

# Understanding Timber Durability & Protection: Treatment & Finishes

**Reliably durable timber structures from treated timber**

**Geoff Stringer – Product Development Manager**

**Hyne Timber**

**26<sup>th</sup> October 2017**

# Presentation

- Learning from failures
- Durability – ABCB Perspective
- Non-Conforming Building Products (NCBP)
- A manufacturer's perspective
  - Safety
  - Compliance
  - Performance
- Reliably Durable Structures from Treated Timber
- Ensuring Durability Performance – Take home messages



# Learning from Failures – Cyclone Tracy 1974



Category 4 cyclone  
71 deaths



70% of homes, destroyed or severely damaged.  
\$6 Billion worth of damage. (2011 \$)



# Learning from Failures – Cyclone Tracy 1974

- Tie down
- Bracing
- Connections
- Member strength
- Workmanship
- Durability
- Maintenance
- Keep learning from future events
- The “Engineered Timber House”



**Cyclone Resistant Housing**

## **Thank you**

- CSIRO, Cyclone Testing Station, TRADAC-TQ, Material suppliers, Building regulators, Builders, Carpenters, Many others.

# Timber Balcony Failures - USA

- E.g. Balconies, Decks, Porches

29 fatalities from 2003-2015

6500 emergency cases concerning balcony collapses

1900 balcony failures

- 2003 Chicago, 13 fatalities, 57 injured, one event
- 2003-15 10 fatalities
- 2015 San Francisco, 6 fatalities, 7 injured, one event
- 2015 + Collapses and fatalities continue



Professor Joseph Loferski





# Chicago – 2003      13 fatalities

Overcrowding was an issue. However, poor construction was ultimately to blame.

- The deck was built illegally,
- The supports were inadequate,
- The floor was built with undersized wood,
- The screws used to attach the balcony to the wall were too short.



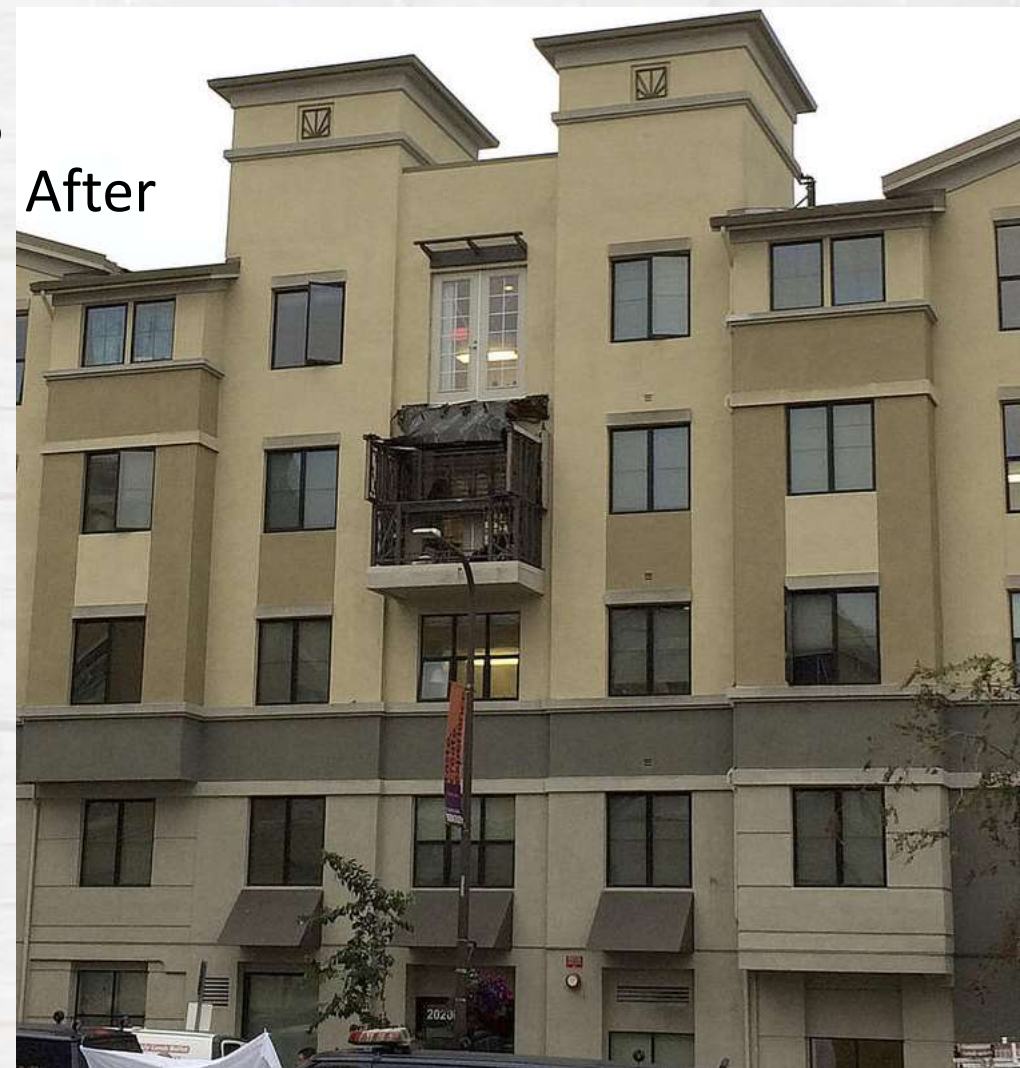
**CHICAGO: A fire department official looks over the damage from the second floor of an apartment building in the Lincoln Park neighborhood here on Saturday.—Reuters**

# San Francisco – 2015 6 fatalities

Before



After

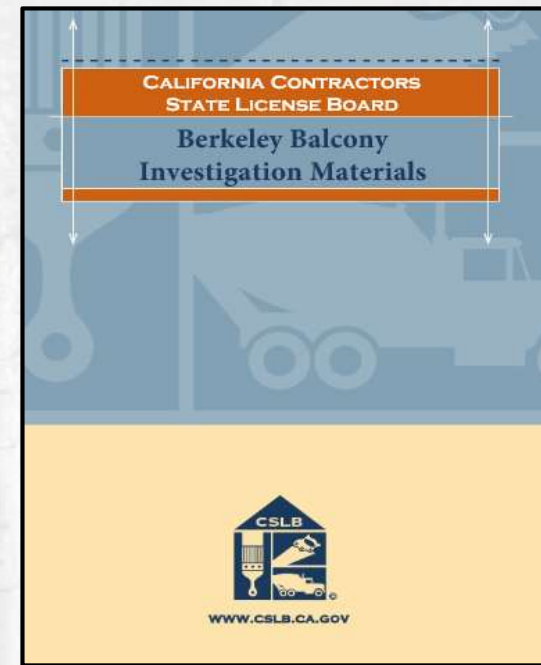


“... snapped off because supports had dry rotted, a problem that structural engineers say can be prevented through proper design, construction and maintenance aimed at sealing out water.”



