TECHNICAL INFORMATION

Ad VERSION 2

BORDEN RESORCINOL ADHESIVES

Resorcinol adhesives have undoubtedly become established as reliable construction adhesives since they combine ease of use with the advantages of high strength, durability and long storage life. Borden Resorcinol adhesives are liquid resins in alcohol-water solution, and are used in conjunction with powder or liquid hardeners which must be thoroughly mixed into the resin before use. Technical Information on individual products is available in and should be read in conjunction with this bulletin.

DURABLE

Because of their outstanding durability under conditions of severe exposure these glues should be used for all work where the maximum resistance to weathering is required; they are particularly recommended for constructional laminating, for marine craft (stems, keels, frames, knees, masts etc), for laminated roof members (such as sports halls etc), for arches for bridge-work, and for concrete formers. In the marine field they are also used as a bonding medium in the multi-skin method of construction (ie double or treble skin) and for edge-glued planking and decking which avoids the need for caulking and a seam filler. Being naturally gap-filling these glues are also ideal for use in the cold-moulded method of boat construction.

VERSATILE

Other uses for Borden Resorcinol adhesives include the gluing of laminated plastics both to wood and to themselves; gluing mineral board; as a bonding agent in the laminating of phenolic impregnated asbestos-felt; as a sealer for expanded polystyrene prior to coating with glass-reinforced plastic; and as a bonding agent for expanded polystyrene and expanded PVC buoyancy blocks.

TEAK

Teak, normally a difficult timber to bond owing to its oily nature, can also be successfully bonded with Borden Resorcinol adhesives without any degreasing of the gluing surfaces, provided that these are freshly machined.

Borden Chemical UK Ltd, Sully, South Glamorgan, CF64 5UY, UK **Tel: +44 (**0) 845 310 9200
Fax: +44 (0) 845 310 9035 **E-mail:** eurosales@bordenchem.com

STORAGE

Controlled storage temperature is not normally required for Borden Resorcinol adhesives, and most grades of these resins remain in a usable condition for over one year at a temperature of 20°C. As with most synthetic resin glues, the cooler the storage the longer they remain usable. Should the resin become frozen in transit, etc, it should be thawed slowly to room temperature before use. In all cases containers should be kept tightly closed to prevent loss of solvents, etc.

Hardeners used with Borden Resorcinol adhesives also have a very long storage life at normal room temperature (20°C). Containers must again be kept tightly closed and should not be subjected to high temperatures for prolonged periods.

QUALITY OF BOND

Borden Resorcinol adhesives will produce bonds which withstand intermittent or continuous exposure to moisture, cold or boiling water immersion, moist or dry heat, mould or fungus attack and most organic solvents. With most types of construction the joints when properly made are stronger than the wood itself, and no deterioration of strength has been observed to take place upon ageing, even under tropical conditions.

SPECIFICATIONS

The glues comply with BS EN 302, BS1203 and BS1204 "Synthetic Resin Adhesives" Part I and II - the specifications recognised for weatherproof adhesives. Other specification requirements met by Borden Resorcinol adhesives are the US Military Specifications covering laminated constructions etc, those issued by the Admiralty in this UK in connection with marine craft construction and BS476 part 8, Fire Resistance of Elements of Building Construction.

USE OF ADDITIONAL FILLERS

Whilst Borden Resorcinol adhesives are gap filling it may, in certain circumstances, be beneficial and necessary to add a percentage of extra filler in order to thicken the glue mix and so prevent a `starved joint'. For example when testing to the gap-filling section of BS1204, a 10% addition helps to retain the glue in the 1.25 mm gap (under no circumstances should extra filler be used in an endeavour to fill gaps larger than 1.25 mm. The filler recommended for the purpose is a coconut shell flour available from BORDEN CHEMICAL UK LTD, which can be used in proportions from 10% to 12% by weight depending on the work being carried out. The addition of the filler has no adverse affect on the strength and durability of the glue line.

