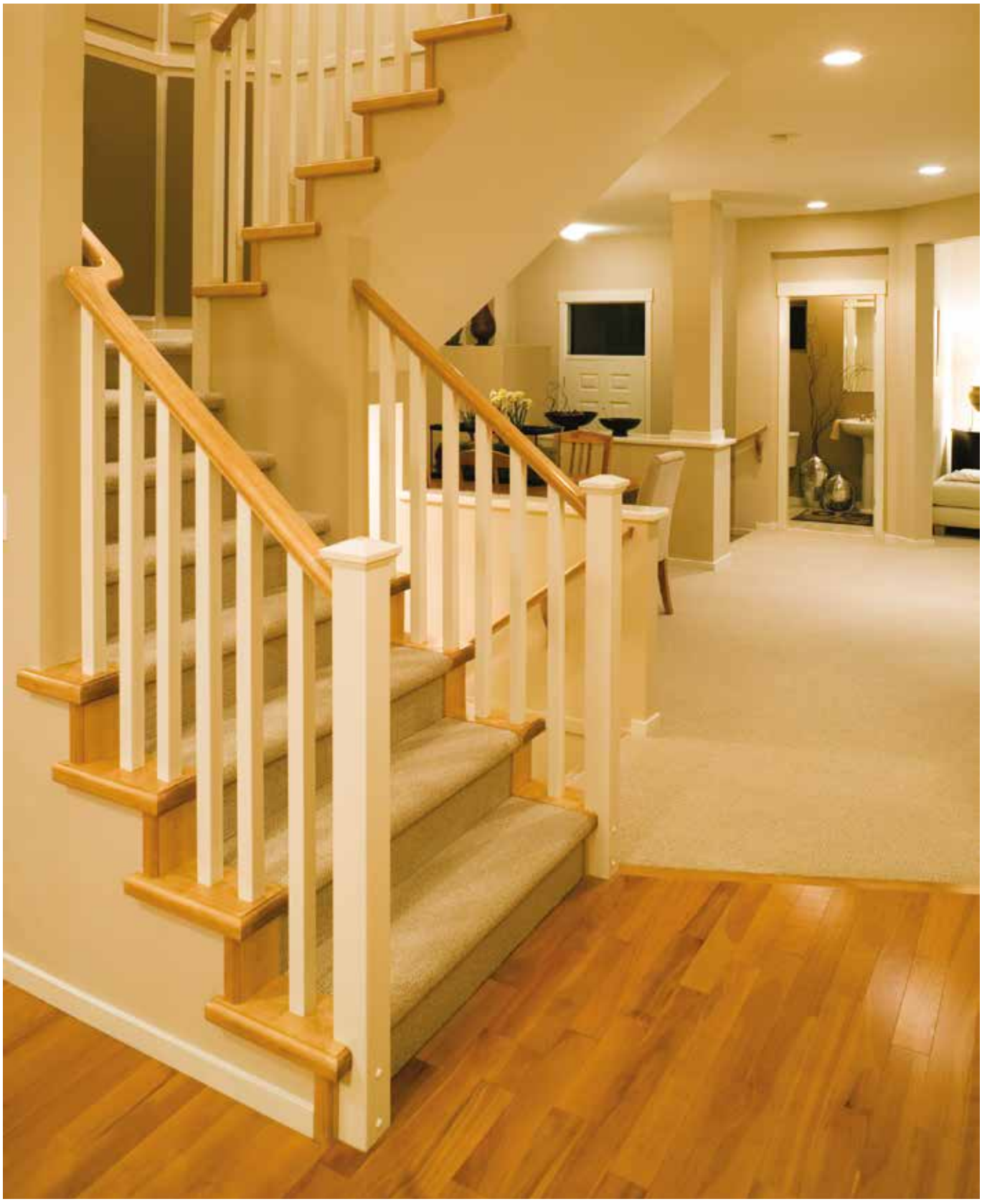
Guidance on the design and construction of basements

Technical guidance for building control surveyors, designers and installers

LABC
Delivering building control through local authorities



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Introduction

Basements are having resurgence in residential developments, particularly in refurbishment projects as a result of limited available space to construct above ground extensions. However, their construction can cause many potential problems if not properly designed and built. Of particular concern is the potential for water ingress and structural stability of the existing superstructure.

This guidance has been prepared with LABC Warranty and reflects its extensive experience in dealing with basement construction. Its purpose is to highlight key design and construction issues that can have a significant impact on the outcome of any basement project. It is accepted that this guidance does extend the definition of a basement beyond that of BS8102:2009. We have adopted this approach because failures in basement construction have led to serious water ingress, which is both costly and difficult to rectify.

