



Department of
Building and Housing
Te Tari Kaupapa Whare

Investigation into TimberSaver Treated Framing Timber - Final Report



Investigation into TimberSaver Treated Framing Timber

Findings

1. This is the final report on the issues raised in the media in July 2005. This report follows the interim report released in August 2005. This report is based on tests undertaken by BRANZ Ltd, as well as other information gathered following the release of the interim report. This report concludes that:
 - providing the TimberSaver treated framing timber was and is used in accordance with the conditions of use, it will meet the performance requirements of the Building Code;
 - the conditions of use are practical, and not dissimilar to those of other treated timber products; and
 - manufacturers and builders' merchants need to ensure a practical means of allowing builders and building officials to identify how long timber treated with TimberSaver has been exposed to weathering.
2. Specific recommendations are that manufacturers and builders' merchants:
 - ensure that prior to being used that treated timber, is transported, handled and stored such that it is protected from weathering, where this is necessary to protect the efficacy of the treatment system; and
 - provide information to users, with each sale, about how to use the treated framing timber, and its conditions of use.

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Executive Summary

3. The issue of how well TimberSaver treated framing timber performs was raised in July 2005 via the media. The Department of Building and Housing conducted an initial investigation and released a preliminary report in August 2005. The recommendations in that report included:
 - no basis was found for withdrawing TimberSaver treated framing timber from the market or revoking its certification;
 - there was a need to ensure adequate information be made available to users on how the TimberSaver treated framing timber should be used;
 - more information was needed on how TimberSaver treated framing timber performed with respect to the performance requirements of the Building Code; and
 - further examination was needed to determine if any evidence of product failure was beginning to emerge.
4. TimberSaver is a boron based treatment for framing timber which creates a protective envelop around the outside of a piece of timber. When the timber is moistened or wetted, the preservative is diffused into the timber. This is different from treatment systems that conform to New Zealand Standard 3640, where preservative must penetrate sap wood at the time the preservative is applied to the timber. TimberSaver treated framing timber does not conform to requirements of New Zealand Standard 3640.
5. TimberSaver was appraised by the Building Industry Authority and granted accreditation as meeting the performance requirements of specific clauses of the Building Code if used in accordance with the terms and conditions of use set out in the Appraisal Certificates.
6. The Department commissioned BRANZ Ltd to undertake tests on TimberSaver Treated framing timber to determine how the timber performed with respect to weathering. This report is mainly based on the information derived from the BRANZ Ltd tests.
7. The BRANZ Ltd tests show that preservative leaches from framing timber treated with TimberSaver, when the timber is weathered. In some circumstances, a significant amount of preservative was leached from the samples, leaving insufficient preservative present in the timber to provide protection against decay. However, in these cases, the weathering the timber was exposed to was in excess of that recommended as the maximum exposure in the Appraisal Certificates for the framing timber treated with TimberSaver.
8. No evidence was found of the TimberSaver treated framing timber failing where it had been used. This was based on information from within industry and the Weathertight Homes Resolution Service.
9. This is the final report on the issues raised in the media in July 2005. This report follows the interim report released in August 2005. This report is based on tests undertaken by BRANZ Ltd, as well as other information gathered following the release

of the interim report. This report concludes that:

- providing the TimberSaver treated framing timber was and is used in accordance with the conditions of use, it will meet the performance requirements of the Building Code;
- the conditions of use are practical, and not dissimilar to those of other treated timber products; and
- manufacturers and builders' merchants need to ensure a practical means of allowing builders and building officials to identify how long timber treated with TimberSaver has been exposed to weathering.

10. Specific recommendations are that manufacturers and builders' merchants:

- ensure that prior to being used that treated timber, is transported, handled and stored such that it is protected from weathering, where this is necessary to protect the efficacy of the treatment system; and
- provide information to users, with each sale, about how to use the treated framing timber, and its conditions of use.

11. The Department will write to manufacturers, producers and builders' merchants about the findings of the investigation and provide guidance on the use of treated timber.

Investigation into TimberSaver Treated Framing Timber

Final Report

Purpose

12. This report outlines the Department's findings with respect to the issues raised about TimberSaver boron treated framing timber, also sold as T1.2. This report should be read in conjunction with the preliminary report released in August 2005, *Investigation into TimberSaver Boron Treated Framing Timber – Preliminary Report*, as the interim report summarises the specific performance concerns raised via the media and provides contextual information about the investigation.
13. This report is based on tests undertaken by BRANZ Ltd, which was commissioned by the Department to conduct a number of scientific tests on how TimberSaver treated timber performed when exposed to weathering.