# San Francisco – 2015      Aftermath

In December 2015, a court was told that the collapse happened because contractors cut corners to save costs. It is said the management company for the building, XXXXXX, ignored a "red flag" when students who rented the apartment complained about the presence of mushrooms growing on the balcony.



Issues,

- Specifications not followed
- Joist preservative treatment
- OSB floor instead of plywood
- Weather protective membrane
- Construction weather protection





# Failures Continue

Emails from Joseph Loferski

- “Below is a link to the deck collapse that occurred last weekend in Connecticut. The deck to house connection failed and everyone fell to the ground. The deck was three levels and each fell onto the next deck below. It is amazing the no one was killed—only two dozen people injured!”
- <http://wtnh.com/2016/09/11/students-injured-after-deck-collapsed-at-an-off-campus-party/>



# Failures - Australia

- <http://deckfailure.com/Failures.html>



www.**DECKFAILURE**.com

Michael Leavitt & Co Inspections, Inc.

NORTHERN UTAH'S FINEST DECK INSPECTION FIRM!



**Australia, Melbourne - 4 Hurt in Balcony Collapse 8/11**  
**Australia, Brisbane - 7 Hurt in Balcony Collapse 10/09**  
**Australia, Brisbane - 7 Hurt in Balcony Collapse 11/08**  
**Australia, Melbourne - 13 Injured in Balcony Collapse 3/08**  
**Australia, Sydney - 7 Hospitalized in Balcony Collapse 12/07**  
**Australia, Balgowlah - 1 Killed in Awning Collapse 12/07**  
**Australia, Geelong Victoria - Corio Bay Collapse Injures 18 3/06**

- 2 deck related deaths in Qld in last 10 years
  - 2008 Ascot, 2010 Yeppoon



– Morayfield (QLD) – October 2009



8 injured

Cause of collapse was water ingress into wall cavity and subsequent decay of studs supporting deck bearer. i.e. failure to maintain a water proof building envelope.

– Ascot – November 2008



23 injured, 1 fatality

Cause of failure was lateral movement (outward bowing) of external deck bearer away from house with time (specific reason not identified) and loss of restraint due to corrosion of nails resulting in disengagement of joists from bearer.

**Decks can be better than the house sometimes.**



*Damage from Hurricane Opal in Florida. This deck was designed to meet State of Florida Coastal Construction Control Line (CCCL) requirements. The house predated the CCCL and was not.*



# Timber balcony issues.

- Overloading
- Poor design
- Inadequate connection to house
- Handrails not adequately fixed
- Corrosion of connectors
- Poor workmanship
- Material deterioration
- No regular inspections
- Little or no maintenance
- Load capacity signage?



Joseph Loferski

- Can we improve decks in Queensland?
- Do we need to improve?
- Have we got a problem?

# Durability – ABCB Perspective

## 2 Definition of Terms

- **Durability** means the capability of a building to perform its function over a specified period of time.
- **Maintenance** means the total set of activities performed during the design life to retain a building in a state in which it can fulfil its intended function.

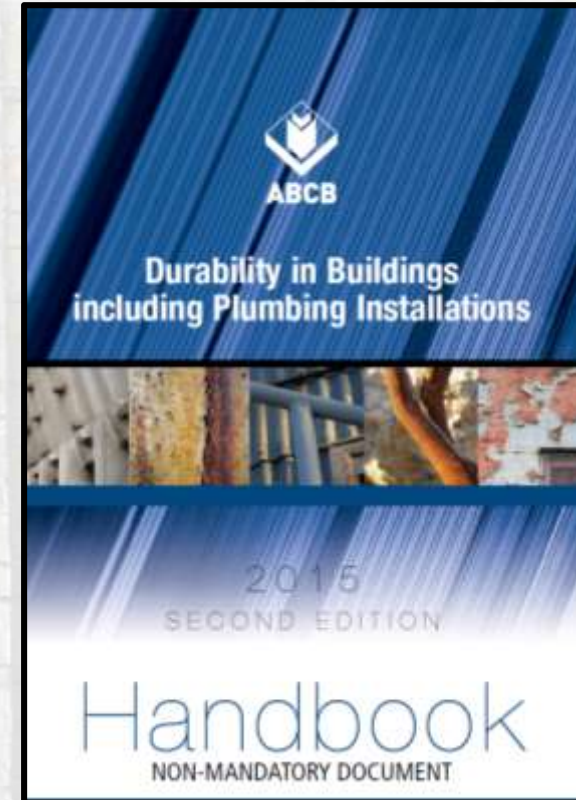
## 3 Durability Performance

### 3.1 Aim

The aim of durability performance is to ensure that the objectives of safety, health, amenity and sustainability are maintained for the length of time necessary to fulfil community expectations of the building.

### 3.3 Performance Criteria

The durability of a building in its environment should be such that it remains fit for use during the design life, given appropriate maintenance.



[http://www.abcb.gov.au/  
Resources/Publications/Ed  
ucation-  
Training/Durability-in-  
Buildings-including-  
Plumbing-Installations](http://www.abcb.gov.au/Resources/Publications/Education-Training/Durability-in-Buildings-including-Plumbing-Installations)



# 4 Factors Affecting Durability

The following factors should be specified or investigated when deriving durability solutions -

- (a) the service conditions;
- (b) material characteristics including jointing material;
- (c) design and detailing;
- (d) workmanship; and
- (e) maintenance.

## ***Reminder:***

Durability is not an inherent property of a material or component. It is the outcome of complex interactions among the above factors.



