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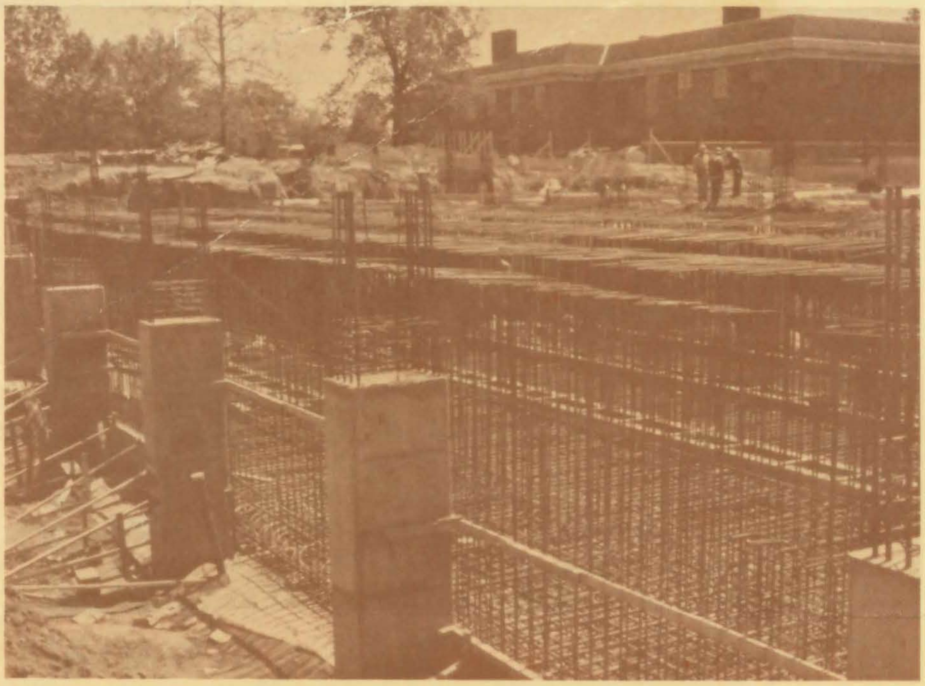

Web steel for the walls of the structural lab at the Fairbank Highway Research Station shows above the completed bottom slab.

New Structural Lab At FHRS

Among the new laboratory facilities being constructed at the Fairbank Highway Research Station (FHRS) in McLean, Va., is a major structural research laboratory. When completed, the laboratory will be used to conduct static and cyclic (fatigue) loading studies on full-size bridge girders, large-scale sections of bridges, and other structural members. Structural concepts for bridge rehabilitation and for new bridge construction will be evaluated, and structural problems that constantly arise in practice will be investigated.

The test floor of the structural research laboratory will be 50 m (161 ft) long and 15 m (51 ft) wide. The floor forms the upper flange of a four-cell concrete box girder that is 4 m (13 ft) deep; the bottom flange is 0.6 m (2 ft) thick and the top flange is 0.8 m (2.5 ft) thick. The clearance above the working floor is 7.6 m (25 ft). The laboratory will be serviced by two 18 140 kg (20 ton) traveling bridge cranes that may be operated independently or together.

Structures bearing on the test floor will be loaded horizontally and vertically with servo-hydraulic jacks. The laboratory is designed to enable many of the test specimens to be subjected to adverse environmental conditions during the physical loading. The loading experiments will be monitored from a test control center adjacent to the laboratory. The control center will contain data recording instrumentation, a small online computer, and a link to a major computer center.

Researchers in the Offices of Research and Development, Structures and Applied Mechanics Division, are instrumenting the structural box girder during construction so that its behavior can be evaluated later when structural testing is in progress. The instrumentation includes weldable strain gages (attached to the reinforcing steel), Carlson strain gages (embedded in the concrete), and thermocouples in both the top and bottom flanges. Pressure meters are located at the interface between the bottom flange surface and the subgrade.

This new structural research laboratory is expected to be in service by late 1982.

Solar-Powered Safety Sign

In a study by the Colorado Department of Highways, sunlight was converted directly into electrical energy to improve the nighttime conspicuity of a sign that warned motorists of a steep grade immediately ahead. Two photovoltaic panels, each having an output of 37 W, were installed near the sign, and a 12 V storage battery was charged by the solar panels. Two 203 mm (8 in) yellow traffic signals were mounted at the top corners of the sign and driven by a solid-state, nonalternating flasher with a 50 percent on, 50 percent off duty cycle. The traffic signals then were modified with automobile taillight sockets to accept 12 V lamps. The flasher was operated only during darkness because the low level of power capable of battery storage would not support the high intensity illumination needed for daytime. Maintenance requirements were minimal.

