

Photograph 26



Photograph 27

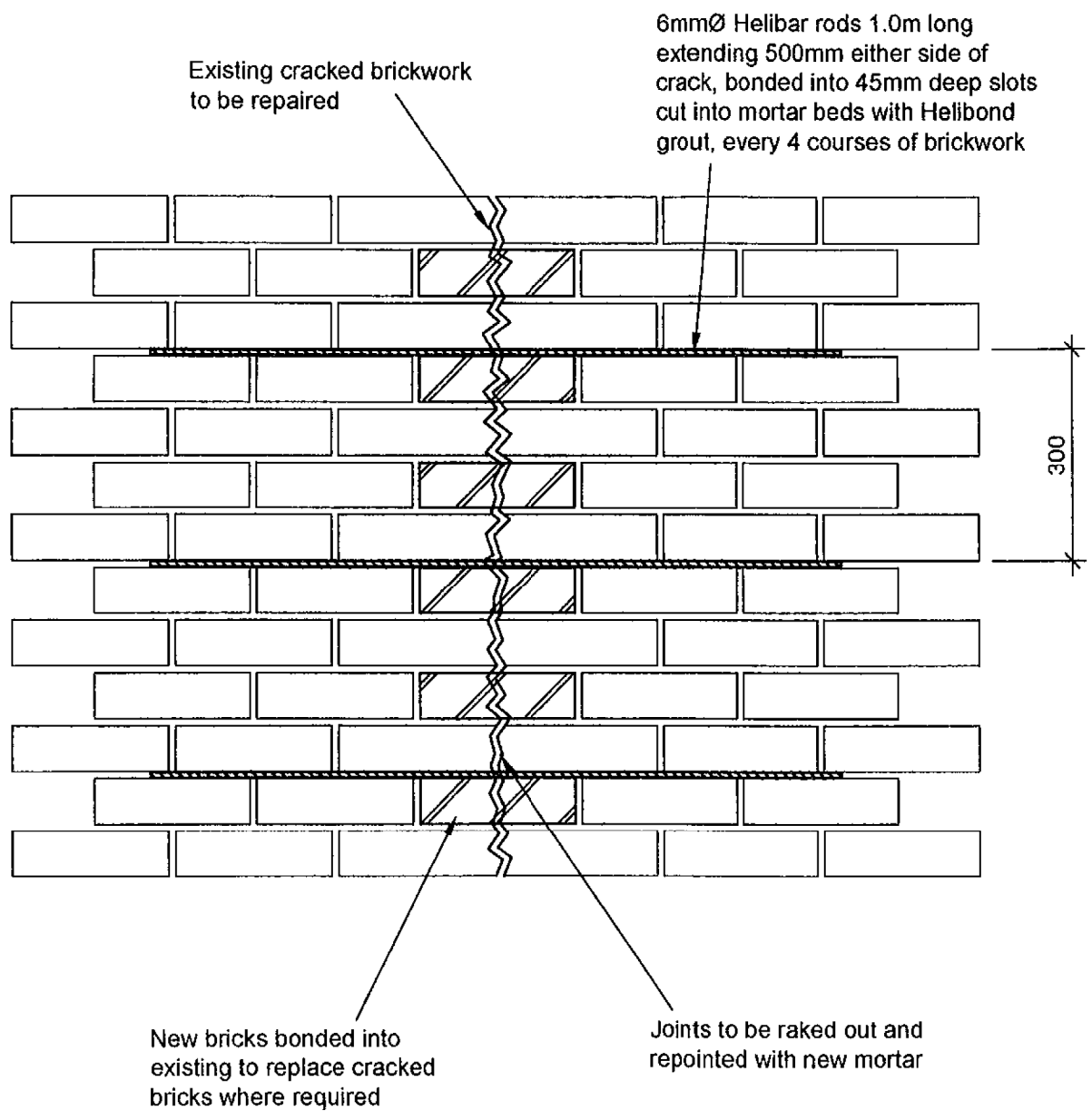


Photograph 28



Photograph 29

Appendix C



DETAIL S16
(1:10 @ A4)

REMEDIAL REPAIRS TO CRACKED BRICKWORK

Repointing of brickwork

Editor:
R G D Brown MA CEng MICE

7

JR Harding TD CEng FInstF FICeram and L B Bevis AIPHE MFB

It is generally recognised that well-built brickwork requires little maintenance. However, as a building ages, the surface of the mortar joints may tend to show signs of decay, which can be attributable to one or more of the following causes:

- 1 Ingress of water due to faulty damp-proof course details at ground-floor level; at cills and lintels; at roof junctions and parapets, etc.
- 2 Incorrect proportioning of the original bedding mortar mix.
- 3 Frost damage due to the use of unsuitable mortars.
- 4 Sulphate attack arising from the presence of soluble sulphates, tri-calcium aluminate and water in juxtaposition.
- 5 Permanent damp situations due to the use of porous bricks in positions sheltered by deep overhangs or in the close proximity of adjacent buildings, where the normal evaporation process is restricted.
- 6 Water damage from leaky roofs, gutters and rain-water pipes and leaking plumbing.
- 7 Structural movement.

