

## ROLLING CONTACT FATIGUE (SQUAT) SITE TRIALS AT CARPENDERS PARK AND CHEDDINGTON

In the mid-1970s rolling contact fatigue (RCF) defects in rails, colloquially called 'squats', began to appear in large numbers especially on the London Midland Region and Western Region. They were found to represent a derailment hazard due to the possibility of multiple fracture and difficulties in ultrasonic detection and assessment.

This report summarises the results obtained from site trials to date and some relevant observations on normal service rails.

It is concluded that:

- Contrary to the general effect of steel strength in laboratory tests, results suggest that increasing the strength of rail steel would increase the tendency to RCF. On straight and shallowly curved track, fine cracking initiated in the two higher strength steels after six to eight months but propagation in the other steel took eight years.
- Many of the fine cracks generated early in the trials wore out over a period of years, suggesting a fine balance between head wear and crack propagation.
- Very few of the fine cracks propagated to full sized defects.
- The contact conditions on the high rail of curves of even shallow radius are more likely to lead to RCF damage than the condition in straight track.
- Corrugations can assist with the development of RCF. It is likely that some of the fine cracks observed would survive the normal grinding for corrugation control.
- Differential wear when running from stronger to weaker rails can produce small squats in the latter.

It is recommended that the current policy of keeping corrugations down to a small amplitude by grinding should be maintained to minimise dynamic contact stresses. Further work is recommended to investigate:

- more aggressive grinding to remove fine cracks
- the effect of weld profiles
- the contact conditions which lead to high incidence of RCF on the high rail of curves
- the discrepancy between track and laboratory tests with regard to the effect of steel strength
- the apparent importance of initial rail condition in crack propagation

Theoretical investigation and further trials could investigate the effect of contact stresses.