



## ADVANCED UNIVERSAL SOLUTIONS

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### Ground Resistance Measurements Report

#### **Project Description:**

Plant Site Ground Resistance Measurements:

Grounding and bonding are among the most important topics covered in the National Electrical Code and IEEE. They are essential for the safety of personnel working around electrical equipments, as well as for proper operation of circuit protective devices. Also, proper grounding and bonding techniques are essential in assuring that sensitive electronic equipment is protected from transients and other spurious signals that can seriously affect the way data is processed.

Therefore it is essential to verify the integrity of the ground grid of each substation and electrical devices by the measurements of the ground resistance on annual basis.

Fall of Potential, IEEE Standard No. 81, and Section 9.04 on the Main Grounding Electrode or System; is used to accurately measure the resistance of an earth electrode using auxiliary stakes driven into the soil, which form a circuit for the test current injection and voltage measurement as used for the two - terminal method.

Visual and Mechanical Inspection, The Ground System integrity and loose connections were verified.

Electrical Test; Insert the Current Test spike (C2) into the Ground 300 Ft. away from the earth electrode to be tested, Insert the Potential test spike (P2) into the Ground 0% to 100% away from the earth electrode to be tested.

Connect all the Potential Current and Electrode Test Cables to the equipment respective terminals; C1 and P1 to earth electrode, P2 to Potential spike, C2 to Current spike. Turn on the unit and read the Ohms values at each point.

Point to Point or Direct Method; this technique is used to measure the resistance between two earth points, e.g. between an earth electrode of unknown resistance and a known "good" ground connection such as metallic underground pipe work or building steelwork.

Visual and Mechanical Inspection; The Ground System integrity and loose connections were verified.

Electrical Test; Connect all the Potential Current and Electrode Test Cables to the equipment respective terminals; C1 and P1 to earth electrode under test, P2 to Potential spike, C2 to bldg grd. System. Turn on the unit and read the Ohms values at each point by trained personnel for technical support.

All work will be performed in accordance with National Electrical Code, prudent construction practices, OSHA requirements, and accordance with the safety provisions, International Electrical Testing Association, IEEE Institute of Electrical & Electronic Engineers and requirements of the owner.

## **Test Results:**

### **Tie Down area:**

Tie Downs 4, 8 and 12 = .5 Ohms, All values are under 5 Ohms. The maximum value acceptable for Industrial System is 5 Ohms, otherwise specified by customer applications and/or specifications.

### **Tower area:**

Tower 12 = measures of 1.3, 1.3 & 4.3 Ohms, All values are under 5 Ohms. The maximum value acceptable for Industrial System is 5 Ohms, otherwise specified by customer applications and/or specifications.

Tower 8 = measures of 5.3, 5.6 & 5.6 Ohms, All values are over 5 Ohms. The maximum value acceptable for Industrial System is 5 Ohms, otherwise specified by customer applications and/or specifications.

Tower 4 = measures of 15.8, 15.8, 15.8 & 15.8 Ohms, All values are over 5 Ohms. The maximum value acceptable for Industrial System is 5 Ohms, otherwise specified by customer applications and/or specifications.

### **Main Electrical Substation:**

The ground resistance measures in all ground points are .3 Ohms. The maximum value acceptable for Industrial System is 5 Ohms, otherwise specified by customer applications and/or specifications.

Values obtained during the test are acceptable. **Except Tower Points that reflects high values and Substation Transformer bank that has corroded connection.**

## **Conclusions:**

1. The ground system in Tower 8 and especially in Tower 4 shall be Rebuild and Re-Test the Ground system.
2. The ground system in Main Electrical Substation shall be Repair and Re-Test ground system.
3. The ground system in Tie Down is under industrial System of 5 Ohms maximum value accepted. We recommend an insulated or floating ground system to protect the existing control circuits of Tie Down area.

### **Note:**

The maximum value acceptable for Industrial System is 5 Ohms, otherwise specified by customer applications and/or specifications.

Values under 5 Ohms obtained during the test are acceptable.

Values over 5 Ohms like 5.3Ohms, 5.6 Ohms & 15.8 Ohms obtained during the test in Towers 8 and 12 respectively are unacceptable.