

MICHIGAN
STATE HIGHWAY DEPARTMENT
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RESEARCH ACTIVITIES
OF
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By
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In September 1939, a new Research Division was incorporated into the Michigan State Highway organization. The purpose of the new division is to carry on more effectively the research work previously done by the various divisions and to investigate the specific technical problems arising within the Highway Department.

The Research Division offices and laboratory are located in Olds Hall of Engineering at Michigan State College. The laboratories of the Civil Engineering Department are used jointly by the College and the Research Division. The regular equipment of the bituminous, soil, cement and concrete laboratory has been augmented by such special equipment as concrete saw, lapping machine for preparing petrographic specimens, freezing and thawing cabinet, special joint testing machine, sonic apparatus for measuring modulus of elasticity of concrete specimens, microscopes, photo micrographic camera, electrical instruments for measuring moisture, temperature and compressive stresses in concrete, cement autoclave, special bituminous recovery apparatus and special soil testing equipment.

The personnel of the new organization is under the direction of J. W. Kushing, Research Engineer and E. A. Finney, Assistant Research Engineer. The personnel is supplemented by graduate students majoring in problems pertinent to Highway Research. In this relationship the Research Division is cooperating with the Engineering Experiment Station of Michigan State College in the direction of the work of a fellowship sponsored by the Calcium Chloride Association.

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The Research Division is studying primary problems pertaining to higher quality concrete and bituminous pavements as well as subgrade investigations and soils stabilization. In regard to concrete pavements, special emphasis is being placed upon such subjects as, scaling, curing, design, including slab thickness, spacing of joints, joint design and concrete mix design. The changes in characteristics of binding medium and consequent development of specifications for binding material are being considered in connection with bituminous pavements. Subgrade and soil studies involve measurement of subgrade modulus, relation of characteristics of subgrade soil to supporting value and methods of soil stabilization.

The laboratory work is being supplemented with field studies. In this connection a test road is being constructed by the Michigan State Highway Department on M 115 between Farwell and M 66, by regular contract and construction procedure. The test road will consist of 17.6 miles of 22 ft. concrete pavement in which will be included all of the latest ideas of modern concrete road construction. Ten miles of the test road will be devoted to such factors in design as spacing of expansion and contraction joints, uniform thickness cross section versus thickened edge cross section, amount of reinforcing steel necessary, relation of cross section to subgrade supporting value, cross section thickness and the prestressing of concrete slabs during curing. Construction factors incidental to this particular test section are the mechanical handling of concrete, mechanical tamping of forms, vibration of concrete at joints and the use of several different types of joint seals.

The remaining 7.6 miles of the test road is devoted to a durability study of concrete. In this section the constituents which affect the durability of concrete are varied to include such factors as, the grading of the

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aggregate, the design of the concrete mixture, the change in physical and chemical characteristics of concrete as influenced by the addition of various types of admixtures with the Portland cement, the use of various finishing methods and different methods of curing.

In the design section various measuring devices are being installed such as electric strain gages for measuring stresses, thermocouples, moisture cells for determining moisture content at different positions, both in the slab and subgrade, permanent monuments for detecting slab movement and elevation points for determining the vertical displacement of the slab at expansion joints. The durability section will be subjected to calcium chloride treatments as a comparative study of durability. This will be augmented by extensive laboratory studies.

A meteorological station has been installed from which a complete record of local weather conditions will be obtained for the entire project.

It is estimated that four to five years will be required to make a complete study of all of the factors, but periodic reports will be made as the work progresses.