

# Technical Extra

January 2018 | Issue 23



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Raising Standards. Protecting Homeowners



## Welcome to Technical Extra 23

Standards 2018, the latest edition of the NHBC Standards, came into effect for homes where foundations are begun on or after 1 January 2018. One of the more significant changes to the new edition is the introduction of Clause 7.2.24 'Spandrel Panels', incorporated into Chapter 7.2 'Pitched Roofs'. We discuss the use of spandrel panels, and the range of guidance available, in this edition of Technical Extra.

In Technical Extra 22, we made reference to the introduction of Construction Quality Reviews (CQRs). They provide an in-depth review of construction quality on a site-specific basis and are undertaken by an NHBC inspection manager, with the site visit typically taking between two and three hours.

The review is undertaken on build stages currently underway, from the 38 available. Build stages span the full range of construction, from ground preparation to external finishes and hard and soft landscaping. The inspection manager will categorise the quality of construction for each build stage reviewed on a range from 'Very Poor' to 'Outstanding'. CQRs focus on understanding why and how the quality of construction seen during the review has happened and highlight good construction practice, not just what's gone wrong.

In this edition of Technical Extra, we provide more details on what CQRs are, along with some early findings. Importantly, CQRs are confirming that the root cause of many issues can be traced back to factors such as design, planning, materials or procurement. Often, it's not just about site workmanship.

Suspended ground floors are a popular form of construction and are recommended where there is a risk of ground movement. Drainage under such floors must be designed and installed to take account of ground conditions in order to achieve and maintain good performance. The article in this edition of Technical Extra highlights NHBC requirements and the main design issues that should be addressed.

Other articles in Technical Extra 23 include requirements for timber frame certification, details of vehicle access that should be provided for fire appliances, fibres in structural floor toppings and details of the latest publications from the NHBC Foundation.

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

Mark Jones  
Head of Special Projects



# NHBC Standards



**Who should read this:**  
Architects, designers,  
manufacturers,  
technical managers  
and site managers.



## Standards 2018 - what's new?

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### Introduction

Coming into effect for homes where the foundations are begun on or after 1 January 2018, Standards 2018 is the first printed edition in two years, and incorporates Chapter 6.11 'Render' into the printed document for the first time.

Mailing to NHBC registered builders, housing associations and industry professionals began in October, with hard copies available to purchase from our online shop ([www.nhbc.co.uk/shop](http://www.nhbc.co.uk/shop)). In addition to the hard copy, the 2018 edition is freely available online in a Standards Plus format at [www.nhbc.co.uk/Builders/ProductsandServices/TechZone/](http://www.nhbc.co.uk/Builders/ProductsandServices/TechZone/).

### Guidance

Standards 2018 sees the introduction of Clause 7.2.24 'Spandrel Panels', incorporated into Chapter 7.2 'Pitched Roofs'. This clause formally recognises the use of spandrel panels and sets out what performance criteria need to be considered in their design, manufacture and installation. See the spandrel panels article on page 18 for more information.

Several clauses have been adjusted as follows:

- Clause 5.4.4 has been amended to clarify the frequency of borehole monitoring expected for ground water investigation
- Clause 6.1.6 'Frost attack' has been revised to improve clarity
- Clause 9.1.7 has been amended to clarify the tolerance for variation in the surface level of adjacent tiles.

Standards 2018 now references the MMC Hub, which has guidance for innovative building systems, including those that have been accepted for use on NHBC registered sites, and how to submit new systems for review.

### You need to...

- Review NHBC Standards 2018 and familiarise yourself with the updated technical content
- Contact Standards and Technical if you have any queries: please email [technical@nhbc.co.uk](mailto:technical@nhbc.co.uk) or call **0344 633 1000** and ask for 'Technical'.

# Requirements for timber frame certification

**Who should read this:** Timber frame certifiers, technical managers, architects, designers and site managers.

## Introduction

The design of the timber frame structure needs to be checked by a registered NHBC timber frame certifier, this is an essential part of NHBC's approach to ensuring good structural design. This review of the structural design of timber framed homes must not be undertaken by the timber frame designer.

In 2010, we rationalised the process across the UK and the old HB 353B form was replaced by the HB 2445 form.

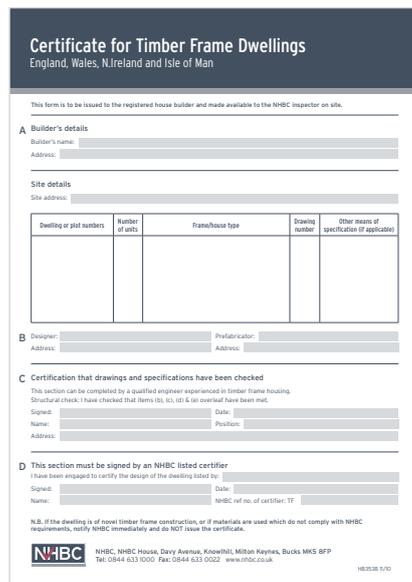
## Guidance

NHBC maintains a list of approved timber frame certifiers – engineers who have provided evidence of their expertise, qualifications and experience to demonstrate that they are suitably qualified to review timber frame designs and calculations. These are the only parties accepted by NHBC to sign off a timber frame design.

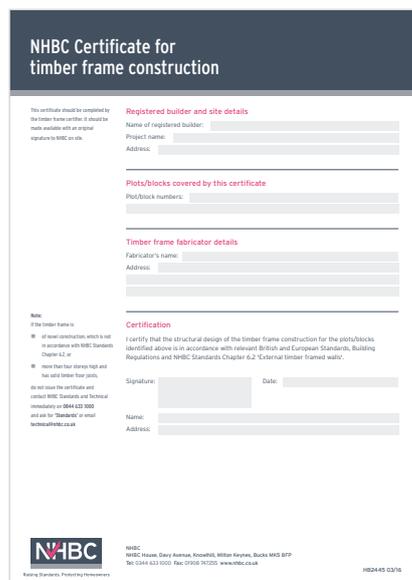
In 2017, we wrote to all timber frame certifiers to remind them that they now need to use the more recent HB 2445 form in place of the older HB 353B form, which we still come across occasionally. HB 353B forms have been phased out and should no longer be used.

Although a copy of the completed HB 2445 timber frame certificate should be available on site, a recent survey of over 800 sites found that a copy of the certificate wasn't available on approximately half of these sites.

If you require details of approved timber frame certifiers from the most recent list, or wish to apply to become a certifier, please contact NHBC Standards and Technical, email [technical@nhbc.co.uk](mailto:technical@nhbc.co.uk) or call 0344 633 1000 and ask for 'Technical'.



An example of the superseded HB 353B form



An example of the current HB 2445 form

## You need to...

- Ensure that your timber frame designs are being certified by an approved timber frame certifier
- Ensure that certification isn't undertaken by the designer of the timber frame
- Check that any certificates you issue or receive are on the HB 2445 form
- Ensure a copy of the certificate is available on site
- Contact Standards and Technical if you have any queries.



## Regulation and compliance



### Who should read this:

Technical and construction directors and managers, architects, designers and site managers.



## Vehicle access for fire appliances

### Introduction

Firefighters need to be able to reach a fire quickly with their equipment. Physical safety and lives of both the firefighters and the occupants of the building, can be jeopardised by delays in reaching the fire.

Requirement B5(2) of the England and Wales Building Regulations states that 'reasonable provision shall be made within the site of the building to enable fire appliances to gain access to the building'. The requirements will be met if 'there is sufficient means of external access to enable fire appliances to be brought near to the building for effective use'.

Firefighting facilities should include, where appropriate:

- Provision of vehicular access for appliances to the perimeter of the building or site
- Provision of easy and speedy entry to the site and the interior of the building for firefighters and their equipment
- Provision of and access to sufficient supplies of a firefighting medium (usually water), as determined by a risk assessment.

General guidance is given below. If it is proposed to deviate from this, you should seek advice from your NHBC surveyor.

