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# Surveying Individual Properties for Flood Resilience – Case Studies

## FD2681

March 2015



Llywodraeth Cymru  
Welsh Government



Joint Flood and Coastal Erosion Risk Management  
Research and Development Programme

# **Surveying for Flood Resilience in Individual Properties**

## **Case Studies**

**FD2681**

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This is a report of research carried out by a research consortium comprising JBA Consulting, Manchester Metropolitan University, The University of Manchester, National Flood Forum and Turnstone Learning Ltd, on behalf of the Department for Environment, Farming and Rural Affairs



**Research contractor:** JBA Consulting, Manchester Metropolitan University, University of Manchester, National Flood Forum and Turnstone Learning Ltd.

**Authors:** Peter May, Phil Emonson, Paul O’Hare, Paul Cobbing, Dr Angela Connelly, Nigel Lawson and Hugh Burchard.

### **Publishing organisation**

Department for Environment, Food and Rural Affairs  
Flood Risk Management Division,  
Nobel House,  
17 Smith Square  
London SW1P 3JR

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# Introduction

The Surveying Individual Properties for Flood Resilience project was asked to identify case studies, which can be referenced internationally, where an increase in the professional capacity and number of advisors and/or the introduction of accreditation schemes has resulted in increased consumer and insurance industry confidence and in property-level protection flood risk measures.

Three types of case study were chosen with a view to informing the research:

1. Case studies exploring commensurate international practice, namely how PLP surveying practices have evolved elsewhere. Selected case studies were: Australia; British Columbia, Canada; and the United States of America.
2. Case studies identifying analogous cases or examples from other fields in the UK. These would identify regimes of practice in England and Wales that could serve as a model for the development of the PLP surveyor scheme. The chosen cases were: The Green Deal; Secured by Design; Smoke Control Areas and Heating Appliances.
3. A further case study that used to identify and summarise good practice in the UK.

The case studies are designed to be succinct (each consisting of around two to three pages) and make use of graphics, charts and illustrations. In the first instance, research undertaken on the user needs of case studies for the new Climate Ready Support Service will be followed.<sup>1</sup> The case studies are driven by a focus on the methods and techniques used in practice, as well as drivers, motivations and barriers. References to further information will be provided. Where the gathered data is sufficiently rich or detailed, a technical appendix can be included. Beyond isolating best practice, the case studies identify limits to surveying and potential pitfalls that will provide lessons for the development of assessors and assessments in England and Wales.

This document presents each case study.

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<sup>1</sup> Environment Agency/Mott MacDonald. 2013. Climate Ready – Case Studies to Support understanding User Needs.

# International Case Studies

## British Columbia - Canada

### Background

British Columbia has a regime of legislated flood assessments<sup>2</sup> that sit alongside earlier guidance for assessing landslide risk. These make reference to ‘flood proofing’, although this is defined widely, encompassing both mitigation and adaptation strategies. Like the USA and Australia, **non-structural measures are preferred options**.

### Principles of flood risk assessments

Flood assessments are comprehensive and take account of **holistic models of flood risk management**. It specifically refers to primary flood defence measures (such as dikes) and secondary flood proofing measures (non-structural but including elevation). Importantly, however, the document also notes “In most cases, floodproofing measures will be defined without the need for a formal risk assessment” (p 24). The assessment is also expected to be **dynamic**, taking account of **climate change and the future use of buildings**.

### Professional practice – the ‘Qualified Professional’

The flood assessment guidance<sup>3</sup> identifies when risk assessments are required, and emphasise the need to consider climate change (p 1). The guidance is **only applicable to proposed new developments or extensive renovations or extensions**. It refers to the need for a **Qualified Professional (QP)** (an engineer or geoscientist<sup>4</sup>) that can conduct assessments. “The QP is responsible for carrying out the flood assessment and, if required/appropriate, outlining proposed measures to protect the proposed development” (page 10). They are **professionally accountable** for their work under the RSBC Act 1996 (Chapter 116, amended). Their responsibilities prior to conducting any assessments are outlined in the guidance (APEGBC, 2012, see Figure 1 for a summary). These could prove pertinent to the role of an Independent Flood Risk Assessor. QPs require **public liability insurance** (as stipulated by APEGBC Bylaw 17). The guidance outlines the themes and issues that the QP must consider when conducting a flood risk assessment. Although the guidance stresses that it is not a step-by-step process, it provides considerable **detail of the hazard assessments** (Section 3.8, p 28-30; there is a useful flowchart summary on p.

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<sup>2</sup><https://www.apeg.bc.ca/getmedia/18e44281-fb4b-410a-96e9-cb3ea74683c3/APEGBC-Legislated-Flood-Assessments.pdf.aspx>

<sup>3</sup> APEGBC (2012) *Professional Practice Guidelines –Legislated Flood Assessments in a Changing Climate in BC*. Territory of British Columbia - Ministry of Forests, Lands and Natural Resource Operations (MFLNRO).

<sup>4</sup> The Association of Professional Engineers and Geoscientists (APEG) represent Qualified Professionals.

16). It also stipulates the **caveats and uncertainties** of such approaches to risk management.

The guidance identifies two approaches: ‘**standard**’ and ‘**risk based**’ approaches to assessments. The former entails by-laws and covenants, whilst the latter entails “flood *consequences* which are combined with hazard scenarios to estimate flood risk” (p 26). The standard based approach (Appendix G) specify the need for building permits for new construction and recommend “...it would be **prudent for the QP to ask the local authority to make the report (in whole or in part) available to future landowners through registration of an appropriate restrictive covenant**” (p. 113). Notably, the same Appendix makes recommendations for properties undergoing substantial renovation. Figure 2 provides a summary of the alternative ‘risk based’ approach that could be adapted to account for PLP. The guidance also details issues around **Quality Assurance, education and experience, professionalism** and the need for assessments to undergo **an independent peer review** (see table below and Chapter 5 for full details).

|  |   |
|--|---|
| <p><b>Professional registration</b></p>          | <p>Legislation requires a qualified professional. These are registered with APEGBC in the discipline of geology or environmental geoscience. It is the responsibility of the professional engineer or geoscientist to determine whether they are qualified by training or experience to undertake and accept responsibility for flood hazard/ risk assessments for proposed developments (APEGBC <b>Code of Ethics</b> Principle 2). As the flood hazard complexity increases, site characterization and understanding the geology and hydrogeological processes becomes critical.</p>  |
| <p><b>Education, training and experience</b></p> | <p>Flood hazard and risk assessments, as described in these guidelines, require minimum levels of education, training and experience in <b>many overlapping areas of geoscience and engineering</b> as well as economics and biology. Education, training and experience can vary depending on the QP’s background and whether specialty services are provided. Appropriate experience can only be gained by working under the direct supervision of a suitably knowledgeable and experienced professional engineer or professional geoscientist. Academic training for the above skill sets are acquired through formal university or college courses, or through continuing professional development (CPD). CPD includes formal courses; attending conferences, workshops, seminars and technical talks; reading new texts/ periodicals; searching the web; and participating in field trips.</p> |

Beyond these criteria, the guidance refers to how QPs should adhere to a series of principles, including the need: for **consistency, transparency and standardisation** across BC; for **consultation** with approving authorities; to consider **protection afforded by structural works**; to consider **risk management and adaptation beyond protection and defence**; to consider **social and environmental outcomes of the works**; to include **forecasted changes** in the hydroclimate, natural and anthropogenic changes to systems; to **identify situations that require expert input** (p. 3).

