

INDICATIONS

- 1 The cost of finishing bituminous surfaces by mechanical equipment is less than by hand methods on projects which are of sufficient size to justify the use of mechanical finishing equipment
- 2 Density and uniformity in mixture of the compacted surface is equal to the results from hand methods
- 3 There will be an increase in the use of mechanical equipment for finishing bituminous surfaces

REFERENCES

- I Surface Treatments
State Highway Departments of Maine, Indiana, Virginia and North Carolina
- II Mixed-In-Place Types
State Highway Departments of California, New Mexico, South Carolina, Wisconsin and Minnesota
- III Premixed-Laid-Cold Types
State Highway Departments of Indiana, Maryland and Pennsylvania
- IV Premixed-Laid-Hot Types
State Highway Departments of California, Oklahoma, South Carolina and North Carolina
- V Penetration Macadam
State Highway Departments of Rhode Island, Connecticut, New York, Ohio, Indiana, North Carolina and Georgia

APPLICATION OF PRESENT KNOWLEDGE IN THE CON-
STRUCTION AND MAINTENANCE OF BITUMINOUS
MACADAM AND BITUMINOUS CONCRETE

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Very little planned research work has been done to date in connection with bituminous macadam or bituminous concrete construction, and the improvement in the construction of these types of flexible pavement has resulted mainly from experience covering many years of practice. To attempt to state the best practice to pursue for each step in the construction of a bituminous macadam or bituminous concrete pavement, from our present knowledge, would necessitate a complete description of the proper construction of these types of pavement, each step being closely related to the adjoining steps and all being important

It is not the intention of the committee that this paper present such a complete description of the processes of construction

Considerable attention has been directed to bituminous macadam during the past few years and numerous excellent articles giving the details of design and construction as practiced in various sections have been written. The same is true, likewise, in the case of bituminous concrete, which has been in use in road construction for a much longer period of time. In the following paragraphs, are a few suggestions which may prove of value to those in charge of construction, covering as they do some of the more important steps in the construction of these types of pavement

BITUMINOUS MACADAM

This type of surface requires good subgrade support, which in certain localities may mean the construction of a well drained subbase, or foundation course, to adequately support the pavement

No fixed standard design is applicable to all sections of the country, owing to differences in the character of materials reasonably available for constructing the pavement

Successful bituminous macadams have been built with relatively soft stone as well as with hard stone. If soft stone is used, the best results have obtained when larger sizes are used

A rough rule to follow in building a penetration top course, that has been checked many times in practice, is that the maximum size of stone in inches, the depth of the course in inches and the amount of asphalt used in gallons per square yard are approximately the same

Uniformity in the size and depth of aggregate is particularly desirable in the penetration course of stone in order to obtain a uniform distribution of voids, which will be followed by a uniform distribution of bitumen

The building of a sufficient shoulder to properly retain the pavement, and the practice of extending base and subbase courses beyond the limits of the pavement proper to support the same along the edges, is worthy of consideration in both bituminous macadam and bituminous concrete construction

All defects in one step of the work should be eliminated before the next step is taken

The resistance of a bituminous macadam surface against waving is largely dependent on the uniformity of size and mechanical bond, or interlocking effect, of the crushed stone and the quantity of bitumen

An excess of bituminous material is one of the known causes of lack of stability and one of the evils to be guarded against in bituminous macadam construction

There is a very definite trend toward the use of stiffer bitumen for

penetration macadam work, but asphalt of from 85 to 100 penetration has been widely used successfully. With tars, the major portion of the work is now being done with tar having a float test at 50°C of from 120 to 180 seconds.

Temperature and amount of moisture present at time of application of bitumen greatly affect final results. A limiting date should usually be placed in specifications, in areas where cold weather prevails, beyond which the application of bitumen is not permitted except under very favorable conditions. In extremely hot weather it is sometimes necessary to refrain from rolling after the application of bitumen until the temperature has dropped.

Key stone for binder course and the chips for the sealcoat should be of such a size and so applied that they will wedge the top course tightly in place without building up a layer on top of the larger crushed stone.

An excess of stone in these key courses is undesirable and the best results obtain when the crushed stone in the surface course is exposed and allowed to take the wear.

Thorough rolling is very important in order to firmly lock the stone courses together. Extensive back-rolling after the bitumen has been applied is required.

In the maintenance of bituminous macadam, uniformly satisfactory results have been obtained by the use of materials and construction methods similar to those used in the original construction.

The art of patching bituminous macadam in localities where public service cuts are numerous has reached a point well nigh perfection. Probably one of the most important things to remember in this practice is that the temporary patch should be allowed to remain until the subgrade has thoroughly settled before attempting to make the permanent patch.

Properly constructed bituminous macadams do not require sealcoats for a period of years, and sealcoats should not be applied unless signs of disintegration are distinctly evident. Too frequent sealcoats or too heavy an application in a sealcoat has ruined the riding qualities of many bituminous macadams.

BITUMINOUS CONCRETE

Bituminous concrete, like bituminous macadam, when laid upon a flexible base requires excellent subgrade support to insure the integrity of its surface and the preservation of its riding qualities.

Successes and failures have resulted from the construction of fine graded aggregate bituminous concretes as well as from the use of coarser aggregate mixtures.

In the construction of the fine graded bituminous concrete it is becoming apparent that no hard and fast rules can as yet be laid down governing the grading of the particles.

Experimental work and service results have shown that sands which previously were refused as being too coarse or too fine may be successfully used. Leading authorities in asphalt paving mixtures contend that the problem is one of combining bitumen with the aggregates at hand in an intelligent manner.

Research has indicated that thorough compaction of the pavement mixture is of at least as great importance as the grading of the aggregate.

Aside from the integrity of the pavement, the combining of the fine aggregate and the asphalt is most important in the securing of a smooth riding surface. A mixture which cakes and which is difficult to rake or screed presents a serious stumbling block to a smooth riding pavement.

Coarse aggregate bituminous concretes, where little or no grading of the aggregate was attempted, have been constructed successfully and have stood up under severe traffic in some cases for twenty years or longer.

In the maintenance of bituminous concrete pavements success has attended the use of materials and methods similar to those that produced the original pavement.

Both bituminous macadam and bituminous concrete lend themselves to various methods of repair. Bituminous concrete bonds easily with bituminous macadam, and bituminous macadam is being successfully repaired with bituminous concrete. Similarly, penetration patches have been made in bituminous concrete surfaces successfully.

When expediency demands it and the costs are of secondary importance, successful bituminous macadam and bituminous concrete repairs have been made with various proprietary pavement mixtures.

WHEEL LOAD AND IMPACT IN PAVEMENT DESIGN

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In discussing the relation of wheel load and impact to the structural design of a rigid pavement, there are several phases and inter-relations that should be considered. These are: the magnitude of the forces, their duration of application, their points of application, their degree of concentration as to area and linear width, and the stresses produced under the influence of these factors. Complete data and information concerning each of these factors is not available. During the past few years this committee has collected and considered some information and facts which will be discussed at this time.

Knowledge concerning the influence of the time and duration of