## Requirements

### Specification for typical fire appliance access route

A fire appliance access route may be a road or other route which, including any inspection covers and the like, meets the standards in Table 1 below. It should be noted that other dimensions or carrying capacities may need to be adopted if the local fire and rescue service has appliances of greater weight or different size.

Table 1

Appliance type	Minimum width of road between kerbs (m)	Minimum width of gateways (m)	Minimum turning circle between kerbs (m)	Minimum turning circle between walls (m)	Minimum clearance height (m)	Minimum carrying capacity (tonnes)
Pump	3.7	3.1	16.5	19.2	3.7	12.5
High reach	3.7	3.1	26.0	29.0	4.0	17.0

#### Notes:

- Fire appliances are not standardised. Some fire and rescue services have appliances of greater weight or different size. In consultation with the fire and rescue authority, the Building Control body may adopt other dimensions in such circumstances.
- Because the weight of high reach appliances is distributed over a number of axles, it is considered that their infrequent use of a carriageway or route designed to 12.5 tonnes should not cause damage. It would therefore be reasonable to design the road base to 12.5 tonnes, although structures such as bridges should have the full 17-tonne capacity.

## Vehicle access for fire appliances

### Requirements (continued)

#### Specific access requirements

Vehicle access to the exterior of a building is needed to enable pumping appliances to supply water and equipment for firefighting, search and rescue activities. It may also be required to enable high reach appliances, such as turntable ladders and hydraulic platforms, to be used. For houses and small blocks of flats, it is usually only necessary to ensure that the building is sufficiently close to a point accessible to fire and rescue vehicles. Every elevation to which this vehicle access is provided should have a suitable door, not less than 750mm wide, giving access to the interior of the building.

#### Houses and blocks of flats not fitted with fire mains or sprinklers

There should be access for a fire appliance to within 45m of all points within the house or within each flat, measured on a route suitable for laying hose.

#### Houses and blocks of flats in Wales provided with automatic fire suppression

In Wales, the additional requirement for sprinklers to the Category 1 standard of BS 9251:2014 allows the vehicle access for a pump appliance to be within 60m of all points within the house or within each flat, measured on a route suitable for laying hose.

#### Houses and blocks of flats with sprinklers fitted as a compensatory measure

Provision is made in BS 9991:2015 for increasing hose lengths where sprinklers, in accordance with BS 9251:2014 or BS EN 12845, are fitted throughout a house or block of flats as a compensatory feature. The stated maximum distances in such instances are as follows:

- (a) The distance between the fire appliance and any point within the house (in houses having no floor more than 4.5m above ground level) may be up to 90m
- (b) The distance between the fire appliance and any point within the house or flat (in houses or flats having one floor more than 4.5m above ground level) may be up to 75m.

Mixing and matching of codes is not allowable. Where a code-compliant approach cannot easily be achieved, it may be possible for a fire engineering proposal which deems it reasonable to adopt these recommendations for schemes assessed under Approved Document B to be considered on a case-by-case basis. As a minimum, it would be expected that the sprinkler system is enhanced to the Category 2 standard of BS 9251:2014 using the minimum design discharge density given in Table 2 footnote B of BS 9251:2014.

#### NOTE

Access arrangements need to be complete before affected plots can be finalised for either Warranty or Building Control. This will require the construction of all roads and pathways to be sufficiently advanced such that they can adequately support the weight and provide the appropriate widths required for fire brigade personnel and vehicles serving the properties to be finalised. All life safety systems (e.g. sprinkler systems, fire mains, smoke venting arrangements etc) will need to be fully installed, tested and commissioned.

## Vehicle access for fire appliances

### Requirements (continued)

#### Blocks of flats fitted with fire mains

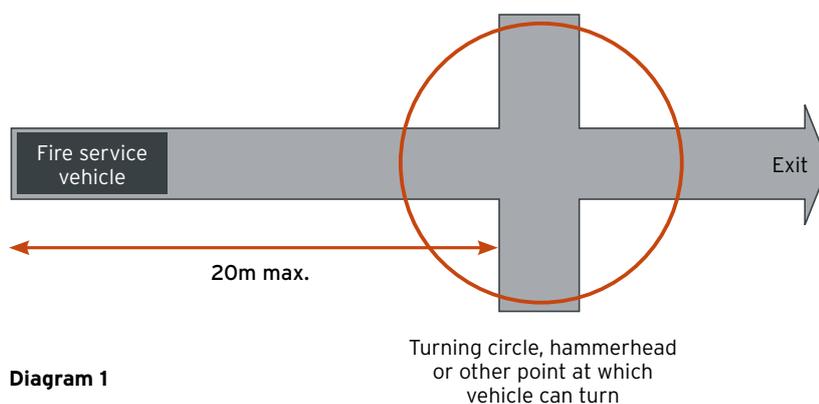
If it is not possible to provide vehicle access for a pump appliance to blocks of flats to within 45m of all points within each individual dwelling, a fire main should be provided. Fire mains enable firefighters within the building to connect their hoses to a water supply.

Fire mains may be of the 'dry' type, which are normally empty and are supplied through a hose from a fire and rescue service pumping appliance. Alternatively, they may be of the 'wet' type, where they are kept full of water and supplied from tanks and pumps in the building. There should be a facility to allow a wet system to be replenished from a pumping appliance in an emergency.

In the case of a building fitted with a dry fire main, there should be access for a pumping appliance to within 18m of each fire main inlet connection point, typically on the face of the building and visible from the appliance. In the case of a building fitted with a wet main, the pumping appliance access should be to within 18m and within sight of a suitable entrance giving access to the main and within sight of the inlet for the emergency replenishment of the suction tank for the main.

#### Dead-end access routes

Turning facilities should be provided in any dead-end access route that is more than 20m long (see Diagram 1 below). This can be done by a hammerhead or turning circle, designed on the basis of Table 1. Fire and rescue service vehicles should not have to reverse more than 20m from the end of an access road.



Whilst this can often be achieved, situations sometimes arise where a dead-end road exceeds 20m but, from a point situated 20m from a turning facility, all parts of the dwelling(s) are within the reach of a 45m hose (60m hose in Wales). This is shown in Diagram 2 (page 8). Such an arrangement is considered to be in accordance with the recommendations of Approved Document B without any additional road markings. However, it should be noted that the road needs to be constructed with a minimum load bearing capacity of 12.5 tonnes for at least the first 20m. It is further recommended that this enhanced strength be provided to the end of the road if there is no visual indication of the limit of the enhanced strength.

