HIGHWAY RESEARCH CIRCULAR

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COMMITTEE ACTIVITY
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BITUMINOUS DIVISION
DEPARTMENT OF MATERIALS AND CONSTRUCTION
HIGHWAY RESEARCH BOARD

RESEARCH NEEDS

Research Problem Statements

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HIGHWAY RESEARCH BOARD
NATIONAL RESEARCH COUNCIL NATIONAL ACADEMY OF SCIENCES - NATIONAL ACADEMY OF ENGINEERING
2101 CONSTITUTION AVENUE, N.W. WASHINGTON, D.C. 20418

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FOREWORD

There are many problems involved in the successful design and construction of Bituminous Concrete pavements and bases, and the work of the committees of the Bituminous Division besides adequately covering the materials and mixes themselves, must mesh with that of pavement designers on one hand, and those actually doing the construction on the other.

The twenty research problem statements published here represent a fairly good cross section of the problems involved, but by no means include all those on which research is needed. The committees are constantly seeking to define such problems and would welcome contributions from any source.

Research Problem Statement No. 1

Title:

A Laboratory Method of Accelerated Simulated Weathering for Asphalts.

The Problem Area:

Bituminous Materials

The Problem:

An asphalt must be durable to withstand the constant destructive effects of weathering. The problem is: no laboratory method of accelerated, simulated weathering exists. From this research, it is expected that a method of simulated weathering will be developed for use in the laboratory. Many research projects are now underway to study the durability of asphalt. The results of this research are based on in-service samples. With this method of research, it will take years to determine the durability of an asphalt. An accelerated, simulated weathering method would be of great value to asphaltic producers and users.

Objectives:

The object of this study will be to determine the hardening effects of accelerated, simulated weathering on the physical properties of asphalt. The weathering will consist of a warming-cooling (30° F to 140° F) temperature cycle. Samples will be weathered in three different environments: (1) in an inert atmosphere, (2) with air flowing over the samples, and (3) with an artificial daylight and air circulation over the asphalt samples.

References:

Vallerga, Monismith, and Grathem, using the thin film oven test (ASTM Design D17-54), weathered asphalt in (1) no light, (2) infrared light, and (3) ultraviolet light. They found that the ultraviolet light had notably hardened the asphalt. This weathered asphalt showed a substantial reduction in penetration and an increase in softening point. Ductility value did not show any noticeable reduction on any of the weathered samples.

The weathering caused by the thin film oven test simulates the weathering that takes place in the pug mill during mixing. No correlation has been made between years of natural weathering and the thin film oven test. The proposed study will correlate results from the accelerated, simulated weathering tests with results from in-service samples.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 2

Title:

Selection of Proper Bituminous Binder for Surface Treatments.

The Problem Area:

Bituminous Materials

The Problem:

Many failures have occurred and considerable criticism has been produced by the misuse of the types and grades of bituminous materials for surface treatment construction. It is known that many factors influence this selection: road surface temperature, viscosity of bituminous binder, size of cover aggregate, type and speed of traffic, etc. No analytical method exists for determining the type and grade of binder that considers the influence of all of these factors. Thus, a simple method is needed that will provide an easy procedure for determining the type and grade (not amount) of bituminous binder.

Objectives:

1. To determine the different factors that influence the type and grade of bituminous binder that is to be used in a surface treatment construction.
2. To evaluate the relative influence of these factors on the necessary type and grade needed.
3. To formulate a fast and simple method for determining the type and grade of bituminous material to be used on a specific surface treatment job.

References:

The only published attempt to formulate such a method was made by N.W. McLeod ("Basic Principles for the Design and Construction of Seal Coats and Surface Treatments with Cutback Asphalts and Asphalt Cements", Proceedings, Association of Asphalt Paving Technologists, Supplement to Vol. 29, 1960.) However, this procedure considers only the road surface temperature and size of cover aggregate. This work though may be a basis for future work.

