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CPD Article

Published on 12 May 2023 11:00

Projecting and recessed brickwork design and durability

Projecting and recessed brickwork design can provide additional interest and texture in buildings and free standing walls. Although projecting and recessed brickwork isn't new, unique contemporary brick aesthetics are being achieved using these techniques.

There are an infinite number of effects that can be created, for example:

- Bands of projecting or recessed brick on alternate courses.
- Creating panels of feature brickwork on elevations with recesses or projections of varying depths.
- The introduction of a special shaped brick to create a textural feature.
- Creating inset panels.

Key Learning outcomes

- To understand popular terminology for the anatomy of a brick and brick types.
- To understand why partially exposing the bed face of a brick is classed as a non-standard application of brick.
- To understand the exposure and its effect on the projecting or recessed brick detail.
- To gain an understanding of what needs to be considered in designing projecting or recessed brickwork.
- To understand freeze thaw durability classification of brick, as defined in BS EN 771-1.
- To understand whether additional mechanical restraint or support will be required to a wall containing these feature details.

1.0 Brick terminology and common brick variants.

For the purpose of this article it is important to explain terminology for the anatomy of a standard clay facing brick and the different variants in its appearance.
Bricks are manufactured to a European Standard, EN771-1, are rectangular in shape and available in various sizes. The most common size in the UK is the metric 215x102x65mm which suits modern housebuilding, although many manufacturers do have larger format variants aimed at the architectural sector.
The bricks may be formed either by compaction into a rectangular mould (stock, moulded or waterstruck) or pushed through a rectangular aperture (extruded) and cut to the desired size (wirecut). Colours and textures can be incorporated during or after forming and, due to the methods of manufacture, are only intended to be visible on one fair-faced side (stretcher face) and one fair-faced end (header). The top and bottom of the brick (bed) is not intended to be seen after construction as it should normally be sandwiched in mortar.
Moulded bricks often contain a large indentation in the bed (frog), extruded wirecuts often contain multiple perforations running through from bed to bed. There are many different types of perforation configurations or size of frog depending on the manufacturers preference to assist with drying and firing.
Some products are produced with no perforations or frogs in the bed and are called solids. However, it should not be assumed that the bed of a solid brick is intended for exposure to the elements.
Aside from rectangular shaped ‘standard’ brick there is the production of ‘Special Shapes’. These bricks are manufactured to compliment standard bricks and are used to create decorative features with infinite possibilities. Special Shapes can be manufactured to offer a fair face to more than just the standard stretcher and header and often the ‘bed surfaces’ can be aesthetically finished to remain visually attractive if they should be used in a detail such as projecting features.

Brick Types

Durability of materials

In accordance with BS EN 771-specification for masonry, manufacturers of clay bricks are required declare a durability rating. The freeze thaw test methodology requires a panel of bricks to be assembled in a flush elevation with only the stretcher or header faces of the brick exposed to the weathering apparatus. Test results range from F0 (suitable for passive exposure), F1 for moderate exposure and F2 for severe exposure. However, because the bed faces of the brick are not exposed during testing, it is not possible to predict with certainty how a brick, classed as F2 freeze thaw durability, with an exposed bed face will perform.

Mortar contributes to at least 18% of brickwork and the correct specification of this and selection of appropriate mortar joint is also necessary to ensure a long lasting durable finish.