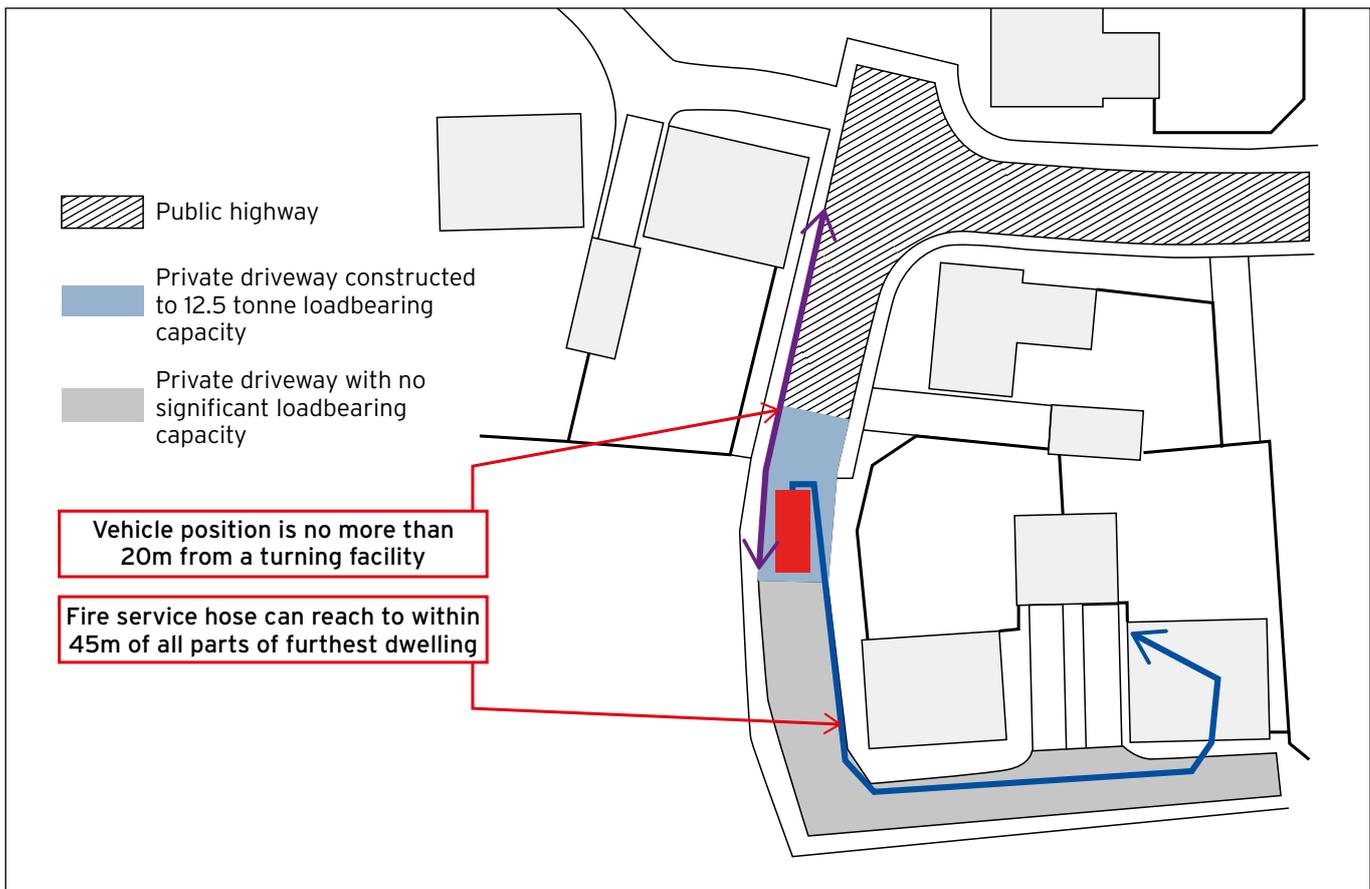
## Vehicle access for fire appliances

### Requirements (continued)

#### Local acts

In some areas of England and Wales, local acts provide fire and rescue authorities (FRAs) with additional powers to act outside the area covered by the Building Regulations works. In these areas, Building Control bodies (BCBs) are obliged to carry out a statutory consultation with the FRA, specifically in respect of the access provisions. In these cases, your NHBC surveyor will inform you of any feedback received from the FRA and work with you to ensure any provisions in addition to the minimum requirements of the Building Regulations are understood.

Diagram 2



### You need to...

- Ensure that you provide compliant arrangements for access for the fire and rescue service
- Check at an early design stage with the fire and rescue service to establish whether they have any appliances or procedures that require any access specifications which differ from the typical guidance provided in the Approved Documents
- Do not assume that design proposals will be checked for compliance as part of the planning permission process. Fire appliance access requirements fall within Building Regulations.
- Consider an early stage consultation with your NHBC Surveyor where NHBC is to be appointed to undertake building control.



## Guidance and good practice



### Who should read this:

Technical and construction directors and managers, architects, material manufacturers and suppliers, designers and site managers.

### KEY FACT

CQRs are confirming that the root cause of many issues can be traced back to other factors such as design, planning, materials or procurement. Often, it's not just about site workmanship.

## Construction Quality Reviews (CQRs)

### Introduction

NHBC works with the house-building industry to raise the standards of new homes and to provide consumer protection for homebuyers.

Last year, NHBC building inspectors undertook over 900,000 inspections. Historically, reporting back on the findings of these inspections has been one of the key elements of our raising standards strategy.

Whilst these inspections remain an important tool for gaining insight into defects during construction, CQRs build on them, aiming to help builders gain a much deeper and broader understanding of construction quality on their site(s). Importantly, this new review and feedback process aims to help builders and the wider industry identify and share what causes both good and bad construction quality.

### Guidance

#### What are CQRs?

Launched in March 2016, CQRs provide an in-depth review of construction quality on a site-specific basis. For maximum impact CQRs are being undertaken on a significant number of larger builders sites, with sampling of others. They are undertaken by an NHBC inspection manager, with the site visit typically taking between two and three hours.

The review is undertaken on build stages currently underway, from the 38 available. Build stages span the full range of construction, from ground preparation to external finishes and hard and soft landscaping. The inspection manager will categorise the quality of construction for each build stage reviewed on a range from 'Very Poor' to 'Outstanding', based on the criteria outlined below. CQRs focus on understanding why and how the quality of construction seen during the review has happened and highlight good construction practice, not just what's gone wrong.

After the review, site-level feedback is provided to the site manager through a report. This report contains a summary of what has been seen at each build stage, including photographic examples and key considerations looking at potential underlying causes.

Very Poor	Many significant instances of non-compliance with the NHBC Standards or Building Regulations – imminent dangers to H&S apparent and almost inevitably resulting in a claim (or claims) of more than £100K	1
Poor	Many minor instances of non-compliance with the NHBC Standards or Building Regulations, and some significant non-compliance – imminent danger to H&S apparent and almost inevitably resulting in a claim (or claims) of more than £30K	2
Requires Improvement	Some minor instances of non-compliance with the NHBC Standards or Building Regulations	3
Good	Meets NHBC Standards and Building Regulations	4
Very Good	In addition to 4, some extra attention to detail over and above the minimum requirements	5
Outstanding	In addition to 5, much of the work seen can't be improved upon	6

## Construction Quality Reviews (CQRs)

### Guidance (continued)

In addition to the site-level reports, findings from CQRs contribute to feedback at a number of levels:

- **Builder-level feedback:** senior management feedback is being provided where a number of CQRs have been undertaken on a representative sample of sites
- **Industry feedback,** such as the information provided in this edition of Technical Extra
- **Sector-level feedback,** providing deeper understanding to a wide range of different groups or organisations, including designers, architects, manufacturers and suppliers.

Over 50,000 build stages have now been reviewed from over 2,750 sites. More details of the CQR process are available at [www.nhbc.co.uk/cqr/](http://www.nhbc.co.uk/cqr/).

### Build stage performance

Before we focus on underperforming build stages, it is worth reflecting on what we can learn from those stages that are achieving a high proportion of Good or better marks.

Electrical services appear twice in the 38 build stages: at first and second fix. Both appear in the top five stages. This area is closely regulated, requiring completed works to be formally certified as being installed in accordance with the Building Regulations. Good CQR results are consistent with low instances of claims contacts being received in the first two years after completion. We also see a fraction of the total number of inspections identifying issues with electrical installation compared with other areas such as roofs and external walls.

Whilst the end result of electrical services appears on the face of it to be a result of good workmanship, it's achieved due to a range of contributing factors. These are broad, including requirements (in this case, through regulation), good planning, training, company focus and culture. Many of these have similarities with those that need to be achieved to meet health and safety obligations.

### Emerging areas of focus

Of the 38 build stages, the following are emerging as the top five areas of focus (those with the most opportunity for improvement):

- DPCs and trays
- Fire stopping and sound proofing
- Framing to roofs
- Cavities and insulation
- Plaster and dry lining to walls and ceilings.

### Creating an environment for good construction quality

A key theme emerging from the review process is the need to establish the best possible environment to achieve good construction quality.

The following examples provide some of the observations we've already gained during the feedback process. They've been grouped under the most appropriate sub-headings, but many will span across multiple disciplines.

The opportunity to learn and provide feedback is a long-established formula for success. Maintaining an awareness of how elements of the build process interact with each other is key. It's vital that each element is never considered in isolation: keep the whole construction process, and how your decisions impact on the quality of others, in mind throughout.

