



INTRODUCTION

The repainting of brickwork is a common periodic exterior maintenance and repair task.

- It is a type of remedial work which is susceptible to unnecessary and ill-considered treatment. In extreme cases of bad pointing, the results are rapid deterioration of the bricks, not just the joints.
- One of the objectives of this factsheet is to promote a better understanding of the function and behaviour of pointing over the lifetime of the building. There is a common misconception that a strong, dense (cement-rich) mix forming an impenetrable barrier to rain is a universal repointing solution.



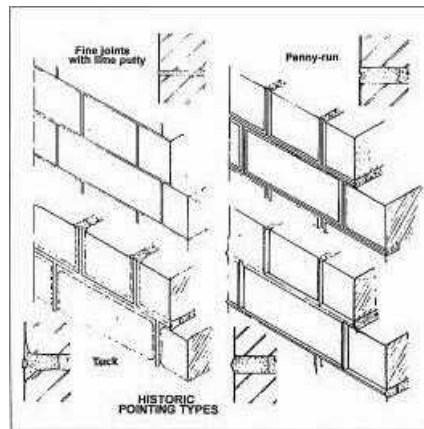
Failed pointing – open joints.

WHAT IS POINTING?

General definition: the filling and finishing "plastic" material, normally a mortar, of the outer part of a joint where the bedding mortar has been left recessed or raked back from the face of a wall.

Composition: Historic pointing mortar is usually lime-based, while cement-lime, or cement with plasticiser is normal in more modern buildings. The aggregates used with lime were usually coarser, a combination of sands and grit, than modern mixes where a "softer" sand is common.

Pointing & Bedding. For the purposes of this factsheet, pointing is identified separately from the 'structural' bedding mortar used for building the wall. The mortar mixtures and materials used for bedding and



Pointing types.

pointing are usually identical in typical original work.

In finer historic work, more elaborate pointing designs were used to achieve particular architectural effects.

HISTORIC AND AESTHETIC CONSIDERATIONS

Some examples of traditional pointing are illustrated in the diagram. Included is an example of 18th century tuck pointing. The pointing disguised the fact that the bricks were uneven and lacking sharp arrises, by filling the joints flush with matching coloured pointing then applying a thin band of white lime mortar on the surface, or as a filling in a fine recess in the partly cured coloured mortar.

Fine joints - Rubbed bricks.

Some of the best brickwork was built with very fine joints, one or two millimetres of lime putty, simply finished on the face of the wall by wiping away the excess putty that squeezed out.

- The bricks, invariably a relatively soft red type made from selected clay, were "rubbed". This is a careful grinding to achieve the required shape. This high quality brickwork was typically used in gauged brick arches as an architectural feature in an elevation.
- Pointing and repair of such walls and features should only be carried out by experienced masons.

The approach to repair is dealt within the repair section of this factsheet.

Typical pointing. The majority of historic brick buildings have variations on the typical 'common' brickwork pointing. Preserving the historic integrity of this brickwork is fundamental to conservation policy.

BRICK BONDS:

An appreciation of the types of brick bond encountered in historic buildings is important. The two main types are English and Flemish. The principal distinguishing features are that:

- **English bonds** of various sorts consist of courses with either all headers or all stretchers. There are variations of English bonds in which the sequence of header and stretcher courses change, from alternating courses to four or more stretchers and a single header course
- **Flemish bond** was not generally used in England until the 17th century, and has alternating headers and stretchers in all the courses
- **Other bonds** include relatively uncommon monks, dearne's, etc., and versions of garden wall bonds, such as rat-trap. When unfamiliar brick bonds are found EDG D.E.O. HQ should be consulted.

Indenting bricks. Repointing projects may include an element of replacement of small areas of decayed and damaged bricks. It is important that the type of bonding and any variation, often found below windows and at corners, is identified and faithfully reproduced. Check existing brick sizes in a number of locations. Dimensions of hand-made bricks fired in traditional kilns could vary from batch to batch.

FUNCTION OF POINTING

The primary functions of pointing are:

- preventing excessive rain penetrating into the wall via small voids and gaps between the bedding mortar and masonry
- providing a sacrificial medium which preserves the bricks by allowing the essential movement of moisture and air in and out of walls
- providing a cosmetic, decorative, and important element in the architectural composition.



Detached hard pointing.

POINTING PERFORMANCE CRITERIA

Design for Controlled Decay

Mortar pointing for all types of walls should be designed and specified as a "sacrificial" material, designed to decay slightly more readily than the valuable and expensive bricks.

