

Code of practice for cleaning and surface repair of buildings —

Part 1: Cleaning of natural stones, brick, terracotta and concrete

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/209, General building codes to Technical Subcommittee B/209/7, Cleaning and surface repair of buildings, upon which the following bodies were represented:

- Chartered Institute of Building
- Construction Confederation
- Department of the Environment, Transport and the Regions — Construction Directorate
- National Council of Building Material Producers
- National House-Building Council
- Royal Institute of British Architects
- Royal Institution of Chartered Surveyors

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Brick Development Association
- British Ceramic Research Ltd.
- Concrete Society
- Council for Aluminium in Building
- Council for the Care of Churches
- Department of the Environment, Transport and the Regions — Represented by the Building Research Establishment
- Ecclesiastical Architects and Surveyors Association
- English Heritage
- Historic Scotland
- London Transport
- Mortar Producers Association Limited
- National Grp Construction and Engineering Federation
- Society for Protection of Ancient Buildings
- Stone Federation
- UK Steel Association

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Foreword

This British Standard has been prepared by Subcommittee B/209/7. Together with Part 2, it supersedes BS 6270-1:1982 and BS 6270-2:1985, which are withdrawn.

This part of BS 8221 gives guidance on selection and application of cleaning methods for external facades of buildings. It has been prepared in parallel with BS 8221-2, which provides guidance on surface repairs.

This code of practice covers removal of deposits, including graffiti, from the surface of natural stones, clay brick, calcium silicate brick, glazed and unglazed terracotta/faience, and concrete products for building. Guidance is given on the characteristics of deposits and susceptibilities of substrates to various cleaning materials and processes, and a procedure is given for carrying out investigations into suitable and safe cleaning. Consideration is given to some problems that may be encountered.

This code of practice takes the form of guidance and recommendations. It should not be quoted as if it were a specification and care should be taken to ensure that claims of compliance are not misleading.

WARNING This British Standard calls for the use of substances and/or procedures that may be injurious to health or damaging to the environment, if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 20, an inside back cover and a back cover.

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Introduction

This code of practice is intended to give building owners, architects, surveyors, engineers, and contractors general information on cleaning.

Buildings are cleaned either to enhance their appearance or to assist maintenance and/or conservation. Reasons for wanting to enhance appearance include:

- removal of disfigurements (e.g. stains, graffiti);
- revealing the nature, colour or details of a building;
- unification of the appearance of a building that has been altered, extended or repaired.

Reasons for cleaning a building prior to maintenance and/or conservation include:

- removal of harmful or undesirable deposits or applied materials from the fabric in order to arrest decay;
- exposure of concealed defects, where surfaces are very thickly soiled, in order to establish the extent and nature of repairs required;
- preparation of a surface for additional treatments;
- to fulfil the terms of a lease that requires periodic cleaning of a building.

Buildings have a variety of surfaces and materials and types of soiling. Each should be cleaned with appropriate methods and materials. It is essential to identify, in advance, the type, properties, and condition of masonry (in particular, whether limestone or sandstone) and jointing materials.

NOTE If features of artistic or historic importance are to be cleaned, specialist guidance should be sought.

Each project should be considered carefully, taking into account previous experience with the building (or similar buildings) and available materials and methods. If treatment of one material or surface can harm other materials or surfaces, proper protection should be provided.

1 Scope

This standard provides guidance on removal or partial removal of deposits from the original surface or substrate of a building.

Advice is given on the principal cleaning methods in use and the characteristics of surface deposits. Guidance is given on cleaning natural stones, clay brick, calcium silicate brick, glazed and unglazed terracotta/faience, and cast concrete and concrete products such as cast stone, concrete brick and concrete blockwork.

2 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions 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 1139 (all parts), *Metal scaffolding*.

BS 2482:1981, *Specification for timber scaffold boards*.

BS 3761:1995, *Specification for solvent-based paint remover*.

