Technical Extra

August 2019 | Issue 25

NHBC Standards

Regulation and compliance

Guidance and good practice

Information and support

NHBC
Raising Standards. Protecting Homeowners

Foreword

Welcome to Technical Extra 25

Standards 2019, the latest edition of NHBC Standards, came into effect earlier in the year. Since then, we've been working to update the electronic version. We're pleased to confirm that we've now launched a new version of Standards Plus, which continues to be freely available from the NHBC website (www.nhbc.co.uk/nhbcstandards) and NHBC Partner Portal.

A number of key indicators suggest that the overall quality of homes is improving. The most recent results of the HBF's National New Homes Customer Satisfaction Survey reveals that over 87% of the respondents said that they would recommend their home builder to a friend; a 1% increase on the previous year's results. NHBC's own claims data also reveals a steady decrease in the number of homeowners claiming against the NHBC Buildmark warranty. However, our recent experience is that a small number of claims are giving rise to significant repair bills.

The reason for expensive repairs can be wide-ranging and might result from a number of factors. One area that warrants particular attention is sites in coastal locations, which we consider in detail on page 3 in this edition of *Technical Extra*.

There is growing interest in UK house building regarding the assembly of building components off site to form systems that can be erected quickly on site. Off-site manufacture, however, is not without risk and, without careful and robust processes in place, systems could be assembled with repeated defects. This is particularly true in the case of 'closed' systems where there is limited opportunity to inspect or identify potential defects as part of the established site inspection process. Read more on page 7 on what evidence NHBC requires to ensure systems delivered to site have been manufactured in controlled conditions and in accordance with NHBC Standards.

A number of amendments to Building Regulations and approved guidance have impacted the type of materials that can be used, and/or how they should be assessed. These changes are summarised in the article 'Ban on the use of combustible materials in relevant buildings over 18m'. The regulation and compliance section in this edition of *Technical Extra* also considers downlighter penetrations in intermediate floors.

Recent publications from the NHBC Foundation are briefly summarised. These include 'NF84 – At your services: what to expect during commissioning' and 'NF83 – Watts in store? Introduction to energy storage batteries for homes'.

Other articles in this edition of *Technical Extra* highlight potential issues related to raised external ground levels; flat roofs, balconies and terraces; colour banding in roof tiles; and retaining walls.

We hope you find this edition of *Technical Extra*, and the additional information it highlights, to be of benefit.

NHBC Standards

Who should read this: Technical and construction directors and managers, architects, designers, manufacturers and site managers.

Building on sites in coastal locations

Introduction

Many people aspire to have a home with a sea view. Less desirable is a home with water ingress and corroded lintels and balconies. Unfortunately, far too frequently, that's exactly what owners of new homes in coastal locations are getting, often resulting in a claim being made against NHBC's warranty. In this article, we have summarised some of the issues we find when we investigate these claims, and how these costly and disruptive issues could have been prevented.

Guidance

NHBC has recently been dealing with a number of expensive claims on homes that are located overlooking, or close to, the coast. Appropriate detailing and installation of DPCs and cavity trays is always important, but these become particularly critical in coastal areas. Although our initial findings suggest multiple other reasons for why things have gone wrong, there are recurring issues, often leading to rainwater entering the home. These include:

- Poorly specified doors and windows
- Poor detailing of flat roof coverings
- Unsuitable curtain walling and cladding systems.

By following the guidance within NHBC Standards, many of these issues will be avoided. However, there are times where a more robust approach is advisable.

Identification of 'coastal' sites

Identification of more exposed 'coastal' sites is not as straightforward as it might seem. Currently, NHBC Standards define costal sites as those within 500m of the shoreline. However, homes adjacent to large estuaries can also be exposed to high winds and storms coming in from the sea. Additionally, we are currently taking a detailed look at our claims data on homes slightly further inland, as it seems that these may also be experiencing similar issues.

BS 8104:1992 'Code of practice for assessing exposure of walls to wind-driven rain' provides a method for assessing exposure of walls to wind-driven rain which gives a more precise understanding of exposure conditions on a particular site. Local knowledge and experience should also be taken into account, particularly where the site is exposed to open water. Even when a coastal site is defined as being in a sheltered or moderate location, occasional exposure to storm conditions can test the building's design, detailing and construction, exposing weaknesses and leading to failure.

A prudent approach may therefore be to treat any coastal site as though it is in a very severely exposed location and to use construction materials, systems and detailing appropriate for these conditions.

Detailed guidance can be found in NHBC Standards, but the following key issues should be considered when constructing homes in coastal locations:

Building on sites in coastal locations

Guidance (continued)

Doors and windows

Making the most of the sea views, homes in coastal locations often incorporate large doors and windows. All doors and windows should be classified in accordance with BS 6375 'Performance of windows and doors'. This requires determining, through test and specification, whether they will suitably resist air and water penetration, and wind pressure specifically for the location where they are installed.

Weaknesses can occur where windows are joined together horizontally or vertically to form faceted, ribbon or stacked windows. Weathertightness of the interfaces between windows is just as important as the windows themselves, and joints should not be reliant on sealant alone for weathertightness. Properly designed joints incorporating gaskets or seals should be used. Larger stacked widows are considered as curtain walling, and the guidance in Chapter 6.9 'Curtain walling and cladding' applies.

Sills with drip details should project the external face of the wall and sufficiently shed water away from the building. BS 8213-4:2016 'Windows and doors. Code of practice for the survey and installation of windows and external doorsets' says 'The size of the sill should be such that there is a minimum overhang of at least 25 mm from the face of the building'; however, manufacturers may have their own guidance for more exposed locations. Curved walls below faceted windows can reduce this dimension, so the sill may need to be oversized to account for this.

DPCs and cavity trays around openings should be suitably robust. These details are critical to the performance of the building and are prone to poor workmanship. The devil is in the detail, so their installation needs close supervision to ensure that a good standard is maintained.

Ironmongery should be manufactured from suitably durable materials to withstand the more highly corrosive coastal environments. BS EN 1670:2007 'Building hardware. Corrosion resistance. Requirements and test methods' provides guidance for hardware and its durability.

Detailing of flat roof coverings

There is a trend for homes in coastal locations to adopt a Mediterranean-style design, incorporating flat roofs, often with balconies and interfaces, with other building elements.

Again, the detailing is critical. NHBC has dealt with claims related to water ingress through flat roofs with the following issues identified:

- Poor parapet coping details, often using metal copings with no drip detail (NHBC Standards require a minimum 40mm drip), cavity tray or DPC beneath
- Poorly designed balcony details where the supports penetrate the building façade
- Building elements penetrating or fixed through the waterproof membrane
- Poor detailing between different parts of the building, for example at abutments and/or between adjacent roofs.

Further information on flat roofs is included in the article 'Flat roofs, balconies and terraces', which appears on page 8 in this edition of *Technical Extra*.

Building on sites in coastal locations

Guidance (continued)

Curtain walling and cladding systems

Similar to windows, cladding should be tested to ensure that it can sufficiently withstand air and water pressure. Key issues to consider include:

- The system should be certified for use in the given exposure zone
- Where the cladding is not the primary weather-resisting element, the structure behind should be made weathertight in accordance with recognised standards
- Test samples should accurately represent the proposed end use, taking into account the support structure, fixing arrangement, damp proof details and interfaces
- Sealant joints should be designed in accordance with BS 6213:2000 'Guide to selection of constructional sealants' and ISO 11600 'Building construction – Jointing products – Classification and requirements for sealants'; simply stating 'mastic joint' on the drawing is not acceptable
- Metal components should be manufactured using suitably durable materials or protected to withstand higher corrosive environments.

The recommendations in this article represent good practice that could be applied to all homes, but it is particularly relevant where homes are located near the coast. In these conditions, the building is more exposed, which, without proper consideration, can result in corrosion of metal components and water ingress. There's an array of technical guidance that can be applied that will help prevent these costly and disruptive claims, which are currently all too frequent.

You need to...

- Ensure you carefully consider your sites to identify if they are in an exposed location – a prudent approach may be to treat any coastal site as being in a very severely exposed location
- Ensure all requirements for DPCs and cavity trays are clearly specified and followed
- Remember that, where windows are joined, the weathertightness of the interfaces between them is just as important as the window itself. Joints should not be reliant on sealant alone for weathertightness; properly designed joints incorporating gaskets or seals should be used
- Consider larger stacked windows to be curtain walling and apply the guidance in Chapter 6.9 'Curtain walling and cladding'
- Check products meet the requirements of any relevant standards and any specific requirements for design and certification
- Consider that many of the issues seen highlight the importance of detailing, both in design and build.

Spandrel panels on gable end walls to pitched roofs

Who should read this: Technical and construction directors and managers, architects, designers, manufacturers and site managers.

Introduction

Technical Extra 23 introduced NHBC Technical Guidance 7.2/25 on the design and installation of spandrel panels forming party walls and gable walls to cold pitched roofs. Alternative designs to those shown in the guidance have been recently accepted, and the structural aspects of those designs are described below.

