

---

**TIP Project Brief – 080059/9H9014**

---

**Civil Infrastructure****Microwave Thermoelectric Imager for Corrosion Detection and Monitoring in Reinforced Concrete**

---

*Develop a novel nondestructive technology for early detection of corrosion in reinforced concrete structures.*

**Sponsor: Newport Sensors, Inc.**

7 Murasaki Street  
Irvine, CA 92617

- Project Performance Period: 2/1/2009 - 1/31/2012
- Total project (est.): \$2,498 K
- Requested TIP funds: \$1,249 K

Deterioration and failure of civil engineering structures due to rebar corrosion in reinforced concrete costs the nation tens of billions of dollars annually. Newport Sensors, Inc., (Irvine, Calif.) plans a novel microwave “camera” for *in situ*, real time nondestructive detection of rebar corrosion at an early stage. The proposed system exploits the fact that even a small degree of corrosion around a steel rebar or tendon acts as a thermal insulator, so corroded steel cools more slowly than un-corroded steel. The Newport Sensor device will use inductive heating as a “flash unit” to selectively heat the steel reinforcing bars within a concrete structure and microwave reflectance to measure the cooling rate of the steel. The project entails several significant research challenges that require TIP support, including developing optimal techniques for induction heating of steel rebar that can be buried two to six inches deep in concrete, and obtaining an accurate measure of temperature from microwave reflectance. Because the optimal microwave frequencies for deep penetration of concrete are significantly different from the optimal frequencies for high-resolution imaging of the rebar, a key element of the proposed research is an advanced microwave imaging system to enhance sensitivity and penetration depth. If successful the project innovations will enable direct visualization of rebar corrosion in its early stages, something not possible with any existing nondestructive evaluation technology.

**For project information:**

Dr. Richard Livingston, (949) 378-8666  
[info@newportsensors.com](mailto:info@newportsensors.com)