BS 5973:1993, *Code of practice for access and working scaffolds and special scaffold structures in steel*.

BS 6037:1990, *Code of practice for permanently installed suspended access equipment*.

BS 6100-5, *Glossary of building and civil engineering terms — Masonry*.

BS 6100-6, *Glossary of building and civil engineering terms — Concrete and plaster*.

BS 8221-2, *Code of practice for cleaning and surface repair of buildings — Surface repair of natural stones, brick and terracotta*.

3 Definitions

For the purposes of this code of practice, the definitions given in BS 6100-5 and -6 apply, together with the following.

3.1

Coade stone

proprietary off-white terracotta body produced from a kaolinitic clay, containing titanium dioxide, feldspar as flux and quartz as glass-forming agent, and a grog of powdered pre-fired clay

NOTE Coade stone was manufactured by the Coade family between 1769 and 1820.

3.2

conservation

stabilizing and preventing or retarding deterioration of masonry

3.3

cleaning

removal or partial removal of surface deposits (e.g. grease, organic growth, paint, stains) and mineral deposits that chemically combine with the surface (iron and carbon deposits, gypsum skins, etc.)

3.4

crazing

fine, hair-line stress relief cracks caused by inability of a glazed surface and underbody to accommodate thermal and moisture movement

NOTE Crazing is also known as poor glaze fit

3.5**engobe**

surface application by brush or spray of liquid clay, before firing, to provide an opaque, unglazed coloured finish on some forms of terracotta

3.6**faience**

masonry, similar to terracotta, with some surfaces covered with a clear or coloured glaze

3.7**fired-clay unit**

masonry unit formed from brick-earth, clay or shale, dried and burned

NOTE Fired-clay should not be confused with fireclay, which is used for making refractory bricks.

3.8**fireskin**

thin, smooth, outer layer on unglazed terracotta, containing a high proportion of fines

NOTE In traditional firing processes, fireskin is vitrified to a greater degree than the body of the clay beneath. Fireskin is protective and retention of it should be a priority in cleaning and repair works.

3.9**glaze**

mixed paste of fluxes and colouring ingredients that, applied to a surface and fired, fuses with the open-pored underbody to form a thin, vitreous, transparent, or coloured coating of glassy, opaque or translucent consistency

NOTE Glazes can be plain, mottled or textured and can range from high-gloss to egg-shell finish. Craze resistance should conform to BS 6431-17.

3.10**terracotta**

fired clay, fine textured and unglazed, usually yellow to brownish-red

4 Considerations affecting external cleaning decisions

4.1 General

The following should be understood prior to carrying out a cleaning programme:

- a) the type and properties of masonry and jointing material;
- b) the condition of the masonry units and joints;
- c) the types, extent and nature of surface deposits;
- d) the susceptibility of substrates to various cleaning materials and processes.

All cleaning operations present different criteria to consider, including a suitable method, the materials of construction, and their condition. Previous experience with a building or similar buildings may be useful but should not be assumed to apply fully.

It should be recognized that some deposits are not fully removable from surfaces without causing damage. Residual or uneven marks can remain, but should not be mistaken for poor quality cleaning.

Apart from cost, the factors listed in Table 1 should be considered prior to selecting a cleaning programme.

4.2 Inspection and identification of substrate

A comprehensive survey should be carried out, in the presence of advisors with expertise in the type of building, before cleaning a masonry facade. The nature and condition of masonry materials and the types of surface deposits should be assessed before an appropriate cleaning method can be decided.

Masonry facades should be inspected closely using the following procedure.

- Each material should be identified in sufficient detail so that cleaning can proceed without risk to the fabric.
- The condition of the masonry and its joints and associated materials should be assessed and recorded, as well as the effects of previous cleaning operations.
- The extent and nature of surface deposits should be identified.

Tests to identify a stone type for susceptibility to various cleaning processes and the effects of deposits should be carried out if appropriate.

