Waterproofing of basements and other below ground structures

(December 2016) (First issue)

TECHNICAL GUIDANCE 5.4/01

Background

Chapter 5.4 'Waterproofing of basements and other below ground structures' recognised the importance of good design and introduced a number of technical benchmarks for the correct approach to this technically demanding and critical part of the construction.

This supplementary Technical Guidance document explains in detail how a number of the technical benchmarks should be applied in practice.

1 At what point are normal damp-proofing arrangements in walls likely to become ineffective, resulting in a need for waterproofing?

Damp-proofing materials, such as polythene sheet and DPCs, are typically used to prevent the movement of water vapour through walls or floors. Where liquid water comes into contact with the structure it will often be under pressure from a hydrostatic head or from lateral forces. Damp-proofing is unlikely to prevent the movement of liquid water under pressure, and in these situations waterproofing should be used.

Where an external, internal or party wall is used to retain ground, there is a risk that at some point during the design life of the building the retained ground will become saturated (from rising water table, burst pipes, surcharge etc.) and the retaining wall will be subjected to contact with liquid water.

Chapter 5.4 recognises a range of different situations that represent different levels of risk where waterproofing may be required.

Notes on drawings:

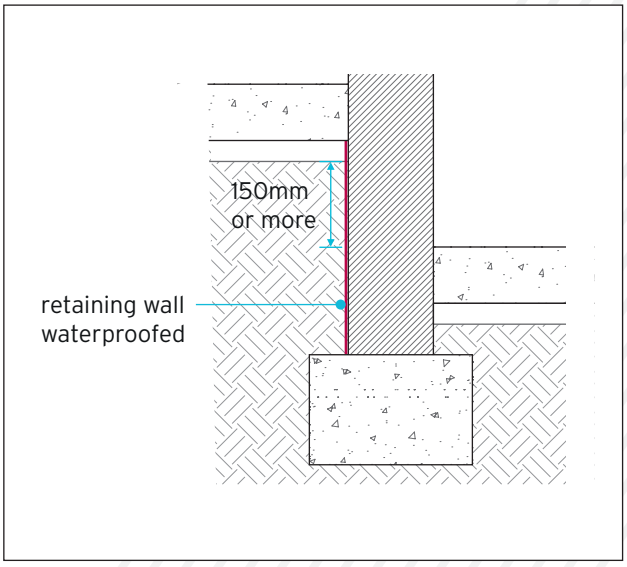
- Measurements for the retained ground should be taken from the top of the retained ground to the lowest finished floor level. Retained ground includes made ground and fill.
- Continuous red lines indicate where waterproofing is required.
- Dashed red lines indicate where waterproofing should be considered.
- They do not show details such as the Type of waterproofing, where the waterproofing is located or how it terminates above ground level.
- The walls shown are to illustrate principles only and may be cavity or solid construction.

Situation:

- Step in the level between suspended floors, either within a single building or at a party wall.
- The sub-floor void is naturally free draining or drainage has been provided.

Is waterproofing required?

Waterproofing is required where the retained ground is 150mm or more.



Waterproofing of basements and other below ground structures

(December 2016) (First issue)

Notes:

- Waterproofing is not usually required where the retained ground level is less than 150mm and the damp-proofing and ventilation arrangements are in accordance with Clause 5.2.10.
- Where the retained ground beneath the higher suspended floor can be reduced or battered back (beyond the soils angle of repose) to less than 150mm above the lowest finished floor level waterproofing is not usually required.

Situation:

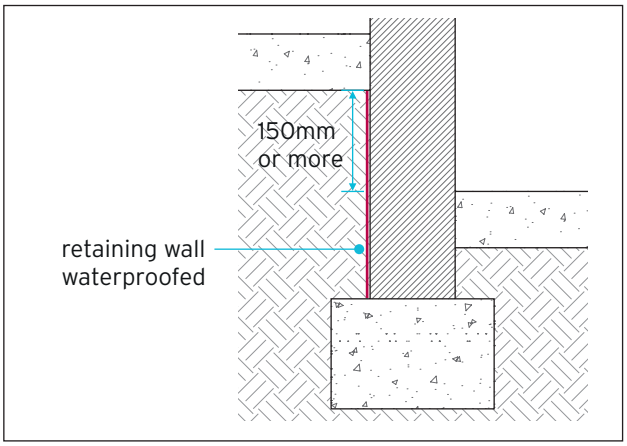
- Step in the level of ground bearing floors, either within a single building or at a party wall.

