

Code of practice for

# Protection of structures against water from the ground

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- Association of British Roofing Felt Manufacturers
- British Board of Agrément
- Cement and Concrete Association
- Concrete Society
- Contract Flooring Association
- Department of the Environment (Building Research Establishment)
- Department of the Environment (Construction Industries Directorate)
- Flat Roofing Contractors Advisory Board
- Incorporated Association of Architects and Surveyors
- Institution of Civil Engineers
- Institution of Structural Engineers
- Mastic Asphalt Council and Employers' Federation
- National House-Building Council
- Royal Institute of British Architects
- Royal Institution of Chartered Surveyors

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# Contents

|                                                                                                                      | Page               |
|----------------------------------------------------------------------------------------------------------------------|--------------------|
| Committees responsible                                                                                               | Inside front cover |
| Foreword                                                                                                             | iv                 |
| <hr/>                                                                                                                |                    |
| Section 1. General                                                                                                   |                    |
| 1 Scope                                                                                                              | 1                  |
| 2 Definitions                                                                                                        | 1                  |
| <hr/>                                                                                                                |                    |
| Section 2. Design and structure                                                                                      |                    |
| 3 Design requirements and design criteria                                                                            | 2                  |
| 3.1 General                                                                                                          | 2                  |
| 3.1.1 Pre-design considerations                                                                                      | 2                  |
| 3.1.2 New construction                                                                                               | 2                  |
| 3.1.3 Existing buildings                                                                                             | 3                  |
| 3.2 Preventative measures                                                                                            | 3                  |
| 3.2.1 General                                                                                                        | 3                  |
| 3.2.2 Exclusion of surface water                                                                                     | 6                  |
| 3.2.3 Sub-surface drainage                                                                                           | 7                  |
| 3.2.4 Water-resisting forms of construction                                                                          | 8                  |
| 3.3 Degree of watertightness                                                                                         | 8                  |
| 3.4 Structural considerations                                                                                        | 10                 |
| 4 Materials                                                                                                          | 11                 |
| 4.1 Waterproofing materials                                                                                          | 11                 |
| 4.1.1 General                                                                                                        | 11                 |
| 4.1.2 Mastic asphalt                                                                                                 | 11                 |
| 4.1.3 Preformed bitumen sheetings                                                                                    | 11                 |
| 4.1.4 Other sheeting materials                                                                                       | 11                 |
| 4.1.5 Bitumen compound                                                                                               | 11                 |
| 4.1.6 Bitumen primer                                                                                                 | 11                 |
| 4.1.7 Cement based waterproof renders                                                                                | 11                 |
| 4.1.8 Polymer/cement based waterproof coating                                                                        | 11                 |
| 4.1.9 Resins of polyurethane etc.                                                                                    | 11                 |
| 4.1.10 Waterstops                                                                                                    | 11                 |
| 4.2 New materials                                                                                                    | 11                 |
| 5 Structures requiring protection against water and water vapour penetration (type A structures: tanking protection) | 12                 |
| 5.1 Structural aspects                                                                                               | 12                 |
| 5.1.1 General                                                                                                        | 12                 |
| 5.1.2 Reinforced concrete                                                                                            | 12                 |
| 5.1.3 Prestressed concrete                                                                                           | 13                 |
| 5.1.4 Plain concrete and masonry                                                                                     | 13                 |
| 5.1.5 Pumping                                                                                                        | 13                 |
| 5.1.6 Basement carried on piles where tanking is used                                                                | 13                 |
| 5.2 Barrier materials                                                                                                | 13                 |
| 5.2.1 Mastic asphalt                                                                                                 | 13                 |
| 5.2.2 Preformed waterproof sheet membrane                                                                            | 13                 |
| 5.2.3 Waterproof render                                                                                              | 14                 |
| 5.2.4 Polyurethane resin tanking                                                                                     | 14                 |
| 6 Structures in watertight construction (type B structures: integral protection)                                     | 14                 |
| 6.1 General                                                                                                          | 14                 |

