

not increase the Operating Expenses is only of less importance than one which reduces the Operating Expenses without increasing the cost. Such a reduction in cost is a practical improvement to the standard of the road, as it increases the margin between receipts and expenditures, and so permits of an increase in dividends, or has a tendency to permit of a reduction in freight rates, if that be the object aimed at.

In Canada most of the new construction is through districts which at the time of completion furnish but little traffic: much railway has been built on which the traffic did not justify even one daily freight train per day each way. It is a safe statement that 80% of the mileage constructed in Canada would not furnish at the date of completion traffic sufficient for two freight trains each way per day. Under such conditions, the receipts are low and the Operating Expenses high, and it is of the utmost importance that the construction cost be kept low. On the other hand, the country is growing fast, and traffic is increasing rapidly. It is thus necessary that the engineer keep always in view the almost certain necessity of a good road in the future. He should, therefore, so locate and construct his line that the first cost be low, and that the standard may be raised, when necessary, without unduly increasing the total expenditure. In order to get the very best results, the line giving best grades, alignment, etc., should always be first located. From this, as a standard, the engineer should work to the final or economic location. Working from a poor to a better is apt to lead to grave errors.

Where low construction costs are necessary, and it is probable that a high standard will be required in the future, it is much more effective and advisable to use short sections of temporary line with steep grades, sharp curves, etc., on the heavy or difficult sections, maintaining the higher standard for the light or easy portions of line, than it is to adopt a generally lower standard for the whole route. The first cost of the former will probably be less; it may be operated with helper engines as the traffic increases, and may be improved when advisable, while the cost of improving a generally poor road is frequently prohibitive.

The use of sharp curves with short tangents is often a very effective means of reducing cost without materially increasing the Operating Expenses.

The effect of moderately sharp curvature is essentially different from steep grades, inasmuch as it is not limiting in its effect. The use of one sharp curve does not justify the use of another just as sharp—whereas the use of one ruling grade on a division does justify another as steep.

The use of curves up to 14 degrees does not increase the maintenance or operating expenses. A mile of road in which there are 100 degrees of 10 degree curve, the balance being tangent, does not cost any more to maintain and operate than the same length of road with 100 degrees of 2 degree curve—in fact, if there is any difference, it is in favor of the sharper curvature.