DISTRIBUTION COMMISSIONING TEST SHEET – EARTH TESTING OF DISTRIBUTION SUBSTATIONS
HPC-4DL-07-0004-2014

This commissioning test sheet covers the checking and testing of distribution substation earthing systems.

NOTE: These tests must be carried out after the installation of a new earth system for ground-mount distribution substations. Where equipment has been replaced, altered or repaired do not use this sheet, instead use HPC-4DL-07-0037-2017 *Earth Testing of Altered Systems*

SAFETY: At all times maintain suitable clearance to all other electrical equipment, and verify planned escape routes.

DATE:		**Project No.**		**Name of Officer**	
Location:					

1. VISUAL INSPECTION

Rated System Voltage	V	No of stakes		Size of earth cables	mm²

Check that the earth conductors are correctly installed to the earth bar (if applicable) and that there is no signs of damage.	☐	
Check if earth stakes are properly installed and connected to earth system by earth conductors.	☐	
Check if earth pits are properly installed, access to earth stake is possible, and earth pit lids are in good condition.	☐	
For distribution substations with an isolated screening fence, check that the earth system is bonded to the fence.	☐	☐ N/A
For distribution substations near a customer fence, measure clearance between the earth system and fence (minimum 2 m is required).	_____m	

Where the measured clearance is less than 2 m, the Asset Manager should be contacted to determine the action required.

2. EARTH STAKE RESISTANCE TEST

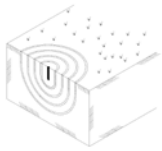
Test each earth stake using an Earth Resistance Tester (three-pole fall of potential method). The earth stake under test (electrode 1) must be disconnected from the earthing system. This test involves two test instrument electrodes (electrode 2 and electrode 3), installed at distances as per the reference table shown in section 6.

Number each earth stake to be tested, and describe location (e.g. north west corner): Estimate the depth of each stake Write down the corresponding distances to the C probe and P probe using the table in section 6. Where there are more than 5 stakes, more room is provided in section 0		Stake Location	Estimated depth (m)	Distance to P probe (m)	Distance to C probe (m)
	1				
	2				
	3				
	4				
	5				

This test is repeated by moving electrode 3 a distance of 3 metres forwards and backwards from its initial position, in a straight line.

The final test result for each stake, is the average of the three test results. For each stake, the results should be within 10% of each other.

Installed Earth Stake Number:		1	2	3	4	5
Disconnect earth stake		☐	☐	☐	☐	☐
Electrode 2 at C metres, Electrode 3 at P metres	Measured Resistance	Ω	Ω	Ω	Ω	Ω
Electrode 2 at C metres, Electrode 3 at P metres **plus 3 metres**	Measured Resistance	Ω	Ω	Ω	Ω	Ω
Electrode 2 at C metres, Electrode 3 at P metres **minus 3 metres**	Measured Resistance	Ω	Ω	Ω	Ω	Ω
Average value of the above three measurements	Average Value	Ω	Ω	Ω	Ω	Ω



Installed Earth Stake Number:	1	2	3	4	5
Reconnect earth stakes. Grease stainless steel bolts if not already greased, to prevent galling and seizure.	☐	☐	☐	☐	☐

3. EARTH SYSTEM RESISTANCE TEST

Test the combined substation earth system using an Earth Resistance Tester (three-pole fall of potential method)

Test the *combined* substation earth system using an Earth Resistance Tester (three-pole fall of potential method)				
Testing Point (e.g. transformer HV earth bar):			Required resistance as per design package documents:	Ω
The earth system under test (system 1) must be isolated from other interconnected earthing systems (e.g. those of other substations). Describe the disconnection points (e.g. HV feeder name & cable screen) Where a combined HV-LV system is tested, the LV MEN network should remain connected. HV cable screens should be disconnected.	Other earth system	System Description	Disconnection Point	Disconnected
	2			☐
	3			☐
	4			☐
This test involves two test instrument electrodes (electrode 2 and electrode 3), installed at distances as per the reference table shown in section 6. The distance for test electrode '2' should correspond to the deepest installed stake in the system. This test is repeated by moving electrode 3 a distance of 3 metres forwards and backwards from its initial position, in a straight line. The final test result for the system is the average of the three test results. The results should be within 10% of each other.				
Electrode 2 at C metres, Electrode 3 at P metres		Measured Resistance		Ω
Electrode 2 at C metres, Electrode 3 at P metres **plus 3 metres**		Measured Resistance		Ω
Electrode 2 at C metres, Electrode 3 at P metres **minus 3 metres**		Measured Resistance		Ω
Average value of the above three measurements		Average Value		Ω
The measured system resistance is less than the design package requirement			☐ Yes	☐ No

