

RECOMMENDATIONS FOR
GENERAL LANDSCAPE
OPERATIONS
(EXCLUDING HARD SURFACES)

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BS 4428 : 1969
METRIC UNITS

BRITISH STANDARDS INSTITUTION

**RECOMMENDATIONS FOR
GENERAL LANDSCAPE
OPERATIONS
(EXCLUDING HARD SURFACES)**

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BRITISH STANDARDS INSTITUTION

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These Recommendations, having been approved by the Committee for Landscape Work, were published under the authority of the Executive Board on 30 April, 1969.

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The Institution desires to call attention to the fact that these recommendations do not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9,000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The Catalogue may be consulted in many public libraries and similar institutions.

These recommendations make reference to the following British Standards:

- BS 1377. Methods of testing soils for civil engineering purposes.
- BS 1722. Fences.
 - Part 1. Chain link fences.
 - Part 4. Cleft chestnut pale fences.
- BS 2468. Glossary of terms relating to agricultural machinery and implements.
- BS 3854. Farm stock fences.
- BS 3882. Recommendations and classification for top soil.
- BS 3936. Nursery stock.
 - Part 1. Trees and shrubs.
 - Part 4. Forest trees.
 - Part 5. Poplars and willows for timber production.
- BS 3969. Recommendations for turf for general landscape purposes.
- BS 3998. Recommendations for tree work.
- BS 4043. Recommendations for transplanting semi-mature trees.

BS* Recommendations for ground maintenance.
CP 301. Building drainage.
CP 2001. Site investigations.
CP 2003. Earthworks.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

* In course of preparation

The following BSI references relate to the work of these recommendations:

Committee references FAFA/2 and FAFA/2/3
Draft for comment 67/285

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CO-OPERATING ORGANIZATIONS

The committees responsible for the preparation of these recommendations consist of representatives from the following Government departments and scientific, professional and industrial organizations:

Arboricultural Association
 Association of British Tree Surgeons & Arborists
 Association of Municipal Corporations
 Association of Tree Transplanters
 British Association of Sports Ground & Landscape Contractors Ltd.
 Cement and Concrete Association
 Civic Trust
 Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales
 Forestry Commission
 Glasshouse Crops Research Institute
 Greater London Council
 Horticultural Education Association
 Horticultural Trades Association
 Institute of Landscape Architects
 Institution of Park and Recreation Administration
 Ministry of Housing and Local Government
 Ministry of Public Building and Works
 Ministry of Transport
 National Coal Board
 National Farmers' Union
 National Garden Contractors
 National Playing Fields Association
 Nature Conservancy
 Retail Seed Trade Association
 Royal Horticultural Society
 Royal Institute of British Architects
 Royal Institution of Chartered Surveyors
 Sand and Gravel Association of Great Britain
 Scottish Woodland Owners Association
 Seed Trade Association of the United Kingdom
 Sports Turf Research Institute
 Timber Growers Organization
 Urban District Councils Association
 Individual experts

RECOMMENDATIONS FOR GENERAL LANDSCAPE OPERATIONS (EXCLUDING HARD SURFACES)

FOREWORD

These recommendations are published under the authority of the Executive Board of the British Standards Institution. They have been prepared at the request of the Institute of Landscape Architects.