Guidance

Wind loads on gable walls must be safely transferred back into the roof structure. With masonry gables, this is achieved by using hook-ended metal restraint straps against the cavity face of the masonry and fixed back to the roof timbers.

With a gable spandrel panel supported on a masonry wall, the lateral wind forces acting on both the panel and masonry can create a slip plane at the junction between the two. Lateral movement at the junction can be resisted by laterally supporting the panel and wall independently, as shown in detail 8 in Technical Guidance note 7.2/25.

We are aware of an alternative approach using proprietary metal 'H' brackets that clip over the top of the masonry wall and around the sides of a timber wallplate, which is bedded onto the masonry and level with the wallplates at the eaves. Using a number of these 'H' brackets, together with holding-down straps and specific timber-to-timber fixings to join the spandrel panel to the wallplate, the lateral forces on the masonry can be safely transferred into the spandrel panel. Lateral restraint of the panel back into the roof structure at the ceiling joists completes the lateral restraint of both the panel and the masonry wall.

An acceptable variation to the above approach is where the masonry finishes level with the top of the ceiling joists and is restrained with lateral restraint straps and blocking pieces or noggings to the ceiling joists. The lateral forces on the spandrel panel are transferred to the masonry wall using the same metal bracket and wallplate arrangement described above.

With both approaches, the junction details between the masonry, spandrel panel and ceiling joists should be designed by a chartered civil or structural engineer using accepted proprietary products in order to meet NHBC Technical Requirements. NHBC currently accepts the following 'H' brackets: Cullen GRB by ITW Construction Products Ltd. and GPC by Simpson Strong-Tie Ltd.

You need to...

- If you are considering providing restraint to spandrel panels at the end gable walls over masonry using 'H' brackets, consult your restraint strap manufacturer and have it designed by an engineer
- Contact NHBC's Standards, Innovation and Research Team if you have any queries: email: **technical@nhbc.co.uk** or phone **0344 633 1000** and ask for '**Technical**'.

Quality assurance of MMC systems

Who should read this: Technical and construction directors and managers, architects, designers, specifiers, manufacturers and site managers.

Introduction

There is growing interest in UK house building regarding the assembly of building components off site to form systems that can be erected quickly on site.

Off-site manufacture, however, is not without risk and, without careful and robust processes in place, systems could be assembled with repeated defects. This is particularly true in the case of 'closed' systems where there is limited opportunity to inspect or identify potential defects as part of the established site inspection process.

As such, NHBC requires evidence that systems delivered to site have been manufactured in controlled conditions and in accordance with NHBC Standards.

Guidance

NHBC defines Modern Methods of Construction (MMC) as off-site manufacture, innovative technologies and other non-conventional methods of construction that form the structure and envelope of the home. As such, methods of construction that are described in NHBC Standards and can be inspected on site during the build process are considered as conventional construction rather than MMC.

All MMC systems must be manufactured under controlled conditions, with the Quality Management Systems (QMS) audited by a third party acceptable to NHBC.

This can be demonstrated in one of two ways:

1. In line with NHBC Standards Chapter 2.1 (Requirement R3), proprietary building systems can be accepted following satisfactory assessment by an appropriate independent technical approvals authority acceptable to NHBC. These technical approvals authorities operate under accredited processes, and their certification schemes include periodic review of the QMS
2. Where the MMC system is not assessed by a technical approvals authority but follows established technical principles, quality assurance of MMC systems can be demonstrated through:
   - A review of the design principles by NHBC to ensure compliance with NHBC Standards
   - Manufacture under a QMS audited by a UKAS-accredited, independent certification body against the requirement of ISO 9001:2015.

Guidelines on the scope and procedures for the review of MMC systems can be found on the MMC Hub (**www.nhbc.co.uk/mmchub**).

You need to...

- Check that all materials used meet NHBC Standards Requirement R3
- Ensure that all systems manufactured off site are produced under an audited certification scheme.

Flat roofs, balconies and terraces

Who should read this: Technical and construction directors and managers, architects, designers, manufacturers and site managers.

Introduction

Weatherproofing of flat roofs and terraces is in the spotlight due to an increasing level of defects leading to water penetration into buildings. This article takes a look at some of the issues we are finding and recaps on how good design and workmanship can address these issues.

Guidance

NHBC Standards Chapter 7.1 'Flat roofs and balconies' sets out the performance requirements and provides guidance for key issues such as detailing around penetrations, drainage outlets, abutments and interfaces. Further guidance can be found in BS 6229 'Flat roofs with continuously supported flexible waterproof coverings. Code of practice', which was updated in November 2018.

A key issue with flat roofs is rainwater management, and a well-designed roof will have effective drainage without creating ponding. A leak in a ponded area will cause greater water penetration and damage than the same leak on a roof laid to falls. Ponding can also increase the build-up of debris which could block drainage outlets, and long-term ponding can become stagnant and encourage infestation of insects. The degree of fall should take account of build tolerances and deflection that occurs in the roof structure during construction, and settlement during the design life of the roof.

With complex roof shapes and large roof areas, a detailed structural analysis should be carried out at the design stage to establish the location and magnitude of deflection over the whole roof area. Best design practice is to place rainwater outlets at all points of maximum deflection. If this is not practical, the specification should include work to fill the depressions caused by deflection and to form suitable falls to the rainwater outlets without leaving any ponding.

Falls can be created by sloping the support structure, by screeding, firrings or use of tapered insulation. It is good practice to design a roof with twice the fall that you require in the finished roof to allow for deflection and construction tolerances. Flat roofs generally should have a minimum finished fall of 1:80 and, for green roofs or roofs using tapered insulation, the minimum finished fall should be 1:60. Care must be taken to ensure the minimum upstands at abutments and thresholds are not compromised by a build-up of components used to form the falls.

Some waterproofing systems have third-party certification for use at 'zero falls' (roofs with a finished fall below 1:80). Despite this certification, there should be no ponding on the finished waterproofing; therefore it is recommended that the roof is designed with a fall not less than 1:80. A level survey of the completed roof structure should be undertaken prior to the application of the waterproofing system, and if any backfalls are found, they should be removed using localised screeding or additional rainwater outlets.

In addition to good design, it is important to ensure the waterproofing materials are suitable for the design and comply with product standards or have third-party assessments.

Although problems can occur with the waterproofing materials, it is usually poor design and quality of workmanship that causes roofing defects. The waterproofing should be installed in accordance with the manufacturer's recommendations by a specialist roofing contractor approved by the manufacturer.

All waterproofing systems should be checked for water tightness after laying. The testing should follow the guidance of the waterproofing manufacturer, which may involve physical checking of joints with probes or use of an electrical testing method, if appropriate.

Penetrations of the waterproofing system by pipes or balustrade posts need careful detailing and correct sealing to avoid water penetration. Reliance on gun-applied sealants as the main line of defence is unacceptable as a long-term water seal, and proper flashings and collars should be used.

You need to...

- When designing a flat roof, give careful consideration to providing effective drainage on the finished roof, including the provision of suitable overflows in the event of a blockage
- Take care with correct detailing around penetrations and at interfaces to ensure there is continuity of the water protection with adjoining elements of construction.

Regulation and compliance

Who should read this: Technical and construction directors and managers, architects, designers and site managers.

Ban on the use of combustible materials in relevant buildings over 18m

Introduction

In November 2018, the Ministry of Housing, Communities & Local Government (MHCLG) introduced an amendment to the Building Regulations 2010 banning the use of combustible materials in certain buildings with a storey 18m or more above ground level. The ban was implemented on 21 December 2018 for all new projects registered on or after this date together with any existing projects that had not commenced before 21 February 2019.

This change may have a significant impact on the materials or systems that can be used in the construction of any project, and careful planning is recommended to ensure compliance with the regulations can be achieved before starting work on site.

The change applies only to England at this stage. Amendments are expected in Wales at a future date.

Requirements

Combustible materials

The ban on combustible materials in England has been implemented following a 2018 consultation on the combustibility of external walls in certain buildings.

The ban restricts the use of combustible materials in defined buildings with a storey 18m or more above ground level containing a sleeping risk. Known now as **'relevant buildings'**, they are defined by the new Building Regulation 7(4).

Relevant buildings

Relevant buildings (illustrated in diagram A) are those with a storey at least 18m above ground level and which:

- contain one or more dwellings
- contain an institution
- contain a room for residential purposes (excluding any room in a hostel, hotel or boarding house).

Height 'above ground level' is measured from the lowest ground level adjoining the building to the top of the highest floor surface of the highest storey (not consisting entirely of plant rooms or roof-top plant areas).

Subject to certain **exclusions**, materials or products used in the **'external walls'** and any **'specified attachments'** must now be non-combustible when assessed under the European fire classification system.

