CI/SfB (41) F
Issue 5 September 2021
(SUPERSEDES Issue 4 June 2015)

Guide to minimising rain penetration through masonry walls

Introduction

When subjected to persistent wind driven rain, the outer leaf of most masonry cavity walls will permit water to enter the cavity, generally through cracks at the interface between the masonry units and mortar. If the wall is properly constructed, water will flow down the inside face of the outer leaf and be discharged out of the cavity usually through weepholes.

Very often cavities contain defects which enable water to penetrate the inner leaf causing dampness to appear on the inner surface. Eventually decorative finishes may be damaged but before any repairs are undertaken, the underlying cause should be identified and corrected.

The diagnosis of rain penetration is rarely straightforward, particularly where insulated cavity walls are concerned. Various techniques are available to view the cavity; alternatively a number of masonry units may be removed. Once the cause has been identified, appropriate corrective action can be taken.

As with all remedial measures, significant expenditure is often involved. The most cost effective solution is. however, prevention. By paying greater attention to design, and in particular, workmanship on site, the incidence of problems attributable to rain penetration willalmost certainly be reduced.

This data sheet sets out to highlight some of the principles that need to be adhered to in respect of good practice. For more detailed guidance, refer to British Standard Code of Practice BS 1996-1-1 and BS 8000-3, MPA Mortar data sheets or other specialist literature.

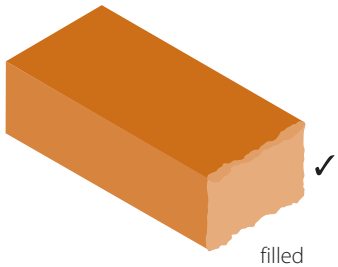
Recommendations

Mortar joints

Partially filled mortar joints can allow wind driven rain to enter the cavity. To provide adequate resistance against rain penetration, it is essential to ensure that all joints are filled.

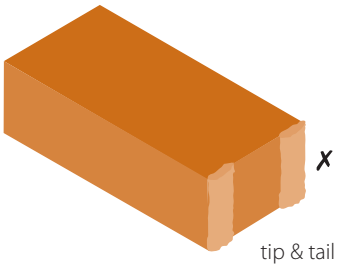
Bed joints should always be level and even and it is good practice not to use excessive furrowing. Cross joints, more commonly known as perpends, should be filled by spreading mortar evenly across the entire end face of the masonry unit. The practice of applying a small dab of mortar to the front and rear edges only, known as 'tipping and tailing', is not to be recommended.

Once the masonry units are in place and the mortar has begun to stiffen, do not attempt to adjust the masonry to line or level as this may break the bond causing cracks through which water can penetrate.



filled

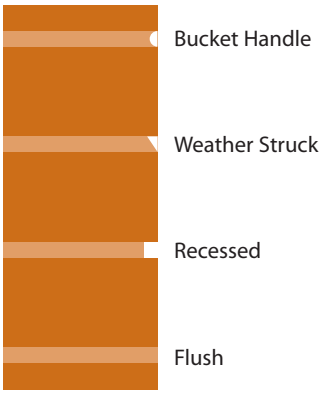
Perpend joint



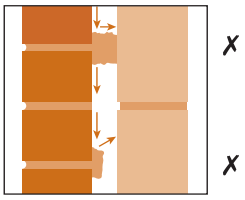
tip & tail

Joint profile

Pointing as the work continues is preferable to pointing at a later stage. Correct tooling compacts the mortar in the joints and helps improve durability. Recessed and flush joint profiles are used, but to provide the greatest resistance to rain penetration, joints should be formed with either a weather struck or bucket handle profile.

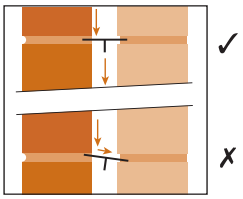


Cavity Obstructions



Deposits of mortar on wall ties, large mortar obstructions and mortar extrusions on the inside face of the outer leaf, particularly at bed joints, can deflect or transmit water to the inner leaf. To prevent mortar and debris entering the cavity, use boards or draw battens as the work proceeds.

Wall ties



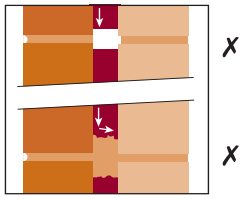
Incorrectly installed wall ties can act as a route for water to pass across the cavity. They should always be bedded horizontal and never slope down towards the inner leaf. Position drips in the middle of the cavity pointing downwards.