4.3 Identification of surface deposits

Deposits on external facades of buildings can vary from a few microns to as much as 50 mm in thickness and cleaning may involve removal of one or more of the following deposits:

- a) atmospheric particulates, often bound together as well as to the masonry surface with either calcium sulfate or silica, depending on the substrate;
- b) mortar splashes and runs;
- c) encrustations of calcium carbonate from lime-rich masonry;
- d) efflorescent salts;
- e) bird fouling;
- f) paint and graffiti;
- g) anti-pigeon gel;
- h) heavy and light oils;
- i) biological growth;
- j) metallic stains.

It is essential at the investigation stage to distinguish between the layer of soiling and the altered surface of the substrate, so that the level of cleaning can be decided.

Table 1 — Factors affecting choice of cleaning method

Factor	Remarks
Type and condition of surface	Extent of deterioration, nature of joints, extent of ornamentation and other surfaces should be considered
Type and condition of material	Stonework (see clause 5); clay and calcium silicate brickwork (see clause 6); terracotta and faience (see clause 7); and concrete (see clause 8) should be identified
Amount and type of deposits	See clause 9
Construction	ab
Type and use of building	cd
Location of building	efghi
Health and safety risk assessment	jk
Environmental assessment	ek
Availability of services	See 4.11
Weather conditions	l
Interior work	Additional protective measures should be taken to contain the effect of cleaning processes

^a Some buildings may contain embedded ferrous cramps or steel frame supports. These may require cleaning that restricts or eliminates water use.

^b Mortar in joints can entrap and be dissolved by cleaning chemicals, or can be eroded by abrasives.

^c Buildings of architectural or historic interest require special consideration and permission may be required to clean these.

^d The use or contents of a building may limit the cleaning process or add to preparatory and support measures.

^e The proximity of a building to vegetation and waterways and the position of the water table may prevent use of certain chemical agents. Biodegradable proprietary products should be used. Alternatively, special collection or containment measures can be required.

^f The height and position of a building can make water, abrasive or chemical use hazardous, particularly in very windy conditions.

^g The position, use and condition of adjoining buildings (especially listed buildings) can affect selection of a cleaning method.

^h Noise nuisance can restrict working methods or times.

ⁱ Dust nuisance can affect selection of a cleaning method.

^j Health and safety considerations may restrict use of certain processes.

^k Lead-based and other toxic paint residues and spent chemical poultice should be collected for disposal at toxic waste sites. Consent to discharge waste water from chemical cleaning and from other wet processes may be required from the local authority or the local water authority.

^l Certain cleaning processes are restricted in cold weather (see 4.12).

4.4 Documentation

Records should be kept of buildings and cleaning operations, including:

- photographs of the building showing its condition and appearance before cleaning is carried out; and/or
- drawings of deposit patterns, thicknesses, the nature of deposits, and condition of masonry.

NOTE Photogrammetry or rectified photography can be used for complex cleaning programmes.

Work schedules should be used.

4.5 Selection of cleaning method

Following assessment of the masonry, an appropriate cleaning process should be selected.

NOTE 1 A cleaning process can involve multiple applications of one system or several removal systems, with procedures specified in the main contract.

Trials should be carried out so that a detailed cleaning procedure can be specified.

NOTE 2 Commonly used cleaning methods are described in clause 10.

4.6 Trial cleaning areas

A trial area should be cleaned to determine:

- the suitability of the cleaning method for the masonry, its condition, and the surface deposits;
- the standard of cleaning that can be achieved, and its acceptability.

Cleaning processes should be pretested on materials, surfaces and deposits representative of the whole building. If possible, test areas should be located in unobtrusive locations. Test areas should be small in case it is decided not to clean.

A detailed record should be kept of trial cleaning and the location of trial areas. Trial cleaning should be observed and assessed by persons responsible for preparing the cleaning specification. Trial areas should be available for inspection by relevant authorities.

