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COMMITTEE ACTIVITY
in the
Construction Division
Department of Materials and Construction
Highway Research Board

RESEARCH NEEDS IN CONCRETE PAVEMENT CONSTRUCTION

Report by HRB Committee MC-C1 - Construction Practices - Rigid Pavement

Portland Cement Concrete pavements are not new. We have been building them for many years. Yet, in spite of all the things we have learned over the years, there is much that we do not know and that we cannot explain. All of the ingredients of the concrete used for pavements come from Mother Earth with a minimum of alteration or change. Thus, the variables involved are countless in just the materials. Added to this is the treatment these materials get in the mixing, placing and finishing by numberless men using many kinds of equipment in every possible condition and subject to all the vagaries of weather and environment.

So it is not strange that the pavements we get develop various mysterious maladies, ailments and characteristics. It is therefore necessary to continue serious research into such variables as can be controlled and to be able to, in some way, measure what we are producing in time to do something about it while it is practical to do so.

The task of identifying outstanding research needs for concrete pavement construction is a continuing assignment of the committee. This report summarizes progress over the last five years to the end of 1969 and provides the following ranking which, in the opinion of the committee, should reflect the relative priority of the various items to the highway engineer and contractor alike.

1. Finishing of Concrete

   a. Best method of consolidation - what constitutes adequate vibration
   b. Amount of manipulation - screeds, etc.
   c. Effect of the amount of mortar in the surface
   d. Relation of finishing methods to durability, skid resistance, and smoothness

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2. Joint Design to Simplify Construction

   a. Most effective load transfer device including seal
   b. How to install load transfer devices
   c. Simplification of jointing details
   d. Are Keyways necessary?

3. Skid Resistance

   Methods of providing skid and wear resistance including the use of special aggregates for maintaining high skid resistance

4. Devices for Determining Properties of Plastic Concrete

   a. Strength
   b. Durability
   c. Rideability (Smoothness prior to set)
   d. Thickness
   e. Air Content

5. Curing and Methods of Control

   a. Improvement of materials and methods
   b. Compatibility with traffic markings and sealers
   c. Development of method or product to remove membrane inexpensively

6. Concrete Properties and Environmental Controls to Facilitate Extension of the Paving Season and Extirpate the Adverse Effects of Weather

   a. Lowest air and ground temperatures permissible at time of placement without adverse effects to pavement
   b. Procedures in extremely hot weather and effects on concrete including use of low heat of hydration cements

7. Cracking of Pavements

   Basic causes and cures for the various types of cracking as related to construction practices

Many of these items have been considered in detail by the committee and the following research statements, committee reports, and conference sessions have been developed:

Consolidation - at a meeting of the committee on August 20th, 1969, "By unanimous vote, Committee MC-C1 by resolution urges the Portland Cement Association, the Construction Industry Manufacturers Association, and other organizations to immediately undertake the basic research required to show the vibration requirements for proper consolidation of concrete paving mixtures". A joint subcommittee of

A2F06 (Highway Equipment) and A2F01 (Rigid Pavement Construction) is to assemble further information with a view to preparing a research statement.

Joints - "Joints in Concrete Pavement", Research Problem Statement No. 1, Highway Research Circular No. 52, October 1966, outlines the problems in construction and performance of transverse joints. This theme was further developed at a conference session "Joints in Concrete Pavements" held at the 46th Annual Meeting, HRB 1967. The proceedings have not been published but copies of the 15 individual presentations and a taped recording of the whole session are held on file.

Smoothness - "Smooth Riding Concrete Pavement", Research Problem Statement No. 2, Highway Research Circular No. 52, October 1966, deals with the lack of standard means for measuring the smoothness both when the concrete is plastic and after it has hardened.

Quality Control - "Concrete Pavement - Construction Control", Materials and Construction Department, Information Series No. 1, March 1968, presented a committee report outlining deficiencies in the present practices for the control of concrete pavement construction.

Education - "Educational Needs for Rigid Pavement Construction", Highway Research News No. 36, Summer 1969, discussed needed programs for continued education and training to meet the challenge of future construction.

General - "Concrete Pavement - Construction Problems". A conference session dealing with a wide range of problems of present concern was held at the 49th Annual Meeting, HRB 1970. No proceedings are to be published but a taped recording of the meeting is held on file.

Looking over the whole picture, it appears that transverse joints which were identified earlier on as being of first importance still present a major problem, though now relegated to No. 2 in the listing by problems connected with finishing. Of these finishing problems, consolidation by vibration is the major concern at the moment because of the development of new types of equipment, including slip form pavers, capable of laying large quantities of concrete very rapidly. The increasing use of continuously reinforced pavement in many areas which require only construction joints rather than the fact that the joint problem in conventional pavements has been solved is another reason for the change in emphasis. Increasing concern with highway safety and wear of pavements due to studded tires place the two interrelated items of skid and wear resistance, which are connected with properties of the immediate surface layer of the pavement, in the third spot.

The progress that has been made in identifying research needs is largely due to the willing help received from highway engineers and contractors across North America too numerous to mention individually, who have made their views and experience available to the committee. Regretably the committee cannot at present point to equal progress in providing the solutions necessary

for building better, longer lasting, more economical concrete pavements in the future. It is hoped, however, that by drawing attention to areas needing active research, interest will be sparked both amongst individuals who might carry out the work and those who hold the purse strings to correct this.

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