Flood Sense

FLOOD DEFENCE METHODS RESIDENTIAL UK

www.floodsense.co.uk

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This guide is aimed at:

Private & public residential property owners
Built & unbuilt environment environment professionals
Stakeholders in property

Who are in Flood Risk Areas.

This guide is a look at traditional and innovative methods and techniques of flood defence in residential applications in the UK.

Aim:

The purpose of this guide is to shed light on the different approaches available for flood defence in private and public residential applications available today, to highlight key advantages and disadvantages of both traditional and innovative methods and techniques involved and the influence of sustainability on them all.

Why should Flood Defence be employed?

Flood defences are visible signs of flood risk management which aims to reduce the impact of flooding to property near the coast or rivers.

With more residential properties being affected with flooding each year, there is an increased requirement for flood defence systems for them to avoid the cost, trauma and upheaval involved in flood events.

Yours Sincerely

Kevin Williams
Flood Sense MD

Contents

Chapter 1 : Hard/Soft Flood Defence Approach?

This chapter covers:

- Who should be interested in flood defence
- Discussion about the types of engineering approach
- UK Building Regulations in relation to flood defence for Residential properties

Who should be interested in flood defence?

Private and public residential owners in the UK in proximity to rivers or the coast, as well as built and unbuilt environment professionals and stakeholders involved with this should be concerned with the flood defence of it.

How can flood defence be made; should a 'hard' or 'soft' engineering approach be taken?

Methods and techniques of flood defence, for the large part, employ either 'hard engineering' solutions and products or 'soft engineering' solutions and products or a combination of the two

At the same time, this can benefit wildlife by providing areas of habitat and are often used in combination with hard defences to provide areas for recreation and leisure alongside residential developments.

They may serve urban or rural domestic property either in coastal locations or near rivers and be either traditional or innovative in nature.

'Hard' options can have a significant visual and physical impact on the surrounding landscape and are often considered as the 'traditional' solution. However recent innovations attempt to mitigate the physical and visual impact of this, with defences either being demountable, having automated mechanisms or with an increased variety of size and/or colour options available for any permanent fixtures forming part of them.

There is a cost attached with such products however it is negligible when compared with the potential cost involved in repairing damage in the event of a serious flood event and the fact that investment in quality design for good visual impact provides real psychological benefit.

'Softer' options are more ecologically sensitive as low impact systems and are increasingly available for the residential sector. They are becoming more available and cost-effective for smaller-scale applications and are becoming increasingly available for use in urban areas.

These options are generally cheaper for large scale areas than 'hard' alternatives and becoming a viable alternative or addition to flood defence strategy, for both existing and new-build public or private residential developments.
Ironically the 'soft engineering' approach to flood defence is the area where there is higher degree

of innovation focus as it represents the most sustainable approach and for once innovation does not necessarily equate with high cost.

The key to this 'sustainable innovation' seems to be harnessing the inherent forces of nature to counter the powerful post industrial revolution progress made earlier by man.

A note about UK Building Regulations in relation to flood defence for Residential properties

As mentioned in the UK **Planning Portal**, current UK building regulations do not require design details or materials to withstand long-term immersion in flood water. However key Building regulation information and requirements are as follows:

England and Wales

• **Approved Document C**: guidance on site preparation and resisting contaminants and moisture.

It does not provide information on preventing or reducing the impacts of flooding.

• **Approved Document H**: information on drainage and waste disposal
It covers the mitigation of flood risk associated with the surcharge o f drains and sewers.

• **Approved Document J**: identifies the need for secondary containment where there
is a significant risk of oil pollution but does not contain recommendations for ensuring storage is above the predicted flood level.

There are however some proposed changes afoot as further outlined in the planning portal.
"…existing guidance on flood-related issues in England and Wales is in a number of
Approved Documents and for clarity and ease of use this needs to be brought
together in one place, together with any new guidance…
"…any changes to the Building Regulations should be consistent with the requirements of PPS25/TAN15 and should concentrate on managing the residual risks insofar as they affect the health and safety of persons in and about buildings.

The requirements should incorporate:

• a flood risk assessment (England)/flood consequence assessment (Wales)

• a requirement to incorporate measures to mitigate possible consequences.

