

## HANDY HINTS AND NEW IDEAS FOR RESTORATION AND MAINTENANCE

*Chaired by Trevor Burling, Wellington Tramway Museum*

This workshop provided an opportunity to exchange handy hints and new ideas to assist in all aspects of maintenance and restoration of tramcars, railway carriages and permanent way - mechanical, electrical, woodwork etc.

### **Epoxy Resin Compounds in Wood Restoration/Conservation**

Bruce Gamble (MOTAT) described MOTAT's experience of using epoxy resin compounds for:

1. Repair of structural timber work
2. Plugging holes
3. Re-lamination
4. Preserving timber by impregnation

MOTAT have been using low-viscosity epoxy resins and hardeners marketed (in N.Z.) by West Systems for use in boat building. However, other similar low-viscosity epoxies (e.g. Ciba-Geigy's Araldite range of materials) are also suitable for tram and railway carriage restoration work. After mixing with an appropriate hardener, the syrup can either be thinned or mixed with various fillers and pigments depending on the end purpose.

In load-bearing timbers where strength is important, a careful balance must be struck between removing rot or other damage, maintaining as much of the original strength as possible and ensuring that the epoxy replacement has a good bond to sound timber. The alternative of splicing in a new section of timber should be considered, particularly where appearance is a factor. However, the use of epoxies to impregnate doubtful areas surrounding the slice and/or as an adhesive can be helpful even in these cases. If in doubt get a qualified opinion!

For structural work MOTAT's preferred procedure is:

- Trim out any rot back to sound timber (drill, chisel or rotary burr).

- Saturate the cavity with a primer of thinned down epoxy and leave until it starts to harden (this may be up to 12 hours) - a very important step.
- Fill the hole with epoxy compound and leave to harden
- Trim the surface

Several types of fillers have been tried in these mixtures, including saw dust, wood flour (saw dust sieved to get only the finest particles), lightweight micro silica ("micro balloons") and polyester micro-fibres. These artificial wood mixtures are like making concrete - liquid binder, coarse filler and fine filler. The more binder, the more fluid the mix. By juggling the proportions everything from a dough (used on vertical surfaces) to a "self-levelling" compound can be produced.

A high proportion of wood allows the area to be shaped, sawn, and screwed into, and provides resilience. However, too much wood reduces the strength. Mixing in polyester micro-fibres improves the strength. Too much epoxy makes the patch hard to work and somewhat brittle. A good general purpose mixture, where little reworking is required is (proportions rough and by volume):

- 40% epoxy resin
- 20% wood flour (or micro-silica)
- 40% polyester micro-fibres

MOTAT uses epoxies a lot for plugging holes, particularly where rusted nails and screws have had to be (painfully) extracted, or where oversized screws have enlarged the holes. Where the hole is in a vertical surface, the first step is to form a dam. MOTAT usually just uses masking tape. (in difficult or critical cases, a glass pipette with a right angled bend can be inserted.) A runny mixture of epoxy and a small volume of polyester micro-fibre is then poured in - preferably preceded by the primer treatment. Usually, a nail or piece of wire must be jiggled around in the hole to get out all the air bubbles. A little pigment in the mix helps if the area is eventually to be varnished.

Thinned epoxy is used not only as a primer, but also as a means of re-laminating areas of plywood where water has damaged the original glue (e.g. the casein type) and in strengthening/stabilising/sterilising rot. A good publication on the last application is available from Ciba-Geigy: "Araldite in Wood Conservation", Publication No. 24714/e

A solvent/thinner with the following composition is recommended:

- 75% xylene
- 15% isopropanol
- 10% ethyl acetate

However, MOTAT has used PA10 thinners and other epoxy solvents and found them satisfactory. Dilution of not more than 20% solvent to 80% epoxy, decreases the viscosity significantly allowing saturation of the wood.

When re-laminating ply, MOTAT's method is to pepper the panel with holes, leaving the front ply intact. The panel is then propped up or clamped and diluted epoxy poured in from the rear. A similar approach is used for areas of rot in other timbers, using a series of holes radiating from a small number of points at the surface.

Jack Nyman (Maitland) noted that experts say to dry wood properly and use paraloid micro balloon filler as long as there is no fungus present.

In answer to other questions:

- Holes do not have to be primed to bond the filler, but it does help in stopping the filler shrinking into the wood pores, leaving a void.
- MOTAT has no experience in repairing or laminating Masonite with epoxy.
- The filler MOTAT uses for plugging holes can be shaved with a chisel and is very resilient. Pull out tests on screws have demonstrated equal strength to the original timber.

Any further queries can be forwarded to MOTAT

### **Overhead Poles**

Overhead poles need to be treated to stop white ants and Perth Electric Tramway Society have found that a suitable treatment is bitumen oil. It was noted that in NZ tanalised pinus radiata poles are used but this would not stop white ants as they will burrow underground and up the centre of pole.

## **Sleepers**

The Tramway Historical Society have had success in using ground treated tanalised pinus radiata sleepers coated with engine oil on the exposed top surface to stop water penetration.

Maitland Tramway Park and Museum suggested that, as Australia Rail are using steel sleepers, it may be worth looking into if the costs are acceptable.

Wellington Tramway Museum are using ground treated tanalised half rounds on a section of track to evaluate if they are suitable.

Bendigo Trust are using red gum sleepers at A\$16 per sleeper.

Delegates were warned that they should be careful if using creosote as it is carcinogenic.

## **Conservation of Timber**

When disposing of trams, timber should be recovered for future use rather than burning it.