively growing in different areas of the UK. Differences in the length of growing season can result in variations of as much as 35 % in the number of occasions work has to be carried out to achieve comparable standards. Allowances for regional variations should be made when calculating costs. A contingency allowance should also be included to cater for variations in the length of the growing season and the effect of shelter/exposure between one year and another. A wet summer and mild autumn could extend the normal growing season by 4 weeks to 5 weeks in the midlands and eastern counties. Having established categories, frequencies and numbers of occasions a year for each task, calculation should be carried out by work study methods to estimate the number of man-hours per year that each will take.

Multiplication of the man-hours needed by the current hourly rates will give a sound base for calculated labour costs. To this, however, should be added predicted extra costs for additional pay for working overtime in unsocial hours, bonus payments, loss of time in travelling between base and out-stationed sites, holiday and sickness pay, and cost of training.

Reference should be made to 5.2.1 where an example of a method of assessing numbers of working staff from man-hour calculations is given.

10.4 Machinery costs

Capital costs in purchasing machines for a grounds maintenance organization are relatively high. For most organizations the largest cost commitment will be for grass cutting and maintenance machinery, but purchase of other machines such as chain saws, small mechanical trucks, and transport for the movement of staff will all help to make the best use of labour and will contribute to the overall cost effectiveness and efficiency of the organization.

Allowance should also be made for the cost of depreciation, repairs and spare parts, fuel and lubricants. The cost of spare parts and their reputation for reliability and long life should be part of an assessment made of various makes of machinery before deciding on initial purchase.

10.5 Materials and costs

All grounds maintenance work will require the provision of materials which will include the following:

- a) pesticides including herbicides, fungicides, insecticides and rodenticides;
- b) fertilizers, for use at different times of year on many turf areas, shrub beds, flower beds and trees;
- c) top dressing materials such as:
 - 1) sterilized screened topsoil for fine turf;
 - 2) bulk topsoil for general use;
 - 3) washed sand in various grades including lime-free;
 - 4) specialist mineral dressings for hard porous water-bound areas;
 - 5) gravel and hoggins for repair of paths, car parks, etc.;
 - 6) processed tree bark;
- d) grass seeds in a range of mixtures for specific uses;
- e) seeds of annual flowers;
- f) bulbs and corms;
- g) hardy nursery stock including trees and shrubs and herbaceous plants;
- h) compost for sowing seeds and potting, pots and seed trays, pot cleaning machines, etc.;
- i) tree stakes, tree ties, nails, multistrand cable, turnbuckles, tree guards and tubes;
- j) bamboo canes, soft garden twine, rolls of nylon mesh netting;