Is waterproofing required?

- Waterproofing is required where the retained ground is 150mm or more.

Note:

- Waterproofing is not usually required where the retained ground level is less than 150mm and the damp-proofing arrangements are in accordance with Clause 5.1.20.



Situation:

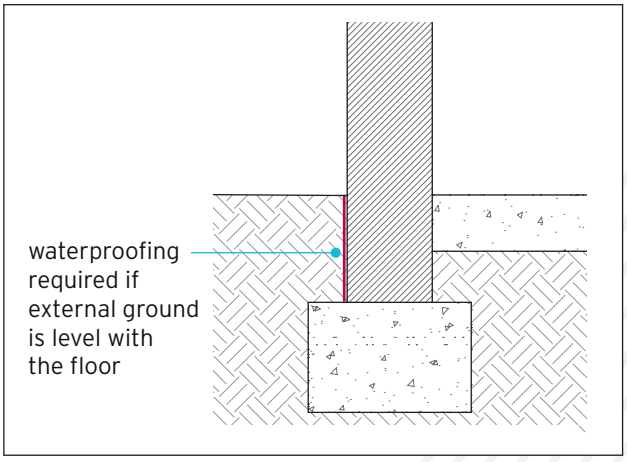
- External ground level generally raised to or above the internal floor level.

Is waterproofing required?

- Waterproofing is required to the areas of wall adjacent to where the ground level has been raised.

Note:

- Waterproofing is not usually required where ground levels have been raised locally for door openings (maximum 15% of the perimeter of the building) and the ground has been graded down either side of the opening.



2 Where Chapter 5.4 refers to waterproofing being considered in certain situations, what does this mean in practice?

As Chapter 5.4 is about restricting the transmission of water through parts of the structure at or below ground level, it is important to identify areas of the structure which could come into contact with liquid water.

In the Introduction section of Chapter 5.4 there are a number of illustrations that show typical situations where waterproofing is required (indicated by a solid red line) or should be considered (indicated by a dashed red line).

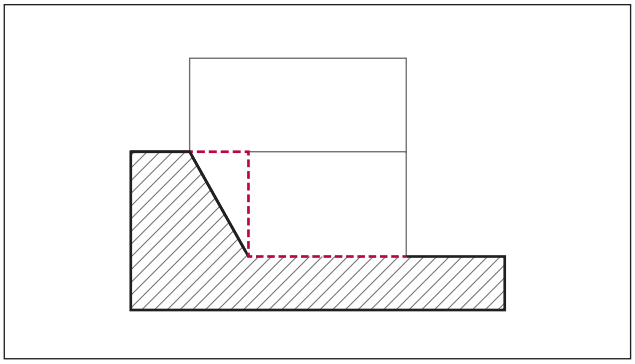
The situations identified in the chapter as requiring waterproofing are those where there is a high risk of the structure coming into contact with water. In other situations there are a range of factors that need to be taken into account to determine if the structure is likely to come into contact with water and therefore if waterproofing is required.

Waterproofing of basements and other below ground structures

(December 2016) (First issue)

Situation:

- Structures adjacent to voids where water may accumulate.



What should be considered to determine the risk of water coming into contact with the wall?

- Is the void drained or free draining?
- Is the water table known to be high or variable – if so are the drainage arrangements adequate?
- Is the wall retaining 150mm or more of ground (measured from the top of the retained ground to the lowest floor level)?

Is waterproofing required?

- A site specific assessment should be made and waterproofing applied where there is a risk of the structure coming into contact with water or more than 150mm of ground is retained.
- Where the assessment is inconclusive, guidance from a waterproofing design specialist should be sought.

