

Workmanship on building sites —

Part 3: Code of practice for masonry

ICS 91.200

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Committees responsible for this British Standard

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- Autoclaved Aerated Concrete Products Association
- Brick Development Association
- British Ceramic Research Ltd.
- British Masonry Society
- British Precast Concrete Federation
- Construction Confederation
- Concrete Block Association
- Department of the Environment, Transport and the Regions represented by the Building Research Establishment
- Department of the Environment, Transport and the Regions Construction Services Directorate
- Institution of Civil Engineers
- Institution of Structural Engineers
- National House Building Council
- Royal Institution of British Architects

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Foreword

This part of BS 8000 has been prepared by Subcommittee B/525/6, Use of masonry. It makes recommendations and gives guidance on basic workmanship for conventional types of building work. It supersedes BS 8000-3:1989 which is withdrawn.

The recommendations given are not fully comprehensive as particular project documents, e.g. project specifications, may need to cover particular recommendations not dealt with by this standard. This standard may not be applicable to the use of some proprietary systems¹⁾.

BS 8000-3 is unique in that it draws together recommendations given in other British Standards.

The purpose of BS 8000-3 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 designers' requirements for workmanship may be satisfactorily realized.
- d) Guidance on 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.
- f) The recognition that design, procurement and project information should be conducive to good workmanship on site.

During the preparation of BS 8000-3 the Building Industry's Co-ordinating Committee for Project Information (CCPI²⁾), produced a Common Arrangement of Work Sections (CAWS) for building work. BS 8000-3 has been drafted in accordance with this CAWS so that it can be used easily with project specifications and bills of quantities using the CAWS. Other major documents are being restructured in accordance with the CAWS.

¹⁾ The user's attention is drawn to the need to follow any relevant Technical Approval.

²⁾ 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.

BS 8000 is published in 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 slating and tiling of roofs and claddings;*
- *Part 7: Code of practice for glazing;*
- *Part 8: Code of practice for plasterboard partitions and dry linings;*
- *Part 9: Cementitious levelling screeds and wearing screeds — Code of practice;*
- *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);*
- *Part 16: Code of practice for sealing joints in buildings using sealants.*

The content of BS 8000-3 is based on and is consistent with that of BS 5628 and BS 8215. However, BS 5628 and BS 8215 cover the subject matter more comprehensively and include design, materials and other related aspects in addition to workmanship on site. The user's attention is also drawn to [1].

In this standard a commentary on the relevant principles accompanies the recommendations that are made. The commentary is intended to provide further guidance.

NOTE Commentary text is printed in italics.

As a code of practice BS 8000-3 takes the form of guidance and recommendations. It should not be quoted as though it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

This standard was drafted on the assumption that the execution of its recommendations is entrusted to appropriately qualified and competent people.

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 26, an inside back cover and a back cover.

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1 Scope

BS 8000-3 gives recommendations for basic workmanship in relation to masonry but does not specifically address health and safety issues.

For design aspects of masonry, the user is referred to BS 5628.

BS 8000-3 does not necessarily cover the use of proprietary systems. The user is referred to the particular recommendations of any technical approval in this case.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 5628-3:2001, *Code of practice for use of masonry — Part 3: Materials and components, design and workmanship*.

BS 8000-2, *Workmanship on building sites — Part 2: Code of practice for concrete work*.

3 Definitions

For the purpose of this part of BS 8000, the definitions given in BS 5628-3 apply.

NOTE Other associated definitions which may be of use to the user of this standard can be found in BS 6100-1 and -5.

4 Materials, handling and preparation

4.1 Checking, handling and site storage of materials and components

4.1.1 General

Keep the site clean and tidy to ensure that checking, handling and storage of materials and components can be carried out speedily and effectively.

4.1.2 Checking

Check delivery tickets and certificates against the specification. Examine marks, labels and the condition of materials and components and report any discrepancies to the supplier immediately. Check masonry units that are delivered wrapped or banded, at the time of delivery.

