Brickwork

February 2025

[2nd Edition]

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Introduction

Brickwork is probably second only to timber framing as a means of constructing walls in East Anglia. The presence of abundant suitable clays and general absence of local stone, except for flint, meant that very often bricks were fired on site from locally dug material.

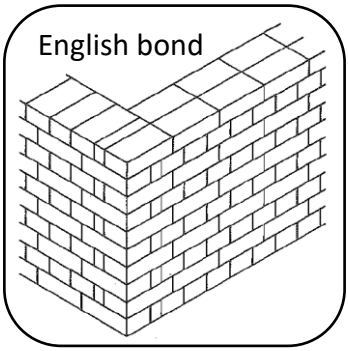
Two types of brick are generally found in traditional buildings in Suffolk: common soft reds, made from a sandy iron-rich clay, and whites from a less common chalky clay best known from Woolpit near Stowmarket or Ballingdon near Sudbury. Reds are generally found in buildings from Tudor times onwards, whilst whites became very fashionable in the early nineteenth century.

Brickwork, particularly if it is historic or characteristic to an area or building type, forms part of the significance of a listed building or non-designated heritage asset. In these cases, brickwork will often contribute positively to the heritage value of a building because of its attractive aesthetic appearance, its traditional use and form of construction, as well as referencing local building materials and crafts. Its detail can also say a lot about the type of building, whether it is finely detailed and therefore probably reflects high status or a wealthy owner, or whether it is more vernacular and functional in character such as in 19th century farmsteads. Brickwork has its place in Suffolk and when it is looked after, can really benefit the character of an area, demonstrating the age, use and historic development of buildings and structures.

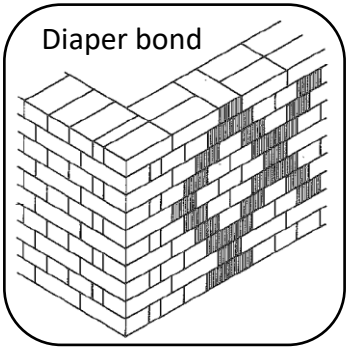
Brick Bonds

Most brick walls in older buildings are one brick thick, about nine inches, built with bricks in varying patterns or bonds. In general, bricks are bedded on their largest face, leaving two possible vertical faces appearing on the wall as we see it. The longer of these is called a stretcher face laid parallel with the wall; the shorter is approximately half the length and is called a header, passing through the wall and tying the two faces of stretcher together.

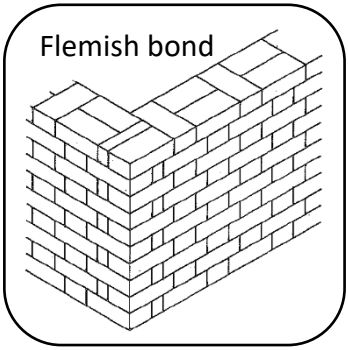
The earliest surviving walls appear to have no set pattern to the brickwork, but by the sixteenth century English Bond had become the norm. This consists of alternative courses of headers and stretchers, requiring equal numbers of each overall, which equates to a 1:1 ratio.



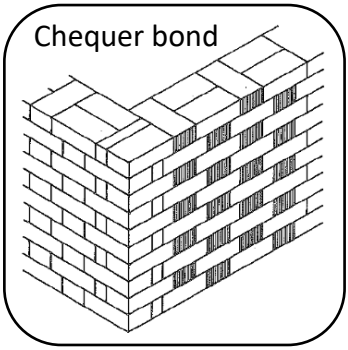
This was not very economic as the header faces of bricks tended to fire darker in the kiln leaving them a poor match to the stretchers. In the extreme, the headers would be a dark blue and these were often used for incorporating Diaper Work patterns into the face of the wall.



Another two-tone variant that became popular in the seventeenth century was the use of darker red headers as aprons, framing window and door openings.

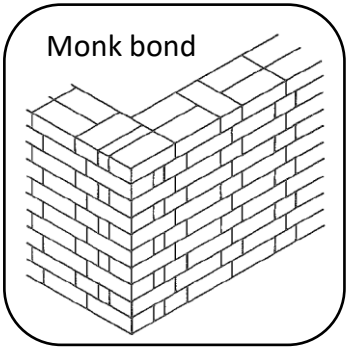


By the end of the seventeenth century, Flemish Bond had become popular. It consists of alternating headers and stretchers in each course, only requiring a 1:2 ratio of headers to stretchers, somewhat alleviating the header supply problem.



