IRG/WP 04-20288

THE INTERNATIONAL RESEARCH GROUP ON WOOD PRESERVATION

Section 2 Test methodology and Assessment

Changes to New Zealand Timber Treatment Specifications

Mick Hedley,
Forest Research, Rotorua, New Zealand

Prepared for the 35th Annual Meeting
Ljubljana, Slovenia
6-10 June 2004

IRG Secretariat
SE-100 44 Stockholm
Sweden

Changes to New Zealand Timber Treatment Specifications

Mick Hedley,
Forest Research, Rotorua, New Zealand

ABSTRACT

Changes have been made to the New Zealand timber treatment specifications in response to frequent incidences of decay in framing timber and doubts about the long-term performance of tributyltin formulations when used in exposed situations.

Changes have been made to Hazard Class H1 to allow a level of treatment to provide short to medium decay resistance to framing which would protect it, should leaks in the building envelope develop, until such time as those leaks are detected and rectified.

Changes have also been made to Hazard Class H3, so that use of tributyltin light organic solvent preservatives is restricted to those products whose structural integrity is not critical to a buildings long-term performance.

These changes have been included in a 2003 revision of the NZ Timber Preservation Council Specifications which are now published as NZS 3640:2003 "Chemical preservation of round and sawn timber". They have been undertaken in conjunction with changes to other Standards and Codes which affect the use of timber in NZ building construction.

INTRODUCTION

The New Zealand wood preservation standard: NZS 3630:2003 "Chemical preservation of round and sawn timber" has recently been published. It now recognises two sub-classes within Hazard Classes H1 and H3. The reasons for this are the subject of this paper.

In 1999 the New Zealand news media's attention was drawn to failure through decay of untreated softwood framing in relatively new constructions. The use of untreated kiln-dried framing had been introduced in 1995 in an amendment to NZ standard NZS 3602 'Timber and wood-based products for use in buildings", whose new provisions were immediately adopted by the NZ Building Code - a document published by the Building Industry Authority (BIA) - compliance with which is mandatory for all domestic construction in New Zealand.

It was therefore ironic that cause of most failure was lack of weathertightness of cladding systems; a clear contravention of the Building Code which requires buildings to be constructed so that they do not leak.

As reports of failures continued unabated in 2000/02, the BIA was prodded - somewhat tardily, according to some commentators - into commissioning an overview of likely causes of failure of building envelopes.

The outcome was the Hunn Report (Hunn *et al.* 2002) which identified many issues associated with leaking buildings, including poor designs, lack of knowledge by builders of new building products, inadequate documentation supplied for building consents and inadequacies in the Building Code and related documents. While not contributing to the causes of leaks, the widespread use of untreated, kiln dried timber for framing in houses prone to leaks, vastly increased the costs of repairs

The introduction of untreated framing came at a time when building design and construction methods were changing. Condominium style apartment blocks 2-3 storeys high became common in inner city developments, designed to give "The Mediterranean Look" with narrow or no eaves, complex designs with a multiplicity of junctions. Monolithic claddings became the vogue, with stucco being common. Rigid fibrecement boards on to which plaster finished were applied, were fixed directly to the exterior wall framing. Window designs required complex flashings, but there was scant knowledge among builders how these should be fixed and they were frequently omitted from the final building.

While not addressing the primary cause of the problem (water ingress through faults in the building envelope), manufacturers of Exterior Insulated and Finish Systems (EIFS) proposed that in order to minimise decay as a result of leaks, exterior framing should be given some form of preservative treatment which would protect the timber should leaks develop. The minimum level of treatment which would comply with the then current wood preservation specifications was to Hazard Class H3 level. Treatment to this level was taken as admission of total defeat, since it implied acceptance of the exposure criteria for H3 "Above ground, exposed to the weather".

What was proposed was a level of treatment which would protect timber from decay should framing get wet, until such time as causal leaks were detected and permanently rectified. Thus it would provide a "window of opportunity" of, say, five years to detect and rectify leaks, with the knowledge that the preservative treatment would protect framing from decay during that time and there would be no requirement for wholesale replacement of framing should it have been untreated.

