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RESOBOND® INDUSTRIAL ADHESIVES

The Resobond range of industrial timber adhesives are manufactured in Western Australia by MZ3 Pty Ltd.

The Resobond range has been specially formulated to provide performance on difficult to glue timbers such as Jarrah, Spotted Gum, Brush Box and other dense Australian and Asian hardwood species. The range also includes adhesives that give high quality bonds on softwoods such as pine.

All Resobond adhesives are based on resorcinol formaldehyde technology and are manufactured from premium quality raw materials to exacting standards.

Resobond adhesives have been tested to a variety of National and International Standards and shown to conform to the requirements of Australian/ New Zealand Standard AS/NZS 1328.1:1998 Type 1 adhesives for weather proof and boil proof structural glue laminated timber structures.

All of the Resobond adhesive resins require the addition of a hardener for full cure, and various neutral fillers may be specified from time to time.

The resins are not classified as dangerous goods, however since the hardeners generally contain paraformaldehyde, they are classified as dangerous goods. Please refer to the Material Safety Data Sheets for details of precautions, handling, storage and disposal.

RESINS

Resobond A3 & A3W

Resobond A3 is a 100% resorcinol formaldehyde resin that has been specially modified to give high performance bonds on difficult to glue timbers such as jarrah, teak, kapur, chengal, etc. Resobond A3 is classified as a cold setting adhesive for use at temperatures of 20°C and above. Better quality glue lines will be achieved if the curing temperature is +30°C. Resobond A3W may be used at lower temperatures (see Cold Weather Gluing below).

Resobond RF

Resobond RF is similar to Resobond A3 except for the additives. This makes Resobond RF suitable for radio frequency curing. Resobond RF may also be used as cold setting adhesive in the same way as Resobond A3, however its performance on difficult to glue timbers such as teak and spotted gum will not be as good.

The addition of 1 - 2 parts by weight of common salt will decrease the curing time in radio frequency curing, however care must be taken to prevent arcing.

Resobond 220

Resobond 220 is a tannin modified resorcinol formaldehyde adhesive suitable for manufacture of fire-proof doors, container flooring and large surface area bonding of veneers, fire-proof panels, and general timber bonding. When mixed with an appropriate hardener, Resobond 220 forms a strong, weatherproof bond suitable for exposed situations.

MZ3 recommends elevated curing temperature for Resobond 220 to produce the optimum glue-line, however this adhesive will cure satisfactorily above 25°C

Resobond FJR

This is a special, 100% resorcinol formaldehyde resin designed for high-speed finger jointing using automatic glue mixing and application equipment. It is intended for use where the hardener is mixed with the resin just prior to application and pressing. Experience has shown marked increase in finger joint strength using this type of system.

Resin Specifications

| Resobond | A3 | A3W | RF | 220 | FJR |
|--------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Type | 100% resorcinol | 100% resorcinol | 100%resorcinol | tannin resorcinol | resorcinol |
| Appearance | reddish brown clear liquid | reddish brown clear liquid | reddish brown clear liquid | reddish brown clear liquid | reddish brown clear liquid |
| Viscosity at 25°C | 200-500 cPs | 200-500 cPs | 200 - 500 cPs | 200 - 500 cPs | 200 - 500 cPs |
| S. G. at 25°C | 1.15 kg/m ³ | 1.15 kg/m ³ | 1.17 kg/m ³ | 1.2 kg/m ³ | 1.15 kg/m ³ |
| Solids Content | 58% W/W | 58% W/W | 56% W/W | 51% W/W | 55% W/W |
| pH | 8.0 | 8.5 | 8.0 | 8.0 | 9.0 |
| Shelf Life at 25°C | 2 years | 2 years | 2 years | 6 months | 2 years |
| Packaging | 220kg net | 220kg net | 220kg net | 220kg net | 220kg net |

HARDENERS/ ADDITIVES

Hardener P4

This is a powdered hardener containing 60% Macadamia nut shell flour and 40% paraformaldehyde. It is designed for use on highly dense timbers and where maximum gap filling is required. Hardener P4 should be mixed one part to four parts by weight with Resobond resins.

Hardener P6

This is a powdered hardener containing 50% Macadamia nut shell flour and 50% paraformaldehyde. It is designed for general use on medium density timbers and softwoods. Hardener P6 should be mixed one part to five parts by weight with Resobond resins.

Hardener PD4

This is a paste hardener containing 54% paraformaldehyde in diethylene glycol and water. It is designed to reduce the hazards associated with handling powdered paraformaldehyde in the workplace, and to facilitate liquid based automatic glue mixing systems. Hardener PD4 should be mixed one part to five parts by weight with Resobond adhesives.

Hardener ZT-50

This hardener is based on oxazilidine technology. ZT-50 will cure all Resobond resins with zero formaldehyde emission. This is of great benefit to health and safety of workers. The reaction is, however very fast and the mixtures have pot lives of approximately 10 minutes. With appropriate in-line mixing equipment, Hardener ZT-50 can be used for finger jointing and scarfing operations. Please ask our sales consultant for details.