# 5 Design for Durability

## 5.1 Strategy for Reliability

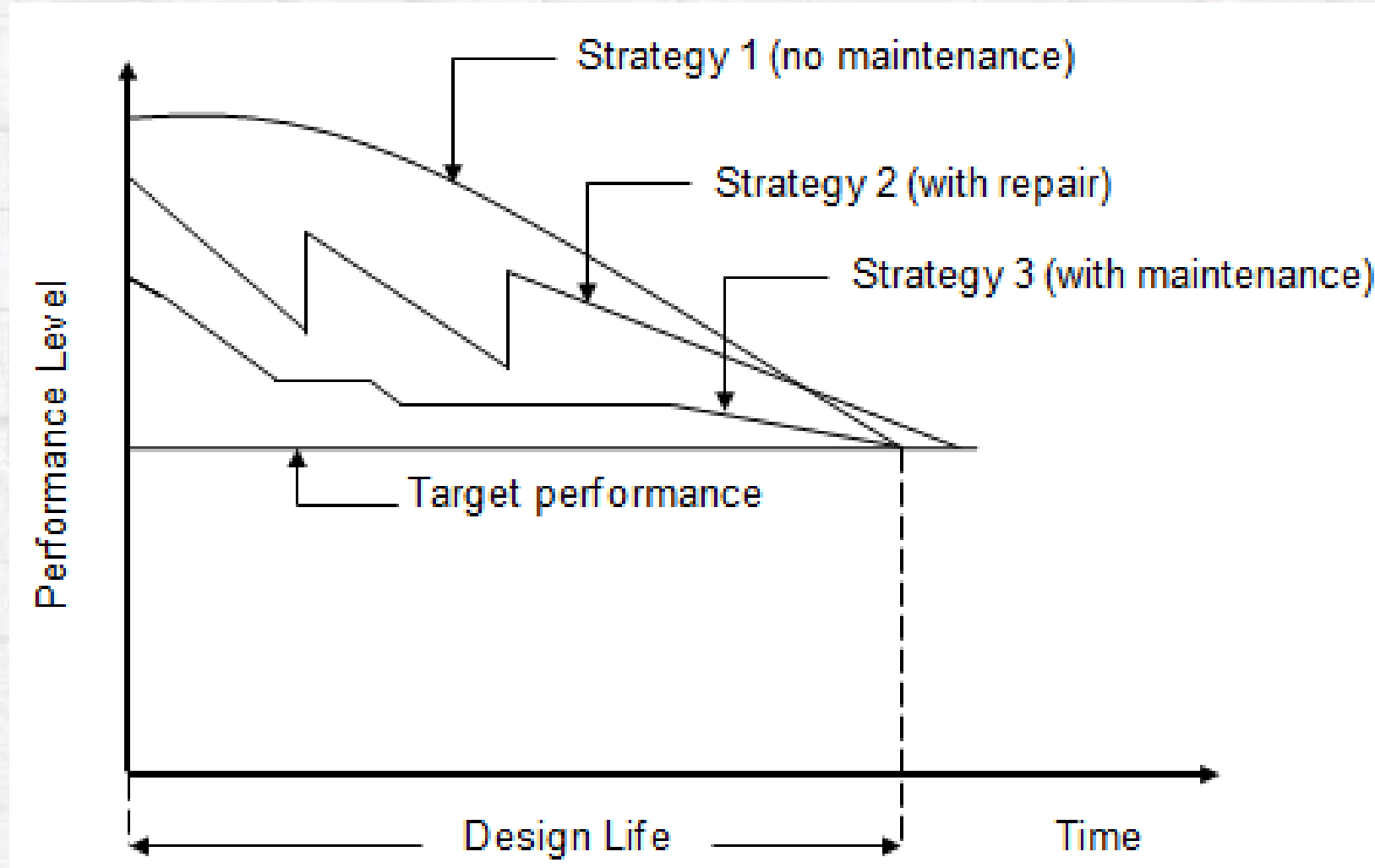


Figure 5-1 Performance level with respect to design life



## 5.2 Factors to be considered in designing for durability

- (a) intended use of the structure or system;
- (b) required performance criteria;
- (c) expected environmental conditions;
- (d) composition, properties and performance of the materials;
- (e) structural system;
- (f) shape of the members and the structural detailing;
- (g) quality of the workmanship and level of control;
- (h) particular protective measures; and
- (i) maintenance during the design life.



# Non-conforming building products (NCBP)



- *Building and Construction Legislation (Non-Conforming Building Products – Chain of Responsibility and Other Matters) Amendment Act 2017.*

- **What is a non-conforming building product?**

*“any material or other thing that is, or could be, incorporated into a building” and is not safe; or does not comply with regulatory provisions; or does not perform.*

- **Motivation (Building Failures)**

- Fires. 2014 Melbourne Lacrosse Tower fire, London Grenfell Tower fire
- Flammable external cladding
- Inferior electrical wiring

- **Desired Outcome (No Failures)**

Increased accountability and disciplinary action for the use of unsafe, non-compliant or non-performing products in Queensland buildings

- **Who does the legislation apply to?**

Individuals or corporations who are "persons in the chain of responsibility"



# NCBP - A Manufacturers Perspective



Hyne welcome the legislation and believe it will benefit the community.

Safety, Compliance and Performance are in Hyne's DNA

- Safety (First)
  - Operational safety in sawmills
  - Customer safety when using Hyne products
- Compliance
  - Quality products
  - Quality manufacturing
  - 3<sup>rd</sup> Party Product Certification
- Performance
  - Product Design
  - Product Testing
  - Product Installation Requirements





# Safety First

- Duty of care
  - To Hyne staff, contractors and customers





# Safety First

- Duty of care
  - To Hyne staff, contractors and customers
- Product Safety
  - Safety Data Sheets



**HYNE TIMBER**

**SAFETY DATA SHEET**

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**1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER**

**1.1 Product identifier**  
Product name: HYNE TIMBER T3 GREEN PLUS  
Synonym(s): LOW ODOUR H3 TREATED OUTDOOR TIMBER FRAMING

**1.2 Uses and uses advised against**  
Use(s): CONSTRUCTION MATERIAL • TIMBER  
Timber treated to H1, H2 and H3 as per Australian Standard AS1604.

**1.3 Details of the supplier of the product**  
Supplier name: HYNE & SON PTY. LIMITED  
Address: 160 Kent St. Maryborough, QLD, 4650, AUSTRALIA  
Telephone: (07) 4121 1211  
Fax: (07) 4121 4228  
Email: [maryborough@hyne.com.au](mailto:maryborough@hyne.com.au)  
Website: <http://www.hyne.com.au>

**1.4 Emergency telephone number(s)**  
Emergency: (07) 4121 1211 (Mon-Fri 8.30 am – 4.30 pm)

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**2. HAZARDS IDENTIFICATION**

**2.1 Classification of the substance or mixture**  
NOT CLASSIFIED AS HAZARDOUS ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

**2.2 Label elements**  
No signal word, pictograms, hazard or precautionary statements have been allocated.

**2.3 Other hazards**  
No information provided.

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**3. COMPOSITION/ INFORMATION ON INGREDIENTS**

**3.1 Substances / Mixtures**

| Ingredient                                      | CAS Number | EC Number | Content |
|---|------------|-----------|---------|
| SOFTWOOD(S)                                     | -          | -         | >99%    |
| Hyne Ready-to-Use WBA/P Solution with Colourant | -          | -         | <1%     |

**Ingredient Notes** WBA/P Solution consists of trace amounts of Borates, Propiconazole, Tebuconazole, Permethrin, and Copper carbonate.

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**4. FIRST AID MEASURES**

**4.1 Description of first aid measures**

**Eye** Exposure is considered unlikely unless dust is generated. Hold eyelids apart and flush the eye continuously with running water for at least 15 minutes.

**Inhalation** If inhaled (dust during machining), remove from contaminated area. Apply artificial respiration if not breathing.