- A combination of characteristics has to be achieved when specifying repointing mixes. The essential properties are; strength, hardness, porosity, flexibility, colour and texture. If the correct balance is achieved, the pointing will perform satisfactorily for decades and the life of the bricks will be maximised.

CAUSES OF POINTING FAILURE

- **Weathering and decay** over time results in the gradual breaking down and erosion of pointing.

If pointing is correctly specified and applied, the bricks will decay at a natural slow rate. That rate will obviously depend on the

hardness and durability of the bricks. The relatively soft bricks such as rubbers, will decay rapidly in certain aggressive conditions.

- **Other factors** will accelerate the decay and breakdown of pointing. Minute seasonal and thermal changes affect all structures.
- **Structural movement** can cause cracks in the Joints, allowing water into the wall in greater quantities than the material can cope with in a freeze-thaw weather cycle. As ice forms, it expands and can cause significant damage in a single severe winter.

Two less common problems are damage caused by:

vegetation, ivy and other climbing plants which can root in open or defective joints, feeding to some extent on lime-rich mortar. However, some vegetation gives a degree of protection, it should not be removed without careful consideration of the consequences.

Mason (mortar) bees can, in rare instances, burrow into soft mortars and brick creating extensive cavities in the pointing and wall.

The most common cause of pointing failures and unnecessary damage to the bricks is bad remedial treatment.

BAD REMEDIAL TREATMENT takes a number of forms:

- **Unnecessary work**, commonly cutting out joints which are in a reasonable condition and will perform satisfactorily for many years. Every time hard wall pointing is cut out and raked back it is probable that brick arrises will be damaged. A skilled mason can remove 'soft' mortar causing virtually no damage.
- **Poor joint preparation**, such as inadequate depth, incomplete clearing and flushing out.
- **Inappropriate repointing mortar mixes.**

The damaging consequences of hard impervious, cement-rich pointing are now widely accepted.

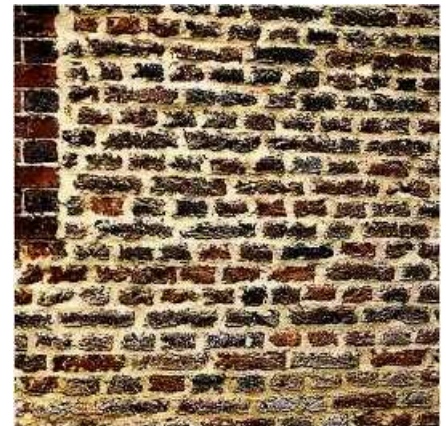
If the pointing is harder and denser than the adjacent brick, excess water is absorbed into

the bricks where serious damage can result from freezing, salt migration and crystallisation.

Hard mortars are prone to crack when the wall reacts to thermal and seasonal changes. Traditional lime mortars will accommodate these minor movements without cracking.

Water will penetrate into cracked pointing but is inhibited from evaporating from the joints. The freezing and salt damage which can result has been described above.

- **Inappropriate pointing finishes**, and careless workmanship are disfiguring and possibly harmful. Over-filled joints and mortar smeared over brickwork are ugly and can cause local spalling.



Careless pointing, over-full joints.

SELECTING THE RIGHT MORTAR

All pointing must be designed for the particular circumstances, taking into account all relevant factors, including:

1. Properties of the original mortar.
2. Type and characteristics of the walling brick.
3. Prevailing weather conditions, minimum temperatures, exposure.
4. The possibility of harmful structural movement
5. Fundamental changes in the nature of the wall, eg buildings, unroofed and ruined
6. The appearance of the finished work. Sample panels are vital in determining the desired end result.

Mortar Analysis

Quantitative analysis is useful for checking the proportions in the original mix. Analysis, linked to visual checks will give a good indication if the mix was satisfactory, and help in specifying a repointing mix. Several samples should be taken from different positions in the wall. Wide variations do occur in the quality and proportions of mortar mixes in historic buildings.

Qualitative analysis is more complicated and costly, in the great majority of cases it is not necessary.

RECORDING:

Before commencing any activity on the building, apart from emergency protection or support, an appropriate record must be made of the present condition and appearance with particular attention to architectural features.

