

INFORM

INFORMATION FOR HISTORIC BUILDING OWNERS

Repairing brickwork



Introduction

Bricks can be defined as small rectangular blocks of fired clay. They come in a variety of sizes, shapes and colours. They also vary in age and quality. A large number of our traditional building stock utilise brick in some element of their construction. As such, the conservation of the material is important for the preservation of our built heritage. This INFORM seeks to give information on:

- The history of brick in Scotland
- Signs of deterioration in brickwork
- Causes of deterioration
- Repair and maintenance of brick structures

History

Bricks were first used in Scotland by the Romans but their application soon fell into disuse thereafter. Whilst manufacture and use began again in the 17th century it was with the industrial revolution at the end of the 18th century that the use of brick really came to prominence in Scotland. From as early as the 18th century Scotland had a significant indigenous brick industry with many important works such as the Seaton Brick Works in Aberdeen. The rapid expansion of towns and cities, and the building of large industrial complexes, gave rise to a huge demand for the material. Continued improvements in the manufacturing process led to better quality bricks being produced and greater levels of production with demand and use remaining high throughout the 20th century and this is still continuing today.



Deterioration of Brickwork

As with all elements of a traditional building, brickwork will deteriorate and decay if not properly maintained. Such deterioration can be caused by a number of factors and can take various forms. The main signs that brickwork is suffering are:

- **Surface growth and staining**
- **Efflorescence (white powdery residue building up on the wall face)**
- **Soft, loose or crumbling mortar**
- **Spalling (deterioration of the surface of bricks)**
- **Loose bricks becoming dislodged**
- **Cracks appearing through the bricks or mortar**

If a brick structure begins to exhibit any of these signs it is important to identify the cause and rectify it as soon as possible. This will prevent the problem from spreading and further damage being caused



Causes of deterioration

Water Ingress

One of the most common and serious problems which can affect brickwork is uncontrolled water ingress. This can be a particular problem on exposed areas of a building such as upper floors and chimney stacks and in the vicinity of leaking rain water pipes. Although a brick building may appear sound when viewed from ground level this may not be the case higher up on the wall face. Other areas at particular risk are parapets, areas surrounding down pipes and quoins (brickwork on the corner of a building). Once water has begun to penetrate brickwork it can quickly spread to affect a large area.

The following can be causes of water penetration and associated deterioration:

- Rising damp from subsurface moisture
- Windblown rain
- Condensation caused by lack of ventilation
- Failure of roof systems or rainwater goods
- Infiltration through failed mortar
- Inadequate surface drainage
- Encroaching vegetation
- Defective copings and flashings or damp proof courses





Salts

Salts are a major cause of deterioration. Salt can enter bricks through contaminated water ingress. In coastal areas salt can come from the sea and, in winter, the nearby application of road salt is a constant threat. Salt is damaging because it creates a steady expansion of crystals within the bricks. This can eventually force the structure of the brick apart. The source of salt can occur from within the bricks themselves or from the

application of contaminated mortars or renders. Brick lined chimney flues are also vulnerable as sulphates can be introduced when flu gasses condense. This is a common defect where a chimney has been sealed without adequate ventilation.

The most obvious sign of the presence of salts is efflorescence. Efflorescence appears as a white powdery deposit on the brick. In severe



cases a thick build up of white crystals can form. This illustrates that salts are present in the construction and are migrating to the surface. The problem of efflorescence can be exacerbated by the improper use of cement mortars during repair. To prevent significant deposits of efflorescence from causing serious damage to bricks it needs to be regularly brushed off the surface using a bristle brush and the source of water causing the build up of the deposits to be stopped.

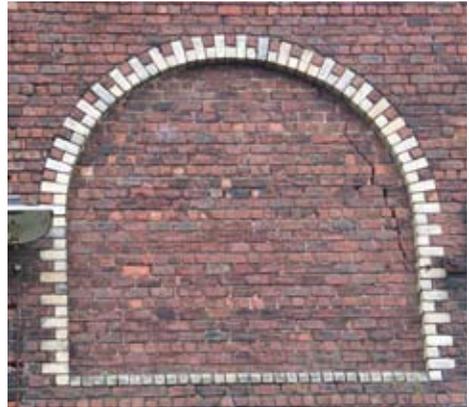
Structural faults

The most common sign of a structural fault in brickwork is cracking. This can be caused by structural movement, unstable foundations, tree roots or defects in the original construction. Minor cracking will be superficial and restricted to a few isolated bricks but extensive cracking can be an indication of a serious problem. Professional advice should be sought from contractors.

In minor cases of cracking it will be necessary to carefully cut out the affected area and re-point it using a mortar appropriate to the existing structure of the building. In some cases it may be necessary to replace a few fractured bricks rather than fill the crack.

Where bricks are displaced due to structural movement particular note should be taken of any areas where the wall face projects out from the adjacent build. This will usually indicate the presence of some structural movement and lead to the creation of ledges on which water can gather and penetrate the build.