Background

14. A number of issues were raised via the media about the durability of the timber treatment process using a product called TimberSaver boron or sold as T1.2. In brief, the concerns raised focused on:
 - the accreditation process used by the Building Industry Authority to assess the efficacy of the TimberSaver treated framing timber and its accreditation to CodeMark;
 - builders' merchants supplying TimberSaver boron treated framing timber to builders where other timber may have been specified (eg, timber that meets the H1.2 hazard class conditions that are specified in NZS3640); and
 - the information supplied to merchants and builders describing the requirements for storing, handling and using framing timber that has received envelope¹ boron treatment.
15. At the time these concerns were raised, a request² was made to withdraw the product from the market until full and adequate testing of in-service durability and leaching had been carried out.
16. The Department completed a preliminary investigation and released a report in August 2005.
17. TimberSaver treated framing timber is no longer available, although other products using similar treatment processes are available on the market.

Investigation Process

18. The investigation process used by the Department consisted of three elements:

¹ Envelop treatment refers to a treatment where preservative is brushed, sprayed or dipped on to a piece of timber, creating a protective layers around the timber. In the case of TimberSaver, the preservative then diffuses into the timber when the timber is wetted.

² See the interim report *Investigation into TimberSaver Boron Treated Framing Timber – Preliminary Report*

- i. Interviews with people within the industry
 - ii. Field investigations undertaken by BRANZ Ltd, and in addition performance testing of timber treated with TimberSaver boron
 - iii. A review of some aspects of the accreditation process used by the Building Industry Authority.
- 19. The preliminary report released in August 2005 was drawn from the first element — interviews with manufacturers, researchers, building officials, merchants and those who raised the concerns through the media.
- 20. The third element was undertaken by PricewaterhouseCoopers, and was discussed in the preliminary report.
- 21. This report is based on the findings of the second element — the work completed by BRANZ Ltd, on behalf of the Department.
- 22. The findings of the preliminary report were:
 - No evidence was found or presented that demonstrated that timber treated with TimberSaver boron did not perform to the performance requirements of the New Zealand Building Code. Consequently, there was insufficient evidence to warrant consideration of revoking the certification of TimberSaver boron as an envelope treatment solution that meets the requirements of Clauses B1 Structure, B2 Durability and F2 Hazardous Building Materials of the New Zealand Building Code.
 - Issues were raised about some aspects of the robustness of the product testing and accreditation process in this case. It was concluded that it would be prudent for these matters to be looked into further.
 - Some evidence was found to suggest that there was substance to concerns about the availability of information on how to handle and use timber treated with TimberSaver boron.
- 23. Recommendations of the preliminary report derived from the findings were:
 - advising builders' merchants that:
 - i. timber treated with TimberSaver is an accredited product and therefore meets the nominated Clauses of B1 Structure, B2 Durability and F2 Hazardous Building Materials of the New Zealand Building Code, provided it is used in accordance with the conditions specified in the Appraisal Certificates and the manufacturer's recommendations;
 - ii. it is important to ensure that builders and/or users of timber treated with TimberSaver boron are made aware of the conditions of use, and are able to readily acquire associated products for treating cuts, holes and notches as detailed in the Appraisal Certificate; and
 - iii. TimberSaver boron treated timber is not synonymous with treated timber that specifically meets the requirements of NZS 3640;
 - field sampling be undertaken by BRANZ Ltd to determine whether there is any evidence of *in-situ* product failure;

- a peer review of the research findings used to assess the products' performance as part of the accreditation process be undertaken; and
- consideration be given to practical means of determining how long timber treated with TimberSaver boron may have been exposed to weathering.

24. Following the interim report, the Department:

- released information³ on how to use TimberSaver boron treated framing timber in July 2005; and
- contracted BRANZ Ltd to undertake field sampling and performance tests of the timber treated with TimberSaver boron.

25. The Department had established through an independent review, undertaken as part of its preliminary investigation, that the Building Industry Authority had followed its established procedures to accredit TimberSaver. The Department did not undertake a peer review of the research findings used to assess the products' performance as discussed in the preliminary investigation. After consideration, it was decided that findings of research on the actual performance of the product would better inform the Department and the sector of any further issues about timber treated with TimberSaver boron.

