

INVESTIGATIONS INTO THE DESIGN PARAMETERS REQUIRED FOR IMPROVING CURRENT COLLECTION OF PANTOGRAPH HEADS

Before new pantograph heads can be designed with some confidence of achieving an improvement, it is necessary to know how existing pantograph heads, both service and experimental, behave. This report gives details of the laboratory tests and theoretical studies that have been carried out since the test requirements were finalised in February 1974. For the experimental head work it has been assumed that metallised carbon will be used until a more suitable material is developed, as this causes least wear of the contact wire.

The report concludes that, considering the theoretical behaviour of pantographs, the line of design to be pursued is for a reduction in mass and/or an increase in flexibility. For the former, the only major method of reducing weight is by reducing mass of the carbon strips with the side effect of reducing their working life. Examination of worn pan heads has shown that the end carbon's thickness can be reduced by 6mm at the tapered end as this is not worn away. However, it would make the carbon a non-uniform cross section. If the horns are removed from the secondary suspension this will reduce mass but can only be achieved satisfactorily if the secondary suspension is of limited travel. For the latter case, the frame supporting the carbon strips can be designed to give greater flexibility only if the carbon strips are shortened in length. This was done in the design of the flexible head. Variations in behaviour of the pantograph heads on test has shown that considerable attention will need to be placed on future detail design to ensure uniformity of service performance when new and when reconditioned.

To know the actual dynamic trajectory of the pantograph head and contact wire profile, as at a registration arm, would be useful so that the pan head design can be based on the actual requirements. This report recommends that further design work should now proceed with consideration being given to a head construction with lighter carbons and alternative methods of fixing them to a lightweight support of titanium alloy, high strength aluminium alloy or a suitably coated reinforced plastic.