In order to minimise the costs to developers the requirements for flood risk assessments should mirror those in PPS25 (link to guide PPS25) / TAN15 so that there is no unnecessary duplication of work.

The guidance to support any requirement for flood mitigation should be consistent with the guidance in this (PPS25) report…"

Scotland

Building Standards deal with mitigating the damage to buildings and removing the threat to the health and safety of occupants as a result of flooding.

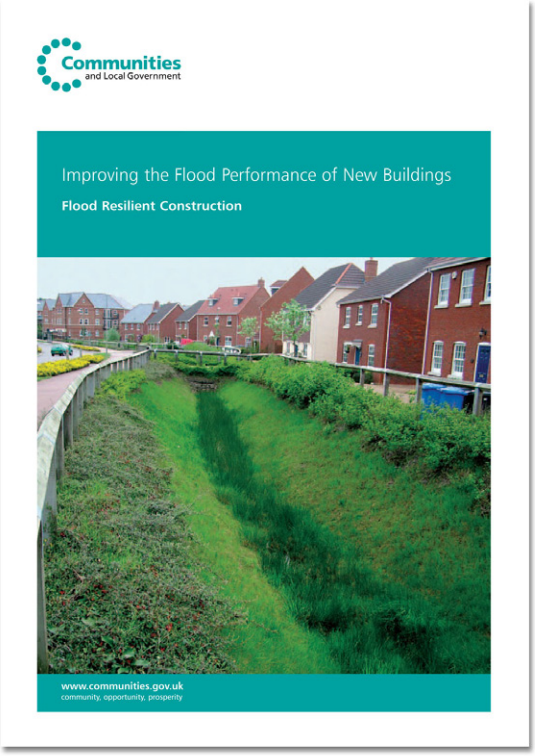
Guidance is given on the use of building materials that are not adversely affected
by flood water. The following Standard is relevant to new buildings prone to
flooding (Scottish Buildings Standards Agency, 1996):

"…BS3.3: Every building must be designed and constructed in such a way that there will not be a threat to the building or the health of the occupants as a result of flooding and accumulation of groundwater…."

N. Ireland

The NI Building Regulations do not make specific mention of the use of flood
resilience.

Flood Avoidance measures



Planning Portal Document

These measures are flood defence measures that are permanent in nature and generally form part of wider landscaping and land use strategy. Flood Resistance and Flood Resilience measures.

As described in the Planning Portal: Flood resistance measures are defined as:

"…those measures taken at building level to revent floodwater entering the building and damaging its fabric. For example, these measures can include the use of materials with low permeability…

They can probably only be effective for short duration, low depth flooding (under 0.3m). They include the use of low permeability materials that reduce the rate of water ingress into a property…"

Flood resilience measures are defined as:

"…sustainable measures that can be incorporated into the building fabric, fixtures and fittings to reduce the impact of floodwater on the property. This allows easier drying and cleaning, ensures that the structural integrity of the building is not compromised and reduces the amount of time until the building can be re-occupied…"

and

"…Resilience measures on their own are not suitable for areas with potential combined risk of high flood discharge rates, rapid rising levels and/or where speed
of flow is likely to be high and dangerous to the stability of buildings and the safety
of people…"

Many of these measures are temporary in nature and rely on occupants to store, install and maintain effectively overtime and are on the whole less suited for residential new-build developments where permanent avoidance measures should be applied as permanent and integrated features of the residential environment.

Chapter 2 : ‘Hard’ Flood Avoidance Measures

‘Hard’ flood defence avoidance approaches that can be considered for residential property developments in locations of flood risk.

Hard engineered solutions such as dams, reservoirs, embankments and drainage control are classed as flood avoidance.

Flood barriers, seals and other protection are flood resistance/resiliance methods.

‘Hard’ flood avoidance measures:

Embankments (artificial levees / bunds or contouring)

Embankments are raised banks and they effectively make the river deeper so it can hold more water. They can incur significant cost, are visually unnatural and if breached can cause significant damage, sometimes requiring electrically operated pumps to protect from this and rainwater but they do protect the land around them if sized appropriately.

Permanent Flood Walls

Permanent flood walls can be built around residential development in locations of flood risk. They are often lined with concrete rendering them unsightly although effective, natural stone linings can improve the effect but depletes this natural resource.