**Skin** (Dust exposure) Gently flush affected areas with water. Seek medical attention if irritation develops.

**ChemAlert.** Page 1 of 6 SDS Date: 03 Nov 2016 Version No: 1.5

# Safety First

- Duty of care
  - To Hyne staff, contractors and customers
- Product Safety
  - Safety Data Sheets
  - Safe wood preservatives



**1 Exelpet Flea Colour = 7.2 m of T2 Blue 70x45**



# Safety First



- Duty of care
  - To Hyne staff, contractors and customers
- Product Safety
  - Safety Data Sheets
  - Safe wood preservatives
  - No VOC's



**Volatile Organic Compounds (VOC's) are chemicals that have a high vapour pressure and can be dangerous to human health / the environment.**

# Safety First

- Duty of care
  - To Hyne staff, contractors and customers
- Product Safety
  - Safety Data Sheets
  - Safe wood preservatives
  - No VOC's
  - No health impacts (e.g. low odour)





# Safety First

- Duty of care
  - To Hyne staff, contractors and customers
- Product Safety
  - Safety Data Sheets
  - Safe wood preservatives
  - No VOC's
  - No health impacts (e.g. low odour)
  - Installation Requirements

## Installation Requirements



HYNE TIMBER T2 BLUE  
TREATED TIMBER FRAMING





# Product Compliance

- Quality Products

## Reliable Durable Products

### Termite Resistant Framing



Suitable in interior applications  
South of the Tropic of Capricorn



Suitable all interior applications  
Australia wide



### Outdoor & Indoor Framing

Suitable all above ground  
applications Australia wide



## Reliable Structural Products

### Framing

MGP15, MGP12, MGP10, F5

### Glue laminated timber

GL13, GL17, GL18, GL21



# Product Compliance

- Quality Products
- **Quality Manufacturing**



Quality Management System





# Product Compliance

- Quality Products
- Quality Manufacturing
- **3<sup>rd</sup> Party Product Certification**

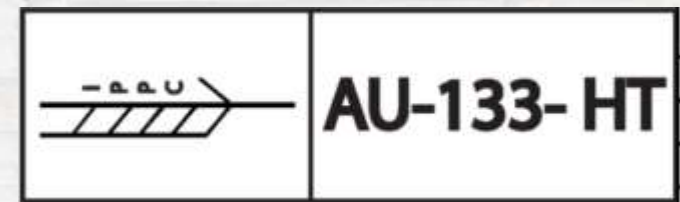


### Structural Timber Compliance

|               |                         |
|---------------|-------------------------|
| AS/NZS 1328.1 | GL13, GL17, GL18, GL21  |
| AS/NZS 1748.1 | F5, MGP10, MGP12, MGP15 |



Chain of Custody Compliance  
AS 4707



Wood Packaging Compliance  
ISPM 15



### Durable Timber Compliance

|                  |                  |
|------------------|------------------|
| AS 1604.1        | T2 Red, T3 Green |
| Proprietary Std. | T2 Blue          |



# 3<sup>rd</sup> Party Product Certification – How it works.



E.g. CodeMark – Hyne T2 Blue

- Owner/Manager of scheme



- Accreditation of Certification Body



- Certification Body



- Scheme Mark



- Product requirements

Performance requirements of NCC-BCA

- Manufactured product



- Audit of product, manufacture and installation requirements by Certification Body

- Certificate of Conformity



# CodeMark - Certificate of Conformity



## Certificate of Conformity

Certificate number: CM70001

Certification Body:



BUREAU  
VERITAS

Bureau Veritas Australia  
Pty Ltd

3/435 Williamstown Rd  
Port Melbourne  
VIC, 3207

Ph: 1800 855 190  
www.bureauveritas.com.au

Certificate Holder:



Hyne & Son Pty Limited  
Tuan Forest Road  
Maryborough  
QLD, 4650

Ph: 1300 300 4963  
www.hyne.com.au

### THIS TO CERTIFY THAT

### Hyne Timber Termite Resistant Framing (Hyne Timber T2 Blue) – Tuan Site

Type and/or use of product:

Termite resistant timber framing for internal above ground use in buildings.

Description of product:

Hyne Timber T2 Blue is sourced from plantation grown Pinus species including Radiata Pine, Hoop Pine, Slash Pine, Caribbean Pine & hybrids of Slash/Caribbean Pines and is blue in colour.

Sizes: Widths up to 240 mm (Standard widths are 70, 90, 120, 140, 190, 240), Thicknesses up to 45mm (Standard thicknesses are 35, 45 mm), Lengths up to 12 m (Standard lengths are 1.8, 2.4, 3.0, 3.6, 4.2, 4.8, 5.4, 6.0 m)

COMPLIES WITH THE FOLLOWING BCA PROVISIONS AND STATE OR TERRITORY VARIATION(S)

BCA 2016

Performance Requirement(s)

Volume One

Clause BP1.1 (b) (xv) termite actions

Volume Two

Clause P2.1.1 (b) (xv) termite actions

SUBJECT TO THE FOLLOWING LIMITATIONS AND CONDITIONS AND THE PRODUCT TECHNICAL DATA IN APPENDIX A AND EVALUATION STATEMENTS IN APPENDIX B

Limitations and conditions:

- Hyne Timber T2 Blue is limited to use in buildings in internal, above ground, dry structural and non-structural applications which are located in Australia south of the Tropic of Capricorn and within a 50km radius from Rockhampton City Centre.
- Hyne Timber T2 Blue has a termite resistant envelope treatment that is not to be removed other than in accordance with AS1684.2-2010 clause 6.2.1.4. Where removal does occur, refer to Hyne Timber T2 Blue Product Installation Requirements (July 2015).

Building classification/s:

Class 1 - 10

**Scope of certification:** The CodeMark Scheme is a building product certification scheme. The rules of the Scheme are available at the ABCB website [www.abcb.gov.au](http://www.abcb.gov.au). This Certificate of Conformity is to confirm that the relevant requirements of the Building Code of Australia (BCA) as claimed against have been met. The responsibility for the product performance and its fitness for the intended use remain with the certificate holder. The certification is not transferrable to a manufacturer not listed on Appendix A of this certificate.

**Disclaimer:** The Scheme Owner, Scheme Administrator and Scheme Accreditation Body do not make any representations, warranties or guarantees, and accept no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any material contained within this certificate; and the Scheme Owner, Scheme Administrator and Scheme Accreditation Body disclaim to the extent permitted by law, all liability (including negligence) for claims of losses, expenses, damages and costs arising as a result of the use of the product(s) referred to in this certificate.

Date of issue: 4/11/2016

Re-issue Date: 29/06/2017

Date of expiry: 4/11/2019



Certification Body: Bureau Veritas Australia Pty Ltd

Unrestricted Building Certifier : Mark Lewis

Certificate number: CM70001

This certificate is only valid when reproduced in its entirety.

Page 1 of 4



# Product Certification of Timber Products

Why should you specify building products that are independently audited and certified?

