MEMORANDUM ON THE PROPOSED ABT SYSTEM AT ARTHUR'S PASS.

Prepared for information of Committee of Legislative Council on the subject of the Midland Railway.

In considering the subject of adopting a steep incline in preference to a comparatively flat grade, the point to be ultimately settled is, whether the additional cost of working the former will compare favourably with the saving in interest on the large capital to construct the latter.

The experience gained in working the Rimutaka incline, which is conducted on the Fell system, with a grade of 1 in 15, will be of some use. As much misapprehension prevails about the capacity of such a line as the Rimutaka for carrying a large traffic, it may be remarked that, given the proper siding accommodation at the foot and summit, and enough engine-power, and working twelve hours a day, there would be no difficulty in taking up it 200,000 tons of goods per annum; that is, four times as much traffic as now goes over it in both directions. The length of this is about three miles.

The Abt system, which has been well tested of late years, is considered by competent authorities to be superior to the Fell system, and there can therefore be no doubt of the sufficiency of such a system for carrying on a much larger traffic than is likely to develop for many years on the Springfield–Brunner line.

It may be well to note, however, the different circumstances in the cases of the Rimutaka incline and the proposed Arthur's Pass incline. The former was adopted as an alternative to a circuitous and expensive route some twenty-five miles longer on ordinary grades, as it was quicker in point of time for transit of traffic, and cheaper to work to an extent equal to 2s. 6d. a ton on the present traffic than the longer and more expensive route would have been. In the case of Arthur's Pass, however, the proposed incline does not shorten the route, and it gives a slight disadvantage in point of time.

In my opinion the adoption of a steeper grade than 1 in 15 on the Abt system, with 130-ton loads, would be a mistake, because it would introduce great practical difficulties in working, through the strength of the stock and draw-bars of the Government stock being insufficient to bear greater strains than this grade and load would entail, and the through transit of the Government stock would be thus prevented. This is a point which the company building the line would necessarily be as much interested in as the Government, and which would no doubt influence them in considering the advisability of adopting a steep grade.

The only means I have of arriving at a rough estimate of the cost of working the Abt incline is by comparing it with the Fell incline. A Fell engine, weighing 35 tons, takes habitually 65 to 70 tons gross load up it. I find it stated that an Abt engine of 55 tons would take 120 to 130 tons gross load up an incline of 1 in 16 up the Blankenberg–Tanne Railway, in the Harz district, in Prussia. The latter probably has a considerable advantage, but it cannot be expressed accurately with the data available. The cost of locomotive power on the Fell incline, Rimutaka, is equal to about 4d. per ton per mile on the present traffic. As, however, the rate of wages and the price of fuel govern the cost of working, it is necessary to make a considerable modification in estimating the cost of working an incline at Arthur's Pass by the company: first, because fuel would probably cost less than half the price of that at the Rimutaka; and secondly, because the company would probably command cheaper wages.

Taking these three items—better loads, cheaper fuel, and lower wages, and allowing a large traffic of 150,000 tons—we should probably be safe in estimating the locomotive charges at 2d. per ton per mile, and allowing a length of Abt line of six miles for the two inclines, one on each side of the saddle, and making a deduction for the alternative of working an ordinary line,* we should find that the extra annual cost of working the Abt line, for locomotive charges, would be about £6,000, which, capitalised at 5 per cent., represents £120,000. If more than this sum would be saved by adopting Abt inclines of 1 in 15 to work 130-ton loads on a total length of incline about six miles, instead of having the 1 in 50 grades and a long tunnel, it would be reasonable to adopt the Abt system.

This is a very rough estimate, but it would probably be found sufficient. If a longer length of incline were adopted,† about £1,000 per extra mile should be added for working such a traffic as I have indicated; some additional charge would be entailed by extra maintenance charges on this incline.

I have no very intimate acquaintance with the locality, or with the trial surveys or sections, and can, therefore, offer no opinion as to the possibility of crossing the saddle with such a gradient or of approaching it so as to cross it with inclines of moderate length.

J. P. Maxwell, M. Inst. C.E.,
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7th June, 1888.

* The locomotive charges on an ordinary line, with 1 in 50 grades, and wages at rates current on New Zealand railways, should not exceed ½d. per ton per mile.

† I am since informed that it is unlikely that the length of inclines would be less than 8 miles.

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