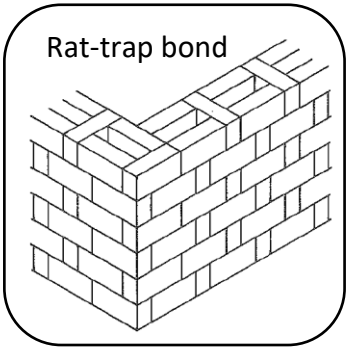
In the eighteenth century, if blue headers were available, they were often used in Flemish bond to create an attractive Chequer Work pattern.

Whilst the fronts of buildings usually received the best bricks, the sides and back were often relegated to cheaper materials or methods. Many white brick buildings have red brick side elevations, because red brick had by that time become relatively cheap in comparison with the newly employed white clay -

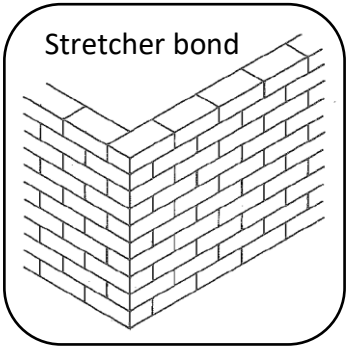


and these were occasionally built in Monk Bond, a variant of Flemish bond with alternating headers and pairs of stretchers in each course, which only requires a 1:4 header to stretcher ratio.

Another variant of Flemish bond involved laying the bricks on their edges, exposing the normal bed face. This is known as Rat-Trap Bond and achieves a saving of 25% the number of bricks. This is a good deal weaker than a solid wall and is usually only found on relatively low status and late buildings.



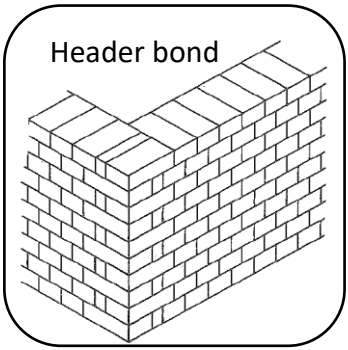
The twentieth century has seen the rise of true cavity construction where an inner blockwork wall is given a single skin brick face. This, like traditional single skin half brick walls, is usually built in Stretcher Bond with no headers at all other than snap headers (half bricks) to finish at the ends, or included to feign one of the more traditional bonds.



One historic use of Stretcher bond is in crinkle crankle walls (also known as serpentine walls) built in a sinuous, weaving plan, achieving a pleasant decorative effect. Overall, they

produce a stronger wall using fewer bricks than the modern single skin with brick piers equivalent, although they do require more space on the ground.

Header Bond, without any stretchers except at corners, is perhaps the strongest because there are no joints which cross. It was often used for the curved parts of buildings such as bay windows and with its small unit size was easily adapted for decorative use. Victorian engineering projects utilised the bond in tunnels, viaducts and sewers.



Problems with historic brickwork

Dampness is perhaps the root cause of most problems with historic brickwork, underlying or being aggravated by most other problems.

If brickwork deteriorates, it is usually as a result of dampness. Walls can become damp in three main ways:

- moisture can get into brickwork from outside
- or from inside
- or from the ground

External penetration can be caused by windblown rain or faulty rainwater goods and can be aggravated by poor detailing, for

instance inappropriate mortar jointing directing water into the wall, or inadequate drips on cills, etc.

The internal faces of walls can get damp from condensation: the relatively high U-value of solid brickwork, coupled with poor ventilation of rooms, will often lead in winter to damp patches, especially in pockets of still air found behind furniture or inside built-in cupboards.

Finally, water can get into a wall from the ground: rising damp will bring with it dissolved salts which, when they dry out, leave efflorescence on the wall. Attempts to seal a wall with waterproof coatings outside or modern waterproof plasters inside inevitably fail as the wall acts like a wick and will continue to draw water up to a level at which it can evaporate: the efflorescence simply migrates higher up the wall. In extreme cases, the damp can rot out a timber first floor if this is the only place it can escape.

Treatment for rising damp is controversial. From the later Victorian period onwards, a horizontal damp proof course at low level was inserted, but this is difficult to insert retrospectively using lead or a course of slate in the traditional manner.

An injected chemical DPC is sometimes the only solution for a damp brick wall, but need not entail the often recommended, expensive and unnecessary removal of internal plaster to a height of 1 metre. This extreme action should only be

considered if, a year after installing the damp proof course, there is still a problem with efflorescent salts erupting from the wall. NB. A chemical DPC should be injected into the mortar beds only and not the brick face, as doing so can be damaging to the brick and results in an ugly intervention.