**Figure 1 – The Qualified Professional (see page 10)**

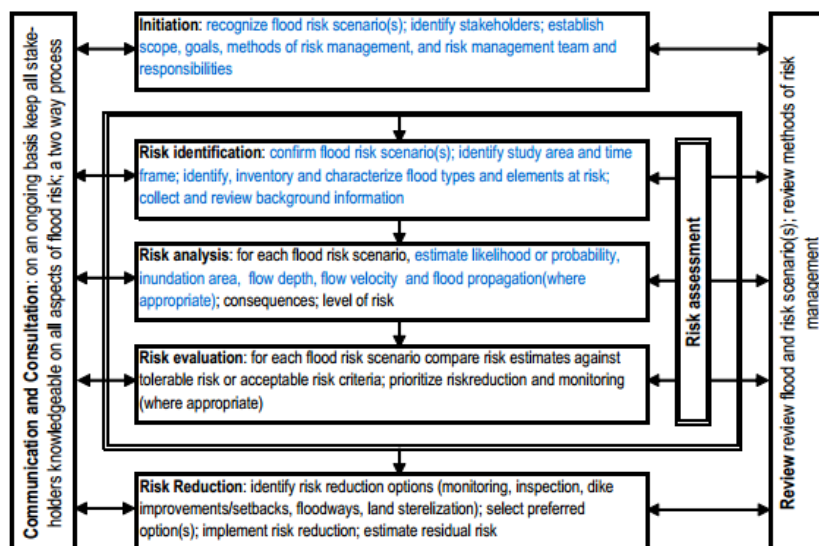
**2.2.2 The Qualified Professional**

The *QP* is responsible for carrying out the flood assessment and, if required/appropriate, outlining proposed measures to protect the proposed development.

Prior to carrying out an assessment the *QP* should:

- be knowledgeable about any the applicable approval processes for the proposed land development project;
- confirm that he/she has appropriate training and experience to carry out the assessment in view of the terrain characteristics, the type of potential *flood hazard*, and the type of mitigative works potentially needed;
- appropriately educate the *client* regarding pertinent aspects of flood assessments;
- consult with the *Approving Authority* regarding applicable regulations, available information, application of the guidelines, role of *structural mitigation works*, applicability of *risk assessment* and requirements for development approval;
- determine whether the scope of work should include a hazard assessment, a *risk assessment*, a mitigation plan and/or engineering works;
- consider the need for and scale of investigations that address land use changes and climate change;
- consider the need for the involvement of other specialists;
- establish an appropriate mechanism for internal checking and review;
- consider the need for independent peer review;
- where possible and appropriate, review the draft report with the approval authority and the technical advisory staff;
- when a report recommends a significant variance from a guideline (e.g., variance of a bylaw Flood Construction Level (FCL) that covers a wide area), it is suggested that variance be discussed with the approval authority prior to final submission;
- obtain a copy of any guidelines or regulations that are pertinent to carrying out an assessment and/or preparing an assessment report; and
- if one exists, obtain the adopted level of *flood hazard* or *flood risk* tolerance, or other assessment approval criteria, for the proposed development in the approving jurisdiction.

**Figure 2 Generalized risk based approach for flood risk management (see page 27)**



# The United States of America

## Background

Property level protection (PLP) in the US has long been considered as a solution to flooding. The U. S. Army Corps of Engineers (USACE) originally published *Flood Proofing Regulations* in 1972.<sup>5</sup> The document deals with elevation, relocation, wet and dry flood proofing; the latter is what UK practitioners refer to as resistance measures or PLP and therefore the research for this case study concentrated on dry flood proofing.

The US case demonstrates **a preference to mitigate flood risk through relocation or elevation** and this is managed through regulations, land use planning, local building codes, and incentives such as potential reductions on insurance premiums under the National Flood Insurance Program (NFIP). Dry flood proofing methods are approached as “interim measures that can provide protection from smaller floods while a larger flood protection project is being designed, funded, and built”.<sup>6</sup>

## Principles

Dry flood proofing is only permitted in certain Special Flood Hazard Areas (SFHA) since floods in Zones V and A are often accompanied by high velocity waves.<sup>7</sup> In line with long-established USACE & FEMA principles, dry flood proofing is recommended where **there are short duration, low velocity and shallow floods (less than 1m), where the building is considered structurally sound, and where there are no basements**.<sup>8</sup> Non-residential properties in certain SFHAs may be dry-proofed if it is difficult for them to relocate (for example, cultural institutions, hospitals, public buildings, historic buildings) and there is evidence that the structure will not be subject to high velocity waves.

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<sup>5</sup> USACE, 1972. *Flood Proofing Regulations*, EP 1165-2-314. Washington D. C: US Army Corps of Engineers. The USACE is the federal agency concerned with large-scale public engineering programmes with control for flood protection.

<sup>6</sup> USACE (National Nonstructural/ Floodproofing Committee). 2005. *Local Flood Proofing Programmes*, p. 19. Available at: <http://www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/nfpc/Local%20Flood%20Proofing%20Programs%202005.pdf>

<sup>7</sup> SFHA's are defined as the area that will be inundated by the flood event having a 1-percent chance of being equalled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labelled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30. Moderate and minimal flood hazards are also indicated. Moderate flood hazard areas are labelled Zone B or Zone X are also shown on the FIRM, and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labelled Zone C or Zone X.

<sup>8</sup> E.g. FEMA 2012. *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*. Available at: [www.fema.gov/media-library-data/.../fema259\\_complete\\_rev.pdf](http://www.fema.gov/media-library-data/.../fema259_complete_rev.pdf); USACE, 1993. *Flood Proofing: How to Evaluate Your Options*. Washington D. C: US Army Corps of Engineers. Available at: <http://www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/nfpc/Flood%20Proofing%20How%20to%20Evaluate%20Your%20Options%201993.pdf>



Given the US's federal structure, **states and cities develop design codes applicable to their circumstances** (See Fig. 1). Consistent with the NFIP are the International Code Series (I-Codes).<sup>9</sup> Otherwise, there are consensus standards that are consistent with NFIP regulations, of particular note are the American Society of Civil Engineer's *Minimum Design Loads for Buildings and Other Structures*, and *Flood Resistant Design and Construction*.<sup>10</sup> Some states require **dry flood proofing proposals to be submitted to the local building authority** to ensure that they are in line with local building codes.

## Professional practice

Dry flood proofing designs should be signed off by a "Registered Design Professional" (RDP) such as an architect, engineer, or land surveyor who is registered and licensed by a state (and only eligible to practice in that state). Interviewees indicated that certified state floodplain managers or members of FEMA's building science team could be capable of this task. In the UK, the equivalents would be professional bodies such as RICS, RIBA and the ICE.

Property owners and potential designers are provided with much information, including calculations and cost-benefit analyses. This places the onus on the property owner to check the credentials of designers and contractors. A designer or contractor will typically belong to a professional or recognised body (and is licensed by the state). Thus, an individual can be struck off the register if malpractice is proven.

Surveyors typically sign flood elevation certificates, whilst architects or engineers sign flood-proofing certificates.<sup>11</sup> Property owners use the flood-proofing certificate to receive a reduction in insurance premiums (Figure 2). The federal-level National Flood Insurance Programme (NFIP) underwrites this.

Whilst property owners may undertake their own measures, the NFIP's Community Rating System awards extra points (and thus the possibility of further reductions on insurance premiums) for projects designed by RDPs, depending on local building codes and a property's presence in an SFHA (See Tables 1a and 1b).

It is recommended that RDPs require knowledge of techniques, materials, building codes, certification, risk mapping, policy, funding & finance, CBA and community resources.<sup>12</sup> RDPs must be able to support the dry flood proofing proposals with structural engineering analyses in order to demonstrate that a property is capable of being made watertight. The

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<sup>9</sup> ICC/FEMA 2008. *Reducing Flood Losses Through the International Codes Meeting the Requirements of the National Flood Insurance Program (Third Edition)*.

<sup>10</sup> ASCE. 2005. *Flood Resistant Design and Construction*. ASCE Standard 24; ASCE . 2010. *Minimum Design Loads for Buildings and Other Structures*. ASCE/ SEI Standard 7-10

<sup>11</sup> Information courtesy of the Association of State Flood Plain Managers via French Wetmore (Affiliation Details) and George Riedel (Director, Emergency Management & Mitigation, Michael Baker International; Co-Chair of ASFPM National Nonstructural/Floodproofing Committee).

