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TECHNICAL PAPER

BRITISH STANDARD 8102:2022

An Overview of the New British Standard for Waterproofing

British Standard 8102:2022

Updates to the British Standard for Waterproofing

Standard

Protection of below ground structures against water ingress. Code of practice

BS 8102:2022 · Current · 31 Mar 2022

CONTENTS **PAGE**

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British Standard 8102:2022

Updates to the British Standard for Waterproofing

INTRODUCTION

The British Standard 8102:2022 is the 'Code of Practice for Protection of Below Ground Structures Against Water Ingress'. The Standard takes the form of recommendations and guidance, and it is assumed in its preparation that the execution of its provisions will be entrusted to appropriately qualified and experienced people.

The aim of this paper is to provide a section-by-section overview of the most important updates in the new 2022 version of the Standard, which replaces the previous version issued in 2009. Where possible, we will summarise how this affects the waterproofing design philosophy and strategies that we are able to recommend and employ.

Newton Technical Director Richard Crossley (CSSW, WDS) was one of the specialist waterproofing experts who contributed as part of the rewrite committee for the revision to the Standard. The committee consisted of representatives from numerous waterproofing industry manufacturers, installers, designers, insurers, engineers, gas specialists and trade associations. Every guidance statement and recommendation within the Standard was considered and debated at length by the committee, and it is important that any individual statement is not considered in isolation, but as one element of the many interlinked sections that make up the Standard.

Please note: This is not a comprehensive list of every single change made within the 2022 version of BS 8102. Rather, this is our overview of what we consider to be the most significant and noteworthy updates.

PROTECTION OF BELOW GROUND STRUCTURES AGAINST WATER INGRESS

The first, and most obvious amendment to note is the title of the Standard. The previous and current iterations of the title are as follows:

- 1990 - Protection of Structures Against Water From The Ground
- 2009 - Protection of Below Ground Structures Against Water From The Ground
- 2022 - Protection of Below Ground Structures Against Water Ingress

The evolution of the title is to ensure that considerations are also made for protecting against water that is not necessarily ground water. This includes, but is not limited to, water that may come to bear against a below-ground structure as a result of rainfall and flood events, or from burst water mains, both of which would not be considered as part of the normal water table within the ground.

SECTION 1 - SCOPE

An update to the scope of the standard was expected, and in this case the scope of BS 8102:2022 has been both expanded and clarified with regards to several factors:

- Reference is now made to other factors that can be associated with the design of below ground structures, such as ground gases and flooding;

- It adds clarification by specifically:
    - potential end uses for structures that are partially or wholly below ground;
    - mentioning the most common materials used for retaining structures;
    - adopting well-recognised terms for certain building elements; and
    - recognising that, in some cases, for example in civil engineering or energy sector projects, that the guidance regarding acceptable levels of water ingress can be very different from those that are outlined in the Standard.

SECTION 2 - NORMATIVE REFERENCES

This Section has been generally updated to reflect the status of the most relevant recognised Standards that are linked with BS 8102:2022, and which have changed or updated since 2009.

Furthermore, previous references to material specification Standards for damp proof courses and bitumen or mastic asphalt products have been removed. This is in favour of a more detailed commentary under the relevant Sections later on in the Standard, specifically sections 6 and 8 which cover 'Water-Resisting Design' and 'Type A (Barrier) Protection' respectively.

There are also some new reference Standards introduced into Section 2 of the 2022 version, in this case concerning the execution of concrete structures, which is pertinent to Section 9 on 'Type B (Structurally Integral) Protection' of British Standard 8102.

SECTION 3 - TERMS AND DEFINITIONS

Several existing references have been the cause of some debate within industry in previous years, and consequently this revision has attempted to provide clarity within the general context of the Standard. Furthermore, in recognition of the revised Scope, some new references have also been included, for example for "buried decks" and "ground gas barriers".

Further new references are included in a technical context, such as for "fully bonded" and "water resisting admixture" to reflect their common usage in the industry, and to cover similarly used hydrological terms such as "hydrostatic pressure".

The terms "ground barrier" and "vapour check" have both been removed in favour of more detailed technical references, which have been included either in this section or elsewhere in the Standard.

Some of the notable terms and definitions to be aware of are as follows:

3.4 - Damp Area - **REVISED**

"area which is slightly wet but no seepage (see 3.14)"

3.6 - Free Lime - **NEW**

"salt deposits caused by water moving over/through concrete and dissolving calcium hydroxide from the matrix
NOTE: On contact with the atmosphere, calcium hydroxide reacts with carbon dioxide to form calcium carbonate, which is precipitated as a solid deposit when the water evaporates."