Situation:

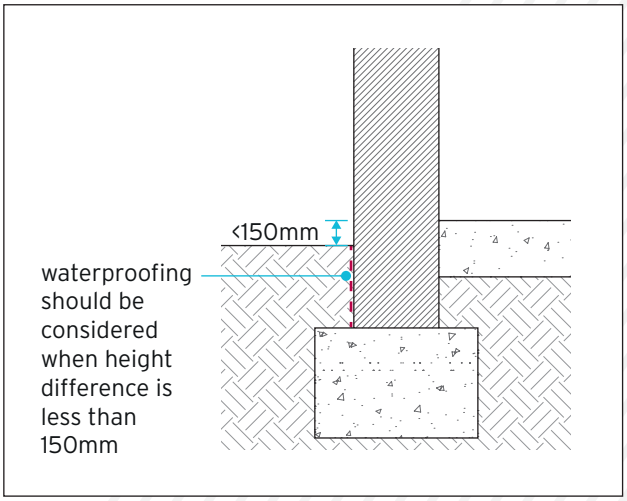
- External ground level raised to within 150mm of the internal floor level.

What should be considered to determine the risk of water coming into contact with the wall?

- 5.4.4 Table 1 contains a list of what could be considered in a desk study to determine risk.
- A desk study should typically include consideration of:
  - ground water and flooding issues
  - flood potential of the site
  - available ground water data
  - drainage characteristics of the ground
  - topography of the site
  - effects of adjacent surface finishes
  - surface water drainage arrangement

Is waterproofing required?

- A site specific assessment should be made and waterproofing applied where there is a risk of the structure coming into contact with water.
- Where the assessment is inconclusive, guidance from a waterproofing design specialist should be sought.



Notes:

- Waterproofing is not usually required where ground levels have been raised locally for door openings (maximum 15% of the perimeter of the building) and the ground has been graded down either side of the opening.
- If waterproofing is needed, it is usually only to the parts of the wall retaining the raised ground levels.
- Timber frame buildings should be detailed in accordance with 6.2.10b.

Waterproofing of basements and other below ground structures

(December 2016) (First issue)

Situation:

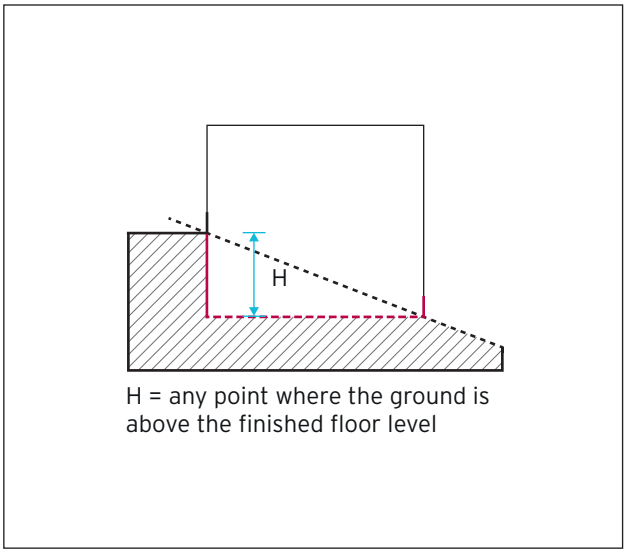
- Any floor that is adjacent to a waterproofed wall.

What should be considered to determine the risk of water coming into contact with the floor?

- Can water below the floor drain freely? If not, is there a risk that water will come into contact with the floor?

Is waterproofing required?

- A site specific assessment should be made and waterproofing applied where there is a risk of the structure coming into contact with water.
- Where the external ground levels are raised on all sides, it is unlikely that the ground below the floor will be free draining, therefore waterproofing is required.
- Where the assessment is inconclusive, guidance from a waterproofing design specialist should be sought.