<sup>12</sup> FEMA 1993. *Non-Residential Flood-proofing — Requirements and Certification for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program*. Technical Bulletin 3-93, pp. 3 – 6. Available at: <http://www.fema.gov/media-library-data/20130726-1511-20490-5294/job6.pdf>

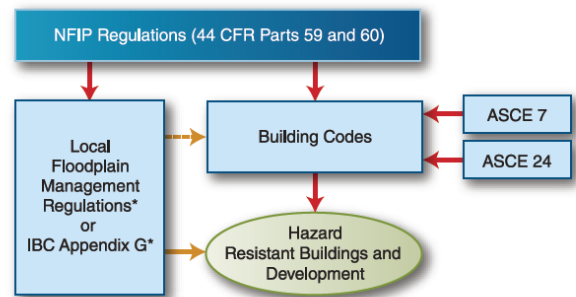
evidence suggests that a high level of knowledge is required on flooding, flood risk management and building science.

FEMA provides two independent study courses<sup>13</sup>, through its Emergency Management Institute in Maryland, which are aimed at engineers, architects, floodplain managers, building code officials, hazard mitigation, planning, zoning, public works, and other building officials with building science knowledge. These are:

- IS-279: Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures.
- IS-280: Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures.

The professions stated above typically undertake these courses. USACE guidance shows a number of case studies where professionals and authorities come together with the community to help to plan for flood mitigation measures, therefore anyone interested in flood risk management is encouraged to take the FEMA courses.<sup>14</sup>

**Figure 1 – Ensuring that NFIP requirements are met through building codes. Source: FEMA. 2013.**



\*NFIP-consistent administrative provisions, community-specific adoption of Flood Insurance Studies and maps, and technical requirements for development outside the scope of the building code (and higher standards, in some communities)

**Figure 2 – FEMA’s Flood Proofing Certificate. Source: FEMA. 2013.**

| Preparation of the Floodproofing Certificate for Non-Residential Buildings   |              |        |                           |           |  |
|--|--------------|--------|---------------------------|-----------|--|
| The Floodproofing Certificate is required for all non-residential buildings to be floodproofed and is to be completed by the design professional. The first part of the Certificate contains information concerning the location and ownership of the building.  |              |        |                           |           |  |
| FEDERAL EMERGENCY MANAGEMENT AGENCY<br>NATIONAL FLOOD INSURANCE PROGRAM  |              |        | GWR No. 3007-007          |           |  |
| <b>FLOODPROOFING CERTIFICATE</b><br>FOR NON-RESIDENTIAL STRUCTURES   |              |        |                           |           |  |
| The floodproofing of non-residential buildings is made permitted as an alternative to elevating to or above the Base Flood Elevation, however, a floodproofing design certification is required. This form is to be used for that certification. Floodproofing of a residential building does not allow a community's floodplain management elevation requirements or other the insurance rates unless the community has been issued an exception by FEMA to allow floodproofed residential basements. The permitting of a floodproofed residential basement requires a separate certification certifying that the design complies with the local floodplain management ordinance. |              |        |                           |           |  |
| BUILDING OWNER'S NAME  |              |        | FOR INSURANCE COMPANY USE |           |  |
| STREET ADDRESS (including Apt., Unit, Suite and/or Bldg. Number) OR P.O. ROUTE AND BOX NUMBER  |              |        | POLICY NUMBER             |           |  |
| OTHER DESCRIPTION (Lot and Block Numbers, etc.)  |              |        | COMPANY SAC NUMBER        |           |  |
| CITY   |              |        | STATE ZIP CODE            |           |  |
| Building location and Ownership information  |              |        |                           |           |  |
| Section 1 of the Certificate is the Flood Insurance Rate Map (FIRM) information, including the IWF used in designing the floodproofing system. Copies of the FIRM should be available through the community's floodplain administrator.  |              |        |                           |           |  |
| <b>SECTION 1 FLOOD INSURANCE RATE MAP (FIRM) INFORMATION</b>   |              |        |                           |           |  |
| Provide the following from the proper FIRM   |              |        |                           |           |  |
| COMMUNITY NUMBER   | PANEL NUMBER | SUFFIX | DATE OF FIRM INDEX        | FIRM ZONE | BASE FLOOD ELEVATION (in feet above sea level) |
|  |              |        |                           |           |  |

<sup>13</sup>See: <http://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=IS-279> and <https://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=IS-280>

<sup>14</sup> USACE (National Nonstructural/Floodproofing Committee). 2005. Local Flood Proofing Programmes, p. 15. Available at: <http://www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/nfpc/Local%20Flood%20Proofing%20Programs%202005.pdf>

**Table 1a – Insurance Premium Reductions under the NFIP Community Rating System.  
Source: National Flood Insurance Program (NFIP) Community Rating System (CRS)  
Coordinator's Manual**

| Score | Credits     | Discount in SFHA <sup>1</sup><br>(%) |
|-------|-------------|--------------------------------------|
| 1     | 4500+       | 45                                   |
| 2     | 4000 – 4499 | 40                                   |
| 3     | 3500 – 3999 | 35                                   |
| 4     | 3000 – 3499 | 30                                   |
| 5     | 2500 – 2999 | 25                                   |
| 6     | 2000 – 2499 | 20                                   |
| 7     | 1500 – 1999 | 15                                   |
| 8     | 1000 – 1499 | 10                                   |
| 9     | 500 – 999   | 5                                    |
| 10    | 0 – 499     | ---                                  |

**Table 1b - Credit points for dry flood-proofing under the NFIP Community Rating System.  
Source: National Flood Insurance Program (NFIP) Community Rating System (CRS)  
Coordinator's Manual**

| Technique          | Criteria   | Credit point |
|--------------------|--|--------------|
| Elevation          | -  | 1.0          |
| Dry flood-proofing | If the project was designed by a registered design professional and the design accounts for openings, internal drainage, seepage, and underdrainage.   | 0.6          |
| Dry flood-proofing | If the project does not depend on human intervention to close openings; the project protects to a level less than 3 feet above the first flood; the design accounts for internal drainage seepage and underdrainage; and the building has no basement. | 0.4          |
| Dry flood-proofing | For all other cases, including those for which there is no documentation of how openings, interior drainage, seepage or underdrainage are handled.   | 0.2          |
| Wet flood-proofing | If the project was designed by a registered design professional.   | 0.5          |
| Wet flood-proofing | If the project was not designed by a registered design professional.   | 0.3          |
| Wet flood-proofing | If the furnace, water heater, electrical breaker box, and other utilities are relocated above flood level.   | 0.2          |

# Australia

## Background

Our initial assessment of property level protection in Australia suggests there is no surveying framework in place at the national or state government scale. Flood proofing - consisting of both wet (often referred to as 'flood') or dry proofing - though not unheard of, is not commonplace. Policy documents stipulate that **initiatives should complement other (hierarchical) flood risk management strategies** such as land use planning, or raising floor levels. However, the Australian case study does offer some lessons for UK practice.

## Principles of property level protection

Flood resilience and property level protection is not widely accepted, primarily due to a **lack of information on the part of prospective residents and the lack of incentivisation or regulation** for the construction sector/ property market.<sup>15</sup>

The Australian case demonstrates the importance of considering PLP against **broader regimes of flood risk management**, including those in operation at **scales** beyond properties and communities, and through **alternative administrative arrangements** such as land use planning. There is a clear preference to ensure construction on the flood plain is minimised (ABCB, 2012). **Adaptation, therefore, is considered an adjunct to mitigation.**

There is a clear **preference for wet proofing** rather than dry proofing (resistance), primarily to ensure the structural integrity of buildings are protected and to protect life (the primary concern of performance standards). The remit of the ABCB is the health, safety and amenity of building occupants; **protection of property is not mentioned.**

Standards can be prescriptive, although there are also more discretionary '**Alternative Solutions**' that may encompass dry proofing. Given the aforementioned federal structure, there is **scope for states and cities to develop design codes applicable to their circumstances.**<sup>16</sup>

## Professional practice

The ABCB states that in "all instances, designers are required to use **professional judgment** in order to develop designs intended to comply with the BCA Performance Requirement" (2012: 7). A **Building Certifier** (Building Practitioners Board<sup>17</sup>) issues building and occupancy certificates, and assesses 'Alternative Solutions' that theoretically could include wet and dry proofing. Certifiers **encompass several professions and trades** (e.g. plumbers, architects, drainage engineers). The requirement to practice as a

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<sup>15</sup> ABCB (2012) *Proposals to address the risk of floods to new residential buildings: Final regulation impact statement.*

<http://www.abcb.gov.au/~media/Files/Download%20Documents/Consultation/Floods%20RIS%20Final%20or%20website.pdf>

<sup>16</sup> The ABCB Information Handbook 'Construction of Buildings in Flood Hazard Areas' presents an outline of requirements in each State and Territory. (2012, 20)

<sup>17</sup> For a list of the competent professionals see: [www.bpb.nt.gov.au/practitioners](http://www.bpb.nt.gov.au/practitioners)

Building Certifier including accreditation, registration and licensing is a responsibility of each of the six states and two territory jurisdictions.