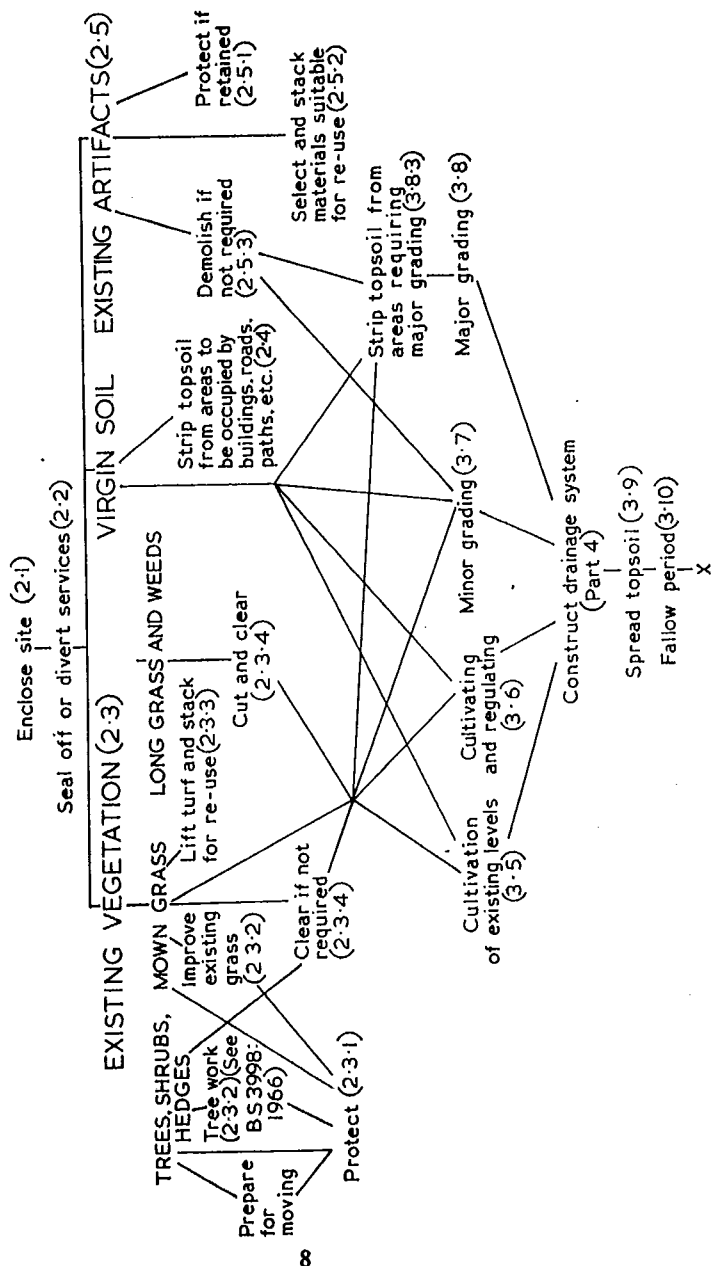
The scope of the recommendations has been intentionally restricted to *general* landscape operations. For example, in Section 6, Turfing, no attempt has been made to include specialized sports areas such as bowling greens, cricket tables and golf greens, both because these are specialized and because appropriate specifications have been published by National Playing Fields Association and Sports Turf Research Institute. Similarly, Section 8 does not include planting of alpiners or aquatics.

Attention is drawn to BS 3998, 'Recommendations for tree work', and BS 4043, 'Recommendations for transplanting semi-mature trees'. British Standard recommendations are being prepared for grounds maintenance.

NOTES ON THE USE OF THE NETWORK ANALYSIS DIAGRAM (FIG. 1)

1. The diagram is designed to show the normal sequence of operations on site for landscape work. The headings at the top of the sheet describe the range of conditions likely to be encountered at the start of the work; those at the bottom indicate the intended treatment on completion. By following the linking lines in the direction of the arrows from top to bottom, the intermediate headings giving the correct work sequence will be found. Where linking lines diverge from any operation, the one relating to the appropriate conditions should be followed. If an operation is not required in particular circumstances it may be omitted, and the linking lines followed to the next part of the work.
2. It is assumed that the design process has been carried out prior to starting work on site. This would include in a landscape appraisal such items as a survey of existing vegetation, soil tests, analysis of drainage requirements, etc., leading up to the preparation of a design and working drawings.
3. Grass areas may be prepared before or after tree and shrub planting according to whether the work is done in the autumn or the spring, hence the alternative linking lines.

