

# Engineering basis of NZS 3604

NZS 3604: 1999 *Timber framed buildings* is one of the most widely used Standards in building design. A BRANZ Study Report investigates how it is used, and asks whether it is time for a rethink.

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**N**ovember next year will see the 30th anniversary of the first publication of NZS 3604. The Standard it replaced, NZS 1900, Chapter 6.1, was only 36 pages long, and merely codified what had been standard building practice for many years. Today's document, after the addition of nearly 100 pages of tables resulting from the changes in timber grading, is now well over 400 pages, and is regarded by many in the industry as too big, too complex and too difficult to use.

## A designers' Standard

In reaching that size and complexity the Standard has moved out of builders' sheds and into the design office. It is now recognised (perhaps reluctantly) as a designers' Standard, used mainly by architectural designers. In fact, many of its users are now the structural engineers which it was originally intended to replace. How did this happen?

One reason is that the Standard reflects the increasing complexity of today's house designs. The simple single storey rectangular box is now a rarity, and the ambitious mansions that have replaced it place very high demands on the 'cookbook' approach that NZS 3604 uses. Those designers who use it regularly will be well aware of how frequently the solutions in NZS 3604 still fall short of the design problems they face on a daily basis. In spite of its increasing complexity and size, it has not really kept pace with the changes in building design.

Another reason is simply that, as greater knowledge is gained of the built environment, more products and systems are developed,



and new design features have become more common, there is an understandable desire to include them into the building control system. NZS 3604 provides an ideal vehicle for this process, and so there is a continuing demand to include more and more information in the document. Such 'content creep' invariably results in an increase in size and complexity.

## A timber framing benchmark

An important role for NZS 3604 is as a benchmark for the design of timber framing used in buildings. As an Acceptable Solution under the New Zealand Building Code, it sets out the standard against which any Alternative Solution must be judged. For example, manufacturers and suppliers and their designers whose products and systems

fall outside the scope of NZS 3604 (and even those who depart considerably) need to develop their own Alternative Solutions. They need to know exactly where the boundaries are, and what the fundamental basis is for the 'traditional' solution. NZS 3604, in encompassing the whole design process, also provides a framework for those systems which are outside the traditional timber stick framed approach (for example, steel framing, and panelised or prefabricated systems).

## Time for reassessment?

With another revision on the horizon, perhaps this is the time to step back and reassess what is really required from a timber framed building standard providing an Acceptable Solution to Clause B1 *Structure* of the Building

Code. The key question is, what information is needed and by whom, and what method of delivery should be used? Perhaps there is a need for a graduated series of documents, each aimed at a particular sector – builder, supplier, pre-nailer, designer and checker. We should be reassessing the fundamental need, and not just fine-tuning again.

The first step in such a reassessment process is to thoroughly understand where the current standard is coming from. If we are to meet the needs of the huge diversity of players in the industry, we need to fully understand the product we are to deliver. BRANZ has just completed a research project (funded by Building Research) which sets down the reasoning behind the provisions and selection tables in NZS 3604, with the intent of providing a starting point for future revisions, as well as a resource for providers of Alternative Solutions.

### **Back to basics**

Pared back to its basics, NZS 3604 is a series of pre-engineered solutions for the structural components of small to medium sized timber framed buildings. For example, components in the Walls Section include studs, plates, lintels, and sill trimmers.

By applying rigorous engineering rationale, together with the lessons learnt from a large number of experimental investigations over the years, the humble 4 x 2 (or 100 x 50, or 90 x 45) has been stretched out towards its full potential. This has been achieved by considering the contributions made to strength and stiffness by attached linings and claddings, load sharing available

from adjacent construction, and built-in redundancies.

The recently published Amendment 2, incorporating timber grading changes, was based on a comprehensive series of spreadsheets built up from scratch, based on structural engineering design principles. With access to these spreadsheets, as well as a detailed knowledge of the drafting committee's deliberations over the last 30 years, it was possible to uncover the assumptions made, and set them out for the benefit of the industry. Questions such as how much load sharing, what strength model or loading algorithm, what timber moisture content, and what end fixity were used in the derivation of the selection tables of NZS 3604 have now been answered and are freely available.

*The BRANZ Study Report SR168 'The engineering basis of NZS 3604' is available to download free from the BRANZ website, [www.branz.co.nz](http://www.branz.co.nz). To order a paper copy, phone 0800 80 80 85. ◆*