The Hawkesbury-Nepean Floodplain Management Steering Committee (New South Wales) has a range of documentation advising regarding flood risk<sup>18</sup>. Other documents reference 'flood aware building measures', but make no reference to surveying and only ever as part of a wider management regime and using a '**graduated planning control matrix**'<sup>19</sup> (Figures 1a & 1b). It also provides a **checklist of potential uncertainties** in Flood Model Estimates and a 'sample Flood certificate' (Figure 2). Remaining in NSW, a new process is being introduced permitting 'complying' development to be undertaken on land subject to flood controls. A rigorous assessment regime has been developed to determine and minimise flood risk, with the local council or a professional engineer<sup>20</sup> specialising in hydraulic engineering certifying that the proposal complies with the development standards for flood control lots (see Figure 3<sup>21</sup>).

Other good practice examples include the use of '**knowledge hubs**' that could be used to share information across Independent Flood Risk Assessors or for training purposes. It also emphasises **dynamic risk assessments**<sup>22</sup>. The same document cites that **residual risk remains** even after management measures and the **need to emphasise individual and community responsibility. Product certification schemes** providing nationally consistent quality of materials and products may prove to be a useful model for PLP. Of note are the voluntary **CodeMark** building product certification scheme and the mandatory **WaterMark** plumbing and drainage product certification scheme (ABCB), both of which are online. Legislation requires building control authorities to accept CodeMark certified products.

**Figure 1a: Distribution of land uses on the floodplain**      **Figure 1b: Graduated planning matrix**

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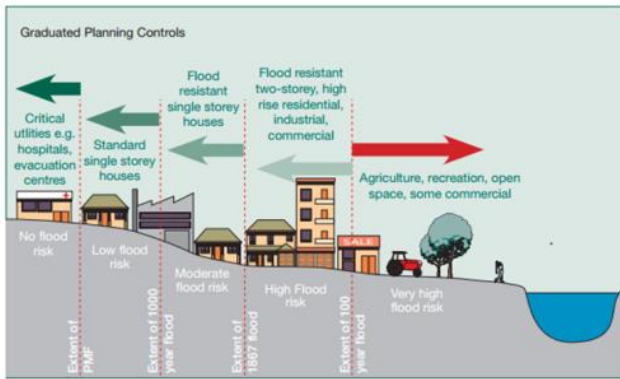
<sup>18</sup> See: [http://www.ses.nsw.gov.au/content/documents/pdf/resources/Subdivision\\_Guidelines.pdf](http://www.ses.nsw.gov.au/content/documents/pdf/resources/Subdivision_Guidelines.pdf) and [http://www.ses.nsw.gov.au/content/documents/pdf/resources/Building\\_Guidelines.pdf](http://www.ses.nsw.gov.au/content/documents/pdf/resources/Building_Guidelines.pdf)

<sup>19</sup> [http://www.ses.nsw.gov.au/content/documents/pdf/resources/Land\\_Use\\_Guidelines.pdf](http://www.ses.nsw.gov.au/content/documents/pdf/resources/Land_Use_Guidelines.pdf)

<sup>20</sup> A 'professional engineer' is someone who is a registered Corporate Member of the Institution of Engineers, Australia, and has appropriate experience and competence in the relevant field (New South Wales Housing Code).

<sup>21</sup> [www.certgroup.com.au/wp-content/uploads/2012/12/Complying-Development-Customer-Guide-issued-APRIL-2011.pdf](http://www.certgroup.com.au/wp-content/uploads/2012/12/Complying-Development-Customer-Guide-issued-APRIL-2011.pdf)

<sup>22</sup> Australian Government Handbook 7: Managing the floodplain  
[www.em.gov.au/publications/australianemergencymanualseries/Pages/default.aspx](http://www.em.gov.au/publications/australianemergencymanualseries/Pages/default.aspx)



An example of the possible distribution of land uses in the floodplain according to the flood risk offering opportunities for safer occupation of the floodplain and reduced flood damages (note: the number of risks bands may vary between floodplain areas depending on the range in depth of flooding above the flood planning level).

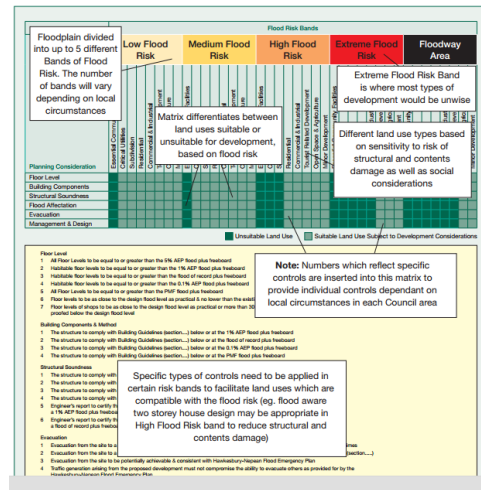


Figure 2 – New South Wales Flood Certificates (Page 160)

Figure 3 – New South Wales Housing Code: A guide to complying development<sup>i</sup> (c.f. Flood control lots)

| Council Name<br>Flood Certificate  |   |   |                                   |
|--|---|---|-----------------------------------|
| Property:  | 16 Albany Way, Lachlan Downs<br>Lot 2, DP 45690 |   |                                   |
| Owners:  | John and Jenny Smith                            |   |                                   |
| Known Flood and Ground levels of the property:   |   |   |                                   |
| The lowest floor of the main building on this property is 20.9 m AHD   |   |   |                                   |
| Source of information: Survey dated 1998   |   |   |                                   |
| The lowest ground level on this property is 20.4 m AHD   |   |   |                                   |
| Source of information: Survey dated 1998   |   |   |                                   |
| Estimated flood levels:  |   |   |                                   |
| Size of flood  | Flood level<br>m AHD                            | Depth over floor level<br>(without freeboard) | Depth over lowest ground<br>level |
| PMF  | 27.6  | 6.3 m   | 6.8 m                             |
| 1 in 1000 year flood   | 23.3  | 4.0 m   | 4.5 m                             |
| Flood of record  | 19.7  | 0.4 m   | 0.9 m                             |
| 1 in 100 year flood  | 17.3  | Not flooded                                   | Not flooded                       |
| 1 in 20 year flood   | 14.9  | Not flooded                                   | Not flooded                       |
| The PMF is the probable maximum flood that could conceivably occur. It is extremely rare.  |   |   |                                   |
| The 1 in 1000 year flood has a 0.1% chance of occurring in any one year.   |   |   |                                   |
| The flood of record in the (inset name of river) floodplain is estimated to be a 1 in 350 year event (figure reflects the return interval of the relevant flood of record for each certificate).   |   |   |                                   |
| The 1 in 100 year flood has a 1% chance of occurring in any one year.  |   |   |                                   |
| The 1 in 20 year flood has a 5% chance of occurring in any one year.   |   |   |                                   |
| Classification of Flood Risk:  |   |   |                                   |
| Council records indicate that the property is located within   |   |   |                                   |
| Flood Risk Band D  |   |   |                                   |
| and has a  |   |   |                                   |
| <b>LOW Risk Rating</b>   |   |   |                                   |
| Flood risk bands are rated as Extreme, High, Medium or Low. The bands reflect the level of financial risk from flood damages which would occur if there were no additional flood-aware building controls applied to new dwellings on this land. The flood risk management bands are described in the Flood Policy, copies of which are available from the Council offices. |   |   |                                   |



# National Case Studies

## The Green Deal

### Background

The Green Deal provides interest-bearing loans for energy saving home improvement schemes. Loan repayments can be added to electricity bills with the 'Golden Rule' that loan repayments should never exceed the savings on energy bills. It is a commercial scheme with no government subsidy but is backed by government-approved standards and code of practice through the Department for Energy and Climate Change (DECC).