In particular check that:

- a) materials and components are clean and are not damaged or unduly wet;
- b) the colour and texture of facing masonry units match the agreed reference panels;
- c) that there is continuity in the supply of materials and components, and particularly of sand and cement from the same source and of materials for the approved mortar mixes and facing work;
- d) sand is visually clean.

COMMENTARY. *The condition of masonry units at the time of delivery can impose requirements on site before use (see 4.2.2). Testing and/or certification may be called for by the specifier.*

It is desirable that colour differences between consignments of masonry units do not result in banding or patchiness of colour in finished walling. Distributing units from different packs throughout the site helps to blend units of different colour within the consignment. Ascertaining in advance whether the manufacturer can blend the units in their factory is useful. Where several consignments will be delivered to site over a long period of time, blending on site may not solve the problem of colour variation between consignments. It is worthwhile identifying the problem before deliveries begin and consulting the manufacturer.

Sands and cement supplied from different sources can give rise to colour variations in the mortar. This can significantly affect the appearance of walling.

4.1.3 Handling and site storage

4.1.3.1 General

The manufacturers' recommendations for handling and site storage of materials should be followed.

4.1.3.2 Masonry units

Unload masonry units with care, either by machine or by hand, to minimize soiling, chipping and breakage. Handle prepacked masonry units with wrapping and banding in place unless it is not practical to do so. Use mechanical handling equipment where practicable.

Protect the stacks from rain and frost, and from soiling from the ground and passing traffic. Protect the bottom of the stack from becoming wet from ground moisture.

Stack unwrapped masonry units in such a manner as to allow free circulation of air.

COMMENTARY. If masonry units are too wet they can be difficult to lay and the finished work can develop efflorescence or leaching from the joints causing white stains. The risk of unacceptable shrinkage cracking, particularly with concrete block masonry and calcium silicate brick masonry, is greater when units have been wetted unnecessarily because of lack of protection.

4.1.3.3 Stone

Deliver the stone from the yard to a suitable off-loading facility on site, and in the fixing sequence. Stack clear of the ground on battens to prevent contamination from moisture and soluble salts in the earth. In wintry weather take precautions to prevent damage to the stones from the freezing of rainwater or residual quarry-sap by covering with tarpaulins or polyethylene sheet over straw, hessian or other suitable insulating materials, which contain nothing that might damage or stain the stone. Protect against staining from other building materials, particularly hardwoods, oils and fuels.

4.1.3.4 Ancillary components

Handle all ancillary components, e.g. lintels, flue linings, tiles, cavity closers and edge trims with care to avoid cracking, damage to edges, damage to surfaces and coatings, distortion and soiling.

Stack lintels and copings of precast concrete and pressed metal on level bearers so that they are clear of the ground. Cover the stacks, to protect them from staining and splashing of mud, and follow any additional advice in the manufacturer's recommendations.

Store metal and plastics components, e.g. wall ties, straps, etc. under cover and protect from damage and distortion.

4.1.3.5 Bags of cement and hydrated lime and dry prepacked cementitious mortar mixes

Where materials are to be stored for later use, store:

- a) in a dry, frost-free, enclosed shed or building with a dry floor. If the floor is concrete, upon a timber platform;
- b) with different materials in separate stacks;
- c) with bags stacked away from walls, not more than eight high, and covered with a tarpaulin or polyethylene sheet;
- d) in an arrangement so that consignments can be used in the order of delivery.

Keep cement stored on site to a practical minimum. Check materials for deterioration when taken out of storage and discard if lumpy.

Stack small quantities of cement and hydrated lime intended for immediate use, if not stored in a shed or building, on a timber platform, well clear of the ground. Cover with a tarpaulin or a polyethylene sheet so that all the bags are protected from wind and rain.

Arrange deliveries so that the materials do not arrive at site too early and that excessively large quantities are not delivered at one time.