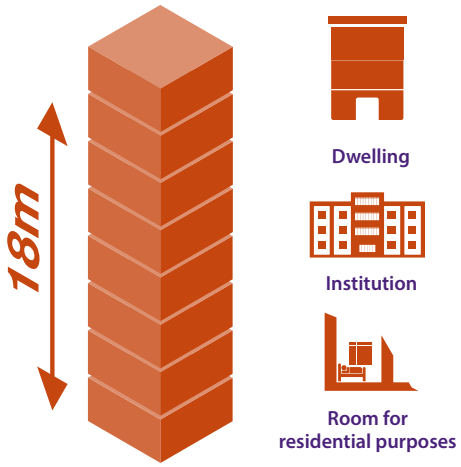


Diagram A: Relevant buildings

Ban on the use of combustible materials in relevant buildings over 18m

Requirements (continued)

External walls, specified attachments and exclusions

Definitions have been introduced by new Building Regulations 2(6)(a) and 2(6)(b) for 'external wall' and 'specified attachment' respectively, as detailed in diagram B. These definitions apply to any building to which the Building Regulations apply, not just those classed as relevant buildings.

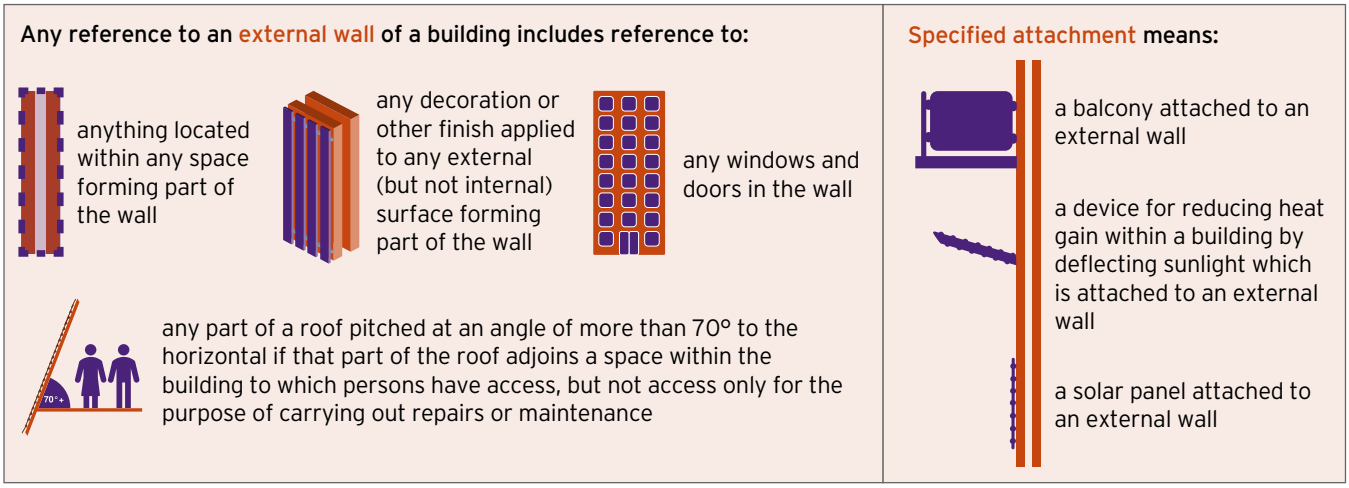


Diagram B: External walls and specified attachments

Despite the new definitions illustrated in diagram B, there are some elements in an 'external wall' or 'specified attachment' of a 'relevant building' that are excluded from the ban, these are indicated in diagram C. Any of these elements may be subject to alternative requirements that dictate their minimum performance, as indicated within Approved Document B.

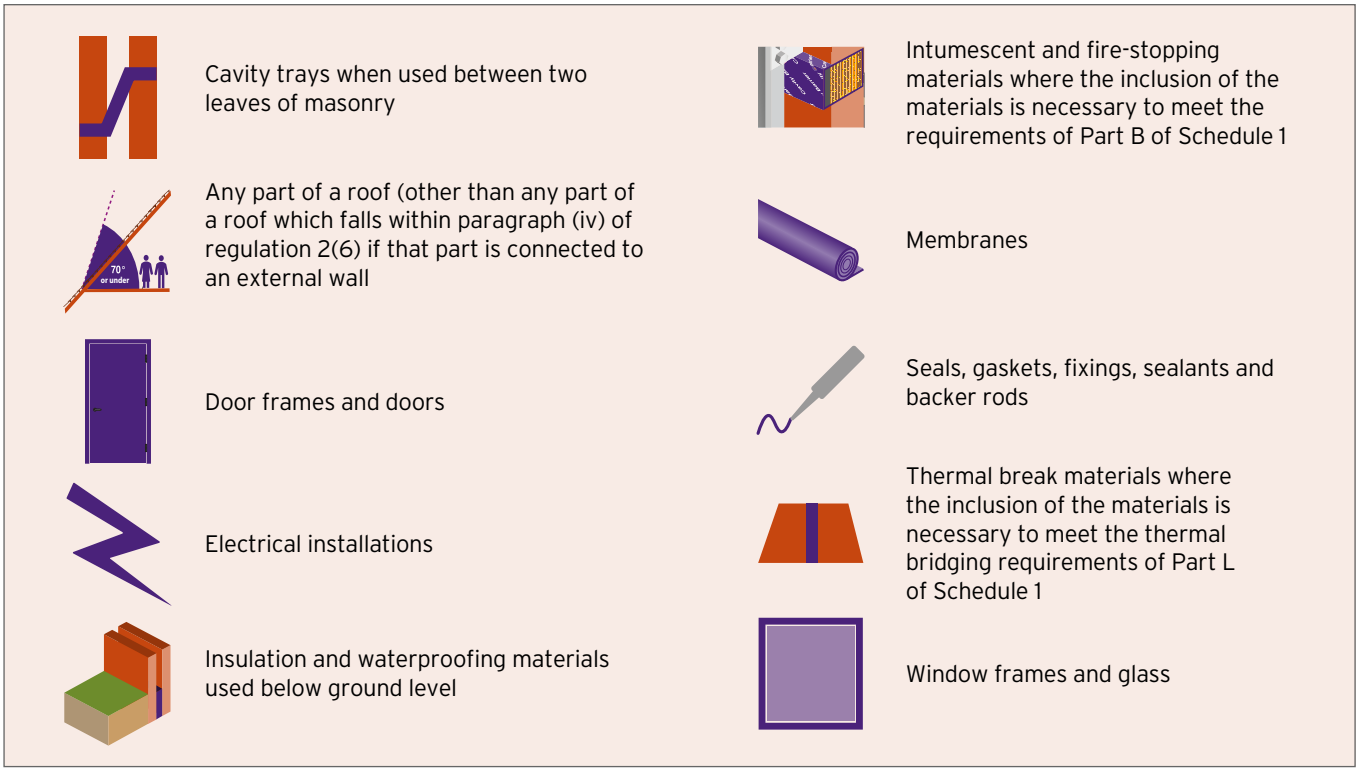


Diagram C: Elements not part of an external wall

Ban on the use of combustible materials in relevant buildings over 18m

Requirements (continued)

Materials, products and systems

Where a building is classified as a relevant building, Building Regulation 7(2) requires that the materials, products and systems of external walls and specified attachments (with the exception of the exclusions mentioned above) achieve European reaction to fire classification of either **A1** or **A2-s1, d0** when classified in accordance with BS EN 13501-1:2007+A1:2009 *Fire classification of construction products and building elements. Classification using test data from reaction to fire tests.*

Class **A1** provides the least reaction to fire, with products demonstrating a low temperature rise (less than 30°c), no sustained flaming and the lowest heat generated from combustion under test. Class **A1** products are assumed to generate limited or no smoke and produce no droplets under test that flame; therefore, they are not given an additional 's' or 'd' class.

Class **A2** provides a slightly greater reaction to fire, with products demonstrating a temperature rise up to 50°c and a maximum 20 seconds sustained flaming or a slightly higher allowable heat generated from combustion under test. In addition, Class **A2** must be accompanied by separate classifications in respect of smoke generation (**s**) and flaming droplets (**d**). In the case of Regulation 7(2), the highest classification for both are needed, requiring limited smoke generation (Class **s1**) and no droplets that flame (Class **d0**) under test to give the classification **A2-s1, d0**.

In both cases, Class **A1** or Class **A2-s1, d0** are considered to give little contribution to fire growth and load.

It is important to note that the current material definitions and classifications of 'combustible' and 'materials of limited combustibility' contained in Tables A6 and A7 of Approved Document B: Fire safety, Volume 2, 2006 edition amended up until 2018, **are not appropriate** for use in the context of Regulation 7(2).

Products achieving Class **A1** or **A2-s1, d0** are determined from a set of tests defined in BS EN 13501-1:2007+A1:2009. They will need to be accompanied by a classification report undertaken by a suitably qualified body (typically UKAS accredited). However, certain materials have been deemed to achieve Class **A1** or **A2-s1, d0** without further test by the European Commission under delegated regulation. These are known as products 'classified without further testing' (CWFT) and can be searched on the European Union law website (**eur-lex.europa.eu/homepage.html**).

Mixed-use buildings

The ban applies to any **relevant building** regardless of whether there is another use of the building, even if the use that defines that a **relevant building** is on a storey within 18m of ground level.

