

Australian/New Zealand Standard™

**Methods for sampling and analysing  
timber preservatives and preservative-  
treated timber**

**Part 2: Determination of preservative  
penetration by spot test**



## **AS/NZS 1605.2:2018**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee TM-012, Timber Grading and Preservation. It was approved on behalf of the Council of Standards Australia on 22 December 2017 and by the New Zealand Standards Approval Board on 5 March 2018.  
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The following are represented on Committee TM-012:

Australian and New Zealand Timber Preservative Manufacturers Association  
Australian Forest Products Association  
Australian Pesticides and Veterinary Medicines Authority  
Australian Timber Flooring Association  
Australian Timber Importers Federation  
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# Australian/New Zealand Standard™

## **Methods for sampling and analysing timber preservatives and preservative- treated timber**

### **Part 2: Determination of preservative penetration by spot test**

Originated in Australia as AS 1605—1974.  
AS 1605—1974 jointly revised and designated AS/NZS 1605:1998.  
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## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TM-012, Timber Grading and Preservation, to supersede AS/NZS 1605.2:2006.

The objective of this Standard is to set out a series of methods for sampling and analysing timber preservatives and preservative-treated timber.

This objective of this revision is to—

- (a) introduce a method for determination of zinc penetration in timber treated with zinc-containing preservatives; and
- (b) introduce the PAN indicator for spot testing of copper in timber treated with copper-containing preservatives.

This Standard is part of a series of Standards that cover the sampling and analysing of timber preservatives and preservative-treated timber as follows:

### AS/NZS

1605	Methods for sampling and analysing timber preservatives and preservative-treated timber
1605.1	Part 1: General requirements, sampling, and determination of sapwood and heartwood presence
1605.2	Part 2: Determination of preservative penetration by spot tests (this Standard)
1605.3	Part 3: Analysis methods for determination of preservative retention
1605.4	Part 4: Analysis methods for determination of preservative solution concentration

This Standard is intended to be read in conjunction with AS/NZS 1605.1 and the AS/NZS 1604 series, NZS 3640 or the relevant Standard to which timber is claimed to have been treated. The preservatives incorporated in the AS/NZS 1604 series are required to be accompanied by analytical methods for their determination, which are incorporated in the AS/NZS 1605 series.



## CONTENTS

	<i>Page</i>
<b>SECTION 1 SCOPE AND GENERAL</b>	
1.1 SCOPE.....	4
1.2 APPLICATION .....	4
1.3 REFERENCED AND RELATED DOCUMENTS.....	4
1.4 DEFINITIONS.....	5
1.5 PREPARATION OF TEST PIECES FROM TEST SPECIMEN.....	5
1.6 RECOGNITION OF PENETRATION.....	5
1.7 EVALUATION OF PENETRATION.....	5
 <b>SECTION 2 DETERMINATION OF PENTACHLOROPHENOL PENETRATION IN TIMBER TREATED WITH OIL SOLUTION</b>	
2.1 PRINCIPLE .....	6
2.2 REAGENTS .....	6
2.3 PROCEDURE.....	6
 <b>SECTION 3 DETERMINATION OF COPPER PENETRATION IN TIMBER TREATED WITH COPPER-BASED PRESERVATIVES</b>	
3.1 METHOD 1 .....	7
3.2 METHOD 2 .....	7
3.3 METHOD 3 .....	7
 <b>SECTION 4 DETERMINATION OF BORON PENETRATION IN TIMBER TREATED WITH BORON-BASED PRESERVATIVES</b>	
4.1 METHOD 1 .....	9
4.2 METHOD 2 .....	9
 <b>SECTION 5 DETERMINATION OF FLUORIDE PENETRATION IN TIMBER TREATED WITH FLUORIDE-BASED PRESERVATIVES</b>	
5.1 PRINCIPLE .....	11
5.2 REAGENTS .....	11
5.3 PROCEDURE.....	11
 <b>SECTION 6 DETERMINATION OF TIN PENETRATION IN TIMBER TREATED WITH TIN-CONTAINING PRESERVATIVES</b>	
6.1 PRINCIPLE .....	12
6.2 REAGENT—BROMOPYROGALLOL RED SOLUTION 0.2%.....	12
6.3 PROCEDURE.....	12
6.4 PRECAUTIONS.....	12
 <b>SECTION 7 DETERMINATION OF ZINC PENETRATON IN TIMBER TREATED WITH ZINC-CONTAINING PRESERVATIVES</b>	
7.1 GENERAL.....	13
7.2 METHOD 1 .....	13
7.3 METHOD 2 .....	13

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Australian/New Zealand Standard

Methods for sampling and analysing timber preservatives and preservative-treated timber

Part 2: Determination of preservative penetration by spot test

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out the method for determining the penetration of preservative into preservative-treated wood products. It deals with the preparation of material for testing and the methods for determining the penetration of creosote, boron, copper in copper-based preservatives, pentachlorophenol, tin, zinc and fluorine.

