

PREDICTING THE TRANSIENT RESPONSE OF VEHICLES TO TRACK WITH KNOWN LATERAL AND VERTICAL ALIGNMENTS

A description is given of the method developed to predict the transient vertical and lateral dynamic response of a railway vehicle to an arbitrary known plain track geometry. Wheel-rail contact forces are calculated using the techniques developed for the 'Non-Linear Curving Theory' combined with an approximate allowance for the effect of rail lateral flexibility. The vehicle dynamic equations are integrated numerically by time stepping. Simple sample predictions are presented.

The report concludes that the current state of development of the theory to predict the transient response of a vehicle to irregular track has been set out in detail. At present the theory has been shown to predict severe transient situations such as switch blade entry with good accuracy. The situation with regard to less severe lateral alignments where the responses contain a relatively large proportion of kinematic motion is less satisfactory. In order to resolve the discrepancies several lines of investigation have been, or are being pursued and will be reported separately. Among these is the inclusion of the ability to account for variable wheel-rail profiles along the track, and the correct modification to the creep force – creepage relationships to account for the effect of surface contamination. More complicated vehicle models; perhaps incorporating friction elements or cross bracing, could be developed if required.