

ITEM 252

IN-PLACE FULL DEPTH COLD FLEXIBLE PAVEMENT RECYCLING

252.1 Description. This work shall consist of a stabilized base course composed of a mixture of the existing bituminous concrete pavement, the existing base course material, any required new material and an admixture. The manufacture of the stabilized base course shall be done by in-place pulverizing and blending of the existing pavement and base materials and the introduction of additives, if called for. Additives may be in the liquid or dry form.

252.2 Materials. The additive shall be of the type called for on the drawings or in the proposal. Asphalt emulsions and cutback asphalts, when used, shall meet the requirements of the TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges Item 300, titled "Asphalts, Oils and Emulsions, Latest Edition.

Portland cement shall be in accordance with Item 222, titled "Portland Cement Stabilized Subgrade". Lime shall be in accordance with Item 221, titled "Hydrated Lime and Lime Slurry", or Item 224, titled "Quicklime". Fly ash shall be in accordance with Item 223, titled "Lime-Fly Ash or Fly Ash Stabilized Subgrade".

Water shall meet the requirements of ASTM Designation C94, "Standard Specification for Ready Mixed Concrete".

When new materials are added, black base shall meet the requirements of Item 250, titled "Hot Mix Asphaltic Concrete Base Course" (Black Base) and granular materials shall meet the requirements of Item 230, titled "Crushed Stone Base Course".

252.3 Equipment. The Contractor shall furnish a self-propelled machine capable of pulverizing the existing materials to minimum depth of ten (10) inches, in one pass. The equipment shall be of sufficient size, equipped with uniform blades and be capable of obtaining a uniform blend of existing and added materials. The equipment shall be capable of producing the gradation indicated herein, or additional screening and crushing will be required. The equipment must also be capable of mixing the pulverized material and additive to a homogeneous mixture. The method of depositing the mixed material shall be such that segregation does not occur. The mixing equipment used shall be a Bomag MPH 100 Recycler, or equipment that is approved as equal.

When liquid additives are used, the mixing equipment shall be equipped with a positive displacement pump, capable of accurately metering the required

quantity of liquid additive. The pump shall be equipped with a positive interlock system which will permit addition of the additive only when the pulverized material is present in the mixing chamber and will automatically shut off when the material is not in the mixing chamber. Each mixing machine shall be equipped with a meter capable of registering the rate of flow and total delivery of the liquid additive introduced into the mixture.

252.4 Application and Mixing of Liquid Additives. Liquid additives shall be uniformly distributed and mixed with the pulverized material and any existing underlying material, or new imported material, as specified. The machine used for injecting the liquid additive shall have a variable speed pump with a control system as specified above. The mixing machine shall be equipped with a foot per minute instrument that is integral to the variable speed pump controller ensuring that additive can be added only when the machine is moving.

The totalizer shall be such that the amount of liquid used during any given period can be read directly. The application rate of the liquid additive shall be expressed in terms of gallons per square yard. This rate shall be based on the percent by weight of the total mixture, as determined by the Engineer.

252.5 Construction. When new base material is required, it shall be spread on the existing pavement section before the recycling process is begun. The type of equipment used, shall be capable of being adjusted so that an application rate, of the new material, of 5-percent is provided. When exposed during the mixing process, the subgrade shall be firm and able to support, without displacement, the construction equipment used. Soft or yielding areas shall be corrected and made stable by scarifying and aeration, or the introduction of additives, and compacting until it is of uniform stability. The cost of repair of the subgrade is incidental to this item.

Where excessive surface deformation is evident, or when elevation or profile changes are required, pulverization should take place prior to the introduction of additives. Pulverization should also be the first step when aeration is necessary, or when the moisture content must be increased or decreased.

The existing pavement, base material and new material shall be pulverized and blended so that the entire mass of material shall be uniformly graded.

A. Granular Base

The bituminous surface, any new material, except additive, and the existing granular base material shall be pulverized and mixed initially by the mixing equipment. If sufficient moisture is absent for proper mixing, water in the

amount specified by the Engineer, shall be introduced using the mixing equipment. Graders may be used in the mixing operation, after the material has been given a preliminary pulverizing with the mixing equipment.

The mixing and aeration shall proceed from one side of the work area to the other (windrowed) using a motor grader, until the mixture has a uniform appearance, free from "flat" spots and excess moisture. Aeration of the mixture shall continue in this manner, until the mixture is dried to a moisture content acceptable to the Engineer.

