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booklets

masonry

GUIDE TO MASONRY

Masonry Units

Masonry units are classified both by their quality, which affects their use, and the manufacturing process and can be divided into two distinct categories, being; Clay and Concrete (concrete bricks or blocks are sometimes incorrectly referred to as cement bricks or blocks).

Size

Size varies depending on category, type and the manufacturing process. When describing the dimensions of a masonry unit, the standard procedure is length x width x height (all in millimetres).

How masonry units are manufactured

Clay

Clay Bricks are manufactured from a mixture of Clay and other additives, which are mixed together to make a pliable type mixture almost like plasticine, which is then shaped usually by extrusion and cut to size, then dried and fired. Different clays produce the different colours – in most cases the clay contains some traces of iron oxide that will give most clay bricks a reddish colour.

Concrete

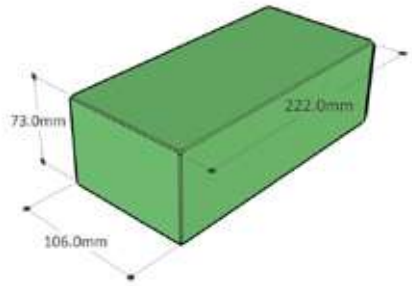
Concrete bricks (sometimes incorrectly referred to as cement bricks) and blocks are manufactured from various types of aggregate (sand and other materials like ash mixed with small stone particles) creating the texture and colour, mixed with cement and water, which is then vibrated into a mould creating the shape, size and profile of the brick or block. The moulded products are then cured either in steam chambers or in the air and are regular in size and colour.

Brick Sizes

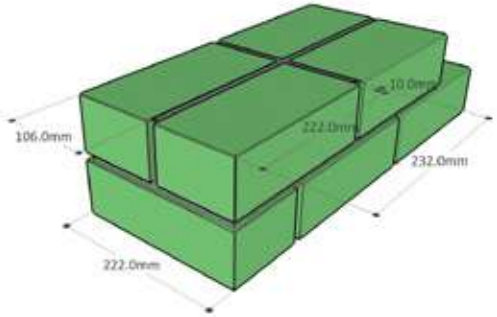
Most bricks (solid units) are usually manufactured to the imperial size 106mm (1 module) wide and 222 mm long (i.e. 2 modules, 2 x 106 plus a 10 mm mortar joint) long. There is a rough ratio of length to width of 2:1 and an aspect ratio of height to width of 0,7 in the standard or imperial brick of 222mm long x 106mm wide x 73mm high; when used with a 12mm mortar joint, the following formats are applicable:

- The format size becomes 234 x 118 x 85mm.
- The format length (234) is the module of stretcher + perpend.
- The format width (118) is the module of perpends.
- The format height (85) is the coursing height.

Standard Imperial brick



Imperial brick as modular unit including mortar



Block Sizes

Modular co-ordinating for specific blocks (hollow units) of suitable modular dimensions is 100 mm (1 module, i.e. 90 wide plus a 10mm mortar joint) or multiples thereof when built into a wall as in the case with bricks. Modular co-ordination is a method of co-ordinating the dimensions of buildings and building components to reduce the range of sizes required and to enable components to be built in on site without modification; modular door and window frames are required. While bricks are laid on a full-bedding face of mortar hollow units are laid on shell bedding across the width of the face shell.

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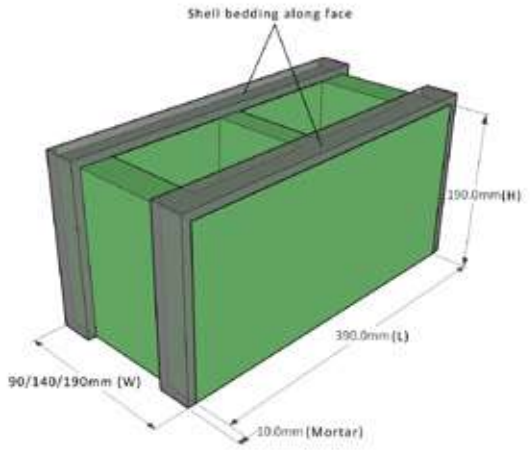
Typical block



Masonry Units (Bricks And Blocks) Sizes and Quantities Required per m²

Masonry unit size (mm)			Masonry units per m²
Length	Width	Height	
Standard imperial brick – single leaf wall			
222	106	73	52
Standard imperial brick – double leaf wall			
222	106	73	105
Maxi bricks			
222	90	114	34
290	140	114	27
290	140	90	34
Blocks			
290	140	140	23
390	90	190	13
390	140	90	25
390	140	140	17
390	190	190	13

Note: The table is based on exact sizes of solid masonry units, with 10 mm thick bedding and vertical joints, and no wastage (Quantities are rounded up).

A figure of 10% is usually accepted when making allowance for wastage, which also includes for breakages (during off loading and construction).

0,34m^3 of mortar is required per 1000 bricks (standard imperial brick). 1,0m^3 of sand would be required for every 1,0m^3 of mortar.

