

Guide to

Building maintenance management

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Foreword

This British Standard guide has been prepared under the direction of the Basic Data and Performance Criteria for Civil Engineering and Building Structures Standards Committee from guidance documents provided by members of the subcommittee to which the drafting of the standard was entrusted.

The guide has been written primarily for people having suitable qualifications and experience in building maintenance, but it should also be of considerable assistance to building owners or occupiers who have an active interest in the well-being of their premises.

It may at first sight be thought that this guide is applicable only to large organizations or to complex buildings. However, if read fully and carefully it will be seen that much of the information is relevant to all types of building from domestic premises to hospitals or large commercial buildings. To have divided the document to cope with the differing types of building would have involved an unacceptable level of duplication. It is therefore hoped that all who are likely to be affected by the maintenance of buildings and their engineering services will find this guide useful.

Health and safety is an important aspect of building maintenance. The recommendations mention a number of appropriate references, but the statutory requirements are extensive and it is not possible to cover them fully in every detail. It is assumed that those responsible have a knowledge of all the relevant Acts, and in particular the Health and Safety at Work etc., Act 1974.

Appendix A has, with the approval of the Royal Institute of British Architects, been based upon the CI/SfB System.

In addition to a list of publications referred to in this guide, given at the end, a separate bibliography is included as Appendix H.

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 to iv, pages 1 to 48, 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.

Section 1. General

1.0 Introduction

1.0.1 A building is an asset which needs to be maintained to ensure that its value is not eroded. This is all too often ignored with unfortunate economic consequences including a subsequent greater expenditure on the maintenance of the building and its engineering services. This may be because there is sometimes a failure by building owners to appreciate that buildings are an asset, and by occupiers to realize that buildings are a resource, and that these assets and resources need to be protected just as any other form of asset or resource does. In such cases there is consequently a lack of recognition regarding the full effects of a failure to maintain buildings and their services adequately, and of the resulting effects on the value and function of assets. This is somewhat surprising as large amounts of money are often spent in protecting the value of other forms of asset and production resources are usually well maintained.

1.0.2 Lack of maintenance may in part arise from a feeling that buildings are long lived assets which deteriorate only gradually. In fact this is true only of the more robust forms of structure and even these can deteriorate rapidly with the ingress of moisture. Fittings, external decorations and engineering services usually have very much shorter lives than building structures. Therefore a failure to maintain buildings may affect their functioning in addition to reducing their value.

1.0.3 There is a further important reason why buildings and their engineering services should be maintained. It is to ensure the health and safety of persons in and around buildings coupled with the need to discharge the responsibilities that are conferred by building ownership. There are basic statutory requirements that buildings should be kept safe for their occupants and for those who pass or visit buildings. There are other statutory requirements regarding health and safety particularly in respect of cleaning, fire and the safety of pressure vessels, boilers, lifts and hoists. In addition there may be further legal requirements regarding maintenance such as conditions in leases, etc.

1.0.4 The maintenance characteristics of buildings are a result of the original design process. In addition inefficient designs, bad specifications and poor workmanship can result in faults which are subsequently often difficult and usually expensive to diagnose and remedy.

1.0.5 Those responsible for managing the maintenance of buildings and their engineering services need to have both management ability and technical expertise. There is evidence which suggests that in the past large amounts of money have been wasted by inappropriate maintenance and repairs. Where this expertise is not available in the owner's or user's organization it is important that appropriate consultants are employed.

1.0.6 Domestic cleaning of buildings is often not the responsibility of maintenance management and guidance on cleaning is therefore not covered by this standard.

However poor cleaning or the use of inappropriate cleaning methods or materials can have a significant adverse effect on the life of buildings and their services. Consequently it is important that maintenance managers cooperate closely with those responsible for cleaning and that owners and users are aware of this requirement. Further detailed guidance on cleaning is available in BS 6720¹⁾.

