

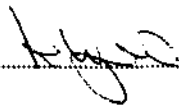
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Issue	2
Date	December 2005

Business Process Document

Work instruction for production of mean and peak current profiles for 25 kV a.c. electrification

Endorsement & Authorisation

Endorsed by:



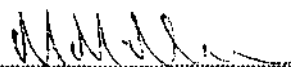
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Issue record

Issue	Date	Comments
2	December 2005	Re-issued as a SAF3 Business Process Document

Implementation

3 December 2005

Compliance

This Network Rail work instruction is mandatory and must be complied with by Network Rail and its contractors from 3 December 2005.

When this work instruction is implemented, it is permissible for all projects, which have formally completed GRIP Level 4, to continue to comply with the Issue of any relevant Network Rail standards current when GRIP Level 4 was reached and not to comply with requirements contained herein unless the head of electrification and fixed plant has stipulated otherwise in the accompanying briefing note.

Where the head of electrification and fixed plant has specified that all projects will comply with the requirements, specific authority not to comply can be sought in the usual manner using the appropriate non-compliance authority processes described in Network Rail standard, [NR/SP/STP/045](#) Managing the process for non-compliance authority (formerly RT/LS/P/045).

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Ref:	NR/WI/ELP/27096
Issue:	2
Date:	December 2005

Contents

1	Purpose	4
2	Scope	4
3	Reference documentation	4
4	Mean current	4
4.1	Feeder station mean current	4
4.2	End of section current	5
4.3	Mean current profile	5
4.4	Emergency feeding conditions	5
4.5	Presentation of results	5
5	Peak current profile	6
5.1	Basic data and assumptions	6
5.2	Feeder Station peak current	7
5.3	Peak current profile	8
5.4	Presentation of results	9
6	Division of current between tracks	9
	Appendix A	10
	Appendix B	11
	Appendix C	12

Ref:	NR/WI/ELP/27096
Issue:	2
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1 Purpose

Profiles of predicted mean and peak currents flowing in the overhead line are used by the Electrical Distribution Engineer to determine the rating of electrical equipment and by the Signalling and Telecommunications Engineer for electromagnetic interference studies.

The purpose of this document is to set out the methods followed when producing mean and peak current profiles for the 25 kV ac, 50 Hz overhead line electrification system.

2 Scope

This instruction sets out the methods of producing mean and peak current profiles, and the assumptions which have been made for the calculation.

Factors based on test results are included on both of the profiles to enable an assessment to be made of the current in any one track.

The instruction gives a method for producing profiles of mean and peak currents.

This instruction assumes that the traffic is typical of suburban and mixed traffic main line situations. Further consideration should be given on heavily loaded sections where the division of currents between tracks may differ from the typical factors.

This instruction does NOT cover the 25-0-25 kV autotransformer electrification system.

3 Reference documentation

Report SBR 25 "Peak to Average ratio of 25 kV, 50 Hz Traction Current - Test Figures".

4 Mean current

The instantaneous current which flows from the feeder station into the overhead line changes rapidly with train movements. The mean current profile smoothes out these rapid variations and represents the current which flows at a given distance away from the feeder station averaged over a half-hour period. The mean current profile gives predicted values of current only.

4.1 Feeder station mean current

Mean current at the feeder station is calculated using the value for maximum half-hour energy demand in Mega-Watts [MW].

The formula shown below is used when calculating the mean current, I_{mean} , from the maximum half-hour energy demand.

$$I_{\text{mean}} = \frac{\text{Half-Hour Energy Demand [MW]} \times 10^6}{\text{Power Factor} \times \text{System Voltage [kV]} \times 10^3}$$

Typically,

System Voltage = 25 kV

Power Factor = 0.85

4.2 End of section current

According to theory, for an evenly distributed load, the mean current flowing in the overhead line falls from a maximum at the feeder station to zero at the end of the section.

To allow for uneven traction load distribution and current flowing through the busbar at the end of the section, the mean current at the end of an electrical section is assumed to be whichever is the larger of the following quantities:

- 10% of the mean current at the Feeder Station.
- 50 Amps
- The equivalent current, of any significant standing load at the end of section eg. Stabling sidings etc.

4.3 Mean current profile

The mean current profile is a graph of mean current against distance. The graph is plotted by drawing a straight line between using values of current at the Feeder Station and the end of section.

4.4 Emergency feeding conditions

The mean current profile shall include the feeding arrangements under both normal and emergency conditions, taking into account the same or a new point in time for consideration of the worst condition overall.

4.5 Presentation of results

Appendix A shows a typical feeding arrangement for a 40 km section of twin-track railway. Feeder Stations F1, F2 and F3, mid-point TSL's M1 and M2 and intermediate TSL's I1, I2, I3 and I4. The sections are loaded asymmetrically.