Requirements of the Appraisal Certificate Issued for TimberSaver Treated Timber

26. The Appraisal Certificates for TimberSaver treated timber placed the following conditions on the use of TimberSaver treated timber, and included that it:

- is limited to treating framing timber up to a maximum of 45 mm thick and maximum of 290 mm wide
- can only be used where the in-service moisture content is 20% or less and the timber is not exposed to the elements or subject to regular wetting
- must be stored under cover and clear of the ground
- must not be exposed to the weather for longer than two months, including all periods of storage, transportation and construction.
- has cut ends more than 1.5 x cross-sectional area of the timber and bored holes greater than 25 mm diameter, liberally coated on site with brush-on PROTIM® FrameSaver™
- is site treated as described above where machining, rebating, notching, ripping or planing of surfaces occurs.

27. This is important contextual information, as the conditions of use state how TimberSaver treated timber is expected to be used. In particular, the requirements for weather protection; specifically not more than two months exposure to weather; provides the basis for the tests undertaken by BRANZ Ltd.

BRANZ Ltd Report

28. Some of the conditions of use set out in the Appraisal Certificates for timber treated with TimberSaver are that it:

- must be stored under cover and clear of the ground;
- **must not be exposed to the weather for longer than 2 months**, including during storage, transport and construction;

³ Building Controls Update No.22 - Guidelines for the specification and site handling of TimberSaver boron treated framing

- is only used where the in-service moisture content is 20 percent or less; and
 - the timber is not exposed to the elements or subject to regular wetting.
29. BRANZ Ltd was contracted to undertake field investigations and to undertake some performance testing on timber treated with TimberSaver boron. The purpose of field investigations was to identify any cases where *in-situ* failure had occurred in buildings constructed using timber treated with TimberSaver boron.
30. BRANZ Ltd found:
- No 'problem sites' following discussions with industry representatives and the Weathertight Homes Resolution Service. Consequently, no invasive testing of buildings was undertaken.
31. BRANZ Ltd was also contracted to undertake weathering testing. It did this by three means:
- a) Taking sample frames, and placing them at the BRANZ Ltd exposure site at Judgeford for between 10 and 12 weeks
 - b) Taking small scale frame samples and subjecting them to accelerated weathering by cyclic rain exposure using a 'Cyclic Rain Rig';
 - c) Taking small scale frame samples and subjecting them to accelerated weathering by continuous high humidity conditions using a 'fog room'.
32. The purpose of the three test regimes (natural weathering, cyclic rain exposure and fog room testing) was to determine how much of the TimberSaver boron treatment was leached from the sample frames. Establishing this would provide data about the efficacy of the treatment process after timber treated with TimberSaver boron had been exposed to rainfall on a construction site.
33. It is important to note that a condition of use associated with timber treated with TimberSaver boron is limiting the exposure of the timber to weathering to a period of two months.

Exposure Site Test Results

34. The exposure site test was undertaken at BRANZ Ltd's Judgeford exposure site. Large scale frame samples were vertically mounted and north facing. Control specimens were taken from the timber used to make the frames. The frames were exposed to natural weathering for between 10 and 12 weeks. Rainfall of 160mm was recorded during this period. This rainfall was below the mean two-monthly rainfall for the region of 200–220mm.
35. Samples from the exposed frames (200mm sections) were removed and sent, along with the relevant control specimens, to AgriQuality for quantitative analysis of the boron content. The method used by AgriQuality to test the boron content of the samples was based on AS/NZS 1605:2000.
36. The BRANZ Ltd report states, based on data from ENSIS (formerly part of the Forest Research Institute) that 0.15% BAE (a measure of boron content in treated timber) is the lowest amount that effectively controls decay. The exposed specimens from the BRANZ Ltd exposure site had a mean boron content, after weathering, of between 0.42% and 0.48%. Compared to the control samples, the weathering process resulted in a reduction of boron content of between 34% and 47%.
37. The results of the analysis show that boron was leached from the timber during natural weathering. In other words, preservative was lost from the timber samples

because of exposure to weathering. However, in all samples tested sufficient boron treatment was retained to remain effective.

38. The exposure testing was for a period longer than stated in the appraisal certificate (eight weeks compared to 10–12 in the exposure test). The timber subjected to the test retained sufficient boron to remain effective in the prevention of decay.