1.1 Scope

1.1.1 General

This British Standard provides guidance on a systematic approach to the management of building maintenance in the UK. It:

- a) stresses the advantages of economy and convenience which may result from the regular and planned maintenance of a building and its services;
- b) provides a check list of types of construction and many of the materials and components commonly encountered in the UK;
- c) considers the bearing that the external and internal environments and the type and intensity of use will have on the frequency of inspection and maintenance;
- d) stresses the importance of up-to-date building fabric records and engineering services records and makes recommendations as to their content, preparation and use in respect of maintenance;
- e) considers the advantages of maintenance guides for individual buildings;
- f) makes recommendations as to the frequency of types of inspection, the reporting on these inspections, the planning of the necessary maintenance work and the making of arrangements for the carrying out of such work;
- g) draws attention to the need for safe access for both inspection and subsequent work;

¹⁾ In preparation

- h) discusses health and safety requirements applicable to inspection and maintenance work.

1.1.2 Exclusions

This guide does not cover the following:

- a) domestic and frequent routine cleaning;
- b) detailed guidance as to how various types of maintenance work should be carried out, for which reference should be made to the appropriate British Standard publication covering the product, component or type of work involved;
- c) improvements, additions or alterations of a building to make it suitable for a purpose other than that for which it was designed; however, it may be noted that it is frequently necessary and economically desirable to carry out maintenance at the same time as such work;
- d) maintenance of civil engineering structures.

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

1.2 Definitions

For the purposes of this British Standard, the definitions given in BS 3811 apply together with the following.

1.2.1

breakdown maintenance

operation of restoring an item to fulfil its original function after a failure in its performance

1.2.2

building fabric

elements and components of a building other than furniture and services

1.2.3

building maintenance

work, other than daily and routine cleaning, necessary to maintain the performance of the building fabric and its services

1.2.4

building scientist

person with knowledge and experience in the field of the behaviour and performance of buildings and their components under the influence of physical, chemical and biological phenomena

1.2.5

client

person responsible for the running and maintenance of a building, who may or may not be the legal owner or the legal owner's agent or representative. The client will be the person to whom a professional adviser will report, and who will be able to order maintenance works to be carried out

1.2.6

competent person

person having sufficient professional or technical training, knowledge and experience to enable him or her:

- a) to carry out allotted duties at the level of responsibility laid down;
- b) to understand fully any potential hazards when carrying out those duties.

1.2.7

confined space

space which may be inadequately ventilated for any reason, and may result in a deficiency of oxygen, or a build-up of toxic gases, e.g. closed tanks, sewers, ducts, closed and unventilated rooms, and open-topped tanks, particularly where heavier than air gases or vapours may be present

1.2.8

inspector

person carrying out an inspection or examination of the area or item concerned, and reporting on its condition

1.2.9

owner

person or body having a legal interest in a building. This includes freeholders, leaseholders or those holding a sub-lease which both bestows a legal right to occupation and gives rise to liabilities in respect of safety or building condition

1.2.10

planned maintenance

maintenance organized and carried out with forethought, control and the use of records, to a predetermined plan based on the results of previous condition surveys

1.2.11

remedial work

redesign and work necessary to restore the integrity of a construction to a standard that will allow the construction to perform its original function

1.2.12**repair**

restoration of an item to an acceptable condition by the renewal, replacement or mending of worn, damaged or decayed parts

1.2.13**residual life**

period of time during which a building or component may reasonably be expected to continue to fulfil its present function provided it is given normal routine maintenance

Section 2. Owners

2.1 General

It will be very much in the interests of building owners that they should take part positively in the maintenance of their buildings. A failure on the part of a building owner to recognize the need for building maintenance or to participate in the decisions discussed below may significantly increase the risk of financial loss and may have very real economic implications. Attention is drawn to the definition of “owner” in 1.2.9.

2.2 The value of buildings to an owner

Buildings may be included in a property portfolio from which a financial return is required. In such cases the buildings are a capital asset and may be shown as such in a balance sheet. Like all other assets the capital value of such buildings needs to be protected against depreciation. Buildings may also be a resource in that they may be used in production of a product whether that be manufactured, a commercial service, a health service or education. As such they are as much a resource as manpower or money and they need to be protected against any loss caused by the lack of that resource.