### Principles of the Green Deal

To be eligible for the Green Deal, a property requires an **assessment by a Green Deal assessor**. The assessor must be accredited with the **Green Deal Quality Mark** and work as part of a certificated Green Deal Advisor Organisation.<sup>23</sup> The assessor produces a 'Green Deal Advice Report' that lists possible improvements and their cost-effectiveness. The assessor is required to carry out an impartial assessment, but is not required to be independent of a company selling other home improvement measures. The assessor will issue an Energy Performance Certificate (EPC), which determines the measures required and the amount that a household can borrow. Property owners typically have to pay for the report at a cost of roughly £100 - £150.

Following the assessment, property owners are encouraged to find quotes for products from accredited Green Deal Providers who may include energy companies, local

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<sup>23</sup> All companies involved in the Green Deal must bear this mark and comply with a code of practice. The Green Deal Quality Mark is given to registered assessors, providers and installers, the latter of whom must have a mark specifying the measures they are permitted to install.



authorities, and shops and companies that install energy efficient technology. Once the technologies are identified, property owners are then provided with an interest-bearing loan to pay for some or all of the energy improvements through a Green Deal Provider, who will also arrange the installation itself.

## Professional practice

**Training:** Green deal assessors, providers, and installers must be authorised to demonstrate compliance with Green Deal Standards and to use the Green Deal Quality Mark. Whilst existing skills are recognised, many businesses can require top-up training on areas specific to the Green Deal. Local colleges, trade bodies, and sector skills councils provide such training.

**Assessor Specification and Certification:** DECC developed Assessor Specifications to cover types of assessor organisations and certification bodies. Certification Bodies must be accredited by the United Kingdom Accreditation Service (UKAS) and meet the terms of PAS 2031 in evaluating installers in respect of PAS 2030.<sup>24</sup> Training to become a registered assessor varies between £1, 100 and £2,300 dependant on previous qualifications/requirements.

**Control and Registration:** The Green Deal Oversight and Registration Body (GD ORB) manages the authorisation scheme on behalf of DECC. The GD ORB is responsible for:

- maintaining a register of all participating organisations;
- maintaining a Code of Practice;<sup>25</sup>
- ongoing monitoring and for gathering evidence of non-compliance and for making sanction referrals to the Ombudsman.

## Observations

There have been instances of 'hard' selling techniques being employed on property owners. Moreover, there is little to prevent a Green Deal provider from selling other home improvement services such as furniture, kitchens or other building services, thus

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<sup>24</sup> PAS 2031: 2012 "**Certification of energy efficiency measure (EEM) installation services**" is a British Standards Institute (BSI) Publically Available Specification (PAS) that is applicable to certification bodies that provide conformity evaluation services in respect of PAS 2030 , "Improving the energy efficiency of existing buildings – Specification for installation process, process management and service provision".

<sup>25</sup> A number of methods are used to ensure that the Code is adhered to including compliance check visits, spot checks and monitoring of complaints. See <http://gdorb.decc.gov.uk/code-of-practice>



compromising the impartiality of such assessments. This suggests that the assessment process could be more independent of products and their installation.

The surveyor needs to be able to **recoup the substantial cost of training and accreditation**. This suggests a need to look at the affordability of training schemes.

There are criticisms that a **lack of clarity and continual change in the process** has inhibited uptake of the Green Deal.

## Information Sources

Building Research Establishment. 2014. Green Deal Page: [www.bre.co.uk/accreditation/greendealpage](http://www.bre.co.uk/accreditation/greendealpage)

Edie Newsroom. 2014. 'Green Deal: Success or Failure?' Available at: [www.edie.net/library/print.asp?id=6490](http://www.edie.net/library/print.asp?id=6490)

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[www.gov.uk/buy-sell-your-home/energy-performance-certificates](http://www.gov.uk/buy-sell-your-home/energy-performance-certificates)

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Guertler, P., Robson, D. and Royston, S. 2013 *Somewhere between a 'Comedy of errors' and 'As you like it'? A brief history of Britain's 'Green Deal' so far*. ECEEE Summer Study Proceedings, pp. 153-164

"Green Deal cashback scheme shuts with immediate effect as homeowners exhaust £120 m fund". The Telegraph on-line 24 June 2014. Available at: <http://www.telegraph.co.uk/finance/personalfinance/energy-bills/10989815/Green-Deal-cashback-scheme-shuts-with-immediate-effect-as-homeowners-exhaust-120m-fund.html>

## Secured By Design

### Background

Secured By Design (SBD) is a **not for profit** initiative launched by the Association of Chief Police Officers (ACPO) in 1989<sup>26</sup>. Secured by Design emphasises the benefits of crime prevention in homes and commercial premises. SBD may provide an interesting model that PLP surveying and flood risk assessments could mirror (through the Association of Chief Fire Officers, for instance).

### Principles of Secured By Design

From a conceptual perspective, SBD can trace its development to notions around **Crime Prevention Through Environmental Design** (CPTED) and **'Defensible Space'**. Although there is a wide range of physical products that are approved through SBD (referred to as 'target hardening'), it is important to note **that SBD provides a more holistic approach to crime prevention**. Cozens *et al.* (2005) state that CPTED concepts are allegedly most successful when used away from excessive 'target hardening' and instead are interwoven with management interventions. SBD deals with the territoriality of space, reducing the anonymity of potential offenders, providing incentives and opportunities for natural surveillance ('eyes on the street') and civic control of neighbourhoods, thus reducing opportunistic crime (the ACPO **Neighbourhood Watch**<sup>27</sup> initiative provides a useful complementary scheme, that again could provide lessons for community engagement with PLP). Guidance produced by the Home Office and Department of the Deputy Prime Minister provide broader examples of crime prevention through design (Figure 1).<sup>28</sup> It is also important to note that SBD and CPTED is widely critiqued for **displacing crime, rather than addressing the causes of crime**.

Manufacturers and innovators can apply for **SBD approval for products** (Figure 2). For instance, Secured by Design 'member company status' can be given to companies with products that pass standards developed in conjunction with ACPO. The SBD website has a directory of companies and products<sup>29</sup>. **SBD does not sell or provide any guarantees in respect of the product**. Rather, emphasis is placed on the standard that products have been tested to. Other useful initiatives pioneered through SBD include an **interactive**

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<sup>26</sup> <http://www.securedbydesign.com>

<sup>27</sup> <http://www.ourwatch.org.uk/>

<sup>28</sup> *Safer Spaces: the Planning System and Crime Prevention*  
[http://www.securedbydesign.com/pdfs/safer\\_places.pdf](http://www.securedbydesign.com/pdfs/safer_places.pdf)

<sup>29</sup> <http://www.securedbydesign.com/companies/index.aspx>

**three-dimensional online guide** outlining examples and scenarios of crime prevention through environmental design (see Figure 3)<sup>30</sup>. The SBD website also hosts other guidance, including **burglary prevention advice for homeowners** 'on a budget'<sup>31</sup>, advice on **finding installers**<sup>32</sup> and detailed guidance for architects and planners. The SBD organisers also fund research and knowledge exchange partnerships.

## Enforcement and leverage

The SBD website claims that the scheme has "been proven to achieve a reduction of crime risk by up to 75%, by combining minimum standards of physical security and well-tested principles of natural surveillance and defensible space". In spite of the government's support for SBD as 'good practice' it is not obligatory (ACPO, 1999: 4).