If possible, trial cleaning should be agreed in a separate pre-contract, and carried out by trained and experienced specialists conversant in a variety of cleaning systems.

4.7 Assessment of trial areas

Trial areas should be assessed wet and dry. Full assessment should include:

- a) potential damage to the fabric as a result of cleaning;
- b) colour changes resulting from the cleaning process;

NOTE 1 It can take several weeks for colour changes to become apparent in some stones.

NOTE 2 A colorimeter should be used to make accurate colour comparison between test areas not immediately adjacent to each other, or at different points in time.

- c) the probable appearance of the facade after cleaning;
- d) the probability and time span of deposits returning to the cleaned facade;
- e) an estimate of periodic recleaning operations and the effects of these on the building.

4.8 Specification

After an assessment has been carried out and documented, a detailed specification for the work should be prepared. Specifications for cleaning should be integrated with specifications for surface repair.

NOTE Certain aspects of repair work relating to prevention of water penetration may be required prior to cleaning.

4.9 Selection of a specialist contractor

The competency of the contractor and the skilled operatives assigned to carry out proposed work should be established. Works supervisors should have a full working knowledge of the materials and cleaning processes, since any cleaning method involves potential damage to the fabric of the building.

4.10 Records

All cleaning of masonry facades should be recorded as executed. Documents should be retained to provide background information prior to further assessments or work.

4.11 Use of scaffolding

Scaffolding should be erected in accordance with BS 5973, BS 1139-1 to -5, and BS 2482. If permanently installed suspended access equipment is used, guidance should be obtained from BS 6037.

Means of access should be suitable for the cleaning operation. Particular attention should be paid to:

- a) tying-in to avoid or reduce damage to the faces of masonry units;
- b) avoiding physical damage during erection and striking;
- c) use of base plates to isolate stones or other surfaces from scaffold standards;
- d) avoiding rust staining of the building;
- e) capping pole ends if chemicals are used.

4.12 Availability of services

Before choosing a cleaning method, the water supply, drainage, and electricity supply should be examined to ensure they are satisfactory.

Only mains quality water should be used. Water should not deposit or cause stains.

NOTE Non-ferrous, non-corroding pipes, fittings, nozzles, booms, etc., may be required to avoid staining.

Temporary catchments and gutters should be provided, if required, to remove large amounts of water from the building and to avoid over-saturation at lower levels.

4.13 Weather conditions

Wet cleaning methods should be suspended, or suitable protection provided, if there is a risk of freezing of the building fabric.

4.14 Protection of buildings and surroundings

Protection and preliminary works requirements for the building should be considered prior to carrying out cleaning work.

Before cleaning, it is essential to temporarily seal any fractures or open joints, including around windows, to prevent entry of cleaning agents (non-staining, readily removable materials, such as foam rods, silicon, or temporary pointing, may be used). Repointing should be carried out if required.

Glazing and window frames should be protected with plastics and tape.

NOTE More durable protection (e.g. purpose-made plywood sheets) may be required to protect stained glass.

Electricity to external signs should be disconnected and external fittings (e.g. signs and nameplates) should be removed and stored, or protected in situ. Protection should be provided for street furniture, railings, signage, meters, vents, etc.

Decorative features (e.g. balustrades, cornices and carved ornamentation) should be protected.

Cleaning areas should be sheeted in. Other masonry materials should be protected within the cleaning area if applicable. Polished granite, limestone, marble, terracotta, and faience should be protected if chemicals are used to clean sandstone or brickwork. Soft or brittle materials should be protected from adjacent abrasive cleaning.

When cleaning building interiors, special precautions may be required to protect floors, plasterwork, woodwork, and building contents (e.g. electronic equipment, monuments, organs, paintings).

4.15 Protection of building surfaces

4.15.1 Water washing

Before cleaning the exterior of a building, the building's rainwater drainage system should be inspected to ensure that it is of sufficient capacity, and free from blockages.