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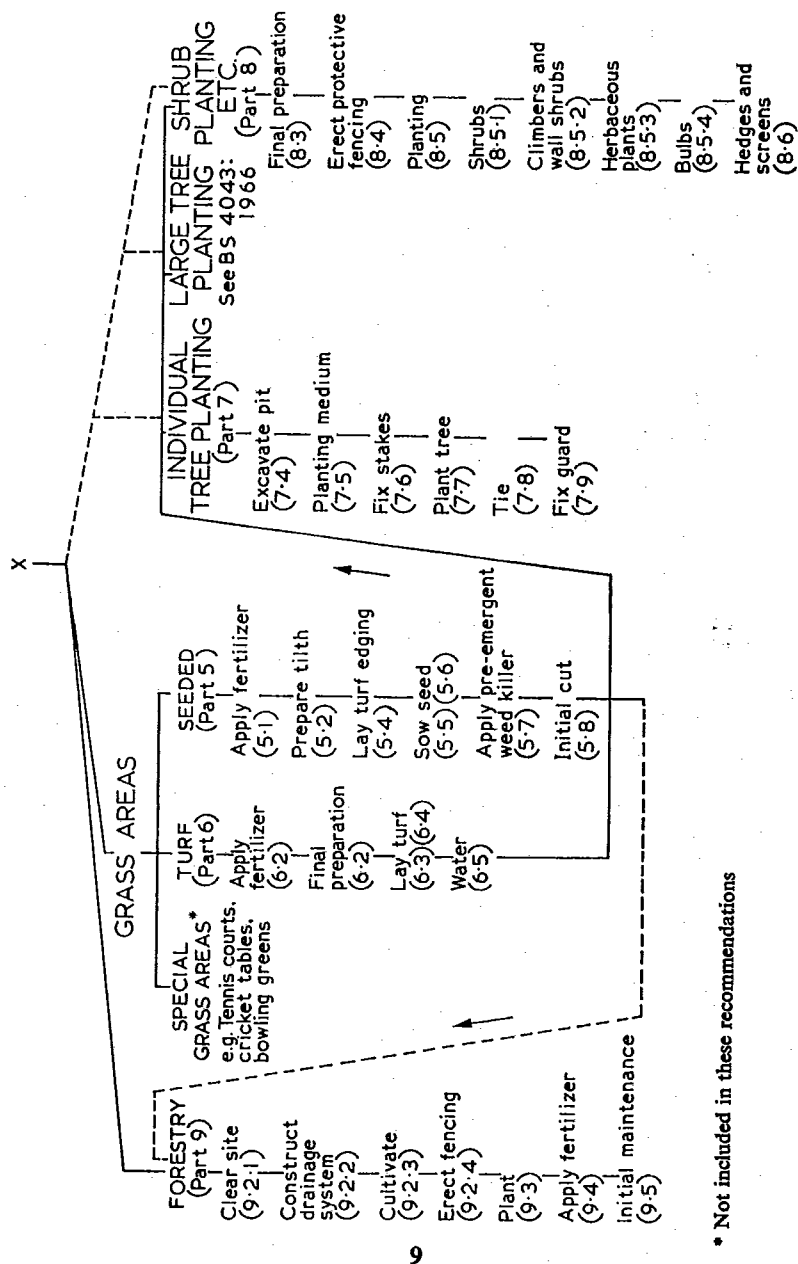


Fig. 1. Network analysis diagram for landscape work

RECOMMENDATIONS

1. GENERAL

1.1 SCOPE

These recommendations deal with the following general landscape operations:

- (1) Preparatory operations, including earthwork, land shaping and drainage.
- (2) Seeding of grass areas.
- (3) Turfing.
- (4) Planting of shrubs, hedges, climbers, herbaceous plants and bulbs.
- (5) Individual tree planting.
- (6) Forestry planting for amenity purposes.

Fig. 1 is a diagram showing a normal sequence for general landscape operations.