Macadamia Nut Shell Flour

This is dry, ground Macadamia nut shells of low moisture and less than 150µm particle size. It is an excellent filler for resin systems due to its low absorption and low wear on cutting blades.

N.B. Powdered hardeners, and Macadamia nut shell flour, have a shelf life of two years, provided they are kept in sealed containers in a dry area.

Hardener PD4 has a shelf life of one year, provided the container is kept sealed. This product may settle over time, and should be mixed well before use.

MIXING

All Resobond adhesives must be mixed by weight using calibrated scales with the appropriate accuracy. Mixing is best accomplished by adding the powdered component slowly to the resin with good stirring. Any liquid component can then be added and the mixture stirred well. Paddle mixers are okay, but high-speed disc type mixers are preferred since the introduction of air into the mix is reduced.

The mix should be left to stand for 5 minutes and then stirred again slowly before use.

If a thicker glue mix is required, up to 5% by weight of Macadamia nut shell flour may be added to the mixed resin and hardener.

If a thinner glue mix is required, up to 10% of clean water may be added to the mixed resin and hardener.

Please note that these additions must be made **after** the resin and hardener have been mixed as described above. Users are encouraged to conduct trials when modifying the standard mix to confirm the performance of the modification.

A summary of the quantities and characteristics of commonly used Resobond adhesive systems is given below. Note that the quantities and additives are only a suggestion and that users may vary these ratios after conducting appropriate trials.

| 100 parts by weight of Resobond mixed with 25 parts by weight of Hardener P4 (high solids glue) | | | | | | |
|---|--------------------|--------------------|-----------------------|------|------|------|
| | Gel Time (secs) | Viscosity (cPs) | Pot Life (minutes) | | | |
| | | | 100°C | 25°C | 15°C | 25°C |
| Resobond A3 | 48 | 4000 | N/A | 190 | 40 | 15 |
| Resobond A3W | 36 | 4000 | 120 | 90 | N/A | N/A |
| Resobond RF | 35 | 4500 | N/A | 115 | 35 | 10 |
| Resobond 220 | 43 | 7500 | N/A | 115 | 45 | 20 |

| 100 parts by weight of Resobond mixed with 20 parts by weight of Hardener P6 (medium solids glue) | | | | | | |
|---|--------------------|--------------------|-----------------------|------|------|------|
| | Gel Time (secs) | Viscosity (cPs) | Pot Life (minutes) | | | |
| | | | 100°C | 25°C | 15°C | 25°C |
| Resobond A3 | 48 | 3800 | N/A | 190 | 40 | 15 |
| Resobond A3W | 36 | 3800 | 120 | 90 | N/A | N/A |
| Resobond RF | 35 | 4000 | N/A | 115 | 35 | 10 |
| Resobond 220 | 43 | 7000 | N/A | 115 | 45 | 20 |

| 100 parts by weight of Resobond mixed with 20 parts by weight of Macadamia nut shell flour and 20 parts by weight of Hardener PD4 (medium solids glue) | | | | | | |
|--|--------------------|--------------------|---------------------|------|------|------|
| | Gel Time (secs) | Viscosity (cPs) | Pot Life (hours) | | | |
| | | | 100°C | 25°C | 15°C | 25°C |
| Resobond A3 | 48 | 3800 | N/A | 190 | 40 | 15 |
| Resobond A3W | 36 | 3800 | 120 | 90 | N/A | N/A |
| Resobond RF | 35 | 4000 | N/A | 115 | 35 | 10 |
| Resobond 220 | 43 | 7000 | N/A | 115 | 45 | 20 |
| Resobond FJR | 15 | 4000 | 15 | 10 | N/A | N/A |

100 parts by weight of Resobond A3 mixed with 15 parts by weight of Macadamia nut shell flour and 45 parts by weight of Hardener ZT50
(high solids glue, in-line mixing)

| | Gel Time (secs) | Viscosity (cPs) | Pot Life (minutes) | | | |
|-------------|----------------------------|----------------------------|-------------------------------|-------------|-------------|-------------|
| | 100°C | 25°C | 15°C | 25°C | 40°C | 50°C |
| Resobond A3 | 13 | 3800 | 15 | 10 | N/A | N/A |

GENERAL CONDITIONS OF USE

MOST IMPORTANT!

Before starting production, it is strongly suggested that trials be conducted to establish the conditions best suited to the job. Please contact MZ3 for most detailed technical advice.

Preheating

In cold environments it may be advantageous to preheat timber to a temperature of 18-22°C. Heating above this temperature range can lead to problems if assembly times are long.