Reconnect other earth systems. For busbar connections, use appropriate torque setting, e.g. 66 N.m for M12 stainless steel bolts. Grease stainless steel bolts if not already greased, to prevent galling and seizure.	System No. 2 reconnected	☐
	System No. 3 reconnected	☐
	System No. 4 reconnected	☐

4. CONTINUITY CHECK

After all connections are remade, a continuity check must be made from the testing point (used in section 3) to all stakes and interconnected equipment

Equipment		**Earth stakes**					
Equipment label	Measured resistance	Installed Earth Stake Number:	1	2	3	4	5
	Ω	Measured resistance	Ω	Ω	Ω	Ω	Ω
	Ω						
	Ω						
	Ω						
	Ω						

5. OPERATIONAL HANDOVER

The commissioning officer must ensure that all checks are completed and the test results comply with the minimum standards.

I hereby certify that all sections have been completed with satisfactory results and transfer responsibility to the network operating authority. This equipment is ready to be **SAFELY** energised.

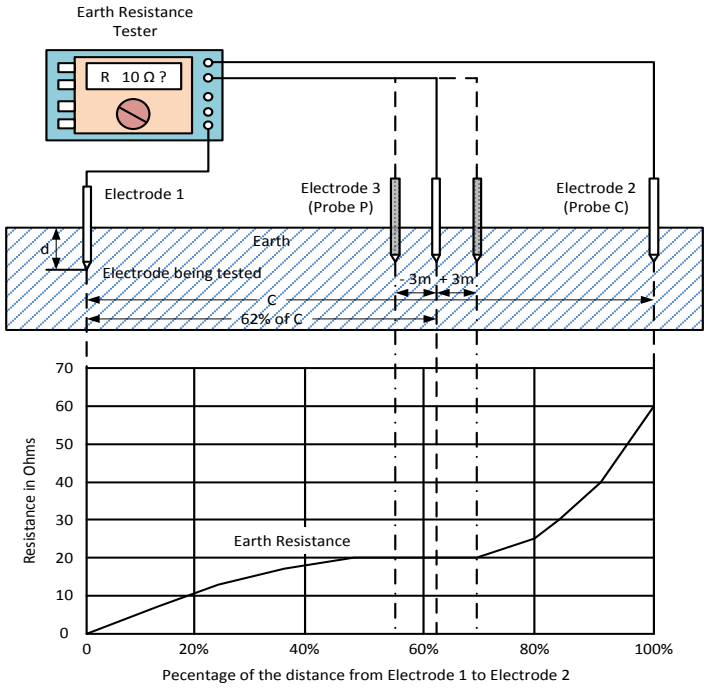
Commissioning Officer: _____ Pay Number: _____

Signature: _____ Date: DD/MM/YY Time: HH:MM

1. Ensure the work area is left tidy with no hazards to the public.
2. Hand over responsibility to the operating authority
3. Return this sheet to the project/working file as a record of commissioning and as a document required for the Handover Certificate.

IMPORTANT: PLEASE ATTACH AS-BUILT DRAWINGS AND DATASHEETS TO THIS SHEET AND SEND TO RELEVANT ASSET MANAGER

6. REFERENCE TABLE



Electrode Depth	Test Lead lengths from Earth Electrode	
	Potential Probe (P)	Current Probe (C)
< 15 m	30 m	50 m
15 to 30 m	60 m	100 m
30 to 45 m	90 m	150 m
45 to 60 m	120 m	190 m
60 to 75 m	150 m	240 m
75 to 100 m	200 m	320 m
Unknown	30 m	50 m