1.2 SEASON

Some landscape operations, e.g. preparation of the ground, can be undertaken at any time of the year providing the soil is in a workable condition.

Others can be carried out at any time if special precautions are taken, whilst the remainder should only be done at certain seasons. Specific recommendations are made in each section of these recommendations.

1.3 EQUIPMENT

The choice of equipment will depend on the total scope of the work, soil conditions, the area of the individual space being dealt with and the means of access for machinery. Special attention should be paid to hard pans caused by heavy machinery (see Section 3 of these recommendations).

1.4 WORKMANSHIP

Landscape operations involve living materials. This should always be borne in mind when dealing not only with seed or plants, but also topsoil. Attention to detail in all respects is necessary to ensure the ultimate success of the work undertaken.

1.5 SUPERVISION

Constant supervision is necessary to ensure that the desired standards are achieved. It is needed not only on completion, but at all stages, since much of the important preparatory work will be below the surface when the work is finished.

1.6 CHEMICALS

Chemicals which are not on the Ministry of Agriculture's Agricultural Chemicals Approval Scheme current List of Approved Products should not be used. Strict adherence to the manufacturer's instructions is absolutely essential.

1.7 USE OF ANTI-DESICCANTS

1.7.1 Description. The term anti-desiccant refers to any substance applied to the surface tissues of a plant to prevent excessive evaporation while still allowing the passage of gases through the film.

1.7.2 Use. All anti-desiccant fluids used at present are susceptible to crystallization if exposed to frost. Cans of the concentrate should therefore be stored in a frost-free shed.

Anti-desiccants may be used for the following purposes:

(1) To slow down transpiration as an aid in transplanting plant material in leaf, especially with evergreens.

(2) To aid in the recovery of a plant which has received damage in aerial or root sections.

(3) To aid in the recovery of a plant after insect or fungus attack.

1.7.3 When to use

1.7.3.1 Transplanting. Transplanting is greatly aided by spraying plants in leaf before digging, and again soon after they are planted in the new site. Special care should be taken to spray the undersides of the leaves where most of the stomata are situated. A good treatment should last approximately six weeks.

1.7.3.2 Plants suffering from inadequate moisture. Plants may be suffering from desiccation for a number of reasons, such as damage to the root or aerial portions resulting from transplanting, the digging of underground service lines adjacent to the plant, damage to plant cells by fungus or bacterial action, removal of sap or leaf area by surface pests. To aid in the recovery of attacked or damaged plants an anti-desiccant can be of value to hold moisture within the plant for a short while, until other remedial measures can remove the cause and help mend the damage.

2. PREPARATORY OPERATIONS

2.1 SITE ENCLOSURE

All fencing* should be maintained in good and effective condition until the work is completed. The type of fencing used will depend on a number of factors, e.g. the location of the site, the likelihood of trespass and pilfering by children

* Site fences should be an adequate height between 1.2-2.1 m (4-7 ft) according to functions. Permanent fencing may have to be delayed for machine work at perimeter.

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or others, and the degree of danger to persons accidentally trespassing. Urban sites are more likely to need protection than rural ones, and in some cases the latter may not need fencing at all. The following types of fence are considered suitable:

- (1) 1.2 m to 1.8 m (4 ft to 6 ft) cleft chestnut fencing complying with BS 1722, Part 4*.
- (2) 1.2 m to 2.1 m (4 ft to 7 ft) chain link fencing complying with BS 1722, Part 1†.

2.2 EXISTING SERVICES

The location of all service runs, such as water supply, gas, electricity (overhead or underground), telephones and drainage should be ascertained before work is started and marked upon a plan, giving position, size and depth. Where they will be affected by excavation, or where machines may be working nearby, they should be carefully sealed off, protected or diverted. In most cases it will be necessary to obtain the approval and assistance of the Statutory Undertakings and Local Authorities concerned.

