A Technique for Examining Tower Guy Wire Anchor Rods

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The use of tall towers as platforms for environmental, radiological, and meteorological monitoring equipment is common in the nuclear industry. Typically, guy wires and anchor rods are used to support the tower. These anchor rods extend below grade into a massive support such as a concrete block and must withstand a force of several tens of thousands of pounds to remain secure. In order to maintain a proper level of performance, these anchor rods should be examined periodically to ensure that the integrity of the rod is not compromised due to corrosion and/or stress related flaws which could result in failure of the rods. Corrosive environments due to dissimilar metals such as iron rods connected to or nearby copper grounding infrastructure and corrosive soil or concrete characteristics are commonplace and inherently damaging to anchor rods over time.

Historically, inspections of the below grade portion of an anchor rod have been made by excavation and a visual inspection, however, this technique has several undesirable characteristics including the high level of labor involved, the incompleteness of the examination, and the difficulty of repeated examinations over time. Also, the removal of fill-dirt adjacent to the anchor rod may hinder the ability of the anchor block to maintain the proper design load during excavations. Nicks or scrapes into the protective coating of the rod during excavation may provide an avenue for future damage due to corrosion. Visual examinations are acceptable for detecting fully developed flaws, but are inadequate for detecting cracks, internal flaws, or any part of the rod encased in the concrete anchor block.

To avoid the potential complications cited above, an alternative examination method was developed to improve man-power efficiency, technical rigor, and cost effectiveness. A nondestructive examination technique has been adapted to determine the status of each individual rod by emitting energy through the entire length of the rod. Field test data from *in-situ* rods are compared to data obtained from a full-scale mock-up or calibration rod. Any deviation from the expected signatures is identified or, in the case of a fully-intact rod, a favorable comparison to the calibration rod is made. This technique can also be applied to new anchor rods prior to installation. The man-power required to perform this nondestructive examination is minimal compared to an excavation, and the examination can be readily performed at any time interval. An assessment of the entire length and interior of the anchor rod is made including any portion encased inside the anchor block. Trends in deterioration can be monitored by comparing a series of inspections made over time.