BRITISH STANDARD

BS 8000-1: 1989

Workmanship on building sites —

Part 1: Code of practice for excavation and filling

CAWS D20

UDC [69.05 + 624.134.135]:658.562.3

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Council for Building and Civil Engineering (B/-) to Technical Committee B/146, upon which the following bodies were represented:

Building Employers' Confederation
Chartered Institute of Building
Consumer Policy Committee of BSI
Department of the Environment (Building Research Establishment)
Department of the Environment (Property Services Agency)
Federation of Associations of Specialists and Sub-Contractors
Institute of Clerks of Works of Great Britain Inc
Institution of Civil Engineers
Institution of Structural Engineers
National Building Specification Ltd.
National Council of Building Materials Producers
National House Building Council
Royal Institute of British Architects
Royal Institution of Chartered Surveyors
Society of Chief Architects of Local Authorities

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Contents

Foreword

This Part of BS 8000 has been prepared under the direction of the Council for Building and Civil Engineering. It makes recommendations and gives guidance on basic workmanship for conventional types of building work.

The recommendations given are not necessarily comprehensive; particular project documents, e.g. project specifications, may need to cover particular recommendations not dealt with by this code of practice.

This code of practice is unique in that unlike other British Standards, it draws together recommendations given in other codes of practice.

The purpose of this code of practice is to encourage good workmanship by providing the following:

a) the most frequently required recommendations on workmanship for building work in a readily available and convenient form to those working on site;

b) assistance in the efficient preparation and administration of contracts;

c) recommendations on how designer's requirements for workmanship may be satisfactorily realized;

d) definitions of good practice on building sites for supervision and for training purposes; this guidance is not intended to supplant the normal training in craft skills;

e) a reference for quality of workmanship on building sites.

It is recognized that design, procurement and project information should be conducive to good workmanship on site.

During the preparation of this code of practice the Building Industry's Co-ordinating Committee for Project Information (CCPI), produced a Common Arrangement of Work Sections (CAWS) for building work. This code of practice has generally been arranged in accordance with the Common Arrangement so that it can be used easily with project specifications and bills of quantities using this arrangement. Other major documents are being restructured in accordance with the Common Arrangement.

NOTE The CCPI was sponsored by the Association of Consulting Engineers, the Building Employers' Confederation, the Royal Institution of Chartered Surveyors and the Royal Institute of British Architects.

When complete BS 8000 will comprise the following Parts.

— *Part 1: Code of practice for excavation and filling*;
— *Part 2: Code of practice for concrete work*;
— *Part 3: Code of practice for masonry*;
— *Part 4: Code of practice for waterproofing*;
— *Part 5: Code of practice for carpentry, joinery and general fixings*;
— *Part 6: Code of practice for roof, slate, tile covering and cladding*;
— *Part 7: Code of practice for glazing*;
— *Part 8: Code of practice for plasterboard partitions and dry linings*;
— *Part 9: Code of practice for cement/sand floor screeds and concrete floor toppings*;
— *Part 10: Code of practice for plastering and rendering*;
— *Part 11: Code of practice for wall and floor tiling*;
— *Part 12: Code of practice for decorative wallcoverings and painting*;
— *Part 13: Code of practice for above ground drainage and sanitary appliances*;
— *Part 14: Code of practice for below ground drainage*;
— *Part 15: Code of practice for hot and cold water services (domestic scale).*

Technical Committee CSB/3, Earthworks, has also participated in the preparation of this Part of BS 8000 and the content is based on and consistent with that of BS 6031. However, BS 6031 covers the subject matter more comprehensively and includes design, materials and other related aspects in addition to workmanship on site.

The text of this Part of BS 8000 includes commentaries and figures. These commentaries are separately identified and are intended to be for guidance only and do not form part of the recommendations. They refer, unless otherwise stated, to the clause which immediately precedes each commentary.

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 8, 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.

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Section 1. General

1.1 Scope

This Part of BS 8000 gives recommendations on basic workmanship on building sites and covers those tasks which are frequently carried out in relation to excavating and filling.