2.3 EXISTING VEGETATION

2.3.1 Protection. Where work is to be carried out near existing vegetation which is to be retained it should be protected from damage with 1.2 m (4 ft) cleft chestnut fencing or similar. This should be maintained in good and effective condition until the work is completed. Fencing to protect trees should coincide, as far as is practicable, with the spread of the branches, or in the case of fastigate trees with a radius of half the height of the tree. Materials should never be stacked within the root spread of trees. Normal maintenance should be carried out within fenced areas during the execution of the work. Areas of grass to be cut for turf should be treated during the growing period with weed killer and should be kept well mown before lifting. Where work is done by contract, a penalty clause should be inserted to cover damage done to trees and shrubs.

2.3.2 Remedial work. Existing plants and grass included in the landscape plan, and which have been neglected, should be restored to a healthy condition and shapely habit. Accidental damage which occurs during the execution of the work should be carefully repaired. Tree work is described in BS 3998‡ and renovation of turf is dealt with in BS§.

2.3.3 Preparation for moving. Trees and large shrubs which are to be transplanted normally require preparation some time in advance. Advice on this subject is

* BS 1722, 'Fences', Part 4, 'Cleft chestnut pale fences'.

† BS 1722, 'Fences', Part 1, 'Chain link fences'.

‡ BS 3998, 'Recommendations for tree work'.

§ BS, 'Recommendations for ground maintenance'. (In course of preparation.)

given in BS 4043*. Turf to be stripped for use elsewhere should be left in situ and not lifted until the site on which it is to be laid has been prepared; the area of turf to be lifted should be divided into parallel strips 300 mm (1 ft) wide with a half-moon edging iron or turf racer. Each strip is then divided in the same way into suitable lengths (usually 1 m (3 ft)) for lifting with a turf lifting iron. Alternatively, for larger areas, turf may be cut with a turf cutting machine. The aim should be to produce a turf 25 mm or 40 mm (1 in or 1½ in) thick, and of even thickness throughout. If hand lifting, it is better to take up a thicker turf which can subsequently be reduced in thickness in a turf gauge box. The turves can then be rolled or folded and stacked ready for moving.

2.3.4 Vegetation to be cleared. Long grass and weeds should be cut, and trees, hedges and other plants not required should be cleared and the roots grubbed out. The material arising should be burned clear of existing trees and the ash spread on site, or carted away if burning is not permitted (or practicable). Clearance of tree stumps is described in BS 3998†.

2.4 STRIPPING

In certain cases it is necessary to strip the topsoil. This will occur when the area is to be occupied by buildings, roads or other hard surfaces, when major changes of level are required, or when the soil is likely to suffer damage from building or engineering activities. In such cases the full depth of topsoil should be carefully stripped and strict precautions taken to prevent it becoming mixed with subsoil or any other deleterious materials. While topsoil is stacked measures should be taken to ensure that weed control by spraying with total or appropriate selective weedkillers is carried out during the growing season to prevent weeds seeding. Alternatively, the appearance of the heap may be improved, and weeds suppressed, by sowing a short term crop of Italian rye grass.

2.5 EXISTING ARTIFACTS

2.5.1 To be retained. If work is to be undertaken close to existing buildings, paved areas and special structures to be retained, they should be protected from damage with 1.2 m (4 ft) cleft chestnut fencing complying with BS 1722, Part 4‡.

2.5.2 Materials for re-use. Before starting demolition, any stone, brick, clay tiles, paving slabs, granite setts or other materials suitable for re-use should be carefully taken up and stacked on site until required, or removed by agreement.

* BS 4043, 'Recommendations for transplanting semi-mature trees'.

† BS 3998, 'Recommendations for tree work'.

‡ BS 1722, 'Fences', Part 4, 'Cleft chestnut pale fences'.