The causes of jointing decay should be corrected before repointing is undertaken. For 1), 3), 5) and 6) above, this means taking precautions to prevent the entry of water. For Item 4, the removal of the source of water is necessary, but the possibility of repair will depend on the degree to which the decay and movement has proceeded. In the worst circumstances, partial rebuilding may be the only remedy.

Usually, repointing should not be carried out during the winter period when there is danger of frost. However, if it does become essential to repoint in winter, then the work must be satisfactorily covered against the effects of icy winds and rain.

Repointing should commence at the top left-hand corner of a wall, working across and downwards, so that the work is kept clean and the face free from damage as the scaffolding is removed. About two square metres should be completed at a time.

Before preparing the joints for repointing, remove all lichen and moss by careful scraping, care being taken not to damage the brick face.

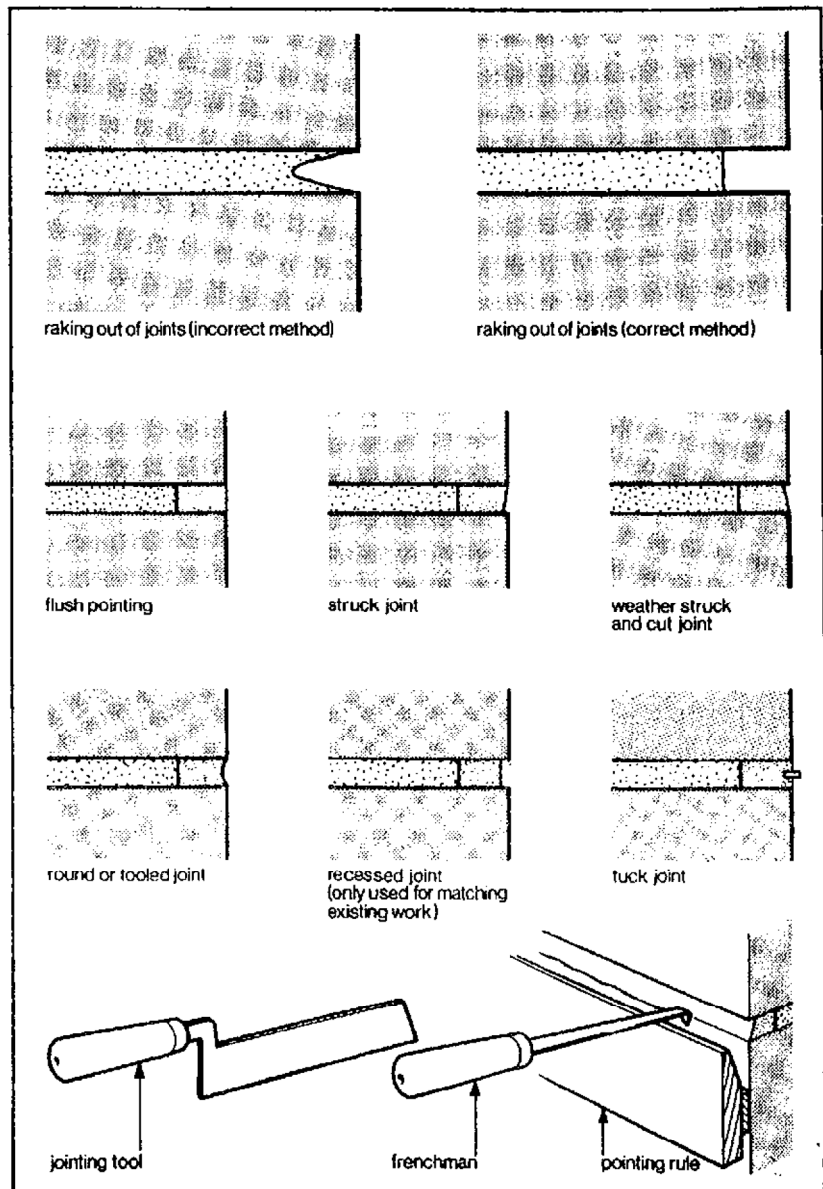
Then the perpends (vertical or cross joints) and the bed joints (horizontal joints) should be raked out, using a 'timber dog' made of steel or a similar tool, to a minimum depth of 10 mm ($\frac{3}{8}$ ins) and a maximum depth of 20 mm

($\frac{1}{2}$ ins)—ideally about 15 mm.

