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## Design of Masonry Structures for Earthquake in Australia

Electronic Blueprint and ENVIROSPEC provide building specifications and training, on safe and sustainable buildings, for architects, engineers and builders. Until the 1970's, there was no comprehensive design standard controlling the design of masonry buildings in Australia. These were designed by a combination of engineering judgement, rule of thumb and experience. Over the last thirty years, piecemeal introduction of loading rules and capacity rules has led to a situation where, using AS 3700-2001 *Masonry structures* with AS 1170.4-1993 *Earthquake loads*, traditional construction can no longer be justified in many cases. The simultaneous publication of AS 1170.4-2007 and AS 3700 Amendment 3 seeks to redress these anomalies.

The following paper covers:

- Probability of exceedance of load and probability of failure.
- Design of masonry at base of the building for in-plane base shear
- Design masonry walls for out-of-plane face load
- Geometric limitations on masonry building height.

Johnston, R.K, "Design of Masonry Structures for Earthquake in Australia", 14<sup>th</sup> International Brick & Block Masonry Conference, Sydney, Australia, 2008.



Recommendations include:

1. The BCA (Building Code of Australia) does not overtly regulate the probability of building failure, only the exceedance of loads. There are inconsistencies in the probabilities of exceedance of various loads (e.g. wind and earthquake load) in the BCA.
2. It is suggested that designers consider detailing housing to resist racking forces due to moderate earthquake, even though AS 1170.4-2007 exempts most houses.
3. Horizontal loads assumed using EDC I to be equal to 10% of seismic weight are often less than the corresponding values calculated using EDC II.
4. When considering the use of loadbearing unreinforced masonry, adhere to the height limits of AS 3700 Appendix AA.
5. For minor masonry structures and mezzanine floors supported by loadbearing unreinforced masonry within larger buildings, adhere to the restrictions in AS 3700 Appendix AA.
6. AS 3700 Appendix AA includes typical details for the incorporation of masonry into building subject to earthquake loads. It is suggested that reinforced masonry or reinforced concrete shear cores be incorporated into buildings supported by unreinforced loadbearing masonry.
7. The design process should include a check of vertical load capacity of all loadbearing unreinforced masonry elements (including piers), when subjected to the expected inter-storey drift.

For further information, please contact the publishers, University of Newcastle, Callaghan, NSW, 2308, Australia or Electronic Blueprint [www.electronicblueprint.com.au](http://www.electronicblueprint.com.au)