H = any point where the ground is above the finished floor level

3 Why is the use of post applied Type A membrane restricted in some situations?

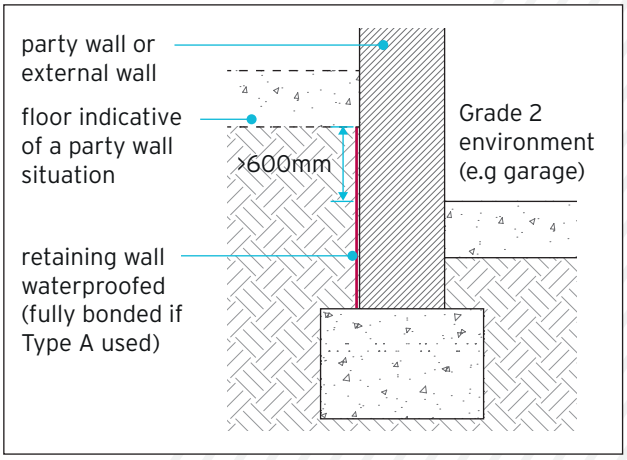
One of the key issues identified in BS 8102 is the ability of the waterproofing system to be repaired. Post applied Type A membranes (adhesive or torch applied) can be more difficult to repair than other forms of Type A, such as liquid applied systems, which are fully bonded.

The difficulty of a repair typically increases with the depth of retained ground, therefore Chapter 5.4 identifies situations where a post applied Type A membrane is no longer acceptable as the only means of waterproofing.

Where the depth of the retained ground is greater than 600mm and a Grade 2 (non-habitable) environment is required, post applied Type A membranes should not be used as the only means of waterproofing. Fully bonded Type A, Type B or Type C systems should be used (this could be an external wall, a step in floor levels or a party wall).

Notes:

- Where the retained ground is 600mm or less post applied Type A membranes are acceptable.
- Post applied Type A membranes can be used as part of a combined system where the retained ground is greater than 600mm and a Grade 2 environment is required.



Waterproofing of basements and other below ground structures

(December 2016) (First issue)

4 Where are combined systems needed?

Further recognising the increased consequences of failure when the internal environment is habitable i.e. Grade 3, Chapter 5.4 asks for a combination of two waterproofing systems to be used where: a Grade 3 environment is required and the wall is retaining more than 600mm of ground (this could be at an external wall, a step in floor levels or a party wall).

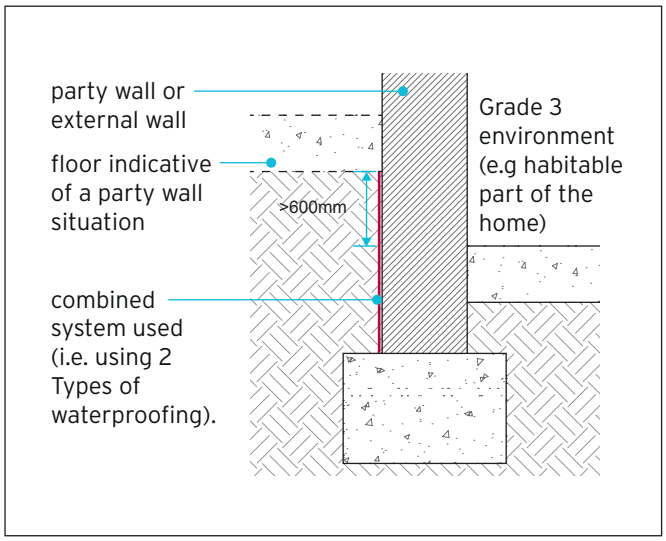
Combined systems include:

- Type A and Type B
- Type A and Type C
- Type B and Type C.

As combined systems do not rely on a single means of waterproofing, they will generally offer more repair options should they fail. As such, post applied Type A membranes can be used as part of a combined system.

Notes:

- Where it can be demonstrated that the water table is permanently below the underside of the lowest floor slab, a Type B structurally integral concrete system is acceptable without further protection from a combined system.
- Combined systems are not required for walls retaining 600mm or less.



5 Where can I find a waterproofing design specialist?

Waterproofing design is multi-disciplinary and can be complex. In order to help get the design right across the broad spectrum of scenarios likely to be encountered, Chapter 5.4 calls for the waterproofing design to be undertaken by a waterproofing specialist. The benchmark for this role is the Certificated Surveyor in Structural Waterproofing (CSSW) qualification which is offered by the Property Care Association (PCA). Other qualifications that are specific to waterproofing design can be considered by NHBC.

A number of waterproofing manufacturers as well as independent surveyors offer this service. A list of CSSW surveyors can be found at **www.property-care.org.**