Poor quality bricks, often due to under firing in the kiln, are particularly vulnerable to the action of salts crystallising within the brick fabric, causing them to spall and erode away on the face. Frost action on a damp wall can cause a similar effect with the formation of ice crystals. The temptation to seal the faces up with a silicon treatment should be avoided as this traps moisture and ultimately leads to larger lumps falling off. It also changes the colour and texture of the brick.

Erosion by frost and salts is worsened by the presence of cement in mortars. This is a fairly impervious material which forces all evaporation from the wall to occur from the faces of the bricks, concentrating the problem. Traditional lime-based mortars are more absorbent and porous, allowing water to diffuse more freely and evaporate more quickly from a larger area.

Cement is also bad for brickwork because its thermal properties and rigidity make it incompatible with relatively soft bricks. Lime mortars keep the bricks apart equally well, but with relatively less adhesion, allowing gentle movement to occur, whereas cement tends to stick more firmly and under stress will damage the brick before giving way itself. Bricks are less

likely to fail in lime mortar walls, but if they do, their removal and replacement is not so difficult; indeed lime mortars generally ease the re-use of bricks from demolished buildings, allowing small repairs with matching materials.

Brickwork can appear to be damaged by pollution and dirt accumulating, leading to a temptation to clean it. Blasting with sand or other fine particles can cause irreparable damage by removing the fireskin or outer face of the bricks, making them more vulnerable to damp penetration and the more rapid accumulation of further dirt and water ingress on a more porous surface. If cleaning is required, brickwork should simply be sprayed with water jets, hand cleaned gently with a bristle brush, or treated with a dilute, non-alkaline chemical cleaner by a specialist contractor.

Jointing

Both the performance and appearance of a brickwork wall can be seriously affected by the quality of jointing. Traditional bricks often had one of the bedding faces hollowed out to form a 'frog'. This saved clay and helped key the bricks to the mortar, although this was often minimal as they were usually laid 'frog' down. Modern specifications are often for 'frog up' to give the wall greater strength and maintain the wall's density.

Traditionally, brick walls were simply jointed as they were built, but more recently the practice adopted has been to rake out the joints and point the wall up once the bedding mortar has set.

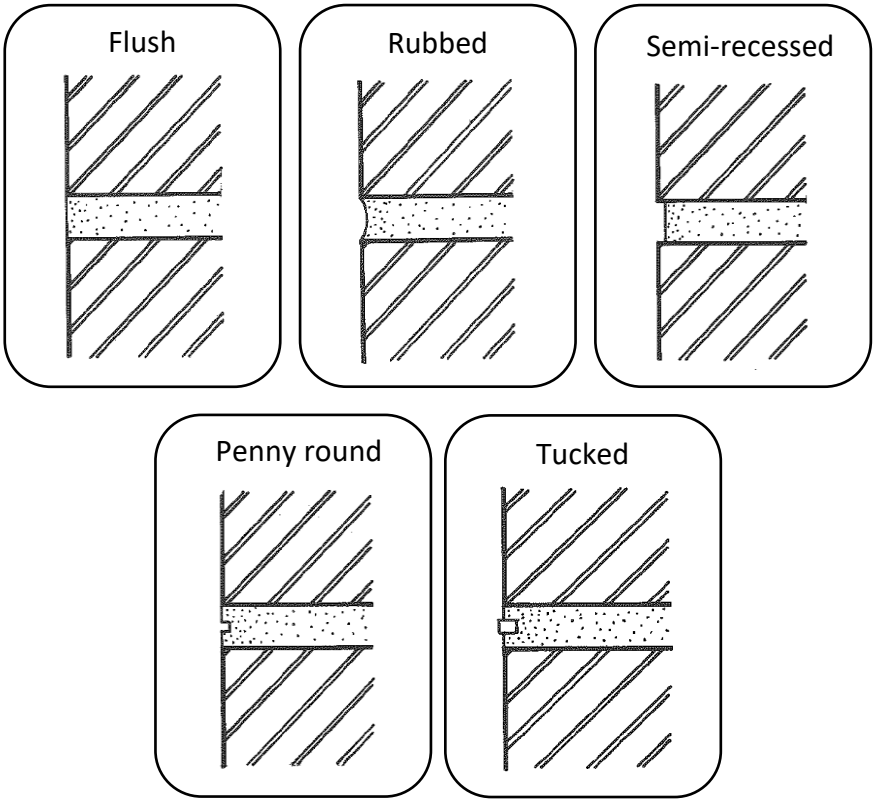
Pointing

Five specific types of joint should not be used on historic brickwork. Reverse Struck and Recessed joints have a tendency to collect water from the ledges formed at the top of each brick. Ribbon or Strap pointing similarly collects water on top of the mortar and places undue visual emphasis on the jointing material, rather than the bricks themselves. Buttered joints are similarly visually intrusive giving an untidy smeared effect with mortar over the brick face. Weatherstruck joints are tidier and do not throw the water off, but are relatively modern and not appropriate on historic buildings.

