

SECTION 025422
COLD MIX LIMESTONE ROCK ASPHALT PAVEMENT (Class A) (S-33)

1. MATERIAL

This specification shall consist of a surface course, a leveling-up course, or a combination of these courses as shown on plans, composed of a compacted layer of natural limestone rock asphalt, cold mixed with prescribed flux and shall be constructed on the completed and approved base course, existing pavement or floor slab, all in accordance with these specifications and in conformity with lines, grades, quantities and typical cross section shown on plans. The mixture when designed and tested in accordance with these specifications shall have a laboratory stability of not less than 30 percent unless otherwise shown on the plans.

2. MATERIALS

- (1) Rock Asphalt. This material shall be composed of natural limestone rock asphalt. This material shall contain not more than 1 percent by weight of organic matter (other than native bitumen), clays, loam or pebbles coated therewith and shall contain not more than 5 percent by weight of any one of or combination of slate, shale, schist, soft particles or other undesirable materials when tested in accordance with Test Method Tex-217-F.

The rock asphalt mixture shall be uniform and well graded and shall contain natural limestone rock asphalt aggregate with an average bitumen content of 5 to 9 percent by weight of naturally impregnated asphalt as determined by Test Method Tex-215-F, and shall contain not more than 2 percent by weight of any one of or combination of iron pyrites, or other objectionable matter, as determined by Test Method Tex-217-F.

No aggregate shall contain a total of more than 5 percent by weight of impurities or objectionable matter listed above.

The portion of the material passing the No. 10 sieve shall have by weight not more than 8.5 percent or less than 5 percent of naturally impregnated asphalt.

Except for Type 'D' Paving Mixture, the portion of the material retained on the No. 4 sieve shall contain by weight from 20 percent to 35 percent of material with a naturally impregnated asphalt content of less than 1 percent. The portion of the material retained on the No. 4 sieve for Type 'D' Paving Mixture shall contain by weight from 15 percent to 35 percent of the material with a naturally impregnated asphalt content of less than 1 percent. This percentage shall be adjusted within the grading limits to obtain an acceptable mixture.

The percent of wear on limestone rock asphalt aggregate shall be no more than 40 as determined by Test Method Tex-410-A and shall be made on that portion of the material retained on the No. 4 sieve having a naturally impregnated asphalt content of less than 1 percent. Rock Asphalt shall have a minimum polish value of 35, unless otherwise specified, when tested in accordance with Test Method Tex-438-A.

No material shall be used before the source has been approved and the material has been sampled, tested and approved by the Engineer. The Contractor shall notify the Engineer in advance if change in source of any material is desired, and both the new source and material shall be

approved by the Engineer prior to use.

- (2) Flux. The fluxing material shall meet the Flux Oil requirements of the specification, Section 025404 "Asphalts, Oils and Emulsions".

Tack Coat. The asphalt material for tack coat shall meet the requirements for emulsified asphalt, EA-11M, or cut-back asphalt, RC-2. If RC-2 cut-back asphalt is used it may, upon instruction from the Engineer, be diluted by the addition of an approved grade of gasoline and/or kerosene, not to exceed 15 percent by volume. Asphaltic materials shall meet the requirements of the specification, Section 025404 "Asphalts, Oils and Emulsions".

3. PAVING MIXTURES

- (1) Types. The paving mixture shall consist of a uniform mixture of crushed limestone rock asphalt aggregate, flux and water if needed. The grading shall be such as to produce, when properly proportioned, a mixture which, when tested in accordance with Test Method Tex-200-F, will conform to the limitations for grading given below for the type specified prior to the aggregate. The grading to be used in these mixtures, within the limits specified, shall be approximately as designed by the Engineer, and the mixture produced shall be uniform.

