# Profile Rail Grinding

The high interest among North American railroads in asymmetrical profile grinding has led to serious investigations and testing of this technique on several major railroads. This interest has arisen from the very dramatic results reported by the Australian heavy-haul mining railroads in their use of rail profile grinding to reduce rail wear and to extend rail life.

Rail profile grinding is the technique of shaping or "profiling" the running surface of the rail head in order to optimize wheel/rail contact, and to enhance the curving ability of the wheel/ rail system. The first objective is accomplished by providing a zone of conformal wheel/rail contact and by restricting this contact to an optimum location on the rail, that is, near the center of the head. The improving of curving ability is obtained by enhancing the rolling radius differential between high and low rails on curves. This takes maximum advantage of the conicity of the wheel.

These objectives were reached in Australia through the adoption of a profile grinding technique as shown in Figure 1. It produced the asymmetrical profile of the railhead, and virtually eliminated gage-face wear in the shallow and moderate curves (less than 5 degrees) on the mining railroads there.

### North American differences

In attempting to introduce this profile grinding technique to North America, it quickly became apparent that significant differences exist between the operating conditions and rail problems of North American railroads and the Australian mining railroads. Among the most obvious are the sharper curves in North America and the higher density of curves; more restricted track maintenance accessibility; and poor control of wheel profile in North America, primarily due to the interchanging of freight equipment.

In addition, the objectives of the grinding activities differed. The primary aim of the Australian mining railroads was the reduction of rail gage-face wear. North American railroads, on the other hand, attempted to address three different types of problems: development of rail corrugations, gage-corner shelling or spalling, and gage-face wear. In many cases the first two problems, corrugations and shells, were of primary concern. [1]

In order to evaluate the profile grinding technique, as well as variations of the Australian method, several North American railroads have implemented tests of profile ground sections of track. While most of these tests have been internal to the company in question, they are carried out usually by the railroad with a rail grinding contractor. At least two railroads have moved out of the testing stage into full scale implementation.

### Problem specific patterns

One of the early conclusions that can be drawn from the various tests is that the specific profile to be used is dependent on the problem that is being addressed. This is clearly seen in comparing two sets of profiles being

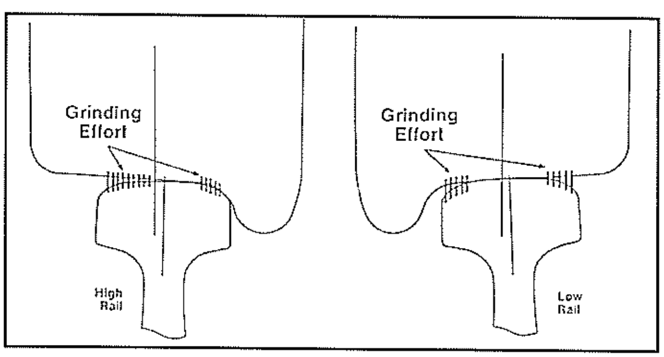


*Figure 1 — Locus of grinding effort in curved rail ("Australian Profile").*

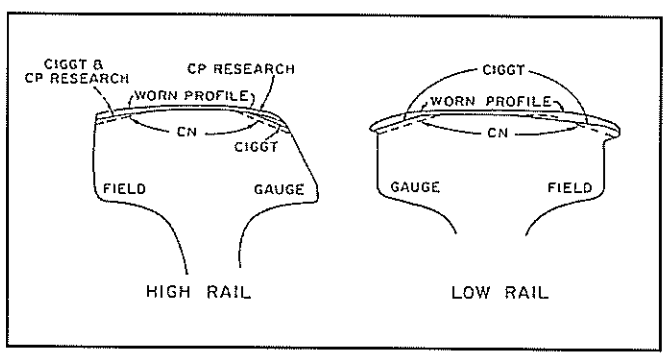


*Figure 2 — CP Research, CIGGT, and CN grinding patterns.*

used by the two Canadian railroads.[2,3] Figure 2 presents a comparison of the grinding patterns of the Canadian National and the Canadian Pacific (CP's is shown as the CIGGT profile) as implemented in a series of recent field tests. While both profiles attempt to address corrugation, shelling/spalling, and wear, the primary emphasis of the profiles differ, however. Thus, the CP profile has, as its first objective, the control of corrugations,[1,2] while the primary purpose of the CN profile is to prevent flange corner contact, and thus reduce shelling and spalling.[3] In both cases, secondary objectives include elimination of double or 'false' flange wheel contact on the field side of the low rail, and of centralizing the wheel/rail contact area on the rail head.

In examining the reported results of a comparative field test,[2] it is apparent that after six months, the CP profile provided better corrugation control while the CN's furnished better rail surface condition. However, in *both* cases, improvement was reported in corrugation and rail surface condition, in comparison to the more conventional grinding of rail. Thus, for both of the investigated profiles, the rate of corrugation regrowth and the reappearance of rail surface defects six months after profile grinding was less than that observed after conventional grinding carried out at six month intervals. While profile grinding was shown to be effective in addressing both corrugation and rail surface problems, the effect on rail wear was not significant in this test. It revealed little variation between the different profiles.

The test report concluded with the recommendation that profile grinding be adopted and performed on a four month grinding schedule. This corresponds with the schedule of grinding used in Australia, where rail profile is maintained by regrinding on three to four month cycles.

References:


1. Lamson, S. T., "Rail Profile Grinding' Canadian Institute of Guided Ground Transport, Report No. 82-7, Nov. 1982.
2. Lamson, S. T., "Rail Profile Grinding Phase II Test Report", Canadian Institute of Guided Ground Transport, Report No 84-14, February 1985.
3. CN Profiles the Premiums, Progressive Railroading, July 1985.