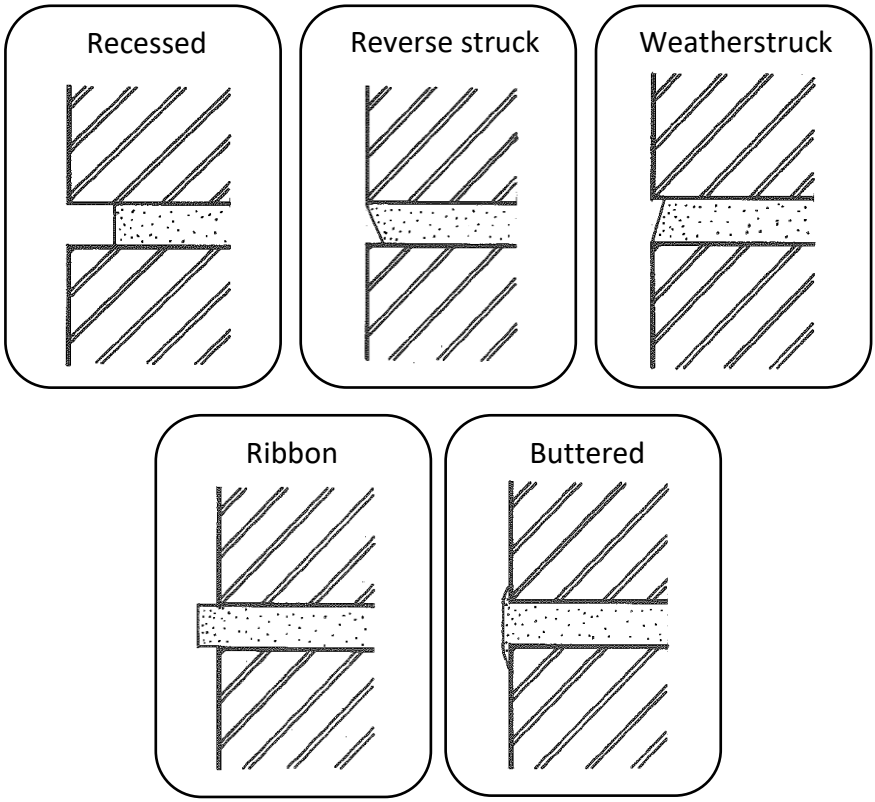
Most historic brickwork was constructed with flush joints or some variety thereof. This could be literally Flush, Rubbed to a slightly concave shape to expose the aggregate or even Semi-Recessed. A flush joint could also be incised with a coin applied along a straight edge to give a shadow line known as Penny Rolled or Penny Round joints.

The very best brickwork in the eighteenth century was carried out with rubbers - soft bricks rubbed down to the most exact dimensions to allow ultra-thin joints. This was much copied in the nineteenth century using tuck pointing. Here, however, ordinary bricks were used but pointed up using a mortar coloured with brick dust to match the bricks. A fine groove cut in this was then filled with a fine silver sand-lime mortar, or even pure lime putty, to give a thin white line joint reminiscent of rubbed brickwork.

Good Pointing



Bad Pointing



Repointing

With an older brick wall built using a lime mix, the mortar is naturally softer than the bricks, and weathers back over many years. Eventually, this will require repointing, where the decayed mortar is raked out to about an inch depth and then replaced. Only loose mortar should be raked out, including any easily removable lumps of cement mortar from previous repointing. On no account should mechanical means such as chisels or angle grinders be resorted to, as they invariably damage the bricks themselves.

In addition, repointing rarely needs to be carried out over an entire wall at once, because the most vulnerable points are damp areas at low level or where a high corner catches the weather. One other minor problem with lime mortars in brickwork which makes repointing necessary is attack by masonry bees (Osmia rufa). These can cause a lot of damage when they colonise a wall or chimney, each bee excavating a tunnel in the mortar within which it raises its young. Repointing is thus best done in limited areas where necessary and to match in with the existing mortar. The match should be in terms of colour, mix and texture, which is influenced by the choice of sand, and the pointing profile.

Mortar Mixes

As a general guide, a 1:3 lime to sharp sand mortar mix is best. Analysis of existing mortar can provide some help in the choice of a suitable sand to match the final appearance of the mortar as well as helping to identify additives that may have been used in the original. Very often additives such as crushed chalk or limestone were used to maintain a light colour, or sometimes ash or soot for a darker mortar. Such additives can also have a 'pozzolanic' effect helping a lime-based mortar to set more rapidly.