A building can lose value as an asset or a resource as a result of:

- a) a reduction of the capital value of the building due to deterioration;
- b) a loss of income arising from lost rent or lost production as a result of facilities ceasing to be available through lack of maintenance;
- c) a loss of a service being supplied by a building such as health care.

2.3 Maintenance finance

2.3.1 The planning and control of finance is an important aspect of maintenance management not only for the control of maintenance but also to demonstrate that the owners are getting value for money and that the maintenance proposals justify the funds requested.

2.3.2 Financial considerations start with the development of maintenance programmes and the preparation of budget proposals. This can include repair/replace decisions, the optimization of programmed planned maintenance and life cycle costing. It is important that budget proposals are presented to management in a way which will identify the cost benefits which will accrue from the funds required.

2.3.3 Financial considerations continue with the preparation of the detailed maintenance programme following the allocation of budget funds. These will involve decisions regarding optimum repair reaction times and the choice of the most appropriate method of execution (directly employed labour or contract and the best type of contract). This will lead to the need for budgetary control during the course of the financial year.

2.3.4 During the following financial year a technical audit should be carried out to ascertain the extent to which value for money was obtained from the funds expended in the previous year and what improvements in management might be made to improve cost benefits.

2.3.5 It will be obvious from 2.3.1 to 2.3.4 that the owners or their executive management need to be directly concerned with many of the aspects of maintenance finance described, particularly those aspects which will have a direct impact on the owner's primary activities.

2.4 Statutory or legal liabilities

Owners also need to prevent any breach of their statutory or legal liabilities. Such a breach can have serious and costly consequences, especially where it involves safety, and may result in prosecutions through the criminal or civil courts. It may also apply to other legal situations such as the imposition of major dilapidations when a lease terminates.

2.5 Specific items with which owners should be concerned

To minimize the consequences described in 2.2 and 2.4 an owner should be directly concerned with:

- a) the policy for maintenance;
- b) the programme for maintenance works;
- c) the programme and methods of cleaning.

2.6 Maintenance policies

A maintenance policy should ensure that value for money expended is obtained, in addition to protecting both the asset value and the resource value of the buildings concerned and the owner against breaches of statutory and legal obligations. The policy should therefore cover such items as:

- a) the owner's anticipated future requirement for the building taking account of the building's physical performance and its functional suitability. This may lead to decisions regarding:
 - 1) the present use of the building anticipating any likely upgradings and their effect on the life cycles of existing components or engineering services;

- 2) a change of use for the building and the effect of any conversion work on the life cycles of existing components or engineering services;
- 3) the anticipated date of demolition or other disposal;
- b) statutory and other legal conditions affecting maintenance requirements;
- c) any cycles of maintenance work determined in accordance with **2.6 a)** and **2.6 b)**;
- d) the standard of maintenance taking account of the life cycles discussed in **2.6 c)** together with the requirements of the owner in respect of the use of the building and any special standards to which this may give rise.

2.7 Maintenance work programmes

The programming of maintenance work can affect an owner or his activities in the following ways:

- a) maintenance work should be carried out at such times as are likely to minimize any adverse effect on output or function;
- b) programmes should be planned to obviate so far as possible any abortive work. This may arise if upgrading or conversion work is carried out after maintenance work has been completed or if work such as rewiring is carried out after redecoration;
- c) any delay in rectifying a defect should be kept to a minimum only if such delay is likely to affect output or function. The cost of maintenance increases with shortening response times;
- d) maintenance work, completed or being carried out, should comply with all statutory and other legal requirements.

NOTE The planning of maintenance work is considered in more detail in **3.5**. See also **3.8.10**.

2.8 Access equipment

Permanent access equipment provided for routine cleaning can be used for appropriate maintenance and may greatly reduce access costs. See also **3.6** and Appendix C.