This code of practice does not cover civil engineering works for which reference should be made to BS 6031.

NOTE This code of practice includes supplementary elements in the form of commentaries to assist in its use and understanding. Compliance with the commentaries is not necessary in order to be able to claim conformity with the standard.

1.2 References

1.2.1 Normative references

This Part of BS 8000 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 8000 only when incorporated in it by amendment or revision.

1.2.2 Informative references

This Part of BS 8000 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

1.3 Definitions

For the purposes of this Part of BS 8000, the definitions given in BS 6031:1981, BS 6100-1.0:1984 and BS 6100-2.2.2[1)] apply.

[1)] In preparation

Section 2. Materials and preparation

2.1 Checking materials and equipment

Check delivery tickets and certificates against the specification and examine marks, labels and the condition of materials and equipment. If necessary refer to the supplier immediately.

Check quantities as soon as possible so that work is not delayed by shortages.

In particular check that:

a) safety barriers, screens and other equipment for guarding the works are suitable for the site circumstances;

b) materials and equipment for supporting the excavations are in good order, well maintained and in safe working condition.

2.2 Preparation of work

2.2.1 General

2.2.1.1 *Liaison.* Liaise and cooperate with the appropriate authorities, and with owners and occupiers of adjoining land or buildings likely to be affected by the works.

Where it is necessary to make use of adjoining property, check that permission from the owners has been obtained. Clear away and make good any damage. Do not trespass on adjoining property.

2.2.1.2 *Existing drains and services.* Locate the positions and levels of existing drains and services indicated on the drawings before sitework commences; seek instructions on the method for dealing with those which are likely to be affected (see also **3.2.6***).*

2.2.1.3 *Cables, pipes and services.* Mark the location of all underground cables and pipes with sign boards, indicating their type, e.g. water, gas, electricity, telephone, cable TV, and their depth. Where any overhead cables, etc., restrict headroom for site plant, install headroom indicators.

2.2.2 Site clearance

2.2.2.1 *Surface vegetation clearance.* Cut and clear away long grass, weeds, branches, saplings, etc.; grub up stumps and major root runs without unduly disturbing topsoil.

COMMENTARY. *Removal of vegetation is not to be regarded as routine. On clay slopes, the reinforcing effects of roots and the suction of water from the clay by plants may have a vital stabilizing effect. Removal of all vegetation could result in instability of the slope.*

2.2.2.2 *Stripping and stockpiling topsoil.* Strip topsoil to a depth of not less than 150 mm from areas to be regraded or to be occupied by buildings, pavings and roads.

Either remove the stripped topsoil from the site or stockpile it in temporary spoil heaps not exceeding 1 500 mm high as directed. Keep stockpiles separate from other materials and prevent them from becoming:

a) compacted;

b) adulterated with subsoil, rubbish, stone or hardcore;

c) contaminated by petrol, oil, lime, cement or other injurous substances;

d) buried.

2.2.2.3 *Disposal of rubbish and spoil.* Tip rubbish and spoil only on tips controlled or recognized by the Local Authority and that comply strictly with any regulation governing the controlled tipping of refuse.

2.2.2.4 *Burning on site.* Where permitted burn unwanted timber and combustible materials on site, ensuring such burning is safe and appropriate to the site conditions and environment. Locate fires so that no damage is caused to the spread of any tree or shrub to be retained.

COMMENTARY. *A minimum distance of 10 m from retained trees is normally adequate.*

2.2.3 Protection and preservation

2.2.3.1 *General.* Before excavation commences check that the site is securely protected against unauthorized access by the provision of adequate barriers, lighting and signs.

2.2.3.2 *Trees and planting to be retained.* Before commencing site clearance identify and mark throughout the works, plants, trees, shrubs, hedges, areas of shrub, etc., to be retained, protected and preserved. Do not cut, lop or sever roots of shrubs and trees to be retained unless otherwise directed.

