A FLOOD RESISTANT BUILDING CODE?

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While the Building Code of Australia sets standards for buildings to resist bushfires, earthquakes and cyclones, there is currently no standard for flooding. This may change, as recent research reveals deficiencies in contemporary materials and designs.

The Australian Building Codes Board will be considering research undertaken by the CSIRO, the University of NSW and the University of Newcastle with support from the NSW Department of Natural Resources which shows that the majority of contemporary houses are highly vulnerable to component damage and structural failure when exposed to floodwaters. This is particularly the case should flooding exceed the local authority's designated minimum floor level.

Vulnerability of Buildings to Floods

Neil Watson of Victoria's Department of Sustainability and Environment advised Floodplain Manager that when floods swept through Shepparton in 1993, a mudbrick house returned to the very material from which it was made.

Yet even conventional building designs are susceptible to unexpected damage. What is often overlooked is that being flooded is not a normal design condition. However, if the risk of flooding is taken into consideration during building design, the building can have increased flood protection and durability at little increased cost, according to a paper presented at this year's NSW FMA conference.

The paper reported that research shows flooding can not only cause buildings to fail through the dynamic forces of floodwaters and debris but in several other ways as well.

Of particular note was testing undertaken on modern building materials such as composite timber products.

The research showed that:

- Both plywood and hardboard wall bracing lose 30% of their resistance to nail pull out when immersed for 96 hours.
- Both plywood and particle board (flooring) lose 50% of their strength from immersion.
- Glued "I" beams with oriented strand board webs lose around 50% strength from immersion.
- Metal web timber trusses lose around 35% of their strength from immersion.

This means that a modern house subject to shallow, low velocity, above floor flooding for more than a few hours could become structurally unsound.

The vast majority of contemporary houses are either brick veneer or full brick. Both consist of an external brick wall cladding tied to an internal load bearing wall. Brick walls are particularly susceptible to failure from unbalanced lateral pressure. This occurs during a flood if there is a significant difference between the inside and outside water levels due to limited entry or exit for floodwaters. The paper reported that this could occur with differences of as little as one metre.

High silt loads in floods can also be a concern. Silt can get trapped in cavities, holding moisture and leading to the gradual deterioration of building materials, as well as encouraging mould and creating smells and health-related problems.

Testing of building components was also undertaken to investigate the penetration of silt into wall cavities, possible methods of silt removal and drying times for concrete slabs after prolonged immersion.

A key finding was that the drying time for a 100 mm concrete slab on ground would be between two and three weeks, providing floor coverings are removed and good ventilation is available.

Anecdotal reports provided to Floodplain Manager from the 1990 Nyngan floods suggest that floor slabs took months to dry even when assisted by gas-fired dryers.

Drying times for other components, including various timber elements of houses, were obtained from literature and research. This revealed that in the Sydney area, timber wall framing in a brick veneer house will take up to 22 weeks to dry compared to seven weeks for the timber wall framing in a weatherboard house.

Existing Controls

Floodplain Manager canvassed subscribers and others to determine how building designs and materials are regulated in flood prone areas around the country.

The feedback showed that the vast majority of local authorities stipulate a minimum floor level but little else. Some specify that below this level the building must use flood compatible materials and/or resist the forces of a flood up to this level.

Of course there is always a risk that a flood will exceed the flood planning level and if it does, many houses may suffer significant damages which could be avoidable if adequately designed.

There does appears to be an emerging trend of councils specifying more stringent requirements for buildings in floodplains.

For example, Lismore Council, in Northern NSW, requires buildings to be able to withstand a 1 in 500 AEP flood.

Craig Ross, of Penrith City Council in Western Sydney, reports that it has recently required some new urban developments to maintain their structural integrity in the flood-of-record which has about a 200 year return period.

A draft development control plan being developed by Fairfield City Council in South Western Sydney is specifying that sensitive developments such as aged person

housing must resist the forces of floodwaters, debris and buoyancy up to the probable maximum flood.

Draft Guidelines

Guidelines are being drafted to help councils in Sydney's Hawkesbury Nepean Valley more clearly specify or advise on flood resistant building materials and designs. Because of the importance of preserving the structural integrity of buildings, the focus of the guidelines will primarily be on the structural components of the building and not its fixtures or contents. There is a particular need for such guidelines in this valley where floods can rise several metres above the 1 in 100 level.

The publish paper recommends that in the selection of materials, three basic characteristics should be kept in mind:

- Materials that are weakened when wet should be used with caution, particularly if they are used in structural components.
- Materials that are stable when saturated but are porous and readily absorb moisture should only be used in locations where good flow through ventilation will dry them effectively.
- Materials that are not adversely affected by water and do not absorb water readily are ideal for use in building (however, tradition and cost can inhibit the use of such materials).

Whilst the ability of the house structure to withstand immersion is dependent on good detailing, use of flood resistant material for structural elements is vital. In particular, special care needs to be given to the use of potential moisture absorbing components such as timer beams, particleboard flooring and fibreboard bracing to minimise decay and weakening or failure of the house structure

The paper suggests that to adapt a standard two-storey brick veneer house to flood-aware design principles to withstand a flood of record would cost an additional 5% in the total cost of the standard house. Structural enhancement will also improve recovery after floodwaters have receded.

Building Code of Australia Revisions

This research has been presented to the Flood Committee of the Australian Building Codes Board (ABCB) which is responsible for the Building Code of Australia (BCA). It is considering whether the BCA should be amended to include provisions for flooding in a similar way to the bushfire provisions.

The Committee includes government flood experts from states and territories around Australia, as well as representatives of the Master Builders Association (MBA) and the Housing Industry Association (HIA). It is looking at proposals to put flood standards within the BCA which local authorities can refer to when setting conditions for building and development approvals.

Neil Evans, the MBA representative, says he is keen to see the BCA used to provide some consistency. "At the moment there are state variations plus come local government variations," he said. He believes the focus needs to be on structural elements, not non-structural items. The BCA needs to set out what buildings should

be reasonably expected to withstand and avoid elements which would be difficult to replace or repair after a flood. What he thinks will be difficult is knowing where to draw the line between increased cost to build and decreased probability of failure.

The HIA committee member was on extended leave when contacted by Floodplain Manager and was not available to put his organisation's point of view.

Tas Twyman, the ACBC representative, says that even if the Committee agrees to the proposals before it, it could take some time before they find their way into the BCA. If recommended by the Committee, the ACBC will issue a technical amendment proposal accompanied by a regulatory impact statement for public comment. This will need to set out the form and cost of the proposed changes. Following consideration of submissions, the BCA may be amended. This would occur in "2007 at the earliest," Tas said.