Urgency:

One of the most common causes of failure in surface treatments is the improper selection of the bituminous binder. Since many miles of surface treatments are constructed each year, if failure can be reduced, considerable savings will result.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 3

Title:

The Functions and Value of Prime Coats.

The Problem Area:

Bituminous Materials.

The Problem:

Although bituminous primes are widely used, many times their need has been questioned. Different persons have radically different ideas as to the functions and value of a prime. There is a need then to determine the physical actions that occur in priming and their relation to performance.

Objectives:

1. To determine the functions of bituminous primes.
2. To learn what physical actions occur when a surface is primed.
3. To evaluate the effectiveness of a prime to fulfill its functions.

References:

There are no known research publications on bituminous primes.

Urgency:

Since one of the most common complaints about highway construction is in regard to the "tar" that gets on motor vehicles from primes, an improvement in primes should result in better public relations and also eliminate the source of many pavement failures.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 4

Title:

Method and Criteria for Determining When a Bituminous Surface should be Resealed.

The Problem Area:

Maintenance of Bituminous Surface Treatments.

The Problem:

Regardless of the type of pavement, a decision has to be made sometime when the pavement is to be significantly improved. Since the life of surface treatments may be as short as three years, this decision has to be made frequently for this type of pavement. In many instances, the wrong time for resealing has been selected; either the sealing was done before it was actually needed, which is uneconomical, or it was done some time after it should have been done, which resulted in an unsafe and/or a weakened pavement. The wrong decisions have been made in many cases because no good method and criteria have been developed for determining when a surface should be resealed.

At present the decision for resealing may be made by (a) a general visual observation of the pavement, (b) doing all streets or roads in a certain area, or (c) periodical improvements. None of these is satisfactory in all instances.

Thus there is a dire need for a method and criteria for determining when a surface should be resealed. Because of the time element and the personnel involved, the method should be quick and the decision easily made. If at all possible, the method should be developed so that a minimum of testing is required. A method utilizing large and expensive equipment, such as a towed roughometer, would be impractical.

Objectives:

1. To determine the purpose of a seal coat and the factors that influence the Present Serviceability Index of a surface treatment.
2. To establish a procedure of evaluating the Present Serviceability Index of a previously sealed surface.
3. To keep the evaluation procedure simple, utilizing minimum equipment.
4. To establish criteria, based upon the results obtained from the developed Present Serviceability Index procedure, that will indicate when a surface should be resealed.

References:

There is almost no published literature relating to this problem. However, the Physical Research Division of the South Dakota Department of Highways has done some work in this field and they have prepared several reports on their work.

Urgency:

Every year the cost of maintaining highways has increased. Probably, some of this money was spent on resealing surfaces that actually did not need to be

resealed. In addition, accidents have occurred on old surface treatments that were not resealed soon enough. A simple method is urgently needed to indicate to the engineer when a surface is unsafe and no longer performing the functions for which it was constructed.

Research Problem Statement No. 5

Title:

Spreading Rates of Aggregates and Bituminous Materials for Surface Treatments.

The Problem Area:

Design of Surface Treatments.

The Problem:

The greatest difficulties in obtaining a good, serviceable surface treatment arise in determining the proper rate of spread for the bituminous material and the aggregate. Bleeding and slippery pavements, or use of excessive quantities of aggregate, with subsequent loss, often result from improper or unbalanced rates for bituminous materials. Rates are dependent upon type of bituminous material, condition of the surface being treated, size and particle shape of aggregate and perhaps also on aggregate surface texture. Optimum rate of spread for a given size of aggregate should probably vary with particle shape and certainly varies with unit weight or specific gravity of the aggregate. Rates of spread, of course, affect economy of the construction.

Objectives:

1. To determine the best means for establishing proper rate of spread of bituminous material, taking into consideration the effects of road surface characteristics and aggregate properties.
2. To establish a method for determining proper rate of spread for surface treatment aggregates, considering the shape, surface texture, and unit weight characteristics of the aggregate.
3. Proper balance of the bituminous and aggregate spread rates to avoid undesirable deficiencies or excesses of either.