Percent
by Weight

Type "A"

Retained on 1" sieve	0
Retained on 7/8" sieve	0 to 2
Retained on 5/8" sieve	5 to 15
Retained on 3/8" sieve	25 to 35
Retained on No. 4 sieve	50 to 60
Retained on No. 10 sieve	25 to 35

Type "B"

Retained on 5/8" sieve	0
Retained on 1/2" sieve	0 to 2
Retained on 3/8" sieve	5 to 15
Retained on No. 4 sieve	45 to 60
Passing No. 10 sieve	25 to 35

Type "C"

Retained on 1/2" sieve	0
Retained on 3/8" sieve	0 to 2
Retained on No. 4 sieve	40 to 55
Passing No. 10 sieve	20 to 35

Type "CC"

Retained on 1/2" sieve	0
Retained on 3/8" sieve	0 to 2
Retained on No. 4 sieve	40 to 55
Passing No. 10 sieve	35 to 50

Type "D"

Retained on 3/8" sieve	0
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Retained on 1/4" sieve	0 to 2
Retained on No. 4 sieve	5 to 15
Passing No. 10 sieve	35 to 50

- (2) Sampling and Testing. The mixture shall be tested in accordance with Texas Test Methods to determine whether it complies with the governing specification requirements.

Stability is a control requirement. If the stability of the mixture produced has a value 10 percent lower than that specified, corrective measures shall be taken to bring the mixture within the specified requirements.

- (3) Tolerances. The designated grading and fluxing material content shall be such that when the tolerances listed below are allowed, the grading and the fluxing material content will be within the grading limits specified. The respective tolerances, based on the percent by weight of the mixture, are listed as follows:

	Percent by Weight
Retained on 7/8" sieve	plus or minus 4
Retained on 5/8" sieve	plus or minus 4
Retained on 1/2" sieve	plus or minus 4
Retained on 3/8" sieve	plus or minus 4
Retained on 1/4" sieve	plus or minus 4
Retained on No. 4 sieve	plus or minus 4
Total Retained on No. 10 sieve	plus or minus 3
Fluxing Material	plus or minus 0.2

- (4) Material Produced for Maintenance Requisition. The limestone rock asphalt aggregate grading and flux content of the mixture shall be within the limits specified. The designated grading and flux content shall be selected from the first shipment for material on each shipment or partial shipment where requested by the Engineer, and the mixture produced shall conform to this designated grading and flux context throughout each shipment or partial shipment, respectively, within the tolerances specified above.

- (5) Water Content. If the rock asphalt mixture is prepared at some central point and shipped to the work, water may be added to prevent setting-up in transit. If water is added, the total water so added shall not exceed 4 percent by weight and shall be administered to the mixture through an approved spray bar. If the rock asphalt mixture is prepared on or adjacent to the project, the addition of water will not be permitted unless authorized by the Engineer. The amount of water that may be added shall be as designated by the Engineer but shall not exceed 4 percent by weight. In order to insure uniformity of the rock asphalt mixture a suitable measuring devise, subject to approval of the Engineer, shall be used to accurately measure the amount of water to be incorporated into each batch. All water in the mixture on the truck scales shall be deducted in determining the tonnage of mixture for payment. The method of determining the water content of the mixture shall be in accordance with Test Method Tex-212-F. The water content shall be measured on representative samples, each representing approximately 200 tons. Not less than one sample shall be taken on each day's run.

- (6) Physical Properties of the Mixture. The material may be mixed on the job or at some central mixing plant and shipped ready to use. Mixtures that do not remain workable a sufficient period of time to permit unloading by

normal means, proper spreading, blading and rolling, will not be acceptable.

The type and amount of the mixture used shall be as specified on the plans.

4. EQUIPMENT

- (1) Mixing Plants. Mixing plants that will not continuously produce a mixture meeting all of the above requirements will be condemned.

Mixing plants may be either the weight-batching type or the continuous mixing type. Both types of plant shall be equipped with satisfactory conveyors, power units, aggregate handling equipment, aggregate screens and bins and shall consist of the following essential pieces of equipment:

(a) Weight-Batching Type.

Cold Aggregate Bin and Proportioning Device. The cold aggregate bins or aggregate stockpiles shall be of sufficient number and shall be of sufficient size to supply the amount of aggregate required to keep the plant in continuous operation. The proportioning device shall be such as will provide a uniform and continuous flow of aggregate in the desired proportion to the plant.