A research advisory panel that monitored this study established that the solar-powered sign improved highway safety and recommended the use of similar installations at other hazardous highway sites located outside areas supplied with commercial electric power. Although the present cost of electricity generated by photovoltaic panels is substantially higher than the cost of power purchased from utility companies, the cost of solar panel installation (about $5,000 in the Colorado study) compares favorably with costs of hookups to commercial power networks in many remote areas where low-wattage illuminated warning signs are needed.

A report on the Colorado solar-powered highway sign study suggests a method for mounting the solar panels to make them virtually bulletproof. It also suggests using a steel pole for mounting panels because it is vandalproof and electrical wiring can be run through the pole. The battery box should be buried in the ground, and sealed, zero maintenance batteries should be used.

Other uses of photovoltaic power systems have been reported on Federal-aid projects in Mississippi for traffic counting and in Alaska for a railroad grade crossing signal system. As the costs of manufacturing photovoltaic devices decrease, greater use of this form of power for operating signs at remote locations is anticipated.

The Colorado report "Solar Powered Highway Sign," report No. FHWA-CO-80-9, may be purchased from the National Technical Information Service, 5285 Port Royal Road, Springfield, Va. 22161 (stock No. PB 81 160004).

Recent Research In HAR

FHWA recently completed research to develop additional design, licensing, installation, operation, and maintenance information to assist users of highway advisory radio (HAR). HAR, a means of providing motorists with pertinent driving- and travel-related information through their vehicle's standard AM radio, is licensed under the Federal Communications Commission (FCC) as a travelers information station (TIS). HAR stations transmit on either 530 or 1610 kHz. These frequencies are close enough to the commercial AM broadcast band that many automobile AM radios can be tuned to them. Because HAR is a manual system, no modifications or adapters are required for automobile radios.

An HAR broadcasting station consists of a low power AM transmitter (a type accepted by the FCC), a cable or vertical monopole antenna, and a continuous-format type recorder/playback unit. Typically, the AM transmitter is interconnected to the tape unit via leased telephone lines.

The critical component of an HAR station is the antenna, which establishes the system's licensing requirements, coverage zone along the roadway, purchase and installation cost, and, possibly, operating frequency.

Because the coverage zone of an HAR station is confined either to a specific roadway or several segments of roadways, other factors require attention for an effective HAR installation. These include HAR station programing and advance roadside visual signing alerting motorists to HAR.

To date, HAR has been deployed in more than 20 States. Its primary applications include highway construction and maintenance zone routing, transportation terminal traffic and parking advisories, freeway traffic information (for example, incidents, lane blockage, delays, congestion), inclement weather warnings and advisories, and motorist services (availability of gas, food, and lodging).

Installations are also in use in more than 24 States by the U.S. Park Service to provide park-related information to motorists. At present, five States are planning to expand the use of HAR and six other States are planning to initiate its use.

To provide additional assistance to State and local officials in designing, licensing, installing, maintaining, and operating HAR, FHWA is publishing the following reports: Highway Advisory Radio Users Guide, Report No. FHWA/RD-80/166, and Highway Advisory Radio System Design Guidelines, Report No. FHWA/RD-80/167. While supplies last, limited numbers of copies of these reports will be available from the Traffic Systems Division, HRS-32, Federal Highway Administration, Washington, D.C. 20590.

Bridge Coating Failure

Because highway bridge steel coatings are designed to have service lives of 10 to 20 years, the coatings usually are tested and evaluated before actual use through a series of accelerated environmental tests designed to simulate stresses that a coating experiences during normal service life. The most widely used tests are salt spray, cyclic weathering, and high relative humidity. Based on the performance of coatings under these conditions, coatings are selected for field applications.

Under Federal Highway Administration sponsorship, the National Bureau of Standards (NBS) has completed a thorough state-of-the-art review of accelerated tests for steel coatings. It was concluded that the existing tests provide a poor indication of actual performance in the field. A major inadequacy of the accelerated test procedure lies in the nature of correlation tests, which cannot provide a quantitative service life prediction. A second problem is that rankings from different repetitions of the same accelerated aging tests are seldom reproducible. Finally, poor correlations exist between accelerated and outdoor exposure tests. Because of these deficiencies, it is difficult to predict coating service life reliably from accelerated test results, and experienced users of coating systems tend to rely on long term outdoor exposure results rather than accelerated test results.