For example, if an office building contains flat(s) at ground floor level only, and the building has a floor in excess of 18m above ground level, the whole building is classed as being **relevant**, and the external walls with any specified attachments will need to achieve European Class A1 or A2-s1, d0 as demonstrated within diagram D.

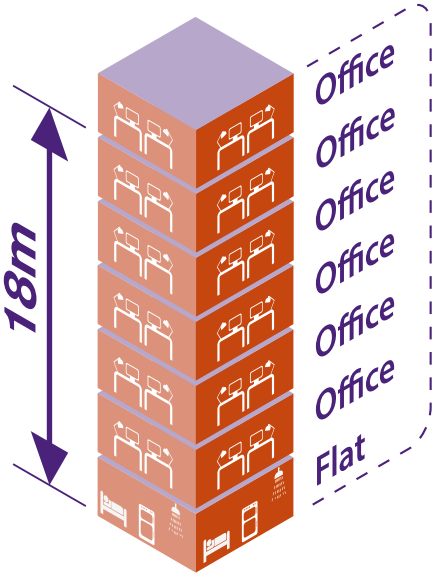


Diagram D: Mixed-use relevant building

Ban on the use of combustible materials in relevant buildings over 18m

Requirements (continued)

Material change of use to form a relevant building under new Building Regulation 5(k)

New Building Regulation 5(k) introduces a class of material change of use to form a relevant building where previously it was not. Therefore, if a material change of use is undertaken to an existing building so that it becomes a relevant building, the external walls and specified attachments of the entire building must achieve Class A1 or A2-s1, d0 in addition to any other requirement listed within Regulation 6, or as part of any other applicable category of material change of use. This would be the case if the building becomes relevant because a dwelling is formed at any single level (see example in diagram D).

Material alterations to relevant buildings

Any 'material alteration' (defined under Building Regulation 3) to an existing building classed as a relevant building will need to be undertaken to ensure that the works do not make compliance any worse than before the works were commenced. This does not necessarily mean that a material alteration will require the walls to be upgraded to achieve Class A1 or A2-s1, d0 unless required by other regulations applicable to the works at the same time.

You need to...

- Ensure that the external walls and specified attachments of a relevant building achieve European Class A1 or A2-s1, d0 before work starts
- Ensure that any other materials used within the construction are suitable and have the relevant test to demonstrate their performance
- Consider consultation with your NHBC surveyor if issues are anticipated.

Application of the ban on combustible materials in buildings over 18m

Who should read this: Technical and construction directors and managers, architects, designers and site managers.

Introduction

Since the introduction of Regulation 7(2) banning the use of combustible materials in the external walls of relevant buildings, the MHCLG has published FAQs and clarified many issues on the interpretation of the new regulations.

Requirements

The following provides up to date guidance on the application of the new requirements issued by the MHCLG.

Relevant buildings which adjoin another building

A relevant building connected to an adjacent building can be treated as a 'separated part' in line with guidance in Approved Document B Volume 1 (2019) Appendix A (definitions), Appendix D – Diagram D5 and paragraph 7.9. This is illustrated in diagram A.

Therefore, each separated part of a building following this principle can be assessed individually in terms of Regulation 7(2).

In the case of blocks built off a podium or a site which has a large underground car park, it may be necessary to apply Regulation 7(2) to all blocks if a line of separation cannot be formed in one continuous vertical line through all storeys (including any car park or ground floor commercial area).

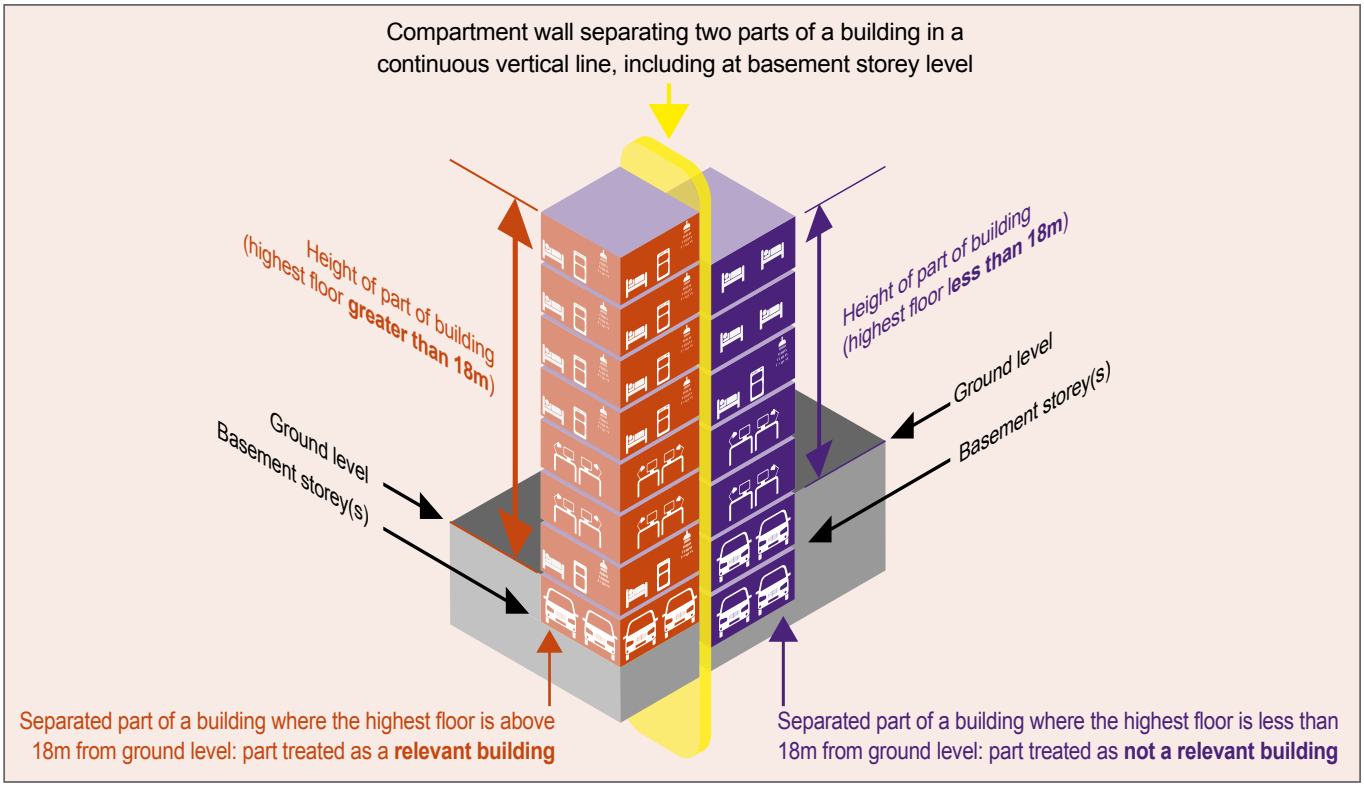
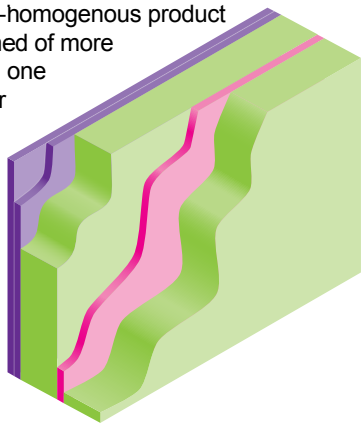


Diagram A: Separated parts of the same building

Application of the ban on combustible materials in buildings over 18m

Requirements (continued)

Non-homogenous product formed of more than one layer



Non-substantional component of a non-homogenous product allowed in accordance with BS EN 13501-1:2007

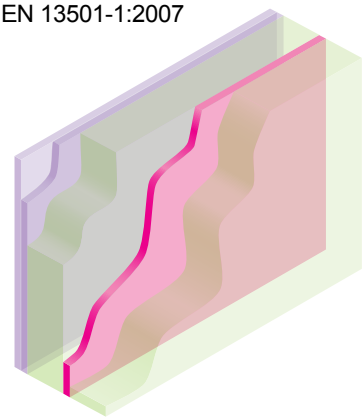


Diagram B: Small layers of combustible material in an external wall panel

Systems achieving Class A1 or A2-s1, d0 classification formed by multiple components

An example of this could be a brick slip system formed from insulation, adhesive and external brick slips. In these cases, small amounts of combustible materials are allowed within the system or product as long as they meet limits given within BS EN 13501-1:2007 and have their classification confirmed by an approved assessment body. An example of a layer is given in diagram B.

Such systems may be assembled in a factory and delivered to site as a complete unit or the component parts may be assembled on site. In the case of the latter, it is more difficult to control the amount of combustible component, site assembled systems need to be supported by robust quality management controls (provided by the builder) to demonstrate to NHBC that the accepted limits of combustible material are not exceeded and the installation is fully in accordance with the manufacturer's instructions.