Screening and Proportioning. The screening capacity and size of the bins shall be sufficient to screen and store the amount of aggregate required to properly operate the plant and keep the plant in continuous operation at full capacity. Proper provisions shall be made to enable inspection forces to have easy and safe access to the proper location on the mixing plant where accurate representative samples of aggregate may be taken from the bins for testing. The aggregate shall be separated into at least four bins when producing Type "A" mixtures, at least three bins when producing Type "B" and at least two bins when producing Types "C" and "D".

Type "A":

- Bin No. 1 - will contain aggregates of which 85 to 100 percent by weight will pass the No. 10 sieve.
- Bin No. 2 - will contain aggregates of which at least 85 percent by weight will be of such size as to pass the 3/8 inch sieve and be retained on the No. 10 sieve.
- Bin No. 3 - will contain aggregates of which at least 85 percent by weight will be of such size as to pass the 1/2 inch sieve and be retained on the 1/4 inch sieve.
- Bin No. 4 - will contain aggregates of which at least 85 percent by weight will be of such size as to pass the 7/8 inch sieve and be retained on the 3/8 inch sieve.

Type "B":

- Bin No. 1 - will contain aggregates of which 85 to 100 percent by weight will pass the No. 10 sieve.

Bin No. 2 - will contain aggregates of which at least 85 percent by weight will be of such size as to pass the 3/8 inch sieve and be retained on the No. 10 sieve.

Bin No. 3 - will contain aggregates of which at least 85 percent by weight will be of such size as to pass the 1/2 inch sieve and be retained on the 1/4 inch sieve.

Type "C", Type "CC" and Type "D":

Bin No. 1 - will contain aggregates of which 85 to 100 percent by weight will pass the No. 10 sieve.

Bin No. 2 - will contain aggregates of which at least 85 percent by weight will be of such size as to pass the 3/8 inch sieve and be retained on the No. 10 sieve.

Aggregate Weigh Box and Batching Scales. The aggregate weigh box and batching scales shall be of sufficient capacity to hold and weigh a complete batch of aggregate.

Flux Oil Bucket and Scales. The flux oil bucket and scales shall be of sufficient capacity to hold and weigh the necessary material for one batch.

Mixer. The mixer shall be of the pug mill type and shall have a capacity of not less than 3,000 pounds in a single batch. The number of blades and the position of same shall be such as to give a uniform and complete circulation of the batch in the mixer. The mixer shall be equipped with an approved spray bar that will distribute the fluxing material quickly and uniformly throughout the mixer. If, in the opinion of the Engineer, any mixer has a tendency to segregate the mineral aggregate or fails to secure a thorough and uniform mixing with the fluxing material, it shall not be used. All mixers shall be provided with an automatic time lock that will lock the discharge doors and the shaft seals of the mixer shall be tight enough to prevent the spilling of aggregate or mixture from the pug mill.

(b) Continuous Mixing Type

Cold Aggregate Bin and Proportioning Device. Same as for weight-batching type of plant.

Screening and Proportioning. Same requirements as specified under weight-batching plants. These requirements shall also apply to materials that are stockpiled and that are proposed for direct use by a continuous mixing plant without the use of plant bins.

Fluxing Material Spray Bar. The fluxing material spray bar shall be so designed

Mixer. The mixer shall be of the pug mill continuous type and shall have a thorough and uniform mixing of the aggregate with the fluxing material, it shall not be used.

(2) Spreading and Finishing Machine. The spreading and finishing machine, when permitted, shall be a type approved by the Engineer and shall be capable of producing a surface that will meet the requirement of the typical cross section and the surface test.

(3) Motor Grader. The motor grader shall be a self-propelled power-

grader; it shall be equipped with smooth tread pneumatic tired wheels; shall have a blade length of not less than 12 feet; shall have a wheel base of not less than 16 feet; and shall be tight and in good operating condition and approved by the Engineer.