3.7 - Fully Bonded - **NEW**

"waterproofing material that provides a physical barrier to exclude water, and specifically achieves a degree of bond with the structure, such that water moving through any defects, is then unable to migrate laterally between the waterproofing material and the structure, as a result of the "full bond". "

3.14 - Seepage - **REMAINS**

"slow transmission of water through discrete pathways of a structure
NOTE: This can also be known as weeping, as defined in ICE publication, Specification for piling and embedded retaining walls [1]."

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SECTION 4 - DESIGN PHILOSOPHY

Overall, added emphasis has been given to the importance and scope of the waterproofing designer role, and the Standard now recommends that a waterproofing design specialist should be consulted at the earliest stage of a project. This is ideally before the technical design stage, and the specialist should be consulted and approve of any amendments which may impact on the overall waterproofing design.

The design approach for a waterproofing solution should now:

- include principal considerations for a robust waterproofing design
- consider a continuous waterproofing design
- consider manufacturers recommendations
- consider BS 8102:2022 and its requirements
- include desk top studies
- include a risk assessment
- include end use/users of the structure
- ensure that remedial measures are devised

Some important sections to be aware of are:

4.2 - Design Team - **NEW**

A significant factor in the recommendations of BS 8102:2022 is the inclusion of a Waterproofing Specialist in the design team, a recommendation which is also supported in the NHBC Chapter 5.4.

The inclusion of a Waterproofing Specialist is recognised to offer the best chance of success and specialists should be a Certificated Surveyor in Structural Waterproofing (CSSW) and/or a certified Waterproofing Design Specialist (WDS).

In cases of litigation or dispute and where the design process is looked at and it is found that a Waterproofing Design Specialist is not involved in the design process, the designer - and not just the installer - can be culpable. Section 4.2 of the Standard states that:

> *"The waterproofing specialist should:*
> *a) be suitably qualified and experienced commensurate with the type and size of the proposed project"*
>
> *"If the RIBA Stages are used, a waterproofing specialist should be appointed before the technical design stage (STAGE 3) at the latest"*

4.3.2 - Defects and Remedial Measures - **REVISED**

The Standard recognises that defects might occur in waterproofing installations, which can include the following revised definitions:

> *"a) defects owing to design;*
> *b) defects owing to poor workmanship;*
> *c) inappropriate use of the materials being used and defects owing to the specific properties of the materials being used; and*
> *d) defects caused by follow-on trades and site operations."*

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Figure 1 - Design Flowchart - **REVISED**

The flowchart outlines the principal factors and stages that need to be addressed to produce an effective and robust waterproofing solution for below ground structures.

As part of this, it is vitally important that the form and feasibility of remedial treatment and maintainability are considered – meaning your ability to highlight any problem with the waterproofing system and rectify it, should there ever be a problem. The chart also recommends that you revisit the waterproofing design if you cannot ensure these things.

SECTION 5 - SITE EVALUATION

There has been a simplification to the primary and secondary research recommendations, with the aim of ensuring that the studies are, in all parts, related to the relevant Eurocodes.

The minimal steps that are recommended to be undertaken as part of the site evaluation include:

- a desk study; and
- a risk assessment that includes the potential effects of climate change, along with a water table classification, inclusion of ground gas contaminants and other external risks.

The aim of the risk assessment is to provide the justification for the proposed waterproofing design, and there are numerous parts of Section 5 that have been revised and added to, that you should be aware of:

5.1.2 - Risk Assessment

NEW: *"NOTE 1: The principal risks with respect to water ingress into structures are the external environmental conditions."*

REVISED: *"The risk assessment should also take into account:*

a) the potential effects of climate change, burst water mains, flooding, defects in underground sustainable urban drainage (SUD) systems and defective soakaways 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."

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

NOTE 2: Even in a permeable subsoil, groundwater requires time to drain away and this can result in limited pressure periodically coming to bear against the structure."

5.1.3 - Water Table Classification in Relation to the Structure

REVISED: *"NOTE 2 The type of structure can inherently raise the risk, e.g. block work construction below ground level, due to number of joints within these forms of construction."*

NEW: *"Modular systems, such as twin wall and insulated concrete formwork (ICF) construction should be deemed inherently high risk. See 4.3.2 on defects and remedial viability."*

5.2.3 - Buildings of Historic Significance or Protected by Legislation - **NEW**

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SECTION 6 - WATER-RESISTING DESIGN

This section of the Standard is a significant and lengthy one, and includes perhaps some of the most notable changes in the 2022 version. These are summarised below:

6.1 - Groundwater - **NEW**

Measures to resist water for a below-ground structure should be considered for any part of the structure that is below the DPC level:

