

Technical News Briefs

New Technical Developments

NEW WAY TO MEASURE CORROSION IN HIGHWAY BRIDGES

NBS has developed a new system for highway engineers to measure the corrosion rate of steel reinforcing bars in concrete. The system will provide engineers with a way to evaluate the effectiveness of various surface coatings and sealers applied to bridge decks to reduce internal corrosion. The technique, developed for the Federal Highway Administration, uses a portable, computerized system for making nondestructive spot measurements within a matter of minutes. It eliminates the need to bore holes in concrete to inspect steel reinforcing bars. The system consists primarily of a small computer, a data logger and two probes for sending and receiving electrical impulses. Measurements are made by placing the probes on a bridge deck to make contact with internal steel reinforcing bars. One of the probes is used to polarize the steel bars and the other is used to measure the change in voltage. The new system has wide potential for inspecting buildings, parking garages, and other reinforced concrete structures subject to corrosion.

For further information contact Edward Escalante, National Bureau of Standards, Gaithersburg, MD 20899.

ARSON DETECTION IS GOAL OF ANALYTICAL METHOD BEING DEVELOPED

Experiments in analytical chemistry have uncovered a technique that shows promise as a method of detecting arson. NBS scientists have found that the fire "accelerants" many arsonists use, such as gasoline and kerosene, produce specific by-products that become part of soot. Known as polycyclic aromatic hydrocarbons (PAHs), these products can be

removed by solvent extraction from sooty deposits sampled at the scene of a fire. Gas chromatography is used to detect PAH presence. The technique has been successful in identifying PAHs both in soot from controlled laboratory fire tests and in samples taken from on-location fires started with accelerants. The Treasury Department's Bureau of Alcohol, Tobacco and Firearms has provided soot samples from training fires in abandoned residential buildings. While NBS researchers describe the PAH test as "a simple one that could be easily used as a forensic device," they emphasize that the method is only experimental at this point and that it cannot be applied to all arson situations. NBS plans to test the technique further and to produce a report aimed at forensic chemists.

For further information contact Stephen Chesler, National Bureau of Standards, Gaithersburg, MD 20899.

NBS IMPROVED PHASE ANGLE DEVICE DESCRIBED IN REPORT

The invention of a 50-kHz phase angle calibration standard by an NBS physicist received considerable attention when it was announced in 1985. Three commercial versions of the device are presently on the market. Now the inventor has authored a technical report [1] that gives a detailed description of the device and suggestions for its efficient operation. Calibrated phase angle equipment is needed for such applications as testing aircraft instruments, tracking satellites, and checking the functioning of electrical power lines. The NBS-developed device improves the speed of existing phase angle calibrators by 10 times or more. It works by creating two sinusoidal signals with an accurately known phase angle between them. Signals are generated using digital waveform synthesis and are programmable in amplitude (0 to 100 V) and in frequency (2 Hz to 50 kHz).

For more information contact Raymond Turgel, National Bureau of Standards, Gaithersburg, MD 20899.

Reference

- [1] NBS 50 kHz Phase Angle Calibration Standard (TN 1220), Stock Number 003-003-02726-0, the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (price \$4, prepaid).

EXPLOSION INVESTIGATION UNCOVERS WIDE POTENTIAL HAZARD

NBS researchers' findings into a steel pressure vessel accident should concern the operators of hundreds of similar pieces of equipment all over the United States and the world [1]. The tank, at the Union Oil Company's Chicago refinery, apparently had been built properly, operated properly, and inspected at regular intervals. Nonetheless, it developed severe cracks and failed, with fatal results.

At the request of the U.S. Occupational Safety and Health Administration, and after an on-site inspection by NBS researchers, pieces of the destroyed tank were shipped to the Bureau's laboratories in Boulder, CO, for examination. There, exhaustive tests determined the composition and strength of the materials used, the condition of the tank before it failed, and the probable sequence of events leading to failure.

Chemical and mechanical testing showed that the materials used to build the tank met or exceeded specifications, and that the welds were stronger than the base metal.

