



Durability

Galvanized steel has been used successfully for over 60 years in light steel framing and other components in housing and low-rise residential buildings in Australia, Japan, France, USA and Canada. In the USA, nearly 500,000 homes have been built with steel framing over the past decade, which is evidence of great user confidence and an excellent track record. Modern light steel framing systems use sections that are cold formed from rolls of steel strip, which are hot-dip metallic coated to provide corrosion protection. Because of the rather casual use of the term 'galvanizing' within the building industry, it is not always appreciated that immersion of steel in molten zinc can create various products. Differing steels, different zinc alloys and variations in the process may be used to alter the character of the final coating.

Although Aluminum/Zinc/Magnesium (AM) coatings have been developed and are starting to become commercially available, the most common form of corrosion protection for cold formed steel sections is continuous hot-dip zinc coating (Z). Coated steel is usually produced with a standard Z275 coating according to AS 1397, corresponding to 275 grams of zinc per square metre summed over both faces of the steel strip (this level of coating is equivalent to approximately 0.02mm overall thickness of zinc per face). Zinc/Aluminium (ZA) coatings are also available, and are used preferentially for roofing and cladding applications.

The design life of a building or any part of it is defined in the New Zealand Building Code (NZBC) Clause B2: Durability¹. Typically, the normal design life of a building is 50-years, unless specified otherwise. The design life of a coated steel component consists of the life of the protection system plus that of the underlying steel. The design life of the protection system could be defined as the time period to the first major maintenance of the coating, when recoating or some other treatment is required to restore the total effectiveness of the protection. If there is no maintenance at this time, the coating would continue to deteriorate and the underlying steel would start to corrode. The design life does not represent structural failure of the component, and there may be a considerable margin between the design life of the protective system and potential structural failure.

Steel is thermally conductive, meaning that in cold conditions, heat from the warm interior will want to escape to the cold exterior, necessitating the use of thermal breaks for insulation, as described in the section on thermal and energy efficiency. This means that steel framing in the external envelope will be above the dew point and hence remain dry in service, preventing corrosion from developing over time. This is a very important factor in maintaining durability in NZ's cool, damp climate.

In recent research conducted by Lawson *et al.*², which received the prestigious Institution of Civil Engineers Howard Medal in 2010, extensive monitoring of cold formed steel sections used in housing has shown that the performance of zinc coated sections in internal environments is very good. By measuring the zinc loss on light steel framing in various applications and locations throughout Europe, it has been shown that the predicted design life of standard Z275 coating is over 200-years, provided that the building envelope is well insulated and properly maintained.

In addition to the durability of coated steel, the good performance of buildings using these light steel components is enhanced because:

- Steel does not shrink, warp or change its shape.
- Steel does not creep under load.

¹ New Zealand Building Code, Department of Building and Housing, Wellington, New Zealand, 1992, <http://www.dbh.govt.nz>

² Lawson R.M., Popo-Ola, S.O., Way, A., Heatley, T. and Pedreschi, R.: Durability of light steel framing in residential applications. Proceedings of the Institution of Civil Engineers, Construction Materials 163(2), 2010, pp. 109–121

- Steel has properties that remain constant over its life.
- Zinc coated steel is unaffected by water overflow (provided that this is an infrequent occurrence).
- Zinc coated steel does not suffer from fungal or biological deterioration.
- Any local damage can be identified and rectified.
- Steel is non-combustible, will not add to the fire load and will not support the spread of flame.
- Steel is not susceptible to insect infestation.
- Steel is of reliable and high uniform quality.
- Steel is not affected adversely by normal temperature ranges, and a well designed and built house will not crack due to changes in external temperature.

These properties are all aspects of durability and maintenance-free construction. Particularly important to the owner and builder is the reduced number of callbacks in light steel framing that would otherwise be necessary to rectify cracking caused by shrinkage and other movement of more traditional materials.



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