The NBS study also revealed that many local public agencies and the standard specifications for acceptance testing rely almost exclusively on accelerated testing, principally the salt spray test.

Because of the deficiencies of the accelerated test procedures, NBS is investigating alternative techniques that could provide a more scientific method for the quantitative prediction of coating service life. One approach currently being evaluated is reliability theory, which predicts the rate and frequency of product failure based on modeling of coating performance under different stress levels. NBS currently is testing various coatings and collecting data for model development.

For additional information on this research, contact the Materials Division, HRS-23, Federal Highway Administration, Washington, D.C. 20590.

Standard construction equipment is used to pave with Sulphlex as shown at the field test section on Loop 1604 north of San Antonio, Tex.

Update on Sulphlex Pavement Construction

Field test sections on public highways in five States were constructed with Sulphlex binders in the late summer and fall of 1980. The largest section is 2.4 km (1.5 miles) of single lane overlay, 38.1 mm (1.5 in) thick, placed on Loop 1604 north of San Antonio, Tex. Smaller sections have been placed in North Dakota, Nebraska, Pennsylvania, and Florida. Two additional sections are scheduled for construction this year in Arizona and Michigan. This construction program has enabled assessment of (1) Sulphlex production in large volumes, (2) the use of Sulphlex binder with various aggregate types and construction equipment and techniques, and (3) the performance and durability of Sulphlex pavements under a variety of climatic conditions and traffic loads.

All test sections will be monitored for at least 2 years, and reports on the construction and performance of the sections will be issued by FHWA. For additional information, contact the Materials Division, HRS-23, Federal Highway Administration, Washington, D.C. 20590.

Traffic Controls For Low Volume Intersections

A recently completed FHWA contract study determined the operating characteristics and the relative hazard associated with using stop signs, yield signs, and no signs at low volume intersections. Criteria for signing were developed on the premise of using the least restrictive control necessary to promote a reasonable level of safety.

Signalized intersections and those controlled by multiway stop signs were precluded from the study. At least one of the intersecting roadways at each intersection had an average daily traffic volume of less than 500 vehicles, and no roadways warranted signalization according to the Manual of Uniform Traffic Control Devices. Major road volumes up to 10,000 vehicles per day were included in the study.

Observations and measurements were made at 140 low-volume intersections in three geographically different States (Texas, Florida, and New York). Control type (stop, yield, no control), region, location (urban/rural), geometry (three-leg/four-leg), major roadway volume, and sight distance were examined to determine their individual and interactive effects on driver behavior, accident experience, and travel time through the intersection.

The findings indicated that region, location, and geometry have a negligible effect on safety and traffic operation at low volume intersections. Increasingly restrictive control (for example, stop sign control) did not show lower accident experience. Stop signs had the highest travel times through the intersection and hence the highest total road user costs. Yield signs had the lowest road user costs of the three kinds of control considered.

With respect to drivers' compliance to the kind of control (excluding drivers who had to stop because of traffic conflicts), only 19 percent of the drivers came to a legal stop at stop signs, 8 percent voluntarily came to a legal stop at yield signs, and 8 percent voluntarily came to a legal stop at intersections without a control sign. Accident rates based on 3 years of experience at all of the intersections investigated averaged 0.13 accident per intersection per year, or about 1 accident every 7.5 years. Travel time through an intersection averaged 2 seconds higher at intersections with major road volume over 2,000 vehicles per day. Sight distance had no discernible effect on safety or traffic operation.

Legibility of Highway Guide Signs

The Traffic Systems Division of the Office of Research recently completed a staff study on the legibility of eight message elements, including cardinal directions, place names, route numbers, and exit numbers and exit information, on highway guide signs. The research was conducted in a vision testing alley using small-scale replicas of highway signs. Subjects advanced toward the signs in measured increments, attempting to read the sign at each increment, until all sign elements could be communicated correctly.

The findings indicate that route numbers had the poorest legibility of the eight message elements displayed on the tested guide signs. Route numbers were seen at a 10 percent shorter distance than place names. Cardinal direction indications (North, South, East, and West) could be identified at farther distances than any of the sign elements except the message "Next Right." In addition, capital-lowercase lettered cardinal direction indications were seen at 10 percent farther distances than conventional block letters.

For additional information on this staff study, contact the Traffic Systems Division, HRS-30, Federal Highway Administration, Washington, D.C. 20590.

The Federal Highway Administration NEWSLETTER is an official publication of this Agency and is published to draw attention to and promote the adoption of recent developments in highway programs and to advance new technology and methodology being fostered by the Federal Highway Administration.

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