## Benefits

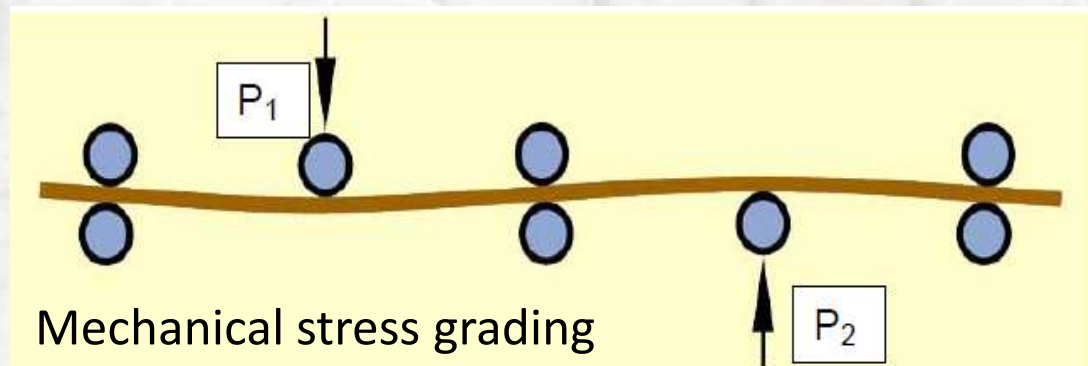
- Increased certainty of,
  - Product Compliance
  - Product Performance
  - Product Safety
  - Compliance with NCBP legislation
- Reduced risk of
  - product failure
  - injured occupants and/or building damage
  - call back costs
  - unhappy customers
  - breach's of NCBP legislation



# Product Performance

- **Product Design**

- Customer requirements
- Manufacturing capabilities
- Available Technology

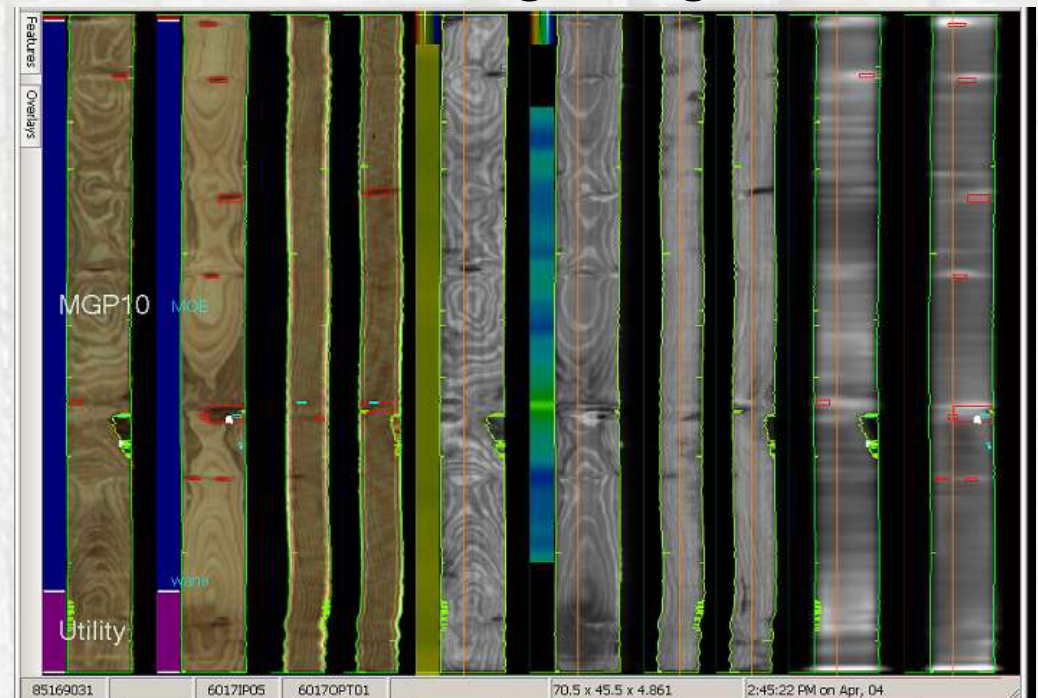


## Example

Structurally reliable timber

Modern Softwood Sawmill

Automated timber grading machines





# Product Performance

- Product Design
- **Product Testing**
  - Initial testing – Performance Establishment

## Research -Northern Territory Field Site



### Example

Termite trials of preservatives





# Product Performance

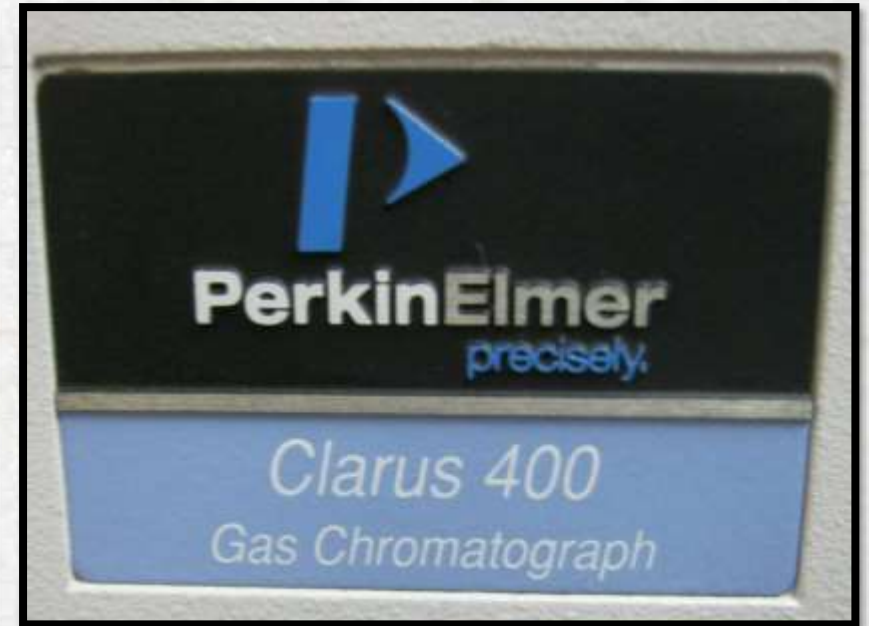
- Product Design
- **Product Testing**
  - Initial testing – Performance Establishment
  - On-going testing – Performance Verification

