

The pointing of brickwork



ENGLISH HERITAGE

This leaflet outlines the development and techniques of pointing. It offers practical advice, as well as suggestions for further reading.



The difference pointing makes to a wall: this detail of two adjoining Georgian houses shows what happens when original mortar is removed. The brickwork of the house on the right has retained much of its tuck pointing and both brick and mortar have mellowed together. The brickwork on the left has undergone excessive repointing which has widened the mortar joints and created a visually discordant effect. The window arches consist of gauged red bricks with narrow mortar joints.

Introduction

The appearance of brickwork owes as much to the character of the mortar joint as to the bricks themselves. Pointing can significantly affect the look and durability of brickwork. Much unnecessary pointing is carried out, and the techniques used are often inappropriate. Poorly done, it can damage brickwork beyond repair and ruin it for ever.

- **Pointing** is the process of filling the outer part of the joints between bricks either as part of the original construction, where the joints have

been deliberately left or raked back from the surface, or as a later repair to replace original mortar which has weathered back from the face.

- **Repointing** is the refilling of the outer part of the joints where the previous pointing has weathered out or is unsuitable. A brick facade will often show signs of having been repointed at several different times.

- **Listed Building Consent** may well be needed before any repointing is carried out on a listed building. The local Conservation Officer will be able to give advice about this.

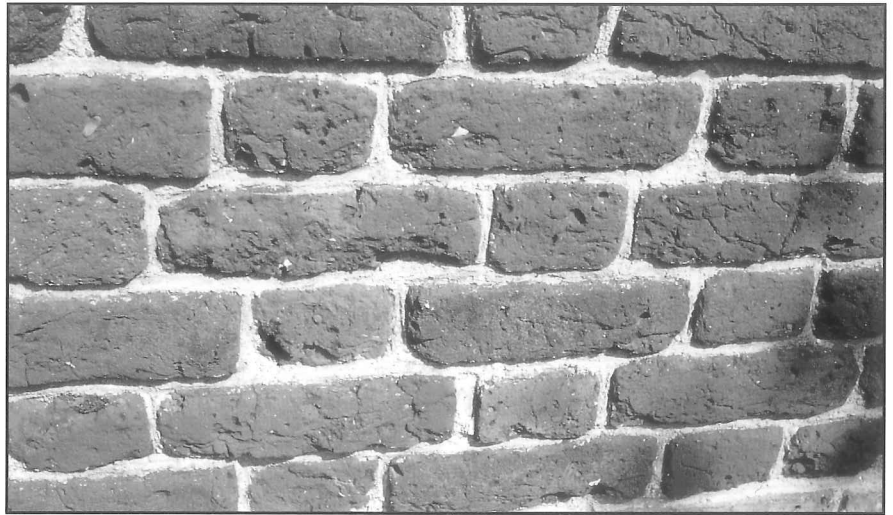
Historical background

Bricks were first used in this country during the Roman period. Before the seventeenth century bricks were generally thinner than standard modern bricks and were irregular in shape and size. As a result, mortar joints tended to be very much thicker than in more recent work: this difference must be respected.

During the seventeenth century brick construction developed rapidly and became one of England's principal building techniques. Different brick bonding patterns evolved, with regular courses of

consistently sized bricks laid with narrow mortar joints. Gauged work, with bricks accurately shaped by cutting and rubbing and laid with very narrow joints of lime putty, was increasingly used for arches and other architectural features.

Georgian and Victorian bricklayers developed a number of repointing techniques which sought to retain the neat appearance of new brickwork upon older walls: tuck pointing is the best known of these. During the nineteenth century, building technology developed to produce both denser bricks, and cement-based mortars. This resulted in the use of unsympathetic mortar finishes applied to earlier brickwork, a problem that is all too often encountered today.



A successful example of sensitive repointing: the brick retains prominence over the mortar, which is recessed back from the face of the wall. These old and fairly soft bricks have irregular arrisses which would have required an unacceptably wide mortar joint had the pointing been flush with the outer face of the bricks.