> *"Waterproofing measures should be designed on the basis that water might come against any part of the structure that is below DPC level or ground level, or is earth retaining at some time during the life of the structure. Waterproofing should therefore, whenever practicable, be taken above ground level and linked to the horizontal DPC*

A new reference to BS EN 752 'Drain and sewer systems outside buildings - sewer system management' has been included with regards to surcharge flooding from sewers:

> *"The risk of flooding from surcharge of sewers should be taken into account (see BS EN 752).*

There is also a new recommendation that the Waterproofing Design Specialist, as part of the design team, agrees on the potential head of water that may come to bear against the retaining structure, as based on the site evaluation and risk assessment in Section 5 (covered above):

> *"The waterproofing specialist together with the design team should agree a head of water which the system is designed to accommodate. This head of pressure should be informed by the risk assessment covered in Clause 5."*

6.2.1 - Waterproofing Protection - General - **REVISED**

There are now many more considerations that need to be taken into account when selecting and specifying a choice of waterproofing system, or combination of systems. These considerations include:

> *"1) the need for combined protection (see 6.2.3);*
> *2) the water table classification and required performance grade (see 6.2.4);*
> *3) the need for continuity in the protection (see 6.2.5);*
> *4) the form and feasibility of repair of the system;*
> *5) buildability and the need for protection from site activities and follow on trades;*
> *6) the need for protection against water vapour transmission;*
> *7) the weather/environment effect on programme for weather dependent systems; and*
> *8) the durability of the system and performance over time with any ongoing maintenance considerations.*

6.2.2 - Waterproofing Protection - Waterproofing Design for Existing Structures - **NEW**

This section now includes considerations that should be made by the design team regarding the effects of a waterproofing design on existing structures. The design team should therefore take into account:

> *"1) the impact on floatation forces; and*
> *2) the impact on the existing structure on matters such as embedded timbers and moisture balance."*

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6.2.3 - Waterproofing Protection - Combined Protection - **REVISED**

For ease, we have included a copy of the revised text Section 6.2.3 of the Standard below, highlighting the sections that have been amended. These include a new combination of waterproofing types, as well as new considerations regarding the performance characteristics and compatibility of different types of waterproofing protection when used in combination:

> *"Consideration should be given to the use of combined protection in various forms (e.g. Type A + B, Type A + C, Type B + C, Type A + B + C, Type A + A) where in a single system:*
>
> *a) the assessed risks are deemed to be high (see Clause 5);*
> *b) the consequences of failure to achieve the required internal environment are deemed too high; or*
> *c) the required grade of waterproofing performance is Grade 3.*
>
> *Where a combination is being considered, systems should have different performance characteristics to mitigate the risk of failure due to a common cause.*
>
> *Although structures with Type B protection are designed to be water resistant, additional waterproofing systems may be applied internally or externally to control water vapour movement, where appropriate.*
>
> *Although structures with Type C protection are designed to control and manage seepage into a structure, where this is deemed unacceptably high, the water resistance of the structure should be improved prior to the installation of the Type C protection (see Clause 10 for more information on Type C protection).*
>
> *NOTE Suitable approaches include the application of Type A or Type B protection or the use of resin injection (see Clause 11).*
>
> *When combining types of protection, the compatibility of the different protection types should be assessed in order to minimize the risks and negate the need for remedial measures.*
>
> *When combining Type A and Type B, these systems should be integral (see Figure 7)."*

Section 6.2.3 also includes three schematic illustrations regarding Type A, B and C waterproofing respectively (Figures 2a, 2b and 2c), and these too have undergone updates:

Figure 2a - Type A (barrier) protection

The 2009 version of the Standard showed three possible positions for Type A waterproofing membranes - external, internal and sandwiched.

However, the 2022 version now only shows two possible positions for Type A waterproofing membranes - either external or internal (image to the right).