A limited (in time) testing programme at Forest Research had shown a number of treatments could probably meet the required criteria and these were:

TBTO or TBTN to a retention of 0.06% Sn mass/mass
IPBC to a retention of 0.025% mass/mass
Borates to a retention of 0.4% BAE mass/mass.

Retentions were those in the total sapwood cross-section which required complete penetration with the preservative solution.

This became known as "H1 Plus" treatment, i.e. a level of treatment somewhere between untreated or H1 (purely insecticidal) treatment and H3 treatment. It was proposed by a majority - but not all - manufacturers of EIFS systems that their cladding products would only be warranted if fixed to "H1 Plus" treated framing.

There was no intention at the time to "formalise" this treatment by including it in preservation specifications; the informality being emphasised by the term "H1 Plus". It was, however, proposed that it be included in an amendment to the New Zealand Building Code. This was to prove unworkable, because provisions in the Building Code have to be based on existing Standards for certification of compliance with the Building Code.

CHANGES TO THE STANDARD

At the beginning of 2003, specifications for wood preservation in New Zealand were contained in the document MP 3640:1992 "Minimum requirements of the NZ Timber Preservation Council Inc". Although published by Standards New Zealand, as its name suggests, it was compiled by the NZ TPC, which was solely responsible for its content and, unlike a full standard, any amendments did not require public review.

A decision was made in 2003 to raise MP 3640 to a full New Zealand Standard, which provided an opportunity for a complete revision. This was undertaken in conjunction with a revision of NZS 3602 "Timber and wood-based products for use in buildings" - the principle standard which determines which timber and wood-based-products can be used in particular situations in buildings - and a revision of the NZ Building Code, published by the NZ Building Industry Authority.

Whereas the preservative treatment standard only assigns preservatives and retentions to six Hazard Classes, durability requirements (and hence the level of preservative treatment) in NZS 3602 and, more importantly, the NZ Building Code, are specified according to a service life expected of them. Thus, structural timbers which are used in critical situations and are difficult to replace, such as foundation piles, exterior beams or bearers and framing, require a minimum service life of 50 years. Timber materials which are not critical to the structure and which are moderately easy to replace, such as exterior joinery and weatherboards, require a minimum of 15 years durability.

Thus, an H3 level of treatment could be required weatherboards for 15 years, or to protect beams or bearers exposed to the weather for 50 years. Because of doubts about the long term durability of exposed timbers treated with tin-based LOSP formulations (Hedley, 2003), both NZS 3602 and the Building Code wished to exclude such treatments from products requiring a minimum of 50 years durability.

A decision was therefore made to formalise the "H1 Plus" level of treatment within Hazard Class H1 and to revise Hazard Class H3 so that tin-based LOSP treatments could be restricted to products requiring only a minimum of 15 years durability.

Logically and ideally, "H2" would have been more appropriate, but in Australasia Hazard Class H2 is reserved solely for timber which will remain dry and the principle biological hazard is termites. There is no provision within that Hazard Class for decay resistance treatments.

HAZARD CLASS H1

The new wording describing Hazard Class H1.1 and H1.2 is shown in Table 1

Table 1. Hazard Class H1 descriptors

Hazard Class	Exposure	Service Conditions	Biological Hazard	Typical Uses
H1.1	Protected from the weather, above ground	Protected from 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 weather, but with a risk of moisture content conducive to decay	Borers, decay	Wall framing – see NZS 3602

(1) Sub-class H1.2 is often referred to as H1 Plus.

The standard also requires lumber to be branded to identify the treater and the Hazard Class to which it has been treated. For many years, extensive use was made of strip branding, either by ink rollers or by incising, along the length of each piece of timber. Changes in the infrastructure of sawmilling and treatment industries, often meant that the miller (who also dried and machined the wood) did not know whether or not his product was destined for treatment and thus there was now no opportunity to strip brand at the planer head during framing manufacture. Also, much timber was now machine graded, a process which left different coloured ink marks along each piece to signify the grade and there was now scant room for any other information to be included on the piece!