2.2.3.3 ***Drains***

a) Protect drains, manholes, gullies, etc., from damage.

b) Keep drain lines clear of debris at all times.

c) Where drains are uncovered during excavations, backfill around them with selected fill material as specified and compact with care around the pipes.

2.2.3.4 *Bench marks.* Report any bench marks and other established survey information found on areas to be cleared. Do not remove or destroy them unless instructed to do so.

Section 3. Excavating and filling

3.1 General

3.1.1 Site care

Take all practical steps during site operations.

a) Do not carry out excavations which could undermine or affect the stability of adjoining property, buildings, services and pavings. Where such excavation cannot be avoided ensure that adequate protection and support is provided and has been approved by the owner.

b) Minimize noise, vibration, dust and other pollution which causes nuisance and damage.

c) Make safe provision for pedestrian and vehicular traffic when working in or near public highways.

d) Check, adequately maintain and vary as necessary all barriers, lighting and signs provided for the prevention of unauthorized access and the safety of the public and site staff.

COMMENTARY. *A site survey and ground investigation may not provide complete data. Prudence in carrying out excavations is essential in order to avoid injury to people and damage to property.*

3.1.2 Keeping excavations free of water

Provide temporary gradients, water courses, ditches, drains, pumping or other means for the rapid disposal of water flowing on to the area of work during excavation and filling. Ensure that:

a) when pumping, excavated faces are not disturbed;

b) the disposal of pumped water does not affect the stability of other parts of the site or adjoining property by flooding;

c) any sumps for water collection are constructed clear of the excavations and filled in on completion of the works;

d) permanent drains are not used for the disposal of water from the excavations unless otherwise directed.

COMMENTARY. *The Construction Industry Research and Information Association Report 113 [1] gives guidance on techniques of dewatering for various circumstances.*

When pumping in granular soils, particular care is necessary to avoid extracting the fine particles.

3.1.3 Plant and transport

Use only equipment which is:

a) of suitable type for the location and type of work;

b) in the charge of a competent operator;

c) maintained in good working condition.

COMMENTARY. *Plant left unattended should be properly immobilized to prevent unauthorized use or tampering.*

The correct and up-to-date documentation required by statute for each item of plant is to be made available.

3.2 Obstructions

3.2.1 Underground voids and tanks

Report any underground chambers, vaults, wells, etc. Do not enter or disturb them until checks have been completed and instructions given.

COMMENTARY. *Special care is needed when working in made-up ground on domestic waste and building debris tips, on the site of previous industrial activity or in peat-bearing soils. In any of these cases dangerous chemicals and/or gases, e.g. methane, may be present in the soil.*

3.2.2 Waterways

Temporarily divert, as necessary, ditches, field drains and other waterways encountered during excavations; reinstate them to approval on completion. Do not fill in existing ditches until diversion ditches have been excavated.

COMMENTARY. *The diversion of waterways can only take place after approval by the statutory body concerned (usually the appropriate Water Authority).*

3.2.3 Old foundations

Break out and clear away old foundations encountered within excavations and fill any resulting voids as instructed.

3.2.4 Disused manholes

Remove any disused manholes to 450 mm below the formation level and fill the void as instructed.

3.2.5 Disused drains

When disused drains are encountered during excavations, trace and excavate for them as instructed, then with approval either:

a) take them up and clear away; or

b) completely fill them with concrete; or

c) plug the ends with concrete of effective length 150 mm or equal to the diameter of pipe, whichever is the greater.

Remove any contaminated earth and fill the void, as instructed.

3.2.6 Existing services

a) Support and protect existing operating service lines exposed by excavations.

b) Report details of any unrecorded services that may be discovered and obtain instructions.

COMMENTARY. *Existing services, once identified, are to be marked on site in a manner which makes their location visible to site operatives, particularly those driving plant.*

3.3 Excavating

3.3.1 Profiles and levels

Excavate to required profiles and levels.