There are also a number of structural elements which can fail and lead to associated deterioration. Where timbers have been embedded in a brick wall (for example timber joists or lintels) these can rot and decay if



water is allowed to penetrate through the brickwork and this can lead to instability. Likewise where structural iron or steel elements are incorporated in the build, these too can corrode in similar circumstances. Rust can lead to unsightly staining and, if the corrosion is serious enough, this can create instability due to the fact it expands and creates pressure on the surrounding brickwork sufficient to burst off the wall face.

Frost

Bricks vary greatly in their ability to withstand frost. Porous bricks are more easily penetrated by water and consequently have much poorer frost resistance than denser ones. Frost damage results as the water expands within the brick when it freezes. Where such damage occurs it will often be necessary to replace the affected bricks.

Original Construction Defects

Sometimes brick work was poorly constructed and defects inherent in the original construction can lead to later problems. Typical defects of this type are:

- Poor bonding between walls or into existing masonry where a brick addition has been executed.

- Poor quality bricks utilised (this is a particular problem with later mass produced bricks and those manufactured from colliery shale)
- Frog' turned upside down to reduce mortar requirements.

Vegetation

Vegetation can be very harmful to brick structures if left unattended to. Ivy can cause serious damage particularly where some minor decay is already in evidence. This allows the growth to gain a foothold on the broken surface and penetrate into the wall core. Moss is likely to be a sign of a long standing water penetration problem and will damage bricks further by encouraging more water to penetrate the build.



Repair and maintenance of brick structures

Tackling Decay

Where decay has occurred it will be necessary to take action to rectify the damage before this leads to greater problems. The use of chemical treatments to stabilise brick should only be considered with extreme caution. Whilst they may be effective initially, there has been insufficient research carried out on the possible long term damage such treatments could have. Chemical sealants can trap moisture within the brick just as effectively as the claims to keep water out.

Replacement of bricks

In some cases it may be necessary to carefully replace single bricks or small areas of brickwork particularly where spalling has occurred. Great care should be taken when cutting out the affected brickwork not to cause new damage to the surrounding area.

Replacement bricks should match as closely as possible the colour, texture and, most importantly the size of those which they are replacing. As historic bricks were often not of a standard size it may be hard to source suitable replacements. In some cases they may have to be specially manufactured, and there are a number of companies who can still do this. When introducing new bricks it is inadvisable to use a colour stain to tone in new bricks with the existing wall. The weather will do this automatically over time.

Second hand bricks may be available through salvage yards and other building material suppliers. Careful inspection of these is necessary before buying them to ensure they have not been badly damaged by demolition or mishandling.

It is possible in some cases to identify the manufacturer and date of a brick from the makers stamp put on many bricks at the point of manufacture (source information on this can be found in the further reading section). This identity may help in obtaining suitable replacements. It should also be noted that different types of brick are sometimes used in different parts of the building such as corners. Harder bricks were often used on exposed parts of the building such as cornices with poorer quality soft bricks being utilised for walling. It is important when considering replacement bricks that all of these factors are taken into consideration to ensure that a satisfactory job emerges.

Cleaning

Cleaning soiled brick buildings should be undertaken carefully if at all. In the past the use of inappropriate cleaning techniques has resulted in considerable damage being done. If considered essential small scale tests should be employed to assess the effectiveness and likely damage which could be caused before any large scale work is carried out.

Brickwork can simply be washed down using water and a bristle brush to remove some surface deposits but care should be taken to avoid exposing the brickwork to too much water. To avoid it penetrating into the brick care should also be taken not to be too vigorous in scrubbing the face. The use of high pressure hoses is also not recommended, as this will force water deep into the structure.

Decayed pointing

Throughout the life of a brick building there will always be some loss of the original mortar. This can lead to a need to repoint areas of brickwork although weathered pointing can still function adequately provided the joints are not totally open.

Where re-pointing is necessary the raking out of the old mortar should carefully be carried out by hand in order to avoid damage to the corners of bricks. The correct tools such as a thin chisel and pointing tool should be used and in many instances the use of a skilled tradesman will be required. Appropriate replacement mortar should



be used. For traditional brickwork this will most often be lime based although, from the late Victorian period onwards, cement is likely to have been used. Cement mortar should not be used as a replacement for lime mortar as this removes the ability of the wall to allow water to escape. Whenever re-pointing is being undertaken it is important to use the same mortar type as originally used. It is also important to note the pointing technique that was used before the existing pointing is replaced as changes to this can have a dramatic effect on the visual appearance and performance of the structure.



Further reading / contacts

Practical Building Conservation Vol. 2, J & N Ashurst, ISBN 0-291-39746-8

Brickwork, G. Lynch, ISBN 1-873394-02-0

A Survey of Scottish Brickmarks, G.J. Douglas

Georgian Group Guide No. 2, *Brickwork*

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