|                                                                                | Page |
|--------------------------------------------------------------------------------|------|
| 6.2 Design considerations                                                      | 14   |
| 6.3 Site conditions                                                            | 16   |
| 7 Structures with internal drainage (type C structures:<br>drained protection) | 16   |
| 7.1 General                                                                    | 16   |
| 7.2 Floor cavities                                                             | 16   |
| 7.3 Wall cavities                                                              | 17   |
| 7.4 Cavity ventilation                                                         | 17   |
| 8 Inspection and waterproofing of existing basements                           | 17   |
| 8.1 General                                                                    | 17   |
| 8.2 Inspection and survey                                                      | 17   |
| 8.3 Tanking systems and methods                                                | 17   |
| 8.4 Control of condensation                                                    | 18   |
| 8.5 Decorative finishes                                                        | 18   |
| 8.6 Provision for fixings                                                      | 18   |
| 8.7 Land drainage                                                              | 18   |
| 8.8 Pressure grouting                                                          | 18   |
| 8.9 Repair by waterproof renderings                                            | 18   |
| <hr/>                                                                          |      |
| Section 3. Tanking systems                                                     |      |
| 9 Mastic asphalt tanking                                                       | 19   |
| 9.1 General                                                                    | 19   |
| 9.2 Externally applied tanking                                                 | 19   |
| 9.3 Internally applied tanking                                                 | 20   |
| 9.4 Pumping                                                                    | 21   |
| 9.5 Site preparation                                                           | 21   |
| 9.5.1 Key for tanking vertical and sloping surfaces                            | 21   |
| 9.5.2 External angles                                                          | 21   |
| 9.6 Thickness and finish                                                       | 21   |
| 9.7 Applications: special conditions                                           | 21   |
| 9.7.1 Boiler houses, sumps and fuel oil storage areas                          | 21   |
| 9.7.2 Ventilated boiler bases                                                  | 22   |
| 9.7.3 Hot water pipes                                                          | 22   |
| 9.7.4 Manholes                                                                 | 22   |
| 9.7.5 Discharge of hot liquids                                                 | 22   |
| 10 Bitumen sheet tanking                                                       | 22   |
| 10.1 General                                                                   | 22   |
| 10.2 Externally applied tanking                                                | 22   |
| 10.3 Internally applied tanking                                                | 24   |
| 10.4 Pumping                                                                   | 24   |
| 10.5 Number of layers                                                          | 25   |
| 11 Internally applied cementitious waterproof render                           | 25   |
| 11.1 General                                                                   | 25   |
| 11.2 Site preparation                                                          | 25   |
| 11.2.1 Brickwork or blockwork                                                  | 25   |
| 11.2.2 Concrete                                                                | 25   |
| 11.2.3 Natural stone                                                           | 25   |
| 11.2.4 Floors                                                                  | 26   |
| 11.3 Thickness and finish                                                      | 26   |
| 11.4 Curing                                                                    | 27   |
| 12 Polyurethane resin tanking                                                  | 27   |

|                                                                                                    | Page              |
|----------------------------------------------------------------------------------------------------|-------------------|
| 12.1 Site preparation                                                                              | 27                |
| 12.2 Externally applied tanking                                                                    | 27                |
| 12.3 Internally applied tanking                                                                    | 27                |
| 12.4 Protection                                                                                    | 27                |
| 13 Self-adhesive rubber bitumen membrane tanking system                                            | 27                |
| 13.1 General                                                                                       | 27                |
| 13.1.1 Materials                                                                                   | 27                |
| 13.1.2 Surface preparation                                                                         | 27                |
| 13.1.3 Corners                                                                                     | 28                |
| 13.1.4 Openings                                                                                    | 28                |
| 13.2 Externally applied tanking                                                                    | 28                |
| 13.3 Internally applied tanking                                                                    | 29                |
| 13.4 Pumping                                                                                       | 30                |
| 13.5 Finish                                                                                        | 30                |
| Section 4. Waterstops                                                                              |                   |
| 14 General                                                                                         | 31                |
| 15 External waterstops                                                                             | 31                |
| 16 Internal waterstops                                                                             | 31                |
| 17 Limitations                                                                                     | 31                |
| Figure 1 — Example of stepped construction for sloping ground                                      | 3                 |
| Figure 2 — Example of cavity masonry wall construction                                             | 4                 |
| Figure 3 — Example of solid masonry wall construction                                              | 5                 |
| Figure 4 — Drained cavity construction                                                             | 6                 |
| Figure 5 — Deep basement construction suitable for utility uses, car parking etc.                  | 7                 |
| Figure 6 — Structure classification                                                                | 8                 |
| Figure 7 — Tanked concrete basement carried on piles                                               | 12                |
| Figure 8 — Movement joints and service pipe penetration in internal waterproof cementitious render | 15                |
| Figure 9 — Asphalt tanking: treatment of pipes                                                     | 19                |
| Figure 10 — Asphalt tanking to column bases                                                        | 20                |
| Figure 11 — Asphalt tanking applied to concrete externally                                         | 20                |
| Figure 12 — Internally applied asphalt tanking: vertical loading with masonry                      | 22                |
| Figure 13 — Bitumen sheet tanking: treatment of pipes                                              | 23                |
| Figure 14 — Externally applied bitumen sheet tanking: junction of vertical and horizontal sheeting | 23                |
| Figure 15 — Internally applied bitumen sheet tanking: method of forming internal angle             | 24                |
| Figure 16 — Formation of lap and corner joints in cementitious waterproof renders                  | 26                |
| Figure 17 — Example of self-adhesive damp proof membrane applied externally                        | 28                |
| Figure 18 — Example of self-adhesive damp proof membrane applied internally                        | 29                |
| Figure 19 — Typical details of service penetrations through self-adhesive membranes                | 30                |
| Figure 20 — Typical applications of waterstops                                                     | 32                |
| Table 1 — Guide to level of protection to suit basement use                                        | 9                 |
| Publications referred to                                                                           | Inside back cover |