### KEY LEARNING

**Electrical services score well in relation to CQRs. Close regulation might be contributing to a different approach or culture in relation to this area of construction.**

## Construction Quality Reviews (CQRs)

### Guidance (continued)

#### Tender process and contractual arrangements

The tender process will often provide the first opportunity to lay out requirements, not just in terms of finished form and programming but, importantly, quality as well.

We're seeing examples (for instance, with the use of photographs) of the level of standard expected being included in a range of documentation. Whilst 'good build' guides, or similar, have been emerging for a number of years, examples have now been seen of these photographs being used during the tender process.

With so many trades involved, it's also vital that individual responsibilities are clearly defined. You've probably heard a variant of this story: there were three people - everyone, someone and no-one - involved in a job that everyone could do, and whilst it was critical someone did it, in the end, no-one did! Make sure this doesn't happen on your sites; whilst it ends up as a site issue, it could be a result of contractual arrangements being missing or unclear.

#### Design

We have come across numerous instances where design information is not made available to those who need it on site, which has resulted in errors. For example, ground workers positioning telescopic underfloor ventilators in the incorrect position (including in doorways where they would need to be removed and repositioned) due to a lack of drawings available to guide them on the correct position.

Where drawings have been available, we've seen a significant number of examples where house type drawings are only available in one layout, with mirrored or handed plots being referred to as such on the drawings. Anyone visiting the site regularly will no doubt have seen handed drawings taped to windows on their reverse so that the handed layout can be seen. Anecdotally, this has led to issues with incorrect measurements and layouts being adopted: for example, when reading backwards, it's a surprisingly simple mistake to read dimensions such as 1520mm as 1250mm.

Drawings themselves are becoming increasingly complicated. Often, the same arrangement drawings are used for several functions: planning, Building Regulation approval and construction. The results of CQRs are encouraging builders to review this approach. Is the 'one size fits all' approach always the best? For example, would some phases of construction benefit from simplified drawings specifically prepared for the purposes of that part of the construction?

Drawings will often refer to one or more other sets of drawings, general arrangements or applicable British Standards. Is it the expectation that the relevant British Standard is available to the trade on site? If not, does this reference really need to be included on the construction drawings? If it is, is having copies of the British Standards available on site realistic, or can this need be better met?

#### Materials

Some of the CQRs are asking questions regarding material selection. Others are indicating opportunities to develop products to meet requirements more reliably on site. Some of these materials concerns are discussed in more detail in the following sections.



#### KEY LEARNING

Do quality requirements feature throughout the process, including tender documentation?

#### KEY LEARNING

Do you rely on handed drawings?  
Has this caused any issues?

#### KEY LEARNING

Are construction drawings fit for purpose? If you're preparing drawings, put yourselves in the contractor's shoes.  
Encourage feedback.

## Construction Quality Reviews (CQRs)

### Guidance (continued)

#### Superstructure - DPCs and trays

DPCs and trays have attracted the smallest proportion of Good or better scores of all build stages.

##### Profiles

Too often, stepped cavity trays are incorrectly positioned. Insisting on the use of profiles to help setting-out has been shown to significantly improve the installation of stepped cavity trays. Where a range of roof finishes, pitches and sizes are constructed on site, meaning that there are a range of profiles to choose from, it would be worth both numbering the profiles and noting which profile should be used on the drawings that are made available to trades.

##### Sequencing of work

The quality of construction achieved may be a consequence of poorly sequenced work. Even if profiles are provided, can they be used or has the sequence been thrown out by a late request for an optional extra? For example, has a request for a conservatory been approved after the superstructure has been erected, meaning that the trays require fitting retrospectively? Or are the templates supplied by the truss manufacturer after the walls on some plots have been constructed?

##### Basic construction knowledge

Water may penetrate the external leaf of a cavity wall. The purpose of the tray is to direct water away from the cavity so that it doesn't enter the home. NHBC's 3D animation shows the sequencing of construction (including the positioning of lead flashing below the tray) and the resulting passage of water. The 3D animation [can be viewed here](#), or accessed via NHBC Standards Plus.

##### Consequences of getting it wrong

Water entering a home causes damage. Understanding the impact that this has on homeowners might help reinforce the message about the importance of correct construction.

#### Superstructure – cavities and insulation

##### Cavity closers

Are the correct cavity closers specified and available, and, importantly, who is responsible for supplying them? We've seen examples where the cavity closer came up short on multiple sites on the same type of house. A one-off might have suggested a workmanship issue, but multiple examples suggests another cause. It might also be that a 'feature' window is specified. Who's responsible for specifying and sourcing the closer? Again, we've seen examples of a circular window being adopted on a house type but no details provided as part of the construction package as to what closer should be used. We've also seen examples of where pre-formed closers are being called off from outdated drawings, meaning that the site teams are receiving the wrong size of closer and implementing site-based solutions to continue working.

##### Blown cavity fill

Thermal imaging is readily available. Are you making use of this technology to check for any improvements that can be made to fill patterns on house type or those with common or similar features?



NHBC's 3D animation shows the sequencing of construction and the resulting passage of water



Water entering a home causes damage

## Construction Quality Reviews (CQRs)

### Guidance (continued)



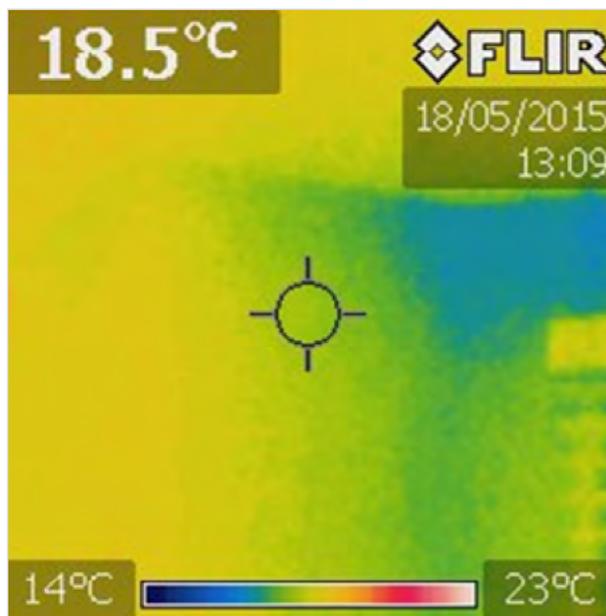
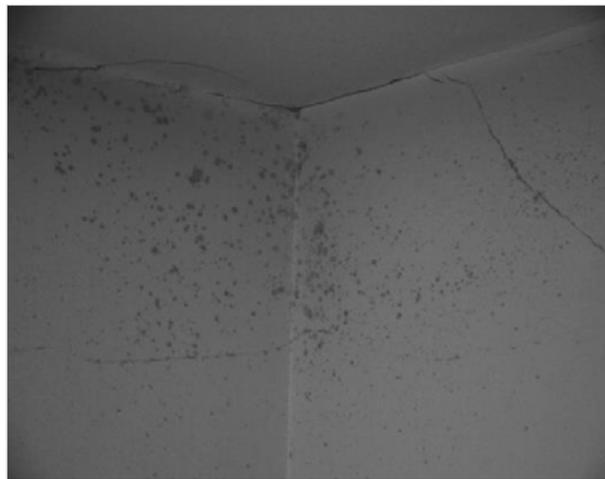
#### Partial cavity fill

When using partial fill insulation, good workmanship with close attention to detail is vital. Below are some common issues we find with partial fill.

Insulation should be fixed to the inner leaf, be continuous, maintain a minimum 50mm gap in the cavity and have ties in vertical rows in the joints between the boards. Additionally, installation requirements should be followed, it may be a requirement that the joints are taped. Particular care should be taken when positioning insulation near cavity trays.

#### Consequences of getting it wrong

Gaps in insulation can cause cold spots, condensation and mould growth which can contribute to health issues. Gaps can also increase the chances of water ingress and increase heat loss by 20-30%.