Corrosion and hydrogen cracking tests performed on samples from the tank showed that the materials were susceptible to hydrogen pressure cracking in the sort of environment that existed in the tank.

Magnetic particle, ultrasonic, and metallurgical studies of the fracture surfaces and adjacent areas revealed that extensive cracking had occurred, particularly in the heat-affected zone near repair welds. These areas near welds were hardened by the repair welding and especially susceptible to hydrogen cracking. One of the cracks extended more than nine-tenths of the way through the inch-thick tank wall, leaving insufficient steel to contain the internal pressure. Once a leak penetrated at this crack, the crack continued to grow right around the tank, like unzipping a zipper. The final, near-instantaneous fracture was triggered by this crack because the toughness of the steel had been reduced by hydrogen embrittlement.

Reference

- [1] Examination of a Pressure Vessel that Ruptured at the Chicago Refinery of the Union Oil Company on July 23,

1984 (NBSIR 86-3049), Stock Number PB 226594/AS, National Technical Information Service, Springfield, VA 22161 (price \$22.95, prepaid).

COMPANIES, AGENCIES STUDY IMPROVED FLOW MEASUREMENTS

In an effort to reduce financial losses from inaccurate measurements, several industrial makers and users of meters that measure the multibillion-dollar flow of materials through pipes—commodities such as oil, natural gas, and chemicals—are working with NBS to examine ways of improving flow metering.

Because research programs needed to understand the complexities of fluid-flow phenomena are costly, several corporations have entered into cooperative agreements with NBS as cost-effective approaches to improving flow measurements. One such agreement, a consortium on meter "installation effects," is investigating the persistent problem of how to get satisfactory results from meters installed in "non-ideal" locations: too close to a pipe "elbow" or valve for instance.

Another consortium is focusing on the performance of vortex-shedding flowmeters, which determine flow rate by detecting the whirl-shaped vortices produced by flow through the meter. The goal is to combine the measurement expertise and fluid research facilities at NBS with the industrial needs of the consortium members.

For further information contact George Mattingly, National Bureau of Standards, Gaithersburg, MD 20899.

NBS EXAMINES LITERATURE ON GASES FROM BURNING PLASTICS

Smoke and toxic gases, not burns, kill 80 percent of the people who die in fires. In a project partially sponsored by the Consumer Product Safety Commission, the NBS Center for Fire Research conducted an extensive literature review on the toxicity and chemistry of the gases produced when seven synthetic materials were exposed to high temperatures. More than 400 different gases were identified.

Except in a few cases involving additives, the literature shows that these seven plastics did not produce extremely or unusually toxic products when compared to those of other synthetic or natural materials. But NBS researchers note that these exceptions cause concern that other untested materials or future formulations may produce such toxic products. They also caution that toxicity is only one factor in determining the total harmful effects from a fire. Other factors to be considered include

the quantity of material, its proximity to other combustibles, ventilation conditions, and fire protection systems. Separate reviews on each of the seven materials are cited in an NBS summary report of the literature reviews [1].

Reference

- [1] A Summary of the NBS Literature Reviews on the Chemical Nature and Toxicity of the Pyrolysis and Combustion Products from Seven Plastics: Acrylonitrile-Butadiene-Styrenes (ABS), Nylon, Polyesters, Polystyrenes, Poly (Vinyl Chlorides) and Rigid Polyurethane Foams (NBSIR 85-3267), Stock Number PB 86-230679, National Technical Information Service, Springfield, VA 22161 (price \$9.95, prepaid).

THREE DEVELOPMENTS IN SUPPORT OF COMPUTER COMPATIBILITY

Efforts toward realizing computer compatibility through Open Systems Interconnection (OSI) appear to be gathering momentum, if the following three developments are accurate indicators:

- As the world's largest user of computers, the Federal government is organizing itself to work with industry to meet the special computer compatibility needs of Federal agencies.