After the mixture has been thoroughly mixed and aerated, it shall be spread and shaped with the grader. Spreading will be performed to provide a uniform layer of loose material. The pulverized material shall then be lightly compacted with a roller.

If required by the Engineer, the pulverized material and water shall be allowed to set-up for about 48 hours, or for the time directed by the Engineer. As part of the spreading operation, the mixture will be shaped so that when compacted, it will be in close conformity with the lines, grades, and cross-sections established by the Engineer.

After the curing period, the pulverized material shall be mixed with the kind and amount of additive indicated by the Engineer. The existing bituminous pavement, new material, if required, existing base material and additive shall be pulverized and blended until the new additive(s) is uniformly dispersed throughout the material. The introduction of the additive shall be done with the mixing equipment, as outlined above.

When tested in accordance with ASTM Method C136, "Standard Test Method for Sieve Analysis for Fine and Coarse Aggregates" the pulverized mixture shall meet the following gradation:

Retained On Sieve Conforming to ASTM E11	Percent Retained, By Weight
1 3/4"	0
1 1/2"	0-5
1"	3-15
No. 40	60-90
No. 200	Greater than 95

Prior to the beginning of compaction, the mixture shall be in a loose condition for its full depth. The loose mixture shall then be uniformly compacted to the specified density, lines and grades.

Compaction shall begin immediately after final mixing. The mixture shall be compacted using vibratory rollers. After this initial compaction, final compaction and finishing shall take place with a smooth drum or pneumatic tired roller. The mixture shall be compacted to 95-percent of Standard

Proctor Density (ASTM D698, “Standard Test Methods for Laboratory Compaction”) at 2-percent of the optimum moisture content.

After the material is compacted, water shall be uniformly applied to the surface, as needed. The surface shall then be reshaped to the required lines, grades and cross-section and then lightly scarified to loosen any imprint left by compacting and reshaping equipment.

The resulting surface shall be thoroughly rolled with a pneumatic tired roller and "skinned" by a power grader to achieve final grade, removing all loosened material from the surface. The surface shall then be compacted with the pneumatic roller, adding small increments of moisture, as needed, during rolling. If material larger than a No. 4 screen is present in the mixture, one complete coverage of the surface, with the flat wheel roller shall be made immediately after the skinning operation.

After the surface of the recycled base has been finished as specified herein, it shall be protected against rapid drying by applying an asphaltic membrane to the recycled surface immediately after its completion. The material for the asphaltic membrane shall be EAP&T (Emulsified Asphalt Prime and Tack), CSS-1, or SS-1 (Asphalt Emulsion), per TxDOT Item 300, as approved by the Engineer. The amount of asphaltic material (refer to plans) shall be sufficient to completely cover and seal the total surface and fill all voids. The Contractor shall use this method for curing the recycled base and it shall be his responsibility to protect the asphalt membrane from being picked up by the traffic.

The asphalt membrane may remain in-place when the proposed surface is placed. The surface course may be applied as soon after completion as operations will permit.

At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the total width of completed work to form a true two-inch depth vertical face free of loose and shattered material.

After the 3 day curing period, or as directed by the Engineer, completed sections may be opened immediately to local traffic and to construction equipment, during the curing period, provided the material has hardened sufficiently to prevent marring or distorting the surface by the equipment or traffic.

When a surface course is required, it shall be applied at the required thickness in accordance with Item 340, “Hot Mix-Hot Laid Asphaltic Concrete”. Prior to placement of surface course, the recycled base shall be proof rolled to locate soft or yielding areas, the soft or yielding areas shall be corrected in accordance with section 252.5 or as directed by the Engineer. Proof rolling equipment shall meet the requirements of TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges” Item 216, titled “Proof Rolling”, Latest Edition. A tack coat shall be applied in accordance with Item 340.11.

B. Black Base

When new black base is required, it shall be spread on the existing pavement section before the recycling process is begun, in accordance with Section 252.5.

When exposed during the mixing process, the subgrade shall be firm and able to support, without displacement, the construction equipment used. Soft or yielding subgrade shall be corrected in accordance with Section 252.5.

Pulverization shall take place prior to the introduction of additives. The existing pavement, base material and new material, except additives, shall be pulverized and blended so that the entire mass of material will be uniformly graded.

The bituminous surface and black base shall be mixed initially by the pulverizing equipment. If excess moisture is present, the material shall be worked until it is at the moisture content specified by the Engineer. Graders may be used in the mixing operation after the material has been given a preliminary mixing with the pulverizing machine.