## Example

Termite trials of preservatives  
Preservative testing in plant



## Gas Chromatography





# Testing : Where is the insecticide?

## Mastotermes

North of the tropic of Capricorn



## Hyne T2 Red

FULL SAPWOOD



Termite resistant heartwood

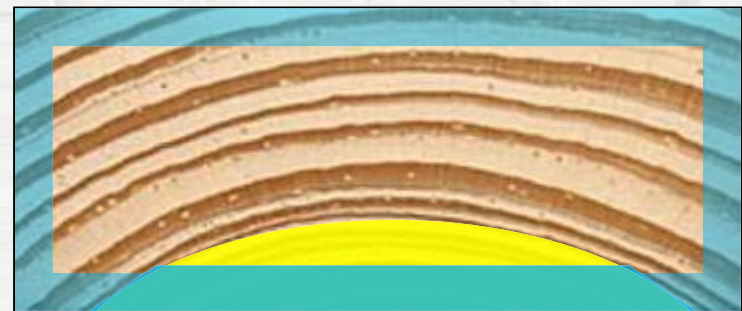
## Coptotermes

Australia wide



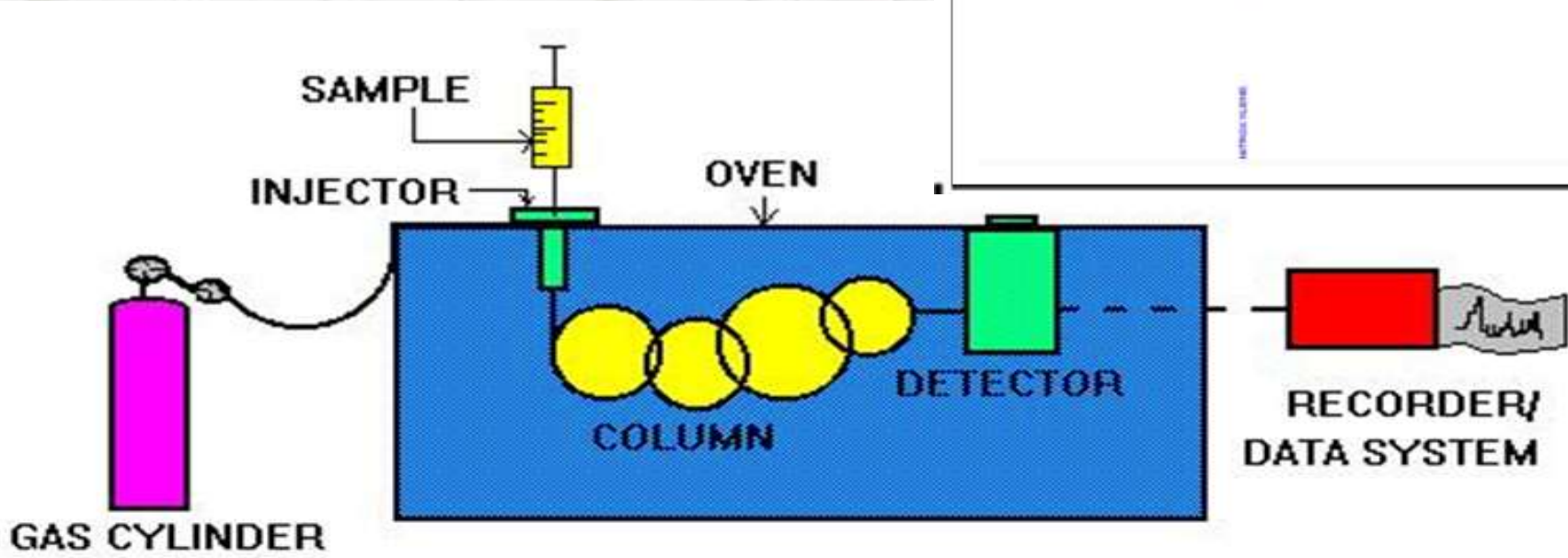
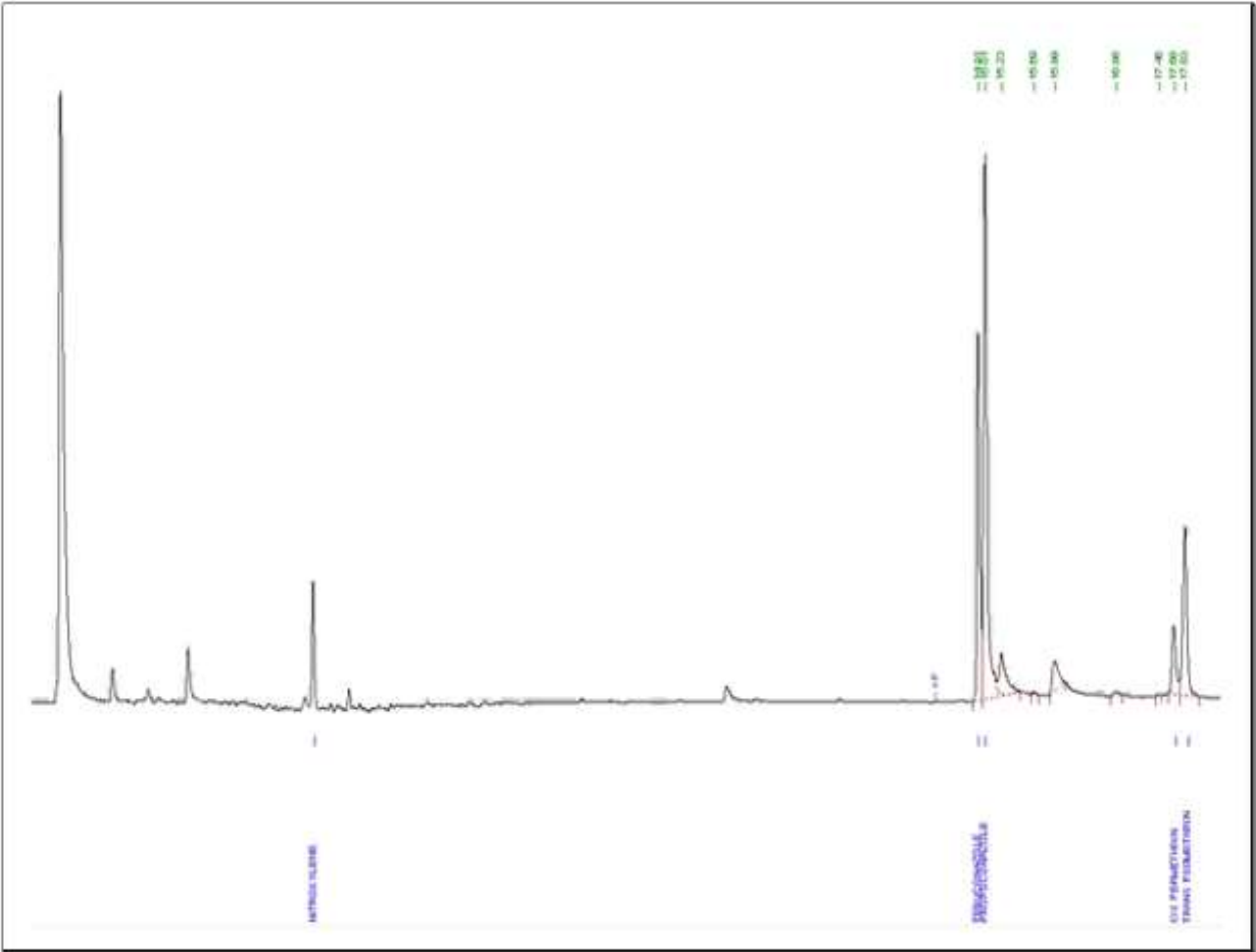
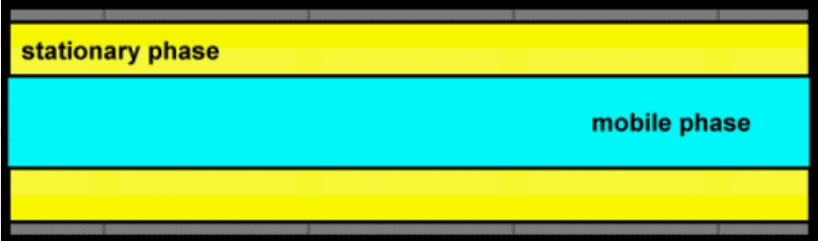
## Hyne T2 Blue

OUTER WOOD (up to 5mm)



