

The Total Asphalt Pavement For Roads, Streets and Parking Areas

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INTRODUCTION

The "Total Asphalt" pavement consists of one or more layers of plant-mixed asphalt base placed directly on a prepared or improved subgrade and covered with a fine textured plant-mixed asphalt wearing surface.

"Total Asphalt" construction provides the following advantages:

- Simplified design procedures and specifications.
- Proven construction processes.
- Reduced construction time—no curing time necessary.
- Low initial cost and low annual cost.
- Smooth, quiet, thump-free surfaces improving the appearance of parking lots and roads.
- Exceptional longevity—more years of maintenance-free service.
- Frost resistance—stronger during freeze-thaw cycles.
- Chemically inert—not affected by snow melting chemicals.

WHY USE "TOTAL ASPHALT"?

"Total Asphalt" refers to pavement construction which utilizes plant-mixed asphalt materials through the full-depth of the pavement structure. It consists of a plant-mixed asphalt surface course and a plant-mixed asphalt base which is placed directly on a prepared subgrade.

The results of considerable research and extensive practical experience show conclusively that "total asphalt" pavement structures perform best. "Total Asphalt" is not an entirely new concept; in fact, there are full depth asphalt pavement structures which were constructed as early as 1889 that are still serving the public.

The current interest in full-depth asphalt pavements was renewed by the outstanding performance of plant-mixed asphalt base on the twenty million dollar American Association of State Highway Officials

Test Road, built in Illinois. The results of the AASHO Test Road demonstrated the superior load bearing characteristics of plant-mix asphalt base in comparison with other "ordinary" base materials. Asphalt base is better because it is an accurately controlled plant-mixed product, because of its inherent water-resistant qualities and because of its natural properties of adhesion and cohesion. The success of "total asphalt" pavements is due primarily to the outstanding performance of plant-mixed asphalt base.

Other Advantages of "Total Asphalt" Pavements Are:

Provides more strength per inch of thickness in comparison with any other type of flexible pavement structure—resulting in appreciable savings of excavation.

Frost-resistance not weakened during the freeze-thaw cycle that is common in many parts of the country during the winter months. It is actually stronger during this critical period.

Water-resistant—the first course of plant-mixed base construction will protect the subgrade from rain during construction, thus reducing construction delays.

Protects the subgrade from construction traffic after the initial course of base has been placed. The base can be used for hauling and storing materials without damaging the subgrade.

Provides better distribution of loadings to subgrade.

Makes stage construction easy since each course of the pavement structure is water-resistant and capable of supporting traffic until the final lifts can be placed.

Since all courses are water resistant, subgrades are drier and stronger than under other types of pavement.

Faster construction of the entire pavement structure is a prime feature. The use of self-propelled mechanical equipment and minimum hand labor permits fast and easy construction.

No long curing periods are required. Pavements may be opened to traffic upon completion of the final rolling.

Provides better riding qualities since self-propelled mechanical finishing machines are usually used to place all lifts in the pavement structure. Automatic grade controls are used on many projects.

BETTER ASPHALT PAVEMENT CONSTRUCTION

A. Specified Pavement Material

Plant-mixed asphalt is a combination of aggregates and asphalt. The aggregates are dried, heated, accurately proportioned and mixed

so that all particles are completely coated with a uniform film of asphalt.

The plant-mixed asphalt is transported by trucks to the paving site. It is spread in a loosely compacted uniform smooth layer with a mechanical paving or finishing machine. The material is further compacted by heavy motor driven rollers to produce a smooth, well-compact pavement course.

B. Engineer-Contractor Teamwork Essential

Possibly the greatest asset in the construction industry today is the ability of the engineer and contractor to recognize and understand the problems of each other. This does not mean that each should be thoroughly qualified in all phases of the industry, but they must work together to complete the job efficiently and satisfactorily.

A specification, in addition to being easily understood, must be specified for a job and the engineer who knows and understands the materials available will meet this objective.

The contractor, before he bids a job, must know and understand the specifications and production schedule, and be prepared to furnish the type of material required at the specified time. If he does not understand these conditions before he submits his bid, he should contact the engineer to remove all doubts or misunderstandings which might develop later. When cooperation begins at this level, it can readily be maintained throughout the contract.

