

405 ROAD MIXED BITUMINOUS PAVEMENT

Road mixed surfacing is a mixture of mineral aggregate and liquid asphalt (cutback), mixed on the roadbed, or on a "mixing table" using travel mixers and/or motor graders.

405-2 Materials

Bituminous Material

Bituminous material used in road mix may be cutback asphalt or emulsified liquid asphalt and may be one of several grades available in each of the types. The grade of bituminous material will be specified in the Special Provisions. The types and grade of bituminous material used will depend on the grading of the mineral aggregate, the atmospheric temperature at the time of mixing and laying, and the traffic requirements. It should, when incorporated with the mineral aggregate, be of such viscosity that it will readily mix with the aggregate at the prevailing ambient temperature. The resulting mix should harden, or "set up" after a reasonable curing period, to support the traffic without bleeding or instability.

Mineral Aggregate

Mineral aggregate is usually produced from sources on the project. The aggregate must conform to requirements specified in the Special Provisions.

In order to obtain a uniform mix, it is first necessary to have uniform distribution of mineral aggregate on the road. Mineral aggregate will usually be placed on the road and bladed into uniform windrows. If the material has not been weighed and placed in the windrow by a controlled weight per foot, the windrows will need to be cross sectioned to get an accurate measure of the quantity of aggregate so that the correct amount of asphalt can be determined. Windrows should be sized using a device that will assure the correct amount of aggregate exists along the entire length of the windrow. Several samples of the mineral aggregate should be taken and asphalt percentage determined prior to the incorporation of asphalt into the aggregate.

The specifications require that the aggregate for liquid asphalt have 1.5% or less moisture.

Emulsion mixes generally require about 3% moisture in the aggregate.

405-3 Construction Requirements

405-3.04 Mixing

Mixing will usually be done by one of several types of traveling plants or by means of motor graders. When a motor grader is used, the top of the windrow is flattened or dished and a portion of the asphalt is sprayed onto the flattened windrow. The motor grader then folds the asphalt into the aggregate, reforms the windrow, and the process is repeated. After all the asphalt has been added, the windrow is mixed by repeatedly carrying it back and forth across the mixing table until the asphalt appears to be uniformly distributed over the aggregate particles. Complete coverage of all the aggregate will usually not occur at this time. In the event that a traveling mixing plant is used, the bituminous material will usually be incorporated and metered through the mixer. If additional mixing is required, it may be done with the traveling mixer or may be done with motor graders. In either case, mixing should continue until the aggregate is uniformly coated. When mixing with motor graders, attention should be given to the vertical angle of the blade so that a complete rolling action of the material is obtained instead of merely drifting the material from side to side.

When the volume of road mix is too large to be handled by the mixer or motor grader, the Contractor should use more than one windrow, or mix and lay in more than one lift. Road mix must be placed in more than one layer when the compacted lift thickness exceeds 2 inches.

Under certain conditions, many materials will form balls of fines and asphalt which are sometimes difficult to break up. Mixing should continue until these "asphalt balls" have disappeared. If ordinary mixing will not break them up, the condition can often be corrected by moving the mixture into a compact windrow and allowing it to cure for a few days. The heat of the sun's rays on the dark colored windrow will usually raise the temperature of the entire windrow to such an extent that the asphalt balls will break up more easily. Before final spreading, the completed mixture should have a uniform appearance and texture without alternate "fat" and "lean" sections.

When using a road-mixing machine, it may be necessary to make a number of passes through the material to obtain a uniformly mixed product. A machine that successfully mixed in one pass at some other location is no guarantee that it will do equally well on all jobs. If the machine cannot operate through partially mixed material, the mixing should be completed by motor graders.

If it should start to rain on a mix before compaction, one method used to minimize the amount of moisture entering the material is to blade the mixture into as steep a windrow as possible, and then compact the top of the windrow with a couple of passes with the wheels of the motor grader. The Contractor may have other methods he or she wishes to use to accomplish the same results; the choice of methods remains with the Contractor.