1.2 APPLICATION

This Standard should be read in conjunction with—

- (a) the AS/NZS 1604 series, NZS 3640 or the relevant Standard to which timber is claimed to have been treated; and
- (b) AS/NZS 1605.1.

Methods for sampling and analysing timber preservatives and preservative-treated timber are categorized into the following parts of the AS/NZS 1605 series, according to the general nature of the tests:

- (i) Sampling preservative liquids and preservative-treated timber ..... Part 1.
- (ii) Determination of the presence of sapwood and heartwood ..... Part 1.
- (iii) Determination of preservative penetration by spot tests..... Part 2.
- (iv) Analysis of preservative retention ..... Part 3.
- (v) Analysis of preservative solution concentration ..... Part 4.

1.3 REFERENCED AND RELATED DOCUMENTS

1.3.1 Referenced documents

The following documents are referred to in this Standard:

AS/NZS	
1604	Specification for preservative treatment (all parts)
1605	Methods for sampling and analysing timber preservatives and preservative-treated timber
1605.1	Part 1: General requirements, sampling, and determination of sapwood and heartwood presence
1605.3	Part 3: Analysis methods for determination of preservative retention
1605.4	Part 4: Analysis methods for determination of preservative solution concentration
4491	Timber—Glossary of terms in timber-related Standards

NZS

3640 Chemical preservation of round and sawn timber

### 1.3.2 Related document

Attention is drawn to the following related document:

Kerner, G. Colour reactions for the detection and determination of the depth of penetration of preservatives in wood. *Holzindustrie*. 1969, vol. 22, no. 9, pp. 275–278.

## 1.4 DEFINITIONS

Refer to AS/NZS 1605.1 for applicable definitions.

## 1.5 PREPARATION OF TEST PIECES FROM TEST SPECIMEN

One test piece shall be cut from each test specimen, which has been prepared in accordance with AS/NZS 1605.1.

Test pieces shall be prepared to enable examination of the full cross section of the test specimen and so that contamination of the freshly prepared surface is minimized.

**WARNING: WHERE TEST PIECES HAVE A ROUGH SURFACE, IT IS UNLIKELY THAT AN ACCURATE ASSESSMENT OF PRESERVATIVE PENETRATION CAN BE MADE. BETTER TEST RESULTS WILL BE OBTAINED WHEN THE SURFACE BEING TESTED IS DRIED AND THEN SANDED SMOOTH, OR CUT WITH A FINE-TOOTHED SAW.**

## 1.6 RECOGNITION OF PENETRATION

### 1.6.1 Method of recognition

The depth and pattern of preservative shall be identified either visually or by the appropriate colorimetric test.

NOTE: For analytical methods, see AS/NZS 1605.3, Clause 1.6.

### 1.6.2 Colorimetric test interference

In some instances, naturally occurring substances may interfere with colorimetric tests. In such cases, analytical methods shall be used.

## 1.7 EVALUATION OF PENETRATION

### 1.7.1 Distribution of preservative

Where a colorimetric test is available, the penetration pattern as described in AS/NZS1604 series or NZS3640 shall apply.

For sawn and round timber, where the distribution is not considered to be continuous over the penetration zone for a given hazard, or for veneers treated prior to gluing where there is no evidence of preservative penetration in the penetration zone, the sample will be deemed to have failed the penetration requirements of the AS/NZS 1604 series, NZS 3640 or the relevant Standard. Chemical tests for retention compliance with the AS/NZS 1604 series, NZS 3640 or the relevant Standard need not be carried out.

### 1.7.2 Interpretation of penetration tests

Preservative penetration tests will only indicate the location of one or more of the preservative components. No inference can be made as to whether or not the test piece passes the retention requirements of the AS/NZS 1604 series, NZS 3640 or the relevant Standard.