Surface Preparation

The laminae must be accurately machined. The surface must be clean and the grain open to allow easy penetration of the adhesive. The freshly machined surface will deteriorate with age; this occurs more rapidly with hardwoods. Consequently, the time between machining and spreading the glue should be kept to a minimum. Ideally the planer should be in line with the glue spreader so that glue is spread only seconds after machining.

Application

The adhesive should be applied at the rate of at least 250g/m² to each of the surfaces being glued (double glue line). Heavier spreads can be used to overcome glue-line starvation.

Timber Moisture Content

For dense timbers such as Jarrah, the best results will be obtained if the moisture content of the timber is between 8% and 10%. Other timbers and materials should have moisture content lower than 15%. Note that adjacent laminae should not differ in moisture content by more than 4%.

Open Assembly Time

The open assembly time is affected by a number of factors including air temperature, relative humidity, timber temperature, air movement across the glue and glue spread. As these factors change and increase the rate at which glue is drying out, the open assembly time must be reduced accordingly. Under mild ambient conditions (25°C, 60% R.H.) the open assembly time should be less than five minutes.

Closed Assembly Time

The closed assembly time must be long enough to allow glue penetration into the timber, but not so long that glue-line starvation or pre-cure occurs. Under most conditions the minimum closed assembly time is five minutes. The maximum closed assembly time at various temperatures is shown below:

| | | | | |
|-------------|-------|------|-------|-------|
| Temperature | 20°C | 25°C | 30°C | 35°C |
| C.A. Time. | 2.5hr | 1.5h | 45min | 30min |

Clamping Pressure

The pressure required is shown below:-

| | |
|-----------|---------------|
| Softwoods | 700 - 1000kPa |
| Hardwoods | 800 - 1200kPa |

With presses which do not take up any movement (e.g. screw presses) it is necessary to re-tension 20 minutes after locking up the press.

Pressing Time and Temperature

The glue must be cured at a temperature above 20°C and for **optimum results a glue line temperature of 25°C should be attained** within 30 mins of clamping.

It is essential the heat is applied as soon after clamping as possible. The pressing time required is as follows:-

| | | | | |
|---------------|-------|------|------|------|
| Temperature: | 20°C | 30°C | 40°C | 50°C |
| Pressng Time: | 12 hr | 8 hr | 5 hr | 3 hr |

Please note that these temperatures refer to the glue line; timing must allow for heat to travel through the timber.

It is most important that users establish the time and temperature in their own plant, under the environmental extremes (ie winter and summer).

After removing from the press, stack the glued material to maintain heat or store in a warm environment. Please note that pressing temperature is most important with Resobond 380 and Resobond 220. These modified resorcinol adhesives are not as forgiving as Resobond A3 and Resobond RF.

RF Heating

Resobond RF has been specially formulated for radio frequency curing. Reducing air gaps and adjustment of the potential across the electrodes may minimise arcing. If the glue line is too slow to heat up, the addition of common salt (sodium chloride): 1 to 2 parts per 100 parts of mixed adhesive may help. Dissolve the salt in a little water and add the solution to the mixed adhesive.

Note: With RF heating, glue application rate should be monitored since glue squeeze-out may not occur on laminae last in press subsequent to solvent evaporation/ absorption.

Clean Up

The uncured glue can be removed by washing with water. Wastewater treatment plant designs are available on request.

Partially cured glue will slowly soften by soaking in hot 25% W/W caustic soda. **BEWARE! CAUSTIC SODA IS CORROSIVE, ENSURE CORRECT PROTECTIVE EQUIPMENT IS WORN.**

Cured glue can generally be removed mechanically.

Storage

Resobond resins, Hardeners and additives should be stored in well sealed containers in a cool, dry environment (5°C to 25°C), in accordance with local dangerous goods regulations where applicable. All Resobond adhesives should be protected from freezing.

Preservative Treated Timber

We recommend that only Resobond A3 be used to glue preservative (copper-chrome-arsenic or boron) treated timber. Gluing conditions are the same as outlined above, however, extra care should be taken to ensure that the moisture content of the timber is correct.

When preservative treatment is undertaken after lamination, the timber component should be left to fully cure for 7 days after gluing.

Cold Weather Gluing

Resobond can be modified for cold weather (less than 20°C) gluing. We recommend that timber is pre-heated, however the modified adhesive will improve bond strength (at the expense of pot life).

Health and Safety

No MZ3 products should be used without consulting and comprehending the most recent Material Safety Data Sheet (MSDS) for that product. MSDS's are supplied as controlled documents with initial purchase of product.

Disclaimer:

The information above is offered and must be accepted on the basis that it is believed to be the best available at the date of issuance and is subject to change without notice. It is furnished without representation or warranty as to its suitability or performance, and **users are encouraged to conduct their own trials and select the form, usage and conditions appropriate to their own requirements and environment.** The information given must not be construed as a recommendation to use the products in violation of any patent rights or in breach of any provisions of any Act or Regulation, Federal or State.