Cyclic Rain Exposure — Accelerated Weathering Test Results

39. The cyclic rain exposure tests simulated approximately 500–550mm of rainfall. The samples were subject to three hours of rain, followed by three hours drying at ambient conditions for a six week period. This test subjected the samples to rainfall that is more than the equivalent of four months mean rainfall for wet areas of New Zealand, such as West Auckland (two monthly mean rainfall of 230–240mm, or four monthly mean of 460–480mm). This is a longer period of exposure than the conditions of use specified in the Appraisal Certificates for timber treated with TimberSaver boron.
40. The BRANZ Ltd report shows that the samples lost significant amounts of boron through the cyclic testing. Between 85% and 92% of the boron present in the control samples was leached from the test samples. The residual boron in the test samples ranged from 0.05% to 0.16% BAE, below the level that is considered effective⁴ in preventing decay. This is also below the 0.4% average often cited with respect to NZ Standard 3640.

Continuous High Humidity Exposure — The Fog Room Test Results

41. Continuous high humidity exposure tests simulated a total rainfall of 350–400mm. The samples were subject to close to 100% RH (relative humidity) at 21° Celsius for a six week period. The aim of this test was to assess the effects of heavy and light rain on the leaching of the preservative. As with the Cyclic Rain Exposure, this test accelerated the amount of weathering the samples may be exposed to over a shorter period of time. If two monthly mean rainfall is used as a surrogate measure for calculating time, then the continuous high humidity tests simulated slightly over three months rainfall.
42. The BRANZ Ltd report shows that the samples lost significant amounts of boron through the humidity tests. Between 63% and 89% of the boron present in the control samples was leached from the test samples. The residual boron in the test samples ranged from 0.11% to 0.26%.

Other Issues from the BRANZ Ltd Tests

43. BRANZ Ltd also commissioned tests to establish the depth of penetration of the timber treatment. Samples were taken before weathering and after weathering. These tests rely on being able to observe colour from a reagent that indicates the presence of boron applied to the timber in order to determine the depth of penetration of the preservative. The results of these tests were inconclusive, as it was not always possible to observe the colour used to indicate the presence of boron.
44. BRANZ Ltd also undertook tests to determine whether ultra-violet light faded the dyes used to colour timber that had been treated with TimberSaver boron. The tests found the dyes faded after exposure to ultra-violet light, and also through the weathering process. This does not pose any issues with respect to the performance of the timber regarding resistance to decay, as the dye colour does not inhibit the performance of

⁴ The BRANZ Ltd Report states 0.15% BAE is required for effective control of decay

the preservative agent. However, it does mean that if the TimberSaver treated framing timber will lose its distinctive orange colouring as it weathers.

Issues for Consideration about TimberSaver Treated Framing Timber

Fitness for Purpose and the BRANZ Ltd Tests

45. The tests undertaken by BRANZ Ltd have not compared the performance of timber treated with TimberSaver to the NZ Standard 3640. In the original media claims, TimberSaver Treated framing timber was criticised because it does not meet NZ Standard 3640, unlike a number of other timber treatment types.
46. Timber treated with TimberSaver has not claimed to meet the requirements of NZ Standard 3640 with respect to the penetration of preservatives to sap-wood. The principle behind TimberSaver is that the preservative contained in the outer layers of the timber (that is the 'envelop' created by the preservative) diffuses into the timber if it gets wet, thus protecting the timber from decay.
47. **Issues about the fitness-for-purpose of TimberSaver treated timber** need to be considered. That is:
 - **would timber treated with TimberSaver perform as required by the Building Code?**
 - are the conditions of use as specified in the Appraisal Certificates realistic given work practices on building sites?
 - are consumers able to make an informed decision about whether to use timber treated with TimberSaver?
48. The tests undertaken by BRANZ Ltd provide information about the technical performance of the product. As discussed above, **timber treatment levels would be sufficient to be effective in controlling decay, and are above the minimum levels suggested by ENSIS (0.15% BAE)**. Providing the timber is used in accordance with the conditions of use stipulated in the Appraisal Certificates, sufficient preservative will be present after two months exposure to weathering to meet the performance requirements of the Building Code. The treatment process is not designed to protect the timber if it is exposed to weathering for longer periods, and the tests conducted by BRANZ Ltd suggest that exposure to weathering for periods of longer than two months would lead to an unacceptable loss of preservative.
49. On the basis of the results from the BRANZ Ltd tests, timber treated with TimberSaver will meet the performance requirements of the Building Code, providing the conditions of use specified in the Appraisal Certificates are strictly adhered to. That is, TimberSaver treated framing timber must be used in accord with the requirements specified in the Appraisal Certificate.

