

Building Flood Mitigation Measures: Water Exclusion Strategy

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Rev -

Reference **C2975**

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1 BUILDING MATERIAL MITIGATIONS

- 1.1 The national government produced guidance for improving the flood resilience of building in the Communities and Local Government (CLG) 2007 'Improving the Flood Performance of New Buildings' publication. This publication provides recommendations on how to protect buildings in the case of a flood event, and propose two scenarios based on maximum expected flooded depths, and provides an explanation between flood resistance and resilient measures, these are summarised below:
 - ⇒ **Water exclusion strategy** is when the emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m). According to the definitions adopted in this Guidance, this strategy can be considered as a resistance measure, but it is part of the aim to achieve overall building resilience
 - ⇒ **Water entry strategy** is when the emphasis is placed on allowing water into the building, facilitating draining and consequent drying. Standard masonry buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m) by utilising resilient materials, and construction methods.
 - ⇒ **Flood resistant measures** are incorporated where it is considered feasible to prevent floodwater entering the building and take the form of flood barriers. Many flood resistant products/barriers are only suitable to typical maximum height being 0.68m, before the risk of structural damage is incurred. As this is a historic structure with limited scope for structural reinforcement.
 - ⇒ **Flood resilient measures** are incorporated where it is accepted that, in severe flood events, water may enter parts of the building so it is necessary to ensure the building will remain useable after the floodwater has receded and the area has been cleaned. Therefore, materials should be incorporated that retain their structural integrity and have good drying and cleaning properties or are waterproof, and services and sockets etc. are located as high as practical to minimise flood damage.
- 1.2 Given the primary risk is related to surface water flooding, most likely from an exceedance event or failure of onsite drainage, it is considered that some of key principles of the **Water Exclusion Strategy** as detailed in 'Improving the Flood Performance of New Buildings' and BS 85500:2015-Flood resistant and resilient construction.
- 1.3 A list of recommended design and detail based on these two standards based on a Water Exclusion Strategy are presented below.
- 1.4 This report should be read in conjunction with the CGS FRA (refer C2975) to understand the full context and flood risk to the building.