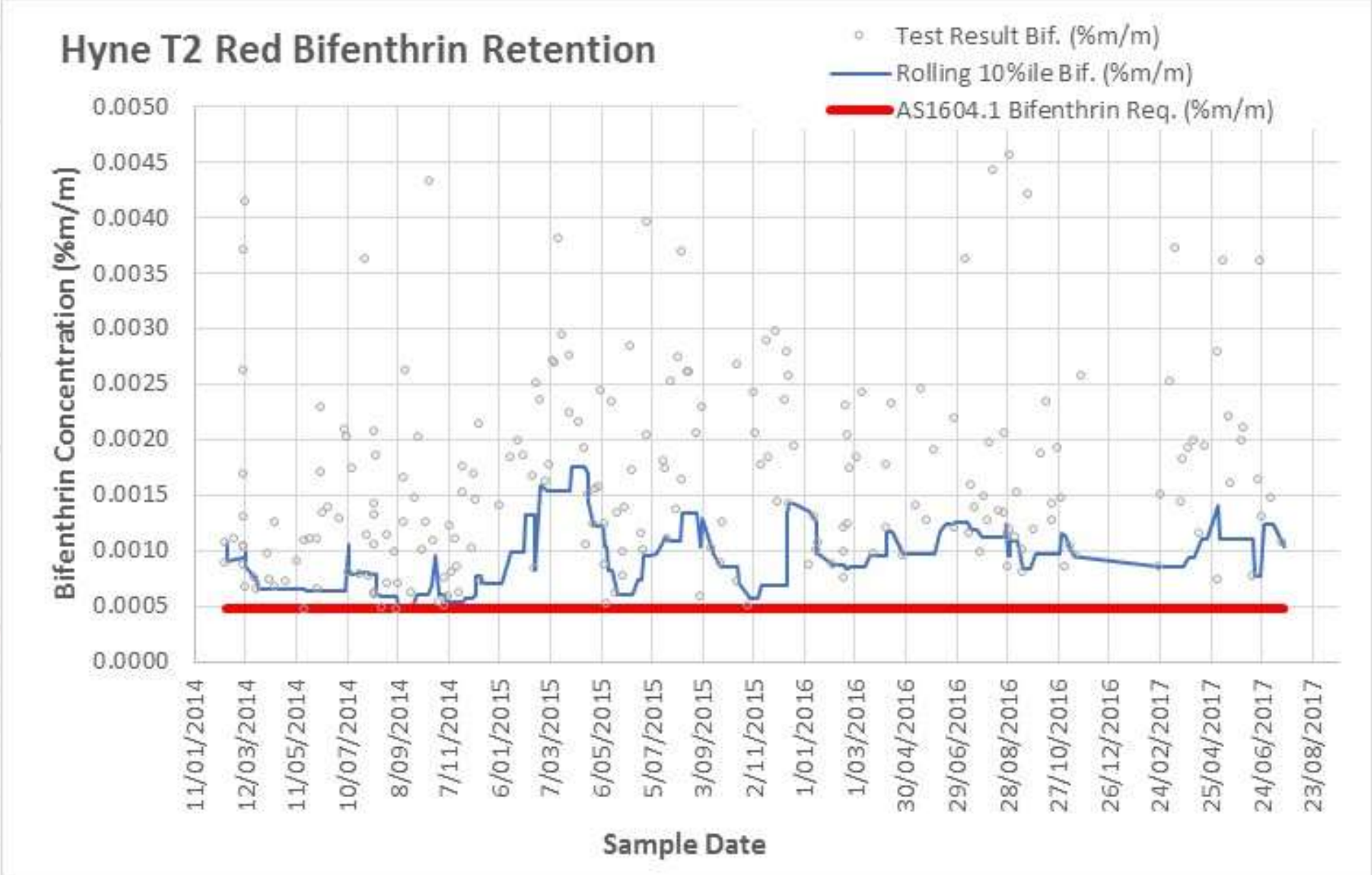
Non- Termite resistant heartwood  
Radiata Pine

# Gas Chromatography





# Analysing Test Results – Control Charts



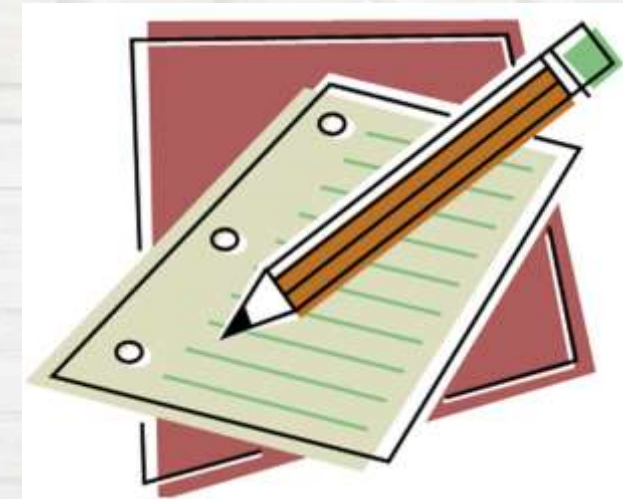
# Reliably Durable Structures from Treated Timber

Design → Construct → Perform

Scorecard ? 1 Poor - 10 Excellent

## Design Durable Timber Structures

- Performance Requirements (Safety, Health, Amenity)
  - Customer Requirements, Service Life (NCC, CTIQ) 5
- Agents/Mechanisms of deterioration
  - Types, Maps, Severity, Factors affecting hazards (CTIQ) 5
- Material Resistance
  - Natural durability (AS 5604) 7
  - Treated durability (AS 1604) 4
  - Test methods (AS 1605, AWPC Protocols) 4
- Durability Design Methods
  - Member durability (AS1604, Manuf., TQ guides, CTIQ) 5
  - Connection durability (Manufacturers, TQ guides) 3
  - Deterioration Models (TimberLife) 5
- Verification/Assessment of Durability Design 5



**DESIGN**



# Reliably Durable Structures from Treated Timber

Design → Construct → Perform

Scorecard ? 1 Poor - 10 Excellent

## Construct Durable Timber Structures

- Product Installation Requirements 6
- Prefabrication 8
- Site assembly (AS1684, TQ Guides) 7
- Workmanship (AS1684, TQ Guides) 7
- Finishing 7
- Construction Assessment/Verification 4



**CONSTRUCT**

# Reliably Durable Structures from Treated Timber

Design → Construct → Perform

Scorecard ? 1 Poor - 10 Excellent

## Performance of Durable Timber Structures

- Maintenance
  - Plans
  - Inspection & Monitoring
  - Restoration, Repair, Replacement
- Performance Assessment/Verification