3.3.2 Foundation and over-site formation levels

Excavate to the formation levels required by the specification and drawings. Take out soft soil, loose rocks and other unsuitable material if found at the foundation or formation depths specified. Fill the extra excavation with concrete or suitable compacted materials as directed.

COMMENTARY. *Soft or otherwise unsuitable material may be encountered at locations not recorded in the pre-contract site investigations. It is necessary to determine its extent and depth and bring it to the attention of the specifier. The type of material for filling the extra excavation, the effect on the overall foundation design and the need for additional excavation and backfilling have to be considered.*

3.3.3 Making good

Make good all formation surfaces damaged, e.g. by weather conditions or the construction traffic. Strip the surface layer, replace it with suitable fill and then consolidate.

3.3.4 Approval of excavations

Obtain approval of the level and condition of the formation or foundation bottom, before covering them with any subsequent construction.

3.3.5 Adjacent trenches

Where foundation trenches and services trenches are adjacent, excavate the deepest trenches first.

3.3.6 Foundation bottoms

Do not excavate the last 50 mm of foundation trenches until immediately before laying concrete. Obtain instructions where a natural bearing bottom cannot be obtained at the depths required because either:

a) solid rock is encountered at a lesser depth; or

b) the ground is unsuitable for building upon; or

c) the ground is made-up.

3.3.7 Trench support

Provide adequate trench support to retain the sides of excavations and ensure the safe and proper construction of works and completion of filling (see **3.4**).

Before starting to dig, ensure that there is enough material for support available at the point of work. Fix it in such a way that no one working in the trench, not even the fixer, has to work outside a support. Fix the first support from within a protection box or from the surface level.

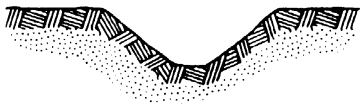
Provide support for all vertically sided trenches more than 1.2 m deep and for shallower trenches in which personnel will have to work substantially below surface level.

COMMENTARY. *Sides of trenches or other excavations can never be relied upon to stay up without support. A person can be buried even in a shallow trench. Many collapses occur soon after the trench has been excavated. It is important that no one enters an unprotected trench for any reason at all.*

If temporary excavations are to be made self-supporting by battering the sides (see Figure 1 and Figure 2), the angle of batter of the ground will normally be stable if it is in general accord with the values given in Table 1.

Further guidance is given in BS 6031 and the Construction Industry Research and Information Association Report 97 [2].

The legal requirements for the temporary support of excavations are contained in the Construction (General Provisions) Regulations, 1961 [3].



NOTE. See table 1.

Figure 1 — Battered trench

Table 1 — Guidance on steepest angles of batter for different soils

Type of ground	Angle of slope from the horizontal as shown in Figure 1 and Figure 2	
	Dry site degrees	**Wet size** degrees
Boulders	35 to 45	30 to 40
Cobbles	35 to 40	30 to 35
Gravel	30 to 40	10 to 30
Sand	30 to 35	10 to 30
Silt	20 to 40	5 to 20
Clay: soft 1.2 m to 3 m depth of cut	30 to 45	10 to 20
Clay: firm 1.2 m to 3 m depth of cut	35 to 45	20 to 25
Clay: stiff 1.2 m to 3 m depth to cut	40 to 45	25 to 35
Peat: soft non-fibrous	10 to 20	5 to 10
Peat: firm non-fibrous	15 to 25	10 to 15
Peat: firm fibrous	35 to 40	20 to 35
Peat: stiff fibrous	35 to 45	25 to 35

NOTE 1 Approximate equivalents of the angles given in this table, expressed as the relationship between the rise of a slope and the horizontal measurements are:

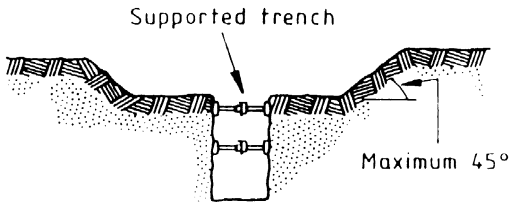
5° = 1 in 11	20° = 1 in 2.8	35° = 1 in 1.4
10° = 1 in 5.8	25° = 1 in 2.2	40° = 1 in 1.2
15° = 1 in 3.7	30° = 1 in 1.7	45° = 1 in 1