COMMENTARY. Even if materials are protected from rain, moisture in the air will gradually cause deterioration. Even in fair weather-conditions cement eventually goes lumpy and gives a lower strength.

4.1.3.6 Cement in bulk

Store cement delivered in bulk in a proper cement silo, in accordance with BS 8000-2.

4.1.3.7 Sand, aggregates and mortars

Store different sands, aggregates and lime–sand mixes in different stockpiles on hard clean bases which permit free drainage. Avoid intermix and contamination from other building materials, debris or other deleterious material.

Store factory produced premixed lime–sand for mortars on a clean hard impervious surface and cover to prevent excessive drying out, wetting and loss of fine particles of lime and pigments.

Store factory produced ready-to-use retarded mortars in covered containers to prevent excessive drying out or wetting.

Cover all sands and mortars and protect from freezing during frosty weather.

Do not store retarded ready-to-use mortars for longer than the manufacturer's quoted periods of retardation.

4.1.3.8 Damp-proof course (DPC) materials

Store DPC materials in the dry, under cover, and protected against damage. In addition, follow these recommendations for flexible materials.

- a) Stand rolls on their ends to form a stable stack not more than three packs or more than 1 m high.
- b) Keep bitumen and other thermoplastic materials away from any direct heat source.
- c) Store sufficient rolls for the next day's use in a warm place prior to use, since some DPC materials can become stiff in cold weather conditions.
- d) Check all labels on adhesives for any particular storage recommendations, e.g. avoidance of high or low temperature, and for any hazards relating to solvent vapours.

4.1.3.9 Thermal insulation materials

Store thermal insulation materials in the dry, under cover, and protected against damage. Follow the manufacturer's recommendations for storage and handling.

4.2 Preparation of work, materials and components**4.2.1 General****4.2.1.1 Distributed components and materials**

Where materials and components are distributed to the work position ensure that:

- a) neither the structure nor the access scaffolding are overloaded;
- b) the components and materials are protected to prevent damage or deterioration before use.

4.2.1.2 Setting out building

Set out masonry relative to securely marked or pegged reference lines and datum levels using appropriate serviceable equipment. Squareness should be checked with diagonal measurements or a builder's square. Securely fix any datum and profile marks. Leave datum level points in position so that a gauge rod can be used for coursing other heights such as openings, storeys and string courses (see 5.1.2).

4.2.1.3 Horizontal setting out

Anticipate the position of openings, etc. in the starting course prior to carrying out work to avoid unnecessary cutting and adjustment of masonry units at a later stage which can lead to incorrect or uneven bonding (see 5.1.3).

4.2.2 Masonry units

4.2.2.1 General

Protect units from rain. Where appropriate allow newly manufactured units to cool before being used.

4.2.2.2 Clay masonry units

In dry warm weather wet the surfaces of very absorbent clay masonry units sufficiently to reduce suction, but without over-wetting.

COMMENTARY. *Low water absorption units such as engineering bricks should not be wetted as they can slide on the mortar. Over-wetting of any bricks can cause efflorescence or lime staining.*

4.2.2.3 Calcium silicate masonry units

To achieve better adhesion and laying of calcium silicate masonry units in dry warm weather adjust the consistency of the mortar. Alternatively, the surfaces to be bedded can be wetted just sufficiently to reduce the suction by briefly dipping in water.

COMMENTARY. *Over-wetting of calcium silicate units prior to laying should be avoided in order to minimize the shrinkage of the built masonry when it dries.*

4.2.2.4 Concrete masonry units

Do not wet concrete masonry units before laying. Where necessary adjust the consistency of the mortar to suit the suction rate of the units.

4.2.2.5 Stone masonry units

Check that stone masonry units as delivered are of proper dimensions and will work-in satisfactorily. Check the positions of the main features, such as quoins, door jambs, etc., and prepare a marked off gauge-lath, making allowance for the joints. In intricate work lay a trial assembly of stones dry for the first two courses to check bonding and jointing.

