

TECHNICAL INSTRUCTION

TI 047

Issue 1

October 2006

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NETWORK RAIL - SIGNAL ENGINEERING

Zero Tolerance to Earth Faults

Relevant Standard: NR/SP/SIG/10660 SMS and NR/SP/SIG/11231 SMTH

Over the years, there have been several incidents caused by earth faults on cables. Fortunately, these have been rare. Single-cut circuits (circuits containing relay contacts in one leg of the circuit only) are particularly prone to wrong side failure. Double-cut circuits (contacts of the same relay in both positive and negative legs of dc line circuits or in both BX and NX legs on ac line circuits) are less prone but may still be affected under certain circumstances.

Experience has shown that zero tolerance to earth faults outside defined acceptable limits reduces incidents and wrong side failures but can also produce performance benefits, as cable faults are located and fixed before they develop into a failure that prevents normal operation of the railway.

This Technical Instruction requires zero tolerance to earth faults outside defined acceptable limits across the network. It will remain in force until such time as the Signalling Maintenance Specifications (SMSs) and Signalling Maintenance Testing Handbook (SMTH) can be amended.

The current maintenance standard (Signalling Maintenance Specifications SMS and Signalling Maintenance Testing Handbook SMTH) currently carry instructions for safety maximum leakage voltage and maximum acceptable leakage. (For dc circuits, these values currently stand at Safety Maximum 75% of stated voltage on any leg, or 90% on the two legs combined {voltages to earth added together}. The maximum acceptable leakage is 60% of stated voltage on any leg, or 80% on the two legs combined.) These values are unchanged. A new category of "reportable", leakage at 50% of stated voltage on any leg or 70% on the two legs combined is introduced for dc circuits. Similar voltages are included for ac.

Projects staff also have responsibilities with earth readings. Projects shall check the earth readings before commencing work. Any earth problems outside the tolerances given in SMSs and SMTH shall be reported to the maintenance staff. At the end of the Project, the Works staff shall ensure that the earth readings have not worsened.

NR/SMS/EL21 Trackside Apparatus Case (Location) and NR/SMS/EL/31 Equipment Rooms and Relay Rooms

NR/SMS/EL21

Amend Clause 3.4 to read:

- 3.4 Rectify any earth fault found outside acceptable limits in steps 3.1 to 3.3. Report to your supervisor the problem and any difficulties rectifying it. Failure to rectify shall be reported to your supervisor for necessary remedial action – the report to be made preferably immediately, and certainly within 24 hours.

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Add Clause 3.5

- 3.5 If any earth fault is found on a circuit with the voltage above the following limits, report it to your Supervisor - the report to be made preferably immediately, and certainly within 24 hours. Your Supervisor will decide if any further action is required.

Actual Busbar Voltage dc	Reportable Voltage		
V	V1	V2	V1+V2
10	5.0	5.0	7.0
11	5.5	5.5	7.7
12	6.0	6.0	8.4
20	10.0	10.0	14.0
22	11.0	11.0	15.4
24	12.0	12.0	16.8
42	21.0	21.0	29.4
46	23.0	23.0	32.2
50	25.0	25.0	35.0
100	50.0	50.0	70.0
110	55.0	55.0	77.0
120	60.0	60.0	84.0

Actual Busbar Voltage ac	Reportable Voltage	
V _B	V1+V2	V1-V2(*)
9.0	7.2	1.0
8.5	6.8	0.95
8.0	6.4	0.9

- 3.6 If any earth fault is found with the voltage below the limits shown in the table shown in 3.5, but the trend is worsening significantly from previous results, report it to your Supervisor - the report to be made preferably immediately, and certainly within 24 hours. Your Supervisor will decide if any further action is required.

NR/SMS/EL31

Amend Clause 5.4 to read:

- 5.4 Rectify any earth fault found in steps 5.1 to 5.3 found outside acceptable limits. Report to your supervisor the problem and any difficulties rectifying it. Failure to rectify shall be reported to your supervisor for necessary remedial action – the report to be made preferably immediately, and certainly within 24 hours.



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