Styles of joint finish

Authentic

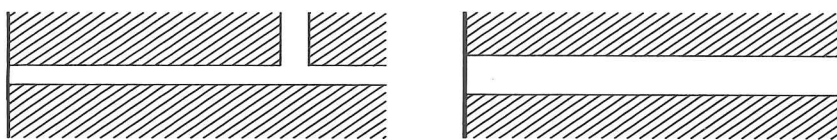
Several different styles of joint finish are found on historic brickwork. Wherever possible, efforts should be made to find a well-preserved area of original brickwork nearby and use that as a model where replacement is required.

Among the most common styles encountered are:

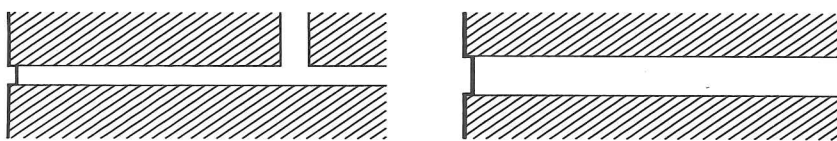
- **Flush** The outer layer of mortar lies flush with the face of the wall, without extending over the arrisses (or edges) of the bricks or spreading over their outer surface.
- **Semi-recessed** The mortar is slightly set back from the face of the brick, leaving the arrisses exposed. Commonly encountered on Georgian and Victorian brickwork, flush pointing that has weathered back can also resemble this finish.

- **Penny-struck or jointed joint** The mortar, flush with the face of the brick, is incised with a square-edged object (such as an old penny - hence the name) to the depth of 1-2 mm to form a groove running along the centre of the mortar joint. The incised lines are ruled using a pointing rule and a jointing tool. The perpends too are scored. The final result gives the effect of crisp regularity. This finish was used both as an original joint finish and in repointing.

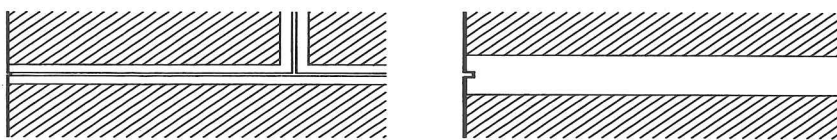
Varieties of period joint finishes



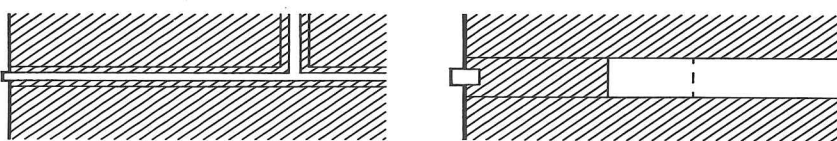
Flush pointing



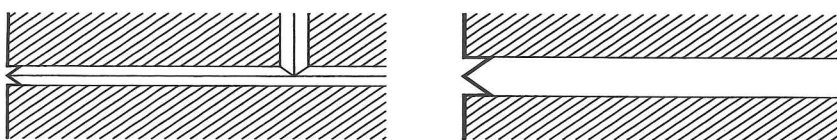
Semi-recessed



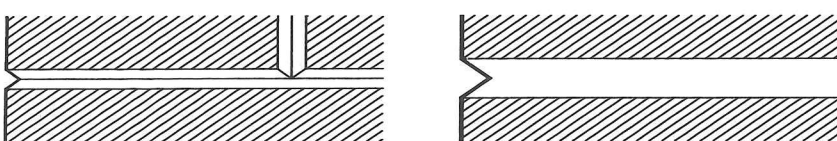
Penny-struck



Tuck pointing



Beak or double-struck



Keyed pointing



Tuck pointing: a recent London example, showing the neat strips of lime putty set into wider mortar joints to create the impression of crisp new work upon an extensively repaired wall.