The contractor is responsible for the final objective—the satisfactory completed job.

C. Basic Considerations for Paving with Plant-Mix Asphalt

The paper describes the principal types of asphalt mixes that are available to the engineer. The recommended thicknesses to which they should be laid are also given. The various types described in the paper have given excellent service in Indiana.

These general rules should be followed:

1. REQUIRE AND LAY AN ADEQUATE PAVEMENT THICKNESS.
2. REQUIRE STANDARD SPECIFICATION MIXES. These are readily available, and will cost the least. Other than standard specification aggregates can be produced but they cost more.
All paving mixes referred to in this manual are standard in Indiana and comply with the current Indiana Department of Highway Specifications, Section 400. They are proven mixes which require crushed aggregates readily available in our State.
3. USE THE ENGINEERING SERVICES of the Asphalt Pavement As-

sociation of Indiana. This organization is ready to assist the engineer or architect solve problems which may arise in asphalt pavement design and construction.

DESIGN AND SPECIFICATIONS FOR "TOTAL ASPHALT" PAVEMENTS

A complete pavement design can be developed with correct use of the standards and specifications provided below.

The designer should first decide upon the pavement thickness (or typical section) which is based upon the type of existing subgrade and the traffic to which the pavement will be subjected. Care should be used in classifying the subgrade on which the pavement will be constructed. The subgrade should be classified as GOOD, FAIR, or POOR. On large projects, we suggest that tests be made to determine the C.B.R.* value of the existing traffic class for the pavement. Refer to the "Thickness Design Chart" to determine the cross section for the pavement.

All pavement designs are built from the subgrade up to the pavement surface. To insure that the ground (or subgrade) is properly prepared, the pavement specification is started with subgrade specification that will be standard for all pavements. Proper preparation of the subgrade and adequate drainage is an important part of any pavement structure.

The base course is the next part of the pavement specification to be considered. In view of the superior performance of plant-mixed asphalt base courses, we recommend that it be specified. You will note that a thickness for only plant-mixed asphalt base is shown in the "Pavement Thickness Chart." A crushed aggregate base course may be substituted for plant-mix asphalt base.

The pavement cross section is completed by adding the specification for the type of plant-mixed asphalt surface desired. The texture and type of material must be determined before a selection can be made.

The engineer, by correctly combining these four parts—thickness design and typical section, subgrade specification, base course specification, and surface course specification—can be assured of a pavement structure capable of supporting the loads to which it will be subjected and a specification to construct the pavement structure that is complete in all details.

PAVEMENT THICKNESS DESIGN

A. Classification of Subgrade Soil

The following classifications of subgrade are considered:

- POOR C.B.R.* 3 to 6 Silts and clays occurring in low lying areas where drainage is very poor and will not be improved or where the soil contains high percentage of fine grain particles.
- FAIR C.B.R.* 6 to 10 Non-plastic clay loam or micaceous clay soils.
- GOOD C.B.R.* Minimum of 10 Gravels, sandy gravel and sands.

If you anticipate a large pavement construction program, engage a soils engineer to determine the exact soil classification.

B. Classification of Traffic

1. Sidewalk and Playgrounds (No Vehicular Traffic).
2. Residential Driveways and Car Parking Lot (50 spaces or less).
3. Light Duty Roads, Local Residential Street, Car Parking Lot (More than 50 spaces).
4. Heavy Duty Roads, Collector Street, and Truck Parking Lot (Parking spaces only).
5. Very Heavy Duty Roads, Industrial or Business Street and Entrance Driveway to Truck or Shopping Center Parking Lot.

C. Total Asphalt Thickness Design†

After selecting subgrade and traffic classifications, the following chart will provide the proper full depth asphalt section for the pavement under consideration.

Traffic		Thickness,‡ Inches, for Subgrade Class		
Class	GOOD	FAIR	POOR	
1	3	4	5	
2	4	5	6	
3	5	6	7	
4	6	8	10	
5	7	10	12	

* C.B.R.—California Bearing Ratio—ASTM D 1883-67.

† The AASHO Test Road Results established that one inch of plant-mixed asphalt base is equal to 2.4 inches of dense graded crushed aggregate base.

