

330 HOT BITUMINOUS MIXTURES – GENERAL CONSTRUCTION REQUIREMENTS.

(REV 1-17-02) (FA 2-5-02) (7-02)

SECTION 330 (Pages 244-266) is deleted and the following substituted:

**SECTION 330
HOT BITUMINOUS MIXTURES -
GENERAL CONSTRUCTION REQUIREMENTS**

330-1 Description.

Construct plant-mixed hot bituminous pavements and bases. Establish and maintain a quality control system that provides assurance that all materials, products and completed construction submitted for acceptance meet Contract requirements.

330-2 Quality Control By The Contractor:

330-2.1 Minimum Quality Control Plan Requirements: In addition to the requirements set forth in Section 105, include in the Quality Control Plan as a minimum the following activities necessary to maintain process control and meet specification requirements:

Stockpiles: Assure materials are placed in the correct stockpile; assure good stockpiling techniques; inspect stockpiles for separation, contamination, segregation, etc.; properly identify and label each stockpile.

Incoming Aggregate: Obtain gradations and bulk specific gravity (G_{sb}) values from aggregate supplier for reference; determine the gradation of all component materials; routinely compare gradations and G_{sb} values to mix design.

Cold Bins: Calibrate the cold gate/feeder belt for each material; determine cold gate/feeder belt settings; observe operation of cold feeder for uniformity.

Dryer: Observe pyrometer for aggregate temperature control; observe efficiency of the burner.

For Batch Plants, determine percent used and weight to be pulled from each bin to assure compliance with Mix Design, check mixing time, and check operations of weigh bucket and scales.

For Drum Mixer Plants, determine aggregate moisture content, and calibrate the weigh bridge on the charging conveyor.

Control Charts: Plot and keep charts updated daily for all Quality Control Sampling and Testing and post in the asphalt lab where they can be seen. Provide the following charts:

1. All components used to determine the composite pay factor (No. 8 [2.36 mm] sieve, No. 200 [75 µm] sieve, asphalt binder content, air voids, and density) by lot.

2. Gradation of incoming aggregate.

3. Gradation and asphalt content of RAP.

4. Any other test result or material characteristic (as determined by the Contractor) necessary for process control.

The above listed minimum activities are to be considered normal activities necessary to control the production of hot mix asphalt at an acceptable quality level. It is recognized, however, that depending on the type of process or materials, some of the activities listed may not be necessary and in other cases, additional activities may be required. The frequency of these activities will also vary with the process and the materials. When the process varies from the defined process average and variability targets, the frequency of these activities will be increased until the proper conditions have been restored.

330-2.2 Minimum Process Control Testing Requirements: Include as a minimum, the following testing frequencies in the Quality Control Plan:

Asphalt Plant

1. Hot Mix Asphalt: Determine the asphalt binder content; mix gradation and volumetric properties at a minimum frequency of one per day. In the event that the daily production exceeds 1,000 tons [1,000 metric tons], perform these tests a minimum of two times per day. Quality Control tests used in the acceptance decision may be used to fulfill this requirement. Verify modifier addition.

2. Aggregate (Including RAP): One sample per 1,000 tons [1,000 metric tons] of incoming material as it is stockpiled for gradation. The testing of RAP material shall include the determination of asphalt binder content and gradation of extracted aggregate.

3. Mix temperature for the first five loads and every fifth load thereafter.

4. Aggregate moisture content from stockpiles or combined cold feed aggregate - one per day.

5. Other tests (as determined necessary by the Contractor) for process control.

Roadway

1. Monitor the pavement temperature with an infrared temperature device. Monitor the roadway density with either 6 inch [150 mm] diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of once per 1,500 feet [500 lineal meters] of pavement. When the layer thickness is greater than or equal to one inch [25 mm] (or the spread rate is greater than or equal to 105 lb/yd² [57 kg/m²] and an approved rolling pattern is used in lieu of density testing, monitor the density (for informational purposes only) by cutting and testing a 6 inch [150 mm] diameter core at a minimum frequency of 3 cores per day or as directed by the Engineer.

2. Mix temperature for the first five loads and every fifth load thereafter.

3. Monitor the pavement smoothness with a 15-foot rolling straightedge as required by these specifications.

4. Monitor the pavement cross slope at a frequency necessary to fulfill the requirements of these specifications, and identify a system to control the cross slope of each pavement layer during construction.

5. Monitor the mix spread rate at the beginning of each day's production, and as needed to control the operations, at a minimum of once per 200 tons (200 metric tons) placed to ensure that the spread rate is within 5% of the target spread rate. When determining the spread rate, use an average of five truckloads of mix.

If the Contractor fails to maintain the construction process in accordance with the approved Quality Control Plan, the Engineer may elect to stop the construction operation at any time until the deficiencies are corrected.

330-2.3 Minimum Quality Control System Requirements:

330-2.3.1 Personnel Qualifications: For asphalt plant operations, keep a quality control technician, qualified as a CTQP Asphalt Plant Level II technician, available at the asphalt plant at all times when producing mix for the Department, and perform all asphalt plant related testing with a CTQP Asphalt Plant Level I technician. For paving operations, keep a qualified CTQP Asphalt Paving Level II technician on the roadway at all times when placing asphalt mix for the Department, and perform all testing with a CTQP Asphalt Paving Level I technician. As an exception, measurements of cross-slope, temperature and yield (spread rate) can be performed by someone under the supervision of a CTQP Paving Level II technician. All mix designs will be developed by individuals who are CTQP qualified as a Hot Mix Asphalt Designer. Document all quality control procedures, inspection, and all test results and make them available for review by the Engineer throughout the life of the Contract.