Section 3. General guidance

3.1 Materials, components and elements of construction

3.1.1 General

Appendix A of this guide sets out types of construction and some of the materials and components likely to be encountered on buildings and their external works in the UK.

The principal object of the appendix is to provide a check list for use when either drawing up record information or preparing inspection schedules for buildings. However, no such list is likely to be entirely comprehensive or, if it is, to remain so indefinitely and, for this reason, vigilance is necessary. When drawing up inspection schedules, consideration should be given to the likely maintenance cycle of each element, in accordance with the known quality of the materials and components employed and their manufacturers' recommendations, when available.

The appendix uses italic type text, within parentheses, to draw attention to likely causes of failure which should be borne in mind when inspections of certain materials, components and elements are carried out. Unless diagnosis of the true cause of a failure is correct, any selected remedial work is unlikely to be effective and may result in costly deterioration. The causes noted in the appendix are in no way comprehensive but include those shown by experience to be sufficiently common to warrant a word of caution.

3.1.2 Specialist advice

In certain instances it may be necessary to seek the assistance of a building scientist or other appropriate specialist to determine the real cause of a defect or failure. No guidance can be given as to when such a course should be followed; the decision will depend on the particular circumstances of each case and should rest, in the light of its corporate expertise, with the practice or organization responsible for inspection. However, some information, such as accurate assessment of slip resistance of floors and pavings, needs appropriate apparatus and experienced operators.

3.1.3 Hazardous materials

When drawing up records, preparing inspection schedules or carrying out inspection work, careful consideration should be given to:

- a) potentially hazardous materials such as:
 - 1) those containing asbestos;
 - 2) lead, that may be present in some paint systems or be used for pipes carrying potable water;

- 3) materials that are either highly combustible or give off large quantities of smoke and fumes when involved in an established fire;

- 4) other toxic substances;

- b) types or methods of construction that, under certain circumstances, may become dangerous, including the use of high alumina cement for concrete and the presence of chlorides in concrete exposed to external or humid environments.

3.2 Environment and intensity of use

3.2.1 General

All buildings are subject to a variety of factors influencing the frequency and scope of maintenance. Appendix B contains an extract from Table 9 in BS 6150:1982 dealing with environmental categories.

3.2.2 Situation

3.2.2.1 General. The factors given in **3.2.2.2** to **3.2.2.5** can act both singly and in combination. For example, rain penetration is more severe when wind-driven.

3.2.2.2 Air. Air is liable to various forms of contamination. Near the coast it contains significant salt-bearing water vapour with consequent corrosion of iron and steel and deleterious effects on other materials. The Clean Air Acts have significantly reduced the effects of industrial pollution, although there still are areas where this is a problem.

Carbonation of mortar may occur and this can have adverse effects on embedded metals, even in rural areas.

3.2.2.3 Wind. While the main structures of all buildings are normally unaffected by wind, damage to claddings is frequently caused. This can vary from displaced roofing slates to significant damage caused by freak conditions. Tall buildings and those in exposed positions are obviously more at risk, but there are places where unexpected wind conditions exist in otherwise sheltered areas.

In cases where damage to the fabric of a building is not caused, excessive air infiltration can nevertheless affect the interior environment and upset plant control.

Wind conditions, for example near tall buildings and groups of buildings, may result in precautions becoming necessary to prevent rain penetration and resultant damage.

3.2.2.4 Precipitation. The various forms of precipitation each influence the maintenance needs of buildings. Rain by itself normally has no deleterious effects, but combined with wind can produce problems. BRE Digest No. 127 deals with this and gives a driving rain index. Moreover rain can also saturate part of a building fabric, causing, amongst other things, sulphate attack or serious frost damage following a sharp drop in temperature. The problems with snow are usually related to the blocking of normal drainage channels, leading to water penetration in seemingly unlikely places. In this country hailstones rarely achieve a size that can cause actual damage, but this is not totally unknown.