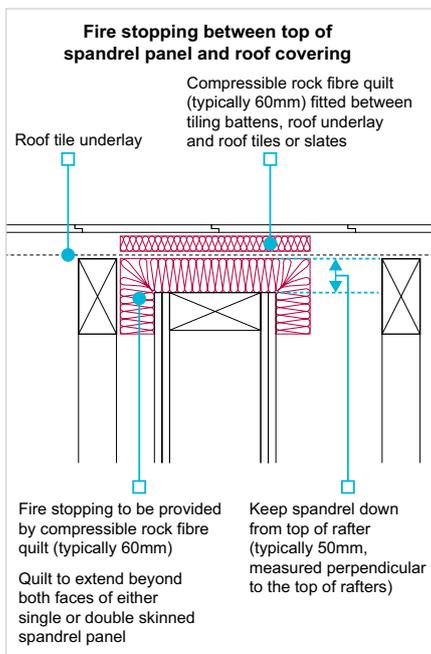
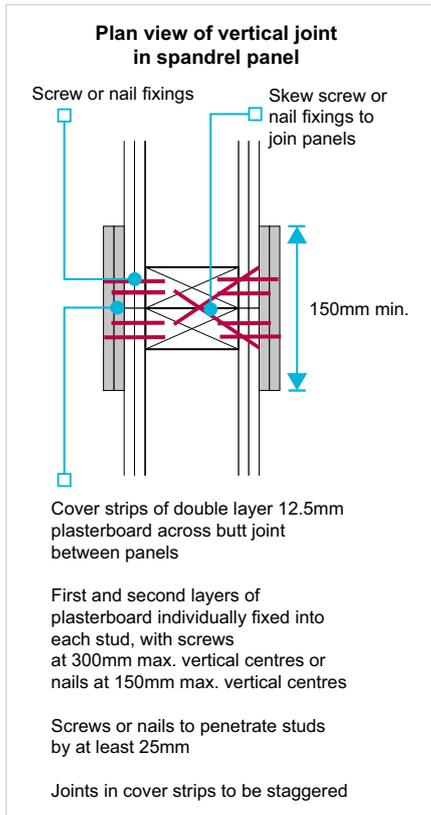


Examples of poorly installed insulation

Potential consequences

## Construction Quality Reviews (CQRs)

### Guidance (continued)



The above are examples of details taken from NHBC Spandrel Panel Technical Guidance 7.2/25, available at [www.nhbc.co.uk/Builders/ProductsandServices/TechZone/nhbcstandards](http://www.nhbc.co.uk/Builders/ProductsandServices/TechZone/nhbcstandards)

### Superstructure - fire stopping and sound proofing

#### Responsibility

Has the individual responsible for installing fire stopping correctly been clearly identified? Do they know that they are responsible? Fire stopping may be required in locations that have elements that fall within an area of construction undertaken by a number of trades. It's vital that, as part of the overall fire stopping strategy, responsibility is clearly defined.

For example, in the eaves detail on attached timber framed dwellings, is it the responsibility of the timber frame installer, those constructing the outer leaf, the roof framer or is it someone else?

#### Materials

To provide an effective barrier, fire-stopping products must be correctly specified, located (in design and construction) and installed - providing the continuous barrier intended. A number of manufacturers provide a range of materials that meet current test requirements. However, our initial observations suggest that the labelling of products might be improved.

For example, did you know that there is no uniform colour for fire stopping? Multiple colours are used by different manufacturers to indicate different things, such as: suitable cavity widths, type of construction and location. This means that products intended for the same situation from different manufacturers could appear in a range of colours, making it difficult for trades to identify the correct type of fire stopping to select on site.

### First fix – plaster and dry lining to walls and ceilings

We have observed a significant number of cases where dry lining is fixed incorrectly. The fixing information is available in the manufacturer's guidance. For example, some manufacturers outline that boards should be tightly butted and fixings should be inserted not closer than 10mm from bound edges and 13mm from cut edges. On partition walls, the board joints should be staggered relative to the opposite side.

### Roofs – framing

We have seen the use of spandrel panels increase in recent years, and their supply and installation has been one of the largest areas of improvement in relation to roof framing. See the separate article in this edition of Technical Extra for more information on spandrel panels (page 18).



## Construction Quality Reviews (CQRs)

### Guidance (continued)

#### Knowledge and guidance

Our reviews have identified that knowledge of spandrel panels and their installation has been an issue for those installing them on site. Technical Guidance Note 7.2/25 has been developed to provide comprehensive guidance for this form of construction, which accompanies guidance from industry bodies such as the Trussed Rafter Association and the Structural Timber Association. For example, blockwork needs to provide continuous support for the panel. The spandrel should be bedded on a compressible mineral wool seal. The panel should be fixed with holding down straps at 1200mm spacing which are fixed to at least two blocks and to the panel framework. It is essential that this guidance is available to those who need it and that individuals understand their responsibilities.

#### Procurement

One of the largest areas of concern we have identified is the failure to fix restraint straps to panels. Construction drawings should clearly show where the straps should be positioned and how they are installed and fixed, but it is also critical that the responsibility for providing the straps and associated components, such as additional timbers and fixings, is understood. For example, is it the responsibility of the panel manufacturer to supply these, or the roof installer?

#### Summary

Emerging opportunities discussed previously are summarised below.

Key learning	How might this be achieved in practice?
Do quality requirements feature in the tender process?	<ul style="list-style-type: none"> <li>• Include reference to expected build quality at the earliest opportunity</li> <li>• For example, can images describing quality requirements be included within the specification, trade conditions etc.?</li> </ul>
Can the design be simplified?	<ul style="list-style-type: none"> <li>• Are any unnecessary changes in level omitted?</li> </ul>
Are the drawings easy to read and follow?	<ul style="list-style-type: none"> <li>• Are any revisions or changes clear?</li> <li>• Is cross-referencing to other information minimised?</li> <li>• Have you removed or minimised the use of jargon or acronyms?</li> </ul>
Can stepped cavity trays be accurately installed?	<ul style="list-style-type: none"> <li>• Have you considered the benefits of making the provision and use of a profile mandatory for stepped trays?</li> <li>• If you are using profiles, does the build sequence allow the profile to be accurately positioned?</li> <li>• Are profiles delivered to site ahead of when they are required for all plots?</li> </ul>
Responsibility	<ul style="list-style-type: none"> <li>• Is responsibility clear, particularly in areas where multiple trades are involved?</li> <li>• Consider reviewing all areas with multiple trades and critical areas of construction to confirm these are accurately covered (it's vital that trades understand your requirements - they might be different from the last site they worked on)</li> </ul>
Suitability of materials	<ul style="list-style-type: none"> <li>• Are the products being specified 'fit for purpose', or is there an opportunity to develop an alternative product or improve the quality of those existing?</li> <li>• Are materials provided with sufficient details on installation where it's required? This might mean reviewing the approach, as a reliance on packaging or supporting literature might not be effective.</li> </ul>

### You need to...

- Explore more of these opportunities, as the knowledge gained from CQRs continues to grow. NHBC will provide feedback on what is being learnt; in particular, which strategies appear to be achieving the best results.

## Drainage under suspended ground floors



**Who should read this:**  
Site managers,  
contract managers  
and designers.

### Introduction

Ground floors are often constructed with suspended precast concrete beams and blocks, particularly where there is a risk of ground movement. Drainage under such floors needs careful design and installation. This article highlights the design issues and examines what is often encountered on site.

## Guidance

### Requirements and potential defects

Once installed under suspended ground floors, any defects in drains can go unnoticed for some time. Access for repair or replacement is likely to be difficult and costly. It is therefore essential that a well-designed and installed drainage system is provided.

NHBC Standards Clause 5.3.8 says 'pipework support should take account of the ground conditions and ensure that the drainage is not adversely affected by ground movement' and 'pipework under suspended floors should not be supported on ground or fill that is susceptible to movement without adequate provision being made to:

- Maintain minimum design gradients
- Protect against backfall
- Protect against leakage'

Drainage under suspended ground floors is usually ground supported but can also be suspended. With ground supported drainage, defects can arise if the ground settles or heaves after installation. With suspended drainage, problems can occur where support brackets corrode and collapse, or provide inadequate support.