4.2.3 Preparation of mortar mixes

4.2.3.1 Gauging

When mortar is gauged by volume use a gauge box, bucket, or similar standard container for each material. Use containers of a size to be completely filled to proportion each batch. When cement is supplied in bags it is preferable to use whole bags of cement for any one mix.

COMMENTARY. *Gauging volumes by the shovelful cannot be relied upon to give sufficiently accurate mix proportions, e.g. the volume of material in a shovelful of free flowing cement is approximately half the volume of material in a shovelful of damp cohesive sand. If mortar materials are not properly proportioned, this will lead to variations in the colour, strength and durability characteristics of the mortar.*

4.2.3.2 Admixtures

Do not use admixtures except where specified by the designer. Where this is the case, follow the manufacturer's recommendations.

COMMENTARY. *Calcium chloride added to mortar can lead to corrosion of embedded metal.*

4.2.3.3 Pigments

Unless otherwise specified do not use more than 10 % pigment or not more than 3 % in the case of carbon black, of the cement mass, in coloured mortar mixes. Proportions should be consistent from batch to batch of mortar.

COMMENTARY. *It is not practicable to proportion accurately on site unless all materials are batched by weight. Inaccuracies can lead to colour variation. It is preferable to use ready-mixed pigmented material. Proportioning small quantities of mortars on site is particularly difficult.*

4.2.3.4 Mixing method

Mix mortar by machine except in the case of small quantities of mortars not containing plasticizers (see 4.2.3.2). Do not load a mixer to more than its rated capacity. Hand-mix mortar on a clean watertight platform.

4.2.3.5 *Mixing sequence*

Where mixing by machine, load about three-quarters of the sand or premixed lime–sand mixtures and water. While mixing, gradually add lime and/or cement and continue mixing. Load the remainder of sand or pre-mixed lime–sand mixtures and further water to achieve required workability. Alternatively, add half the water to the mixer followed by all the cement and all the sand in that order. Add the final quantity of water to achieve the correct workability.

Where mixing by hand, mix the cement (and lime, if used) with sand before adding water until the colour is consistent. Add and thoroughly mix about three-quarters of the required amount of water. Then add further water and mix to achieve the required workability.

4.2.3.6 *Mixing time*

Continue mixing long enough to obtain a uniform consistency and colour from the ingredients.

COMMENTARY. *In general, a machine mixing time of 3 min to 5 min after all the constituents have been added should be sufficient. Wide variation in the mixing time of different batches should be avoided. Prolonged mixing where air-entraining plasticizers are used can lead to excessive air entrainment and thus to a reduction in strength, adhesion and durability.*

4.2.3.7 *Setting time of mortars containing cement*

Use cement based mortars, other than retarded mortars, within 2 h of mixing. Discard any unused mortar (see also 5.1.1.1).

COMMENTARY. *If workability is reduced due to water loss by evaporation the mortar can be re-tempered within a maximum of 2 h by the addition of a small amount of water. Retarded mortars can be re-tempered but only within the manufacturer's stated retardation time. In hot weather the prescribed retardation time may be shortened.*

4.2.3.8 *Mixing in cold weather*

Do not mix mortar when the air temperature is at or below 3 °C and falling or below 1 °C and rising. Do not use sand or lime–sand mixtures containing ice particles (see also 5.1.1.1).

4.2.3.9 *Care of mixing plant*

Clean the mixer at least once a day and whenever mixes are changed. If the mixer has a weighing mechanism check it regularly in accordance with the manufacturer's site work instructions to ensure constant accuracy.

COMMENTARY. *Cleaning the mixer is particularly important when changing from or to coloured mortars.*

4.2.3.10 *Mix proportions*

Use the specified mix proportions.

COMMENTARY. *Mortar mixes may be specified by the Designations given in Table 1. Mixes of the same Designation have approximately equivalent strength and durability.*