NOTE 2 The angles of slope are guide figures and are subject to:

a) temporary conditions (usually not more than 14 days);

b) experience on the site;

c) water seepage affecting the stability of slopes. Ground water flow towards the slope may be intercepted to prevent it entering the trench by the use of cut off drains or lowered by rising well points. The erosion and slumping of sand and silt slopes can be minimized by weighting with a layer of well-graded sand and gravel to act as a filter.



NOTE. See table 1.

Figure 2 — Trench with benches

3.3.8 Keeping edges of excavations clear

Keep the edges of excavation clear to prevent undue pressure on excavation sides. Place soil raised from the excavation away from the edges to avoid overloading the sides of the excavation and to prevent loose material falling back in. Keep building materials away from the edges. Provide barriers to prevent vehicles and their loads endangering the edges of excavations (see Figure 4).

COMMENTARY. *It is essential that spoil heaps, building materials and vehicles be kept at a distance of more than the trench depth away from the trench, depending upon the soil and the weather conditions.*

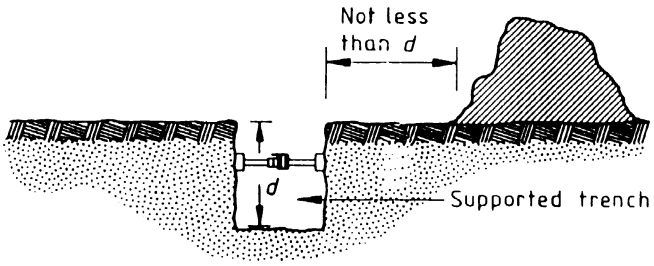


Figure 3 — Spoil heaps and edges of excavations

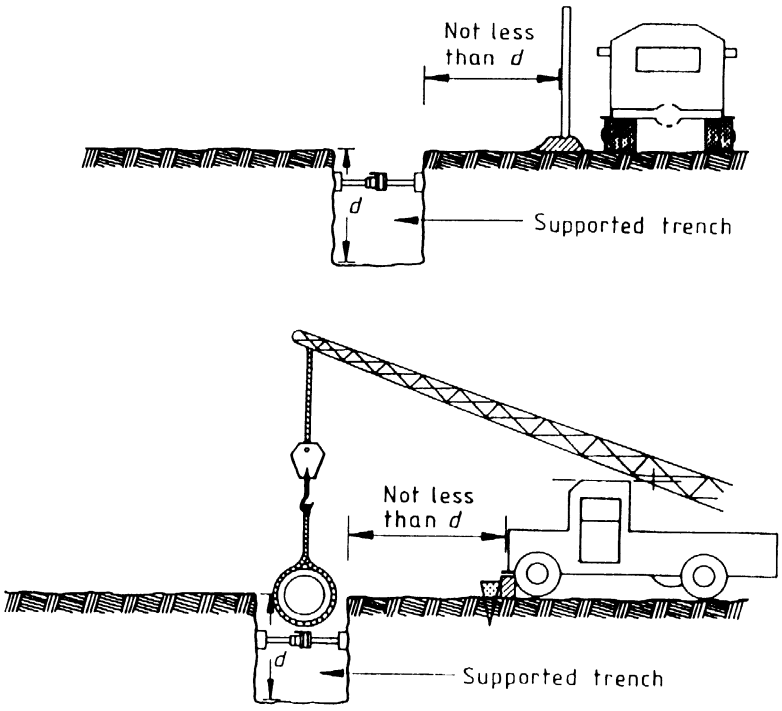


Figure 4 — Barriers for vehicles

3.4 Filling

3.4.1 General

Obtain full instructions on the following:

a) the material to be used for filling;

b) the optimum water content required in the filling material;

c) the depth of layers;

d) the method of compacting the layers;

e) the programme for the filling operation;

f) the testing procedure and programme.

