4.

Ground Floors

Contents

Introduction

This section provides guidance on meeting the performance requirements for the following types of suspended ground floors:

- Proprietary precast concrete floor systems (such as beam and block)
- In-situ concrete slabs
- Proprietary pre-cast insulated concrete floor systems
- Suspended timber

4.1.1 Compliance

The design, specification and installation of suspended ground floors shall meet the performance requirements of this section.

4.1.2 Information to be provided

The Designer shall provide sufficient design details to demonstrate it meets the requirements of this section.

A full set of design drawings and specifications should be made available to the Warranty provider and all other interested parties prior to the associated works starting on site. This may include:

1. For beam and block floor systems, manufacturer's floor layout drawings and calculations.
2. For cast in-situ suspended concrete slab:
   a. An Engineer's full set of structural calculations.
   b. Details on how the slab is to be reinforced.
   c. Details of the concrete mix to be used.
3. For suspended timber ground floors, an Engineer's full set of structural calculations.
4. A third party product conformity certificate for proprietary precast concrete floor systems and proprietary pre-cast insulated concrete floor systems.
5. For all floor systems:
   a. Plan details showing dimensions, levels and locations of incoming service penetrations.
   b. Details indicating the depth and position of below ground services.
   c. Details showing span and direction of structural members.
   d. Details of junctions between DPM and DPC.
   e. Ventilation provision should be detailed by the designer.
   f. Details of ground hazards, contaminants, and their mitigation measures.
   g. Details indicating the locations of all load and non-load bearing walls.
   h. The manufacturer's third party product conformity certificate for the proposed insulation to be used within the floor.
   i. Details of underfloor heating systems where being used.

The Warranty surveyor, at their discretion, may also request supporting information that demonstrates suitability for use of any materials or systems contained within the above.

4.1.3 Influence of trees and clay

Suitable precautions shall be taken by the designer to protect the suspended ground floor from soil heave.

In clay soils if the foundation depth is greater than 1.5m, allowance should be made in the design for heave. This must incorporate either a clear void of a specified minimum depth under the suspended floor, or a proprietary compressible material/void former below the underside of the floor construction (where a cast in-situ suspended concrete slab is specified).

Please refer to the 'Foundations – Trees and Clay' section for further guidance.

4.1.4 Site preparation

The ground shall be suitably prepared prior to any suspended ground floor system being installed.

Proprietary suspended precast concrete floor systems and proprietary suspended pre-cast insulated concrete floor systems

All topsoil and organic matter should be removed from beneath the suspended floor.

Cast in-situ suspended concrete slabs

The material below the proposed floor slab should be compacted sufficiently to support the slab during the pouring and curing stages. Any backfill material should not contain any organic matter, or contaminants that could react with the concrete or be susceptible to swelling, such as colliery waste.

4.1.5 Gas protection systems

Where a gas protection system (e.g. gas membranes) is required it shall be specified in accordance with relevant standards. Gas protection systems shall be installed to manufacturers recommendations.

Ground floors must be designed and constructed to ensure adequate protection against ground gases emanating from the ground below.

Where a gas protection system is required it should be capable of providing a complete barrier and be impervious to the relevant ground contaminants specific to that development.

Where gas membranes horizontally bridges the cavity, a cavity tray should be provided above. Cavity trays should be sealed to the gas membrane in accordance with gas membrane manufacturers instructions to prevent capillary damp ingress at the joint.

Where gas a membrane is required for use with a proprietary pre-cast insulated concrete floor systems, the gas membrane must have a third party product conformity certificate for use with the proposed floor system.

Please refer to the 'Ground Conditions – Managing Ground Contaminants' section for further guidance.

4.1.6 Structural design

Suspended ground floors shall have adequate strength and durability, and safely transfer loads to the supporting structure.

Proprietary precast concrete floor systems

Designs should be in accordance with BS EN 1992-1-1 with loads calculated to BS EN 1991-1-1. Proprietary precast concrete floor systems should have an appropriate third party product conformity certificate.

The manufacturer's details and specification for the floor must include:

- Structural calculations for the floor indicating depth and centres of the precast floor beams.
- The minimum specification of walls supporting the beam and block floor.
- Specifications for the blocks infilling between the beams, including compressive strength and thickness of the block.

Proprietary pre-cast insulated concrete floor systems

Proprietary pre-cast insulated concrete floor systems should be designed by an Engineer with loads calculated in accordance with BS EN 1991-1-1 and have an appropriate third party product conformity certificate.

In-situ concrete slabs

A cast in-situ suspended concrete slab should be designed by an Engineer with loads calculated in accordance with BS EN 1991-1-1.

Reinforced concrete should have a minimum strength of RC35 and be ready mixed and delivered on-site.