Note: in most cases, a panel of the tested system wouldn't contain all the components necessary to function as an external wall (for example, cavity trays, weep holes, etc.). Therefore, any additional components must achieve Class A1 or A2-s1, d0.

Green walls

Due to the nature of materials used in green walls, it is not considered that a green wall system can comply with the requirements.

Cavity trays

The exclusion for cavity trays is for those within masonry wall constructions only. All other uses must be formed from Class A1 or A2-s1, d0 materials (including at low level where the cavity tray sits above a tanking system).

Membranes

Whilst excluded from the ban, membranes would be expected to be no worse than European Class B-s3, d0 in accordance with Approved Document B Volume 1 (2019) paragraph 10.15a. For the purposes of the regulation, membranes are deemed to include:

- Air and vapour control layers (AVCLs)
- Vapour control layers (VCLs)
- Vertical and horizontal DPCs
- Breather papers
- Breather membranes
- EDPM membranes
- Damp proof membranes (DPMs) within the external wall above ground level
- Gas or waterproofing membranes within the external wall above ground level, including at upstands to balconies, terraces or parapets.

Any of the above products may be liquid or hot melt applied, in addition to those that are supplied ready to use.

Application of the ban on combustible materials in buildings over 18m

Requirements (continued)

Balconies, terraces, roof decks, winter gardens and podiums

One type of specified attachment is defined as 'a balcony attached to an external wall'. A balcony could contribute to the spread of fire up a building because of its projection from the external wall. It is therefore considered that the following are covered by this definition, illustrated in diagram C:

- Attached balconies
- Inset balconies.

All materials and components of balconies which fall into the above definition should be Class A1 or A2-s1, d0.

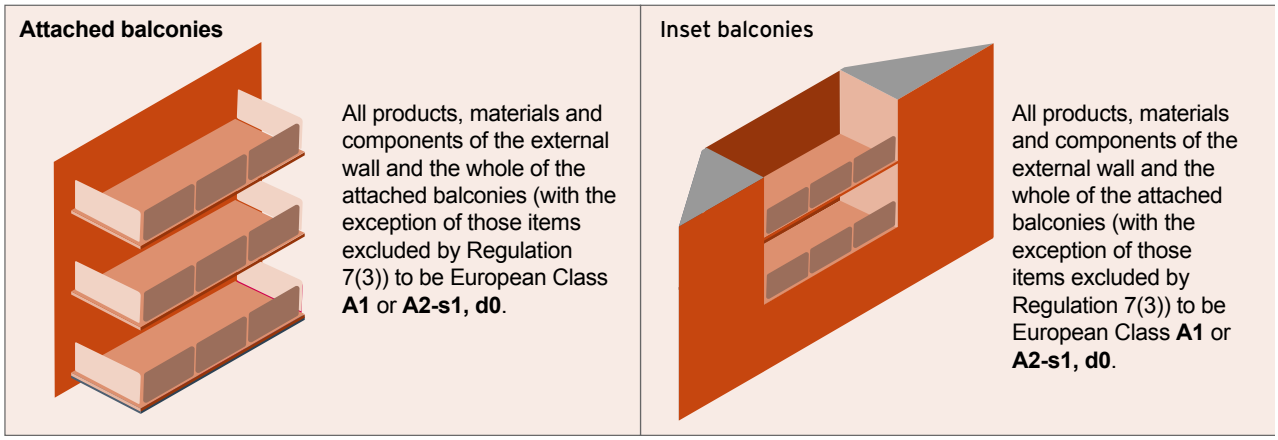


Diagram C: Attached and inset balconies within scope of Regulation 7(2)

The principle aim of Regulation 7(2) is to prevent fire spread up the building. Where a stepped balcony or roof terrace exists, the fire would have to spread horizontally before reaching the external wall of the storey above. This would create a break in any continuous upward fire spread; therefore, in the case of stepped balconies, areas of flat roofs or podium decks as illustrated in diagram D it is considered reasonable to adopt the following:

- All vertical parts (walls, balustrades, etc.) should be formed completely of Class A1 or A2-s1, d0 materials. Note that laminated glass is not a feasible option, as discussed below.
- All horizontal parts (flooring, roof coverings, ceiling linings, etc.) may be excluded from the Class A1 or A2-s1, d0 requirement. Note that Regulation B4 still applies to these areas; therefore, guidance contained in Approved Document B should be adopted. Typically, this would mean the use of Class B membranes and principal components of at least A2-s3, d2 classification.

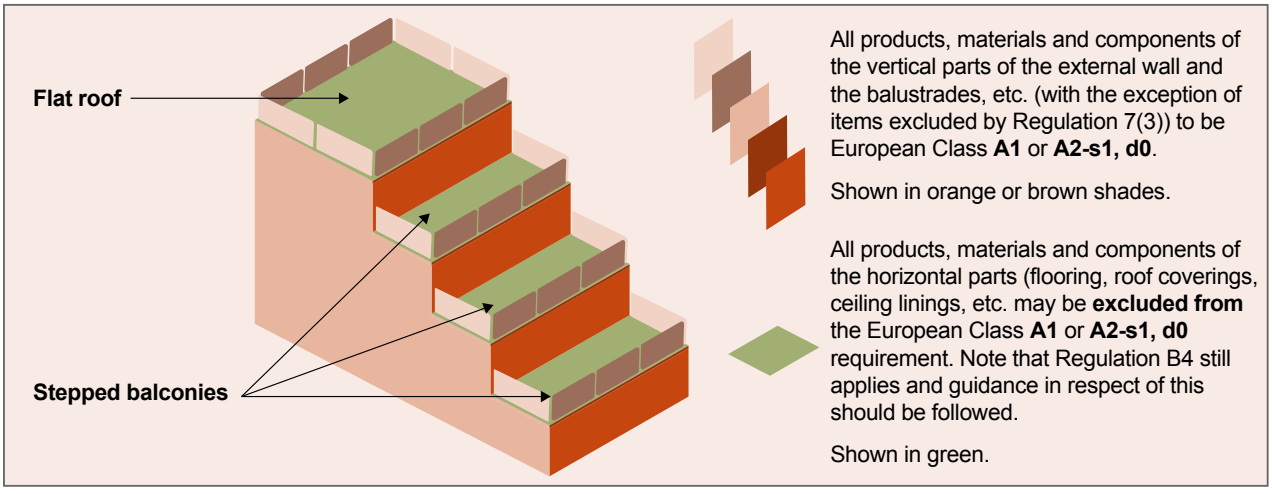


Diagram D: Example of stepped balconies and flat roofs

Application of the ban on combustible materials in buildings over 18m

Requirements (continued)

Insulation between DPCs and ground level

The height of DPCs above the surrounding ground level can vary significantly depending upon site conditions. Where a DPC is close to the ground (typically around 150mm above ground level) it could be considered acceptable to use combustible cavity wall insulation within the 'splash zone' from ground level up to the DPC level, as illustrated in diagram E.

However, where a DPC is significantly higher than the 150mm level, it would be inappropriate to allow the use of combustible insulation between ground and DPC level. Whilst consideration needs to be on a case-by-case basis, it would be expected that insulation outside of the splash zone should meet European Class A1 or A2-s1, d0 in all situations.

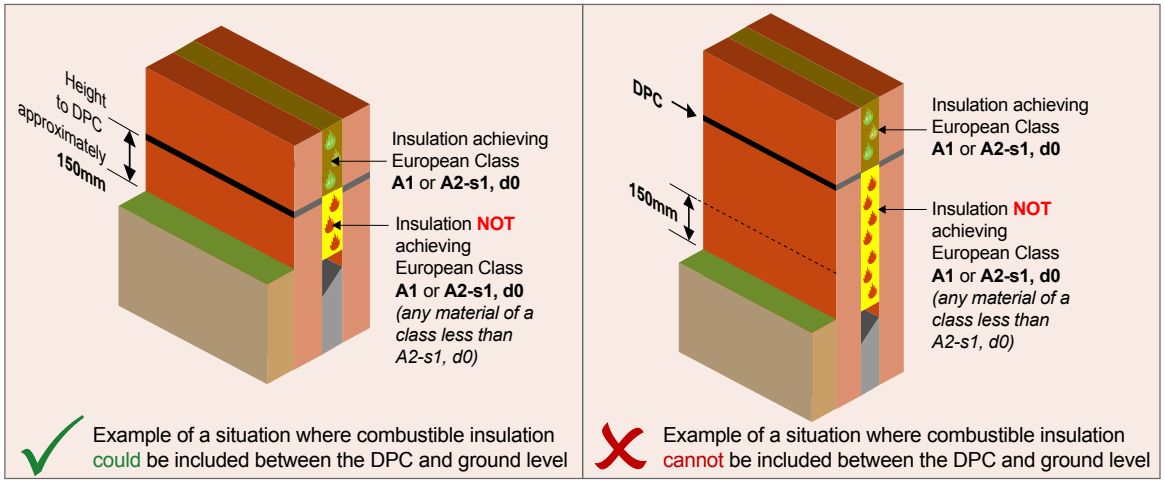


Diagram E: Combustible and non-combustible insulation in external walls between DPC and ground level

Minor components within or passing through an external wall

The aim of the regulation is to remove all combustible components from, or within, an external wall. The majority of air bricks, weep holes, ventilation ducts, etc. can be produced from materials meeting Class A1 or A2-s1, d0, so products meeting these classifications should be used.

