

The background is a blue gradient with several overlapping, semi-transparent circular shapes of varying shades of blue, creating a modern, abstract design.

Developments in Structural Adhesives

Introduction

- Characteristics required for a Structural adhesive
 - Durable for the lifetime of the timber structures (min 50 years)
 - Adhesive must not creep
 - Bonding mechanism stronger than the wood
 - Must comply with AS/NZS4364:2010

Types of exterior Structural Adhesives

- Phenol Resorcinol Formaldehyde (PRF)
- Polyurethane (PUR or PU)
- Aqueous Polymeric Emulsions (API or EPI)

- Semi-exterior
- Melamine Urea Formaldehyde (MUF)

Phenolic Resorcinol Formaldehyde

- Pros

- Very durable and strong
- Fairly easy to work with excellent pot life (eg 1 1/2hour pot life in many cases)
- Can be expensive
- Can be cured at ambient temperature
- Very forgiving
- Excellent track record for performance in the field
- Good Shelf life 12-18 months (at least)

- Cons

- Can be slow to cure without addition of extra heat (approx 4 hours at ambient temperature)
- Formaldehyde based (carcinogenic)
- If housekeeping not maintained can be very dirty and messy

Polyurethane

- Pros

- Durable and strong
- Easy to work with and is in a single pot so no mixing
- Upfront cost of glue can be expensive (however uses $\frac{1}{2}$ spread rate of PRF)
- Can be cured at ambient temperature by using moisture in the wood
- Little to no waste of glue or waste water
- Cure times can be VERY fast

- Cons

- Needs very tight manufacturing conditions to ensure good bonding
- Some PUR's are high foaming which can cause adhesion to press beds
- Requires separating agents and cleaning agents
- 6 month shelf life

API/EPI

- Pros
 - Bonds are semi-structural and strong in interior and semi-exterior situations
 - Cost is reasonable
 - Works on some timber species that other adhesives can not bond
- Cons
 - Not well accepted
 - Is susceptible to creep
 - Has pot life issues and is a two part mix, which requires automated equipment
 - Shelf life 3 months

Melamine Urea Formaldehyde

- Pros
 - Durable and strong in semi exterior conditions
 - Fairly easy to work with even though it needs a hardener added thus requires mixing
 - Cost is very reasonable
- Cons
 - Requires heat to cure
 - Needs an acidic hardener
 - Needs very tight manufacturing conditions to ensure good bonding
 - Can have problems with formaldehyde smells
 - Shelf life 3 months

PVAc (Structural and Exterior?) - NO

- Pros
 - Durable and strong in interior and sometimes wet situations
 - Can be cured at ambient temperatures
 - Good track record for performance
 - With Aluminium Chloride added can make water resistant
 - Very cheap
- Cons
 - Does not pass cyclic wet/dry testing
 - Creeps

Where do they sit with the standards testing

- Shear Test
 - MUF did not survive freeze, dry boil test
- Delamination Test
 - PRF, PU, MUF and EPI all passed
- Creep Test
 - EPI failed