While it was perfectly feasible to end brand at the treatment plant, the majority of timber framing is now built at pre-nail factories; the ends of the timber are removed and if the treatment was colourless (e.g. with LOSP), there was now no way of distinguishing this from untreated timber.

Table 2 Approved preservatives and retentions in Hazard Class H1

Preservative Type	Component	Retention % m/m oven dry weight of wood	
		H1.1	H1.2
Waterborne Preservatives			
CCA	As	0.04	
CCA	Cu+Cr+As		0.20
Boron compounds -			
Hardwoods core	H_3BO_3	0.20	Not applicable
Softwoods (wet) core	H_3BO_3	0.10	Not applicable
Softwoods x-sect	H_3BO_3	0.10	0.40 (1)
Light Organic Solvent Preservatives			
Synthetic Pyrethroids -			
Permethrin		0.0060	Not applicable
Cypermethrin		0.0060	Not applicable
Deltamethrin		0.0006	Not applicable
TBTN, TBTO	Sn		0.06
Permethrin + IPBC (2)		Not applicable	0.006 + 0.025

NOTE –

(1) This cross section retention is required whether the material is sampled wet, where the timber is intended to be air dried, or on the dry timber.

(2) IPBC shall be used only in combination with permethrin and a minimum combined concentration of 3.5 % waxes and hydrocarbon resin in the treating solution.

The treatment standard (and Building Code) now requires colouring to be added to some framing treatments so that the level and type of treatment is readily identified as shown in Table 2:

Table 3 Colour Coding for Timber to be used as Framing

Hazard Class	Preservative	Colour (1)
H1.1	Boron, permethrin	No added color
H1.2	TBTO, TBTN or IPBC/permethrin	Blue (2)
	Boron	Pink (3)
H3.1	TBTO or TBTN	No added color (4)
	Propiconazole & tebuconazole /permethrin	
H3.2	CCA, Alkaline copper quaternary, CuAz, CuN	Green(5)

This requirement is only now being introduced, so there is no information on how successful this approach will be in identifying the timber on construction sites.

HAZARD CLASS H3

The division of Hazard Class H3 into two sub-classes to accommodate different durability requirements of products used in this situation has proceeded relatively smoothly. The new descriptions are shown in Table 3

Table 4 Hazard Class H3 descriptors

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	Structural, decking - see NZS 3602

Table 5 Minimum preservative retention in the H3.1, H3.2 analysis zone

Preservative type	Component	Retention %m/m oven dry weight of wood	
		H3.1	H3.2
Waterborne Preservatives			
CCA	Cu + Cr + As	0.37	0.37
Alkaline copper quaternary	Cu + DDAC	0.35	0.35
CuAz	Cu + azole	0.2288	0.2288
Light Organic Solvent Preservatives (LOSPs)			
CuN	Cu	0.10	0.10
Propiconazole & tebuconazole (1:1)	Propiconazole + tebuconazole	0.06	Not approved
TBTO, TBTN	Sn	0.08	Not approved

H3.1 timbers can be treated with LOSP or waterborne formulations, but H3.2 is restricted to copper-based waterbornes (CCA, ACQ and CuAz) or copper naphthenate LOSP. Essentially, H3.1 is for products which will be painted in use whereas H3.2 is for non-painted structural timber. Since there are a number of H3.1 products which are not required to be painted, or traditionally haven't been painted, such as plywood sheathing and some weatherboards, it was not convenient to divide H3 in the manner which it has been in the AWPA Use Category system (painted and non-painted sub-classes).

REFERENCES

Hedley, M E. 2003. Issues facing wood preservation in New Zealand today. International Research Group on Wood Preservation Document No. IRG/WP 03-30328

Hunn, D, Bond, I and Kernohan, D. 2002. Report on of the overview group on the weathertightness of buildings to the Building Industry Authority.