## Foreword

This British Standard code of practice has been prepared under the authority of the Civil Engineering and Building Structures Standards Policy Committee CSB/-.

This code of practice is an extensive revision of section 1 and section 2 of CP 102:1973. Structures are now divided into three types and a new table giving guidance in the selection of performance requirements and construction of basements is included. The code also includes new materials and a section on the inspection and waterproofing of existing basements. All references to workmanship are excluded, these are now to be found in the code of practice on workmanship on building sites (BS 8000-4).

On the publication of this code of practice, section 1 and section 2 of CP 102:1973 are superseded.

Section 3 of CP 102:1973 which deals with methods of providing damp-proofing of walls and floors at or near ground level is undergoing revision separately and will be published as a new British Standard code of practice for design and installation damp proof courses in masonry construction.

It has been assumed in the drafting of this code of practice that the execution of its provisions is entrusted to suitably qualified and experienced people, for whose guidance it has been prepared.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

### Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 32, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

# Section 1. General

## 1 Scope

This code of practice provides guidance on methods of dealing with and preventing the entry of water from surrounding ground into a building below ground level. The main methods described are the use of applied waterproofing finishes, watertight construction and drained cavity construction.

The code does not make any recommendations concerning the use of embedded heating in basements, floors and walls or for the special requirements in connection with the design and construction of cold stores.

NOTE The titles of the publications referred to in this code are listed on the inside back cover.

## 2 Definitions

For the purposes of this code of practice, the definitions in BS 6100-2 apply.

## Section 2. Design and structure

### 3 Design requirements and design criteria

#### 3.1 General

##### 3.1.1 *Pre-design considerations*

Before any design is carried out for building works below ground level a thorough site investigation in accordance with BS 5930 should be made including the exploration of water levels. The testing of soil and groundwater samples for sulphate or other aggressive conditions should also be included.

Where high concentrations of sulphate or other aggressive conditions are found, consideration should be given to the provision of an external impervious membrane or to the use of special cements, both in the structure and in any internal waterproofing, so as to provide adequate resistance to attack. Otherwise normal concrete or sound brickwork are as adequate for below ground use in saturated conditions as they are in standard foundations. Reference should be made to Building Research Digest No. 250, 1981.

Almost all basement structures are likely to be subjected to water pressure at some period of their life. Even when the site examination indicates dry conditions, the risk of waterlogging at some future time should be considered. In a permeable subsoil groundwater requires time to drain away and if there is a pump failure, working space around basements under construction can soon become inundated with surface water. It is, therefore, recommended that basements should include provision for resisting a pressure equivalent to 1 m head of water at least (see 3.4).

The use of prestressed concrete in basements is rare and generally only employed when shapes are simple.

##### 3.1.2 *New construction*

Basements of reinforced or prestressed concrete, if properly designed and constructed, will resist the penetration of water under a pressure many times in excess of that normally encountered. Water has the capacity, however, of penetrating even minor defects and a high standard of workmanship is required if the structure is to be completely watertight. Some recommendations for the repair of minor defects are given in clause 8.