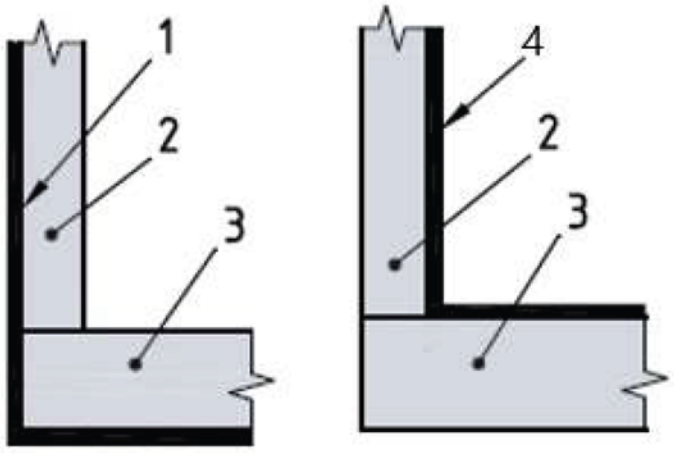

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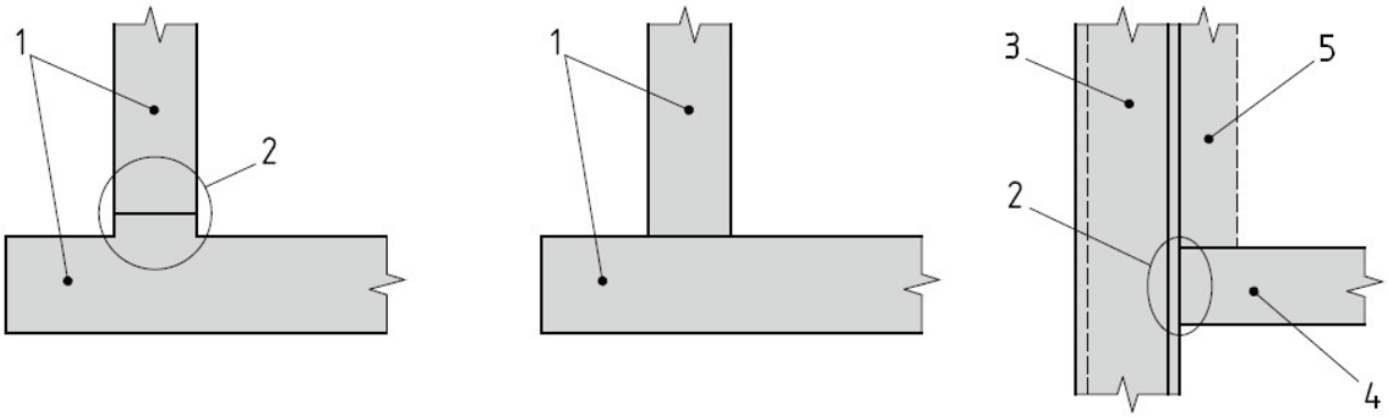
Figure 2b - Type B (structurally integral) protection

The 2022 Standard now refers to the reinforced concrete structure (indicated by the number 1 label in the below image) as "watertight" whereas in the 2009 version this was defined as "water resistant" concrete.



6.2.4 - Water Table Classification and Required Levels of Waterproofing Performance - **REVISED**

Table 2 of the Standard, contained within Section 6.2.4, is the table which defines the "Grades" of waterproofing protection, and updating this was one of the main drivers behind updating the Standard.

Below is a copy of the new Table 2 from the 2022 version of the Standard:

Table 2 – Waterproofing protection – Grades of performance for below ground spaces

Grade[A)]	Performance definition
1a	Seepage[B)] and damp areas[C)] from internal and external sources are tolerable, where this does not impact on the proposed use of below ground structure.
1b	No seepage[B)]. Damp areas[C)] from internal and external sources are tolerable.
2	No seepage[B)] is acceptable. Damp areas [C)] as a result of internal air moisture/condensation are tolerable; measures might be required to manage water vapour/condensation[D)].
3	No water ingress or damp areas[C)] is acceptable. Ventilation, dehumidification or air conditioning necessary; appropriate to the intended use[D), E)].

A) The agreed grade should meet with client's expectations for the intended use of the below ground space. Reducing the grade could increase the risk of not meeting the expectations of the client for the intended use of the below ground space.

B) Seepage (sometimes referred to as weeping) is defined as in **3.14**. If there is seepage, there is a possibility of mineral deposits forming.

C) Damp area is defined as in **3.4**.

D) The scope of this document is limited to detailing the process and best practices that can be followed when creating a waterproof or water-resistant structure below ground, the additional considerations that are required to achieve the required environment are beyond the scope of this document.

E) See BS 5454 for recommendations for the storage and exhibition of archival documents.

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Overall, the new Table 2 is more focused on how the design team should manage the client's expectations regarding the intended use of the structure, and the key recommendation is that the desired Grade of waterproofing protection should be agreed at the earliest stage.

The most significant updates to note regarding this version of Table 2 compared to 2009 are:

- The examples of the user of the structure, that were previously provided for each of the Grades of protection, have now been removed. This is to avoid any confusion regarding the intended end use of the structure and the performance level that is required - for example, is there any reason why a client wouldn't want their car park to achieve Grade 3 protection instead of Grade 1?
- Grade 1 has now been split into Grade 1a and Grade 1b, and further definitions have been added to Grade 2 and Grade 3. This is to avoid confusion regarding what qualifies as a wet, damp or dry structure, and whether the source of the damp comes from external or internal sources.
- Seepage has been defined separately to damp, and specifically mentioned as either acceptable or unacceptable depending on the Grade of protection. This is mainly due to the risk that, if there is seepage, then there is a possibility of mineral deposits also forming.

