SECTION 324
REWORKED ASPHALT CONCRETE PAVEMENT

324-1 Description.

 **324-1.1 General:** Construct a binder course asphalt pavement layer using milling and plant-produced hot-mix asphalt or the hot-in-place recycling process, as specified in this Section. Mill or scarify the existing pavement layer as part of the work described in the plans. If required by the Contract Documents, following the completion of the binder course asphalt pavement layer, construct a hot-mix asphalt layer, as specified in Section 334 or 337.

 Provide a three year Warranty/Maintenance Bond covering the binder course layer and the hot-mix asphalt layer for a period of three years after final acceptance of the Contract in accordance with 5-11, and as defined in 324-7.

 The applicable requirements of Sections 300, 320, 327, 330, 334 and 337 do apply to the hot-mix asphalt layer placed on the project and to the binder course layer, as noted herein. Requirements of Section 338 do not apply to work of this specification.

 Price adjustments for rejuvenating agents will be handled in accordance with the Fuel and Bituminous Price Index for the “AC20/30” category. The URL for obtaining this information is:

[http://www.dot.state.fl.us/Construction/fuel&bit/fuel&bit.shtm](http://www.dot.state.fl.us/Construction/fuel%26bit/fuel%26bit.shtm) .

324-2 Materials.

 **324-2.1 General Requirements:** The following materials requirements apply only to the binder course layer when constructed using plant-produced hot-mix asphalt. The requirements for the hot-mix asphalt layer constructed on top of the binder course layer are specified in Section 334 or 337.

 **324-2.2 Asphalt Binder or Recycling Agents:** Meet the requirements of 916-1 and 916-2.

 **324-2.3 Aggregate:** Meet the requirements of Section 901 for coarse aggregate and Section 902 for fine aggregate.

 **324-2.4 Reclaimed Asphalt Pavement (RAP) Material:** RAP may be used as a component of the asphalt mixture subject to the following requirements:

 1. Assume full responsibility for the design, production and construction of asphalt mixes which incorporate RAP as a component material.

 2. Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.

324-3 General Composition of Mixture.

 **324-3.1 Mix Design:** Compact the mixture in the laboratory using a Superpave gyratory compactor in accordance with AASHTO T 312-08. Utilize a design number of gyrations of either 50 or 75. The design air void content shall be within the range of 3.5 to 4.5%. The minimum voids in the mineral aggregate (VMA) shall be 12.0%. The minimum effective binder content shall be 4.5%. Utilize FM 1-T 209 for determination of the mixture’s maximum specific gravity for air void determination. Assure that the recovered binder from the compacted mix will have a penetration value within the range of 40 - 80 dmm when tested in accordance with AASHTO T 49 or have a recovered viscosity within the range of 5,000 – 15,000 Poises when tested in accordance with AASHTO T 202. Furnish a copy of the mix design(s) to the Engineer prior to any paving work. During production, the Contractor may revise the mix design provided the previous design requirements are met. Submit mix design changes to the Engineer for informational purposes only.

324-4 Construction.

 **324-4.1 General Requirements:** Prior to commencing construction operations, repair all defective portions of the existing pavement as indicated in the plans. The minimum ambient temperature required to begin operations is 40ºF. Clean the pavement such that it is reasonably free from loose materials, sand, dirt, caked clay and other deleterious substances. Remove and dispose of all reflective pavement markers (RPMs).

 **324-4.2** **Milling:** Use the cold milling process per Section 327 to remove the upper layer(s) of asphalt above the binder course layer, if shown in the plans. Use cold milling, hot milling or hot scarifying to remove the existing binder course layer for recycling.

 **324-4.3 Bonding of Pavement Layers:** Construct a pavement in such a manner to assure that the layers are adequately bonded throughout the pavement design service period.

 **324-4.4 Compaction:** Select the compaction equipment and rolling sequences necessary to meet the density specifications as set forth below. Complete all compaction operations before the pavement surface temperature drops to 150ºF.

 **324-4.5 Additional Requirements:** When construction includes the paving of adjacent shoulders (equal to or less than 5 feet wide), the layer thickness for the top pavement layer and shoulder must be the same and paved in a single pass, unless called for differently in the Contract documents.

324-5 Contractor's Process Control.

