Summary of BS 8102: 2009

Code of practice for protection of below ground structures against water from the ground

INTRODUCTION

BS8102:1990 was reviewed by a BS committee and a revised Standard was published in November 2009. The main reasons for the revision are listed as:-

- More deep constructions in congested urban areas.
- An increase in the provision of residential basements
- Development of new materials for waterproofing

It is also clear that levels of understanding have grown as the waterproofing market has matured. This is reflected in BS8102:2009.

This guidance document is aimed at providing a brief overview of the Code but should not be used in place of it. All those undertaking waterproofing work should retain and familiarise themselves with the full Code of Practice.

The PCA also produces its own Code of Practice of structural waterproofing that works with BS8102 and provides additional practical guidance to those involved with waterproofing below ground structures.

REVIEW & GUIDANCE

Foreword

This section of the Code notes the withdrawal of BS8102 1990 and provides the reasons for the production of the new code.

Section 1
SCOPE

This sets out the scope and limitations of BS8102: 2009. Stating that it covers;

a. Waterproofing barrier materials applied to the structure
b. Structurally integral watertight construction
c. Drained cavity construction

The Code deals with ground water assessment, drainage and associated risk assessments and buildings partly, and fully, below ground as well as both deep and shallow basements.

'Shallow structures' are described as being only one storey below ground, and 'deep structures' describe basements more than one storey below ground level.

Section 2
NORMATIVE REFERENCES

The documents that should be considered in conjunction with BS8102: 2009 are listed.

Section 3
TERMS & DEFINITIONS

These provide definitions to terms that are commonly used in the Code. These should be used as source of reference. Amongst the most significant definitions are:-

Type A (barrier) protection
Protection against water ingress which is dependent on a separate barrier system applied to the structure

Type B (structurally integral) protection
Protection against water ingress which is provided by the structure

Type C (drained) protection
Protection against water into usable spaces which is provided by the incorporation of an appropriate internal water management system.

Section 4
DESIGN PHILOSOPHY

The Code sets out the importance of understanding all the elements that might challenge the successful use of underground spaces. This section of the Code is considered to be highly important to the PCA and members of the Structural Waterproofing Group as it reinforces the importance of skilled competent waterproofing specialists.

The need to establish a cohesive team of professionals to assist with the successful planning design and execution of a waterproofing project is highlighted. Section 4.2 of the document makes special reference to the inclusion of a waterproofing specialist being part of the design team to ensure that an integrated waterproofing solution is created.

The waterproofing specialist should

a. be suitably experienced
b. be capable of devising solutions that accommodate the various project constraints and needs:
c. provide the design team with information and guidance that assist with, and influences the design, installation and future maintenance of the waterproofed structure.

The principal considerations for the design should be assessed. These are set out as follows.

a) The characteristics of the water table, soil and drainage together with other site specific properties
b) The appropriate waterproofing based on the water table and the uses of the building
c) The appropriate type of primary waterproofing.

The general principals are to assess the risk of water reaching the structure and to select a waterproofing system capable of achieving the required environment.

The need to understand how any proposed design works in 3D is emphasized, as is the vulnerability of service openings and penetrations.

It is acknowledged that defects can occur in waterproofing systems as a result of workmanship errors or material characteristics. Understanding the implications of, and the potential for, repairing the waterproofing is also set out.

Fig 1 = Design Flow Chart. This sets out the processes that should be adopted when planning a robust waterproofing scheme.
Unfortunately we are unable to reproduce this, or subsequent figures, in this guidance note.

Section 5
SITE EVALUATION

Many of the issues in this section relate to the design of the structure as well as the waterproofing system.

The code highlights the importance of undertaking a desk study to establish the following;

a) "to assess the geology and hydrogeology, including soil permeabilities, flood risk, radon, methane and other ground gases and contaminants (e.g. chlorides and acids);

b) to assess the topography of the surrounding ground in relation to the below ground structure;

c) to establish the likely highest level of the water table and the potential for the occurrence of a perched water table; and

d) to identify any missing ground and groundwater information, which should then be obtained by undertaking a site investigation in accordance with BS 5930 and BS EN 1997."

The need to understand the risks associated with the site and the proposed project is stressed many times within BS8102:2009. In section 5.1.2 it states that-

"Risk assessment should also consider:

a) the effects of climate change, burst water mains and sewers, adjacent trees, sulfates, radon, methane and other ground gases and contaminants; and

b) where external drainage is proposed, the effects of drawdown on adjacent structures, the potential silting of drainage and biofouling issues.

Even when the site investigation indicates dry conditions, the risk of some water logging (see Note 2) in the future should be assumed."

Water Table Classifications are set out as follows;

High – where the water table or perched water table is assessed to be permanently above the underside of the base slab.

Low – where the water table or perched water table is assessed to be permanently below the underside of the base slab. This only applies to free-draining strata.

Variable – where the water table fluctuates.

It is conceded that in some circumstances the use of drainage can reduce **High** or **Variable** water tables to **Low** conditions.

The Code states the need to inspect existing structures carefully before any risk assessment is completed and the waterproofing system is specified or installed. This is essential to ensure the suitability of the structure for the proposed waterproofing and to identify defects or conditions affecting walls and floors that may affect the performance or effectiveness of any waterproofing system.

Section 6
WATER- RESISTING DESIGN

The code clearly states that:-

Waterproofing measures should be designed on the basis of water to the full height of the retained ground at some time during the structure's life where:

a) no detailed geological or hydrogeological assessment has been undertaken;

b) the results of the soil investigations are inconclusive with respect to groundwater;

c) the ground drainage characteristics are unreliable;

d) the drainage measures (either internal or external) are unreliable or un-maintainable and infiltration cannot be controlled.

This passage is significant because it removes any ambiguity that may have surrounded the structural considerations and the expected head of water that can be expected to come to bear on the structure.

It is made clear that water from the following three sources should be considered and that any waterproofing should provide protection from -

1) the inflow of surface water, ranging from percolation of rain to inundation of water from burst water mains.

2) the water pressures acting on the external retaining wall system;

3) the water pressures below the base slab.

It is anticipated that following these evaluations and risk assessments, a decision will be made on the type of waterproofing system that will be adopted.

Types ABC are noted as being suitable in new construction, with type A and C most suited to existing structures. It is anticipated by the Code that combinations of waterproofing types might be best used in specific sites however any problems with compatibility and linking these types of waterproofing should be fully understood.

Table 1 + 2 should be used when selecting the waterproofing system that is to be used.

Table 1 plots the water table type against varying forms waterproofing. Guidance can be taken to establish the suitability of each system when used in these varying ground conditions.

Table 2 Sets out the "grades of waterproofing" these revised definitions are set out below.

"Grade 1 - Car parking, plant rooms (excluding electrical equipment), workshops. Some seepage and damp areas tolerable, dependent on the intended use

Grade 2 - Plant rooms and workshops requiring a drier environment (than Grade 1); storage areas. No water penetration acceptable. Damp areas tolerable; ventilation might be required

Grade 3 - Ventilated residential and commercial areas, including offices, restaurants etc, leisure centres. No water penetration acceptable. Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use.

The previous edition of this standard referred to Grade 4 environments however, this grade has not been retained as its only difference from Grade 3 is the performance level related to ventilation, dehumidification or air conditioning."

The importance of subsurface drainage is set out in section 6.4 of the Code. This section looks at the basic characteristics that should be seen in all subsurface drainage used in conjunction with underground waterproofing.

The position of land drains below the base slab is shown in Fig 3 and the importance of installing maintainable drainage systems is emphasized.

The insertion of a ground barrier for the prevention of radon, methane and other ground gases and contaminants from entering an underground structure is drawn to the reader's attention, as are Building Regulations [3] and BS 8485.

Section 7
GENERAL CONSTRUCTION ISSUES

This short section of the Code provides general information on dewatering a site during the construction phase of a project and also defines the types of structural elements that are suited to waterproof design.

Structural elements are described below.

Walls – constructed from:

1) masonry (plain or reinforced brick or block);
2) precast concrete;
3) in-situ concrete, either cast in form (plain, reinforced or pre-stressed) or embedded walls; or
4) steel or concrete piles in embedded walls.

Base slab – constructed from concrete cast in-situ, plain or reinforced, raft or other form.

Roof, where applicable – constructed from reinforced in-situ concrete, precast concrete with an in-situ topping, or a steel composite slab, as appropriate.

Section8
TYPE A (BARRIER) PROTECTION

Section 9
TYPE B (STUCTURAL INTEGRAL) PROTECTION

Section 10
TYPE C (DRAINED) PROTECTION

These sections of the code describe the uses and characteristics of the three types of waterproofing that are featured. The text provides information on how they perform and gives an indication of the inherent strengths and weakness associated with each form of waterproofing.

BS8102; 2009 no longer provides information of the practical; application of use of each system. The user of the code is referred to the supplier or manufacturer of the waterproofing products for this information.

Section 11
REMEDIAL MEASURES

The issue of reparability is featured several times throughout BS8102: 2009. Section 11 examines the processes that can be adopted in assessing the form and feasibility of repairs to a defective waterproofing system.

The information in this leaflet is given in good faith and is believed to be correct, but since the methods of use of moisture meters and the interpretation of their readings are beyond the control of the Association, it does not accept responsibility for any loss, howsoever arising, resulting from a reliance on the information contained in this leaflet or involving the use of moisture meters.

SW/0509

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