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MODEL PROCEDURE FOR TERMINAL TOWER EARTH TAPE TESTS

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PURPOSE AND SCOPE

This note describes a model procedure for testing terminal tower earth tapes. The aim of this procedure is to ensure that there are safe and viable methods of assessing the condition of terminal tower earth tape connections. There are hazards associated with most practical techniques employed to perform such an assessment. However, if the work is appropriately controlled, a safe method of working is achievable.

It is important that all staff involved in using this procedure are appropriately briefed and trained so that they are aware of these hazards and the importance of following the correct procedure.

Where contractors carry out terminal tower earth tape tests, the contractor shall be responsible for ensuring a safe method of work. National Grid does not accept any responsibility for the contractors use of this procedure. Contractors must produce their own method statements that will need to be agreed by National Grid.

PART 1 – GUIDANCE

1 INTRODUCTION

Terminal towers are installed with a bond to the substation earth mat by at least one earth tape. On recent installations two tapes have been used. As these tapes are sometimes buried and there is no easy access to them at their ends, their condition is difficult to assess visually.

Under certain conditions there may be significant earthwire currents (possibly up to 600A) flowing through these tapes to the substation earth mat. Also, should a fault occur either at the substation or on the overhead line, significant earth fault currents can flow in the tapes.

If the tape is degraded significantly and becomes highly resistive, a hazardous potential difference can arise between the terminal tower and the substation earth mat.

This report describes a model procedure to measure the terminal tower to substation earth mat resistance. This resistance can then be used as an indicator of earth tape integrity.

2 PROPOSED PROCEDURE

2.1 Hazards

2.1.1 Broken or Degraded Earth Tape (plus joints)

If the earth tape and tape to tower and earth mat connections are in good condition, the substation earth mat and the terminal tower will be very similar in potential. If the tape is broken or badly degraded, there can be up to 5kV between the terminal tower and the substation earth mat or any cables or tapes connected to the mat or tower. There is thus a risk of electric shock if a person bridges the conductive part of any cable or wire connected to the substation earth mat and the terminal tower.

The voltage difference between the terminal tower and the local ground, as opposed to the substation mat, will be much lower, but exceptionally may also be hazardous.

2.1.2 One Circuit in Service / One Circuit Out of Service

Where a terminal tower serves a line with one circuit in service and one circuit out of service, the potentials described in 2.1.1 may be far greater. This is due to electromagnetic coupling between circuits, ie. the circuit which is in service may induce energy into the circuit which is out of service. If the circuit is earthed to the tower and the tower to earth mat connections are broken or degraded, hazardous potential differences can arise.

2.1.3 Substation Fences

The substation fence is usually separately earthed from the terminal tower or earth mat. As such there may be a voltage difference between the substation mat and the substation fence, under fault conditions.

2.1.4 System Fault or Lightning Strike

The potentials described in 2.1.1 may be far greater during system fault conditions.

2.2 Risk Control Measures

To protect against touch potentials, insulated boots must be worn throughout testing.

To minimise the risk of a fault occurring during the measurements, the work should not be carried out if the lightning risk in the area is 1 or there are high winds, snow storms, heavy or persistent rain, fog or mist.

Touching the fence and any cables or wires connected to the earth mat or tower simultaneously should be avoided.

Time spent around the terminal tower should be minimised to reduce the risk of being exposed to high voltages in the unlikely event of a fault.

In addition to the above testing must only be carried out by adhering to the test procedure and using the test equipment specified in the subsequent sections: