ESCO POWER&SAFETY SOLUTIONS

GROUNDING SURVEY

Preventing damage, downtime, personnel injury, and protecting sensitive equipment

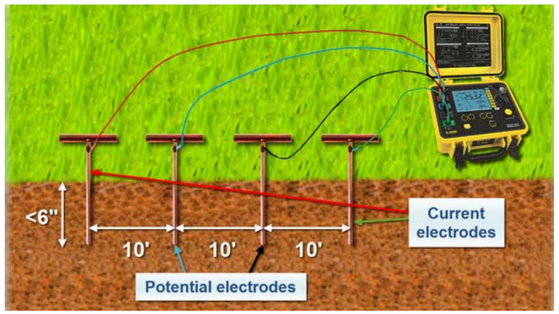
SCINTILLA | ESCO GROUP

Summary of Grounding Survey

Today with ever changing technology advances, a good grounding system is more important than ever to prevent damage, downtime, personnel injury and protecting sensitive equipment. Proper grounding systems help to ensure rapid operation of protection circuits providing low resistance fault paths due to unexpected electrical faults.
The term ground is defined as a conducting connection by which a circuit or equipment is connected to the earth. A ground consists of a grounding conductor, a bonding connector, its grounding electrode, and the soil in contact with the electrodes. Soil varies throughout the world and therefore effects the resistivity of the soil. Temperature, moisture, and minerals also effect the resistivity of the grounding system. Therefore, it can be said that seasonal changes can have a bearing on the resistivity at time of testing. Measurements are required on a regular timed cycle to chart any changes taking place. Seasonal changes may be evident when summer and winter data are reviewed.

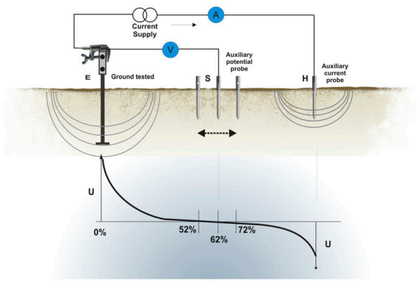
Changes in the value of a low resistance element are one of the best and quickest indications of degradation taking place between two contact points. The measurement will alert the user to changes having taken place from the initial and / or subsequent measurements. These changes can occur from several influences including temperature, chemical corrosion, vibration, loss of torque between mating surfaces, fatigue, and incorrect handling.

How the Grounding Survey is Conducted



SOIL RESISTIVITY TEST

The soil resistivity test is conducted on the soil around the facility to test the resistance of the soil where the grounding system either will be or has already been installed. The test measures the resistance of the soil identifying the grounding systems ability to direct fault currents path to ground. Soil resistivity is determined largely by its content of electrolytes, which consist of moisture, minerals, and dissolved salts. A dry soil has high resistivity if it contains no soluble salts. This test conducted is called the 4-point method using an instrument connected to test stakes positioned in the soil at measured distances from the instrument in which it injects a current into the soil and takes a measurement with the results being the resistance of the soil.

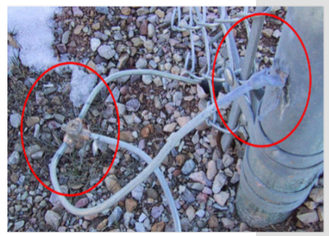


FALL-OF-POTENTIAL TEST

A test called the Fall-of-Potential Test is conducted on the ground rods/grids that measure the effectiveness of the grounding system by giving a resistance measurement. We have found new technology that allows us to do this test without the grounding system under the test being disconnected from the grounding system. In the past, the system had to be disconnected to prevent invalid measurements due to feedback within the system it is connected to.

GROUND EARTH CLAMP-ON METER

Another instrument that is used to test the grounding system is a Ground Earth Clamp-on meter. This meter can be used to test the ground rods without having to disconnect the system if the meter can correctly fit around the ground rod under test. This meter is also used to do continuity and bonding checks where ground connections are looped in the system and not directly connected to earth.



Continuity tests are done to check connections where a bonding test indicates a high resistance connection in the system to isolate the faulty connection if the connections are attainable.

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Severity Classification

< 5 Ohms	5 to 25 Ohms	>25 Ohms
No Discrepancy	**High**	**Critical**
	Below the NEC standard but requires attention or monitored for further degradation	Above the NEC standard and requires attention

Location where the testing was conducted within the facility

Tag number placed on the ground point tested if actual earth ground

Description of test location

Notes and recommendations based on findings of the test data collected

Grounding Survey Results

Location	Earth Ground, Bonding, Continuity	Earth Ground Tag No.	Description	Test Values: Ohms	Test Values: Loop Connection/Earth Ground	Notes/Recommendations
Crush	Bonding		Meal Loadout C980	0.045	Loop Connection	
Crush	Earth Ground	0039	Meal Loadout C970	0	Earth Ground	
Crush	Earth Ground	0038	Meal Loadout Column	3.52	Earth Ground	
Crush	Earth Ground	0037	Meal Loadout C960	1.2	Earth Ground	
Crush	Bonding		Meal Loadout C950	0.048	Loop Connection	
Crush	Bonding		Meal Loadout C930	0.2	Loop Connection	
Crush	Bonding		Meal Loadout C920	0.041	Loop Connection	
Crush	Bonding		Meal Loadout C990	0.19	Loop Connection	
Crush	Earth Ground	0040	Meal Loadout C940	2.1	Earth Ground	
Crush	Bonding		Meal Loadout C1010	0.3	Loop Connection	
Crush	Earth Ground	0041	Meal Loadout C1000	33.4	Earth Ground	Soil has been very dry. This could be the reason for the higher resistance
Crush			C110		N/A	Ground wire broken
Crush	Earth Ground	0042	Tank 10 C50	10.4	Earth Ground	Soil has been very dry. This could be the reason for the higher resistance
Crush	Earth Ground	0043	Tank 10 C60	19.1	Earth Ground	Soil has been very dry. This could be the reason for the higher resistance

Actual Earth Ground Test

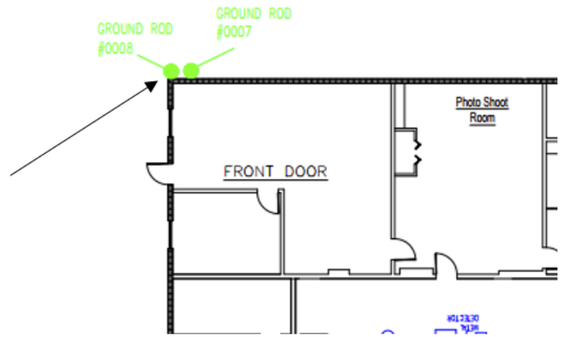
Bonding Test (Was NOT actual earth ground connection)

Continuity Test (Test conducted on connections to Earth Ground Rod/Grid, connections to ground bus bars, and field equipment to equipment

Resistance value obtained from testing with severity classifications in appropriate color

Indicates if the test conducted was in a loop (not actual earth ground but looped through connections back to the tester), actual earth ground or N/A that is associated with a continuity check.

Sample of drawing indicating ground points that will be referenced in the spreadsheet above



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