- (4) Pneumatic Tire Rollers. The rollers shall consist of not less than seven pneumatic tired wheels, running on axles in such manner that the rear group of tires will cover the entire gap between adjacent tires of the forward group, and mounted in a rigid frame and provided with a loading platform or body suitable for ballast loading. The front axle shall be attached to the frame in such manner that the roller may be turned within a minimum circle. The pneumatic tire roller under working conditions shall have an effective rolling width of approximately 84 inches and shall be so designed that be ballast loading the total load may be varied uniformly from 23,500 pounds or less to 50,000 pounds or more. The roller shall be equipped with tires that will afford ground contact pressures to 90 pounds per square inch or more. The operating load and tire air pressure shall be within the range of the manufacturer's chart as directed by the Engineer. The Contractor shall furnish the Engineer with charts and tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the particular tires furnished.

The pneumatic tire roller shall be drawn by a suitable crawler type tractor, a pneumatic tired tractor, or a truck of adequate tractive effort, or may be of the self-propelled type, and the roller, when drawn or propelled by either type of equipment, shall be considered a medium pneumatic tire roller unit. The power unit shall have adequate tractive effort to properly move the operating roller at variable uniform speeds up to approximately 5 miles per hour.

The tire pressure of each tire shall be adjusted as directed by the Engineer and this pressure shall not vary by more than 5 pounds per square inch.

- (5) Two Axle Tandem Roller. This roller shall be an acceptable power drive tandem roller weighing not less than 8 tons.
- (6) Three Wheel Roller. This roller shall be an acceptable power driven three wheel roller, weighing not less than 10 tons.
- (7) Three Axle Tandem Roller. This roller shall be an acceptable driven three axle roller weighing not less than 10 tons.
- (8) Straightedges and Templates. The Contractor shall provide acceptable 10-foot straightedges for surface testing. Satisfactory templates shall be provided as required by the Engineer.
- (9) Trunk Scales. A set of standard platform truck scales, shall be placed at a location approved by the Engineer.

(10) All Equipment. Shall be maintained in good repair and operating condition and shall be approved by the Engineer.

(11) Alternate Equipment. When permitted by the Engineer in writing, equipment other than that specified which will consistently produce satisfactory results may be used.

5. STORAGE, PROPORTIONS AND MIXING

(1) Storage of Rock Asphalt

Central Mixing Plants. Sufficient material shall be stored, stockpiled or produced to permit continuous operation throughout any working period without shutdowns due to material shortages. If the natural limestone rock asphalt aggregates are stored or stockpiled, they shall be handled in such a manner as to prevent segregation, the mixing of various materials or sizes and the contamination with foreign materials.

Storage of the crushed limestone rock asphalt mixture upon the ground will not be permitted at the plant site. Material that comes in contact with earth or other objectionable foreign matter shall be rejected. Mixtures that do not remain workable a sufficient period of time to permit proper spreading, blading and rolling will not be acceptable. Storage, handling or loading of the rock asphalt mixture shall be in such manner as to prevent undue segregation.

(2) Storage and Heating of Flux. The flux storage shall be ample to meet the requirements of the plant. The flux may be heated by steam coil or direct fire to a temperature not to exceed 250°F. Agitation by steam or air will not be permitted. If direct fire heating is used, the heating equipment shall be such that it will insure positive circulation of the flux while being heated and shall be approved by the Engineer. Care shall be taken not to injure the flux by subjecting it to undue continuous heat. The heating apparatus shall be equipped with a recording thermometer with a 24 hour chart that will record the temperature of the fluxing material where it is at the highest temperature.

(3) Proportioning. The proportioning of the various materials entering into the mixture shall be in accordance with this specification. Aggregate shall be proportioned by weight using the weigh box and batching scales when the weight-batch type of plant is used and by volume using the aggregate proportioning device when the continuous mixer type of plant is used. The fluxing material shall be proportioned by weight or by volume based on weight using the specified equipment. The proportions of each constituent by weight of the paving mixture shall be within the following limits.

Crushed Limestone Rock Asphalts, 96 to 97.5 percent by weight.

Flux Material, 2.5 to 4 percent by weight.

(4) Mixing. In introducing the batch into the mixer, the sequence of

addition of aggregate and flux oil and the amount of mixing shall be done in a manner to minimize formation of "flux balls" and produce optimum conditions for a homogeneous mix. The mixer shall be equipped with an approved spray bar that will distribute the flux oil quickly and uniformly throughout the mixer. Any mixer that has a tendency to segregate the rock asphalt aggregate or fails to secure a thorough and uniform mixing with the flux oil shall not be used.