Adjustable pedestals for decking supports to balconies

These are covered by the regulation, and products should be used which meet Class A1 or A2-s1, d0.

Adhesives – mastic and bulk adhesives

Adhesives cannot be classed as fixings, so these would need to be classified as A1 or A2-s1, d0 unless they are a 'non-substantial component' included in the classification of a product tested as a whole to achieve Class A1 or A2-s1, d0 in accordance with BS EN 13501-1:2007.

Laminated glass balustrades

The use of laminated glass within the balustrades of a balcony is not acceptable as the glass is unable to achieve Class A1 or A2-s1, d0.

All other situations

For buildings covered by Regulation 7(2), the starting point should be to find a solution which completely removes combustible components; therefore, any external wall scenario not covered above should be constructed of materials that achieve Class A1 or A2-s1, d0 in accordance with BS EN 13501-1:2007.

You need to...

- Consider early consultation with your NHBC surveyor if issues are anticipated.

Downlighter penetrations within intermediate floors

Who should read this: Technical and construction directors and managers, architects, designers and site managers.

You need to...

- Ensure that any downlighters within an intermediate floor of a house are supported by test evidence to achieve the required fire performance.

Introduction

NHBC previously published guidance note 6.4/10 on the acceptance of downlighter penetrations within intermediate timber floors. This guidance was based on test evidence available at the time of publication and gave some limitations for the spacing or size of downlighters used in a floor with solid joists.

Construction methods and materials have changed significantly since the original publication date, the recommendations of the original version are no longer considered relevant due to the range of materials and construction methods now commonly used. This note has therefore been withdrawn and replaced with a new 2019 version available from the NHBC website (**www.nhbc.co.uk/builders/productsandservices/techzone/nhbcstandards/technicalguidancedocuments**).

A summary of its contents are discussed below.

Requirements

Downlighters in intermediate floors of dwellings can cause a significant reduction in the fire resistance of the floor. This will depend upon the:

- Type and thickness of floor deck
- Type and thickness of plasterboard ceiling
- Type and size of floor joists and whether these are solid, I-joist or metal web.

For this reason, the following guidance should be followed to demonstrate compliance:

Fire resistance of the floor

In England and Wales, intermediate floors in two storey houses need to achieve a 'modified' 30 minute fire resistance. A full 30 minutes fire resistance will need to be provided to intermediate floors in three storey houses and over an integral garage in two storey houses. Greater fire resistance may be required in taller or more complex buildings and it is best to check with your surveyor if this is the case.

Solid timber joists

Non fire-rated downlighters without further protection should have fire test evidence for use in a similar solid joist floor build-up or be fitted with fire hoods. Alternatively, fire-resisting downlighters should be used.

Fire-resistant downlighters and fire-resistant hoods are only acceptable if test evidence supports their use in a similar solid joist floor build-up.

I-joists and metal web joists

For engineered floor joists, all recessed downlighters should either be fire resistant or fitted with fire hoods.

Note that fire-resistant downlighters and fire-resistant hoods are only deemed to be acceptable if test evidence supports their use in a similarly engineered joist floor build-up.

General

In all floor types, insulation should be kept back from the light fitting to safely disperse the build-up of heat around the driver or transformer and lamp.

Guidance and good practice

Who should read this: Site managers, technical and construction directors, architects, designers and clerks of works.

NHBC Foundation

Introduction

The NHBC Foundation supports the industry by delivering high-quality research and guidance. All reports and guides are freely available to download at **www.nhbcfoundation.org**.

Guidance

At your services: what to expect during commissioning (NF84)

In new homes, the range and complexity of domestic services that are installed pose many practical challenges on site.

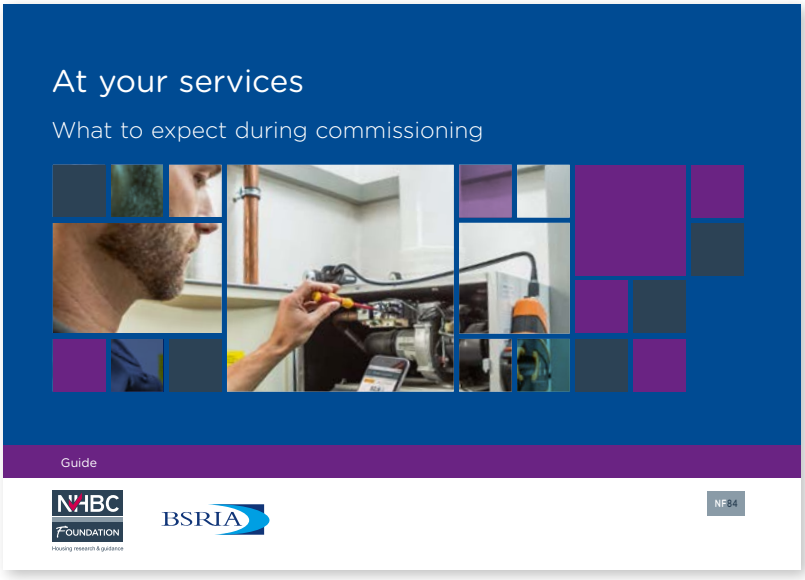
Commissioning is a vital part of the build process, providing reassurance that the services have been designed, installed and adjusted correctly.

The NHBC Foundation's latest publication is an illustrated guide for site managers introducing the commissioning that they should expect to see carried out on the more commonly installed services.

While the commissioning process itself must be carried out by the relevant competent people – qualified specialist installers and commissioning experts – site managers have a strong vested interest in the quality of commissioning.

This guide encourages site managers to understand the commissioning process better. By asking the right question at the right time, whenever they have concerns, they can reduce the risk of expensive and disruptive remedial work before and after handover, and raise the standard of the homes they build.

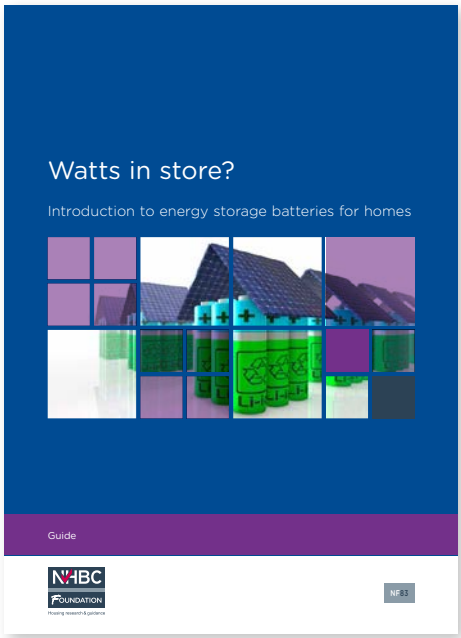
Produced in collaboration with the Building Services Research and Information Association (BSRIA), the new guide explains the key commissioning steps for each service and how these ensure safe, efficient and reliable long-term operation for their customers.



NHBC Foundation

Guidance (continued)

Watts in store? Introduction to energy storage batteries for homes (NF83)



With the UK steadily transforming to an energy infrastructure based on electricity, and with an increasing reliance on renewable sources, the wider use of battery technology is anticipated for infrastructure and household applications.

Today, multiple energy storage batteries are available for installation in homes. They can reduce energy bills by storing low-tariff energy from the grid automatically and making it available to the household at times of high tariffs. Additional benefits will arise if the battery system is coupled with a home's photovoltaic (PV) system. There are, however, marked differences in the performance of the batteries available, and careful selection is important to ensure that reasonable customer expectations are met and to maintain confidence during the introduction of this relatively new technology.

In this guide from the NHBC Foundation, we introduce the main configurations of battery storage systems and their benefits, and set out the main considerations when choosing a system, including:

Power vs. capacity

Crucial to choice is the power of a battery (which determines the number of appliances that the battery can run at any particular time) and its capacity (how long it can meet power demands before it is exhausted). For these two aspects of performance, the guide shows how to select a battery to meet a typical pattern of appliance use. It emphasises the key difference between the total capacity of a battery and the sometimes much lower usable capacity, which should actually govern choice.

Image credit: Moixa

Power cut back-up

Many people would expect that the inclusion of a battery system in their home would ensure they have back-up electricity in the event of a power cut. However, as the guide explains, this is not a standard feature. Back-up (or islanded) operation requires additional wiring and safety features to ensure that the home is properly isolated from the mains in the event of a power cut. This is likely to increase the cost of the system and may not be possible in all cases.

