

A THEORETICAL STUDY TO DETERMINE THE SPEED LIMITATIONS OF A SIMPLE LOW COST OVERHEAD SYSTEM

Over the years, the possibility of designing a simplified 'trolley wire' type of overhead system has been investigated on more than one occasion. The conclusions have been that whilst it might be feasible to design such a system for maximum speeds in the order of 70-100mile/h, the potential cost savings were likely to be small in relation to the overall cost of electrification and the work was not pursued. Since then, significant savings have been achieved in the costs related to overhead construction, particularly the cost of erecting the masts, and it was considered worthwhile to re-evaluate the technical limitations of trolley wire equipment.

The purpose of this study is to identify various simplified overhead configurations which would permit satisfactory current collection at speeds of at least 60 mile/h and possibly up to 100 mile/h. The possible cost savings offered by any suggested designs will be discussed in a separate report.

It is concluded that a trolley wire system based on standard copper wire and tensioned to the maximum allowed under current operating practice can only be recommended for operating speeds up to 45 mile/h. Various methods have been identified by which this speed rating might be increased, the most promising apparently being to support the wire with an 8m-long stitch. Such a system should give adequate current collection at 60 mile/h with a single pantograph, but to assure 60 mile/h operation with a series of pantographs further modification is necessary. The use of a half-size contact wire or a 20% increase in tension for the standard wire is advised.

For acceptable current collection at speeds of 90 or 100 mile/h, the standard copper wire is unsuitable without considerable over-tensioning or reduction in span length. It is recommended that the use of an aluminium contact wire be considered. An extremely simplified overhead design is predicted to perform adequately at 95 mile/h with a single pantograph or 85 mile/h with several pantographs. Multiple pantograph operation at 95 mile/h can be achieved by incorporating a softer support stiffness into the mast design. If the aluminium wire is supported by a stitch wire, then operating speeds can be increased substantially. It is predicted that multiple pantograph operation at speeds up to 140 mile/h is possible.