Borden Chemical UK Ltd, Sully, South Glamorgan, CF64 5UY, UK **Tel: +44 (**0) 845 310 9200
Fax: +44 (0) 845 310 9035 **E-mail:** eurosales@bordenchem.com

DIRECTIONS FOR USE

MIXING

For consistent results the resin/catalyst proportions should always be accurately determined (see Borden's Technical Information). Where a powder catalyst is being used the resin should always be stirred whilst the catalyst is being added, in order to avoid the formation of lumps. The sides of the mixing container and the mixer should be scraped clean of the resin and catalyst (or unmixed glues) so that the materials are thoroughly blended in as the mix is being made.

EQUIPMENT

For small quantities, thorough mixing by hand is adequate, but for large mixes it is preferable to use a mechanical mixer. It should be noted that fast mixing causes an aerated glue mix which, due to its `foamy' nature, might cause loss of strength. After thorough mixing the glue should be allowed to stand for a few minutes before use to overcome any aeration which might have occurred.

CONTAMINATION

Mixing equipment should be kept free of any alkaline or acidic material. Traces of these materials will affect the glue mix and, subsequently, the working life and pressure period. Mixing containers can be made of steel, zinc, copper, bronze or aluminium; in practice, steel is the most serviceable and generally used. For large mixes galvanised or polythene buckets make ideal vessels, whilst for small batches a waxed beaker can be used.

POT LIFE

Borden Resorcinol adhesives are thermosetting materials and the usable life of the glue mix will vary with the temperature; tables giving the appropriate times at various temperatures will be found in the relevant Product Technical Information.

SPREADING

Borden Resorcinol adhesives can be spread by mechanical glue spreaders with either steel or rubber covered rollers, or hand spread with a stiff bristled brush, roller or spatula.

Borden Chemical UK Ltd, Sully, South Glamorgan, CF64 5UY, UK **Tel: +44 (**0) 845 310 9200
Fax: +44 (0) 845 310 9035 **E-mail:** eurosales@bordenchem.com

SPREAD RATE

The amount of glue required will be between 2 and 5 kg per 10 m^2 of surface area being glued, depending upon the work being carried out. When using dense timber or timber of high moisture content or with rough surfaces, the spread should be nearer the higher figure and the lower figure used only for smooth surfaced timber when close fitting joints can be ensured. Generally, a spread of 2 to 2.5 kg per 10 m^2 can be taken as a guide when using smooth timber and high pressures (as in plywood manufacture) and a spread of 3 to 5 kg when undertaking structural work, ie timber engineering. The joints may be single or double spread (ie the glue applied to one or to both surfaces of the joint), but it is recommended that double spreading should be carried out whenever possible. This will ensure even wetting of both surfaces, and will assist in obtaining the maximum assembly times.

DOUBLE SPREADING

In double spreading, the amount of glue spread remains about the same, or is slightly increased, but the total amount is evenly divided between the two surfaces. For dense timber such as oak double spreading is essential.

PLYWOOD

Borden Resorcinol adhesives are basically assembly glues, but sometimes they are used for the manufacture of special plywood. For such applications, the glue spread should be reduced to 1.5 to 2.5 kg per 10 m^2 depending upon the moisture content and the surface condition of the veneer. Again, the higher figure should be used for high moisture contents and rough surfaces.

MOISTURE CONTENT

The recommended moisture content of the timber to be bonded should be between 12% and 18%. If the wood is very dry there is a tendency for the adhesive to bolt into the surface leaving insufficient to form a secure bond. On the other hand if the wood is too damp, the dilution effect within the surface tends to weaken the bond.

ASSEMBLY PERIOD

The assembly period is the time elapsing between spreading the glue and bringing the work under pressure for curing. These assembly times will vary with the temperature, but factors such as the moisture content of the timber and the quantity of glue spread will also affect the time. The figures given in the Product Technical Information, based upon a moisture content of 12% to 15% and a spread of 3 to 5 kg per 10 m^2, may be taken as a good guide.