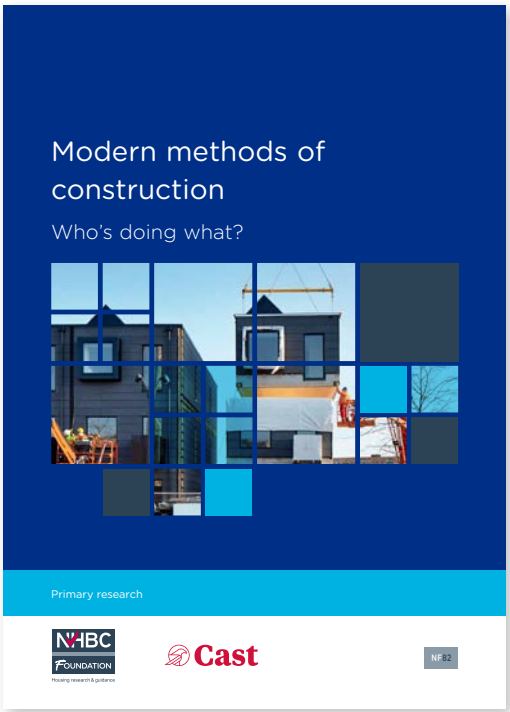
Sizing of battery

Another key consideration is the sizing of the battery system to match the PV system installed. With the changing status on the feed-in tariffs (FITs), there's greater benefit in storing as much as possible of the power generated by the PVs. Expert advice will be needed to optimise the size of the battery.

This guide also includes a section that considers how energy storage may evolve in the future, including more advanced battery systems and other energy storage technologies that could become mainstream within homes.

NHBC Foundation

Guidance (continued)



Modern methods of construction: who's doing what? (NF82)

This research report, produced in collaboration between the NHBC Foundation and Cast Consultancy, highlights how trailblazing housing developers are using MMC.

The research confirms the growing level of engagement with MMC across the housing-development sector, from existing house builders and Housing Associations through to new SMEs setting themselves up specifically to exploit opportunities in MMC. Although the sample size was limited, the research illustrates a clear belief among developers that new homes can be better delivered through the adoption of MMC.

The level of interest in volumetric modules is striking, with over 60% of survey respondents already using or planning to use them in future. Whilst it sometimes seems that volumetric modules are the subject of the majority of the press coverage, there is also the same level of interest in the use of panelised systems, mostly timber framed or steel framed.

Better quality, improved efficiency, accelerated delivery and increased productivity are cited by those surveyed as key factors driving the uptake of MMC. These confirm the potential advantages of innovation identified in the 2017 housing white paper. The research also emphasises the role of MMC in maintaining output where there are growing issues with labour supply.

The case studies add texture to the survey results and serve to illustrate the variety of companies already engaged and the different approaches they are using. Of particular note is the survey finding that 24% of firms are looking to make a sole investment or co-investment in a factory.

The following developers contributed a case study:

Accord, Barratt Developments, Brick by Brick, Brooke Homes, Citu, Click Properties, Crest Nicholson, Home Group, Innerspace Homes, Keepmoat Homes, Midland Heart, Orbit Group, Osco Homes, Pocket Living, Stewart Milne Homes, Swan Housing, TOWN and Urban Splash.

Despite the bold steps being taken by some, the research has found a degree of nervousness from others that are in the early stages of a long journey in publicly promoting their activity with alternative technologies. We hope this publication helps to allay some of those concerns and demonstrates the scale of current and planned activity from contemporaries and competitors.

NHBC Foundation

Guidance (continued)

Three main findings from the survey:

1. MMC systems and technologies: developers identify the types of MMC they were currently using or planned to use. The current or anticipated high level of use of volumetric modules is notable. Previous surveys indicated that panelised approaches were as popular a few years ago, but this study suggests that volumetric modules may be gaining greater acceptance
2. Factors driving uptake: high proportions recognising better quality, improved efficiency, accelerated delivery and increased productivity. However, skills and labour shortage, sustainability, increased control, reduced capital cost and desire to modernise is also significant, along with other drivers
3. Investment in MMC: a large number of developers are investing (or expect to invest) in research and development. Many are also investing specifically to establish partnerships and supply chains, and to retain control of processes and production. Nearly 30% have already invested in their own manufacturing facility.

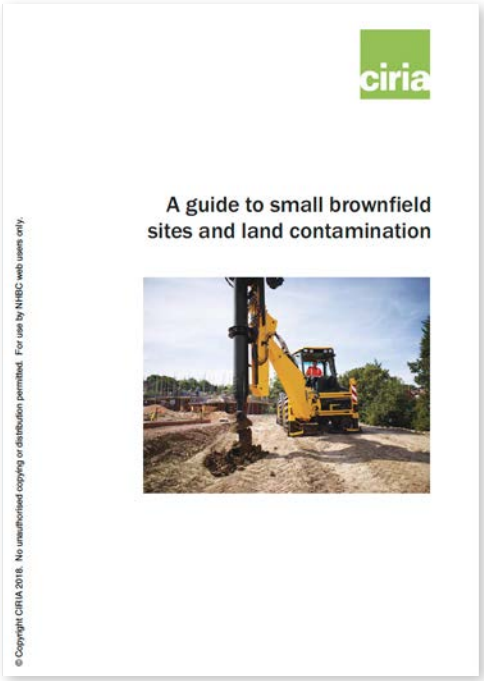
A guide to small brownfield sites and land contamination (RR15)

This guide, prepared by CIRIA (supported by the NHBC Foundation), gives advice for house builders on navigating the particular barriers and issues associated with small brownfield sites. It deals with ground conditions such as contamination, derelict structures and buried services, as well as other characteristics of small sites that can impinge on viability.

It includes:

- Definitions
- Guidance
- Steps before purchasing brownfield
- Planning application stage
- Preparation for building works
- Construction
- Closeout.

The guide also includes a section on managing dormant brownfield sites. In each section, the guide includes informative 'mini' case studies which support the approach taken.



You need to...

- The NHBC Foundation has been delivering high-quality research and practical guidance to help the house-building industry since 2006. All publications are available for free download at **www.nhbcfoundation.org**.

Raised external ground levels

Who should read this: Technical and construction directors and managers, architects, designers and site managers.

Introduction

Designing homes that meet all the performance demands placed on them is challenging, particularly when technical guidance for one part of the construction seemingly conflicts with another. But with thought given to the design before works commence, it is always possible to find a solution. This is particularly true of DPCs and air bricks in masonry walls where external ground levels are raised but, far too frequently, we are seeing poor details being adopted and confusion over their function.

We have also received feedback from homeowners where the DPC on their new home is closer to the ground than the 150mm shown in guidance documents, and they have concerns that its weathertightness will be compromised. Similarly, air bricks, used to provide ventilation to sub-floor voids have also been installed lower than expected, sometimes even below ground level.

Guidance

To ensure that good practice is being applied, NHBC building inspectors have been instructed to focus on this detail. Whilst we will aim to identify and raise concerns at an early stage, homes that are under construction will also be inspected to ensure that both the DPC and air bricks are installed at the correct levels, with the external ground generally 150mm below the internal floor level.

This article looks at the functional requirement, and provides guidance to help you get it right. NHBC Standards contain further information for homes built using timber frame and light steel framing, where additional guidance applies.

Damp proofing

Clause 6.1.17 of NHBC Standards states that DPCs shall be provided to prevent moisture rising or entering the building. A DPC in the external masonry leaf provides this function and is typically shown in NHBC Standards and other guidance documents 150mm above the finished ground level. Requirements for accessible thresholds mean that the external ground is often raised adjacent to doors, and sometimes around the whole building, resulting in the 150mm dimension being compromised. We previously provided guidance for this in *Technical Extra 04* (October 2011).

Although the design should show the DPC 150mm above the external ground, it is accepted that, in some localised areas, this may be less: for example, adjacent to accessible door openings. However, this should be by design and not compromise the performance of the home.

There are two sources of moisture that could rise up the wall, potentially affecting the masonry: water splashing up the wall and water from the ground.

Water splashing up

Masonry walls above a DPC will tolerate occasional wetting from rainfall but can become damaged by frost action or unsightly from salts leaching (efflorescence) or mould growth if they are continually saturated by water splashing up from the ground. In localised areas where the DPC is less than 150mm from the external ground level, assessing if it will perform correctly and prevent damage from rainwater splashing back becomes a matter of professional judgement, but is influenced by a number of factors:

- Extent of the detail (length of wall and height of DPC)
- Exposure location of the building (sheltered or exposed)
- Elevation of the building where the ground is raised (west facing may be more exposed than east facing)
- Protection provided from other parts of the building
- Finish of the surrounding surface (hard surfaces can promote splashing)
- Type of brick and mortar used (some bricks have a greater resistance to frost damage than others).

In other words, the guidance provides a robust solution that will perform in most situations, and should be followed; however, it is not always practical to achieve to the full extent of the building. In favourable situations, carefully designing the home with some localised areas less than 150mm is unlikely to compromise overall performance.

If there is a risk of water splashing back above the DPC and causing damage, it is often possible to include a second DPC above the first (subject to lateral loading conditions).

