

## **I – Problem Statement Title (04-GS122)**

### **Improved Design Standards for Protection of Highway Structures from Corrosion Induced by Stray Current**

## **II - Research Problem Statement**

**Question: Can we revise our current design standards to provide an effective method for protecting highway structures against corrosion from stray current without using the conservative, costly methods currently in place?**

The Bridge Design Details, Section 12-10.1, Stray Current Design Details, are out of date and no longer defensible. In order to develop a stray current design standard for the protection of structures in and around Light Rail Transit (LRT) systems, it will be necessary to research industry and international literature, standard practice, academic theory, and collect field data. Research should also include evaluating actual damage due to corrosion and testing the effectiveness of any new standard.

## **III – Objective**

To develop a stray current design standard for protecting bridge and earth retaining structures subjected to stray current from LRT systems. The research conducted will provide a technical basis for modifying existing State guidelines (where they exist), and provide a basis for developing standardized AASHTO Bridge Design Specifications for stray current mitigation.

## **IV – Background**

While corrosion related damage to rail facilities and adjacent structures due to electric rail stray current has been documented, transportation agencies currently use conservative and often costly methods to protect highway structures against stray current. In addition, AASHTO requires special consultation be performed by a corrosion specialist and appropriate protection be provided for highway structures constructed near or beneath a Light Rail Transit (LRT) system. Most transportation agencies do not have engineering specialists on their staff who has the background to address stray current issues nor to deviate from these conservative standards, and there is little research available upon which to base updated guidelines.

Instead, they rely on stray current mitigation measures provided by the electric rail operators. Operators of electric rail facilities often rely on mitigation measures that are based on older 1920's technology. These measures often focus on stray current mitigation and monitoring for infrastructure related to the rail facility and other buried underground utilities. Stray current monitoring and mitigation plans for nearby transportation structures typically do not exist. Some operators have implemented newer mitigation measures such as thyristor grounding systems, however, there is uncertainty regarding the effectiveness of these measures in preventing stray current corrosion of nearby transportation structures. Conservative methods such as Guidelines For LRT Stray Current Provisions (December 1988) outlined in California DOT (Caltrans) Bridge Design Details (BDD), Section 12-10.1, were included in the BDD because of the I-105 LRT corridor rail system. The

provisions that were developed were an adaptation of the local BART heavy rail stray current design measures, and are often considered by electrified rail operators as too conservative for light rail transit systems. They were conservative for the newly emerging LRT systems and have become overly conservative in current projects. Local Agencies have become increasingly critical of these expensive, overly conservative design details.

## **V – Statement of Urgency and Benefits**

### **A. Support of the Department’s Mission/Goals:**

#### **(Improving Mobility: Safety, Reliability, and Performance)**

There is industry and international standard practice, and academic theory, but no defensible design standard. A specialist in the field of stray current corrosion of bridge and earth retaining structures does not currently exist. This project will develop and implement design specifications, design details and construction specifications that provide necessary reliability, durability and maintainability while reducing design time and construction costs.

### **B. Return on Investment:**

This research affords the opportunity to develop expertise in stray current protection for structures. The focus of this study is to assess the impact of stray current from electric rail facilities on adjacent transportation structures (including bridge and earth retaining structures), determine the effectiveness of existing systems, and develop draft interim guidelines that can be used to set cost effective guidelines for stray current mitigation for implementation by transportation agencies.

## **VI – Related Research**

A search was conducted on TRIS online (<http://ntl.bts.gov/tris>), the Research In Progress database (<http://rip.trb.org/search>) and a general internet search engine. Nothing of this proposed magnitude was found.

## **VII – Deployment Potential**

Immediate deployment. Local Agencies and the Department regularly propose new LRT projects. The product of this research would be a design standard that mitigates the effects of stray currents in adjacent structures. This project could be included with a larger research project on the causes of structure corrosion.

The project will likely include three phases:

Phase 1 should include a literature review of state of the art practices for mitigation of stray current;

Phase 2 should include strategies for monitoring stray current corrosion (if needed) in and around LRT systems by collecting field data to evaluate actual damage due to corrosion and testing the effectiveness of any new standard; and

Phase 3 should include drafting uniform and accepted design standards and monitoring strategies that effectively mitigate the effects of stray currents in adjacent structures.