In certain circumstances, as for example in large deep town centre basements, access to the external face of the perimeter wall is not possible and site restrictions make high standards of workmanship difficult to achieve. Also, the chosen method of construction may be such that watertightness cannot be assumed, e.g. diaphragm or contiguous piled walls – particularly at the junction of the base slab and the wall. In these cases complete watertightness may be neither economically nor practically possible and the designer, after establishing the intended use or possible future use of the basement areas, should make reference to Table 1 for the alternative forms of construction and waterproofing which may be used to meet the performance requirements.

Many basements give the impression of dampness due either to the penetration of moisture or to condensation. Providing the supporting structure is sound, the inclusion of an impervious membrane will resist the former while the provision of adequate ventilation, assisted by heating, coupled with the suitable treatment of floor and wall surfaces will combat the latter.

At the earliest stages, there should be exchanges of information between those responsible for the site preparation, the construction work, the pumping and dewatering, the tanking and waterproofing work and other subsequent work to ensure that the various operations can be carried out in the due sequence and with all necessary prerequisite provision.

House construction on sloping sites introduces a requirement for waterproofing the below ground portion of the structure. Further complications arise where houses are stepped in section and/or staggered in plan. Here the solid separating wall between houses changes to cavity construction when it becomes an outside wall. Different masonry materials are specified to meet thermal and acoustic requirements. The ensuing junction needs to be most carefully detailed if problems of damp penetration are also to be avoided. Typical design solutions are given in Figure 1, Figure 2 and Figure 3.



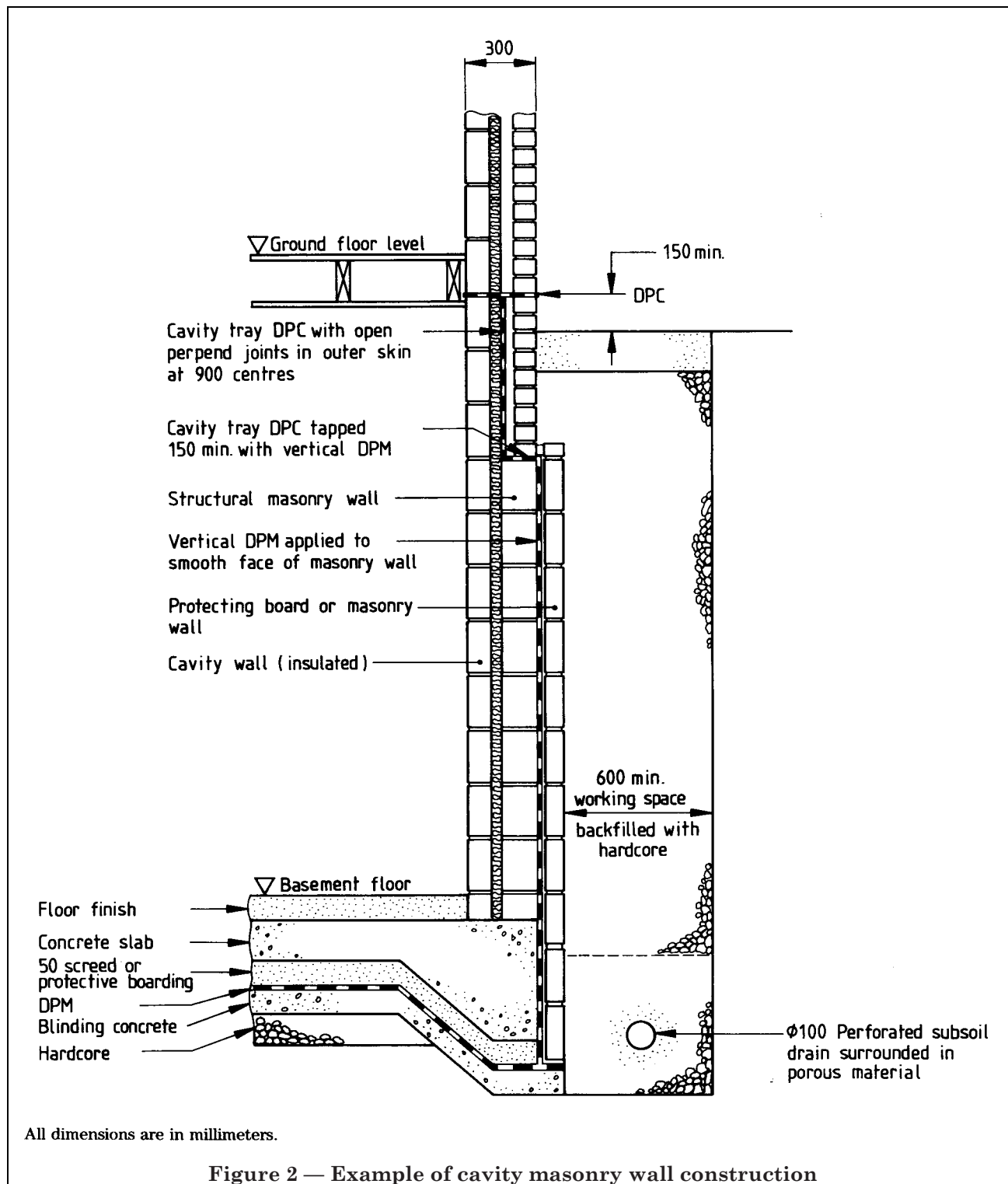
can be masked by dry lining.

