

## WHEEL TREAD DAMAGE – TESTS ON A LOCKED WHEEL

Previous investigations into the cause of wheel damage on Mk III coaches revealed that the damage experienced was potentially due to wheel-sets locking under braking. A study of the wheel slide protection system (WSP) fitted to the vehicles showed that:

- The WSP had a cut-off below 10 km/h to prevent blow-down of the brake pressure at low speed.
- Due to hysteresis within the circuitry, WSP operation may not resume until the vehicle has accelerated to above 15 km/h.
- Delays exist in the pneumatic and electronic response from the WSP system.

It is therefore possible, under low adhesion conditions to lock-up wheels on Mk III coaches of speeds of up to 15km/h with no intervention by a correctly functioning WSP system.

The type of damage sustained is due to high temperature at the wheel/rail interface causing a transformation of the wheel steel to martensite. A temperature of 600°C minimum, dependant on the length of time the temperature is sustained, is required for the transformation to take place. Whilst theories exist to calculate the flash temperatures at the wheel and rail for high creep condition, the approximations do not hold for locked wheel conditions.

This report discusses a controlled brake test of a locked wheel to determine whether equivalent damage to that experienced in Mk III coach operation could be created at low speeds.

The report concludes that:

- It is unlikely that serious martensitic wheel damage will result from low speed (below 20 km/h) wheelslides caused at normal braking rates and by naturally occurring low adhesion.
- At higher speeds, with power levels of 60 kW and higher, wheelslides of short duration will cause wheel damage.