References:

There are references in the literature to various means for obtaining such information, but their relative merits are unknown and it is not believed that any of them take all factors into consideration. In particular, application rate for aggregate as affected by unit weight has been neglected.

Urgency:

The greatest and most common defects of surface treatments - excessive bituminous material or loss and waste of cover aggregate - stem directly from lack of an adequate, simple method for determining proper rates of application. Large savings in highway expenditure could be realized if improvements can be made in surface treatments.

Research Problem Statement No. 6

Title:

Effect of Aggregate Type and Size on Skid Resistance of Surface Treatments.

The Problem Area:

Safety of Surface Treatments.

The Problem:

Many old pavements have become polished, worn, and slippery, creating intolerable hazards to public safety. For many of these pavements, surface treatment offers an economical method for correction of safety deficiencies if properly done with adequate materials. In addition, large mileages of pavement are surface treated for other reasons, often without adequate knowledge of the effects such treatment will have on skid resistance. Assuming proper design and application of a surface treatment, the safety or skid resistance will be dependent primarily on the type, size or gradation of the aggregate, and the speed of vehicles. Information is needed on the effects and interrelationships of these variables on highway safety.

Objectives:

1. To determine the relative effects of various aggregate types on skid resistance of surface treatments.
2. To evaluate the effectiveness of different sizes of aggregate within a given type.
3. To evaluate the effect of vehicular speed in determining optimum size of different surface treatment aggregate types.

References:

The literature contains some comparative tests of aggregates of varying types, but the work has been limited both with respect to aggregate sources and test procedures - most tests have been conducted either with portable equipment or at relatively low speeds. The fact that skid resistance varies with both speed and surface texture of the pavement has been established, but no specific information relating to surface treatments is known.

Urgency:

Highway safety is of critical importance in all construction and maintenance work. Additional information from field tests is essential if optimum or even desirable levels of skid resistance are to be assured in surface treatments applied to correct slippery conditions or for other reasons.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 7

Title:

Procedure for Determining Tolerances for Aggregate Gradation and Asphalt Content of Bituminous Mixes.

The Problem Area:

Bituminous Mixes.

The Problem:

To develop from factual information proper tolerances for the control of asphalt mixtures. Practically all specifications for asphalt mixtures include plus or minus tolerances on gradation and asphalt content. Most of these tolerance values are based on opinion and in numerous cases have been statistically unsound. A procedure for establishing sound, practical tolerance values should be developed. This problem is becoming more widespread as specifications are rigidly enforced.

Objectives:

If one set of tolerance values could be established for asphalt mixtures, this would be the sole objective of this study. If not, then a procedure should be developed for the determination of proper tolerances.

References:

While tolerance values appear in practically all specifications for asphalt mixtures, there are no data in support of these values.

Urgency:

The problem becomes more urgent as each state insists on the rigorous enforcement of specifications on every numerical number contained therein.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 8

Title:

Mix Design Procedure for Black Bases.

The Problem Area:

Bituminous Mixes.

The Problem:

Laboratory method for evaluating the stability of asphaltic mixtures containing aggregate greater than 3/4-inch in size. The use of "black Bases" is expected to increase in areas deficient in regular base materials and also where greater flexibility of base course is desired. At the present, there is no one generally accepted method for designing "black bases".

Objectives:

Develop a laboratory method for compacting and testing specimens for obtaining a measure of stability of asphaltic mixtures having maximum aggregate size between 3/4 to 1 1/2 inch in size.

References:

Urgency:

Stabilization of marginal base material with asphalt has been done and developed primarily for localized conditions. A standardized procedure for designing "black bases" is needed now for obtaining the benefits shown to be possible with these bases.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 9

Title:

Effects of Moisture on Bituminous Mixes.

The Problem Area:

Bituminous Mixes.