Mortar type

Mortar of the correct mix designation should be specified according to the durability requirements and type of masonry unit being used. Note that stronger mixes are less able to accommodate movement due to temperature and moisture changes.

Incorrectly proportioned mixes may result in reduced bond between the masonry unit and the mortar. Batched by weight under controlled conditions, factory produced materials have consistent mix proportions.

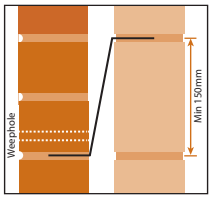
Cavity insulation



Partially filled cavity using boards, fully filled cavity using boards and fully filled cavity using injected or blown foam or granules are the available insulation systems. They should be correctly installed if problems with rain penetration are to be avoided. Although the materials themselves are waterproof, water can be transmitted across the cavity through voids or gaps in the fill or via mortar extrusions or droppings at joints.

Boards or batts should not be pushed into place after construction or fixed by non-approved methods. They should be butted boards and batts at both horizontal and vertical joints and at closures.

Cavity trays and DPC's

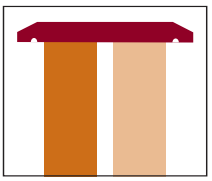


Incorrectly installed cavity trays and DPC's may result in rain penetration problems.

Horizontal DPC's should cover the full width of each leaf and not project into the cavity. Vertical DPC's should be securely built in at jambs to prevent sagging and should project at least 25mm beyond the closer into the cavity.

Wherever possible, cavity trays should be used in continuous lengths. If a joint is unavoidable, the trays should be adequately supported and should overlap by a minimum of 150mm. They should be sealed with an appropriate jointing compound. Effective stop ends should be fixed to prevent water running off the end of the tray into the cavity and drainage weepholes formed in the outer leaf (minimum of two per tray) at centres not exceeding one metre.

Constructional detail



External masonry is much less likely to become saturated if features have been provided to direct run-off water clear of the face of the building. Such features include adequate roof overhangs, projecting throated sills and bell mouths or similar in the case of walls partially clad by tile hanging or other impervious material.

Remedial measures

Where dampness is considered excessive and the underlying cause difficult to detect or repair, it may be appropriate to improve the water resistance of the outer leaf. A number of remedial measures are available, the most common of which are given below. For more detailed guidance, refer to the relevant British Standard code of practice or specialist literature.

Repointing

Where mortar joints are noticeably cracked, eroded or in poor condition, repointing may be necessary to restore the integrity of the masonry. Existing joints should be raked out to a depth of at least 15mm and thoroughly cleaned by removing all debris. The joint should be lightly dampened to reduce suction and replaced with mortar of the required designation. Either a weather struck or bucket handle joint profile should be formed.

Water Repellent Coatings
The application of a water repellent coating may be considered. Applied by either brush or spray, so that the repellent penetrates the pore structure to a few millimetres below the surface. This results in capillary repulsion which resists the ingress of water. As the pores are coated rather than blocked, water vapour is allowed to diffuse to the surface so that the wall can 'breathe'. This is particularly important for walls constructed with complete cavity fill or solid masonry.

In common with most surface treatments, water repellents have a limited life. For most materials, a period of ten years is usually assumed before another application is required.

Good workmanship is fundamental to the intergrity of the masonry construction. The subsequent application of a water repellent coating will not compensate for defective workmanship.

Rendering and Cladding
Rendering, cladding and tile hanging are the most expensive remedial options. Although offering good resistance to rain penetration, these materials may prove difficult to apply or fix to an existing building, particularly around window and door openings. Furthermore, any significant changes in the appearance of the building may be considered unacceptable for aesthetic reasons.

References

BS EN 1996-1-1	Eurocode 6: Design of masonry structures. General rules for reinforced and unreinforced masonry structures. + National Annex.
BS 8000-3	Workmanship on building sites. Ciode of practice for masonry.
Ritchie, T:	Study of efflorescence produced on ceramic wicks by masonry mortars, Journal of the American Ceramic Society 38, 362 - 366

All references to British and/or European standards should refer to the current published edition.
For a comprehensive list of British and European Standards see the MPA Mortar data sheet of technical references.

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MPA Mortar is part of the Mineral Products Association, the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries.

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