3.2.2.5 Temperature. The effects of extremes of temperature are well known. Some claddings have been shown to be subject to frost attack. The effect of thermal expansion on roofs and parapets is frequently observed.

3.2.3 Internal environment

The fabric of a building can be adversely affected as much by the internal environment as by the elements externally. Similar factors of humidity, temperature and pollution should be considered. The effects of intermittent heating can be a problem to a building's fabric. Condensation problems in most buildings have become increasingly significant and their effects cannot be ignored (see BS 5250). Industrial buildings can be subject to many different factors depending on the processes carried out within. Swimming pool structures are vulnerable to the effects of the chlorine used in the water.

3.2.4 User factor

The maintenance requirements of buildings and their various parts are directly related to the type and intensity of use that they receive. For example a special school may necessitate a degree of robustness in the doors and door fittings not needed in normal domestic accommodation. Buildings that house animals or vehicles also need provision for occasional failure of control.

Some buildings may suffer from deliberate misuse and vandalism. An important factor in considering the behaviour of building users is that lack of repair tends to encourage further damage; prompt maintenance in such cases is strongly advised.

3.3 Building records; general

3.3.1 General factors

3.3.1.1 Much of the guidance regarding the need for records, their preparation, use and content is common to both buildings and their engineering services. They should form part of the archives associated with a building and it is important that they should be kept.

3.3.1.2 Good records can save owners and occupiers much unnecessary expense and reduce potential hazards in exploration work when faults arise. By giving information regarding hidden details of construction they can help to avoid seemingly innocent actions which may adversely affect the performance of the building, such as the piercing of vapour barriers by the fixing of articles to a wall. They can also be vital when emergencies arise or when alterations or extensions to a building are planned. Photographic records may be of value in this respect. However, the initial preparation, storage, retrieval and updating of records can be costly. The advice given in **3.3.2** to **3.3.5** is considered to be the minimum that should be put into practice.

3.3.1.3 As-built records should be kept for record purposes during construction work.

3.3.1.4 In addition to information held in archives, it is recommended that wherever appropriate and possible the elements of the building itself should be labelled or marked. In some cases there is a statutory obligation to do so. More detailed guidance is given in sections four and five of this standard.

3.3.1.5 When no records exist, information should be slowly built up as it becomes available during the course of maintenance work. Alternatively (or additionally) consideration should be given to initiating surveys or investigations to obtain faster results.

3.3.2 Types of records

Records may be classified according to:

- a) those which should have been prepared before the handover of a building, such as constructional details, floor plans and plans showing the location of services; and
- b) those which need to be kept during the life of a building, such as details of defects, maintenance, alterations and painting carried out, and cost records.

3.3.3 Preparation of records

3.3.3.1 The preparation of building records should be undertaken in sufficient detail to provide information on building location, structure and services, in order that proper management of maintenance may take place.

3.3.3.2 Due care should be taken when surveys are carried out since unrecorded dangers may exist. Adequate means of safe access should always be used (see **3.6**). If any area is suspected of being hazardous, suitable precautions should be taken before entering and tests undertaken to identify whether the anticipated hazards exist.

3.3.4 Use of building records

3.3.4.1 All personnel involved in the maintenance of the building should be made aware of the existence of the building records.

3.3.4.2 Known hazardous areas should be explicitly marked on the records as well as being marked on site and should be pointed out to such personnel, together with any system of work adopted for use in such areas.

3.3.4.3 Records are of value only if they are kept up to date and arrangements for this should be included in any provision that may be made for records.

3.3.5 Form of record

There are at present four main forms in which records can be kept as follows.

- a) *Paper and plastic film.* When these media are used care should be taken to select suitable stable and durable materials.
- b) *Microfilm.* These records are both more durable and more compact than paper. They should be in a form appropriate to the record. When records are kept in this way, there should be a viewer at the point of storage. Provision should also be made to obtain copies on paper.
- c) *Computer storage.* This form of storage has been developed too recently for experience in its use for long-term purposes to be assessed, but appears to offer much potential. Magnetic media can be corrupted in various ways both physically and electrically, and there may be a need for periodic re-recording.
- d) *Photographic.* This is a useful method of recording stages in building construction and alteration.