It is essential that the recess so formed be left square. The brick edges should be absolutely free of old mortar in order to secure an effective bond. If these rules are not followed, then the pointing material may flake out, due to inadequate key. After raking out, the joints should be thoroughly brushed out with a fibre bristle brush, to remove all dust and loose particles.

Diagrammatic illustrations of preparation and joint finishes for pointing.

When pointing commences, the wall should ideally be in a damp condition, in order to reduce the suction of the old mortar bed and the adjacent brickwork. If this is not done, there is a strong possibility, particularly in hot dry weather, that the water will be soaked out of the pointing mix before hydration has occurred, and, as a result, the joint will be weak and liable to crumble. The correct condition should be achieved by wetting the raked out joints with clean water, using for the purpose an old flat distemper brush. On no account should the brickwork be soaked.



Perpends are filled first, using a 'dotter' (small pointing trowel), the mortar should be pressed firmly into the perpends and tucked into the bed joints above and below the perpend. The bed joint is then run using a large pointing trowel and bonded into the perpends. A small number only of the perpends should be completed in advance of the bed joints.

During the pointing operation only a relatively small amount of mortar should be mixed at one time and used immediately. If the mix begins to dry out or harden, it should be discarded. Never attempt to reconstitute the mortar by a further addition of water and mixing. As each batch of mortar is used, the joints already filled should be tooled or cut, according to the type of joint used, and all loose material brushed away with a soft brush.

Mortar mixes should be carefully chosen to suit the type of bricks in use and the exposure conditions. Under normal conditions of exposure a 1:1:6 (cement:lime:sand) mix is generally acceptable. For the softer type of facing brick, a 1:2:9 (cement:lime:sand) mix is usually satisfactory. The higher lime content mortars are less rigid and, therefore, more capable of accommodating thermal and other movements, and, hence, may offer greater resistance to rain penetration. For very hard dense bricks used in situations of extreme exposure,

a 1:1:3 (cement:lime:sand) mix should be used, but with the richer cement mixes consideration must be given to possible shrinkage of the joint leading to hair-line cracking at the brick/mortar interface.

Whereas a sharp washed sand would normally be specified for a bedding mortar, a softer washed sand is generally used for pointing and, in some instances, a silver sand is preferred.

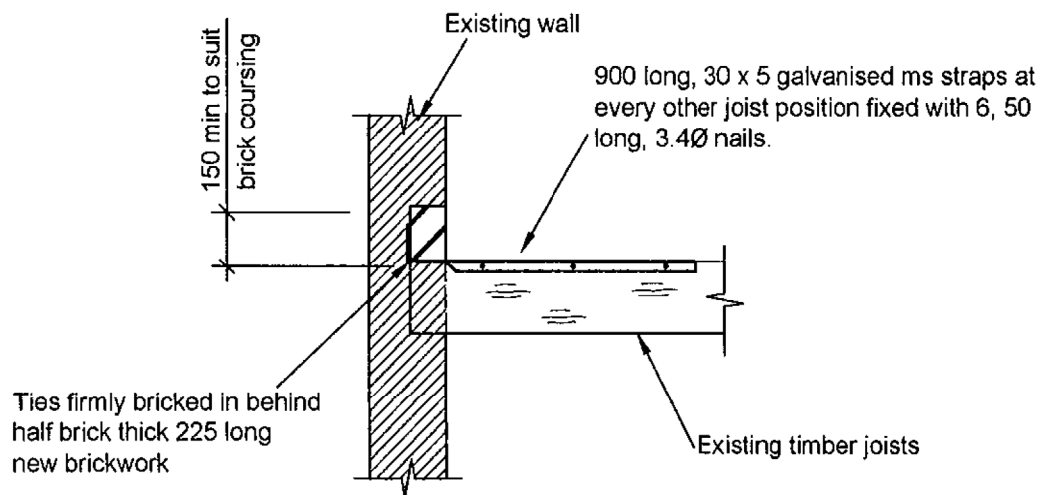
Where the colour of mortar joints is important, a ready-mixed coloured mortar should preferably be used, as there is a better chance of maintaining colour consistency. Shovel gauging should not be used.