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2.5.3 Demolition. Buildings, walls, roads, foundations, disused drains, manholes and any other construction not required should then be demolished and removed to the following minimum depths below finished levels:

	m	ft	in
grass areas	0.45	1	6
ground cover and perennial planting areas	0.45	1	6
shrub planting areas	0.60	2	0
tree planting (within 2 m (6 ft) of tree station)	0.90	3	0

All unwanted material should be carted off the site. Below the depths given, concrete slabs or other impervious layers should be broken up to allow free drainage. When subsoiling and drainage operations are to be carried out involving depths below those mentioned above, then consideration should be given to the need to demolish to lower levels.

2.5.4 Rubbish. All rubbish should be collected and disposed of either by burning 10 m (40 ft) clear of the spread of existing trees or any areas to be grassed down or by carting off the site.

3. GROUNDWORKS

3.1 SYNOPSIS OF OPERATIONS REQUIRED

Depending on circumstances one of the following categories of groundworks will be necessary:

- Category A. Surface cultivations only (see 3.5).
- Category B. Surface cultivations, and regulating by minor grading within the topsoil depth (see 3.6).
- Category C. Minor grading involving adjustment of local high and low spots (see 3.7).
- Category D. Major grading after removal of all topsoil* (see 3.8).

3.2 GRADIENTS DESIRABLE

Maximum gradients are often limited by soil type (see 3.8.5), but where there is freedom to design, the following should be considered.

3.2.1 In ground shaping and modelling. When grass cutting on banks it is essential that the operators should be fully experienced.

* Planning approval may be required for proposals to change the existing ground level by more than 0.9 m (3 ft).

Maximum gradient for hand maintenance	1:1 (45°)
Maximum gradient for small machines	1:1½ (33°)
Maximum gradient for special bank machines*	1:2 (27°)
Maximum gradient for suitable tractor-drawn mowers*	1:3 (18°)

3.2.2 In sports fields. For general playing pitches an absolutely horizontal area is not necessary and indeed may lead to serious drainage difficulties. A uniform fall of 1:80 (0° 43') is perhaps ideal but gradients of up to 1:50 need not be adjusted provided they are even†. In hilly or rocky districts even steeper gradients may be inevitable, though it should be recognized that a reasonable standard of play without undue fatigue will not be possible with a gradient which exceeds 1:40 (1° 25').

3.3 SITE INVESTIGATION BEFORE OPERATIONS

Before carrying out any physical investigation consult:

- (1) Geological and/or soil survey maps for a general indication of the drift or soil type.
- (2) All statutory undertakings and local authorities for the presence of underground apparatus.

3.3.1 Topsoil. The following enquiries and investigations are desirable:

- (1) Ascertain depths over entire site, e.g. by setting out a grid at, say, 30 m (100 ft) centres and determining depths by hand auger or spade.
- (2) Carry out tests for pH, chemical, physical and biological conditions. The facilities of the National Agricultural Advisory Service, local Farm Institutes, the Sports Turf Research Institute and private consultants should be used to pinpoint deficiencies, if they appear to exist.

3.3.2 Subsoil. Inspection should be carried out to 750 mm (2 ft 6 in) below the level of lowest excavation by one or more of the following methods:

- (1) *Hand auger.* In moist clays and soils free from stones, auger sizes 37 mm (1½ in) to 225 mm (9 in) diameter (depths below about 4.5 m (15 ft) in the larger auger sizes are difficult).
- (2) *Tractor-mounted diggers.* Tractor-mounted diggers can excavate open pit inspection pits down to 4.8 m (16 ft), in all soils except rock.
- (3) *Mounted mechanical augers.* Mounted mechanical augers may be used for samples down to 9 m (30 ft) in soils free from rock and boulders, though with some difficulty in dry, sandy soils; auger sizes 225 mm (9 in) to 900 mm (36 in) diameter.

*The use of tractors on some banks can be dangerous—see Ministry of Agriculture Farm Safety Leaflet, 'Tractors overturning', June 1960.

† See also relevant publications of Ministry of Education, AAA and NPFA.