6.2.5 - Continuity of Waterproofing Protection - **REVISED**

Whereas the 1990 version of the Standard included a reference to the continuity of the waterproofing being required from DPC level, this was removed in the 2009 iteration. The 2022 version has reinstated this recommendation however, and Section 6.2.5 now mentions that the waterproofing protection should be continuous from DPC level 150 mm above ground and throughout the below ground structure.

6.4 - External Sub-Surface Drainage - **REVISED**

Compared to 2009, Section 6.4 now includes newer external sub-surface drainage technology that has been introduced in the intervening years, and also now includes and highlights the importance of maintainability for such drainage systems.

6.5 - Buried Decks Below Ground Level - **NEW**

This new Section has been added to emphasise the importance of providing waterproofing protection to buried decks below ground level, and that these should be differentiated from roofs above ground level.

Recommendations and considerations are outlined with regards to falls, substrate movement, bonded systems, outlets, drainage paths, and maintainability. Furthermore, two new details are also included:

Figure 4a – Typical details of a buried deck – Typical buried deck details
Figure 4b – Typical details of a buried deck – Typical buried deck land drain details

6.6 - Ground Gases - **REVISED**

Section 6.6 has undergone some small updates to include newer references to the relevant codes of practice and guidance documents, namely:

- BS 8485 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- BRE Report 211 (2015) 'Radon: Protective measures for new buildings'
- TBIC document on 'Basements: Ground Gases and Structural Waterproofing'

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SECTION 7 - GENERAL CONSTRUCTION ISSUES

7.1 - Site Dewatering - **REVISED**

Within Section 7.1, a whole host of new considerations and recommendations have been included as part of the eight new sub-sections from 7.1.1 through to 7.1.8. Of these, two of the most notable include:

> *"7.1.5 - A "Water Management Plan" should be produced by the main contractor"*
> *"7.1.6 - Water ingress during construction should be taken into account in the design"*

7.2 - Unexpected Hazards - **NEW**

As part of the Waterproofing Design Specialists key role in the project design team, Section 7.2 now includes the following recommendation:

> *"In the event that unexpected conditions are discovered that were not apparent during the site assessment and planning stage, these should be reported to the design team and waterproofing specialist."*

7.3 - Structural Elements - **REVISED**

This Section concerns itself primarily with making recommendations to ensure that the form of below-ground construction is structurally appropriate and sufficiently durable. However, compared to the 2009 version, this also now includes a new statement recommending that:

> *"there should be continuity linking the waterproofing to the horizontal damp proof course above ground (see 6.2.1)."*

7.4 - Continuity in Construction - **NEW**

The purpose of this Section is to highlight the critical requirement to achieve continuity during the construction phase of a project that includes below ground waterproofing. It states that:

> *"To avoid delays, additional costs and defects in the waterproofing systems, every effort should be made at the planning and sequencing phase of the project to ensure that waterproofing works can be carried out without obstruction or interruption."*

7.5 - Protecting Waterproofing - **NEW**

Another new Section, in this case highlighting the need to protect installed waterproofing to ensure that it maintains its ability to resist or manage water:

> *"Every effort should be made to prevent damage and maintain the integrity of these systems during and after the construction phase."*

SECTION 8 - TYPE A (BARRIER) PROTECTION

A comprehensive part of the Standard covering the design and specification of Type A (barrier) waterproofing membranes, there have been numerous updates throughout Section 8 with many regarding the importance of continuity and buildability, and also the removal of sandwich waterproofing as a possible position for a Type A waterproofing barrier.

8.1.1 - Structural Aspects - General - **REVISED**

This list of aspects upon which any evaluation of barrier protection should be based, has now been added to with point g) in order to emphasise the importance of:

> *"g) achievable continuity of waterproofing system."*

8.1.2 - Differential Movement and Cracking - **REVISED**

Minor updates have been made in order to highlight the considerations that should be made regarding the cracking of the structure, both in terms of pre-existing cracks and cracks that form after application.

8.1.3 - Continuity of Waterproofing Barrier - **REVISED**

A range of small revisions have been made to this Section to provide clarity and highlight the need for continuity. This includes the consideration that waterproofing barrier discontinuity can occur when enhancing other types of systems.