- **Tuck** The most complex of all pointing techniques. This evolved in the seventeenth century as a way of emulating the expensive appearance of fine rubbed and gauged brickwork while using cheaper bricks. Facing mortar was coloured to match the brickwork which was sometimes colourwashed before pointing to give it a uniform appearance. A network of thin strips of lime putty 3-5 mm thick was then set into scored grooves within this coloured mortar and then trimmed, creating the illusion of the neat narrow pointing of gauged brickwork. Always a costly process, tuck pointing was reserved for prominent facing walls alone. It was also used to smarten up worn areas of facing brickwork. Tuck pointing is a complex technique best left to skilled specialists. However, it is encountered on many historic buildings and must be respected as part of their fabric.

- **Beak or double-struck** The mortar joint, slightly recessed, is given a V-shaped, or slightly rounded, outwardly projecting profile. Although early examples are known, repointing of this variety tends to be the result of Victorian or later work.

Several other methods are also encountered, but the styles listed are the most common authentic varieties found on historic brick facades.

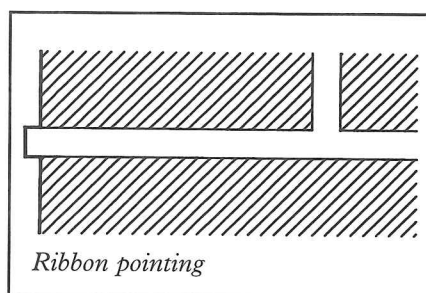
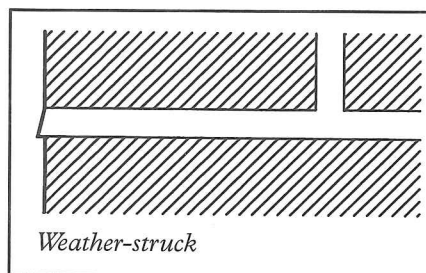
- **Keyed** The mortar is indented to form a V-shaped groove.

Inauthentic

Two modern methods should **not** be used on period brickwork:

- **Weather-struck** and **ribbon** pointing. These, unfortunately, tend to be the most commonly used techniques today but neither is suitable and their use must be resisted.

Lime-based mortars and flushed (or slightly recessed) pointing are suitable for virtually all brickwork. This applies as much to Edwardian and inter-war buildings as it does to Tudor, Stuart or Georgian ones.



Modern joint finishes unsuitable for use on historic brickwork

In all pointing there are two fundamental principles:

- **Keep the mortar subservient to the brick**
- **Use a lime-based mortar**



This Victorian building has suffered both from harsh cleaning and unsympathetic repointing. The former has eroded the surface of the bricks, creating a pitted, irregular effect which is emphasised by the thick strips of unsuitable, cement-rich ribbon pointing.

When is pointing necessary?

Mortar joints are vulnerable to weathering and a brick wall may undergo a number of repointings during its lifetime. But in many cases pointing is carried out unnecessarily and is all too often done badly. It should not be assumed that work is needed just because the existing mortar is weathered to a rough face or appears soft when probed with a tool. As a rule, pointing should be considered necessary only when

- mortar joints are truly soft, ie crumbling or loose
- mortar joints are opened or have weathered back to such an extent that water is seeping into the brickwork
- an unsuitable hard, impermeable mortar has been introduced,

trapping moisture, thereby accelerating the deterioration of the bricks and increasing their vulnerability to frost damage. However, mortar of this type should only be removed if this can be done without causing even more damage to the wall.

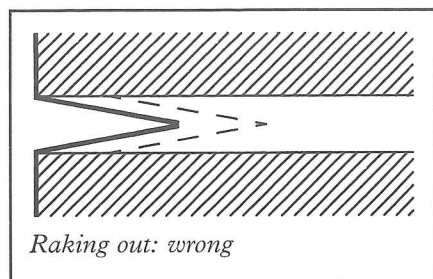
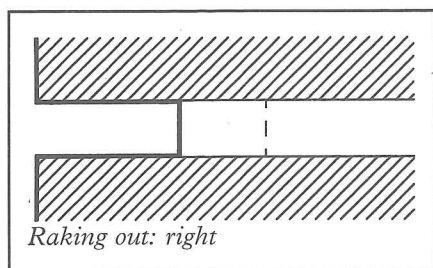
Often, repointing will only be necessary in parts: sound existing mortar should always be left alone.