4  
5  
6  
5



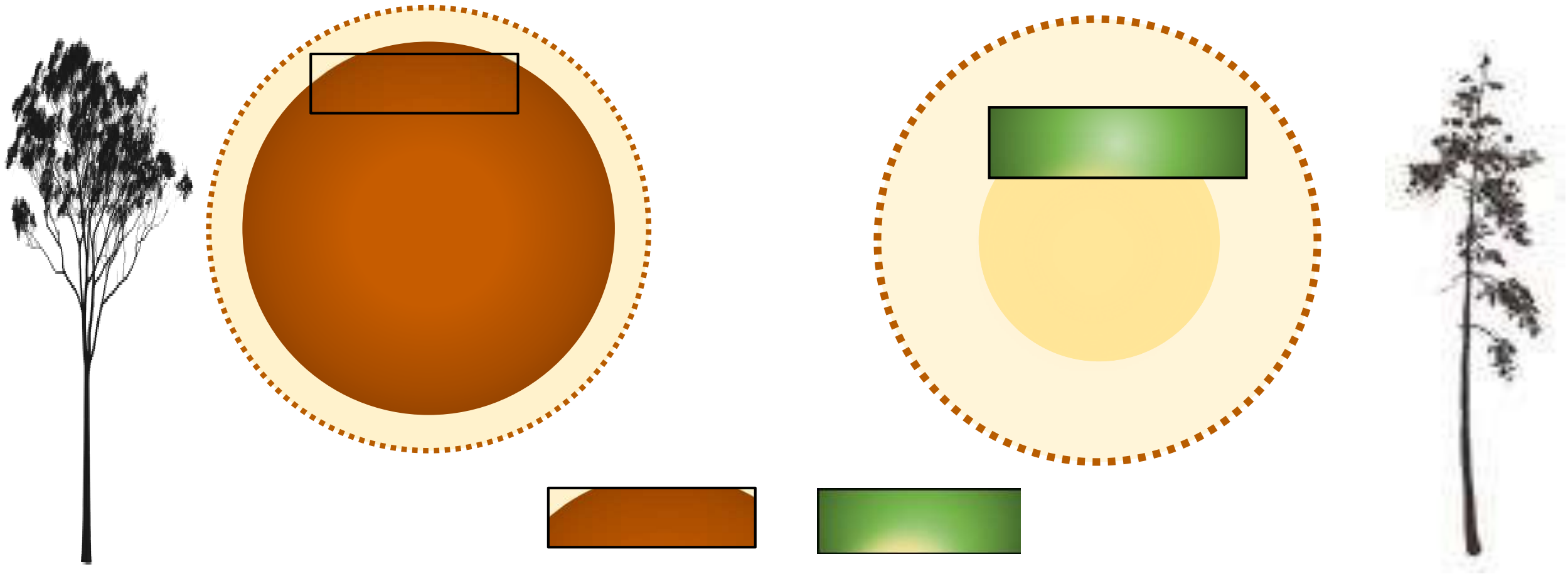
**PERFORM**



# Treated pine is not the same as naturally durable hardwood

Hardwood is naturally durable from the inside out

Preservative treated softwood is durable from the outside in



# Site Preservative Treatments for Softwood

- **Site treat** all cuts, notches, rebates and drill holes. Use a suitable end-sealing product such as,

- Tanalised® Enseal Clear,
- Tanalised® Ecoseal,
- Protim® Solignum® XJ Clear
- or an equivalent.



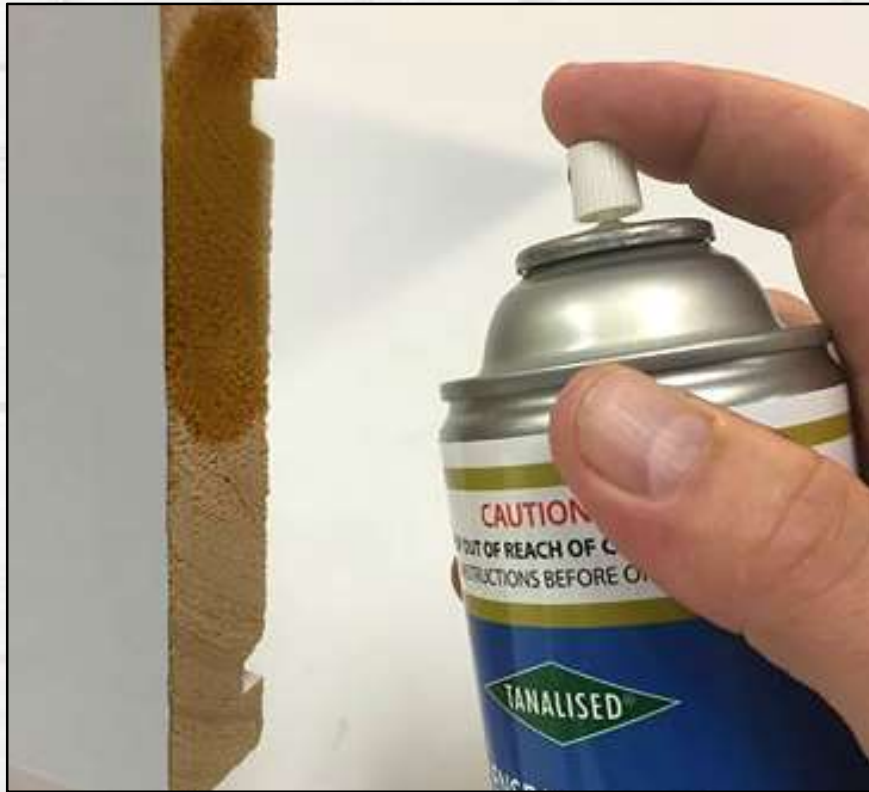
Osmose Protim XJ Clear



Tanalized Ecoseal & Enseal



# Tanalized Enseal Clear & Ecoseal



Source: [www.lonzawoodprotection.com/apac/](http://www.lonzawoodprotection.com/apac/) © Lonza



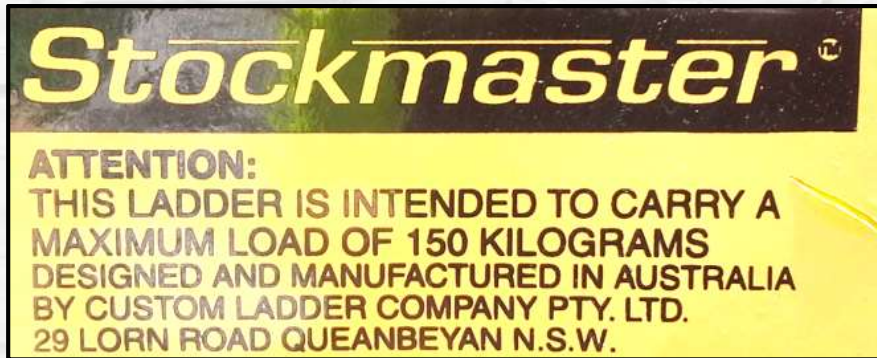
Source: [www.lonzawoodprotection.com/apac/](http://www.lonzawoodprotection.com/apac/) © Lonza

# Safe Load Limits for Decks?

- Elevators



- Ladders



- Bridges



- Chairs



- Decks ?

What is the load capacity of your deck?



# Safe Load Signage for Decks?



Handrails ?

# Ensuring Durability Performance

## – Take home messages

- Learn from durability failures
- Design durability performance into your structures
- Know the expected service life of your structure
- Be prepared to specify maintenance requirements to achieve performance
- Specify durable timber products that are independently audited and certified
- Give special attention to the durability of timber connections
- Treated pine is not the same as naturally durable hardwood
- Know the load capacity of your deck (Safety Signage?)





**Thank you.**

**Geoff Stringer**  
**geofstri@hyne.com.au**