NBS hosted the new "Government OSI Users Committee," involving 15 Federal agencies, in its first meeting on September 9. The group addressed the Federal government's interest in emerging network standards for computer compatibility. The Office of Management and Budget is developing a policy which would require the Federal government to use products for computer-to-computer communication which implement Open Systems Interconnection (OSI) standards. OSI standards provide a set of rules, known as protocols, which enable information processing devices to communicate with one another in a network. These standards will make it possible to connect off-the-shelf computer products from different manufacturers through a variety of communications technologies. OSI development has extensive government and private sector support. Over the next several years, the committee will work with industry to accelerate the development of OSI-compatible products that meet the special needs of the Federal government.

For further information contact Robert Blanc, National Bureau of Standards, Gaithersburg, MD 20899.

- Twenty-five industry and government organizations have agreed to jointly develop OSINET, an experimental computer network for Open Systems Interconnection standards. To be coordinated by NBS, this network will help speed up the development and use of OSI in industry and government.

It will enable cooperating organizations to build and verify test systems, conduct company-to-company testing, and carry out OSI-related research. Participants include: Amdahl, AT&T, Boeing Computer Services, Charles River Data Systems Defense Communications Agency, Digital Equipment Corporation, General Motors, Hewlett-Packard, Honeywell, IBM, ICL, Industrial Networking Inc., NBS, NCR Comten, Olivetti, OMNICOM, Protocom Devices, Retix, Sperry, System Development Corporation, Tandem Computers Inc., The Analytic Sciences Corporation, Department of Agriculture, Department of the Navy, and Wang Laboratories. These organizations plan to cooperate with other groups, such as the Corporation for Open Systems and the MAP/TOP Users Group, that are advancing the development and use of OSI standards.

For further information contact John Heafner, National Bureau of Standards, Gaithersburg, MD 20899.

- In another development related to Open Systems Interconnection, NBS is working with the Defense Communications Agency to build gateways between Department of Defense protocols and OSI protocols. The gateways will be used to maintain the agency's operations during conversion to OSI networks. A guest scientist from IBM is working with an NBS research team to develop automated techniques to test the gateways' computer network being developed cooperatively by 25 industry and government organizations, including NBS, IBM, and DCA.

For further information contact Stephen Nightingale, National Bureau of Standards, Gaithersburg, MD 20899.

REVISED FEDERAL STANDARD FOR COBOL ISSUED

A revised Federal Information Processing Standard (FIPS) for the programming language COBOL [1] went into effect October 1, 1986. A one-year transition period will give industry time to produce COBOL processors conforming to the standard. (FIPS are developed by NBS for use by the Federal Government.) The revised standard, which was approved by the Secretary of Commerce earlier this year, adopts an American National Standard (ANSI X3.23-1985) which reflects major changes and improvements in the COBOL specifications. The specifications are for use by industry as the reference authority in developing processors and by users who need to know the precise syntactic and semantic rules of the standard language. The FIPS also contains changes which

recognize advances in programming technology and make the standard consistent with other Federal standards for languages.

Reference

- [1] FIPS PUB 21-2, COBOL, National Technical Information Service (NTIS), Springfield, VA 22161; \$42.

New Services From NBS

TELECOMMUNICATIONS LABS GET U.S., INTERNATIONAL RECOGNITION FOR TESTING SERVICES

Fourteen private sector laboratories that perform electromagnetic compatibility (EMC) and telecommunications equipment testing have been accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) managed by NBS.

The laboratories were accredited for selected test methods under a new electromagnetics laboratory accreditation program (Journal of Research, Vol. 91, No. 2, p. 106). This LAP was established by NBS at the request of five commercial testing laboratories seeking international recognition for EMC accreditation. International recognition of U.S. laboratories and test methods has been a high priority of industry groups and manufacturers to aid them in exporting their products to foreign countries.

With NVLAP accreditation, the laboratories automatically receive international recognition for their testing services through NBS' agreements with the United Kingdom's National Measurement Accreditation Service, Australia's National Association of Testing Authorities, and New Zealand's Testing Laboratory Registration Council. Under these agreements, test data reports issued by an accredited laboratory in one system are recognized by the other national accreditation systems.