In practice, Secured by Design operates through variety of means including **public information campaigns** the **promotion of security standards for a wide range of physical products, applications and services** and through **regulatory mechanisms such as the planning system**. SBD is championed by local police Architectural Liaison Officers or Crime Prevention Design Advisors who work for police constabularies. Greater Manchester Police Architectural Liaison Unit pioneer the use of SBD across all development applications and, **uniquely, employ built environment professionals to do so**<sup>33</sup>. Initiatives are frequently linked to governmental and local authority agendas of **creating 'sustainable and safe' neighbourhoods**. Leverage is often dependent upon persuading planners, developers, architects and the construction industry of the social and financial benefits of ensuring a development is secured by design. SBD is well known by planners and local authorities, with some **authorities insisting all new developments in an area are secured by design**.

SBD is **supported by insurers** who often offer discounts on premiums if a property has authorised products installed and if these are adequately maintained (e.g. an alarm system). In *Securing the Nation: the case for safer homes*<sup>34</sup> the ABI outlines the benefits of SBD and call for the scheme's wider adoption. Several writers have observed a pressure to implement 'designing out crime' strategies where failure to do so may mean increased liability and litigious proceedings<sup>35</sup>. In addition, SBD has been acknowledged by some in the construction sector to be a **marketable asset** in new developments.

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<sup>30</sup> <http://interactive.securedbydesign.com/>

<sup>31</sup> <http://www.securedbydesign.com/aware/index.aspx>

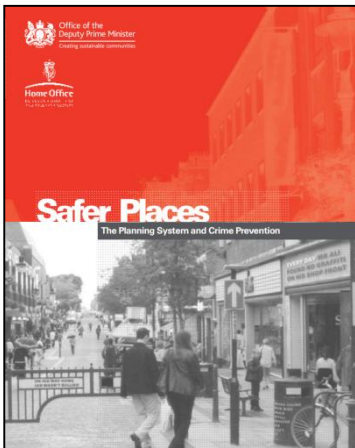
<sup>32</sup> <http://www.securedbydesign.com/aware/supplier.aspx>

<sup>33</sup> They will be able to advise regarding how the schemes operates in practice, and in particular how an analogous scheme may be supported in policy and practice.

<sup>34</sup> <http://www.securedbydesign.com/professionals/pdfs/Securing%20the%20Nation%20-%20the%20case%20for%20safer%20homes.pdf>

<sup>35</sup> See, for example, Gordon and Brill, 1996: 3; Moss and Pease, 1999; Infield, 2000; Cozens, Pascoe and Hillier, 2004.

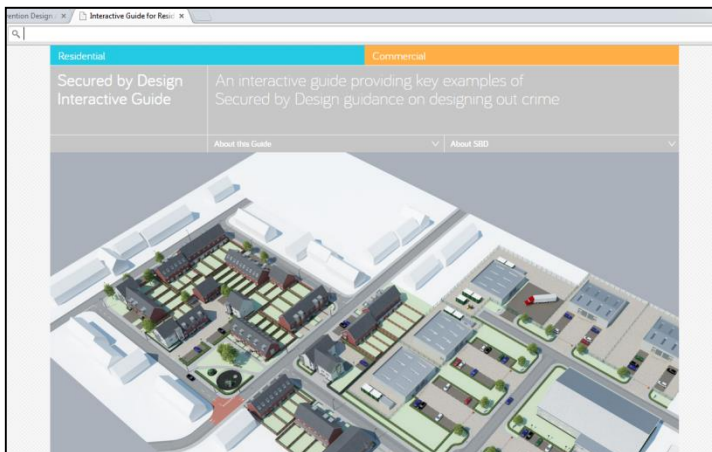
**Figure 1: Safer Places**



**Figure 2: Secured By Design logo**



**Figure 3: SBD online guide**



## Smoke Control Areas and Heating Appliances

### Background

Smoke Control Areas were introduced by the Clean Air Acts to regulate pollutants from fuel emissions. Although the control areas were designed to regulate emissions from industrial buildings, they also stipulated the types of fuels that could be supplied to and burned in domestic properties. Today, the regulations ensure heating appliances such as stoves are designed to burn fuels (particularly wood) cleanly. Such stoves are referred to as Defra approved or as 'exempt' from the Smoke Control Act (through statutory instruments). Non-exempt stove appliances may be used in smoke control areas, but they are only allowed to burn a list of authorised smokeless fuels<sup>36</sup>. The process of purchasing, installing and maintaining wood burning stoves offers an interesting parallel to PLP.

### Stove exemption process

Regulation surrounding stoves and their use and maintenance are quite extensive. Government plays an important role in the use of legislation and statutory instruments, not least given the health and environmental implications of ensuring smoke is controlled in urban areas (an important distinction with personal property protection). Despite extensive regulation, much of the 'enforcement' is conducted through representative trade bodies that also provide training to professionals as well as advice to consumers.

Stoves are manufactured by small and medium sized enterprises that must take appliances through an application<sup>37</sup> for a certificate of exemption<sup>38</sup>. The exemption

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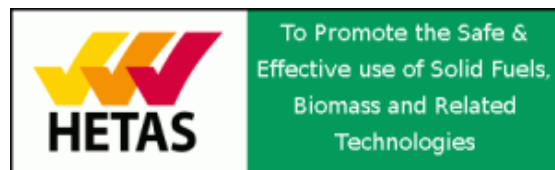
<sup>36</sup> <http://smokecontrol.defra.gov.uk/fuels.php>

<sup>37</sup> [http://smokecontrol.defra.gov.uk/assets/documents/Application\\_Pack\\_Issue\\_3\\_FINAL.pdf](http://smokecontrol.defra.gov.uk/assets/documents/Application_Pack_Issue_3_FINAL.pdf)

<sup>38</sup> <https://www.gov.uk/get-an-exemption-for-an-appliance-to-burn-unauthorised-fuel>

process (which is distinct from the testing process) costs £122539. A list of application documents required by Defra are detailed in Figure 1. Once approved, stoves may be marketed as Defra exempted (for an example, see Figure 2).

**HETAS is the ('umbrella') independent UK body recognised by the Department for Environment, Food and Rural Affairs (DEFRA) for the official testing and approval of domestic solid fuels, solid fuel burning appliances and associated equipment and services<sup>40</sup>.**



## Installation and longer-term maintenance

All stoves, whether they are exempted or not, are **purchased from independent installers**. These in turn are usually HETAS approved. Consumers are advised that **stoves are regularly maintained and that chimneys are swept at least annually**, and sometimes more frequently<sup>41</sup>. They are also advised to inform their insurers that they have an appliance, although anecdotal evidence suggests this has little effect on premiums or the availability of insurance. The **work of installers is regulated, and there are rules regarding the details of installation** (for instance an airbrick must be installed for stoves that are beyond a certain size). Installers also install a carbon monoxide detector.

Chimney sweeps are also approved through HETAS. HETAS states: "The induction, training and assessment procedures of the trade associations represent to HETAS that you are a competent practical sweep with the appropriate equipment and insurance". To gain registration, individuals must apply as a registered member of one of three nominated Trade Associations. The associations are: The National Association of Chimney Sweeps (NACS)<sup>42</sup>; The Association of Professional and Independent Chimney Sweeps (APICS)<sup>43</sup>; and the Guild of Master Chimney Sweeps<sup>44</sup>.

Once a member, the individual or company is listed in the **HETAS online directory** searchable by the public. These organisations and HETAS **provide training courses and seminars**. Consumers that have had their chimney's swept are issued with a certificate. The back of this form has a lengthy 'Industry standard' statement proving a national code of practice for chimney sweeps (see Figure 3<sup>45</sup>).

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<sup>39</sup> A list of exempt appliances may be found here: <http://smokecontrol.defra.gov.uk/appliances.php?country=e>

<sup>40</sup> <http://www.hetas.co.uk>

<sup>41</sup> The chimney needs to be swept of creosote to ensure that the appliance is operating safely to mitigate the risk of chimney fires and minimise the risk of carbon monoxide build-ups, for example). This also ensures the draught in the chimney burns the fuel efficiently and that particulates, gases and smoke are minimised (thus ensuring smoke control regulations are being met).