 **324-5.1 General:** Utilize a Process Control System that will provide assurance that all materials and products furnished to the Department conform to the Contract requirements, and will meet the performance requirements, as outlined below. Document all Process Control procedures, inspections, and tests and make that information available for review by the Department throughout the life of the Contract. Transfer ownership of these documents to the Department at the end of the project.

 Utilize a process control plan that contains the following as a minimum:

 a. Determination of asphalt binder content, maximum specific gravity, air void content, gradation, and asphalt binder viscosity or penetration – minimum frequency of once per day.

 b. Depth determination (uncompacted mix) - once per 100 feet.

 c. Determination of pavement thickness (roadway cores) - per 324-5.7.

 d. Density determination (roadway cores) - one core per 1,000 feet.

 e. Determination of cross-slope - per 324-5.8.

 f. Determination of pavement smoothness - per 324.5.9.

 **324-5.2 Corrective Actions:** Take prompt action to correct any errors, equipment malfunctions, process changes, or other assignable causes which have resulted or could result in the submission of materials, products, and completed construction which do not conform to the requirements of the specifications.

 **324-5.3 Recovered Binder:** Monitor the penetration or viscosity of the recovered asphalt binder during production. Obtain samples on a random basis at a minimum frequency of once per day. Recover the binder from the asphalt mixture in accordance with FM 5-524 and FM 3-D 5404. Maintain the penetration of the recovered asphalt material in the asphalt mixture (determined in accordance with AASHTO T 49), within plus or minus 10 dmm of the target penetration value as indicated on the mix design and within the range of 40 – 80 dmm or maintain the viscosity of the recovered asphalt material in the asphalt mixture (determined in accordance with AASHTO T 202), within the range of 5,000 to 15,000 poises. If two or more consecutive tests exceed this tolerance, stop all recycling operations until the problem is adequately corrected.

 **324-5.4 Air Voids:** Maintain an air void content of the asphalt mixture within the range of 2.0 to 6.0%. Air voids shall be based on specimens compacted in accordance with AASHTO T 312-08 and a maximum specific gravity as determined in accordance with FM 1-T 209. When the air void content of the asphalt mixture falls outside of this range, remove and replace or rework these areas and make all necessary adjustments to the blend of materials to modify the air void content to an acceptable level.

 **324-5.5 Asphalt Binder Content and Mix Gradation:** Obtain samples randomly and test the samples in accordance with FM 5-563 and FM 1-T 030. Maintain an asphalt content within plus or minus 0.55% of the target asphalt content as indicated on the mix design. In the event the asphalt content deviates by more than 0.55% from the target, make all necessary corrections. If the test results for two consecutive samples both deviate by more than 0.55% from the target, stop all operations and make adjustments to assure that the asphalt content is within 0.55% of the mix design target. Maintain the percent passing the #200 sieve within plus or minus 2.5% of the target gradation as indicated on the mix design. In the event the percent passing the #200 sieve deviates by more than 2.5% from the target, make all necessary corrections. If the test results for two consecutive samples both deviate by more than 2.5% from the target, stop all operations and make adjustments to assure that the percent passing the #200 sieve is within 2.5% of the mix design target.

 **324-5.6 Density:** The in-place density of the binder course will be evaluated by the use of 6-inch diameter roadway cores. The in-place density will be based on the daily maximum specific gravity (Gmm) of the as-produced mix. Obtain the roadway cores at random locations identified by the Engineer at the end of each day’s production prior to opening the roadway to traffic, at a minimum frequency of one core per 1,000 feet or portion thereof for distances less than 1,000 feet. Assume responsibility for maintenance of traffic, coring, patching the core holes, and trimming the cores to the proper thickness prior to density testing.

 Determine the density of the cores in accordance with FM 1-T 166, and calculate an average for each Lot, which for purposes of mixture process control, is defined as 5,000 feet. The average density of a Lot shall be a minimum of 92.0% of Gmm. Take corrective actions for those Lots that have an average density less than 92.0% of Gmm. If two consecutive Lots are less than 92.0% of Gmm, stop construction until appropriate adjustments are made to assure the minimum density requirement is met. Remove and replace or rework areas with an average density less than 90.0% of Gmm.

 Once the average density of a Lot has been determined, do not provide additional compaction to raise the average.