### Ground supported pipework

Where the ground is not at risk of settlement or heave, drainage can be installed in a trench with suitable bedding and backfill.

Where fill is used to support drainage on made-up ground at risk of settlement, it should be a maximum depth of 600mm, well graded, inert and without hazardous materials.

The fill should be placed and mechanically compacted in layers not exceeding 225mm in depth, to form a stable mass. Any fill in excess of 600mm which supports drainage should be designed by an engineer to avoid settlement. Drainage pipes should be bedded into the compacted fill.

In ground at risk of shrinkage, drainage can be laid in the normal manner, but at a steeper gradient than recommended minimums, to allow for any settlement and avoid backfalls. Easy or rest bend connections to above ground drainage can be made with proprietary settlement pipe sockets, which provide for more movement than a standard pipe socket connection. Alternatively, drainage can be suspended as described below.

### Suspended drainage

In ground at risk of significant heave, a suspended drainage installation may provide a suitable solution.

Pipe supports should be adjustable to achieve a consistent gradient and rigid enough for rodding without causing dislodgement. Support brackets should be suitable for an underfloor environment. Lightly pre-galvanised thin strapping can easily rust and collapse, so it should not be used. Purpose-made stainless steel or suitably galvanised brackets are more appropriate.

Where suspended horizontal drainage is used, it should be supported as per the manufacturer's recommendations, typically 900mm to 1,000mm centres for 110mm nominal diameter pipes and at every socket. Long pipe runs (typically 5m or greater) should be designed to accommodate thermal movement.

## Drainage under suspended ground floors

### Guidance (continued)

#### Examples of site installations

Ground supported drainage is often seen bedded, backfilled and strapped to the suspended floor (see examples shown on the right). The logic appears to be that if the ground settles, the pipework will be held in place by strapping. However, strapping is often provided at centres well in excess of that recommended by the pipe manufacturers, which means any ground settlement can cause the pipes to sag between the straps and retain effluent.

In many cases, strapping is fixed to floor beams to one side of the drain. Ground settlement here can cause the straps to pull the drain out of alignment. Flexible strapping is also less able to resist movement of the pipework during rodding, thereby increasing the risk of disconnection and leakage.

In such cases, alternative drainage support should be considered. In a ground supported design this could include laying the drainage in fully compacted backfill, at steeper gradients and with settlement collars at all connections to above ground drainage. Alternatively, a fully suspended system could be considered.

With a fully suspended design, supports should be more rigid than that achieved by thin strapping. Rigid proprietary brackets are available which clamp around the drainage pipe and have adjustable threaded support rods (see examples shown on the right). Some brackets clamp to the concrete beams, and others are built into the floor structure. In each case, it is necessary to ensure the pipes are fully supported at the sockets and at horizontal centres in accordance with the pipe manufacturer's instructions.



### You need to...

- Design drainage to take account of the ground conditions below suspended ground floors
- Provide full support to the drainage to ensure effective performance for the whole life of the building.



**Who should read this:**

Site managers,  
contract managers  
and designers.



## Spandrel panels

### Introduction

Spandrel panels, typically used to provide separation between roof spaces in cold pitched roofs or to form the inner leaf of gable walls, are now commonly used in the construction of new homes. Done well, spandrels offer many benefits, including increased speed of build, improved health and safety during construction, and reduced bricklaying.

But, as we look to new ways of doing things, we have to be mindful of the critical functions that elements within homes provide and ensure that innovative products and construction methods perform as well as the traditional ones being replaced.

### Guidance

Recently, NHBC's building inspectors have been paying particular attention to spandrel panels in cold roof spaces. Whilst, for the most part, these seem to be well designed and installed, we have identified a number of recurring issues that have given cause for concern which, without our intervention, may have gone unnoticed by the builder.

To help address these issues and bring a consistent approach, we have been working with industry bodies including the Structural Timber Association (STA) and the Trussed Rafter Association (TRA) to develop technical guidance for the design, manufacture and installation of spandrel panels.

This work has culminated in the development of a new clause in the NHBC Standards (7.2.24 'Spandrel panels'). This is supported by technical guidance from the TRA, which provides advice for spandrel panels used over masonry construction.

In addition, and to tie the guidance together, NHBC has produced Technical Guidance Documents that provide helpful insight on the key building detailing issues that need to be considered if you are using spandrel panels. The Technical Guidance Documents are free to download from [www.nhbc.co.uk/BUILDERS/ProductsandServices/TechZone/nhbcstandards](http://www.nhbc.co.uk/BUILDERS/ProductsandServices/TechZone/nhbcstandards).

#### Key issues considered in the guidance

##### Handling and protection

Spandrel panels should be lifted and handled carefully and in accordance with guidance from the manufacturer. The completed panel should be inspected and any damage made good.

Panels that have plasterboard linings should be protected from adverse weather until the roof covering is complete. Any impervious weather protection, e.g. polythene sheeting, should be removed once the roof is watertight. This is to allow the panel to breathe and prevent problems that could be caused by trapped moisture.

Breathable protective membranes may require removal for inspection if there are signs of trapped moisture or damage to the panel. Where membranes are retained on gable walls, the position of the studs should be marked on the membrane to enable wall ties to be correctly located.

##### Lateral restraint

Spandrel panels require lateral restraint at rafter level and along the base of the panel. In addition, tall panels may require lateral restraint in line with any intermediate longitudinal bracing to the roof trusses. The designer also needs to consider how lateral restraint will be provided to the supporting wall below the spandrel.

## Spandrel panels

### Guidance (continued)

#### Fire stopping

Fire stopping is required between the top of the party wall spandrel panel and the roof covering, and between the spandrel and the masonry supporting wall. This is typically achieved with flexible rock fibre mineral quilt. The fire stopping should extend into any boxed eaves in the form of a fire-resisting board or wired rock fibre quilt, and be screwed or nailed in place.

#### Fire protection

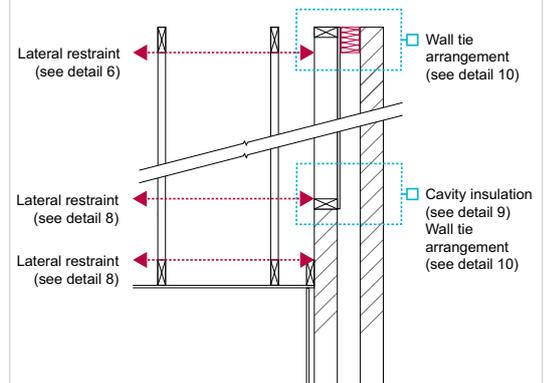
Generally, party wall spandrel panels should provide 60 minutes of fire protection. This can be achieved with two layers of 12.5mm plasterboard on both sides of the framing. Cover strips of plasterboard should be used to protect vertical joints.

Alternatively, a single layer of drylining board may be used if supported by suitable test reports to show compliance with the fire and sound requirements.

#### Acoustics

Spandrel panels used at separating walls should meet the sound insulation requirements set out in the Building Regulations. This can be achieved by either following the guidance in the Robust Details Handbook or by undertaking sound testing on completion.

Example detail from NHBC Technical Guidance 7.2/25 showing a single leaf spandrel panel supported on the inner leaf of a masonry cavity gable wall



### You need to...

- Contact your spandrel panel manufacturer to ensure that they are supplying panels compliant with TRA or STA guidance
- Be aware of who is taking design responsibility for critical performance issues, particularly where performance is reliant on the interface with the building
- Pay close attention to the sitework detailing to ensure compliance with the design
- Visit [www.nhbc.co.uk/Builders/ProductsandServices/TechZone/nhbcstandards](http://www.nhbc.co.uk/Builders/ProductsandServices/TechZone/nhbcstandards) to view the Technical Guidance Documents for more information.

# NHBC Foundation

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

## Introduction

Supporting the industry with high-quality research and practical guidance, all NHBC Foundation reports are available to download free of charge at [www.nhbcfoundation.org](http://www.nhbcfoundation.org).