8.1.4 - Structural Penetration and Loading Through Waterproofing Barriers - **NEW**

This completely new Section has been added in order to expand upon previous information and solely address potential issues when a waterproofing barrier is required to pass through a structural element. The overall aim of the Section is to:

1. ensure that designers consider detailing with a view to providing for the continuity of the waterproofing;
2. ensure that, where external membranes are selected, the system maintains full performance should it become unsupported due to settlement; and
3. provide clearer examples of the potential structural elements that designers must consider. For example, the presence of props, waling beams, anchors and piles.

The above aims are supported by Figures 6a, 6b and 6c, which was one single illustration in 2009 but has now been split into three illustrations to indicate where waterproofing systems can be employed, and also show typical transitions through walls, across pile caps and across pile heads.

8.1.5 - Movement Joints - **NEW**

Previously included within Section 8.1.3 movement joints have now been given their own new and dedicated Section, in order to highlight the need by not only the designer to understand anticipated movements but also the product manufacturer/supplier to ensure that the proposed product is fit for purpose for both any anticipated movement and the environmental conditions.

Finally, it emphasises the need for:

> *"A three-dimensional review of the waterstop network... to ensure full continuity of the system and identify any areas or junctions that might require special consideration."*

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8.2.1 - Waterproofing Barrier Materials - General - **REVISED**

As previously mentioned in relation to Figure 2a within Section 6.2.3 this greatly revised Section on waterproofing barrier materials now also removes sandwich waterproofing as a potential position for barrier waterproofing, due to the consensus view that it is inherently high risk.

Type A waterproofing is now clearly defined for use in either external or internal applications only, which fits with the waterproofing products available in the modern market.

Furthermore, a number of additions have been made to the list of considerations that should be made by designers regarding the product manufacturer's instructions, including:

- penetrations through the barrier;
- fixings, where these are necessary;
- application over joints in the substrate;
- compatibility, durability and buildability; and
- the need for membranes to be fully bonded to both prevent lateral migration (tested to BS EN 1928 Method A) and resist negative hydrostatic head (tested to DIN 1048 / BS EN 1542).

The overall aim is that the designer is informed of the full complexities of their design and can therefore ensure that the proposed products are fully suited to the installation. This therefore leads into Table 3.

Table 3 - Waterproofing Barriers - **REVISED**

The renamed and revised Table 3 has undergone a number of updates:

- The previous descriptions for the different types of barrier membranes in the 2009 version of the Standard were outdated and too narrow in relation to the modern sheet membranes now available.
- The term "Bonded Sheet Membranes" has been removed and replaced with a differentiation between pre-applied and post-applied membranes.
- A new column has been added to indicate the type of bond between a membrane and the structure.
- The types of membrane bonds are now defined as either full, partial or compartmental, in recognition of the different products available in the market.
- A new type of barrier product has been defined as "Active core liners" to better suit available products in the market - this includes both bentonite and polymer core products.
- More detail has been added regarding the abilities of "Cementitious crystallisation coatings", informing designers on the difference between this technology and multi-coat, cementitious renders.
- The 'Relevant Standards' column has been updated to include new standards in line with modern Type A technologies.

The overall result of these updates is that designers can now more accurately use Table 3 in order to advise them on the potentially different levels of performance between different Type A barrier systems.

8.2.2.1 - Pre-Applied Membranes - **NEW**

A new Section to provide more detailed information on the different pre-applied technologies now available in the market since 2009, and provide designers with guidance on areas to consider when employing pre-applied membranes. This includes:

- the need for suitable substrates;
- system continuity; and
- compatibility between systems.

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8.2.2.2 - Post-Applied Membranes - **NEW**

Another new Section that focuses specifically on a specific kind of Type A barrier membrane, 8.2.2.2 highlights where and when post-applied membranes can be employed, as well as the key considerations that should be given to certain limitations during the installation process with regard to:

- the need for suitable substrates;
- the general preparation of substrates;
- the potential for general damage; and
- the need to ensure the integrity of membrane overlaps.

It is also important to highlight the precautionary note that has been included regarding employing post-applied membranes on certain types of composite formwork (such as ICF):

> *"Particular care should be taken with composite formwork systems where substrates might potentially have an adverse reaction to solvent-based adhesives and primers, and when backfilling against post-applied membranes to reduce the risk of damage."*

8.2.3 - Liquid Applied Membranes - **REVISED**

The parts of Section 8.2.3 that have been revised since the 2009 version are as follows:

> *"When applied to the internal face of the structure, the membrane should be suitable to resist a negative or counter thrust hydrostatic pressure without the need for a loading coat"*

> *"Details on the preparation of the substrate, application rate, method and curing requirements should be in accordance with the manufacturer's recommendations."*