Practicality of the Conditions of Use

50. Amongst other things, issues were raised by those interviewed for the preliminary report about whether the conditions of use specified in the accreditation documents are realistic. The core issues are:
 - whether it is practical to protect timber from weathering for more than two months during the building and construction process?
 - whether the remedial treatment requirements for cuts and notches is practical?
51. It should be noted that for other hazard classes (e.g., H3.1 and H3.2), which are commonly used in residential construction, there is also a recommendation to treat cut ends on site in a manner similar to that required for TimberSaver treated timber.

The requirements on the use of TimberSaver treated timber are not unique.

52. For other H1.2 treated timber, conditions of use also apply. The requirements for this type of timber are, again, similar to TimberSaver treated timber in as much as H1.2 Boron treated timber is to be protected from weathering (although no specific time limit is stated in the relevant documentation).
53. In both the case of TimberSaver and other forms of timber treated to meet the H1.2 hazard class, treatment levels are based on the premise that the timber is used in situations where it is protected from the weather, but is at risk of limited exposure to moisture⁵. In other words, the key issue is that reasonable protection from weathering and moisture is required regardless of treatment type or methodology.
54. For TimberSaver treated timber and other forms of treated timber (to the H1.2 hazard class) the practical issue that arises is how is a builder or building official to determine how long the timber has been exposed to weathering? This issue was discussed in the preliminary report, with a recommendation that manufacturers give consideration to date stamping products. Of itself, date stamping does not address the issue, as what happens to a packet of timber after it leaves a timber mill is not always well controlled and documented *per se*. However, during the preliminary stages of the investigation, builders' merchants commented that packets of timber that needed to be kept dry and protected from weather were stored in appropriate conditions (eg, wrapped and protected from the weather).
55. Information is available on the nature of TimberSaver treated timber. Consumers can, via builders' merchants and the manufacturers of the preservative, access information about the product. This is no different to other products used in building and construction.

Conclusions

56. BRANZ Ltd concluded that the results of the natural and accelerated weathering of timber treated with TimberSaver resulted in a loss of boron through leaching. The mean two month rainfall for Wellington and Auckland would cause a loss of preservative to occur if the timber were exposed to weathering.
57. The BRANZ Ltd tests show that provided the conditions of use are met, particularly the requirement that timber treated with TimberSaver boron must not be exposed to the weather for longer than 2 months, including during storage, transport and construction, this would ensure sufficient preservative is in the timber to be effective in meeting the performance requirements of the Building Code; specifically clauses B1 Structure, B2 Durability and F2 Hazardous Building Materials. This assertion is based on the levels of preservative found to remain in samples from exposure site testing, and the levels suggested in the BRANZ Ltd report that are necessary to control decay.
58. With respect to the technical performance of timber treated with TimberSaver, there is no basis to consider banning the product from the market or revoking its certification.
59. With respect to the practicality of the conditions of use, there is an issue about how a builder or building official can determine how long timber treated with TimberSaver may have been exposed to weathering. No practical method has been identified to enable a user of timber treated with TimberSaver, or other weathering sensitive preservatives, to identify how long the timber may have been exposed to the weather.
60. With respect to the practicality of treating cuts and notches, it is considered that the accreditation requirements (ie, paint-on treatment application of holes of 25mm and

⁵ Source: Timber Treatment Requirements: Notes for Builders; Department of Building and Housing and Standards New Zealand, February 2005.

bigger and cuts or notches of 1.5X the cross-sectional area) are practical. It is also noted that other hazard classes, such as H3.1 and H3.2 have similar requirements to have cuts treated, meaning that particular conditions that apply to TimberSaver are not unusual.

61. Therefore, there is no reason why TimberSaver should be banned or have its certification revoked by the Department.

Recommendations

62. It is recommended that builders merchants provide a copy of information to users with each sale about how to use treated framing timber, and its conditions of use, regardless of the treatment system used for the timber.
63. It is recommended that manufacturers and builders' merchants follow good practice, and ensure that the timber is kept undercover or is wrapped (and thus protected from weathering) until the time it is delivered to a site for use. It is noted that this practice is used for other framing timbers where protection from weathering is a requirement, and that during the preliminary investigation some builders' merchants advised this was their practice.
64. It is recommended that builders ensure that the timber, once delivered to a site is protected from weathering and stored clear of the ground, as stated in the accreditation documents and conditions of use. In practice, this means keeping packets of timber under-cover, and stored clear of the ground. For pre-cut timber frames, this means ensuring that the timber is wrapped using building wraps as soon as practical.