Mixtures produced when the limestone rock asphalt aggregates contain moisture in excess of saturated surface dry condition will not be accepted. Excess moisture will be evidenced by visual surface moisture on the aggregates or any unusual quantities of fines clinging to the coarse aggregate.

In order to observe plant operations and the rock asphalt mixtures, adequate lighting shall be provided or mixing shall be confined to the daylight hours.

All limestone rock asphalt mixtures shipped on any one particular requisition or project shall be produced out of the same mixing plan, unless if in the opinion of the Engineer there is no difference in the quality of the rock asphalt mixture when produced by two different mixing plants. Materials produced by a weight-batching plant shall not be mixed material produced from a continuous mixing plant.

6. CONSTRUCTION METHODS

The rock asphalt mixture, tack coat or prime coat shall not be placed when the air temperature is below 60°F and is falling, but it may be placed when the air temperature is above 50°F and is rising, the temperature being taken in the shade away from artificial heat, with the further provision that asphaltic mixture or tack coat shall only be placed when the humidity and general weather conditions, in the opinion of the Engineer, are suitable.

- (1) Prime Coat. If a prime coat is required, it will be applied and paid for as a separate item. The tack coat or rock asphalt mixture shall not be applied on a previously primed flexible base until the primed base has completely cured to the satisfaction of the Engineer.
- (2) Tack Coat. Before the rock asphalt mixture is laid, the surface upon which the tack coat is to be placed shall be cleaned thoroughly to the satisfaction of the Engineer. The surface shall be given a uniform application of tack coat meeting the requirements for tack coat under asphaltic materials of this specification. This tack coat shall be applied, as directed by the Engineer, with an approved sprayer at a rate not to exceed 0.05 gallon per square yard of surface. Where the mixture will adhere to the surface on which it is to be placed without the use of a tack coat, the tack coat may be eliminated by the Engineer. The tack coat shall be rolled with a pneumatic tire roller as directed by the Engineer.
- (3) Placing. If the mixtures are shipped to the job, the railroad cars shall first be cleaned of all foreign matter, and the material shall be loaded in such a manner as to prevent segregation. The rock asphalt mixture, prepared as specified, shall be hauled to the work in tight vehicles previously cleaned

of all foreign materials. The dispatching of the vehicles shall be so that all material delivered may be placed and shall have received its initial rolling in daylight. The mixture shall be laid only on an approved base course or pavement which has been tack-coated as previously specified and shall be free of all foreign materials. All contact surfaces of curbs and structures and all joints shall be painted with a thin uniform coating cut-back or emulsified asphalt as required for tack-coating the base.

The mixture shall be thoroughly aerated and then spread into place with a motor grader, in a uniform layer of such depth that after receiving ultimate compaction by rolling, the requirements of the typical cross sections will have been fulfilled. Hand spreading will be permitted where the mixture is placed on narrow stripes or small irregular areas.

Adjacent to flush curbs, gutters, liners and structures, the surface mixture shall be finished uniformly high so that when compacted it will be slightly above the edge of the curb or flush structure. During the application of asphaltic material, care shall be taken to prevent splattering of adjacent pavement, curb and gutters or structures.

Where more than one course of pavement is to be placed, no succeeding course shall be placed until the preceding course has cured to the satisfaction of the Engineer, but shall contain not more than a maximum of 3 percent moisture and 0.2 percent hydrocarbon volatile content of the mixture by weight as determined by Test Method Tex-212-F and 213-F or test methods included in THD Bulletin C-14

Alternate Method of Placing. When indicated on the plans or directed by the Engineer in writing, the mixture may be spread with the specified spreading and finishing machine. In placing the material with a spreading and finishing machine, rolling shall be deferred for a period of time, as directed by the Engineer, to allow for volatilization. Where more than one course of pavement is to be placed, no succeeding course shall be placed until the preceding course has cured to the satisfaction of the Engineer, but shall contain not more than a maximum of 3 percent moisture and 0.2 percent hydrocarbon volatile content of the mixture by weight as determined by Test Method Tex-212-F and 213-F

(4) Compacting

(a) The pavement shall be compressed thoroughly and uniformly with the specified rollers and/or other approved rollers.