Borden Chemical UK Ltd, Sully, South Glamorgan, CF64 5UY, UK **Tel: +44 (**0) 845 310 9200
Fax: +44 (0) 845 310 9035 **E-mail:** eurosales@bordenchem.com

USABLE LIFE

When the glue mix is nearing the end of its working life, it should be noted that sufficient unexpired life must remain to allow not only for the assembly period, but also for the application of pressure.

SMALL JOINTS

When gluing small constructions an assembly period of more than a few minutes is often not required. It is generally advisable, however, to delay the application of pressure for approximately half the previously mentioned assembly period to allow the glue to wet and penetrate the wood surfaces and thus avoid the possibility of a `starved joint'.

OAK

When gluing dense timbers such as oak, this delay in the application of pressure is essential.

PRESSURE

Adequate and even pressure is required to smooth out the glue film, and to force air out of the joint so that the wood surfaces are brought into uniform contact with the glue. Pressure should also be evenly distributed across the width of the assembly or joints being made. Cramp spacing should be close enough to provide the necessary pressure evenly along the construction being glued, especially when working on curved sections. Although some specifications quote 7 to
14 kg/cm^2 heavy pressures are not usually required when using Borden Resorcinol adhesive since they are gap-filling materials; for general work, sufficient pressure to bring the joints into uniform contact is all that is required.

CLAMPING

Clamping should be carried out from one end of the construction to the other, or from the centre outwards in each direction. In practice, it is usually best to apply moderate pressure over the whole assembly followed by full pressure. When laminating bends, etc, it is important that the laminate should be free to slide as pressure is applied.

METHODS

Various methods of applying pressure may be used and the following are given for guidance: `G' cramps; bolts and bar to form a `U' with top bar, usually known as clamp bolts; compressed air or hydraulic rams; wood screws, nails, etc; inflated fire hoses positioned between two caul boards adequately supported. When using clamping bolts, useful additions are air or electric nut runners, and an adjustable torque wrench, both of which can be set to a specific loading and thus ensure even pressure over the whole construction.

Borden Chemical UK Ltd, Sully, South Glamorgan, CF64 5UY, UK **Tel: +44 (**0) 845 310 9200
Fax: +44 (0) 845 310 9035 **E-mail:** eurosales@bordenchem.com

PRESSURE PERIOD AND CURING TIMES

As mentioned earlier, Borden Resorcinol adhesives, being thermosetting materials, are affected by temperature variations. The pressure periods applicable at various temperatures are given in the appropriate product Product Information, and it should be noted that curing at temperatures below 15°C is not recommended.

SEASONING

The times quoted are sufficient for normal handling of unstressed constructions, but joints should be allowed to season at room temperature for a minimum period of twenty-four hours if they are to be machined.

STRESSED JOINTS

With stressed constructions such as laminated arches, boat frames, etc, longer pressure periods will be necessary and depending upon the stresses involved, up to four times the quoted figures may be required. A further seasoning period of up to ten days, depending on ambient temperature, is necessary to reach full strength.

OTHER SPECIFICATIONS

Other specifications covering laminated constructions lay down specific curing temperatures and cramping periods and all these should be followed closely.

DENSE TIMBERS

When gluing dense timbers such as oak, it is necessary to cure these adhesives at a glue line temperature of at least 20°C in order to achieve satisfactory results and durability. These temperatures may quite easily be obtained by the application of local heat in the form of low-frequency strip heating, rubber heating blankets, radiant heaters, hot air blowers, or even by using electric fires, oil heaters, etc. The areas being glued should be covered by a tarpaulin or similar cover to retain the heat where required. It is also advisable to place a shallow tray of water beneath the glued assembly in order to preserve the atmospheric humidity and prevent excessive shrinkage of the wood when elevated curing temperatures are used. When making smaller constructions which can be handled easily, use can be made of the heating chamber method. In this case a simple cupboard which can be made quickly and cheaply is all that is necessary.

