

Grounding - Soil Resistance & Acidity

When designing a grounding system it is important to determine the resistance and acidity level of the soil. Testing soil resistance allows for effective grounding design whereas acidity testing allows selection of the best materials for long system life.

Measuring soil resistivity requires some training and is time consuming. A trained, competent operator should complete the testing with a four-pole fall of potential test instrument that is in current calibration. The technician must take into consideration the area of the ground system, type of grounding (rods, mats, etc.) and a number of other factors before determination of the test area. The data collected should be from no less than three or four probe spacings at each location and the more data collected, the better the site model. In addition to multiple probe spacings, each of the spacings, should be in four different directions. The data should be plotted to scale on the site plan for the system designer.

For critical sites such as 911 centers, hospitals, telecommunications centers, data centers, etc., the data should be collected from all areas of the site where the grounding is to be installed. When a lightning protection system is designed, each ground conductor's area of grounding must be tested. Particular attention must be paid to the lightning system design and several areas should be tested for potential grounding. Small sites can have a soil resistance differential, therefore, assumptions should not be made and all areas for grounding should be tested. The most effective and cost effective design can be completed with detailed and complete test data. It is not impossible to install a long lasting and low resistance ground without testing, it is just not as cost effective.

Soil resistance will range from 300-500 Ohms in clay to thousands or over a million Ohms in sand or limestone. The factors effecting soil resistance are many combination of these variables makes anything other than detailed and accurate soil testing a guess. The probability of an accurate guess is close to "0". It is also close to impossible to outline all the combinations of variables and create an outline for different soil conditions. A matrix or computer model would still not be as accurate as on site testing and would qualify as a guess.

Test data for acidity of the soil will allow the designer to select the proper materials for long system life. Sites with high soil acidity require materials (such as stainless steel) with the ability to survive once installed. Sites with low soil acidity can use more traditional grounding materials with great success.

Salt-water intrusion in coastal areas also calls for corrosion resistive materials. High soil salt content will have the same effect on materials as acidic soil does.

The design firm selected should be chosen with care and their references should be verified. Look for a firm with no less than 5 years of verifiable experience and the proper tools to complete the project.