‡ Composed of 1.0" or 1.5" of asphalt surface course. The remainder is asphalt base placed directly on the compacted prepared subgrade. The asphalt base may be placed in one or more courses.

D. Typical Total Asphalt Pavement Sections

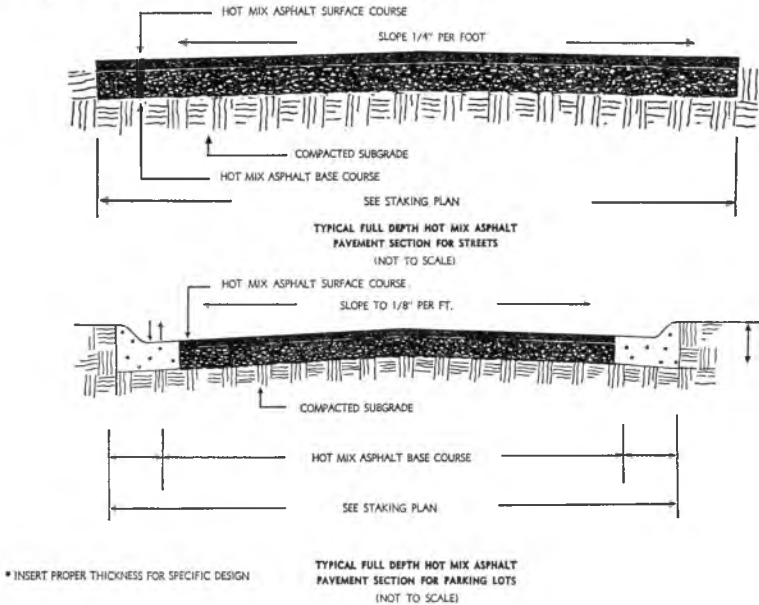


Fig. 1. Typical Total Pavement Sections.

MATERIAL AND CONSTRUCTION SPECIFICATIONS

1. Subgrade Specification

The subgrade shall be shaped to true lines and elevations. Adequate drainage facilities shall be installed to provide for the disposition of underground seepage and the percolation of surface water. The subgrade shall be compacted to at least 100 percent of the maximum density as determined by the provisions of AASHO T99. (ASTM D 698-66T)

All soft, yielding, or other unsuitable material which will not compact readily when at optimum moisture, shall be removed and replaced with suitable material. All rock encountered shall either be removed or broken off to conform with the required cross section.

The prepared subgrade shall be protected by the contractor to prevent undue rutting from truck or other equipment, and if such damage does occur, the subgrade shall be reshaped and compacted prior to placing the asphalt base.

2. Plant Mix Asphalt Base

The plant-mix asphalt base shall comply with the current Indiana State Highway Commission Standard Specifications. The following applicable sections shall cover plant-mix asphalt base installations:

Sections 401, Plant Mix Pavements—General;
 Section 402, Hot Asphalt Emulsion Pavement (Composition No. 4, 53B & 73B);
 Section 403, Hot Asphalt Concrete Pavement (Composition No. 4, 53B & 73B) and,
 Section 406, Cold Mixed Bituminous Pavement (Composition No. 4, 53B & 73B).

3. *Plant Mix Asphalt Surface*¹

The plant-mix asphalt surface shall comply with the current Indiana State Highway Standard Specifications. The following applicable sections shall cover plant-mix asphalt surface installations:

Sections 401, Plant Mix Pavements—General;
 Sections 402, Hot Asphalt Emulsion Pavement (Composition Type — III or — IV), and
 Sections 403, Hot Asphalt Concrete Pavement (Composition Type — B or — D).

(Check the type of asphalt surface selected for each contract.)

4. A tack coat of AE-T or RC-70 in the amount of .05 to .10 gallons per square yard may be applied to the top of the base course prior to placing the surface course. Tack coat may not be required if base course is freshly placed and thoroughly clean.

Note 1. This specification provides a choice of two different gradations for the asphalt surface. The Type III, Section 402 and Type B, Section 403 are dense graded surface mixes providing a smooth, water resistant surface. It has a somewhat coarser texture than sand mixes but it is more resistant to traffic scarring than sand mixes. The Type IV, Section 402 and Type C, Section 403 is a fine textured sand asphalt surface that provides a water resistant, sandpaper-like smooth surface.