3.3.6 Place of storage

3.3.6.1 Records may conveniently be kept by a client's maintenance adviser; otherwise, the most convenient place is probably within the building concerned.

3.3.6.2 The place of storage should take into account the form of the records and the conditions needed to keep them from damage of any kind. However, it is also important that they be readily accessible for use.

3.3.6.3 It is recommended that a duplicate set of records is kept in a secure place in a location other than the building itself. Both sets should be kept up to date.

3.3.7 Contents of record

3.3.7.1 Building classification. It is recommended that owners with a number of buildings should code them according to use or type, to enable efficient storage and recall of records, particularly if the use of computers is envisaged. Table "O" in the CI/Sfb Construction indexing manual is ideal for the purpose.

3.3.7.2 Legal information. The records should contain details of the following:

- a) obligations under conditions of lease or occupancy (e.g. frequency of repainting);
- b) statutory and insurance inspections;
- c) estate terrier (records of property holdings with legal status);
- d) ownership of and/or maintenance obligations of party, separating and boundary walls;
- e) rights of way, easements and wayleaves (particularly of buried services);
- f) the requirements and restrictions laid down by planning, building regulation control and fire authorities.

3.4 Maintenance guides

3.4.1 General

An owner responsible for a large number of buildings may have established procedures for maintenance. When an owner is responsible for the maintenance of only one building or a small number of buildings, the preparation of a guide, tailored to suit each particular building, can offer significant advantages. Such a guide should take into account the following:

- a) type of construction and residual life of the building;
- b) environment and intensity of use, as discussed in **3.2**.

The guide may form part of a wider manual covering other operational matters.

In the event of a change of owner or maintenance adviser, an up-to-date guide should go some way towards ensuring good continuity of maintenance.

Copies of maintenance guides should be held by owners and their maintenance advisers.

3.4.2 Division into parts

3.4.2.1 General. A maintenance guide should be in two parts, the first part addressed to the owner and the second to those responsible for inspecting the building and reporting to and advising the client.

3.4.2.2 First part. The first part of a maintenance guide should:

- a) recommend intervals between:
 - 1) “routine”, “general” and “detailed” inspections, referred to in 4.2.3;
 - 2) inspection and maintenance of each engineering service and items of special equipment, referred to in 5.6.2;
 - 3) maintenance of items which, as recommended by their manufacturers, require regular attention to preserve good performance, such as the cleaning of anodized aluminium window frames;
 - 4) other periodic work as experience in use may later show to be necessary, such as the clearing of gutters and downpipes, or surface water gulleys, found to be subject to leaf blockage.
- b) draw attention to the necessity for ensuring that a building’s provisions for means of escape in case of fire, in respect of fire resisting self closing doors and exit hatches, etc. are in sound working order at all times, including those periods during which any maintenance work is being executed;
- c) schedule certain recommended proprietary maintenance materials, such as floor sealers and polishes likely to give good service and acceptable slip resistance, etc.;
- d) set out the names, addresses, telephone numbers and contacts of firms responsible for the following:
 - 1) inspecting, reporting and advising on the building fabric;
 - 2) emergency building repairs;
 - 3) servicing and emergency repairs for each engineering service and items of special equipment.

3.4.2.3 Second part. The second part of a maintenance guide should:

- a) consist mainly of concise information, abstracted from a building’s records and likely to be needed during inspections. This information can conveniently be ordered in the sequence in which examination is likely to be carried out (see 4.2.4);

- b) schedule those materials and details that later experience may show to be troublesome and to need special attention.

3.4.3 Preparation of guides

Helpful advice will be found in BS 4884 and BS 4899²⁾

3.4.4 Up-dating of guides

The value of maintenance guides depends on the degree to which they are kept up to date. When changes occur to the buildings concerned or when new information becomes available, all copies of maintenance guides should be amended, and they should be reviewed annually.