Where brickwork is decaying it is important to identify the true cause so that the appropriate remedies can be selected, such as repairs to guttering and rainwater pipes where damage has been caused by leaking water.

Preparing joints for pointing

Great care must be taken to avoid damaging the arrises or widening the joints. Loose mortar can be raked out with a hooked tool. If the mortar proves resistant to raking out it may well be best to leave it alone. If it has to be cut out (as is frequently the case with recent, cement-rich mortar mixes), this will require the use of a range of tools such as **sharp** quirks or plugging chisels narrow enough to fit into the joints. Cold chisels and punches should never be used as these tend to wedge into joints causing damage to the arrises of surrounding bricks.

As a general rule joints should be



Raking out: right and wrong. It is important to clear out the joint thoroughly and remove failing mortar from the full width of the groove.



The danger of using cement-rich mortars: frost damage caused to a soft red brick. Moisture, unable to escape from the impermeable mortar, has frozen, causing the brick to spall.

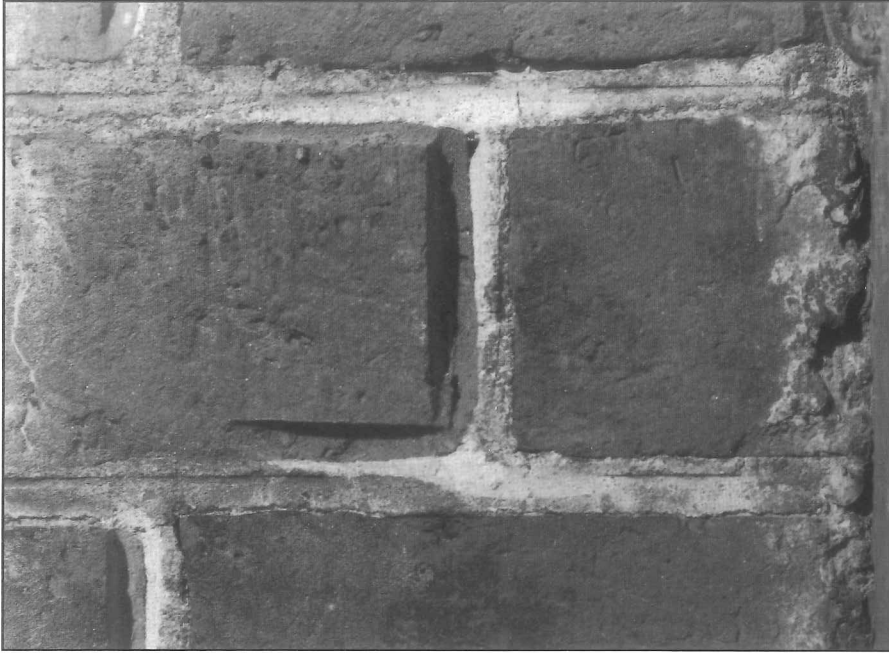


Crude replacement of a gauged window arch. Work of this low a standard deprives a building of its historical and architectural interest and lowers its value too.

raked or cut out to a depth not less than twice their width, but badly decayed mortar may need to be removed to a greater depth. Joints should be thoroughly cleared out for their full width and cut square at the back. Care should be taken to remove all traces of old mortar from

the brick surfaces within the joint.

The use of power tools, such as angle grinders, is not recommended as these do not completely remove old mortar from the joints and can easily damage the face of the bricks, especially if used on the vertical perpend. However, a thin



The danger of using power tools: the bricks have been permanently scarred by an angle grinder, making satisfactory repointing almost impossible.



