Wood preservation

A Scion Impact Statement 2010

Scion's wood preservation research underpins new legislation in New Zealand's Building Codes, permitting annual savings of at least $12 million and streamlining timber selection for the construction industry.

The Department of Building and Housing is developing legislation that will streamline the use of preservative treated timber in New Zealand by recommending the adoption of H1.2 as a single hazard class for framing timber within buildings.

Only boron treatment is specified in the new standard, although Light Organic Solvent Preservatives (LOSP) to Hazard Class H3.1 will still be allowed. This change will simplify matters for builders and provide spill over benefits in safety and health.

This new legislation is supported by Scion's work in wood durability assessment which is itself based on over 50 years of research and knowledge in wood preservation and wood durability performance.

BACKGROUND

Radiata pine comprises almost all of the wood used for construction in New Zealand. This wood is not naturally durable and therefore requires the application of a preservative such as boron to protect it from attack by insects and fungi.

In 1995 changes to the NZ Building Code permitted the use of untreated kiln-dried framing for buildings on the assumption it would remain dry at all times. Unfortunately a combination of poor design, poor building practices and lack of knowledge of new building products[1] led to much of this framing getting wet and subsequently rotting.

Whilst not directly contributing to the cause of leaks, the widespread use of untreated, kiln dried timber for framing in houses prone to leaks vastly increased the costs of repairs.

Changes to the New Zealand Standards and Building Code

As a result of the "leaky home" issue, a complete revision of the NZ Building Code took place in 2003. As part of this process, changes were made to New Zealand Standard 3602 "Timber and wood-based products for use in buildings" and the specifications for wood preservation in New Zealand (MP3640:1992).

This revision served to complicate matters by significantly expanding timber treatment requirements and changing the Treatment Hazard Classes, in particular Hazard Classes 1 and 3. In general, most external wall framing comprises predominantly H1.2 treated timber however H1.1, or untreated timber can also be used in some low-risk situations such as internal walls, whilst a smaller amount of H3.1 is required in higher risk areas (see Table 1 below):

[1] Don Hunn, Ian Bond & David Kernohan 17th August 2002

Table 1[2]

Hazard class	Exposure	Service conditions	Biological hazard	Typical uses
H1.1	Protected from the weather, above ground	Protected from the weather, always dry	Borers	Interior finishing timber – see NZS 3602
H1.2(1)	Protected from the weather, above ground, but with a possibility of exposure to moisture	Protected from the weather, but with a risk of moisture content conducive to decay	Borers, decay	Wall framing – see NZS 3602
H2	Protected from the weather, above ground	Protected from the weather, dry, exposed to ground atmosphere where well-ventilated but not in contact with the ground	Borers, termites	Framing timber in Australia
H3.1	Exposed to the weather, above ground	Periodic wetting, not in contact with the ground	Decay fungi and borers	Cladding, fascia, joinery – see NZS 3602
H3.2	Exposed to the weather, above ground, or protected from the weather but with a risk of moisture entrapment	Periodic wetting, not in contact with the ground, more critical end uses	Decay fungi and borers	All H3.1 uses, plus structural and decking – see NZS 3602

The complexities of the different classes has caused confusion across the industry and created an environment which encouraged many builders and designers to use H3.1 treated timber in all cases, partly to minimise the risk of using the incorrect class and because of the perception of increased durability. The net effect is increased cost for the consumer and an unnecessary use of chemicals.

In its industry consultation document the Department of Building and Housing alleged "There is strong evidence of over-specification in construction projects, where timber of unnecessarily high treatment class is being used in low-risk applications, leading to additional costs and difficulties in construction, mill supply procedures, merchants' inventory management and downstream management of treated timber waste".[3]

In addition all H3.1 treated framing timber is treated with Light Organic Solvent Preservatives, which are associated with health and environmental concerns.

Terry Lemon, Director of A & T Timber Solutions, Rotorua is particularly in favour of the health benefits of boron treatment over LOSP but also believes that provided there is a broad acceptance by Councils and Designers of the single hazard class, stock levels could be reduced by around 10 - 20% freeing up capital and reducing interest costs. He predicts however, that the consumer will reap the greatest benefits, with less room for design/ construction errors, and the cost of H1.2 treated timber being lower than H3.1.

Scion's research

In 2002 at the request of the Wood Preservation Suppliers, Scion commenced decay trials and tested experimental formulations on the timber treatments used at that time for framing in New Zealand

[2] NZ Standard 3640 : 2003

[3] Consultation on proposals for a single hazard class for framing timber inside the building envelope – Department of Building and Housing 2010

From these trials it was concluded that a preservative treatment to protect framing was needed to allow time for any leaks to be found and rectified. A realistic timeframe for this safety margin was identified as being up to five years in most cases.

Over the next six years, the research identified that[4]:

1. Boron at a minimum retention of 0.4% mass/mass boric acid equivalent (BAE), i.e. H1.2 retention, provided an acceptable level resistance to decay on framing within the building envelope which might suffer an occasional wetting;

2. There was no greater protection provided by H3.1 LOSP preservative treatments than from H1.2 boron treatment; and

3. Whilst Boron is not a leach-resistant preservative the durability performance of the approved H1.2 retention was found to be equal to that of the LOSP H3.1 treatments. Thus it was effective on wet timber over prolonged periods and under favourable decay conditions.

A Single Hazard Class
On the strength of these results, the Department of Building & Housing has recommended the adoption of H1.2 as the single hazard class for timber framing inside the building envelope. The only exception to this rule is the critical performance of cantilevered deck joists, which would need to be treated to H3.2 hazard class[3].

Cost of Research and Resulting Benefits
With contributions from Industry totalling some $200,000 over 8 years and $50,000 from the Foundation for Research, Science and Technology, the cost of the research has been relatively small compared to the expected return on investment. Savings on treatment costs, based on total timber framing volume = 870,000 m^3 per annum @100% framing H1.2 have been estimated at around $12 million per annum[3].

On top of this saving the timber industry expects to make significant gains in productivity and efficiency through:

- Reduced labour/handling costs;
- Reduced waste;
- Reduction in the number of product lines;
- Reduction in product turnaround times; and
- Reduction volumes of timber held by merchants

[4] Durability of Boron-treated radiata (2009) Hedley, M, Page, D, van der Waals, J, Nasheri K, and Durbin G, Build pp 36-37 April/May

All the above benefits, coupled with a simplification of the building consent and inspection process, will have a positive effect on the overall cost to the consumer.

Steve Roberts, Sawmill Manager of Red Stag estimates the financial and health benefits of adopting boron treatment over LOSP will be enormous. He believes the savings in treatment costs alone will amount to some $76,000 per month whilst the reduction in stocklines will equate to around $10,000 per month. In addition LOSP treated wood contains around 19% aromatics, mostly benzene (highly toxic and flammable) and must be stored for between 10 to 20 days depending on the season to "flash off". At a cost of $12 per m3 this works out at around $24,000 per month which will be another significant cost saving if boron replaces LOSP. Pre-banding will also be possible saving a further $100,000 per annum.

However over and above all these savings is the safety aspect for those handling the wood. LOSP treatment is highly toxic and can penetrate the skin attacking the body's organs, eventually resulting in death and this, for Steve is the overriding reason that boron treatment should replace LOSP as quickly as possible. A further reason, if anymore were needed, is that as boron is non-toxic it can be ground into fertiliser resulting in a saving on imports of boron for fertiliser.

He agrees that the consumer will also benefit twofold - their house will be built with non-toxic wood framing and of course H1.2 treated wood is significantly cheaper than H3.1.