The structural design should include the following information:

- Adequacy of walls that support the concrete slab (intermediate and perimeter walls).
- Suitable thickness, correct durability of concrete and correct provision of reinforcing.
- Provision of anti-crack reinforcing to the perimeter of floors.

Suspended timber

Suspended timber ground floors should be appropriately designed in accordance with the 'Upper Floors' section.

Timber joists should be adequately treated or finished to resist insect attacks and be suitable for the position used within the structure in accordance with BS 8417.

Timber joists should be appropriately seasoned to prevent excessive shrinkage and movement.

Floor deflection limits for all suspended ground floors

The deflection limit must be 0.003 times the span with a maximum deflection of 14mm where strutting is provided and 12mm where strutting is not provided. This is based on the total and imposed loads for combined bending and shear.

The Engineer is responsible for designing the floor construction to maintain deflections within the specified tolerances, unless more stringent requirements are dictated by the relevant BS or EN design code.

4.1.7 Insulation

Insulation materials shall minimise thermal transmission through the floor and be suitable for their intended purpose and location.

In all circumstances, insulation within the floor construction should be chosen to take the following into account:

- The insulation should have an appropriate third party product conformity certificate.
- The insulation should be durable enough to withstand loadings, moisture and any ground contaminants.
- The insulation should comply with relevant Building Regulations.
- Any risk of thermal bridging is mitigated, especially at junctions with the floor and wall. The following can be considered at design stage:
  - Installing perimeter insulation to floors.
  - Linking floor and wall insulation.
  - Extending cavity wall insulation below floor slab level.

Insulation below In-situ concrete slabs

Where insulation is specified below an in-situ concrete slab, the insulation should:

- Be compatible with the DPM.
- Only be installed on a suitable, compacted and even substrate.
- All foreseeable loading during and post construction.

4.1.8 Protection from moisture

Suitable precautions shall be taken to prevent the passage of moisture to the inside of the home. In respect of:

- Damp proof courses
- Damp proof membranes
- Sub-floor ventilation

Damp proof courses (DPC)

Where DPCs are specified they should be of a flexible material that is suitable for its intended use and have an appropriate third party product conformity certificate.

DPCs should be laid on a mortar bed and correctly lapped at junctions and corners. The depth of lap should be the same as the width of the DPC.

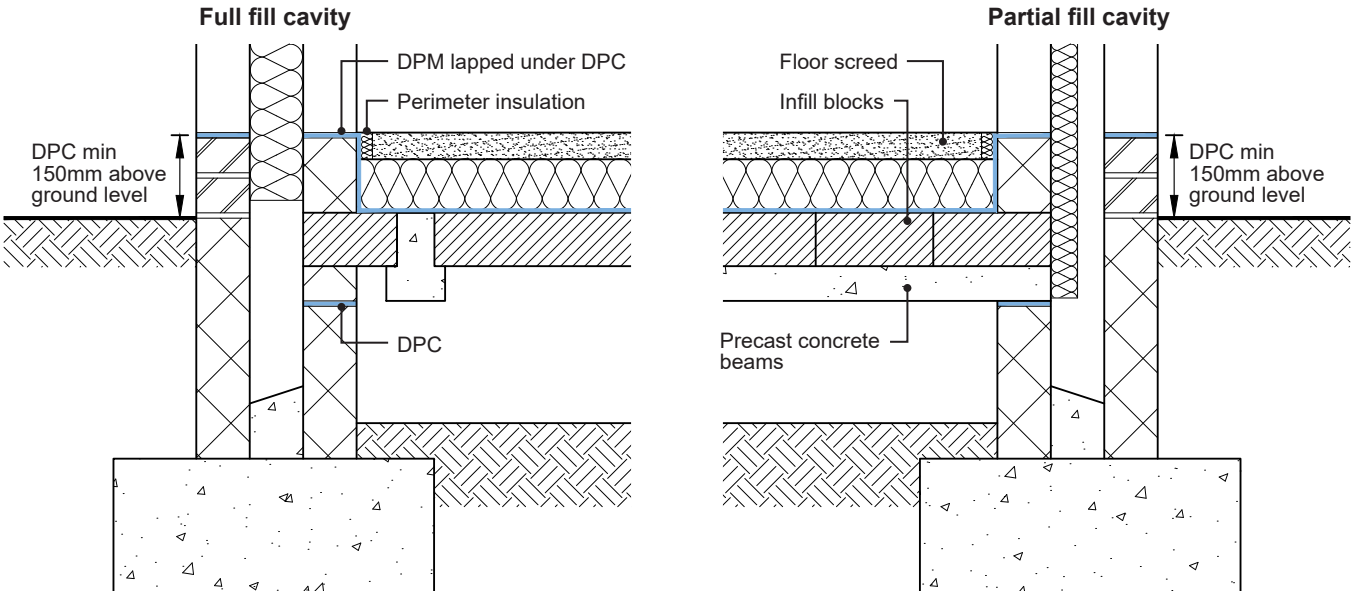
DPCs should not bridge any cavities unless it is acting as a cavity tray. Where a cavity tray is required, please refer to the ‘External Walls’ section for cavity tray, weep holes, and stop end requirements.