Ill-considered partial pointing often has an adverse visual effect on brickwork. This early eighteenth-century example shows two areas of repair which damage the appearance of this pier. The area on the left has correctly reinstated the penny-struck finish, but the lime putty has been smeared over the arrisses so that the joints look too prominent. The repair at the bottom of the pier has greatly widened the mortar joint and ruins the distinction between the brick pier and the stone plinth.

carborundum disc, **if very carefully handled**, can be used on horizontal joints to make an initial breach in very hard mortar, which is then removed with hand tools.

Matching mortar properties and appearance

Mortar should be weaker and more porous than the brickwork in which it is placed. Whilst it is necessary to take account of the exposure to weather to which the walls are subject it is usually the nature and condition of the brickwork in old buildings that will dictate the strength of mortar required. It is also important that the joint finish is historically accurate and aesthetically appropriate to the appearance of the walling.

Replacement mortar should usually match the colour and texture of unweathered portions of the original mortar. Samples should be made, allowed to set, and their broken surface compared with that of the original mortar.

The colours of sand, and other aggregates (eg, crushed stone or brick) are important because it is these which give the mortar its overall colour. The grading (ie range of particle sizes) of the sand particles is also significant because of its effect on the properties of both fresh and hardened mortar, and its contribution to the final texture of the pointing. Pigments should not be relied upon to achieve a satisfactory colour match.

However, some brick walls of the early nineteenth century were deliberately stained black to give the impression of uniform sobriety and this effect should be respected.

Mortars coloured red or black are also encountered, particularly on nineteenth-century buildings and on tuck-pointed walls. Early repointing was sometimes dark in colour in order to blend in with already darkened brickwork.

A soot wash can help offset the patchiness of repaired brickwork and will give a uniform base colour. Commercial wash preparations are now available which perform the same function but these need to be used with caution. Mortar and washes can interact chemically,

producing unexpected results. Experimenting on a trial area first is a wise precaution. Washing down the brickwork before applying such colouring can also reduce the likelihood of adverse chemical reactions.

- **Never use paint**

Only reversible, organic colour treatments are suitable for historic brickwork.

Preparation of mortar mix

Much damage to brickwork is caused by the use of cement-rich mortar. Lime-based mortars are preferable because their elasticity can yield to slight structural movements (whereas a cement-rich mortar would crack) and their porosity allows the wall to 'breathe'.

Lime is the basis of most traditional mortars and should be incorporated in the mix in the form of lime putty (see **Further reading**, Ashurst, J and N, 1988). For best results this should be pre-mixed with a well-graded sharp sand, and other aggregates as appropriate, in sufficient quantities for the whole job, to ensure consistency of colour and texture. This should be stored in sealed plastic bins to mature as long as possible (minimum six weeks) before use. Immediately before use the coarse stuff (as this mixture is called) should be 'knocked up' by thorough chopping, ramming and beating (a roller pan mixer can be used if large quantities are required) until it becomes workable and cohesive. If cement is used, accurately measure and add the correct amount (consult a table of mortar mixes: see **Further reading**, BS 6270) at this stage and use within two hours. Sharp, well-graded sand which matches the colour of the original aggregate should be used. White Portland cement should be used to assist in matching pale-coloured original mortars.

Prepared in this way a lime-based mortar for pointing will have a low water content and a consistency like modelling clay, and will feel slightly sticky: it will cling to the blade of



Detail of a brick wall at Hampton Court, dating from the 1530s. Note the thin and irregular shape of the bricks. A double-struck joint finish of lime mortar has miraculously survived in crisp condition. Every effort should be made to discover the original joint finish of a wall and to replicate it using a lime-based mortar.

the trowel when turned upside-down. This consistency will enable it to be firmly compacted in the joint without smearing or staining the surface of the bricks.