The Problem:

Why does asphalt lose its adhesion to aggregate in the presence of water? Any asphalt aggregate mixture that is exposed to water or moisture over a long period of time may lose its adhesion; that is, water is at the interface of the two materials. If no movement occurs and the mixture dries, adhesion may be restored; however, if movement occurs when there is no adhesion, the pavement will be disrupted and failure will ensue.

Objectives:

1. To develop a fundamental understanding of adhesion of asphalt and aggregate and the chemical or physical properties of water and their relation to the other materials in causing loss of adhesion which in an advanced form manifests itself by stripping.
2. To develop a method of test for properly evaluating loss of adhesion.

References:

A great deal of research has been conducted, but most of it on surface characteristics of aggregate. The fundamental study that is needed is on the properties of the three materials -- asphalt, aggregate, and water.

Urgency:

The problem is of long standing and when some material is wrongly rejected as a result of a poor method of test, the urgency becomes paramount. A few years ago the problem had a place of prominence among researches. Then, with the use of additives, it has not been so prominent, but there has been little basic knowledge with respect to why, when, and how to use additives. In other words, there are many additives for portland cement concrete with full knowledge of the conditions for their use -- air entrainment, for example. With adhesion in bituminous mixtures, knowledge is lacking for an effective solution to the problem.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 10

Title:

The Effect of Asphalt Properties on the Design and Performance of Asphalt Concrete Pavements.

The Problem Area:

The serviceability of bituminous pavements.

The Problem:

Inconclusive information is available to determine the effect of asphalt properties on the design and performance of asphalt concrete pavements. Some of the needed information may exist in files of State Highway Departments. Other conclusive information could be obtained from a study of existing pavements in service in the United States in which asphalts of known properties were used. Asphalts representing production in the United States have been studied by the Bureau of Public Roads and data concerning physical and chemical properties are available.

Objectives:

A comprehensive study of the condition of pavements where known asphalts were used together with a comprehensive study of the paving mixtures, aggregates and asphalts in the pavements should reveal the significant functional properties of the asphalts that affect serviceability. The study would determine the physical and chemical properties of the asphalts to determine their change in service.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 11

Title:

Cracking of Bituminous Pavements.

The Problem Area:

Serviceability of bituminous pavements.

The Problem:

This problem is specifically concerned with cracking of bituminous pavements which tends to reduce the structural integrity, durability, and riding qualities of the pavement surface and which is primarily associated with factors other than load. Intended for primary consideration are factors which contribute to the volume change characteristics of the mix.

Objectives:

1. To identify factors causing such cracking. This would include mix variables and environmental conditions.
2. To devise suitable test procedures to evaluate the effects of these factors.
3. To establish criteria for controlling this type of cracking.

References:

1. Zube, E. and J. Cechetini, "Expansion and Contraction of Asphalt Mixes." Paper prepared for presentation at Annual Meeting of the Highway Research Board, January 1965.
2. Shields, B.P., "Current Studies in Transverse Cracking of Asphalt Pavements." Proceedings, Conference in Recent Developments in the Design and Construction of Asphalt Pavements, University of Alberta, Canada, February 1964.
3. Shields, B.P. and K.O. Anderson, "Some Aspects of Transverse Cracking in Asphalt Pavements." Paper presented at Canadian Tech. Asphalt Association Meeting, November 1964.
4. Vallerga, B.A., "An Asphalt Pavement Performance". Proceedings, AAPT, Vol. 24, 1955, pp. 79-102.
5. Doyle, P.C., "Yardstick for Guidance in Evaluating Quality of Asphalt Cement." Highway Research Record No. 24, 1963.

Urgency:

While cracking of this type is not new, more stringent requirements for pavement performance requires immediate attention in this area.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 12

Title:

Flexibility and Fatigue Behavior of Bituminous Paving Mixtures.

The Problem Area:

Design of bituminous paving mixtures.