## Guidance

### Windows - making it clear: energy, daylight and thermal comfort (NF78)

Many considerations have to be taken into account in the selection of windows. However, achieving a good trade-off between energy performance and daylighting, while minimising the risk of overheating, is a particular challenge for today's designers.

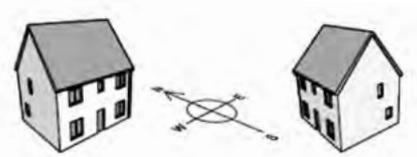
Using new modelling results, this guide steers designers towards the best options. It considers four typical home types (mid-floor apartment, mid-terrace, semi-detached and detached) and shows how performance (in terms of energy efficiency, risk of overheating and daylight) is affected by four critical aspects of window design (shown on the left).

The outcomes from the modelling, including those from a base case (selected to just meet the energy and carbon target of Building Regulations), are presented as design aids. These allow designers to optimise window selection according to design priorities, or to simply identify (see example below) where the overall best options lie.

As well as showing the benefits of careful selection, the guide also highlights how poor selection (or inappropriate substitution) can have a negative impact on performance, resulting in notable increases in energy demand and the risk of overheating.

By helping designers to make informed decisions early in their decision making on window selection, this guide can play a part in delivering good outcomes for occupants in terms of energy efficiency and comfort.

#### Aspects of window design evaluated



**Orientation** - whether mostly south- or west-facing glazing



**Glazing** - whether double or triple

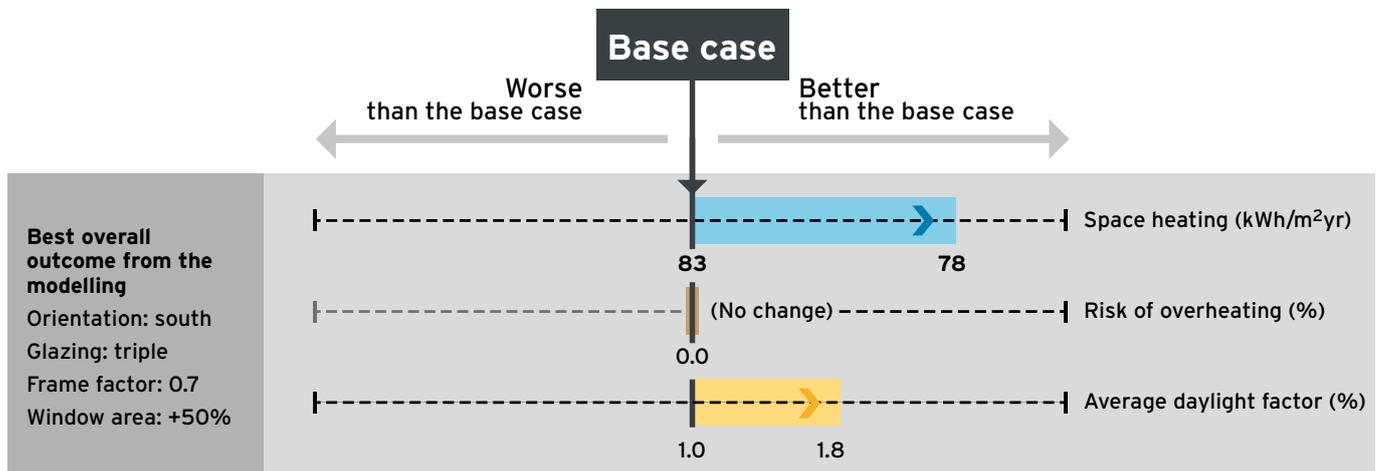


**Frame factor** - whether low (0.53) or high (0.70)



**Window area** - whether typical or 50% greater

**Below:** example chart from NF78. This shows the best outcome for a mid-terrace home, highlighting a window specification that delivers a performance significantly above that for the base case.



## NHBC Foundation

### Guidance (continued)

#### Small house builders and developers: current challenges to growth (NF76)

This research outlines the business climate faced by small firms, using the experiences of almost 500 companies that typically construct less than 10 homes a year.

##### Observations

While a majority (58%) of these small builders were optimistic about the future of the industry, a number of concerns were highlighted:

- Planning: 38% said that a sluggish, costly and inconsistent planning process was posing a major challenge to their business
- Land availability: 37% identified the lack of available land at a suitable price as their most serious obstacle to growth
- Availability of finance: this had improved in recent years, but it was still a major concern for 20% of survey participants.

##### Recommendations

To improve the situation and help reverse the decline in this sector, the report makes recommendations for the Government and the industry, including:

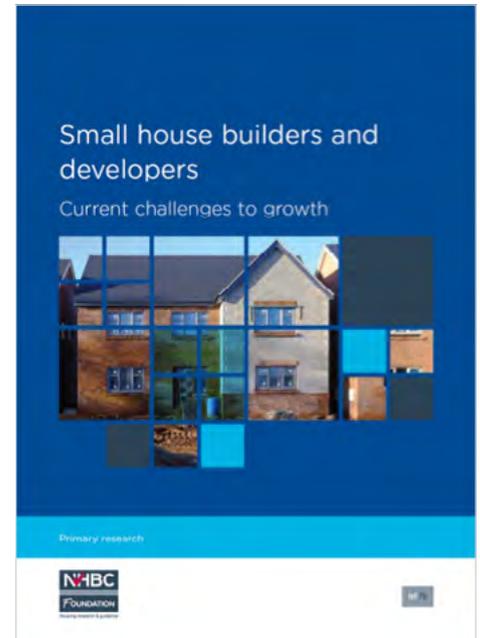
- Planning - speed up decision making, reduce inconsistencies and provide a clear tariff system
- Land availability - increase the availability of smaller sites that could accommodate up to 10 homes.

#### Multigenerational living: an opportunity for UK house builders? (NF77)

This research examined the extent of multigenerational living in the UK and gathered views and insights from people who had opted for this lifestyle. It found that the number of multigenerational households in the UK increased by 38% between 2009 and 2014. Significantly, this was driven mostly by younger adults (aged over 25) who were living with their parents.

The research also found that multigenerational households are not typically large, but are often made up of just three people. For many, an average-sized home, perhaps with some modification to provide a degree of privacy, would often provide satisfactory accommodation. The report gives examples of typical house plans and makes suggestions on how these might be marketed or adapted for multigenerational households.

While some households have adopted multigenerational living out of necessity, those who actively choose to live this way identify many significant advantages.



*It just works so well for us, the whole 'family living' situation. You've got privacy when you want it, you've got support when you need it, you've got company when you want it. It's just so fantastic for my kids to be brought up in this environment.*

**Sarah, three-generation household**

*It's rather nice that several members of the family can live together. You share all sorts of joys and experiences.*

**Ben, three-generation household**

*I get to watch my grandson grow up, which I never did with my own kids because I was a police officer and I was always working overtime to pay for everything.*

**Christopher, three-generation household**

## Fibres in structural floor toppings



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

### Introduction

NHBC's building inspectors have noticed an increasing trend for beam and block floors to be specified with insulating polystyrene infill or lightweight concrete blocks as an alternative to structural infill blocks. We discuss some of the issues and NHBC requirements below.

### Background

Whilst NHBC encourages innovation and the development of new and better ways of constructing homes, we have questioned a more recent development in suspended beam and block floor constructions. Specifically, we have queried the use of non-structural screeds incorporating micro-polypropylene fibres where non-structural expanded polystyrene (EPS) or lightweight concrete infill blocks are used. In such cases, a structural topping is required to transfer the loads to the structure. Test data does not exist to support the use of micro-polypropylene fibres to provide reinforcement to the concrete in this application.

The lack of test data means that we cannot be confident of the concrete toppings structural performance. Furthermore, we have received a large number of reports from sites of cracking to screeds that contain only micro-polypropylene fibre as a means of 'reinforcement'. This has resulted in expensive and disruptive repairs prior to the completion of homes as well as failures in occupied homes.

