

METHODS FOR CALCULATING THE TRANSIENT TEMPERATURE RISE OF TRACK FEEDER CABLES

Track feeder cables for third rail electrified railways generally carry a fluctuating load throughout any 24hour period. Whilst these cables can be rated on a continuous current basis this results in unnecessarily high capital cost because such cables rarely, if ever, reach temperatures corresponding to the peak load continuously maintained. Furthermore, increasing traffic density and more powerful multiple units have increased the power demand on these cables. This raises the question as to whether existing track feeder cables are capable of handling the increased power demand without suffering thermal degradation and ultimate failure.

The possibility of utilizing the thermal delay of a cable to realise economics of operation without exceeding the cable's temperature rating was recognized by electrical engineers around the beginning of the 20th century. Since then many attempts have been made to calculate the transient response of buried and ducted cables to a suddenly applied constant current load.

This report describes a theoretical approaches to this problem, which has been validated by testing. It has been shown that the transient temperature rise of a cable laid on the floor of the laboratory can be predicted to a reasonable degree of accuracy following the application of a step fluctuation of current. Finally the application of these techniques to a cable carrying a fluctuating load current has been outlined.