Water Absorption

Clay brick is subject to irreversible moisture expansion. This occurs as a result of the absorption of moisture from the atmosphere after firing and affects the long term durability, moisture induced movement, rising damp and the aesthetics of walls which is dependent on the class of brick used. Clay brick also have an initial rate of absorption (IRA) over the bedding face that requires that units be wetted to facilitate adequate bond with masonry mortar when laid.

Water absorption is not regarded as a significant characteristic of concrete masonry; concrete brick is permeable but also subject to moisture induced movement (expansion on re-wetting) which is dependent on the inertness of the aggregate. Concrete brick does not have an IRA and shall not be wetted.

To mitigate routine ongoing maintenance of masonry walls, to minimize moisture movement and rising damp and to ensure that walls remain durable the following steps shall be adhered to:

- The use of dissimilar material, i.e. clay and concrete brick in the same wall shall not be permitted;
- A horizontal damp proof course (dpc) shall be placed across the entire cross-section of a wall and shall protrude on the rendered face;
- Parapet walls shall be provided with a coping or the horizontal surface shall be waterproofed;
- The external finished ground level shall be 150mm lower than the horizontal dpc level;
- A vertical dpc shall be placed against the foundation wall where abutting the soil; this may be omitted if a low water absorption face brick is used in the foundation wall;
- Masonry reinforcement (brick or block force) shall be placed over and above window and door heads and under window openings; alternatively control (movement, expansion or contraction) joints shall be placed in walls at predetermined locations.

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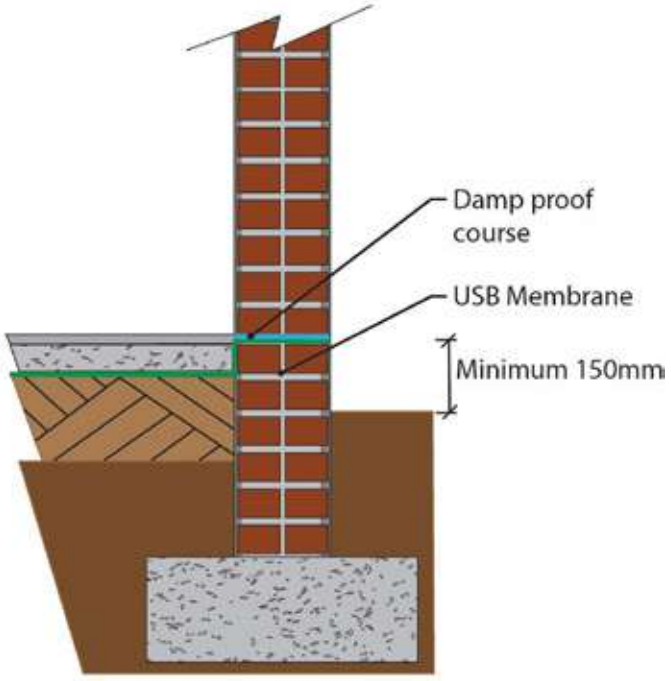
Brickwork

Damp Proof Courses

Damp proof courses (DPC) need to be installed to prevent moisture and water seepage through walls etc. DPC is a sheeting of impervious material; Mastic asphalt, bitumen polymer and fibre felt or embossed polyethylene pre-manufactured in rolls, to suit the different widths of brickwork, also available in different thicknesses known as microns (µm) with the most common being 375 µm.

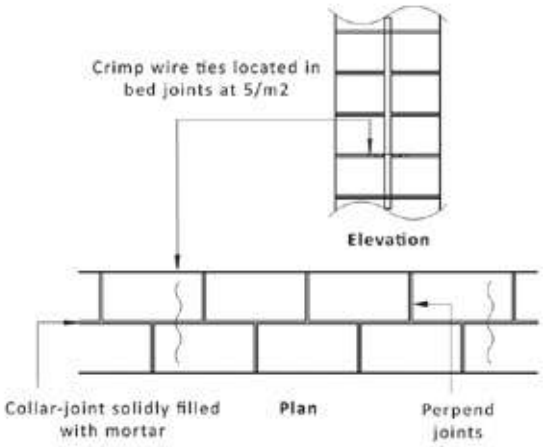
The three basic methods of protection in which DPC courses are used, are:

1. To prevent moisture penetration from below (rising damp)
2. To prevent moisture penetration from above
3. To prevent moisture penetration from the side (horizontal entry)

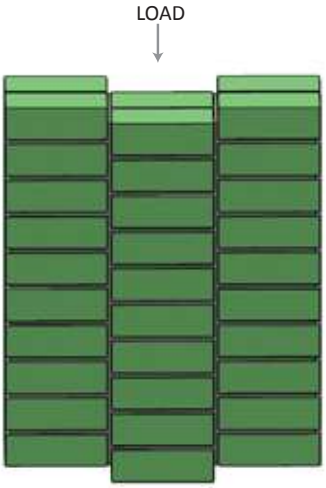


Collar-jointed (double leaf) wall

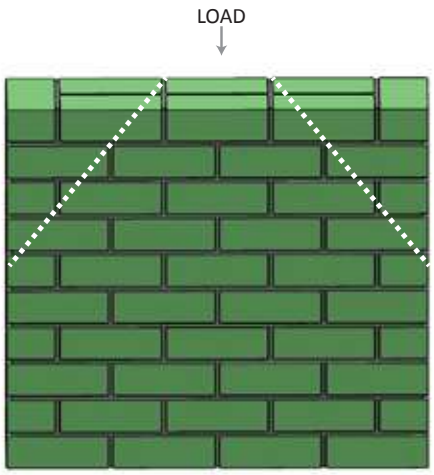
Wall comprising stretcher bonded parallel single leaf walls with the space between them (collar-joint) not exceeding 25 mm (between 10 to 15 mm), filled solidly with mortar and tied together with wall ties (see image below). Walls shall be cross-bonded using header courses or by using a mechanical tie to facilitate composite action between leaves.