- The level and detail of recording will depend on the complexity of the structure, and, the architectural and historical importance of the building. In most brick repointing cases, a targeted measured survey, supplemented by clear photographic coverage will be satisfactory. Any special features involving, for example, rubbed brick details or terracotta require extra attention.
- **Records - Exceptional Buildings** In all cases where alterations and/or repairs works are proposed on Scheduled Ancient Monuments, Grade I and Grade II* Listed Buildings, and their equivalents, EDG D.E.O. HQ should be consulted. They will advise on the appropriate extent and detail of recording. Some architectural analysis may be required if the history of development of the building or group of structures is vague or incomplete.

REPOINTING - GOOD PRACTICE

Inspection and Assessment

- A comprehensive site inspection is essential to identify defective gutters and downpipes, running overflows, structural defects and any other problems that contribute to pointing decay and failure.

Assess the Problem

The success of remedial work depends as much on the quality of analysis and assessment of the findings, as on the specification and workmanship.

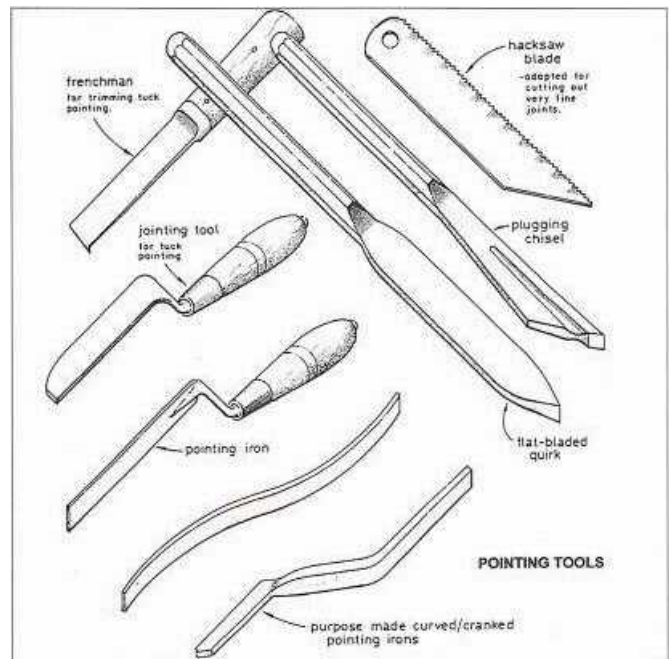
The fundamental cause of an underlying building problem which is contributing to the pointing defects must be analysed and remedied.

- A cautious approach is advisable where sensitive historic buildings are involved.
- Postponing works to monitor the rate of deterioration is sometimes an intelligent option, provided that there is no risk of other decay problems.

Specification

Good practice; careful and thorough pre-planning and specifying is fundamental to the control of activities on-site, the standard of work achieved, and cost control.

- When dealing with historic buildings, it is particularly important that the contractor should be given clear, comprehensive and unambiguous information. Any



Pointing tools.

leeway for interpretation is inadvisable. The contractor should be a specialist who is fully conversant with the correct standards.

- Where it is considered appropriate, specifications for historic works could include the following clauses. It must be clear that any special requirements are additional to standard conditions:
 1. Access routes: material handling routes, and special protection of important features should be considered and designs produced if necessary.
 2. Materials: sources of replacement bricks, lime, sand and other aggregates for mortars should be checked, using local knowledge where this is available. English Heritage is producing a publication identifying a range of sources and Suppliers-
 3. Tools and equipment: contractors' operatives must use the correct cutting-out tools and special pointing tools for all historic work. Tools may have to be adapted or manufactured for particular types of historic work.
 4. Quality control: precise instructions should be given to contractors to match the original and/or existing appearance in all respects, (including finishes, colours, patterns, etc.). Contractors must not damage the patina of age on old common brickwork. Accurate gauging and water content in mortar mixes is vital. Gauging boxes are essential for accuracy and consistency of mortar mixes. Mature lime putty must be prepared correctly, by chopping and ramming to achieve the necessary plastic consistency. It should not be necessary to add water unless the aggregate is too dry.
 5. Protection of finished work from rain, frost, and rapid drying out (by sun and wind), is essential.

The durability and performance of traditional lime-based mortar rely on controlled slow curing.

Timing of repointing work.

Ideally, all repointing would be done when temperature and humidity are moderate. Repointing in very cold conditions, particularly when the wind chill effect is severe, and, in very hot and dry periods should be avoided. The mortar could be adversely affected during pointing, and curing will be difficult to control despite protection measures.

Preparing joints.