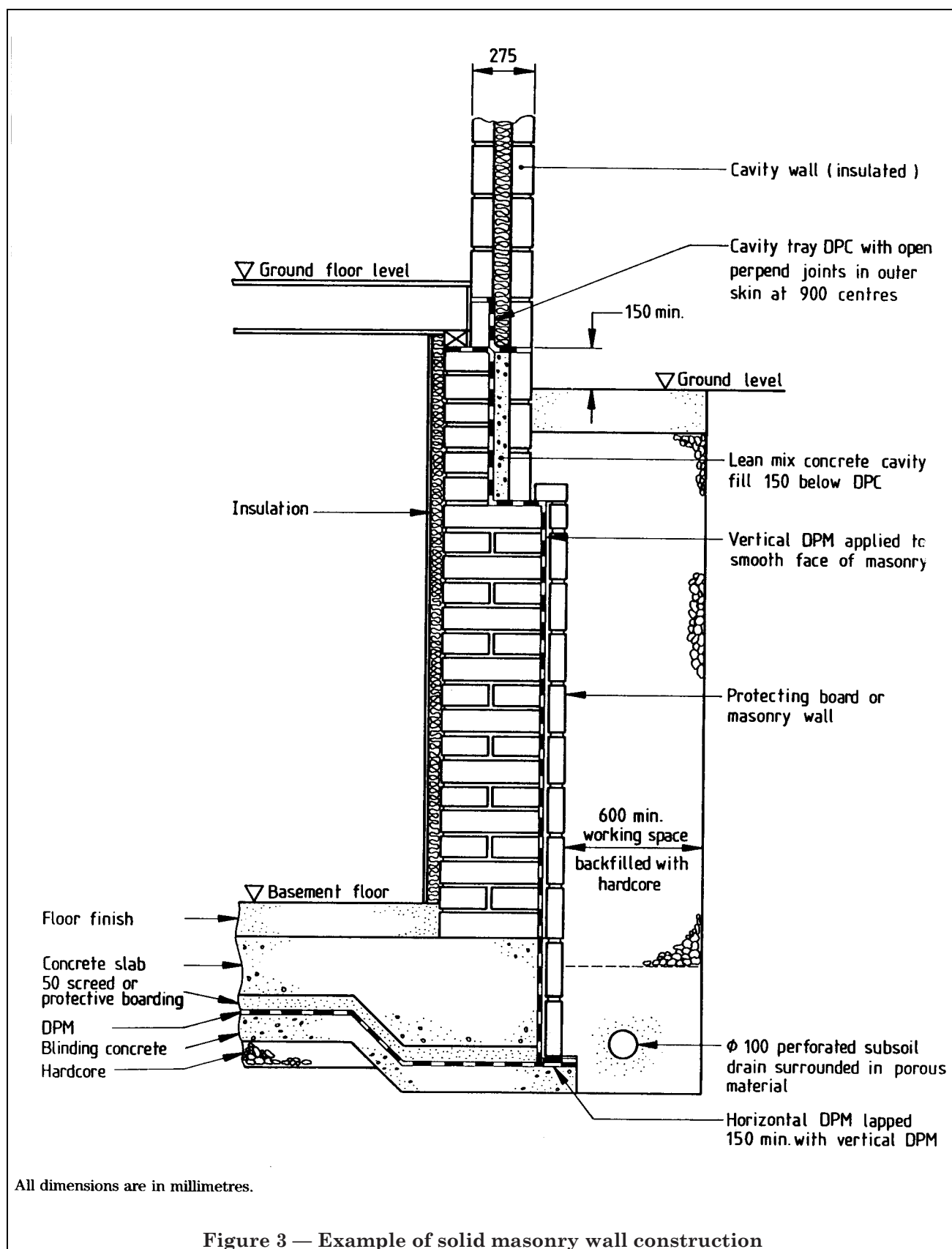
Consideration should be given to any change in use or changes in loading as these could result in ground movements that could crack the structure and thus aggravate water penetrations.