3.5 Inspection reports and planning of work

3.5.1 Introduction

Work should take account of the likely maintenance cycle of each element and be planned logically, with inspections being made at regular intervals.

Owners’ production and operational requirements should be integrated into the planning of work. Annual plans should take into account subsequent years’ programmes to incorporate items and so prevent additional costs or abortive works. It should be stressed that the design of some buildings can lead to high indirect costs in maintenance contracts and therefore careful planning can bring financial benefits. Decisions to replace or repair should be taken after due consideration.

3.5.2 Reports to clients

Reports to clients should be prepared by a professional adviser. The information gained from the inspections should be collated into groups, firstly by the degree of urgency to effect repairs, and secondly, by comparison with the standard of maintenance identified in the maintenance policy. Care should be exercised when considering each item so that:

- a) postponement of apparently non-urgent work could not result (in the long term) in a major defect or failure, e.g. the occurrence of dry rot may result from a delay in carrying out minor maintenance;
- b) the anticipated life of the building or element is taken into account.

²⁾ In preparation.

Professional advisers can report to their clients and give advance warning of expected defects by forming three main lists comprising those requiring immediate attention, those that could be placed into a planned maintenance programme and those which could be indefinitely postponed but kept under observation.

3.5.3 Planning and timing of maintenance work

The use of planned maintenance programmes are recommended and all relevant aspects should be discussed with clients when appraisals and assessments of the timing of the works are made.

Care should be exercised and an economic appraisal undertaken to obtain the maximum benefit from access equipment (see 3.6.2). The access element of maintenance expenditure can be reduced by giving attention to future requirements. This is particularly true of tall buildings.

Programmes should always be drawn up in full consultation with clients and allowance should be made for the following:

- a) owners' requirements of production and operational constraints;
- b) clients'/owners' taxation and/or financial circumstances;
- c) legal requirements;
- d) available feed-back data.

Plans for maintenance work should take the form of an annual programme taking into account the climate and user requirements. Further sorting can refine the plans to prevent unnecessary costs resulting from repeated site visits. Completed programmes should state a review date to assess progress or the need for a new one to be compiled.

3.5.4 Efficiency

The efficiency of all items of construction and equipment should be assessed. This will provide data over a period of time for a study of the economics of repair or replacement.

The development of a feed-back system will greatly assist those responsible for maintenance and defects. Defects reported should not be confined to emergency repairs but should include all faults or potential faults, e.g. frequent blockages or dripping taps.

This feed-back data should be referred to at the time of the next review.

3.6 Access

3.6.1 General

All maintenance activities including any preliminary survey and inspection work require safe access and in some situations this will have to be specially designed. Special precautions and access provisions may also need to be taken for roof work or for entry into confined spaces such as ducts or voids. The following clauses give an indication of the equipment available and its possible application, and an outline of the precautions that should be taken in certain cases.

3.6.2 Access equipment

3.6.2.1 A wide variety of temporary access equipment may appropriately be provided for maintenance work, ranging from ladders to scaffolds or powered lift platforms. These are described in Appendix C.

3.6.2.2 Wherever possible it is better to provide permanent access facilities such as fixed barriers, ladders and stairways, fixed track for cradles or fixed wires or eye bolts for safety harnesses.

3.6.2.3 When such permanent provision is made arrangements should be included in maintenance plans for their regular inspection, maintenance and testing with the current test certificates being readily available. In addition all personnel, whether employed directly or by contractors, should be provided with the necessary protective clothing and equipment and instructed in its use.

3.6.2.4 When physical access is not possible in situations such as wall cavities and drains, inspections may be made with the aid of closed circuit television or optical devices such as endoscopes.

3.6.3 Work on roofs

3.6.3.1 It is recommended that access should be provided to the external surfaces of roofs wherever possible from within buildings, to avoid the use of less secure temporary access systems. For instance where there are valley gutters or hopper heads liable to blockage, small access traps through which an arm can be inserted to clear a blockage, can be of great value.