The critical procedures include carefully cutting out with the correct tools to the correct depth. In repointing work, 25mm is recommended. Operatives must use sharp chisels and quirks at all times. The risk of damage is far greater with blunt tools. Thorough cleaning out and correct

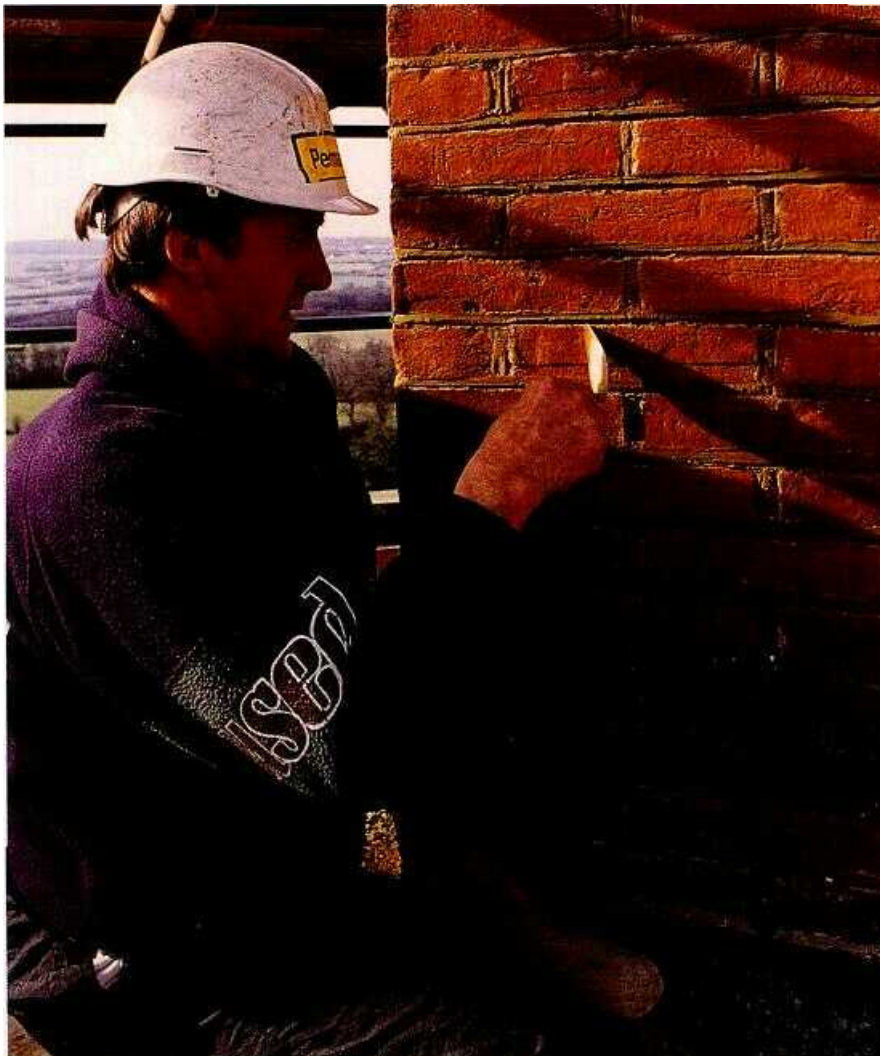
wetting should provide a positive key and good adhesion of the new mortar.

Placing mortar

Cleared joints must be damp and mortar freshly prepared, without excess water, not re-mixed after setting has commenced.

Filling and compaction of the joints is critical, ensure there are no voids. Deep joints may have to be filled in two operations, followed by the required texture or finishing detail.

A final two-stage process is necessary to reproduce the more complicated pointing types and for repointing eroded and uneven bricks. A textured finish is achieved by carefully "stippling" the partly-set pointing with a stiff brush.



Brick pointing in progress.

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STATUTORY CONSULTATION

All alterations and repairs of Scheduled Ancient Monuments require formal clearance including trials and sample panels on the Monument.

Repointing of a Listed Building may require statutory clearance and EDG D.E.O. HQ must be consulted at the earliest opportunity.

SUMMARY

Guidance for brick wall repointing proposals:

- Check, and assess pointing condition and identify historic pointing (if possible)
- Is repointing really necessary?
- Consult EDG. D.E.O. HQ and initiate clearance procedure if required.
- Make appropriate records
- Check general condition of wall or structure for underlying defects, and remedy if necessary
- Examine existing pointing characteristics, and analyse mortar if necessary.
- Design and specify repointing based on findings above, and selection of mix materials.
- Obtain Listed Building clearance if necessary
- Select suitable contractors)
- Order sample panel(s).
- Approval of sample and authorise repointing.
- Monitor standards of work.

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