8.2.4.2 - Active Core Liners - Pre-Applied Liners - **REVISED**

This updated Section now emphasises the importance of a correctly prepared and suitable substrate for the installation of pre-applied active core liners:

> *"Active core liners should be laid onto a stable substrate, such as well compacted sub-base, blinding concrete, temporary or permanent formwork or directly to property line construction."*

8.2.6 - Cementitious Crystallization Slurries and Powders - **REVISED**

8.2.7 - Cementitious Multi-Coat Renders, Mortars and Coatings - **REVISED**

When specifying cementitious systems, designers are advised to consider dimensional changes associated with building settlement, drying shrinkage, and construction processes that cause vibration:

> *"The application of rigid systems should be delayed as long as practicable to allow for dimensional change associated with building settlement and drying shrinkage to occur and for construction processes that cause vibration to be completed."*

Furthermore, the ability to withstand increased water pressure loading should also be considered:

> *"Existing substrates and structural elements should be assessed for their suitability to withstand any increase in applied loads from water pressure and should be suitably prepared prior to the application of the system."*

SECTION 9 - TYPE B (STRUCTURALLY INTEGRAL) PROTECTION

9.2.1.1 - Materials for Structurally Integral Protection - Concrete - General - **REVISED**

As with Section 6.2.3 we have included a copy of the main content from Section 9.2.1.1 and highlighted the most pertinent changes for your attention. This includes an important differentiation between Grade 1a and Grade 1b, and how this relates to Eurocode 2 (BS EN 1992) for the 'Design of Concrete Structures':

> *"Concretes, with or without water resisting admixtures, should be designed to meet minimum design requirements for structural use and durability in the ground, and be properly placed and compacted.*
>
> *Reinforced concrete structures should be designed and detailed specifically to minimize water ingress.*
>
> *Where some seepage is tolerable (as Grade 1a), the provisions in tightness class 0 of BS EN 1992-1-1 may be adopted.*
>
> *Where Grade 1b is required, the maximum permissible through crack width of the concrete should conform to BS EN 1992-3:2006, tightness class 1.*
>
> *Where higher waterproofing performance grades are required, additional measures (such as a combined protection, water resisting admixture, pre- or post-tensioning) should be used."*

9.2.1.3 - Concrete Containing Waterproofing Admixtures - **NEW**

Contains a new statement describing how:

> *"Manufacturers should be consulted as to the performance of a specific water resisting admixture in reducing the risk of water penetration through a crack, possibly under considerable hydrostatic pressure."*

9.2.1.4 - Waterstops - **REVISED**

This has been revised to add more emphasis to the importance of continuity in waterstop systems:

> *"The full waterstop network should be designed to ensure that a continuous system is created or is appropriately terminated at ground level. Special attention is required where active and passive waterstops are to be linked and act as a continuous network."*

SECTION 10 - TYPE C (DRAINED) PROTECTION

Cavity drain waterproofing is perhaps one of the most commonly used waterproofing methods, so it was important that this Section was updated to ensure that modern Type C systems are designed and used correctly.

The updates include a focus on the use of the systems in multi-level basement projects, and on the continuity of waterproofing systems. Furthermore, it emphasises that the waterproofing designer responsible for the design must ensure that it complies with all requirements and uses of the structure.

Two more important additions are also with regards to the specific details on pumping systems and their discharge options, as well as the importance of system maintenance, repair, commissioning and future servicing.

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10.1 - Structural Aspects - **REVISED**

A change of emphasis to state that the whole structure, and not just the outer leaf, must be capable of controlling water ingress:

> *"The external elements of the structure should be capable of controlling the rate of water ingress so as not to exceed the capabilities of the cavity drain system."*

10.2.1.2 - Leachates and Free Lime - **REVISED**

Includes a new recommendation that the structure is treated prior to installing a cavity drain system so as to reduce the risk of future maintenance issues:

> *"Before a cavity drain membrane is laid or fitted on walls and floors constructed of new concrete, the concrete surface should be treated to reduce the risk of leaching of free lime or mineral salts so as to avoid the obstruction of the drainage system."*

10.2.1.4 - Drainage Design - **REVISED**

Includes recommendations regarding the most typical means of designing and installing appropriate drainage for a cavity drain system, but adds the important consideration that:

> *"the requirement for and feasibility of maintenance of the intermediate drainage space should be assessed."*

10.2.2 - Multi-Level Systems - **REVISED**

As cavity drain systems are used in more and more deep basements, the Standard needed to reflect this usage and include multi-level basement designs. This Section therefore raises some of the most important factors that must be made by waterproofing designers for such projects, including, but not limited to, consideration of relevant Building Regulations regarding fire stopping, and also compartmentalisation.