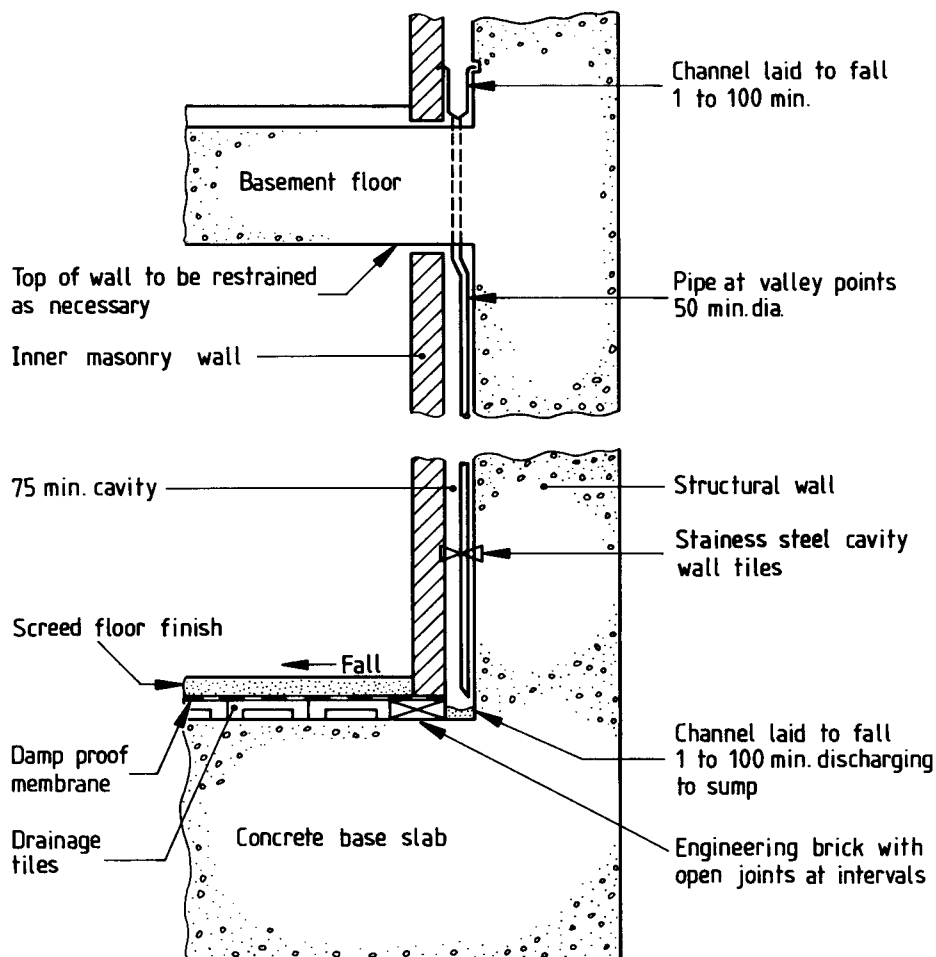
### 3.2 Preventative measures

### 3.2.1 General

Water or moisture penetration of the basement may be reduced by one or more of the methods described in 3.2.2 to 3.2.4 depending on the conditions of the site.







All dimensions are in millimetres.

Figure 4 — Drained cavity construction

### 3.2.2 Exclusion of surface water

Wherever possible, rainwater should be prevented from soaking into the ground adjoining any basement. This may be achieved by one of the following methods.

- Arrange for the adjoining ground surface to slope away from the structure for about 3 m and provide sufficient transverse gradient to avoid ponding.
- On sloping sites or where the gradient of the ground surface adjoining the 3 m strip is adverse, construct a cut-off land drain to intercept approaching surface water to conduct it to a lower level.

c) Where possible, pave the 3 m strip and take its surface water run-off, together with any other run-off from adjoining paving, wall surfaces or roofs to a separate drain, (which should not be an open jointed or other pervious sub-surface drain) for disposal well clear of the structure.

BS 8301 gives recommendations on collecting and disposing of surface and subsoil water.