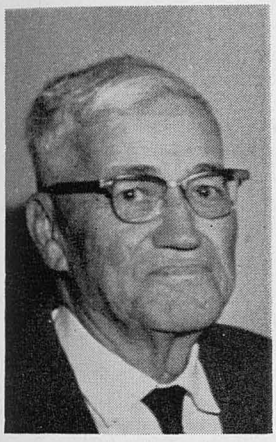
HIGHWAY MATERIALS RESEARCH LABORATORY—1942-1962

D. V. Terrell
Consultant, Highway Research, Education and Training

My subject limits me to the work of our Highway Research Laboratory which was built on the University of Kentucky campus in 1942, by the Kentucky Department of Highways; but since I grew up with highway research, I must go into the history leading up to the establishment of the Research Laboratory and tell you something of our interest in that field since 1912, when I came to the University as a young instructor in Civil Engineering. In 1913 the Department of Civil Engineering installed a small laboratory for testing road-building materials. In 1914 those attending the Road School were invited to bring in samples of road-building materials for test. In that same year, our Highway Testing Laboratory was made the official testing agency for the Kentucky Department of Highways; and all tests for the Department were made in this laboratory until it was moved to Frankfort in 1930. From then until 1941, our University Laboratory served largely in an advisory capacity: promoting highway research of interest to Kentucky.



The Highway Research Laboratory, located on the University Campus, is a three-story building having an open roof which is useful as an outside laboratory. It was built by the Department of Highways in 1942, and has 14,000 sq. ft. of operating space. The entire cost of operation and maintenance is paid for by the Department of Highways. Mr. L. E. Gregg came to the Laboratory in 1945 as Assistant Director of Research, and through his influence and leadership the Laboratory expanded into five sections, each headed by a capable person. When Mr. Gregg left the Department in 1957, Mr. W. B. Drake was appointed Associate Director of Research, and in 1961 he became Director. It has been my privilege to serve the Department on a part-time basis as follows: 1941 to 1961, as Director of Research; since 1961, as Consultant on Highway Research, Education and Training.

Our Research Committee consists of 39 members, representing Highway Administration and Engineering, and the College of Engineering. This Committee meets at least once each year to discuss the work of the Research Laboratory and to offer suggestions for additional projects. During the twenty years of operation, the Laboratory has played an important roll in Kentucky Highway Construction. It has worked in close co-operation with the Department of Civil Engineering. The projects worked on are far too numerous to list or mention here. We have conducted research in basic soil mechanics, soil mapping, concrete, asphalts, paints, signs, pavement slipperiness, pavement roughness, design of culverts, and in other things; but we have not solved all of the problems. In fact, there are so many problems that we have difficulty in knowing which ones to attack first. The ability to accomplish work in all of these categories has been, and continues to be, a determining factor in the success and effectiveness of our organization. It has been estimated by industrial economists that proper investment in research will be returned many fold and is good business. We can

point to many profitable accomplishments by our laboratory processes, and our personnel is well recognized by national committees dealing with highway research.

In general, projects are initiated by the Chief Engineer's Office and by our own personnel. Many of the problems require quick investigation to determine ways and means of proceeding with the work. For most such cases, the answer or recommendation is needed before the Laboratory receives the problem; the problem may involve a pavement surface that is in distress, a drainage structure that is not performing as it should, partial failure of a pipe under a high fill, interpretation of points in the specifications, pavement design, or materials and construction procedure.

When new materials or improvements in materials are proposed to the Department of Highways, the Laboratory is called upon to make an investigation. This may be a long or short project, but usually it is a long one. It may require a service record under actual use. Some materials may be eliminated in short order, whereas some may require considerable time and more extended use. We have one project involving the installation and testing of drainage pipe in acid-water conditions that has been going since 1949. A number of reports have been made on this project. In a similar vein, the Bureau of Public Roads requested a performance investigation on 100 installations of concrete pipe. The first survey revealed the fact that some of the large pipe constructed recently under high fills were in distress, and some were near failure. This led to a complete investigation by the Department of all recent installations on the interstate system. The laboratory offered a plan for repairing the damage as well as an analysis of the cause of the trouble.

Traffic paint has been under study for a long time, and many of the problems are yet to be answered. Our laboratory did develop a method of field and laboratory testing whereby the most economical paint can be purchased. The results have been a considerable saving in the cost per mile, per year of service. Many other states have adopted the plan developed in Kentucky.

Since 1949, our laboratory has been working on a machine that will produce data by which the roughness and riding qualities of a pavement can be evaluated. This instrument is proving to be satisfactory, and we are co-operating with other states and the federal government in perfecting means of assaying the serviceability of road surfaces.

The use of local materials such as sandstone, bank gravel and sand started before the Research Laboratory was set up. The fact has long since been established that a good grade of sandstone can be used satisfactorily in almost any place where limestone can be used. Economics is the only problem: this includes the location of suitable sandstone, production and transportation cost. Studies are being continued on local bank gravel such as those found in the western part of the state in an effort to find out how such material can best be used on an economical basis.

We have many projects under study on which long-range performance records are kept. This is perhaps the most valuable work of the Laboratory. Once we get a project started, we follow it through and will have a record of performance for use in analyzing similar situations. In 1946, the Laboratory personnel began a study of flexible pavement design—that is, starting with existing pavements and taking into account base, surface, and traffic conditions. A method of design was adopted in 1948. After ten years of experience, a re-evaluation was made; and the Kentucky flexible pavement design method was put into wide use and has been used as a model by other states and organizations.

Practically everything that man knows is written into records somewhere. If you want to know what other people know about something you have to study the literature—this is the essence of research. From this, you begin to experiment to find out things that are not known. This becomes a rather tedious occupation, and few have the fortitude to pursue it.

Among other things, the Highway Research Laboratory has co-operated in administering some extracurricular projects such as:

Highway Historical Markers—Some 15 to 20 markers are made each year in the University metallurgy shops in co-operation with the Kentucky Historical Society and the College of Engineering.

On-Job-Training—Many courses of this type have been developed. We are now using two courses of eight weeks each which are designed to train technicians such as chainmen, rodmen, inspectors and draftsmen. More than 500 people have received training in one or more courses.

Extension Courses—Highway Engineering—These are night courses sponsored in co-operation with the University of Kentucky Extension Department. Six courses have been developed. From 1948 to the present, some 600 Highway Department employees have taken one or more of these courses—each consisting of three hours of instruction one night a week for twelve weeks. These courses have aided some 150 in completing the engineering requirements for registration.

Highway Scholarship Program—This program is managed by the Research Laboratory in co-operation with the College of Engineering and the University Scholarship Committee. The program started in 1948 with 18 scholarships supported by the Department of Highways; and in 1958 the Department advanced the program to include 30 freshmen and 12 sophomores each year. This program which is supported by the Department is second to none in the nation and has been highly successful. To date, 316 have entered the program, approximately 95 have graduated; and of this number, some 65 are presently employed by the Department of Highways in responsible positions. Approximately 137 have dropped out of the Educational Program; many of these are working as technicians for the Department; 84 are in school at the present time. Plans are in progress for recruiting 30 top-flight high-school graduates who will enter the Program on June 1, 1962.

I might summarize this brief account of these twenty years with these thoughts: 1) Our objectives have been manifold; 2) We hope that the fruits of these efforts have far exceeded your expectations, 3) We hope that you (the Department) will continue to avail yourselves of such services as we can provide and for as long as there exists a real need for study and research in highways and materials. I cannot yet foresee a time when highways and automobiles will be supplanted.