The Problem:

The significance of flexibility and fatigue behavior of bituminous paving mixtures has been recognized. However, in design the importance of flexibility and fatigue behavior has been overshadowed by the emphasis of stability. None of the existing mixture design methods evaluate the many factors affecting the flexibility and fatigue behavior of a paving mixture. Consequently, a need exists to study the problems of these two characteristics with respect to environment, traffic, and support conditions.

Objectives:

1. Identify the fundamental factors influencing the flexibility and fatigue behavior of bituminous mixtures, such as viscosity, loading variables, etc.
2. Appraise the state of knowledge relative to the evaluation and utilization of such factors that influence the flexibility and fatigue characteristics of these paving mixtures.
3. Indicate existing test methods which will provide information on these fundamental factors. Where existing methods are deficient, recommend methods and areas in which information is needed.

References:

(a) Hveem, F.N., "Pavement Deflections and Fatigue Failures," Highway Research Board Bulletin 114, 1955.
(b) Jimenez, R.A. and B.M. Gallaway, "Behavior of Asphaltic Concrete Diaphragms, to Repetitive Loadings," International Conference of the Structural Design of Asphalt Pavements, Proceedings, 1962.
(c) Monismith, C.L., "Flexibility Characteristics of Asphalt Paving Mixtures," Proceedings, Association of Asphalt Paving Technologists, Vol. 27, 1958.
(d) Monismith, C.L. and Secor, K.E., "Thixotropic Characteristics of Asphaltic Paving Mixtures with Reference to Behaviors in Repeated Loading," Proceedings, Association of Asphalt Paving Technologists, Vol. 29, 1960.
(e) Monismith, C.L., Secor, K.E., and Blackmer, E.W., "Asphalt Mixture Behavior in Repeated Flexure," Proceedings, Association of Asphalt Paving Technologists, Vol. 30, 1961.

(f) Nijboer, L.W., "Mechanical Properties of Asphalt Materials and Structural Design of Asphalt Roads," Proceedings, Highway Research Board, Vol. 33, 1954.
(g) Pell, P.S., "Fatigue Characteristics of Bitumen and Bituminous Mixes," Proceedings, International Conference of the Structural Design of Asphalt Pavements, 1962.
(h) Rader, L.F., "Investigation of the Physical Properties of Asphaltic Mixtures at Low Temperatures," Proceedings, American Society for Testing and Materials, Vol. 35, 1935.
(i) "Symposium on Flexible Pavement Behavior as Related to Deflection," Proceedings, Association of Asphalt Paving Technologists, Vol. 31, 1962.

Urgency:

The problems of flexibility and fatigue behavior of bituminous paving mixtures have been neglected at the present and there is an immediate and urgent need to study this area and recommend testing procedures.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 13

Title:

The Effect of Aggregates on the Skid Resistance of Bituminous Concrete Pavements.

The Problem Area:

Characteristics of aggregate for bituminous pavements.

The Problem:

Many miles of bituminous concrete pavement are constructed each year, either as new construction or resurfacing on old pavements. Design considerations do not adequately cover skid resistance and some of these pavements become dangerously slippery in a relatively short period of time. Factors involved in determining skid resistance include the aggregate type, size, and grading, the surface texture of the pavement and the speed of the vehicles. A study of the effects and inter-relationships of these factors is needed in order to assure adequate design from the standpoint of safety. Surfaces that are satisfactory for low speed travel are not necessarily adequate for high speed expressways.

Objectives:

1. To determine more precisely the effects of aggregate type on skid resistance.
2. To determine the effects of aggregate size and grading within a given type on skid resistance.
3. To evaluate different textures of bituminous concrete surfaces with respect to skid resistance at varying vehicular speeds.

References:

Previous work published in the literature compares aggregate type to a limited extent, but is not complete in coverage and fails to take into consideration the effects of size or gradation. Recent tests indicate that the coefficient of friction decreases with increased speed and that the rate of decrease is different for different pavement surface textures. The data available are insufficient to properly evaluate this factor with respect to pavement design.