- (b) Rolling with the three wheel and tandem rollers shall start longitudinally at the sides and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the rear wheels. Alternate trips of the roller shall be slightly different in length. On super-elevated curves, rolling shall begin at the low side and progress toward the right side. Rolling with pneumatic tire roller shall be done as directed by the Engineer. Rolling shall be continued until no further compression can be obtained and all roller marks are eliminated. One tandem roller, one pneumatic tire roller and at least one three wheel roller as specified above shall be provided for each job. If the Contractor elects he may substitute the three axle tandem roller for the two axle tandem roller and/or the three wheel roller; but in no case shall less than three rollers be in use on each job. Additional rollers shall be provided if needed. The motion of the roller shall be slow enough at all times to avoid displacement of the mixture. If any displacement occurs, it shall be corrected at once by the use of rakes and of fresh mixture where required. The roller shall not be allowed to stand on pavement which has not been fully compacted. To prevent adhesion of the surface mixture to the roller, the wheels shall be kept thoroughly moistened with water, but an excess of water will not be permitted. All rollers must be in good mechanical condition. Necessary precautions shall be taken to prevent the dropping of gasoline, oil, grease or other foreign matter on the pavement, either when the rollers are in operation or when standing. When permitted by the Engineer in writing, equipment other than that specified which will consistently produce satisfactory results may be used.
- (c) Pavement Compaction. When a pavement compaction requirement is specified, it is the intent of this specification that the material be placed and compacted such that the actual specific gravity of the pavement after compaction is equal to or greater than the minimum percent, indicated on the plans, of the laboratory actual specific gravity. The method of determining the in-place actual specific gravity shall be as designated by the Engineer, each method correlated satisfactorily with results obtained from standard tests as described in Test Method Tex-207-F. In-place percent compaction tests are intended for compaction control. If the in-place percent compaction is lower than that specified, work may proceed with changes in the construction operations, rolling procedure and/or, rolling sequence until the in-place percent compaction equals or exceeds that specified.
- (d) Handling Tamping. The edges of the pavement along curbs, headers and similar structures, and pavement mixtures at all places not accessible to the roller, or in such positions as will not allow through compaction with the roller, shall be thoroughly compacted with lightly oiled tamps.
- (5) Surface Test. The surface of the pavement, after compression, shall be smooth and true to the established line, grade and cross section, and when tested with a 10-foot straightedge placed parallel to the centerline of the roadway, it shall have no deviation in excess of 1/16 inch per foot from the nearest point of contact. The maximum ordinate measured from the face of the

straightedge shall not exceed 1/4 inch at any point. Any point in the surface not meeting these requirements shall be immediately corrected.

- (6) Opening to Traffic. The pavement shall be opened to traffic when directed by the Engineer. All construction traffic allowed on the pavement shall comply with the State laws governing traffic on highways.

7. MEASUREMENT & PAYMENT

Unless indicated otherwise in the Proposal, Cold MIX Limestone Rock Asphalt Pavement shall be measured as described below.

- (a) Measured by the square yard of the type and thickness of "Cold Mix Limestone Rock Asphalt Pavement" specified in Section 025422.
- (b) Measured by the total weight of "Cold Mix Limestone Rock Asphalt Pavement" in Section 025422, of the type specified delivered to the jobsite.

The Contractor shall provide the Engineer with copies of the pay ticket identifying the truck and showing the gross empty weight of the truck with driver as it arrives at the plant and the gross loaded weight of the truck with driver as it leaves the plant. The measured amount will be the difference of the loaded and empty trucks converted to tons. Payment shall be full compensation or furnishing all material; for all heating, mixing, hauling, cleaning base course, tack coat, placing rock asphalt mixture; all blading, rolling and finishing; and for all labor, tools, equipment and incidentals necessary to complete the work except prime coat when required.