A Wood Adhesives Function

To bond two or more pieces of timber together, for applications such as:

- Finger-jointing
- Face to face lamination
- Edge to edge lamination
**Structural Adhesives**

- A structural adhesive should be capable of withstanding a continuous load without deforming or creeping.

- In New Zealand a Structural Adhesive is required to be durable for at least 50 years.

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**Structural Adhesives**

- AS/NZS 4364:1996
  “Adhesives, phenolic and aminoplastic, for load-bearing timber structures – Classification and performance requirements”.

- Status
  Under revision by the joint AS/NZ Standards Committee TM004.
Durability of Adhesives

Adhesive Types for Given Service Conditions
(Proposed TM004 Standards Committee revision to AS/NZS 4364:1996)

<table>
<thead>
<tr>
<th>Description</th>
<th>Service Class*</th>
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<td>2</td>
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<td></td>
<td>3</td>
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<tr>
<td>Timber EMC(%)</td>
<td>Interior dry</td>
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<td></td>
<td>Interior—Humid, Exterior protected</td>
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<tr>
<td></td>
<td>Interior hot and humid, exterior exposed</td>
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<tr>
<td>Type I Adhesives</td>
<td>Type I</td>
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<tr>
<td></td>
<td>or Type II</td>
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<tr>
<td>Adhesive(?)</td>
<td>Type I</td>
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<tr>
<td></td>
<td>or Type II, provided the temperature</td>
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<tr>
<td></td>
<td>remains below 50°C</td>
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<td>Examples(?)</td>
<td>PRF</td>
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<tr>
<td></td>
<td>RF</td>
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<td>TF</td>
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</table>

Adhesives

Adhesive Types
(AS/NZS 4364:1996 TM004)

Type I Adhesives
• Resorcinol Formaldehyde (RF)
• Phenol Resorcinol Formaldehyde (PRF)
• Phenol Formaldehyde (PF)
• Tannin Formaldehyde (TF)

Type II Adhesives
• Melamine Urea Formaldehyde (MUF)
• Polyvinyl Acetate (PVAC) [Not recognised as a structural adhesive]
• Urea Formaldehyde (UF)
• Polyurethane (PU/PUR) [Not recognised as a structural adhesive]
• Aqueous Polyurethane (API) [Not recognised as a structural adhesive]
Applications of Structural Adhesives

- Finger-jointed studs
- Laminated beams
- Laminated posts
- I joists / Beams
- Plywood
- Laminated veneer lumber

Comparison of Properties; Different Adhesive Types

Test Piece preparation and Testing

- Lamination of P. Radiata lumber
- 7 day cure at 25°C
- Adhesive used in accordance with the manufacturers instructions.
- Tested in accordance with JAS Shear Block Test;
  - Type 1 Immersion Delamination Test: Test pieces soaked for 4 hr in boiling water, dried for 20 hr at 60 °C, boiled again for 4 hr and dried for 3 hr at 60 °C.
  - Type 2 Immersion Delamination Test: Test pieces soaked in hot water at 70 °C for 2 hr and dried at 60°C for 3 hr.
  - Formaldehyde emissions determined.
Comparison of Properties; Different Adhesive Types

JAS Tensile Shear Block Test - Failing Load

- Sylvic R15/RP50 RF Adhesive
- Sylvic M7/L30 MUF Adhesive
- D3 PVAc
- PUR (Moisture Cure)
- API

Average Failing Load (N/mm²)

Adhesive Type

Comparison of Properties; Different Adhesive Types

JAS Tensile Shear Block Test - % Wood Failure

- Sylvic R15/RP50 RF Adhesive
- Sylvic M7/L30 MUF Adhesive
- D3 PVAc
- PUR (Moisture Cure)
- API

Average Wood Failure (%)

Adhesive Type
Comparison of Properties; Different Adhesive Types

Formaldehyde Emissions (JAS Desiccator Test)

Formaldehyde Emission (mg/L)

Adhesive Type

Sylvic L5F95/L5 W Adhe...
Sylvic M7/L30 MF Adhe...
PUR (Moiosture Cure)
D3 PVAc
Adh