The laboratories accredited under the electromagnetic LAP are: Amador Corporation, AT&T Information Systems, Communication Certification Laboratory, Continental Testing Laboratories, D.L.S. Electronic Systems, Inc., Dash, Straus, and Goodhue, Inc., Elite Electronic Engineering Company, Emaco, Inc., GTE Evaluation and Support Department, MET Electrical Testing Company, Inc., Norand EMC Test Lab, Retlif, Inc. Testing Laboratories, R & B Enterprises, Underwriters Laboratories Inc. Under NVLAP procedures, laboratories can apply for accreditation in one or more of the recognized test methods that make up the electromagnetics LAP. The LAP provides

recognition to accredited laboratories that are capable of performing specific test methods for conducted emissions, radiated emissions, and terminal equipment compatibility in accordance with Federal Communications Commission (FCC) standards.

Established in 1976, NVLAP is a voluntary system whereby organizations and individuals request NBS to establish a laboratory accreditation program. On an individual basis, laboratories seek accreditation for having the competence to use specific test methods.

"Competence" is determined by evaluating applicant laboratories to assure that they have the equipment, staff, and procedures necessary to perform recognized tests in accordance with nationally or internationally accepted standards or test methods.

NVLAP-accredited laboratories pay annual fees, go through on-site reassessment every 2 years, and participate in scheduled proficiency testing to maintain accredited status. The laboratories are listed in the NVLAP directory that is distributed worldwide.

Currently, approximately 200 laboratories are accredited in programs administered by NBS for thermal insulation, carpet, concrete, solid-fuel room heaters, acoustical testing services, personnel radiation dosimeters, commercial products (paint, paper, and mattresses), building seals and sealants, and electromagnetic compatibility and telecommunications equipment testing. Other LAPs have been proposed for asbestos abatement, construction testing services, electrical and safety testing, and metals testing.

For further information, contact: Manager, Laboratory Accreditation, A531 Administration Building, National Bureau of Standards, Gaithersburg, MD 20899; telephone: 301-921-3431.

New Standard Reference Materials*

NEW STANDARD REFERENCE MATERIALS WILL AID PCB ANALYSIS

Laboratories that use chromatographic instruments to analyze environmental samples such as air and water for the presence of polychlorinated biphenyls (PCBs) should find Standard Reference Material (SRM) 1585 useful. Developed for calibrating analytical equipment such as gas chromatographs, SRM 1585 contains certified concentra-

*SRMs can be ordered from the Office of Standard Reference Material, NBS, Gaithersburg, MD 20899, Telephone 301-921-2045.

trations of eight related chlorinated biphenyls. These were chosen because of their environmental interest. For example, three are indicative of Aroclors 1254 and 1260, which are PCB mixtures found in some transformer oils. SRM 1585, Chlorinated Biphenyls in 2,2,4-Trimethyl-pentane (Isooctane), contains five sealed vials, each with about 1.2 milliliters of solution. It is available for \$161.

New Standard Reference Data

BASIC TABLES FOR CHEMICAL ANALYSIS

NBS has published a new set of handy reference tables of important data for use in analytical chemistry laboratories [1]. The tables include, in a single source, information not easily obtainable elsewhere about gas, liquid, and thin-layer chromatography, infrared and ultraviolet spectrophotometry, nuclear magnetic resonance and mass spectrometry, and "wet" chemical tests. Sections on hazardous materials and unit conversions also are included. Some typical tables are carrier gas properties, solvents for liquid chromatography, infrared optics materials and characteristics absorptions, natural abundance of important isotopes, mass fragmentation patterns, and flammability hazards of common solvents.

Reference

- [1] Basic Tables for Chemical Analysis (TN 1096), Stock No. 003-003-02724-3, U.S. Government Printing Office, Washington, DC 20402 (price \$11, prepaid).