## SECTION 2 DETERMINATION OF PENTACHLOROPHENOL PENETRATION IN TIMBER TREATED WITH OIL SOLUTION

### 2.1 PRINCIPLE

Pentachlorophenol is determined visually on the end-grain of a freshly prepared timber surface by the rapid formation of red copper pentachlorophenate.

### 2.2 REAGENTS

All reagents shall be of analytical reagent quality. The water used for preparing the reagents shall be distilled. The following reagents shall be used:

- (a) *Stock solution A* Dissolve 4.0 g cupric acetate monohydrate in 100 mL water. Liquefy 0.5 g non-ionic surfactant (polyalkyleneglycerol ether MW approximately 2500) with heat if necessary, then stir into the cupric acetate solution and keep stirring until the mixture clears.
- (b) *Stock solution B* Dissolve 0.4 g silver acetate in 100 mL water.
- (c) 99% isopropyl alcohol.

### 2.3 PROCEDURE

#### 2.3.1 Preparation of test solution

Immediately prior to use, prepare a test solution by mixing together, in order, equal volumes of stock solution A, stock solution B, distilled water and 99% isopropyl alcohol.

#### 2.3.2 Application

The procedure shall be as follows:

Spray, brush or flow test solution over a freshly prepared end-grain surface of a test piece. Use sufficient test solution to wet the surface and observe the rapid formation of red copper pentachlorophenate.

NOTE: Excessively dark treatments tend to obscure the colour and may make interpretation difficult.



## SECTION 3 DETERMINATION OF COPPER PENETRATION IN TIMBER TREATED WITH COPPER-BASED PRESERVATIVES

### 3.1 METHOD 1

#### 3.1.1 General

The method in this Clause can be used for all preservatives that contain copper.

#### 3.1.2 Principle

Copper is determined visually on the end-grain of a freshly prepared timber surface by the rapid formation of a blue-black or greenish-black colour.

#### 3.1.3 Reagents

All reagents shall be of analytical reagent quality. The water used for the preparation of the reagents shall be distilled. The following reagents shall be used:

- (a) *Stock solution A* Dissolve 0.5 g rubeanic acid (dithiooxamide) in 10 mL ethanol (or denatured alcohol).
- (b) *Stock solution B* Dilute 1 volume of ammonia ( $d = 0.880$ ) with 6 volumes of water.

#### 3.1.4 Procedure

The procedure shall be as follows:

Wet the freshly prepared end-grain surface with stock solution B and apply stock solution A drop-wise to the wet end-grain surface. A blue-black colour indicates the presence of copper.

### 3.2 METHOD 2

#### 3.2.1 General

The method in this Clause is an alternative method to determine copper penetration.

#### 3.2.2 Principle

Copper is determined visually on the end-grain of a freshly prepared timber surface by the rapid formation of a deep blue to blue-black colour.

#### 3.2.3 Reagent—Stock solution

Dissolve 0.5 g chromazurol S (eriochromazurol S) and 5.0 g sodium acetate in 100 mL water.

The reagent shall be of analytical reagent quality.

#### 3.2.4 Procedure

The procedure shall be as follows:

Spray the test solution over a freshly prepared end-grain surface of the test piece. A deep blue to blue-black colour indicates the presence of copper. With some species, it is necessary to use a hand lens to examine the tested surface in order to distinguish a satisfactory result.

### 3.3 METHOD 3

#### 3.3.1 General

The method in this Clause is an alternative method to determine copper penetration.

### 3.3.2 Principle

Copper is determined visually on the end-grain of a freshly prepared timber surface by the rapid formation of a deep red/magenta colour.

### 3.3.3 Reagent—Stock solution

Add 0.05 g of the PAN (1-(2-pyridylazo)-2-naphthol) indicator to a flask then add methanol to 100 g total solution mass. Mix until dissolved. Stopper or store in a screw capped jar. Normally, this reagent must be prepared fresh each day, but can be maintained for longer periods under refrigeration.

### 3.3.4 Procedure

The procedure shall be as follows:

Spray or brush the test solution over a freshly prepared end-grain surface of the test piece. A deep red/magenta colour indicates the presence of copper. Untreated areas remain orange in colour.