Bonds

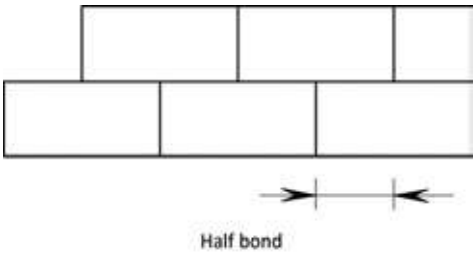


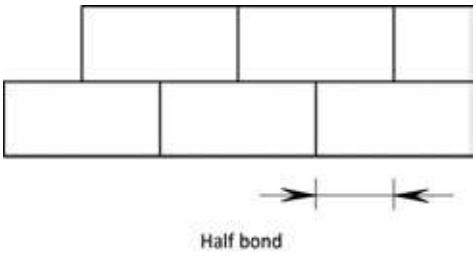
Unbonded Brick Wall
INCORRECT



Bonded Brick Wall
CORRECT

There are two known practical bond methods, that is, the quarter brick lap called the quarter bond, or the half brick lap called the half bond.



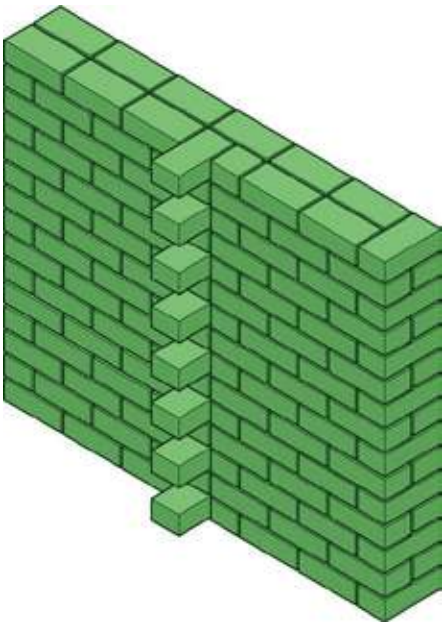


In practice, to maintain proper bonding, the cutting of masonry units to avoid straight joints is unavoidable; however, if the building is designed to standard masonry modules and correctly set out, the cutting of masonry units can be kept to a minimum.

Toothing and racking back

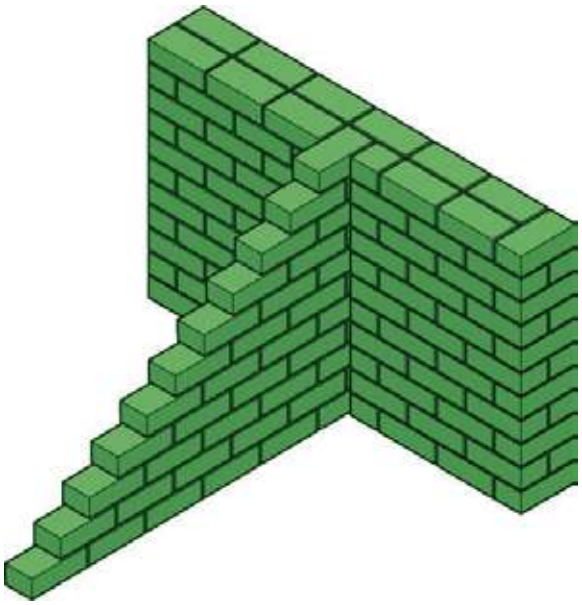
Toothing

A full or half brick is removed or a half brick projects from alternative courses of a wall in order to provide adequate bond if the wall is to be joined or connected at a later stage – see figure below. (Toothing is not usually permitted by many local authorities)



Raking back

The stepped arrangement formed during the construction of a wall when one portion is built to a greater height than an adjoining wall. It is recommended that no part of a wall during its construction should rise more than 900mm above another wall at one lift, if unequal settlement is to be avoided`



Jointing & Pointing

The reasons for jointing and pointing are firstly to prevent the penetration of water into the walls and secondly to provide a neat aesthetically pleasing finish, especially when using face bricks.

Various tools are used to produce a smooth outer edge to the joints in order to allow water to run off without obstruction and thus prevent it from soaking into the brickwork by means of capillary action

Jointing is the process of finishing the face of the joint as the work proceeds. The actual mortar (Dagha) in which the bricks are laid is smoothed by means of the brick trowel or jointing tool; typically done when using stock bricks.