

CORROSION CONTROL LABORATORY

The Corrosion Control laboratory at the Turner-Fairbank Highway Research Center has the required equipment and personnel expertise to characterize coatings, and to evaluate their performance and durability by accelerated testing methods. Equipments and skills are also available to use state-of-the-art electrochemical techniques to evaluate the corrosivity of deicing materials on steel rebars in concrete.

Failure Analysis

Personnel in the laboratory evaluate the degree of corrosion (e.g. rust) and the coating condition of field structures such as steel bridges and steel rebars in concrete, and determine the quality of the coating application. Coating failures are investigated and laboratory analyses are performed to identify the failure mechanisms and determine repair or replacement options.

Material Characterization

The laboratory is capable of determining the chemical composition of dried coating film and liquid paints using various chromatographic and spectroscopic techniques. Liquid paints can also be characterized by their physical, rheological, and application properties.

Toxicity Testing

The laboratory personnel can characterize the hazard of abrasive paint

debris from bridge repainting by determining the heavy metal content of their water leachates such as lead and chromium. These determinations can be made using either of two Environmental Protection Agency leaching procedures, the Extraction Procedure Toxicity Test (EPTox) or Toxicity Characteristic Leaching Procedure (TCLP). Test results are required to classify solid wastes before proper disposal in a landfill.

Accelerated Corrosion Testing

The laboratory is equipped with three accelerated corrosion testing chambers to evaluate coating systems. Ultra-violet/condensation, salt-fog, and alternating salt-fog plus pollutant/dry (so-called Prohesion, as shown in the photo) chambers are available for studying coating resistance to sunlight, humidity, salt, and pollutants.

Electrochemical Techniques

The laboratory is equipped with a potentiostat/galvanostat with supporting computer and software to perform corrosion rate measurements using various electrochemical techniques. With this equipment, polarization, resistance, anodic and cathodic potentiodynamic polarization, cyclic polarization, and AC impedance corrosion measurements can be made.



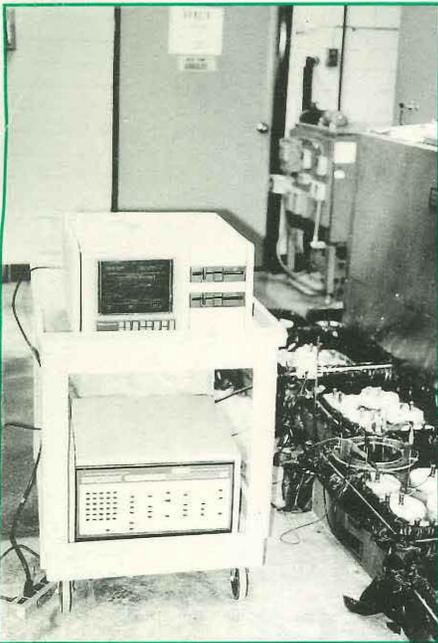
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CORROSION CONTROL

Laboratory



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CURRENT RESEARCH PROJECTS IN THE CORROSION CONTROL LABORATORY

Experts in the Corrosion Control laboratory assist State and local transportation agencies in determining the cause of premature coating failures, in assessing liability, and recovering assets.

Laboratory personnel are actively participating in the paint proficiency round robin testing sponsored by the American Association of State Highway and Transportation Officials Materials Reference Laboratory. Additionally, the laboratory provides quick, in-house support of research in the FHWA's high priority national program area "Steel Bridge Coatings."

A staff study titled Evaluation of VOC-Compatible Coating Systems is evaluating the durability and corrosion protection properties of commercial coating systems that meet environmental regulations with respect to toxic materials and volatile-organic-compounds (VOC) content. VOCs react with nitrogen oxides in sunlight to form ozone (smog), which is regulated by the 1990 Clean Air Act Amendments. The accelerated testing regimen is establishing a laboratory method to accelerate the effect of outdoor exposure so that a short-term prediction of coating life can be made. The study results will provide guidelines for the selection of long

lasting low-VOC coating systems for both new construction and maintenance of steel bridges. The same techniques are also being used to determine the durability of fluorescent coating materials for highway signs.

A staff study on Impedance Spectroscopy and Electrochemical Noise Analysis for the Evaluation of Corrosion Inhibitors in Highway Deicers is underway to test and compare the performance of two electrochemical measurement methods -- impedance spectroscopy and electrochemical noise -- on a number of corrosion inhibitors used in commercial deicing salts. The study will be carried out on small specimens made of steel rods embedded in concrete, and periodically immersed in solutions of the corrosion inhibitors. The results of this research will provide an efficient tool to determine the corrosiveness of commercial deicers.

TURNER-FAIRBANK
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Operated by the Federal Highway Administration's (FHWA) Office of the Associate Administrator for Research and Development, the Turner-Fairbank Highway Research Center (TFHRC) is the Nation's primary highway transportation research and development facility. Located in McLean, Virginia, just inside the Capital Beltway, the Center consists of a number of world-class testing and laboratory facilities. The FHWA built and operates these facilities to support the expertise of scientists, engineers, academicians, students, and others who are working on important highway research. Their efforts help make the world's largest highway system safer and more efficient.

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