## SECTION 4 DETERMINATION OF BORON PENETRATION IN TIMBER TREATED WITH BORON-BASED PRESERVATIVES

### 4.1 METHOD 1

#### 4.1.1 Principle

Boron penetration is determined visually, on freshly prepared cross-sectional surfaces obtained from timber samples treated with boron compounds, by the formation of an orange to red colour.

The moisture content of the samples shall be less than 25% prior to spot testing.

#### 4.1.2 Reagents

All reagents shall be of analytical reagent quality. The water used for preparing the reagents shall be distilled. The following reagents shall be used:

- (a) *Stock solution* Prepare a saturated solution of turmeric acid in 95% ethanol. Filter the solution prior to use only.
- (b) *Acid solution* Concentrated hydrochloric acid/salicylic acid.

#### 4.1.3 Procedure

The procedure shall be as follows:

- (a) Acidify the required amount of filtered turmeric solution by adding concentrated hydrochloric acid at a rate of 5 mL per 100 mL turmeric acid solution;  
*or*  
dilute 20 mL of concentrated hydrochloric acid to 100 mL with ethyl alcohol and then saturate with salicylic acid (about 13 grams per 100 mL).  
NOTE: These acidified solutions should be used within 30 min.
- (b) Spray sufficient stock solution [and acid solution if not combined with the turmeric in Clause 4.1.2(a)] onto a freshly prepared surface of a test piece to thoroughly wet the surface. The presence of boron is indicated by the development of an orange to red colour within 20 to 30 min.

### 4.2 METHOD 2

#### 4.2.1 General

The method in this Clause is an alternative method to determine boron penetration.

#### 4.2.2 Principle

Boron penetration is determined visually, on freshly prepared cross-sectional surfaces obtained from timber samples treated with boron compounds, by the formation of a pink/red colour.

The moisture content of the samples shall be less than 25% prior to spot testing.

#### 4.2.3 Reagents

All reagents shall be of analytical reagent quality. The water used for preparing the reagents shall be distilled. The following reagents shall be used:

- (a) 0.2% solution of pyrocatechol violet in water.
- (b) Buffer solution pH 8–8.2.

The reagents shall be of analytical reagent quality.

#### 4.2.4 Procedure

The procedure shall be as follows:

- (a) Make a solution of 2 g/L of pyrocatechol violet in distilled water. Add a few millilitres of chloroform to stop mould growth. Store in a brown glass bottle out of direct sunlight and out of contact with any metals. Under these conditions, storage life is virtually indefinite.
- (b) Make a solution of 0.68 g anhydrous potassium hydrogen phosphate (previously dried at 110°C) and 13.49 g disodium hydrogen phosphate (previously dried at 130°C) in 1 L distilled water.

Alternatively, make up a 2% solution of sodium hydrogen phosphate and, using a pH meter, add 20% sodium hydroxide solution until the pH of the solution is between 8.0 and 8.2.

When storing, protect the buffer solution from exposure to light.

- (c) Spray sufficient stock solution onto a freshly prepared surface of a test piece to thoroughly wet the surface. The presence of boron is indicated by a pink red colour, which develops almost immediately. The lower limit for detection is c. 0.15% boric acid. Borderline cases will show a muddy brown green colour and untreated areas will appear yellow.



## SECTION 5 DETERMINATION OF FLUORIDE PENETRATION IN TIMBER TREATED WITH FLUORIDE-BASED PRESERVATIVES

### 5.1 PRINCIPLE

Fluoride is determined visually from the formation of a yellow colour on the radial section of timber samples treated with fluoride compounds.

### 5.2 REAGENTS

All reagents shall be of analytical reagent quality. The water used for preparing the reagents shall be distilled. The following reagents shall be used:

- (a) *Stock solution A* Dissolve 2 g sodium alizarin sulphonate in 460 mL water. Acidify the solution with 40 mL of 32% hydrochloric acid. Store in a screw-capped glass bottle.
- (b) *Stock solution B* Dissolve 5 g zirconium oxychloride in 500 mL water. Store in a screw-capped glass bottle.

### 5.3 PROCEDURE

#### 5.3.1 Preparation of test solution

Prepare the test solution by mixing equal volumes of stock solution A [Clause 5.2(a)] with stock solution B [Clause 5.2(b)]. This solution shall be used within 20 min.

#### 5.3.2 Application of the test solution

The procedure shall be as follows:

Brush the test solution onto a dry, radially split section of timber. A change of colour from red to yellow within 2 or 3 min indicates the presence of fluorides.