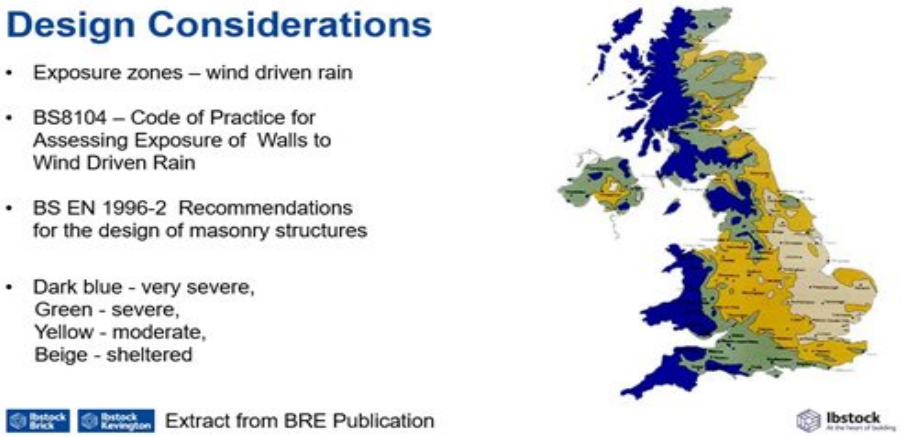
Commonly used mortar joint profiles

Exposure levels

Aside from the durability of materials, the exposure of the region and site should be evaluated at an early stage.
The Map of the UK pictured depicts UK zones for exposure to driving rain, an extract from a BRE publication derived from BS8104 –Code of practice for assessing exposure of walls to wind driven rain. The map is also found in in Section 5. Walls of Building Regulations Approved Document C.
It gives a good indication of how much severe rainfall various parts of the UK can expect and assists in appropriate specification of materials and design considerations.

BS EN 1996-2 Recommendations for the design of masonry structures –selection of materials and execution contains information on microclimates of a building and the relative exposure to wetting.
This highlights zones of caution when selecting materials and design.

The degree of exposure for building elevations is determined by:
- Region and topography – reference to BS8104
- Orientation and proximity to other buildings.
- Structure design and protecting features such as overhanging roof or copings- Reference to EN 1996-2
- The extent of proposed projections/recesses
- Mortar joint profile.
- Impervious materials within the envelope that may contribute to saturation.



Exposure to wind driven rain geographically and zones of relative exposure to wetting of walls to buildings, free standing walls and earth retaining walls.

Successful use of brick in creative design applications

As previously highlighted, the code of practice for the specification of masonry EN771-1 and the suite of testing standards associated with it all assume brickwork will be used in a conventional manner. By convention we mean that each rectangular brick will be fully bedded in mortar with an appropriate mortar joint and flush brickwork.

Deviating from this norm, such as projecting or recessing bricks, will partially expose the ‘bed’ surfaces of the brick which is usually fully bedded in mortar. Therefore, when planning projecting or recessed brick detailing it is important to take into account any impact this may have on the rain penetration performance of the brickwork.

The type of mortar joint used will have an impact on rain penetration and it may be advisable to adopt a joint style with an angled fillet to prevent water pooling on the horizontal bed and shed water away from the brickwork surface.

As a starting point only bricks which are classed as F2 freeze thaw durability should be considered for projecting and recessed brickwork details.

As mentioned previously a solid brick should be specified where the bed with be visible. Even with a solid brick, it needs to be understood that clay brickwork is porous and that any horizontal surface in clay brickwork where rainwater or snow may gather will make it vulnerable to frost attack.
There are two types of solid brick, a standard solid, and solid brick with a finished “fair” face on bed surface known as a BD.1.3.
Ideally a special shaped brick with a solid faced bed should be used which will provide greater durability due to the compaction of the pore structure of the bed surface when forming the special.
The brick manufacturer’s advice should always be sought in relation to specifying a suitable product for this type of application.

Other considerations are the type of bond to adopt to assist in creating the desired aesthetic, the stability of the wall which is discussed under point 5 below and also whether the projections or recesses created could present a security risk if the feature brickwork provides a “climbing wall” or a suitable resting platform for pigeons.

Projecting Headers

Projecting headers Warwick University. Architects: Associated Architects

Restraint, support and detailing

When detailing textural walls incorporating projections, recesses or other features that vary the envelope thickness, the overall stability of the wall may be affected.

Always consult with a structural engineer if brickwork deviates from standard applications, brickwork should comply with structural design requirements set out in BS EN 1996-1-1.

Sufficient wall ties must be incorporated as described in BS EN 1996-1-1 and Building Regulations Approved Document A.

Ensure cavity widths are adequate and the internal facing brick is cut smooth and is flush with surrounding brick surfaces.

Consider adding a cavity tray with stop ends below any area of projecting or recessed brickwork, to catch the additional water that is likely to be blown into the cavity by the wind. The cavity tray should be about 225-300mm below the projecting or recessed brickwork and extend about 300mm beyond the width of the projecting or recessed detail at both sides.

Projecting headers. Foundry, Salford. Architects: Sixtwo Architects