3.6.3.2 For many types of roof work, whether the roofs are flat or pitched, it will be essential that some form of permanent or temporary barrier should be in position around the edge of the roof to safeguard personnel and to prevent tools or equipment falling from the roof. Some ways of erecting effective barriers are illustrated in Guidance note GS10 "Roofwork: prevention of falls", published by the Health and Safety Executive.

3.6.3.3 Even where a barrier has been erected around a roof it still may be necessary for people to use crawling boards or roof ladders of aluminium or timber.

3.6.3.4 A number of roof coverings are not always capable of supporting the weight of a person stepping on them. Materials in this category include asbestos cement, some plastics (particularly those that are not reinforced), slates, tiles and some wood based boards and slabs. Age, condition, thickness and degree of support all have a bearing on the ability of a material to support the weight of a person. It should be assumed, in the absence of firm evidence, that the material will *not* support the weight of a person stepping on it and appropriate precautions should be taken. A notice should be placed in a prominent position close to any suspect material to give warning of the danger.

3.6.3.5 In some cases, such as where the work will be only of a short duration or where it is impossible to fit adequate barriers, safety harnesses secured to an adequate anchorage may be a satisfactory alternative. Suitable harnesses are specified in BS 1397 and some types of anchorage that may be used are detailed in BS 5845.

3.6.4 Access to confined spaces

3.6.4.1 Roofs. When periodic access has to be made into roof voids and the ceilings are of a fragile material, defined pathways should be formed across the area to provide a safe footing and to spread a person's weight. Such pathways should be at least 450 mm wide if for solely pedestrian use, or wider if required for moving equipment. They should also be fitted with guard rails to prevent a person falling onto the fragile ceiling.

3.6.4.2 Ducts and ceiling voids. Service ducts should have sufficient access to enable inspection and renewal of services to be carried out. Long vertical ducts will require platforms at intervals to serve as rest places for those working or climbing in them and to limit the distance a person may fall.

3.6.4.3 Security. Access openings to ducts, voids and roof surfaces should be made properly secure against unauthorized entry.

3.6.4.4 Ventilation. Special precautions need to be taken when entering a confined space. Such confined spaces should be adequately ventilated, particularly before being entered, to ensure that they are free from harmful concentrations of gases, vapours or other airborne substances, and that the air is not deficient in oxygen. Forced ventilation may be necessary when people are in a confined space. If there are any doubts advice should be sought from an appropriate source (see also BS 5925).

It is recommended as a general rule that nobody should enter a confined space such as a duct or shaft with a cross section of less than 750 mm. Forced ventilation may be necessary when people are in a confined space.

3.6.4.5 Lighting. Good lighting is necessary in order that maintenance work can be carried out satisfactorily, being particularly important in confined spaces. When the normal lighting is inadequate it should be supplemented by temporary installations. These should provide general and spot illumination as appropriate.

3.6.4.6 Rescue. Arrangements should exist for rescuing people in a confined space should they become incapacitated for whatever reason. Personnel may, for example, need to stand by with rescue harnesses, safety lines and breathing apparatus.

3.6.5 Safety signs

The design and use of safety signs should be in accordance with BS 5378 and BS 5499. Safety signs should be kept clean and legible at all times.

3.6.6 Adjoining properties

If access is required for maintenance over adjoining properties this should be arranged in good time.

3.7 Health and safety; safe working practices

3.7.1 General

Clients, building owners, occupiers and their professional maintenance advisers should be aware of the health and safety problems that can arise during maintenance work. It is essential that those involved in organizing maintenance work ensure the safety of all persons whether these are involved with the work or not. In particular thought should be given as to how persons working in the building may be protected from any hazards arising from the work.

It is imperative that contractors or others directing maintenance work satisfy all statutory requirements relating to health and safety.

Basic advice is given in **3.7.2** on the sort of precautions that those carrying out various activities should be expected to take to protect others who might be affected by their work.