

# Track Replacement Needs as a Function of Traffic Densities

Track replacement needs, and in particular the requirements for rails, ties and ballast, can vary dramatically as a function of track density. Most maintenance-of-way officers consider rail to be the major category of track component replacement costs, and this appears to be true, primarily on mainline track with high traffic densities. This was illustrated recently when the relative costs of replacing and/or rehabilitating the track structure and its key components — rail, ties and ballast (and/or surfacing) — was examined for different levels of traffic utilization.

One such comparison is presented in Figure 1 (1) which compares an annualized set of replacement costs for the three key track components as a function of traffic density. (It should be noted that these costs represent equivalent annual costs, based on a particular set of track and traffic conditions and corresponding component lives. Varying track parameters, such as curvature and grade, or traffic parameters, such as speed and axle load, will result in different component lives and correspondingly different annual costs.)

## High-density track

As can be seen in Figure 1, rail represents the largest cost area of the three principal categories of track components for the higher densities of track. However, for the lower track densities, rail replacement costs are exceeded by tie costs, and for very low-density tracks, by both tie and ballast (surfacing) costs. In fact, for low-density tracks, rail replacement costs are significantly lower than either tie replacement or surfacing costs. This occurs because at very low traffic densities, rail (of adequate section strength for the traffic being carried) will not experience sufficient cumulative tonnages to develop either excessive wear or a significant number of fatigue defects. For example, at an annual traffic level of 1 MGT, the rail will have accumulated only 100 MGT in the course of 100 years of service. Under these conditions, the rail will “rust out”

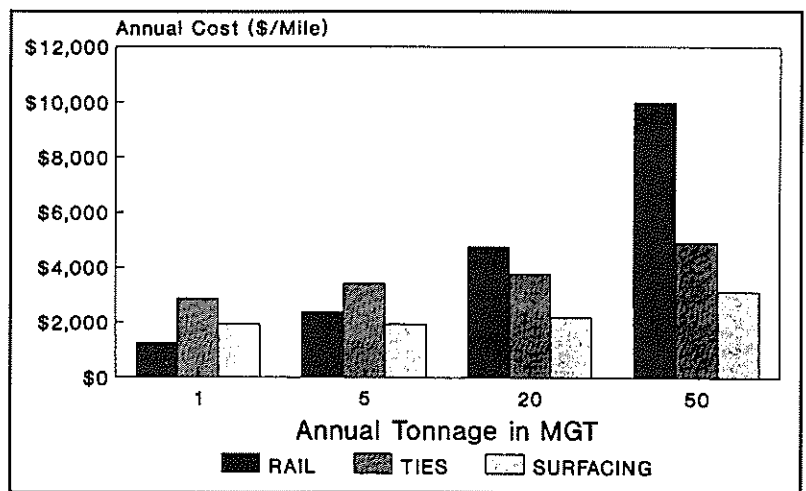


Figure 1 — Annualized track replacement costs per mile of track (1).

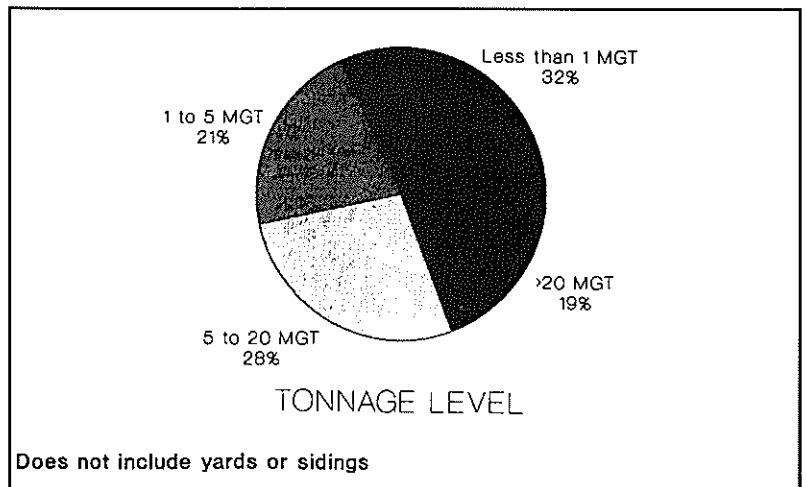


Figure 2 — Distribution of track miles by density categories (1).

before it wears out. The corresponding annual costs for rail replacement under these conditions becomes quite small. Ties, on the other hand, will deteriorate under light-traffic densities as a result of environmentally-caused decay in a significantly shorter period of time than the rail at a corresponding low-density level. This will result in a higher annualized tie replacement cost (1).

### High-density track

Lower-density tracks (less than 5 MGT per year) constitute almost half of all the track miles in the U.S. (Figure 2 (1)). Virtually all of the Class II and Class III railroads, almost all of the shortlines and most of the regional railroads fall into these categories. This suggests that for these smaller, lower-density roads, ties and surfacing, rather than rail, represent the focus of the maintenance officer's attention. This is supported by a recent U.S. Department of Transportation, Federal Railroad Administration study on track-maintenance and track-rehabilitation requirements on small U.S. railroads (2). The results of that study are illustrated in Figure 3, which shows the rehabilitation needs reported by Class II and Class III railroads, by type of project. As can be seen in this Figure, ties, ballast and surfacing represent the largest single component of all maintenance requirements, approximately half of all the reported needs. Rail constituted a significantly smaller portion of the rehabilitation needs.

Although rail may represent the major cost component on high-density mainline tracks, ties and surfacing are of equal or greater importance on lighter-density lines, such as shortline and regional railroads.

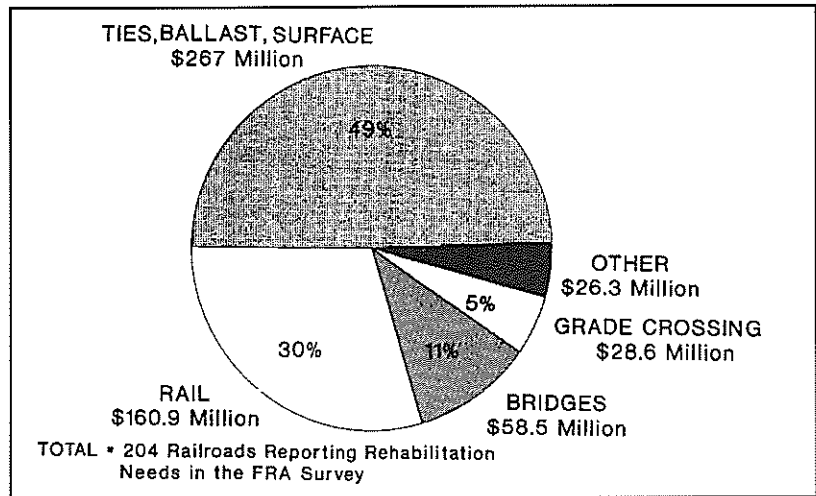


Figure 3 — Rehabilitation needs of small railroads by type of project (2).

### References

- (1) Zarembski, Allan M., "Railroad Infrastructure Needs: Present Requirements and Future Trends," Presentation at the Third Annual American Railroad Conference, Washington, D.C., November 1989.
- (2) Federal Railroad Administration, "Deferred Maintenance and Delayed Capital Improvements on Class II and Class III Railroads," U.S. Department of Transportation report to Congress, February 1989.