#### NOTES:

- 1 The yellow colour may be difficult to observe on dark coloured species.
- 2 Some rainforest species give a false positive.

## SECTION 6 DETERMINATION OF TIN PENETRATION IN TIMBER TREATED WITH TIN-CONTAINING PRESERVATIVES

### 6.1 PRINCIPLE

The presence of tin compounds in TBTO and TBTN LOSP treated timber are determined by using an alcoholic solution of bromopyrogallol red. Areas containing tin compounds turn blue/violet.

### 6.2 REAGENT—BROMOPYROGALLOL RED SOLUTION 0.2%

Dissolve 0.2 g of bromopyrogallol red powder (CAS No. 16574-43-9) in 100 mL of ethanol. Store in a stoppered glass container.

The reagent shall be of analytical reagent quality.

### 6.3 PROCEDURE

The procedure shall be as follows:

- (a) Cut a transverse section of the treated timber approximately 30 mm along the grain.
- (b) Dry the sample in an oven (ca. 100°C) for a minimum of 12 h.
- (c) Remove the sample from the oven and allow to cool to room temperature.
- (d) Cut the sample in half, across the grain.
- (e) Apply the bromopyrogallol red solution to one of the freshly cut faces with a brush. Allow 10 to 15 min for colour development.

The untreated areas remain a pale red while the areas containing tin compounds turn blue/violet.

### 6.4 PRECAUTIONS

A pale blue colour can develop on unpenetrated zones if oven-drying is incomplete and moisture is still present. The presence of residual organic solvent will also interfere with colour development.

Insufficient time in the oven will fail to degrade the tin compounds sufficiently to produce positive results.

Where freshly treated material containing excess organic solvent is to be tested, it should be gently air-dried before being placed in the oven. This is to avoid the possibility of redistribution of the tin compounds, which may occur as the solvent flashes off, if samples are oven-dried directly.

## SECTION 7 DETERMINATION OF ZINC PENETRATION IN TIMBER TREATED WITH ZINC-CONTAINING PRESERVATIVES

### 7.1 GENERAL

The methods given in this Section are particularly useful for determining the penetration of LOSP Azole preservatives that have zinc tracer compounds added.

### 7.2 METHOD 1

#### 7.2.1 Principle

Zinc is determined visually on the surface of timber samples treated with zinc-containing preservative formulations by the formation of a pink colour.

#### 7.2.2 Reagent—Dithizone indicator

Dissolve 0.1 g of dithizone (dimethylthiocarbazon) in 100 ml of chloroform (or other available chlorocarbon solvent) or ethanol.

The reagent shall be of analytical reagent quality.

#### 7.2.3 Procedure

The procedure shall be as follows:

- (a) Ensure any free solvent from the treatment process has evaporated from the wood and that the wood is surface dry.
- (b) Cut a fresh cross-cut face using a fine-toothed saw.
- (c) Apply a fine layer of dithizone indicator to the fresh cut face by spray.
- (d) Penetrated areas will change to a pink colour within a few seconds. Unpenetrated areas will remain green. Record penetration at 5–10 min from the time the indicator was applied. The colour will start to fade after 30 min.

### 7.3 METHOD 2

#### 7.3.1 General

The method in this Clause is an alternative method to determine zinc penetration.

#### 7.3.2 Principle

Zinc is determined visually on the surface of timber samples treated with zinc-containing preservative formulations by the formation of a pink colour. The test may become less selective as the solution in methanol ages. Normally, this reagent must be prepared fresh each day, but can be maintained for longer periods under refrigeration.

#### 7.3.3 Reagent—PAN indicator

Dissolve 0.5 g of PAN (1-(2-pyridylazo)-2-naphthol) indicator in 1 L of methanol.

The reagent shall be of analytical reagent quality.

#### **7.3.4 Procedure**

The procedure shall be as follows:

- (a) Ensure any free solvent from the treatment process has evaporated from the wood and that it is surface dry.
- (b) Cut a fresh cross-cut face using a fine-toothed saw.
- (c) Apply a fine layer of PAN indicator to the fresh cut face by spray and allow it to soak in.
- (d) Penetrated areas will change to a deep red/magenta colour within a few seconds. Unpenetrated areas will remain orange in colour.



## NOTES

NOTES

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