RIBA

Climate Change Toolkit

07 Designing for Flood Risk

175

1834–2009

Resilient Design

Resilient buildings are designed in such a way as to reduce the cost and time required to reinstate the property should it be flooded. Robust materials and finishes should be used, including hard floor surfaces that can be washed down, and solid wood rather than particle board or MDF for doors and fitted furniture in kitchens and bathrooms. Alternatively, finishes can be designed to be removable or sacrificial and easily replaced in the zone affected by flooding.

Special vent covers can be used to close ventilation bricks to prevent underfloor voids and cavities becoming flooded. However, solid floors rather than suspended timber floors are preferable. Insulation should be closed cell in order to reduce water take-up and minimise the time needed for drying out.

Electrical and heating systems should be distributed at high level rather than under the ground floor and drop down within walls to sockets and radiators. Electrical sockets are to be set above the flood level at dado rather than skirting level.

Solid walls finished in cement render systems or tiling, at least up to dado level, should be used in preference to timber stud partitions finished in plaster board.

Building fabrics and components should be designed and specified to be inherently resistant or resilient in order to achieve an end product that integrates both the functions required by the user and the need to mitigate the risk of flooding.

Detailed guidance on the design and specification of resilient buildings is available in the CIRIA document *Development and Flood Risk – Guidance for the Construction Industry* and *Improving the Flood Performance of New Buildings, Flood Resilient Construction* by CLG.

Design of Resistant Infrastructure

The infrastructure serving a scheme or wider neighbourhood should also be designed to be resistant or at least resilient to flooding.

Main utility supply routes for power, data and water should, if possible, be run in the area of lowest flood risk. Any electrical sub-stations and transformers should also be placed in the area of least risk and should be protected by flood defence enclosures if necessary.

Within buildings pump sets for water supplies should be raised above the design flood level along with electrical switch rooms, meter rooms, oil storage tanks, lift motor rooms and any other vulnerable plant. Sewerage systems in areas of flood risk should be fitted with non-return valves in order to prevent foul water backing up into properties.

Public Realm and Landscape

The public realm and landscapes too should be designed to withstand greater fluctuations in rainfall run-off and flooding. Native plants able to withstand periods of dry as well as wet, such as *Salix caprea* (Goat Willow), *Alnus glutinosa* (Alder) and *Hippophae rhamnoides* (Sea Buckthorne) should be planted in or near swales to prevent scouring and wash-out of surface drainage systems and to prevent debris from washing into and blocking storm water culverts.

Combining a Hierarchy of Mitigation Measures

The effective mitigation of flood risk is generally a combination of several different measures. A hierarchy of measures should successively reduce the impact of a series of worsening flood scenarios.

The first measure should be to raise accommodation levels above the flood level. If it is not possible to raise all the accommodation above the design flood level because it is necessary to provide level access to some parts of the building then these areas should be raised above the level of more frequent floods and designed to be resistant.

Should resistant measures fail to exclude flood waters parts of the building below the worst case flood level should be designed to be sacrificial in terms of the use and function of the property. In addition they should be designed to be resilient in order to minimise the cost of any damage and to speed up recovery time.

Within a building, whether commercial or residential, high-value fittings and essential functions should be located well above the flood level to give a degree of future proofing.

Finally safe refuge and access for the emergency services should be incorporated into the design.

Watergaten (Waterholes) project, 's-Hertogenbosch, Ronday Winkelaar Architects The Waterhole houses do not employ conventional foundations but instead respond to fluctuating water levels. www.rondaywinkelaar.nl.