 **324-5.7 Pavement Thickness:** The thickness specified in the Plans shall be the compacted in-place thickness. The thickness shall be determined by the average measurement of roadway cores. Obtain cores at locations determined by the Engineer at a frequency of either one core per 1,000 feet or five cores per day, whichever is less. Thickness can also be determined based on cores cut for the evaluation of density as specified in 324-5.6. Maintain the average thickness of the binder course layer (based on roadway cores) within 1/4 inch of that specified in the Plans. If the average thickness is deficient by more than 1/4 inch but no more than 1/2 inch, take appropriate corrective actions. If the average thickness is deficient by more than 1/2 inch, take additional cores to determine the area of deficient thickness. Correct any area deficient in thickness by more than 1/2 inch at no cost to the Department. If the average thickness is deficient for two consecutive days by more than 1/4 inch of that specified in the Plans, stop construction activities until adjustments are made to the operation that will allow placement at the specified depth. Continued operations when the thickness is deficient by more than 1/4 inch of the thickness specified in the Plans will not be allowed.

 **324-5.8 Cross Slope:** Construct a pavement surface with cross slope in compliance with the requirements of 330-12.3.

 **324-5.9 Pavement Smoothness:** Construct a smooth pavement meeting the requirements of 330-12.4.

324-6 Sampling and Testing by the Engineer.

The Department reserves the right to run any test at any time for informational purposes. Make all Process Control sampling and testing data accessible for review by the Engineer. Obtain additional roadway cores as directed by the Engineer.

 Based on the Department’s review of the processes or results of Department independent testing, take prompt action to correct any errors, equipment malfunctions, process changes, or other assignable causes which have resulted or could result in the submission of materials, products, and completed construction which do not conform to the requirements of the specifications.

324-7 Warranty.

Upon final acceptance of the Contract, in accordance with 5-11, furnish a Warranty/Maintenance Bond written and issued in the amount of $xxx,xxx, warranting the asphalt pavement (including both the binder course layer and the hot-mix asphalt layer) to be free from distresses exceeding the threshold values shown in Table 324-1 for the established warranty period. Use a bonding company that, in addition to satisfying the provisions of Section 287.0935, Florida Statutes, has an A.M. Best rating of “A” or better. If the bonding company drops below the “A” rating during the three year Maintenance Bond period, provide a new Maintenance Bond for the balance of the three year period from a bonding company with an “A” or better rating, at no cost to the Department.

 Warranty requirements apply to the binder course asphalt pavement layer and the hot-mix asphalt layer. Warranty requirements will not apply to any asphalt layers beneath the binder course, asphalt base, and/or miscellaneous asphalt placed on the project. The Warranty/Maintenance bond will cover the repair or replacement of the binder course layer and hot-mix asphalt layer. Assume responsibility for the process control, mix design, construction, compaction, testing and inspection of all asphalt mixtures.

 At the end of the warranty period, the Engineer will release the Contractor from further warranty work and responsibility, provided all previous warranty work and/or remedial work, if any, have been completed.

324-8 Statewide Disputes Review Board.

 The Statewide Disputes Review Board for this project will resolve any and all disputes that may arise involving administration and enforcement of this Specification. The Contractor and the Department acknowledge that use of the Statewide Disputes Review Board is required, and the determinations of the Statewide Disputes Review Board for disputes arising out of this specification will be binding on both the Contractor and the Department, ~~,~~with no right of appeal by either party.

 Meet the requirements of 8-3.8.

324-9 Pavement Evaluation and Remedial Work.

 **324-9.1 General:** The Department’s Flexible Pavement Condition Survey Program, along with observations by the Engineer, will be used as a basis for determining the extent and the magnitude of the pavement distresses occurring on the project. In the event that level of distress exceeds any of the threshold values defined below, remedial action by the Contractor will be required.

 The Department will continuously monitor the pavement for distresses and may require remedial action at any time. For evaluation purposes, the project will be subdivided into LOTs of 0.1 mile per lane. When the segment is less than 0.1 mile, the segment will be called a partial LOT. The Department may conduct a Pavement Condition Survey of the Reworked Asphalt Concrete Pavement following the final acceptance of the project, and at intermediate times throughout the warranty period. The final survey, if determined by the Engineer to be necessary, will be conducted no later than 45 calendar days before the end of the warranty period. The Department will be responsible for all costs associated with the surveys.

