Marshalls
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Brick Technical Bulletin - Resistance to Rain Penetration

BTB 9

Independent research has shown that walls built from Marshalls bricks perform well. The testing was carried out in accordance with BS 4315: Part 2: 1970 and comprised intermittent spraying of water at a length of wall for one minute, at half hour intervals, over a 48 hour period, under a maintained positive air pressure. The area of dampness was then monitored. Tests carried out on various types of concrete brick indicated very low levels of rain penetration occurred, thus clearly showing that there was no correlation between rain penetration and the product readings for strength, density or water absorption of the various types of brick.

The notes below give general guidance for walls built using either concrete or clay bricks, and further reference should be made to following Standards.

- PD 6697: 2010: Recommendations for the design of masonry structures.
- BS 8104: Code of practice for assessing exposure of walls to wind driven rain.
- BRE Report 262: Thermal Insulation; avoiding risks.

Neither the outer leaf of cavity walls nor single leaf walls are impervious to driven rain. During periods of high or prolonged exposure some moisture will penetrate the outer leaf, initially through the joints and then ultimately through the brick itself. The performance of the wall in resisting water crossing over the cavity is affected by the workmanship, degree of exposure and the quality of design and specification. Poor design or practice is more likely to lead to moisture transmission to the inner leaf.

In general Marshalls facing bricks can be classed as having a low-medium rate of absorption and thus tend to initially shed rainfall towards the joints. It is important therefore that full bedding and complete filling of the perpend joints is carried out during construction.result of rain saturating freshly laid work.

PERFORMANCE OF WALLS

Single Leaf Walls

1. Protected by tile hanging or cladding: These will be watertight in all locations provided the recommendations of the manufacturers have been followed.
2. Protected by external rendering: Providing render of the correct specification has been applied then walls may be reasonably watertight but some damp may percolate through to the inside given high degrees of exposure.
3. Unprotected: Walls of this type will not remain dry internally in all conditions, but where necessary their performance can be improved by the application of a proprietary external water proofer with a high solids content.
4. Solid masonry walls: Internally insulated walls should be at least 328mm thick and have a notional cavity between the masonry and the insulation.

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Cavity Walls
Moisture may penetrate the outer leaf of a cavity wall but should not cause dampness on the inner leaf provided the appropriate design and construction, type of insulation, cavity widths and workmanship have been carried out as suggested below.

1. Use the correct grade of mortar and mortar joint.

2. Take all necessary precautions to minimise the effects of movement and in particular the risk of cracking by the incorporation of the appropriate movement joints.

3. Provide weep holes in the outer leaf immediately above any damp proof course or tray. They should be installed at not more than 900mm centres. Provide means of restricting the entry of wind driven rain in areas of high or very high exposure.

4. Ensure clear cavities with a minimum width of 50mm are maintained throughout the wall and that cavities are not bridged by mortar debris or incorrectly fixed insulation.

5. Do not adjust the position of bricks once they have been bedded. This can break the brick/mortar bond, leaving fine cracks for rain penetration.

Determination of Exposure
BS 8104 gives recommendations for two methods of assessing exposure ratings of walls to wind driven rain, namely the local spell index and the local annual index. The former should be used when assessing the resistance of a wall to rain penetration whilst the latter is intended for use when assessing durability, the weathering appearance and the potential growth of mould or mosses.

The exposure categories in terms of wall spell indices are given in the table below using the local spell index. They should not be regarded as exact as local circumstances or experience may require adjustments to be made. Where an assessment produces an intermediate index then the designer should utilise local knowledge, topography and experience to decide the most appropriate exposure index.

Category of Exposure		Calculated Quantity ofWind Driven Rain (L/m2/spell)
Sheltered	Zone 1	Less than 33
Moderate	Zone 2	33 to less than 56.5
Servere	Zone 3	56.5 to less than 100
Very Severe	Zone 4	Not less than 100

The full scale map detailed in the Standards above indicate the approximate zones within the United Kingdom but more accurate data can be derived from large scale maps and the correction factors given in BS 8104. Adjustment may need to be made for local conditions.

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MAXIMUM RECOMMENDED EXPOSURE ZONE FOR FACING MASONRY WITH CAVITY INSULATION

More permutations of cavity type and widths are given in BRE Document 262.

Internal Walls above dpc	Clear Cavity Width (mm)	Mortar Joint Profile	
		Tooled Flush Joint	Recessed Joints
Built In Full Fill	50	Zone 2	Zone 1
	75	Zone 3	Zone 1
	100	Zone 3	Zone 1
Injected Fill (Not UF)	50	Zone 2	Zone 1
	75	Zone 3	Zone 1
	100	Zone 3	Zone 1
Partial Fill:			
Residual 50mm Cavity		Zone 3	Zone 1
Internal Insulation:			
Clear 50mm Cavity	50	Zone 3	Zone 2
Clear 100mm Cavity	100	Zone 4	Zone 2

Thickness of Outer Leaf

The resistance to rain penetration is dependent on its thickness for single leaf walls. The table below gives the recommended thicknesses for various categories of exposure using Marshalls bricks as an outer leaf.

Minimum Thickness (mm)	Unrendered/ Fair Faced	Rendered	Externally Insulated	Externally Insulated
100	Not recommended	Zone 1	Zone 3	Zone 4
215	Not recommended	Zone 2	Zone 3	Zone 4
250	Zone 1	Zone 3	Zone 3	Zone 4