Designers and installers need to be aware that where non-structural infill blocks are used, non-structural screed may not be appropriate. This type of construction should be used in conjunction with a suitably reinforced structural topping. In homes where the foundations are begun on or after 1 January 2018, NHBC no longer accepts beam and block floors with non-structural blocks used in conjunction with screeds that only contain micro-polypropylene fibres and no other reinforcement.

Where beam and block floors incorporate non-structural infill blocks, a structural topping, reinforced with traditional welded wire reinforcement, macro-polypropylene fibres or steel fibres, should be used.

Flooring systems using macro-polypropylene fibres or steel fibres should be independently assessed and certificated as a complete system by a certification body accredited to undertake such assessments. NHBC has been working with the manufacturing sector, trade bodies and certification bodies to ensure that there are certificated systems available.

It is important that site teams, particularly the person ordering the concrete, are fully aware of the correct specification for structural toppings. It is also important to check that the correct mix is ordered and arrives on site from a quality assured supplier.



### You need to...

- Ensure that your designs comply with the latest guidance from NHBC and that your beam and block floors:
  - Incorporate structural infill blocks or a suitably designed structural topping
  - Are designed and installed in accordance with the guidance published by NHBC and British Precast.

Guidance for the appropriate design and construction of beam and block floors can be found at [www.nhbc.co.uk/beamandblock](http://www.nhbc.co.uk/beamandblock).

## Information and support

**NHBC offers a range of training and development options.**

**Welcome to the NHBC Portal**  
All online, saving you time and money

"It saves me a great deal of time and effort. When registering plots I can get quotes for warranty cover back in seconds. I can also see which sites have had submissions, and been accepted, so I know exactly what I need to do to get sites finalised and sold."  
NHBC Registered Builder

**What can the Portal do for me?**

- Fully online so cost-effective and quick.
- Download certificates and CML's.
- Instant accuracy and Building Control quotes.
- Quick response times to queries or requests.
- View all registered sites up to 12 years after completion.
- Access all of your site information 24/7.
- Set up your own reminders and notifications for each site.
- Upload drawings and documents for your sites.

**Follow this quick step by step guide to register your sites**

- Site Registration and initial advice (ongoing)
- Complete your Site form online to self-assess site
- Product Plot Schedule (PPS)
- Quote
- Registration

**Find out more...**  
To find out more about the NHBC portal and to sign up click here [www.nhbc.co.uk/portal](http://www.nhbc.co.uk/portal)  
For help and assistance with any of the steps above watch this short video [www.nhbc.co.uk/nhbcportal/healthguide](http://www.nhbc.co.uk/nhbcportal/healthguide)

## NHBC Portal

Hundreds of registered builders manage their site registrations through the award-winning NHBC Portal. Since launching, there has been a number of updates, enabling you to manage your sites securely, quickly and easily.

The NHBC Portal is also available for architects or contractors who work with NHBC registered builders, which makes it easier for them to submit information, ensuring the build process runs as smoothly as possible.

### Key benefits include:

- 24/7 access to site information
- SNINs and Product Plot Schedules (PPSs) can be submitted online
- instant quotes
- download certificates and CMLs
- fast document uploads.

Feedback from users tells us that the NHBC Portal enables them to manage their sites more efficiently, saving them both time and money.

Visit [www.nhbc.co.uk/portallogin](http://www.nhbc.co.uk/portallogin) to find out more.

## NHBC Health & Safety Services

Following on from customer research, we have revised the services our team offers to ensure we are spending our time where you need us the most.

Our national network of advisers are based locally to you and can offer a fully tailored service to suit your health and safety needs, whatever the size of your business.

For more information, call us on 01908 746113 or email [h&sgeneral@nhbc.co.uk](mailto:h&sgeneral@nhbc.co.uk).



## Information and support



### Machinery Inherent Defects Insurance

Certain elements of communal developments can sometimes carry additional risks to developers, which are not currently covered under the Buildmark Choice warranty and insurance product.

To help bridge this gap we, in conjunction with HSB Engineering Insurance, a market-leading underwriter of engineering risks, are able to offer you Machinery Inherent Defects Insurance. There are two versions of this product: one covering apartment developments and one covering district heating services.

**Benefits:**

- The removal of reliance on collateral warranties
- Technical audits are undertaken before installation, improving quality and reducing the risk of defects
- Policies are fully transferable to future homeowners
- The availability of funds for repairs following the discovery of a defect
- No aggregate claims limit over the lifetime of the policy
- Enhanced tenant confidence, making it easier to rent.

For more information or a quote, visit [www.nhbc.co.uk/midi](http://www.nhbc.co.uk/midi).

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## NHBC Events and training

### Building for tomorrow

Date	Region	Venue
Tuesday 27 February	South West	Taunton Racecourse
Thursday 1 March	South	Oxford Belfry
Tuesday 6 March	North East	York Racecourse
Thursday 8 March	Scotland	The Westerwood Hotel, Cumbernauld
Tuesday 13 March	South East	Sandown Racecourse, Esher
Thursday 15 March	East	Newmarket Racecourse
Tuesday 20 March	North West	Haydock Park Racecourse
Thursday 22 March	West	National Motorcycle Museum, Birmingham
Tuesday 17 April	Northern Ireland	TBC
Tuesday 24 April	London	Central Hall Westminster

### Other courses

Course	Venue	Date
Defects prevention - three days	Milton Keynes	13, 14 and 15 February 2018
Defects prevention hot topics - one day	Wetherby	20 February 2018
Defects prevention hot topics - one day	London	13 March 2018
Defects prevention hot topics - one day	Milton Keynes	14 March 2018
NHBC/APS Management of Pre-Construction Health & Safety (MPCHS) - three days	Milton Keynes	7, 8 and 9 November 2018
NHBC/APS Principal designer - two days	Leeds	20 and 21 February 2018

For more information on these or to view our full list of open and in-house courses, visit [www.nhbc.co.uk/training](http://www.nhbc.co.uk/training).

Visit [www.nhbc.co.uk/bft](http://www.nhbc.co.uk/bft) to book your place.







# Useful contacts for technical information and advice

## NHBC technical advice and support

Tel: 01908 747384  
Email: [technical@nhbc.co.uk](mailto:technical@nhbc.co.uk)  
Web: [www.nhbc.co.uk/techzone](http://www.nhbc.co.uk/techzone).

## Technical Extra

Previous editions of Technical Extra are available on our website at [www.nhbc.co.uk/builders/productsandservices/techzone/nhbcstandards/technicalextra](http://www.nhbc.co.uk/builders/productsandservices/techzone/nhbcstandards/technicalextra).

## NHBC Standards

Buy online at: [www.nhbc.co.uk/nhbcshop/technicalstandards](http://www.nhbc.co.uk/nhbcshop/technicalstandards) or access Standards Plus on the NHBC website at [www.nhbc.co.uk/standardsplus](http://www.nhbc.co.uk/standardsplus)

Using your smartphone and QR reader, you can also scan the codes below to jump directly to Standards Plus or the NHBC 3D Viewer app (via the App Store and Google Play).

## Standards Plus 2018 NHBC 3D Viewer app



## Building Regulations

For guidance on issues relating to Building Regulations, please visit NHBC's TechZone at [www.nhbc.co.uk/techzone](http://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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## MMC Hub

Online resources for offsite and other non-conventional construction are available at [www.nhbc.co.uk/mmchub](http://www.nhbc.co.uk/mmchub).

## NHBC OnSite

For technical resources and career support for registered site managers, please visit [www.nhbcsitemanager.co.uk](http://www.nhbcsitemanager.co.uk).

## NHBC Foundation research

The NHBC Foundation facilitates research and shares relevant guidance and good practice with the house-building industry.

[www.nhbcfoundation.org](http://www.nhbcfoundation.org)

## Training

For information about training, please go to [www.nhbc.co.uk/training](http://www.nhbc.co.uk/training), call 0344 633 1000 and ask for 'Training', or email [training@nhbc.co.uk](mailto: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](http://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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