Whatever the method, the mix should be protected from moisture to reduce the time and effort necessary for aeration. The weather should be watched closely so that aeration or mixing will not be attempted when there is a high probability of rain. Moisture in the aggregate makes it more difficult to remove the volatile material resulting in more difficult mixing and compacting. Excess water also causes instability of the mix that may result in rutting or corrugating.

Bituminous material should be applied when the air temperature in the shade is above 70 °F. The aggregate is slow to coat when mixing at a lower temperature, and consequently does not quickly attain the normally black appearance of a good mixture.

It is advisable to take representative samples (40 pounds "quartered down" to approximately 10 pound) of the partially mixed material, after the proposed amount of bituminous material has been applied. Heat samples to a temperature of 100 to 140 °F and thoroughly hand mix until uniformly coated. Any excess or insufficiency of the bituminous material is readily apparent to the experienced Inspector by observation and "feel" of the mixture. Compare the mixture from the road with the samples that have been warmed and hand mixed. The samples are a measure or gauge by which the Inspector can determine when the mixture on the road has all the soil/asphalt globules thoroughly broken up and disseminated through the mixture. This test is also advantageous when road mixing mineral aggregates that have inherent properties that make them difficult to coat. Succeeding applications of bituminous material should, of course, be in accordance with the information developed by such trial hand mixing. Correction should be made to the windrow by adding asphalt or mineral aggregate whichever adjustment the tests indicate is necessary.

Aerating

Aerating is necessary for driving off excess solvent and/or moisture. The presence of an excess of either can result in corrugating and instability of the mat by overfilling the voids with liquid. The amount of moisture permitted in the mix at the time of laying should be strictly in accordance with the specifications.

The only cure for corrugations and rutting is to break up the pavement and remix it along with additional aeration. Corrugations and ruts due to excess liquid will not roll out.

In general, it can be stated that the finer graded mixtures lose their moisture and solvent more slowly than the coarser graded mixtures. They are also more sensitive to any excess of either moisture or solvent. Too much aeration, especially where the rapid-cure bituminous material is used, is also possible. This will result in a dry, "lifeless" mix, which will ravel and disintegrate under the action of traffic. Test Method AASHTO-T110 is recommended as a suitable test for determining the percentage of moisture or volatile in the mixture. Mixes can usually be laid satisfactorily when the moisture and solvent has been reduced approximately 50%.

405-3.05 & 3.06 Spreading & Compacting

Prior to allowing the spreading of the mixture over the area to be surfaced, the mixing must be complete and satisfactory. Any contention that completion of mixing will be accomplished by the spreading operation is not valid because any mixing accomplished by this operation is negligible. Some Contractors have found the use of self-propelled pavers to be to their advantage. This should be encouraged because normally it will result in a more uniform thickness and a superior riding surface.

A better appearing finished product is obtained if the tires of the grader are smooth and if the front wheels are equipped with large tires.

The appearance and riding quality of the surfacing are dependent on the skill of the operator. A skilled operator will avoid the excessive manipulation of the controls that results in poor riding quality.

It is considered good practice to lay the mixture in as many thin layers as possible; consideration being given to the size and amount of coarse material. The pneumatic compactors should be in operation throughout the entire laying operation in order to avoid differential compaction. Emulsified asphalt mixes must be compacted while there is still some moisture present--while the "break" is taking place ("break" occurs when the asphalt particles separate from the water and attach to the aggregate). The length of time it takes an emulsion to break is variable, depending upon the type of emulsifier used, aggregate characteristics, temperature, and other factors. There is a marked color change when "break" occurs, which will make a good visual guide to judging mix conditions. When there is considerable coarse material in the final lay, it should be taken across the roadway and deposited on the shoulder if there is any possibility that it might cause a rough riding surface. Final compaction will usually be done with a steel-wheel tandem compactor. Thorough compaction is necessary to develop the inherent stability of the mixture. Excessive amounts of compaction or too heavy equipment, as evidenced by displacement of the mat, are to be avoided.

405-3.07 Surface Requirements and Tolerances

Specifications require the surface to be checked with a straightedge. Surface tolerances, especially at joints, should be checked as soon as rolling is completed. If found to be unsatisfactory, corrections should be made as soon as possible. The records must show that the surface has been tested for tolerance.