 The Contractor will be notified if the Department believes remedial action is required. If the survey findings, intermediate or final, are to be disputed by the Contractor, written notification must be provided to the Engineer within 10 calendar days of the date of receipt of the information from the Department.

 During the warranty period, the Contractor may monitor the pavement using nondestructive methods. Do not conduct any coring, milling or other destructive methods without prior approval by the Engineer.

 **324-9.2 Threshold Values and Remedial Actions:** Threshold values and associated remedial work for the binder course and hot-mix asphalt layers are specified in Table 324-1.

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| TABLE 324-1Threshold Values and Associated Remedial Work |
| Type of Distress | Threshold Values | Remedial Work |
| Rutting (1) | Depth > 0.25 inch | Remove and replace the distressed LOT(s) to the full depth of all layers and to the full lane width (2) |
| Ride (3) | RN < 3.5 | Remove and replace the top layer for the full length and the full lane width of the distressed LOT(s)(4) |
| Settlement/Depression(5) | Depth ≥ 1/2 inch | Propose the method of correction to the Engineer for approval prior to beginning remedial work |
| Cracking (6) | Cumulative length of cracking > 30 feet for cracks > 1/8 inch | Remove and replace the distressed LOT(s) to the full depth of all layers and to the full lane width (7) |
| Raveling and/or Delamination (8) | Any length | Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end |
| Pot holes and Slippage Area(s) (8) | Observation by Engineer | Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end |
| Bleeding (9) | Loss of surface texture due to excess asphalt, individual length ≥10 feet and ≥1 foot. in width. | Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end |
| (1) Rutting:Rut depth to be determined by Laser Profiler in accordance with the Flexible Pavement Condition Survey Handbook. For any LOT that cannot be surveyed by Laser Profiler, the rut depth will be determined manually in accordance with the Flexible Pavement Condition Survey Handbook, with the exception that the number of readings per LOT will be one every 20 feet. For a partial LOT, a minimum of three measurements not exceeding 20 feet apart will be made. When the average of the measurements obtained manually exceeds 0.30 inches, or if any individual measurement exceeds 0.6 inches, remedial work will be required. (2) Remedial Work for Rutting: The Contractor may propose removal and replacement of less than the full depth of all layers by preparation and submittal of a signed and sealed engineering analysis report, demonstrating the actual extent of the distressed area(s). Remedial work must be performed in accordance with Table 324-1 unless approved otherwise by the Engineer.(3) Ride: Ride Number (RN) to be established by Laser Profiler in accordance with FM 5-549.(4) If the deficient ride is due to underlying asphalt layers, base, subgrade, or embankment, which was constructed by the Responsible Party, propose the method of correction to the Engineer for approval prior to beginning the remedial work. (5)Settlement/Depression: Depth of the settlement/depression to be determined by a 6 foot manual straightedge.(6) Cracking: Beginning and ending of 1/8 inch cracking will be determined as the average of three measurements taken at one foot intervals. The longitudinal construction joint at the lane line will not be considered as a crack.(7) Remedial Work for Cracking: The Contractor may propose removal and replacement of less than the full depth of all layers by preparation and submittal of a signed and sealed engineering analysis report, demonstrating the actual extent of the distressed area(s). Remedial work must be performed in accordance with Table 324-1, unless approved otherwise by the Engineer.(8) Raveling, Delamination, Pot holes, Slippage: As defined and determined by the Engineer in accordance with the examples displayed at the following URL: www.dot.state.fl.us/SpecificationsOffice/Implemented/URLinSpecs/Pavement.shtm(9) Bleeding: Bleeding to be defined and determined by the Engineer in accordance with the examples displayed at the following URL: www.dot.state.fl.us/SpecificationsOffice/Implemented/URLinSpecs/Pavement.shtm |

 **324-9.3 Remedial Work:** The Responsible Party will perform all necessary remedial work described within this Section at no cost to the Department. If the pavement distresses exceed threshold values and it is determined that the cause of the distress is due to the embankment, subgrade, base or other activities performed by the Contractor, the Responsible Party will be responsible for performing all remedial work associated with the pavement distress. Should an impasse develop in any regard as to the need for remedial work or the extent required, the Statewide Disputes Review Board will render a final decision by majority vote.

