



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Irfan S. Habib</b>	<b>Project Number</b> <b>S0612</b>
<b>Project Title</b> <b>Investigation of the Corrosion Performance of Electrodes Used for Effective and Safe Electrical Grounding</b>	
<b>Abstract</b>	
<b>Objectives/Goals</b> Are copper-bonded or galvanized rods more resistant to corrosion? Do installation damages accelerate corrosion?	
<b>Methods/Materials</b> The procedure was a realistic simulation of the corrosion of a range of ground rod samples in soil using a controlled laboratory-based accelerated corrosion test according to the European Standard EN50164-2. All testing was carried out using a worst-case approach. There were four main steps in the procedure (i) In order to simulate realistic but relatively harsh installation conditions, ground rods were driven a distance of approximately 1m into rocky ground. The samples were then carefully excavated and observed for any damages. (ii) A batch of ground rods were prepared with two of each type of damage observed above from the installation trials. All rods were weighed and diameter, length and resistance were recorded. (iii) Accelerated corrosion testing on the rods were carried out for 28 days. Each rod was inserted separately into a PVC test tube and totally immersed in a non-stirred purified water solution containing calcium chloride and sodium sulphate. (iv) Finally after 28 days all rods were removed, washed, dried carefully. Then mass, diameter, length, and resistance was again recorded.	
<b>Results</b> copper-bonded rods mean mass loss was 176.4mg, diameter loss 0.51mil, mean resistance increase 4.125microohms. galvanized rods mean mass loss was 210.5mg, mean diameter loss 0.75mil, mean resistance increase 5.25microohms	
<b>Conclusions/Discussion</b> 1. Galvanized ground rods corroded at a faster rate than the copper-bonded ground rods. 2. The zinc coating on galvanized rods corroded faster than the copper coating on copper-bonded rods. 3. Our results are in excellent agreement with the 50-year nation bureau of standards field study, which showed that galvanized and copper-bonded rods have a service life of ten to fifteen and thirty to forty years, respectively. 4. Also typical installation damage, such as scratches and dents, on the coating of ground rods did not affect the corrosion effect of rods.	
<b>Summary Statement</b> comparison of corrosion of copper-bonded and galvanized ground rods	
<b>Help Received</b> Mother gathered material and explained chemistry	