2 RECOMMENDED BUILDING DESIGN AND MATERIALS

FOUNDATION DESIGN

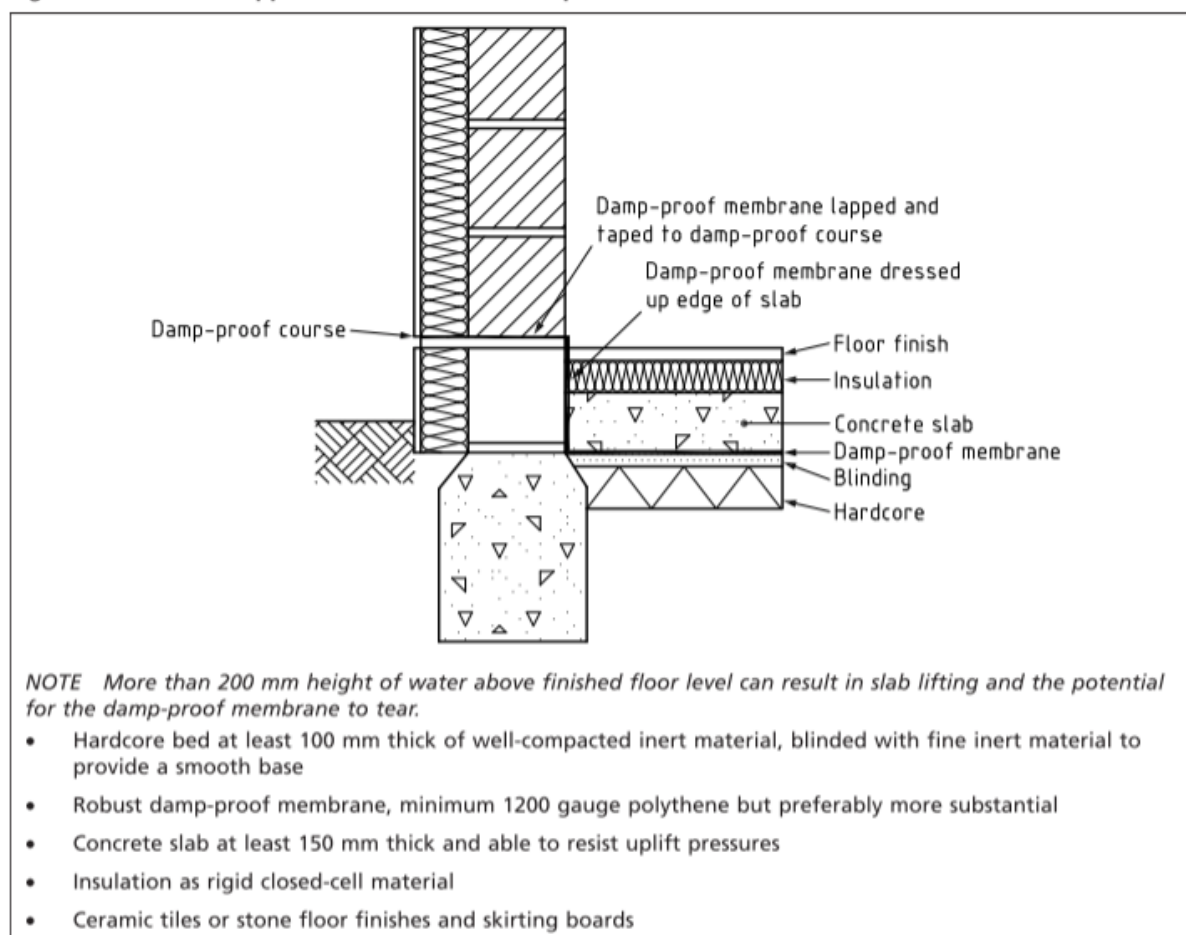
Sealed Foundations

- 1.5 **Material:** Use **waterproof concrete** (integral with waterproof admixtures) or **epoxy-based sealants** for additional water resistance.
- 1.6 **Design:** Incorporate an **integral tanking system** with reinforced concrete slabs. Waterproof membranes (e.g., HDPE membranes) can be added below and around the foundation to act as a barrier against groundwater seepage

Rising Walls and Damp-Proof Courses

- 1.7 **Material:** Install **bituminous damp-proof courses** or **plastic damp-proof membranes (DPM)** to block water rising through capillary action.
- 1.8 **Design:** Extend the damp-proof membrane up the internal wall by at least 150 mm above the external ground level.
- 1.9 A recommended slab on ground floor detail is provided below from BS 85500:2015.

Figure 5 Ground-supported floor – Preferred option



WALL CONSTRUCTION

Waterproof Materials

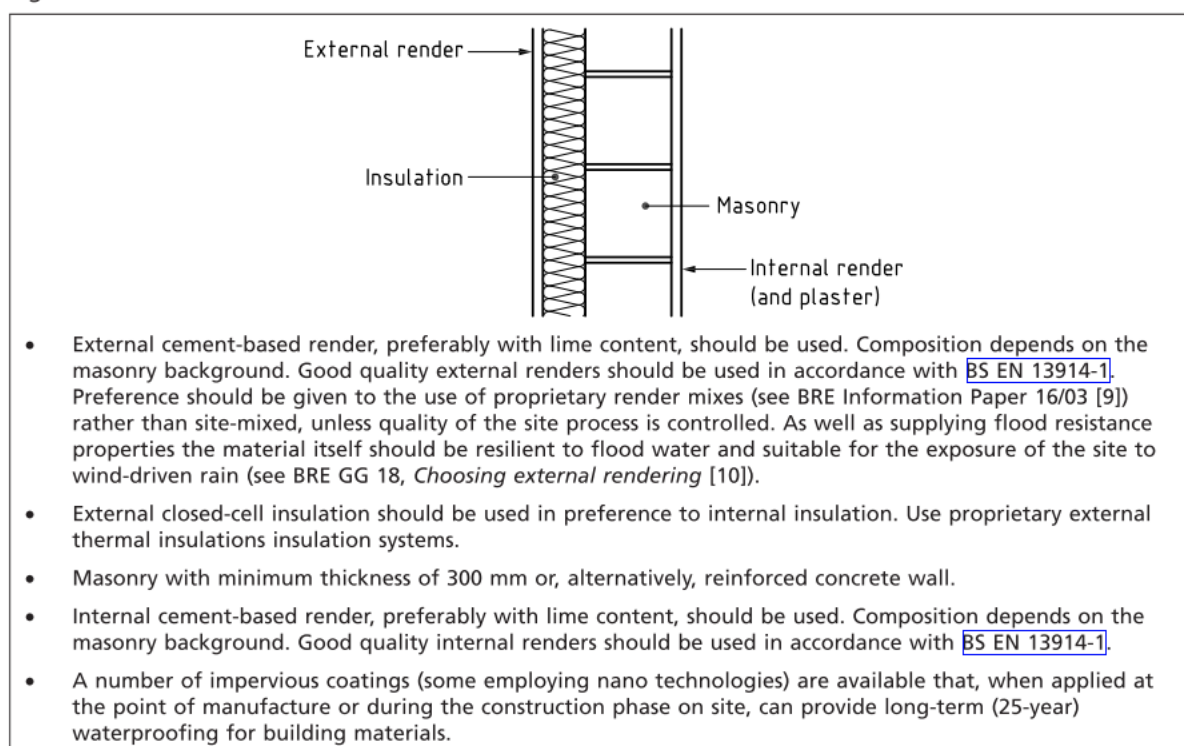
- 1.10 **Material:** Use **engineered concrete blocks**, **hydrophobic bricks**, or bricks treated with a **silane-siloxane-based waterproofing agent** up to at least 600mm above ground level.