 Remedial work will not be required if any one of the following conditions is found to apply:

 a. Determination that the pavement thickness design, as provided by the Department, is deficient. The Department will make available a copy of the original pavement thickness design package and design traffic report to the Responsible Party upon request. The Responsible Party is responsible for performing all remedial work associated with the pavement distress if the pavement design is provided to the Contractor.

 b. Determination that the Accumulated ESALs (Number of 18 Kip Equivalent Single Axle Loads in the design lane) has increased by 25% or more than the Accumulated ESALs used by the Department for design purposes for the warranty period for the pavement design life. In calculating ESALs, the Average Annual Daily Traffic (AADT) will be obtained from the Department’s traffic count data and the T24 (Percent Heavy Trucks during a 24 hour period) will be obtained from the Department’s traffic classification survey data.

 c. Determination that the deficiency was due to the failure of the existing underlying layers that were not the Contract work.

 d. Determination that the deficiency was the responsibility of a third party or its actions, unless the third party was performing work included in the Contract.

 If a measured distress value indicates remedial action is required per Table 324-1, the Responsible Party must begin remedial work within 45 calendar days of notification by the Department or a ruling of the Statewide Disputes Review Board. The Disputes Review Board will determine the allowable duration for the completion of the remedial work, but not to exceed 6 months.

 In the event remedial action is necessary and forensic information is required to determine the source of the distress, the Department may core and/or trench the pavement. The Responsible Party will not be responsible for damages to the pavement as a result of any forensic activities conducted by the Department.

 As applicable to distress criteria for rutting, ride and cracking, when two LOTs requiring remedial action are not separated by three or more LOTs not requiring remedial action, the remedial work shall be required for the total length of all such contiguous LOTs, including the intermediate Lots not requiring remedial action.

 Additionally, where such areas of remedial action are required due to raveling, slippage or bleeding are separated by less than 1,000 feet, the remedial work will be required for the entire area contiguous to the distressed areas, including intermediate areas otherwise requiring no remedial action.

 The Responsible Party has the first option to perform all remedial work that is determined by the Department to be their responsibility. If, in the opinion of the Engineer, the problem poses an immediate danger to the traveling public and the Responsible Party cannot provide temporary mitigation for the defect within 4 hours of written notification and restore the pavement to its original design condition within 72 hours of written notification, the Engineer has the authority to have the remedial work performed by other forces. Temporary mitigation includes the use of traffic control systems such as barricades, drums, or other approved devices to secure the area including lane closures, if necessary, and constructing temporary repairs making it safe for the roadway user until the defect can be restored to its original design condition. The Responsible Party is responsible for all incurred costs of the work performed by other forces should the problem (remedial work) be determined to be the responsibility of the Responsible Party. Remedial work performed by other forces does not alter any of the requirements, responsibilities or obligations of the Responsible Party.

 The Responsible Party must complete all remedial work to the satisfaction of the Engineer. Any disputes regarding the adequacy of the remedial work will be resolved by the Statewide Disputes Review Board. Approval of remedial work does not relieve the Responsible Party from continuing responsibility under the provisions of this Specification.

 Notify the Engineer in writing prior to beginning any remedial work. Utilize hot-mix asphalt meeting the requirements of the Department’s Standard Specifications for Road and Bridge Construction and implemented modifications thereto when performing any remedial work. Perform all signing and traffic control in accordance with the current edition of the Department’s Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System. Provide Maintenance of Traffic during remedial work at no additional cost to the Department. Lane closure restrictions listed in the original Contract will apply to remedial work. Written request(s) to obtain permission for lane closure(s) for either forensic investigation or remedial work must be made to the Engineer 48 hours in advance of any lane closures. Do not perform any lane closures until written permission is given by the Engineer.

 If remedial work necessitates a corrective action to overlying asphalt layers, pavement markings, signal loops, adjacent lane(s), roadway shoulders, or other affected Contract work, perform these corrective actions using similar products at no additional cost to the Department.

324-10 Method of Measurement.

 The quantity of the binder course layer shall be paid for at the Contract unit price per square yard, completed and accepted.

324-11 Basis of Payment.

Price and payment will be full compensation for all work including the cost of milling, the cost of the liquid asphalt, asphalt recycling agent, virgin aggregate, asphalt mixture and Warranty/Maintenance Bond for the binder course layer and hot-mix layer.