Brickwork Repairs

A brick wall or chimney will very rarely need to be completely demolished and rebuilt. Individual bricks that have been spalled can easily be removed and replaced in a lime mortar-based wall. The practice of turning a brick around to present a good face is sometimes adopted, but can only be done once and invariably leaves a poor brick in the wall that will fail again.

If your property is listed, painting or rendering exposed brickwork will require Listed Building Consent, as will some repointing and extensive repairs. The scope of work and the detail will to some extent determine whether consent is needed, even if it is described as repair. It is always best to check with the Heritage Team at the Local Planning Authority to determine whether Listed Building Consent is needed before carrying out works.

Seeking Advice

The Heritage Team can provide initial advice by email exchange regarding the need for Listed Building Consent – and the Development Management Department can provide this regarding questions on the need for Planning Permission (see contact details above).

It is advised to consult the Heritage and/or Development Management (Planning) Departments to determine if Listed Building Consent and/or Planning Permission are needed to address such issues, at:

- heritage@baberghmidsuffolk.gov.uk / 0300 123 4000 Option 5, Option 3
- planning@baberghmidsuffolk.gov.uk / 0300 123 4000 Option 5, Option 3

For more specific guidance on the acceptability of works requiring any form of permission, formal pre-application advice can be sought - for more information please see https://www.babergh.gov.uk/planning/pre-application-advice/ or https://www.midsuffolk.gov.uk/pre-application-advice.

Every historic building has unique characteristics, so alterations acceptable for one might not be suitable for another. Applications for works are considered relative to the specific circumstances of the building in question. Proposals must therefore justify the works clearly and convincingly, aligning

with the specific building's special interest. If your building is also in a Conservation Area, you should also consider the impact of the works on the character and appearance of the Conservation Area.

Useful Resources

Emails

- heritage@baberghmidsuffolk.gov.uk / 0300 123 4000 Option 5, Option 3
- planning@baberghmidsuffolk.gov.uk / 0300 123 4000 Option 5, Option 3

Websites

- Legislation for Designated Heritage Assets – HM Government. *Planning (Listed Buildings and Conservation Areas) Act 1990.* - Planning (Listed Buildings and Conservation Areas) Act 1990 (legislation.gov.uk)
- National Planning Policy – HM Government. *National Planning Policy Framework* - National Planning Policy Framework (publishing.service.gov.uk)

- Heritage Asset Search – Historic England, 2024. *Search The List* - https://historicengland.org.uk/listing/the-list/
- Babergh and Mid Suffolk Conservation Area Appraisals – Babergh and Mid Suffolk District Councils, 2024. *Conservation Areas.* - https://www.babergh.gov.uk/conservation-areas / https://www.midsuffolk.gov.uk/conservation-areas
- Listed Building Consent Process – Historic England, 2021. *Listed Building Consent Historic England Advice Note 16.* - https://historicengland.org.uk/images-books/publications/listed-building-consent-advice-note-16/heag304-listed-building-consent/
- Curtilage Listing – Historic England, 2018. *Listed Buildings and Curtilage: Historic England Advice Note 10.* - https://historicengland.org.uk/images-books/publications/listed-buildings-and-curtilage-advice-note-10/
- Guidance on Planning Permission Requirements – Planning Portal, 2024. - https://interactive.planningportal.co.uk/

- Repointing Brick and Stone Walls – Historic England, 2017 - https://historicengland.org.uk/images-books/publications/repointing-brick-and-stone-walls/
- Traditional Brickwork – The Building Conservation Directory, Geoff Maybank, 2015 - https://www.buildingconservation.com/articles/traditional-brickwork/traditional-brickwork.htm
- A guide to the repair of old brick walls – Society for the Protection of Ancient Buildings, 2024 - https://www.spab.org.uk/advice/guide-repair-old-brick-walls
- Ecology Advice – Chartered Institute of Ecology and Environmental Management, 2016. *A Householder's Guide to Engaging an Ecologist Key Considerations.* - https://cieem.net/wp-content/uploads/2019/02/A_Householders_Guide_to_Engaging_an_Ecologist_Jan_2016.pdf
- Further Ecology Advice – Bat Conservation Trust, 2024. *Getting Personalised Advice.* -

https://www.bats.org.uk/advice/im-working-on-a-building-with-bats/getting-personalised-advice

- Archaeology Advice – Suffolk County Council, 2024. *Suffolk Archaeological Service.* - https://www.suffolk.gov.uk/culture-heritage-and-leisure/suffolk-archaeological-service