COMMENTARY. *It is particularly important to achieve the maximum density in filling where the fill is to support construction work.*

3.4.2 Filling providing support to structure

Spread and compact the filling to finished levels in layers approximately one third thicker than the maximum nominal particle size of the fill. Compact each layer to the specified density or by the specified number of passes of the specified compaction plant. Ensure that the compacted fill is suitable to provide permanent support to completed work.

3.4.3 Hardcore filling providing support to structure

Spread and compact hardcore filling to finished levels in layers not exceeding 150 mm thick with suitable mechanical compacting plant of specified weight. Where necessary add screenings of the same material to even out local imperfections of level and fill surface voids. Continue compaction until there are no visible signs of the fill being pushed up in front of the compacting plant, surface voids are full and the surface is relatively smooth and even.

3.4.4 Soil filling to make up site levels to ground not providing support

Spread but do not compact filling material, allow for settlement and make good any deficiencies. Make up levels for landscaping with approved sub-soil free from extraneous matter and consolidate up to the following depths below finished levels:

a) grass areas: 100 mm;

b) ground cover and herbaceous planting areas: 250 mm;

c) shrub planting areas and hedge lines: 400 mm;

d) within 2 000 mm of any tree planting: 600 mm.

3.4.5 Frozen materials

Do not use frozen materials for filling excavations and do not place fill material on frozen ground.

Index

List of references (see 1.2)

Normative references

BSI standards publications
BRITISH STANDARDS INSTITUTION, London

BS 6031:1981, *Code of practice for earthworks.*
BS 6100, *Glossary of building and civil engineering terms.*
BS 6100-1, *General and miscellaneous.*
BS 6100-1.0:1984, *General.*
BS 6100-2, *Civil engineering.*
BS 6100-2.2, *Substructures, earthworks, foundations, tunnels.*
BS 6100-2.2.2, *Substructures and foundations*[2)].

Informative references

BSI standards publications
BRITISH STANDARDS INSTITUTION, London

BS 8000, *Worksmanship on building sites.*
BS 8000-2, *Code of practice for concrete work*[2)].
BS 8000-3:1989, *Code of practice for masonry.*
BS 8000-4:1989, *Code of practice for waterproofing.*
BS 8000-5, *Code of practice for carpentry, joinery and general fixings*[2)].
BS 8000-6, *Code of practice for roof, slate, tile covering and cladding*[2)].
BS 8000-7, *Code of practice for glazing*[2)].
BS 8000-8:1989, *Code of practice for plasterboard partitions and dry linings.*
BS 8000-9:1989, *Code of practice for cement/sand floor screeds and concrete floor toppings.*
BS 8000-10:1989, *Code of practice for plastering and rendering.*
BS 8000-11, *Code of practice for wall and floor tiling.*
BS 8000-11.1:1989, *Ceramic tiles, terrazzo tiles and mosaics.*
BS 8000-11.2, *Natural stone*[2)].
BS 8000-12:1989, *Code of practice for decorative wallcoverings and painting.*
BS 8000-13:1989, *Code of practice for above ground drainage and sanitary appliances.*
BS 8000-14:1989, *Code of practice for below ground drainage.*
BS 8000-15, *Code of practice for hot and cold water services (domestic scale)*[2)].

Other references

[1] CONSTRUCTION INDUSTRY RESEARCH AND INFORMATION ASSOCIATION. *CIRIA Report 113: Trenching Practice.*[3)] 1983

[2] CONSTRUCTION INDUSTRY RESEARCH AND INFORMATION ASSOCIATION. *CIRIA Report 97: Control of ground water for temporary works.*[3)]

[3] GREAT BRITAIN. The Construction (General Provisions) Regulations 1961. London: HMSO.

[2)] In preparation.

[3)] Obtainable from CIRIA, 6 Storey's Gate London SWIP 3AU.

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