Raised external ground levels

Guidance (continued)

Water from the ground

A DPC will still be effective at preventing ground water (and ground salts) from rising up masonry walls, even when it is less than 150mm from the external ground level. It is worth noting that, in accordance with Chapter 5.4 of NHBC Standards, if the raised ground is extensive (more than 15% of the perimeter), and the ground conditions are unfavourable, the risk of water ingress should be assessed and, if necessary, a waterproofing system installed to protect the home.

Sub-floor ventilation

Where homes are constructed with suspended ground floors, it is necessary to provide ventilation to the void created beneath. This is to prevent the build-up of potentially harmful humidity and gases. Ventilation is typically provided using telescopic ducts and air bricks.

As highlighted in Technical Guidance 6.1/27, air bricks should be kept clear of obstructions that could reduce or block the required airflow. Air bricks below ground level located in small surrounds to retain the ground are at risk of becoming blocked by debris and should be avoided as they create a maintenance issue for homeowners.

By careful setting out, obstructed vents can be avoided. In any case, the amount of free ventilation to the finished home should be sufficient and not compromise the overall building performance.

Gas and radon barriers included in the floor construction can make positioning the air brick above ground level more challenging. This is because they may clash with telescopic vents as they pass through the cavity to the outer leaf, often resulting in the air brick being installed beneath the membrane and below the ground level. This can be overcome with good design and proprietary products that seal the membrane to the telescopic vents.

You need to...

- Ensure that, where a DPC less than 150mm above the external ground is intended in localised areas, it is by design and does not compromise the performance of the home
- If raised ground is extensive (more than 15% of the perimeter) and the ground conditions are unfavourable, assess the risk of water ingress and, if necessary, install a waterproofing system to protect the home
- Refer to NHBC Standards, which contain further information for homes built using timber frame and light steel framing, where additional guidance applies.

Retaining walls

Who should read this: Technical and construction directors and managers, architects, designers, manufacturers and site managers.

Introduction

During January 2019, NHBC building inspectors carried out an extensive survey on retaining walls on NHBC registered sites. The findings have provided real insight into what materials are being used and how retaining walls are being constructed. One key finding was that about 10% of retaining walls over 600mm high had no evidence of an engineered design on site.

Guidance

Whilst retaining wall failures might not necessarily result in total collapse, leaning, cracked or decayed walls are concerning and often expensive for the homeowner to repair. The cause of failures are numerous and varied, including lack of design, use of inadequate materials or details, poor consideration of the ground conditions, lack of movement joints and poor workmanship.

Retaining walls are typically found at site boundaries, plot boundaries, and landscaped areas within a plot and communal gardens. They may be used to provide structural stability to adjoining property or land, or used to create space on sloping sites, but should always be adequate for their intended location and purpose, and suitably durable.

Designers and sites teams are reminded of the following guidance that, if followed, will help to ensure adequate design, construction and performance of retaining walls:

- All retaining wall structures retaining more than 600mm of ground should be designed by an engineer in accordance with NHBC Technical Requirement R5
- Retaining walls should be located on properly designed foundations, which should consider the ground condition at formation level and deepened as necessary
- The design specification and drawings should be available to site operatives and specialist subcontractors
- Gabion and timber structures should not be used to provide support to homes, garages, roads, drives, car parking areas or drainage systems
- Where timber structures more than 600mm high are used for retaining ground in boundary situations, they should be designed for a 60-year life
- Timber crib retaining walls should hold third-party certification acceptable to NHBC, which demonstrates a 60-year design life, and be designed by the certificate holder or an engineer.

You need to...

- Ensure retaining walls more than 600mm high are designed by an engineer
- Ensure timber retaining walls have an appropriate design life, in accordance with NHBC Standards Chapter 3.3 ‘Timber preservation (natural solid timber)’
- Use only timber crib walls that hold independent certification acceptable to NHBC
- Ensure retaining wall foundations are suitable for ground conditions on site.

Colour variation and banding of roof tiles

Introduction

NHBC Standards Chapter 9.1 already provides guidance in relation to preventing banding in fairfaced masonry. Banding is also being observed to roof tiles, and specific guidance in relation to this is now proposed for NHBC Standards.

Who should read this: Technical and construction directors and managers, architects, designers, manufacturers and site managers.

Guidance

When visiting sites, NHBC building inspectors frequently encounter homes where there is significant and unsightly discolouration to tiles and slates installed on pitched roofs. Whilst guidance to prevent banding in fairfaced masonry is included in Chapter 9.1, no specific guidance is currently included in NHBC Standards in relation to pitched roofs.

In practical terms, it might not be possible to mix tiles from three packs, as often recommended by roof tile manufacturers, because scaffold loading bays may only be designed to hold two packs. However, NHBC believes that unsightly variation and banding is unacceptable, and it is possible to install roof tiles without excessive differences in colour. Therefore, the following clause will be added to Chapter 9.1.

Pitched roof coverings

Pitched roof coverings shall have an acceptable finished appearance.

Tile and slate roof coverings that are readily visible from ground level should:

- Be reasonably uniform in texture, finish and colour
- Not have excessive colour banding.

Also note:

- Some minor blemishes will occur on individual tiles and slates
- Some minor variation will occur in the texture, finish and colour in individual tiles and slates
- Efflorescence occurs naturally on some types of tile – it is not harmful and generally disappears over time.

You need to...

- Ensure tile and slate roof coverings to roofs are installed without significant colour variation and banding
- Be aware of the proposed revision to NHBC Standards with respect to colour variation and banding of roof tiles and slates.

Information and support

Our in-house industry experts deliver impactful, insightful and practical training courses, as well as free webinars, across a broad range of topics. Our upcoming training courses and webinars are listed below.

NHBC training

Health & Safety courses	Date	
Principal designer	10 and 11 September 2019	For more information and to book a course, visit **www.nhbc.co.uk/training**.
	30 and 31 October 2019	
	5 and 6 November 2019	
	10 and 11 December 2019	
Management of pre-construction health and safety (APS accredited)	24 and 25 September 2019	
	12 and 13 November 2019	

Technical and sales courses	Date	
Aftersales service and NHBC warranty	3 September 2019	For more information and to book a course, visit **www.nhbc.co.uk/training**.
	29 October 2019	
	12 November 2019	
An introduction to housebuilding	10 September 2019	
	21 November 2019	
Defects prevention	1 to 3 October 2019	
Defects prevention hot topics	12 November 2019	
	27 November 2019	
Effective snagging and handover	13 November 2019	
Building Regulation and control (designers)	5 and 6 November 2019	
Managing timber frame construction	16 October 2019	
	14 November 2019	

For the latest news, updates and discussions, sign up to our dedicated group on LinkedIn – search for 'NHBC training academy' and join the conversation.

Upcoming webinars

- Improving construction quality - 26 September 2019
- External walls - 1 October 2019
- Pitched roofs - 30 October 2019
- Approved Document part M Volume 1 – frequently asked questions

To view our range of webinars and register your interest, please visit **www.nhbc.co.uk/webinars**.

Trade Talks

Learn about the most commonly reported items and defects found by inspectors and claims investigators in our one-hour Trade Talks.

Topics include:

- Brickwork and blockwork
- Foundations, ground floors and drainage
- Carpentry and joinery
- Pitched roofs
- Timber frame
- Dry-lining and plastering.

For more information and to book a course, visit **www.nhbc.co.uk/training**

Notes:

Useful contacts for technical information and advice

NHBC technical advice and support

Tel: **01908 747384**
Email: **technical@nhbc.co.uk**
Web: **www.nhbc.co.uk/techzone.**

Technical Extra

Previous editions of *Technical Extra* are available on our website at **https://www.nhbc.co.uk/builders/products-and-services/techzone/nhbc-standards/technical-extra.**

NHBC Standards

Buy printed copies at: **https://shop.nhbc.co.uk/technicalstandards** or access Standards Plus on the NHBC website at **https://nhbc-standards.co.uk/.**

NHBC 3D Viewer App

Scan the QR code below to download the NHBC 3D Viewer App (via the App Store and Google Play Store).

Building Regulations

For guidance on issues relating to Building Regulations, please visit NHBC's TechZone at **www.nhbc.co.uk/techzone.**

Building control

For building control queries, please call **0344 633 1000** and ask for **'Customer Services'.**

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NHBC Accepts

Online resources for offsite and other non-conventional construction are available at **www.nhbc.co.uk/accepts.**

NHBC OnSite

For technical resources and career support for registered site managers, please visit **www.nhbcsitemanager.co.uk.**

NHBC Foundation research

The NHBC Foundation facilitates research and shares relevant guidance and good practice with the house-building industry. Further information and details of our publications are available at **www.nhbcfoundation.org.**

Training

For information about training, please go to **www.nhbc.co.uk/training**, call **0344 633 1000** and ask for **'Training'**, or email **training@nhbc.co.uk.**

NHBC Clicks & Mortar e-newsletter

NHBC regularly distributes information on a range of industry topics, including new products and services, the building industry market, and house-building news and statistics. To receive this industry information, please register at:
www.nhbc.co.uk/newsandcomment/joinournewsletter.

General enquiries

For all other enquiries, including ordering products and services, please call **0344 633 1000** and ask for **'Sales'.**

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