<sup>42</sup> Formed in 1982 as a professional trade association, promoting high standards for sweeping <http://nacs.org.uk>

<sup>43</sup> <http://www.apics.org.uk>

<sup>44</sup> <http://www.guildofmasterchimneysweeps.co.uk>

<sup>45</sup> For further details see: <http://www.guildofmasterchimneysweeps.co.uk/industry-standard.php>

Figure 2: A stove marketed as 'Defra approved'<sup>46</sup>

Figure 1: Exemption Application documents

**Application documents**

To ensure your application is processed as quickly as possible, please provide the following information/documents and indicate how you will provide them to us. You may upload documents online, send by email or put paper documents in the post. Please indicate here how you will send the documents. Those selected as being sent online will be requested once you press the [Submit] button.

| Document  | Online                           | Email                 | Post                  | None                             |
|---|----------------------------------|-----------------------|-----------------------|----------------------------------|
| Technical drawings of the appliance(s) (See Note 1)               | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>            |
| Manuals (installation, operation, maintenance) (See Note 1)       | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>            |
| Appliance CE Label information (Image or information)             | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>            |
| Test reports including particulate emissions tests (See Note 2)   | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |
| Accreditation certificates if test reports submitted (See Note 3) | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |
| Pictures and/or brochures of the appliance                        | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |

**Notes about the options above:**  
**Note 1:** These are required  
**Note 2:** Test report(s) for the appliance or range of appliances (or identical appliance(s)) required before completion of application.  
**Note 3:** These are required if test reports submitted



Figure 3: Industry standard certificate

<sup>46</sup> <http://www.leedsstovecentre.co.uk>

|  |   |  |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
|--|---|--|--------|------------|----------------|--------|-------------------------|--------------------------|--------------------------|-------|--|--------------------------|--------------------------|-------|
|   | <b>GUILD OF MASTER CHIMNEY SWEEPS</b><br><i>Powering chimney sweeping into the 21st Century</i> |     |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
|  | <b>CERTIFICATE OF CHIMNEY SWEEPING</b>  |  |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| <b>YOUR CHIMNEY HAS BEEN BRUSH SWEEPED IN ACCORDANCE WITH THE NATIONAL INDUSTRY STANDARD</b>   |   |  |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| <b>Guild of Master Chimney Sweeps</b><br>Ocean Deck, Clifford Road, Grays, Essex RM16 6QL<br>email: info@guildofmasterchimneysweeps.co.uk  |   | Membership No. ....<br>Date of Issue .....<br>Time of Issue .....<br>Issued by ..... |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| Your chimney requires re-sweeping within _____ months, being _____ (month) (year)  |   |  |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| Chimneys with solid fuel appliances - Smokeless fuels - at least once per year / house coal - at least twice a year<br>Chimneys with wood burning appliances - Quarterly when in use - Chimneys with gas or oil appliances ..... Once a year   |   |  |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| Method of Sweeping: Line & Weight <input type="checkbox"/> Brush & Rods <input type="checkbox"/> Rotary Power Swept <input type="checkbox"/> Viper & Star <input type="checkbox"/><br><small>CHIMNEYS CANNOT BE CLEANED BY VACUUM ALONE - BRUSHES MUST BE USED - CLEAN CHIMNEYS ARE SAFER CHIMNEYS</small>   |   |  |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| Type of appliance: .....<br>Fuel used (follow manufacturers instructions):<br>COAL <input type="checkbox"/> BIOMASS <input type="checkbox"/> S/FUEL <input type="checkbox"/> WOOD <input type="checkbox"/> OIL <input type="checkbox"/> GAS <input type="checkbox"/><br>Deposit removed from flue:<br>LOOSELINING (spalling) <input type="checkbox"/> SOOT <input type="checkbox"/> OTHER (specify) <input type="checkbox"/> TAR (residue) <input type="checkbox"/> FIRE RISK (detail below) <input type="checkbox"/> FLUE (defective/unsafe) <input type="checkbox"/><br>DETAIL: .....                            |   |  |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| <table border="0" style="width: 100%;"> <tr> <td></td> <td style="text-align: center;">ACCEPTABLE</td> <td style="text-align: center;">NOT ACCEPTABLE</td> <td style="text-align: center;">DETAIL</td> </tr> <tr> <td>Chimney pots/terminals:</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td>.....</td> </tr> <tr> <td>Condition of chimney stack (exterior):</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td>.....</td> </tr> </table> |   |  |        | ACCEPTABLE | NOT ACCEPTABLE | DETAIL | Chimney pots/terminals: | <input type="checkbox"/> | <input type="checkbox"/> | ..... | Condition of chimney stack (exterior): | <input type="checkbox"/> | <input type="checkbox"/> | ..... |
|  | ACCEPTABLE  | NOT ACCEPTABLE   | DETAIL |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| Chimney pots/terminals:  | <input type="checkbox"/>  | <input type="checkbox"/>   | .....  |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| Condition of chimney stack (exterior):   | <input type="checkbox"/>  | <input type="checkbox"/>   | .....  |            |                |        |                         |                          |                          |       |  |                          |                          |       |
| CCTV Inspection carried out: (Optional) Yes <input type="checkbox"/> No <input type="checkbox"/> Detail: .....<br>Carbon Monoxide Alarm Fitted Yes <input type="checkbox"/> No <input type="checkbox"/> Detail: .....  |   |  |        |            |                |        |                         |                          |                          |       |  |                          |                          |       |

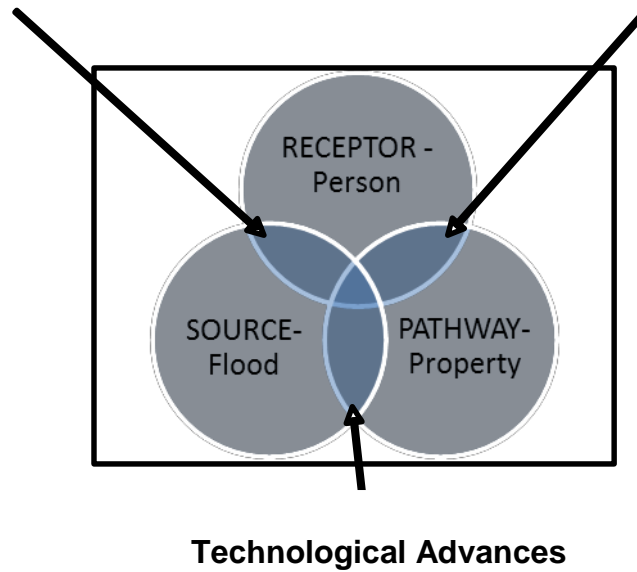
## UK PLP: Best Practice

### Background

Whilst catchment level options and engineered flood alleviation schemes will continue to provide protection to communities at flood risk, it is not possible to provide everyone with such schemes. Property level protection (PLP) now provides individuals and professional partners with practical and cost effective steps to help lower flood risk through the use of more affordable bespoke products. These offer an innovative and effective new response which ‘plugs the gap’ that previously existed between engineered flood protection schemes and either sandbags or the ‘do nothing’ option. Encouraging the wider use of PLP, allied to effective flood warning and raising greater awareness will help inform and empower communities to take effective action themselves. With effective PLP products the approach aims to help build improved flood resilience by bringing the **person, flood and property** together (See Figure 1).