Urgency:

Highway safety is one of the most important aspects of design. In addition to providing safe pavement surfaces, the availability of more information in this field may also result in financial economics by elimination of the need for early resurfacing to correct conditions of inadequate skid resistance.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 14

Title:

The Effect of Aggregate Characteristics on Chip Seals.

The Problem Area:

Aggregates.

The Problem:

Many chip seals result in failures in their very early service life through loss of the chips under traffic. While it is well known that there are various causes for loss of chips, there would appear to be a need to explore this field from the aggregates view.

Objectives:

1. To study the mechanical interlock of cover chips having different shape characteristics to reduce early chip loss.
2. To arrive at a more dependable prediction of the amount of normal loss by whip-off which occurs in chips having shape characteristics which might fall into some general classification.
3. To study the economic feasibility of pretreating the cover chips with some medium to promote adhesion to the binder specifically when placing seals with hot asphalts.
4. Additional or extended study could include temperature of air and pavement, and humidity.

References:

There are, of course, many publications dealing with seal coats and a review would be necessary to determine whether or not the above specifics have been researched thoroughly. Representatives of the South Africa Road Department report verbally that precoating seal coat chips with diesel fuel has virtually eliminated loss of chips in hot asphalt chip seals.

Urgency:

Screening seal coats are probably one of our most versatile road surfacings serving such purposes as sealing, delineation, non-skid, aid to night driving, etc. Because of the degree of improbability of getting a good seal coat job and the serious aftermath when a failure results, some areas of the country have abandoned chip seal coats entirely. There is a need to make the placing of successful chip seal a more sure thing.

Research Problem Statement No. 15

Title:

Local Materials for Hot Mix Asphaltic Base Construction.

The Problem Area:

Beneficiation of Aggregates.

The Problem:

There is an economic need for use of local materials in hot mix asphaltic base construction. Many areas, nationwide either have never had or are depleting the higher quality of available aggregates desirable for base construction.

Objectives:

To make a survey and classify types of locally available materials that may benefit by the use of bituminous aggregate base course construction.

References:

HRB Bibliography on "Bituminous Aggregate Bases", "Gravel Pit Inventions", and "Geological Records".

Urgency:

Long distance transportation of high quality materials particularly for the heavy duty flexible pavements such as on interstate construction makes it desirable to utilize locally available materials for economic reasons.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 16

Title:

Feasibility of Bituminous Aggregate Bases.

The Problem Area:

Design of Bases.

The Problem:

There is a need to evaluate the performance record of bituminous aggregate bases in service. During the past several years numerous agencies have constructed bituminous aggregate bases. Some have been constructed on subbases that did not require additional support to warrant this type of construction. In other cases bituminous aggregate bases have been constructed on poor soil conditions resulting in inadequate support.

Objectives:

Field evaluation of existing pavements and referencing to existing construction and materials records, to determine the feasibility of bituminous aggregate bases versus non-bituminous bases.

References:

HRB Bibliography on "Bituminous Aggregate Bases" and Information on File with federal, state, county, and municipal governments.

Urgency:

Considerable money is now spent in the construction of bituminous aggregate bases, some in questionable areas and of questionable materials and design.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 17

Title:

Moisture Damage to Bituminous Bases and Subbases.

The Problem Area:

Design of Bases.

The Problem:

Field data is required from a wide selection of environmental and materials situations as to the strength and/or waterproofing imparted to soils and/or aggregates by liquid asphalt (cutback asphalt and/or emulsion asphalt). The Thickness Design of Highways, using granular bases or subbases is often arbitrarily increased by engineering judgment by amounts in the order of 20% to allow for loss of strength in the base and subbase during critical moisture periods (spring breakup). Substantial savings in cost of highways and in use of materials could be effected if this loss of strength could be eliminated or even mitigated to some degree.