The Section also includes 'Figure 8 - Example of a multi-level system' which gives the reader an example of a standardised design for draining through an intermediate floor.

10.2.4 - Cavity Ventilation - **NEW**

Updated to include references to the relevant documentation and standards regarding ground gases and potential contaminants, namely:

- BS 8485 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.
- CIRIA C795 - Retrofitting hazardous ground gas protection measures in existing or refurbished buildings.

10.2.5 - Inverted Cavity Drain Systems - **NEW**

The Standard needed to reflect the use of cavity drain systems not only for structures such as vaults, but also for flat soffits (laid to falls), and so this Section provides more guidance.

As well as defining the most important considerations in such scenarios, this Section also highlights the higher levels of risk associated with these forms of application, especially at penetrations through the system for services or fixings.

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10.2.6 - Discharge Systems - **NEW**

Outlines the possible methods of discharging water, and the necessary risk assessments required in order to decide on the most appropriate solution. For systems that opt for a gravity drainage discharge, other important considerations are also raised, including:

- surcharge risk;
- maintainability;
- frozen discharge; and
- the inclusion of flood loops, also illustrated by 'Figure 9 - Example of a flood loop discharge'

10.2.7 - Pumps - **REVISED**

The number of pumps that should be used in a mechanical discharge system is addressed:

> *"the number/type of pumps and attenuation capacity of the system should be designed considering the usable void space of the cavity drain system, anticipated rate of water ingress, distance/length of any discharge pipework and potential running cycles of the pumps."*

As well as the need for battery back-up pump systems in the event of power failure.

10.3 - Servicing and Maintenance - **REVISED**

The importance of maintainability in waterproofing design and installation has been a common theme within the updates made to the revised Standard, and this is addressed directly with regards to Type C cavity drain waterproofing systems in the revised Section 10.3, which includes Sections '10.3.1 - Servicing' and '10.3.2 - Commissioning and Maintenance'.

Amongst others, some of the clear recommendations are as follows:

- *"Type C systems should have a maintenance schedule"*
- *"the waterproofing drainage system should be designed to be easily serviced and maintained."*
- *"Access points that allow routine maintenance of channels and outlets should be incorporated into the design of the waterproofing system."*
- *"Requirements for servicing and maintenance should be incorporated in both the design and upon completion."*
- *"Service visits should be carried out no less frequently than annually."*

SECTION 11 - REMEDIAL MEASURES

11.1 - General - **NEW**

Now includes a list of potential measures that can be employed in order to remediate Type A, Type B and Type C waterproofing systems. It also includes a mention of higher risk construction techniques:

> *"composite and modular structures, such as precast and twin wall, and certainly masonry, beam and block and ICF, have increased risk of failure and are potentially difficult to repair so remediation can be extensive and costly"*

Regardless of the construction method and waterproofing systems employed however, a key recommendation is that "*Strategies for repair should be taken into account at the design stage*", referring the reader back to Section 4 on 'Design Philosophy'.

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11.2 - External Grouting or Injection - **REVISED**

AND

11.3 - Repair with Cementitious or Polymeric Systems - **REVISED**

These Sections, which outline specific potential methods of repair to waterproofing systems, have been updated in line with modern methods and products, including updated methods of:

- external grouting;
- the injection of resin or grout into structures; and
- repairing with cementitious or polymeric systems.

11.5 - Masonry Structures - **REVISED**

Now recognises and includes the potential for scenarios where masonry structures that are historic or traditionally built will be weaker than the more modern and desired concrete structures. In such cases:

> *"A structural engineer should be consulted before repairing or stopping any leak which might be releasing pressure on the structure."*

11.5.2 - Masonry Structures - Investigation/Diagnosis - **NEW**

Highlights the need for a detailed survey to take place prior to any remediation work commencing, and directs the reader back to the specific recommendations contained within 'Section 5.2 - Inspection and Survey for Existing Structures'.

SUMMARY

Overall, we hope that this detailed document has provided you with a good summary of the many points that have been updated as part of the 2022 revision to British Standard 8102. As the Code of Practice for the 'Protection of Below Ground Structures Against Water Ingress' it attempts to bring the Standard in line with modern day best practice, as well as recognising the many technological developments and innovations in that have taken place during the past 13 years in the waterproofing industry.

Furthermore, whilst considerations such as buildability, maintainability, repairability and waterproofing continuity have become consistent themes in many of the updates that have been made, perhaps most important is the idea that no individual statement or recommendation with BS 8102:2022 is considered in isolation, but as just one element of the many interlinked sections that make up the Standard, and which should be considered as a whole.

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