Technical Bulletin

Northern States Metals
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SOLAR FLEXRACK
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Attachments:

None

Corrosive Soil Conditions and Ground Mounted Components

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Corrosive soil conditions can lead to accelerated corrosion of posts on ground mount systems. PV racking structures and foundation systems require careful designs that can tolerate structural loading reactions and corrosive soil environments as well.

Site specific soil conditions and chemical parameters can adversely affect the design service life of structural steel foundation components. Factors that influence the severity and rate of corrosion include the inherent moisture content, conductivity of the soil media, pH and the oxygen concentration. Organics, soil porosity and soil texture (classification) have an indirect impact on corrosion potential by influencing the primary factors noted above. Further, soil can be defined as undisturbed or disturbed media. Undisturbed soil below the ground surface has a lower risk of corrosion than disturbed soil which has become aerated (oxygenated) during the excavation and backfill process.

The most common test methodology employed to quantify soil corrosion potential is the Wenner 4-point Resistivity Test. This method measures the soil resistivity which has a negative relationship to corrosion potential. Other common laboratory tests used to evaluate corrosion potential include, pH analysis and water soluble sulphate and chloride concentrations. A comprehensive site evaluation and design may be warranted if foundation pilings intersect different soil boundaries or layers as opposed to pilings founded within one specific soil type or soil stratum.

Steel foundation pilings are the most common foundation design option used today in ground mounted PV system installation and construction due to their structural load strength and ease of soil penetration. However, it is important to note that the effective surface area of various steel piling components may actually accelerate corrosion due to high surface area to cross-sectional area ratio. Corrosion potential of soil can also be evaluated in terms of its pH level, which is a scale that measures relative acidity. The higher the pH value, the more basic the soil is, and the lower the pH value, the more acidic and therefore corrosive the soil is. A higher concentration of chloride ions present in the soil is directly proportional to low pH value leading to high soil acidity and subsequent corrosion potential.

At Solar FlexRack, our team of engineers carefully evaluate all site specific soil parameters in our foundation design recommendations. In order to prevent and/or minimize soil-based corrosion, foundation mounting systems need to be engineered to provide protection against corrosive environments. There are several methods of corrosion protection that can be implemented to protect against the electrochemical processes of oxidation (anodic) and reduction (cathodic) reactions of soil and steel pilings, including:

- **Hot-dipped Galvanization:** The most common solution to prevent steel corrosion. The zinc layer is a sacrificial coating since zinc is higher than steel on the galvanic series. Zinc will oxidize before steel even with exposed steel with scratches. Zinc is also popular because it is a cost effective solution.
- **Epoxy coating:** With a special blend of materials, it is possible to coat the outside of the structure to serve as a layer of retardant, blocking the corrosive makeup.
- **Concrete embedment:** By simply installing the mounting system in a layer of concrete, you can prevent the acidic soil from eating away at the structure.
- **Galvanized anodes:** With specially designed sacrificial galvanic anodes, a mounting structure can resist the corrosive attributes of acidic soil.
- **Coal Tar Paint:** Can provide considerable protection in acidic soil conditions, however it has an odor and is perhaps the least aesthetically pleasing solution

At Solar FlexRack, our engineers are well versed in the corrosive reactions soil can foster, and actively work against that potential damage with our best-in-class designs. With Professional Geologists and Engineers on staff, we work directly with you technical teams to ensure bankable designs and PE stamped drawings to support these designs. For more information on how the Solar FlexRack reduces possible damage from soil conditions, don't hesitate to reach out to a Solar FlexRack representative.