Objectives:

1. To develop mix design procedures in the laboratory in terms directly related to the field problem.
2. To develop improved methods of construction with a view to optimization of cost and time of construction. (Do we really have to take the time to fully cure a cutback asphalt?)
3. To construct a great number of test sections using a great variety of soils and aggregates as bases and compare their critical spring deflections with and without waterproofing and have this data flow to some central agency for collation and assessment.
4. A generalized economic evaluation (after optimization of design and construction methods) of waterproofing of bases versus use of greater thickness of unbound bases.
5. Publication and wide dissemination of data so produced for use by various authorities with a high degree of confidence.

References:

(a) Two Hills project by Alberta Research Council.
(b) Asphalt Institute Research Project to develop layer equivalencies of asphalt treated bases using materials other than high type asphaltic concrete.
(c) Ontario Department of Highways Highway 10 Test Road.

Urgency:

Since the collection of data cannot take place until the spring following construction it is recommended that an early start be made.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 18

Title:

Thickness Design of Sand Asphalt Base Courses.

The Problem Area:

Design of Bases.

The Problem:

To select or determine, by a comprehensive and comparative study, which of the several laboratory test methods is most suitable for ascertaining a layer equivalency factor for asphalt-sand base courses. This numerical value should be appropriate for substitution in the Asphalt Institute's thickness design formulas (or similar formulas derived from the AASHO Ottawa Test Road).

Objectives:

To standardize the laboratory test method, test equipment and procedures and criteria for determining if a sand-asphalt mixture meets the strength necessary for a certain equivalency (substitution) factor.

References:

The Hubbard-Field Tests, Florida Bearing Value Tests, Modified Florida Bearing Value Tests, Marshall Stability, Hveem, etc.

The Colorado Experimental Base Project No. S 0016(28) Crowley-Ordway; however, this field experiment involves only hot mixed sands.

Urgency:

The economics involved in scattered areas nationwide, due to scarce aggregates and increasing costs of well graded aggregates, makes this a problem of highest interest.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 19

Title:

Design and Construction of Bituminous Aggregate Bases Using Local Materials.

The Problem Area:

Bituminous Aggregate Bases.

The Problem:

There is a need for developing methods for the design and construction of bituminous aggregate bases using local materials. Due to lack of desirable aggregates for base course construction, there is a need for improving the locally available materials for such use.

Objectives:

To search existing literature, contact agencies who have performed such work and to conduct field and laboratory investigations with the purpose of developing specifications, procedures, practices, and quality control for bituminous aggregate base construction.

References:

HRB Bibliography on "Bituminous Aggregate Bases".

Urgency:

Numerous agencies are constructing bituminous aggregate bases without the benefit of proper guidelines, specifications, etc.

Highway Research Board
Department of Materials and Construction
Bituminous Division

Research Problem Statement No. 20

Title:

Design of Cold-Mixed, Cold-Laid, Bituminous Paving Mixes.

The Problem Area:

Bituminous Aggregate Bases.

The Problem:

A method is needed for the design of bituminous paving mixtures of the cold-mixed, cold-laid type prepared with cutback asphalts. Bituminous bases are becoming increasingly popular and research projects are undertaken to determine the service performance of various types including those which are prepared with cutback asphalts. While there are methods which are well known and used for the design of asphalt concrete prepared with asphalt cements, there is no widely accepted method for cold mixes of the type suitable for cold-laid bases.

Objectives:

The main objective of this research project would be:

1. To establish a practical procedure by which:
   (a) the type of mineral aggregate would be selected;
   (b) the proper combination of aggregates would be selected;
   (c) the proper grade of cutback asphalt and optimum quantity would be determined;
   (d) the required properties of the bituminous mix would be guaranteed.
2. To establish a correlation between the design procedure and service performance.

References:

A study of the various methods of design which have been proposed in the past and those which are now in use would give proper orientation to the proposed project. The California method should receive particular attention.

Urgency:

In view of the various projects underway to determine the performance of bituminous bases, this suggested research program should receive immediate attention.

DEPARTMENT OF MATERIALS AND CONSTRUCTION *

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Assistant State Highway Engineer
State Highway Commission of Kansas
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