- 1.11 **Design:** Incorporate **render finishes** made with waterproof cement or **waterproof lime plasters** to create an impermeable outer layer.

Walls

- 1.12 **Material:** Construct cavity walls with **thermalite blocks** for the inner leaf and waterproof bricks for the external leaf. Include a **DPC (Damp-Proof Course)** in the cavity and install **cavity trays**.
- 1.13 **Design:** Use **stainless-steel wall ties** with drips to prevent water bridging the cavity and integrate a **drainage membrane** inside the cavity to direct water to external weep holes.
- 1.14 **There are multiple options for different wall constructions for a water exclusion strategy depending on the required outcomes and preferences of the client.** The architect and building designer should adopt 1 of the 4 recommended wall constructions listed in Section 7.4 of BS 85500:2015. An example of Solid External Wall detail is provided below for reference.

Figure 7 Solid external walls



3. OPENINGS AND PENETRATIONS

Seal All Openings

- 1.15 **Material:** Install **airbrick flood covers** or **automatic airbricks** that seal during flooding. For pipe penetrations, use **EPDM rubber seals** or **expanding foam sealants**.
- 1.16 **Design:** Apply **non-shrink grout** or epoxy coatings around utility penetrations to prevent leaks.
- 1.17 The architect should refer to Section 9.2 of BS 85500:2015 for material details for Windows, Doors and Air Vents.

FLOOR DESIGN

Impermeable Floors

- 1.18 **Material:** Use **waterproof concrete** slabs coated with **epoxy resin** or a **polyurethane sealant** for an impermeable finish.

- 1.19 **Design:** Install **integrated drainage layers** below the concrete slab to manage water and prevent seepage into the interior.

Raised Thresholds

- 1.20 **Material:** Use **precast concrete threshold blocks** or durable **UPVC threshold kits**.
- 1.21 **Design:** Raise thresholds at all external doors by 150–300 mm above the external ground level to prevent water ingress.
- 1.22 For protection against residual impacts, the architect can choose to adopt the recommendations in Section 7.3.3 of BS 85500:2015

DRAINAGE AND LANDSCAPING

- 1.23 **Material:** Use **topsoil, clay bunds, and engineered green slopes** to channel water away from the building.
- 1.24 **Design:** refer to PJC Landscape General Arrangement Plan reference PJC.1277.001 Rev C for recommended surface drainage measures and ground levels to direct overland runoff around the building.

6. MAINTENANCE AND MONITORING

- 1.25 **Material:** Ensure routine inspections include checking **sealants, membranes, and drainage systems**. Use **infrared cameras** to detect water penetration.
- 1.26 **Design:** Maintain an **inspection plan** for early detection of system failures.

7. INTEGRATED SUDS (SUSTAINABLE DRAINAGE SYSTEMS)

- 1.27 **All site runoff should be tied back into the surface water drainage system. Refer to the proposed SUDS Drainage Scheme.**

MATERIAL SELECTION

- 1.28 **Material:** Use **PVC skirting boards, tile flooring, and non-absorbent insulation (e.g., closed-cell foam)**.
- 1.29 **Design:** Ensure materials are non-porous and easy to clean post-flooding.
- 1.30 These measures provide a comprehensive, resilient approach to water exclusion, combining structural design, material selection, and drainage techniques tailored to various flood scenarios.