Where coloured mortars are used, they should not be trowelled excessively, as this can affect the colour achieved.

Types of jointing and pointing are shown in attached Figure.

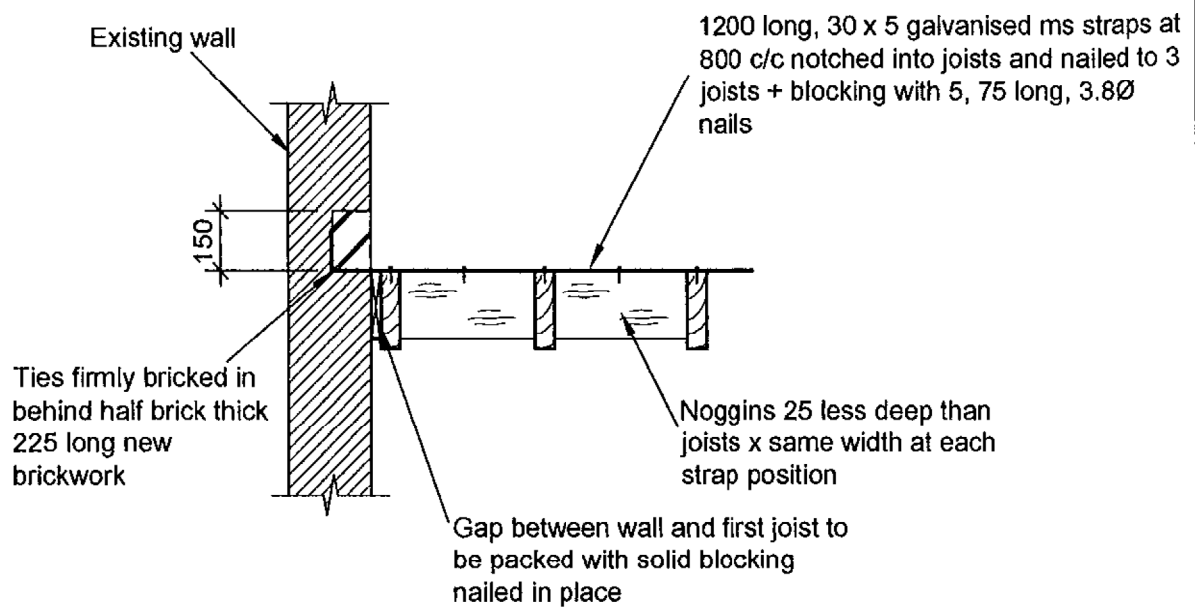
For general repointing work to external brickwork, the 'weather struck' or 'weather struck and cut' joints are the most satisfactory for weathering. The former slopes slightly inwards from the bottom of the bed joints, which are finished flush; whilst the latter is allowed to project at the bottom of the bed joints and at one side of the perpend joints. This mortar projection is cut off square using a straight edge and a frenchman.

For old brickwork, it is normal practice to try and repeat the original type of joint finish, and this may require a type of joint not generally used in modern practice. Usually, either a flush joint, or a rounded or tooled joint is generally acceptable. However, where renovation of ancient brickwork is undertaken, it is sometimes necessary because of erosion that has taken place over the years to the brick arises to use a joint known as the 'tuck' joint. For 'tuck' pointing, the joints are raked out in the normal manner and then flushed-up with a matching mortar, similar to the brickwork colour. According to the colour desired, the mortar can be made from an aggregate of red moulding sand or coarse brick dust obtained from brickmakers. An indentation is then made through the centre of the soft mortar with a pointing tool. The indentation is filled in with a lime putty mortar which is applied by picking up the mortar on a pointing tool drawn along a straight edge held close to the bed joints. The bed joints in the work are always pointed first. The edges of the lime putty mortar are then cut level, top and bottom. The lime putty mortar consists of pure lime putty mixed with a small quantity of silver sand. This type of pointing should only be undertaken by experts as great care is required in setting out and in execution. When completed, it displays a fine white joint which has the appearance of neat gauged work.



DETAIL S01
(1:20 @ A4)

**JOISTS BUILT INTO EXISTING WALL AT
RIGHT ANGLES WITH MASONRY INFILL**



DETAIL S05
(1:20 @ A4)

JOISTS PARALLEL TO EXISTING WALL
WITH MASONRY INFILL