They must be professionally designed to accommodate different water pressures which vary with floodwater depth and any damage caused by debris.

Revetments

These are permanent flood walls built at a low angle to make them more attractive and restrict bank erosion. Additional land needs to be available for them.

Culverts

These are semi-circular, smooth covered channels which can extract water away from residential areas as quickly as possible; they need to be sufficiently sized, particularly around the culvert entrance to avoid localized flooding when in use around the entrance.

Temporary Flood Walls

Sandbag walls have been traditionally employed as demountable flood walls but they have a detrimental effect on the environment with the need for transporting and dredging sand and associated carbon dioxide emissions. They require sig-

nificant time and labour to install as walls.

Modular demountable lightweight flood wall and flood fence systems are now available, to suit a variety of locations, offering protection from the private house owner to an entire residential development, able to block off entire streets or surround entire communities.

‘Hard’ flood resistance/resilience measures

Some ‘hard’ flood defence resistance/resilience measures, that can be considered for residential property developments in locations of flood risk are as follows:

Flood barriers

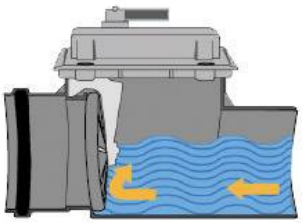
Sandbags have also been traditionally employed as flood barriers up against buildings openings with the same disadvantages as when used to make walls.

Fixing timber boards to openings is another traditional approach.

Demountable flood barriers using ‘a dam engineering’ convex form approach are now available to residential owners to protect doors and windows in the event of a flood. Only a minimum of permanent fixture is required to support them and these can be colour-coordinated.

Non-return valves

These are intended to stop sewage backflow to below ground drainage sewer pipes.



Airbrick Covers

These can be easily clipped on to existing air-bricks and removed after a flood event.

A fixed visually discreet airbrick surround plate can be colour coordinated to match an existing wall to a property.

Smart airbricks

Smart airbricks are now available for new-build or retrofit residential applications, which automatically seal in the event of water entering them.

Damp proof course

Layer or coating of material placed in a wall to resist the passage of moisture from the ground.

Damp proof membrane

Layer or sheet of material placed beneath or within a floor to prevent the passage of moisture. To be fully effective it should be lapped to the damp proof course in the surrounding walls.

Seals and mastics

External and internal dampproofing seals and mastics are available for application in all sorts of residential property. Some internal methods and coatings require specific drylining techniques to house electrical wiring installations, that can reduce floor area and in case of historic or Listed property prove awkward to detail or be unacceptable from the heritage perspective, thereby reducing the potential use of a space. External applications may seem preferable however there are visual implications and again in the case of historic or Listed Property this may be unacceptable.

Sumps and Pumps

A sump pit and electrically operated pump to a residential property, provides an artificially lowered water storage area for flood water to run to and then be pumped and extracted out of.

These may be internally located and are costly items, can take up a sizeable under floor area that can impact other under floor located services or pipework layout, causing additional noise when in operation and consuming additional electricity.

Chapter 3 : ‘Soft’ Flood Defence Measures

This chapter dicusses soft flood defence measures.

It includes avoidance, managed flood wetlands, various green solutions and man made engineered floodwalls.

‘Soft’ flood defence methods and techniques for public or private residential property

Some ‘soft’ flood defence avoidance approaches that can be considered for residential property developments in locations of flood risk are as follows:

‘Soft’ flood defence avoidance measures:

Planning Policy Strategy

Local authorities have planning policies to control proposed residential development, in terms of its location, size and nature, close to or on river floodplains or coasts.

The aim of these policies is to reduce the risk of flooding and any associated damage to property. There can be resistance to restrictions on proposed residential developments in areas where there is a shortage of housing.

The best approach to flood risk management is avoidance. Ideally this would mean building outside of areas known to flood (or likely to flood). If this is not possible it can be achieved by, building above the flood level or preventing floodwater from reaching a building by site layout.

Following the 2007 widespread urban floods, some local authorities have specific policy restrictions in place for individual property owners, governing for example the way people can use their front gardens for parking.