GENERAL NOTES

GLUING OF `DIFFICULT' TIMBERS

Difficulties are sometimes encountered when bonding certain species of timber (eg oak) with resorcinol adhesives. This fact was first observed in the USA when American white oak was used for laminating structural members for marine craft.

Borden Chemical UK Ltd, Sully, South Glamorgan, CF64 5UY, UK **Tel: +44 (**0) 845 310 9200
Fax: +44 (0) 845 310 9035 **E-mail:** eurosales@bordenchem.com

Investigation into the techniques brought to light the need for increased curing temperatures, minimum CAP (Close Assembly Period) and inspection of the surfaces to be bonded (ie to avoid attempts to glue `case hardened' surfaces).

TECHNIQUES

When bonding `difficult' timbers it is recommended that:

a Smooth surfaces should be removed by rough sanding or light toothing (ie to produce a surface as would result from the use of a fine hacksaw blade).

b A minimum of twenty or thirty minutes CAP should be allowed before the application of pressure. This will enable the adhesive to penetrate the surface fibres of the timber and so avoid excessive squeeze-out which causes a `starved joint'.

c The curing temperature of the glue should be a minimum of 20°C. These temperatures may be obtained in the manner described in the section headed `PRESSURE PERIODS and CURING TIMES'.

d Teak and other naturally oily timbers can generally be bonded without further treatment. If however, there is excess oil on the surface, this should be removed by wiping with a cloth soaked in detergent or, if very resinous by using a degreasing solvent. This technique can also be used in "case hardened" timber, though sanding is preferable.

SPECIAL APPLICATIONS

METAL TO WOOD

The use of Resorcinol resin with a primer is recommended for metal to wood gluing, when a high degree of moisture resistance is required. Details of the correct techniques for this application are obtainable on request.

MINERAL BOARDS TO WOOD

Borden Resorcinol adhesives can be successfully used for bonding many mineral boards (including MARINITE board) to itself and to timber surfaces. These do vary considerably and it is recommended that advice is obtained from our technical Sales Department before work of this nature is contemplated.

OTHER USES

In the case of special uses of Borden Resorcinol adhesives not covered in this publication (eg radio frequency gluing, gluing at temperatures above 60°C, the gluing of preservative-treated timber, etc), it is again recommended that contact be made with our Technical Sales Department for information and advice.

Borden Chemical UK Ltd, Sully, South Glamorgan, CF64 5UY, UK **Tel: +44 (**0) 845 310 9200
Fax: +44 (0) 845 310 9035 **E-mail:** eurosales@bordenchem.com

CLEANING OF EQUIPMENT

Borden Resorcinol adhesives are water soluble until they are cured and, as such, may be easily removed from the hands, clothing, brushes, mixing and spreading equipment with cold or warm water. Cleaning may be speeded up by using hot water but this must be carried out quickly before the heat hardens the glue. Once these glues have hardened they are difficult to remove from equipment and cannot be removed from clothing.

DETAILED TECHNICAL INFORMATION

For detailed information of Usable Lives, Assembly Periods and Pressing Times for individual glue mixes, see the appropriate Product Technical Information.

PROTECTION OF THE WORKERS' HANDS

As is well known in the trade, the use of synthetic glues in common with various other materials can produce dermatitis. A wet swab should be frequently used by gluing operatives to prevent any glue from setting on the hands. The use of a suitable barrier cream is also recommended. Full information can be obtained from HMSO.

18/01/96

Borden Chemical UK Ltd, Sully, South Glamorgan, CF64 5UY, UK **Tel: +44 (**0) 845 310 9200
Fax: +44 (0) 845 310 9035 **E-mail:** eurosales@bordenchem.com