When approving an application, the local authority building control team may be provided with product details. It should be noted that most manufacturers do not accept design liability for their waterproofing product on individual project sites. Reliance is often placed on third party accreditation of a product such as a BBA certificate. If the product is unsuitable for use in certain circumstances the certification criteria is void.

Definition of a basement

The traditionally accepted definition of a basement is a storey or storeys of a building constructed partially or entirely below ground. But in the context of this guidance, it also includes a building constructed on a sloping site with changes in levels. The change in levels might involve the walls themselves, which may retain soil and so susceptible to ingress of ground water.

Any building which has floors that are not constructed directly off the ground may contain a void that is susceptible to ground water ingress. However, the existence of a void does not make it a basement and therefore this guide will not apply.

Image 1: Basement being constructed below ground

The provision of level access into commercial and residential buildings can lead to problems with ground water ingress below any suspended floors and/or into solid floors. Again, these are not ‘basements’ in the context of this guidance.

To expand on the descriptions above the following are typical scenarios that can be considered as basements in residential developments:

- Basement – a storey or storeys of a building constructed partially or entirely below ground
- Semi basement – an inhabited single storey with up to three walls constructed partially or entirely below ground, this being of particular relevance where structures are built on sloping sites. This can also apply when there are a number of subfloor voids/walls below ground level
- Shallow basement – one storey entirely below ground
- Deep basement – more than one storey entirely below ground.

Walls that are neither basement walls nor semi basement walls and do not form part of the habitable accommodation can be defined as:

- Retaining walls – walls that hold back earth. Such walls must be adequately designed and constructed. The design process must consider the potential for ground water ingress and if waterproofing may be required.

Pre-installation analysis of the project

The client and the architect will determine the end use of the basement at the outset. Once decided a structural engineer will then be needed to carry out a desktop analysis of the geology and hydrology of the site to guide the design of foundation and basement structure.

Where the project is a refurbishment, the above would be adopted but the construction may be largely dictated by

the existing structure. It is often the case that full geology and hydrology reports are not provided unless the internal ground level is being reduced or the structure is being extended. As a result, due to the higher risk involved, any waterproofing risk assessment should be graded accordingly.

It is likely the design team will consist of:

- Architect
- Structural engineer
- Waterproofing specialist

Where the waterproofing specialist is not carrying out the installation, the design team should clearly and consistently communicate the design to the installation team.

Design of the basement

In free-draining soil where the water table is very low, a simple risk assessment may exclude water ingress as a potential problem. In such cases it is still important to ensure damp proof membranes are positioned above the external ground level and ground and surface water adequately controlled and managed.

Image 2: Example of internal damp proof membrane

A key requirement in the construction of a basement is to ensure the design and construction work is carried out by a suitably qualified and experienced contractor. BS8102 2009 'Protection of structures against water from the ground' says: "A waterproofing specialist should be included as part of the design team so that an integrated waterproofing solution is created."

It does not seek to define who a waterproofing specialist is, but it does call for the specialist to:

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

The BS8102 suggests that the waterproofing specialist may be the manufacturer or material supplier, provided that the manufacturer/supplier has the relevant expertise. It does not say the waterproofing specialist must take design liability for the waterproofing.

A profile of a waterproofing specialist:

- demonstrate experience of acting as a waterproofing specialist
- can offer case studies and project references
- may hold an industry qualification of certificated surveyor in structural waterproofing (CSSW) or other professional qualifications
- have professional indemnity cover that specifically mentions within their business activities, basement waterproofing, tanking, basement conversion etc.
- have a thorough understanding of BS8102:2009
- understand basic hydrology and soil mechanics and are able to communicate this to the rest of design team
- skilled at assessing the risk of water reaching the structure and able to communicate this to the rest of the design team
- have a broad, general knowledge of different types of construction, which will determine the type of project the specialist is able to carry out
- have a broad understanding of the types of waterproofing required and able to communicate their recommendations to the rest of the design team
- have a detailed understanding of the waterproofing system to be used
- provide practical experience on health and safety issues, maintenance liability and "buildability" of the selected method/s of waterproofing.

Image 3: Example of external damp proof membrane

LABC Warranty requirements

Where the architect is taking design liability which includes waterproofing they must be able to demonstrate they meet the requirements for design and construction as mentioned in this guidance. The architect may need to engage a waterproofing specialist during the design process if they are not able to meet the criteria of a waterproofing specialist.

LABC Warranty will, as part of the approval process, require the basement designer to provide a copy of their public indemnity insurance. This document must specifically confirm their business activities include "basement waterproofing, tanking, basement conversion" etc. If it does not, a letter from their broker substantiating the designer's credentials will generally satisfy this clause.

LABC is a membership organisation representing all local authority building control teams in England and Wales who work with industry and building professionals to ensure compliance with Building Regulations. We are a not-for-profit organisation dedicated to promoting public sector expertise.

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