Filling the joints

The area to be repointed should first be thoroughly wetted. Mortar should then be applied cleanly to the raked out mortar joint, avoiding contact with the face of the brickwork, and packed firmly into the back of the joint. A pointing key with a blade narrow enough to fit into the joint should be used; this work cannot be done effectively with a trowel.

Care must be taken not to smear or butter the surface of the bricks with mortar. Damaged bricks may well need to be replaced, and care must be taken not to fill in chipped bricks with mortar any more than is necessary. Newly placed mortar should be protected from rain, wind and direct sun with suitable covers and kept slightly damp for several days to avoid cracking.

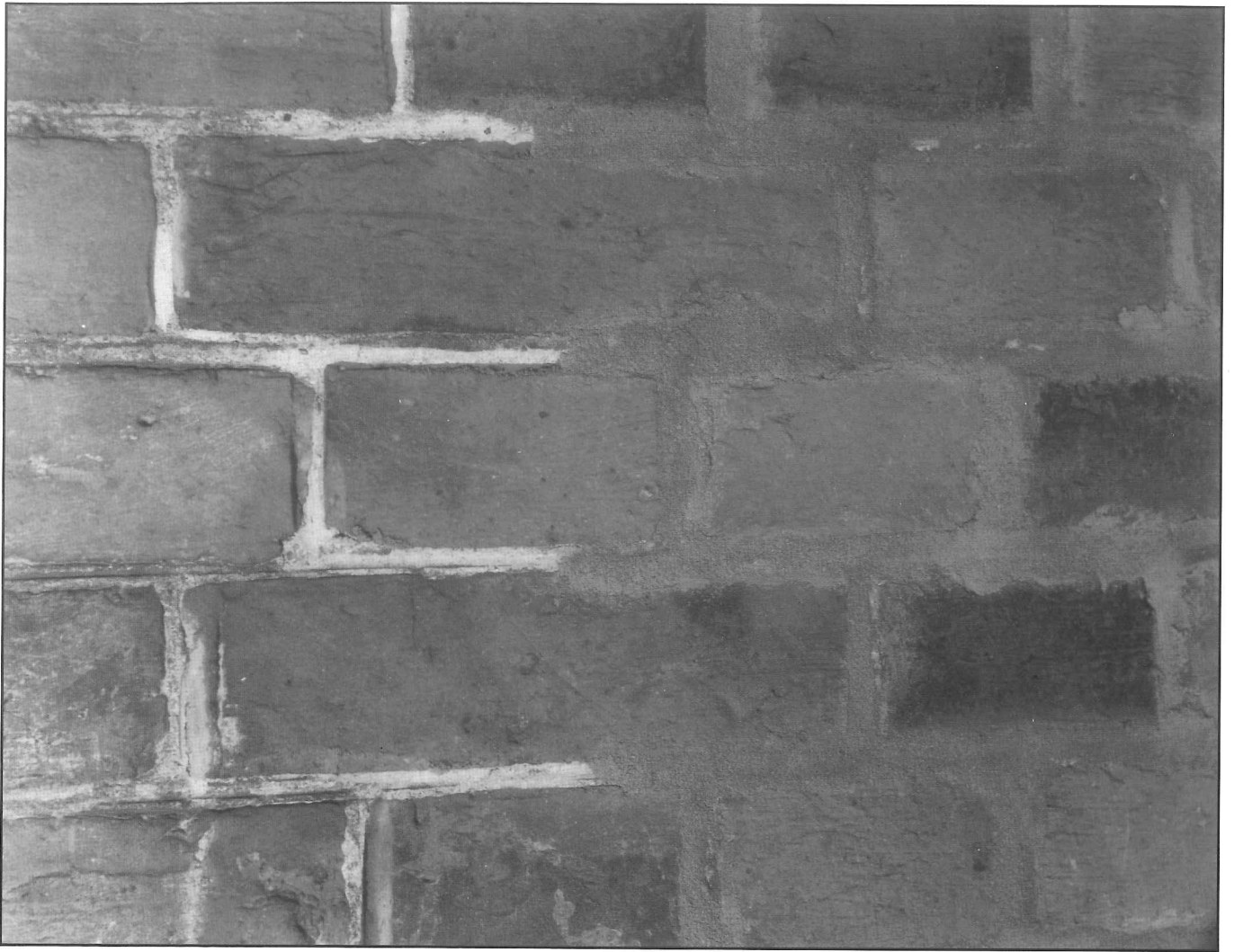
The tiny joints of gauged brickwork need extremely delicate