Flood Warning Systems

The **Environment Agency** issues flood warnings, so that people can put flood defence measures in place by their homes, implement their flood plan or even evacuate the area as expediently as possible.

Managed flooding (ecological flooding or wet wash lands)

Rivers can be allowed to flood naturally in places on a flood plain where development has been restricted in terms of use. The aim of managed flooding is to give adequate space for floodwater and prevent flooding from occurring elsewhere, such as near settlements centres. Simultaneously to this it enhances biodiversity by providing areas of habitat and is often used in combination with hard defences to provide areas for recreation, for example additional playing fields for residential developments.

Water Retention

Water retention can be achieved through the following:

• management of water infiltration, by maintaining or ameliorating soil condition or
using permeable paving that improves infiltration into the soil;

• the provision of water storage areas, including through some green roof systems

• surface water attenuation (balancing) ponds and swales

• lessening flows through hillslope management and river conveyance, by methods such as upland grip blocking, restoring peat bogs, cover crop planting or re-establishing smaller watercourses to a more natural alignment, reestablishing meanders, reconnecting river channels and dismantling culverts with areas of flood plain obstructed by unnatural man-made features.

Afforestation

When trees are planted near to a river there is greater interception of rainwater and lower river discharge. Re-planting woodlands in floodplains flanking commercial developments or as part of agricultural developments will help to slow the flow of water run-off and help it filter through the soil. This is a relatively low cost option, which enhances the environmental quality of the drainage basin as well.

Green Revetments

Revetment that incorporates fibre matting with plants such as willow is a 'soft' flood defence technique, visually pleasing and relatively low-cost.

Green Roofs

Green roofs slow rainwater runoff through filtration and can polish and clean the water to be used in non potable areas of a building as well as allowing for increased bio-diversity.

Clean energy flood walls

Clean energy 'built-in' automated flood walls or barriers are also available that come into operation due to rising flood water itself and self-close to becoming visually discreet as floodwaters recede.

Temporary Water filled 'dam' floodwalls

Used like traditional sandbag walls large water-filled bags are an eco-friendly method of defending residential property and land from flood waters that can be ready to use in minutes. They require no sand, are light, inflate in minutes, require less space for storage and can be stored almost anywhere, flat.

'Soft' flood defence resistance/resilience measures:

Some 'soft' flood defence resistance/resilience approaches that can be considered for residential property developments in locations of flood risk are as follows:

Water filled bags

The equivalent of sandbags but water-filled are available that are biodegradable, lightweight and which can be managed by a single person. They are biodegradable and when floodwater eventually subsides the water in them returns to the environment gradually and naturally over time.

A note on Sustainable Flood Defence for Residential properties

The prevailing view of the **Environment Agency**, paraphrased here, is that flood risk cannot simply be managed by building 'hard' flood defences of an ever-increasing size. Increased use of sustainable 'softer' approaches working with natural processes is required.

Planning policy can provide the justification for working more with natural processes. Planning Policy Statement 25 (link to PPS 25 guide) supports the process of restoring rivers to their natural function:

The Government's '**Making Space for Water**' strategy by the Department of the Environment, Food and Rural Affairs (DEFRA) says that
"…the concept of sustainable development must be firmly rooted in all flood risk management and coastal erosion decisions and operations…"

and it
"…seeks proposals that combine new development with measures to restore heavily- modified watercourses and their flood plains to a more natural state…These measures

can result in reductions in flood risk, as well as significant improvements in amenity, biodiversity and water quality."

In The Pitt Review:
'**Lessons learned from the 2007 floods**,' by Sir Michael Pitt recognised that

"….working more with natural processes does not mean that more traditional hard defences will not be needed, but that more sustainable 'soft' approaches should work alongside them. The approach should complement and extend the life of traditional defences…"

Mutations in flood management philosophy, for the large part governed by predictions of increased flooding probability due to future climate change, along with changes in the way the rural economy is viewed, should allow all future residential land developments in areas prone to flood risk in the UK to rigorously take on board sustainable and innovative concepts embodied in the 'soft' approach to flood defence or at least to complement existing traditional measures.

For individual residential property and land owners there is now a wider choice of cost effective flood defence systems and products available, including ones with far-reaching sustainable benefits.

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