The mixing and aeration shall proceed from one side of the work area to the other (windrowed) until the mixture has a uniform appearance, free from "fat" spots and excess moisture. Aeration of the mixture shall continue in this manner until the mixture is dried to a moisture content acceptable to the Engineer.

After the mixture has been thoroughly mixed and aerated, it shall be spread and shaped with a grader. Spreading will be performed to provide a uniform layer of loose material.

After spreading, the pulverized material shall be mixed with the kind and amount of additive indicated by the Engineer. The existing bituminous pavement, new material if required, existing base material and additive, probably an emulsion, shall be blended until the new additive(s) is uniformly dispersed throughout the material. The introduction of the additive shall be done with the mixing equipment.

When tested in accordance with ASTM Method C136, the pulverized material shall meet the following gradation:

Retained On Sieve Conforming to ASTM E11	Percent Retained, By Weight
1 3/4"	0
1 1/2"	0-5
1"	3-15
No. 40	60-90
No. 200	Greater than 95

After the introduction of the additive(s), and the mixture has been thoroughly mixed and aerated, it shall be spread with a grader and any excess moisture, from the emulsion, shall be removed. If required, aeration of the mixture shall continue until the mixture is dried to a moisture content acceptable to the Engineer.

After the mixture has been thoroughly mixed and aerated, it shall be spread and shaped with a grader. Spreading will be performed to provide a uniform layer of loose material. The pulverized material shall be lightly compacted with a roller and then allowed to set-up for about 48 hours, or for the time directed by the Engineer.

After the curing period, the pulverized material shall be re-mixed with the mixing equipment.

Prior to the beginning of compaction, the mixture shall be in a loose condition to its full depth. The loose mixture shall then be uniformly compacted to the specified density, lines and grades.

Compaction shall begin immediately after final mixing. The mixture shall be compacted in one lift using vibratory rollers. After initial compaction, final compaction and finishing shall take place with a smooth drum or pneumatic tired roller. The mixture shall be compacted to 95-percent of Standard Proctor Density (ASTM D698).

After the material is compacted, a tack coat, if required, shall be applied in accordance with Item 340.11.

Where a surface course is required, it shall be applied at the required thickness in accordance with Item 340, "Hot Mix-Hot Laid Asphaltic Concrete".

At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the total width of completed work to form a true two-inch depth vertical face, free of loose and shattered material.

252.6 Traffic. After the curing period, or as directed by the Engineer, completed sections of recycled base may be opened immediately to local traffic and to all traffic, provided it has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic.

252.7 Maintenance. The Contractor shall be required, within the limits of his contract, to maintain the recycled base course in good condition until all work has been completed and accepted. Maintenance shall include immediate repairs to any defects that may occur. This work shall be done by the Contractor at his own expense and may be repeated as often as may be

necessary to keep the area continuously intact. Faulty work shall be replaced for the full depth of treatment. It is the intent of this specification that the Contractor construct the plan depth of recycled base in one homogeneous mass. The addition of thin layers in order to provide the minimum specified depth will not be permitted.

252.8 Quality Assurance. The Testing Laboratory's representative will determine the in-place density in accordance with ASTM Methods D 2922 "Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods" and D 1556, "Standard Test Methods for Density and Unit Weight of Soil in Place by Sand-Cone Method". The minimum level of testing will consist of at least two tests using the nuclear density gauge and one test using the Sand Cone Method, for each 1,000 feet per lane of roadway or 4,000 square feet of base material.

252.9 Measurement. Cold in-place recycling shall be measured by the **square yard**. The additive of the type specified by the Engineer, shall be measured by the ton or gallon.

252.10 Payment. The basis of payment for Full Depth Cold Flexible Pavement Recycling shall be by the unit price bid per **square yard**, which price shall be full compensation for all cutting back shoulders, stripping and scarifying, if necessary, pulverizing and blending, the addition of any admixture, remixing, compaction and curing, including the removal and disposal of all excess material, including all labor, tools and equipment necessary to do the work. Liquid additives shall be paid for by the unit price bid per gallon for the material. Dry additives shall be paid for by the unit price bid, per ton, for the material. Asphalt membrane shall be paid for by the unit price bid per gallon, per standard specification items 310 "Prime Coat", and 323 "Emulsified Asphalt Treatment".

When it is necessary to add additional materials, granular materials shall be paid for under Item 230, Crushed Stone Base Course and "Black Base" shall be paid for under Item 250, "Hot Mix Asphaltic Concrete Base Course (Black Base)".

The surface course, including any necessary tack, shall be paid for under Item 340, "Hot Mix-Hot Laid Asphaltic Concrete".

END OF ITEM 252