handling: they should only be repaired when absolutely necessary. The brick faces should be protected from contact with mortar by being masked with tape. A finely screened lime/silver sand mortar may then be introduced and compacted with a suitably narrow pointing key. However, the extreme delicacy of this operation requires specialist craftsmen.

- **Do not repoint when there is any risk of frost**

Finishing joints

It is vital to achieve a neat finish during repointing. If a weathered appearance is required, trim back the surface of the joint, after the initial set of the mortar has taken place, to leave the surface of the mortar slightly recessed and the rounded arrisses of the bricks free of feather-edges of mortar. Pointing can be made to match the weathered texture of existing mortar by firm stippling with a brush onto the semi-set mortar: this exposes the aggregate and avoids leaving an over-smooth finish.



The dangers of unnecessary repointing. The brickwork on the left is in good condition and clearly shows the original penny-struck finish. Damage caused by an angle grinder can be seen to the perpend. On the right, the mortar joints have been considerably widened and the faces of the bricks obscured with an unsympathetic cement-based mortar mix. The result is the loss of an authentic joint finish, irreversible damage to the bricks and the spoiling of the visual balance between bricks and mortar.

Further reading

Ashurst, J and N, 1988 *Practical building conservation: 2, Brick, terracotta and earth* (English Heritage Technical Handbook), Aldershot

Ashurst, N, 1994 *Cleaning buildings* (2 vols), Wimbledon

Bidwell, T G, 1978 *Conservation of brick buildings - the repair, alteration and restoration of old brickwork*, Brick Development Association, Winkfield

BS 6270, 1982 *British Standard code of practice for cleaning and surface repairs of buildings*, part 1, British Standards Institution, London

Brunskill, R, 1990 *Brick building in Britain*, London

BRE Digest 200, 1977 *Repairing brickwork*, Building Research Establishment, Garston

Carey, J, 1985 *Tuck pointing in practice*, Society for the Protection of Ancient Buildings, Information Sheet no 8

Lloyd, N, 1925, reprinted 1983 *A history of English brickwork*, Woodbridge

Lynch, G, 1990 *Gauged brickwork*, Aldershot

—, 1994 *Brickwork: history, technology and practice* (2 vols), Wimbledon

Parissien S, 1990 *The Georgian Group Guides no 2: Georgian brickwork*, rev edn

Williams, G B A, 1994 *Pointing brick and stone walling*, Society for the Protection of Ancient Buildings, Technical Pamphlet no 5

Video

English Heritage, 1994 *Pointing brickwork*



Pointing affects the appearance and condition of brickwork. Parts of this eighteenth-century tower have been repointed: the brickwork above and below the window opening has lost its mellowness as the mortar joints have been widened with the introduction of an unsuitable mortar mix.

Summary

- Repoint only when necessary. Identify the true cause of decaying brickwork first, and leave sound mortar alone.
- Take great care when cutting out defective mortar. Avoid using power tools and damaging the bricks.
- Discover the original joint finish and use that as the model for repointing.
- Avoid inauthentic joint finishes such as weather-struck and ribbon pointing.
- Use a lime-based mortar. Cement-rich mixes cause damage.
- Make the mortar subservient to the brick. Ensure it is weaker than the bricks which it bonds together, and keep mortar away from the outer surface of bricks.
- **Poor pointing spoils historic fabric for ever and lowers the value of a property. Seek specialist advice before carrying out extensive repointing.**