Damp proof membranes (DPM)

Where DPMs are specified, the following should be satisfied:

- The DPM should be a minimum thickness of 1200g polythene.
- The DPM must be linked to the DPC with a minimum 100mm overlap.
- DPM sheets should be overlapped by at least 300mm.
- DPMs must be carefully protected where folded up the perimeter walls, and lapped under the DPC particularly at door openings.
- Temporary protection should be given whilst exposed.
- The DPM should not be cut at the floor junction as this will prevent correct lapping with the DPC.
- The DPM should be provided beneath the screed or insulation. A number of insulation products require an additional DPM to protect the surface of the insulation. It is important that this additional membrane is incorporated in these situations.

Other DPMs may be considered if they have an appropriate third party product conformity certificate and are installed in accordance with the manufacturer’s instructions.



Notes:
- Insulation must be installed to meet the manufacturer's installation requirements and relevant Building Regulations.
- Where the solum level is below the external ground line, suitable drainage provision to avoid build-up of ground water must be provided. Where the ground below the floor is to be drained, the design must be provided by an Engineer with relevant experience. The design must be based on site specific site investigation that meets the requirements of our 'Ground Conditions' section.
- DPCs must be provided under bearings of precast floors.

Conditions to be satisfied where the DPM is to be omitted

Where no DPM is incorporated into the suspended ground floor system, the following provisions will apply:

- The sub-floor void must be ventilated as per the guidance provided within this section.
- DPCs must be provided under bearings of precast floors.
- The ground below the floor must be effectively drained if excavated below external ground levels.

Where the ground below the floor is to be drained, the design must be provided by an Engineer with relevant experience. The design must be based on site specific site investigation that meets the requirements of our 'Ground Conditions' section.

Sub-floor ventilation requirements

A sub-floor void and cross-flow ventilation should be provided below:

- Proprietary precast concrete floor systems (such as beam and block)
- Proprietary pre-cast insulated concrete floor systems
- Suspended timber ground floors

Void requirements

A minimum ventilation void of 150mm should be provided below the underside of all suspended ground floors. A larger void will be required for shrinkable soils where heave may take place:

- Low volume change potential – 200mm void dimension.
- Medium volume change potential – 250mm void dimension.
- High volume change potential – 300mm void dimension.

The void dimension is measured from the underside of beam to ground level and includes 150mm ventilation allowance.

Ventilation to the sub-floor void

The sub-floor void should be provided with ventilators on at least two opposing sides of the external wall with air bricks appropriately ducted in accordance with the manufacturer's instructions.

Air bricks should be situated at least 75mm from the external ground level.

Internal walls should be constructed with sufficient openings to ensure cross-flow ventilation is maintained. All internal walls must have air bricks to allow the free flow of air, or be built using a honeycomb technique.

Void ventilation should be provided to whichever gives the greater opening area:

- 1500mm^2 per metre run of external wall.
- 500mm^2 per m^2 of floor area.

Please note, the typical net ventilation area for the air brick will vary by air brick manufacturer.

4.1.9 Installation requirements

Suspended ground floors shall be installed to:

- Ensure durability of materials is maintained.
- Ensure structural performance of the floor system is maintained.
- Ensure precautions to prevent the passage of moisture to the inside of the home is maintained.

Beam and block floors

All beam and block floors shall be installed ensuring that the following standards are met:

- The floor beams must be laid reasonably level and onto suitable solid and level bearings.
- End bearings on supporting walls should be as per the manufacturer's recommendations and in no case less than 90mm.
- Floor beams and blocks are grouted together using cement/sand slurry with a mix ratio of 1:6 respectively.
- The beam and block floor should not be used to support load-bearing walls.
- All walls should be built off an appropriate foundation, as indicated in the 'Foundations' section.
- A suitable mortar bed is required where block work between the floor beams bear onto load-bearing walls, e.g. perimeter walls.
- Holes must not be made through the floor beams and any service penetrations should pass through the holes made in the infill blocks. Any gaps around service penetrations should be filled with concrete (ST3) mix before screeding.

Where beam and block floors are to be installed to areas with higher potential point loads such as garages, additional reinforcing of the screed will be required to distribute loads effectively. This reinforcing should be of at least an 'A' mesh quality, and the screed should be thick enough to give an appropriate depth of cover.