**Figure 1: Flood warning & emergency planning maintenance, standards & social dynamics**



## Developing Best Practice

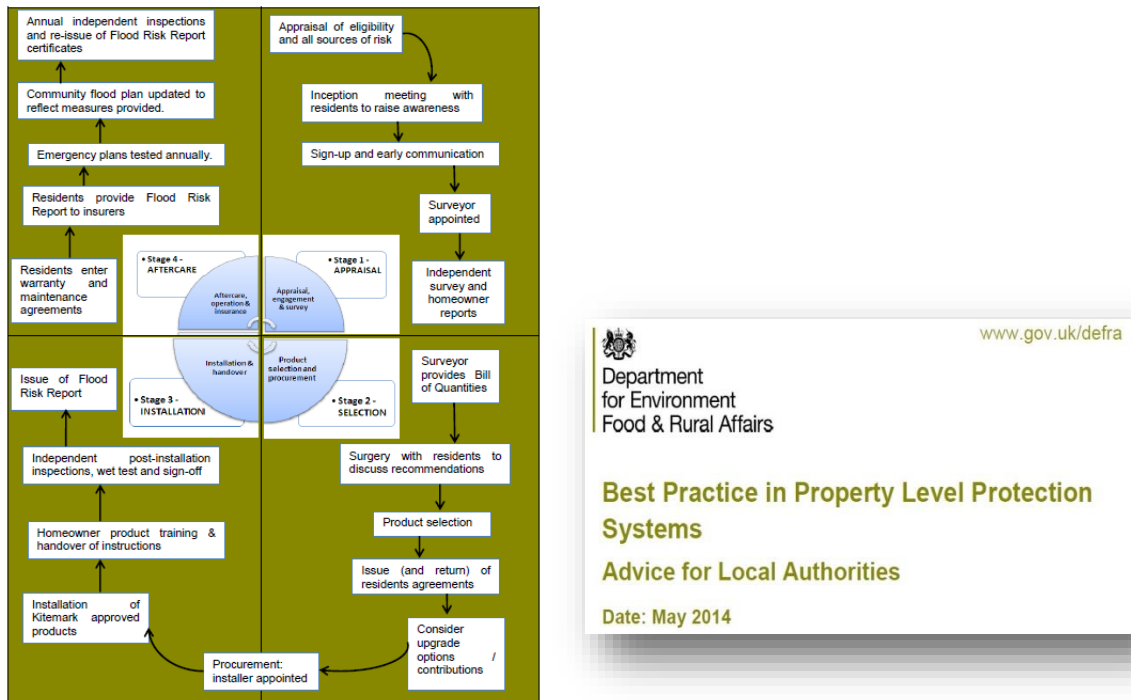
The PLP market has developed significantly in response to the Defra and Environment Agency (EA) grant schemes between 2009 and 2012. Reviews (<http://nationalfloodforum.org.uk/wp-content/uploads/Evaluation-of-the-Defra-PL-Flood-protection-Scheme-25918.pdf>) and feedback from people involved in the schemes highlighted the importance of independent flood risk property surveys by competent professionals. There was confusion amongst stakeholders and residents over the survey process and the differences between the 'Appraisal Survey' and the 'Suppliers Survey', noting they serve different purposes and require different skill sets. There was evidence that residents favour independence between the surveyor and supplier, to be confident that the appropriate choice of measures are installed in their property. At the same time an EU funded research project was undertaken by Manchester University, Manchester Metropolitan University and the Building Research Establishment as part of the **SMARTeST project**. This engaged a wide range of stakeholders to establish both the homeowner and local authority "Six Steps to Flood Resilience" guidance (Figure 2). This sets out the various planning, design and delivery stages involved in establishing PLP as part of an overall community flood resilience strategy.

**Figure 2: Six Steps to Flood Resilience**



Extensive flooding witnessed during 2012 provided the first real tests of both the PLP measures and homeowner emergency plans. An evaluation was undertaken on behalf of Defra to assess performance and learning points, informing the production of a **Best Practice guide published by Defra in May 2014**. A range of stakeholders involved in the planning, delivery and operation of PLP schemes were contacted in order to gather evidence of how these measures performed during the 2012 floods. This included local authority, EA and water company scheme managers and promoters; property flood risk surveyors; product manufacturers and installers, both individually and collectively via the former Flood Protection Association; the National Flood Forum; and homeowners and community groups. Evidence and views on both scheme performance and thoughts on best practice in PLP delivery were collected. The responses received revealed that where PLP measures were deployed and actually required during a flood, measures performed as intended and successfully mitigated against the effects of flooding in 84% of properties. This also highlighted additional learning points and issues relating to the products, their installation, operation, maintenance and storage; and in some instances the expectations, awareness and understanding of the residents involved. Problems were examined in more detail and recommendations made to share best practice through simple step-by-step guidance (See Figure 3).

**Figure 3: Steps in PLP – Defra Best Practice Guidance**



The **Property Protection Advisor** tool has also been developed for Defra, hosted on the National Flood Forum website ([http://nationalfloodforum.org.uk/?page\\_id=1275](http://nationalfloodforum.org.uk/?page_id=1275)) and providing residents with a report indicating the estimated cost of PLP measures for their property, either on an individual basis, or as part of a community scheme. It also serves to raise awareness of PLP and provide information on the variety of products available. Much of the best practice described above is also located on the National Flood Forum website.

The EA noted that PLP measures were effective in preventing water from entering properties in many cases during the 2012 flooding, although in some locations flood protection measures were not as effective as planned. Recommendations of how to achieve best practice to help with new PLP schemes were summarised into three main groups:

- To deliver a comprehensive scheme, the survey and design should consider all flooding sources and routes.
- Engagement with residents should clearly explain how the products should be used and the residents’ responsibilities.
- After care and installation needs to be considered and is an ongoing responsibility.

The EA best practice recommendations included:-

**SURVEY AND SCHEME DESIGN**

- We recommend that surveys are undertaken by independent, suitably qualified survey professionals. Note that under partnership funding there is no ceiling limit on the cost for PLP pre- and post- installation surveys.

- The pre-installation survey should look at all possible sources of flooding including rivers, the sea, surface water, groundwater, sewerage.
- The pre-installation survey should look at all possible routes by which water can enter the property. Ensure the survey looks at the walls of the property as a route of water entry to the building. Consider measures to make walls more resistant such as re-pointing and water-proofing treatments to external walls, both above and below damp proof courses.
- Consider whether PLP will be effective if properties are on permeable soils and do not have concrete floors. Concrete floors may also need to be sealed or tanked.
- Consider using manual or automatic under floor sump pumps where appropriate. Mains electricity powered pumps may not be appropriate as electricity supplies may be cut off during flooding.
- Consider combining PLP with other flood risk management interventions to ensure a more robust solution.
- Consider the duration for which flood water will surround a property and its impact on the effectiveness of PLP.
- In locations where a flood warning service is not available consider bespoke warning systems as part of the PLP package e.g. onsite water level alarms.

## ***ENGAGEMENT WITH RESIDENTS***

- Ensure the product is appropriate for both the property and for the resident.
- Be clear with residents about what is feasible with the funding available. Explain that expenditure over allocated grant will need to be topped up by contributions from residents or other sources.
- Be clear that residents own their PLP measures, that they are responsible for deploying their PLP measures and should plan how to do this. PLP measures will require regular checks and maintenance.
- Be clear on the benefits or effectiveness of PLP to residents.
- Residents should be aware of the height limit of the PLP supplied and that where the flood water level is above this, PLP will not give protection.
- Residents and installers should be encouraged to make the training as effective as possible. Consider a questionnaire with residents, post-installation to see if they feel adequately trained and retrain residents if necessary.
- Many residents may not have experienced previous floods. Residents should be encouraged to work within their communities to share resources, experience and knowledge. Use local resources to help them understand the context better.

## ***AFTER CARE AND INSTALLATION***

- When measures have been supplied complete the new Flood Risk Report template and hand this to the property owner.
- Encourage residents and community groups to run regular exercises to practice fitting their measures.
- Be clear that to be effective it is the resident's responsibility to store and maintain their PLP measures, in accordance with manufacturer's instructions.

PLP is one component of a suite of flood risk management tools that can be used to reduce the impacts of floods on people and property. An assessment of catchment flood management options is essential to ensure that PLP is an appropriate means of managing flood risk in the community. As with all risk management tools, the risk of property flooding remains and this has to be clearly communicated in order to manage expectations and ensure people and the community as a whole remain prepared and have emergency plans in place, reviewed and used. Examples of where PLP has been successful, such as seen in Appleby and Buckingham for example, serve to illustrate what can be achieved by fully engaged communities with a comprehensive package of PLP measures, with operational details described in effective emergency response plans, supported by regular flood group meetings and integrated multi- agency working. The best practice guidance aims to build on these examples and provide evidence that should encourage other flood risk communities to take such effective action themselves.

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