330-2.3.2 Hot Mix Asphalt Testing Laboratory Requirements: Furnish or have furnished a fully equipped asphalt laboratory (permanent or portable) at the production site. The Laboratory must be qualified under the Department's Laboratory Qualification Program, as described in Section 6. In addition, the laboratory shall meet the following requirements:

1. Area - The effective working area of the laboratory shall be a minimum of 180 ft² [17 m²], with a layout of which will facilitate multiple tests being run simultaneously by two technicians. This area does not include the space for desks, chairs and file cabinets. Any variations shall be approved by the Engineer.

2. Lighting - The lighting in the lab must be adequate to illuminate all areas of the work.

3. Temperature Control – Equip the lab with heating and air conditioning units that provide a satisfactory working environment.

4. Ventilation – Equip the lab with fume hoods and exhaust fans that will remove all hazardous fumes from within the laboratory in accordance with OSHA requirements.

5. Equipment and Supplies – Furnish the lab with the necessary sampling and testing equipment and supplies for performing contractor Quality Control and Department Verification Sampling and Testing. A detailed list of equipment and supplies required for each test is included in the appropriate FDOT, AASHTO, or ASTM Test Method.

6. Calibration of the Superpave Gyratory Compactor: Calibrate the Superpave Gyratory Compactor in accordance with the manufacturer's recommendations. Identify in the Quality Control Plan the established frequencies and document all calibrations.

7. Personal Computer – Provide a personal computer capable of running a Microsoft Excel™ spreadsheet program, along with a printer.

8. Communication – Provide a telephone and fax machine (with a private line) for the use of the testing facility's quality control personnel.

330-3 Limitations of Operations.

330-3.1 Weather Limitations: Do not transport asphalt mix from the plant to the roadway unless all weather conditions are suitable for the laying operations.

330-3.2 Limitations of Laying Operations:

330-3.2.1 General: Spread the mixture only when the surface upon which it is to be laid has been previously prepared, is intact, firm, and properly cured, and is dry. Do not place friction course until the adjacent shoulder area has been dressed and grassed.

330-3.2.2 Temperature: Spread the mixture only when the air temperature in the shade and away from artificial heat is at least 40°F [4°C] for layers greater than 1 inch (100 lb/yd²) [25 mm (55 kg/m²)] in thickness and at least 45°F [7°C] for layers 1 inch (100 lb/yd²) [25 mm (55 kg/m²)] or less in thickness (this includes leveling courses). The minimum temperature requirement for leveling courses with a spread rate of 50 lb/yd² [25 kg/m²] or less is 50°F [10°C].

330-3.2.3 Wind: Do not spread the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

330-3.2.4 Night Paving: Provide sufficient lighting for night operations.

330-4 Preparation of Asphalt Cement.

Deliver the asphalt cement to the asphalt plant at a temperature not to exceed 370°F [188°C], and equip the transport tanks with sampling and temperature sensing devices meeting the requirements of 300-3.2. Maintain the asphalt cement in storage within a range of 230 to 370°F [110 to 188°C] in advance of mixing operations. Maintain constant heating within these limits, and do not allow wide fluctuations of temperature during a day's production.

330-5 Preparation of Aggregates.

330-5.1 Stockpiles: Place each aggregate component in an individual stockpile, and separate each from the adjacent stockpiles, either by space or by a system of bulkheads. Prevent the intermingling of different materials in stockpiles at all times. Identify each stockpile, including RAP, as shown on the mix design.

330-5.2 Prevention of Segregation: Form and maintain stockpiles in a manner that will prevent segregation. If a stockpile is determined to have excessive segregation,

the Engineer will disapprove the material for use on the project until the appropriate actions have been taken to correct the problem.

330-5.3 Blending of Aggregates: Stockpile all aggregates prior to blending or placing in the cold hoppers. Place all aggregates to be blended or proportioned in separate bins at the cold hopper. Proportion by means of securely positioned calibrated gates or other approved devices.

330-5.4 Cold Bins:

330-5.4.1 Adequacy of Bins: Use separate bin compartments in the cold aggregate feeder that are constructed to prevent any spilling or leakage of aggregate from one bin to another. Ensure that each bin compartment has the capacity and design to permit a uniform flow of aggregates. Mount all of the bin compartments over a feeder of uniform speed, which will deliver the specified proportions of the separate aggregates to the drier at all times. If necessary, equip the bins with vibrators to ensure a uniform flow of the aggregates at all times.

330-5.4.2 Gates: Provide each bin compartment with a gate which is adjustable in a vertical direction. Provide gates that can be held securely at any specified vertical opening. Equip the gates with a measuring device for measuring the vertical opening of the gates from a horizontal plane level with the bottom of the feeder.

330-5.5 Mineral Filler: If mineral filler is required in the mix, feed or weigh it in separately from the other aggregates.

330-5.6 Heating and Drying: Heat and dry the aggregates before screening. Control the temperature of the aggregates so that the temperature of the completed mixture at the plant falls within the permissible range allowed by this Section.

330-5.7 Screening Unit:

330-5.7.1 Oversize Aggregate: Remove any oversized pieces of aggregate by the use of a scalping screen. Do not return this oversized material to the stockpile for reuse unless it has been crushed and reprocessed into sizes that will pass the scalping screen.

330-5.7.2 Screening: Ensure that the quantity of aggregates being discharged onto the screens does not exceed the capacity of the screens to actually separate the aggregates into the required sizes. Allow up to a maximum of 10% plus-10 material in the minus-10 bin. The Engineer will determine the maximum amount of minus-10 material allowed in the plus-10 bins, in accordance with its effect on the uniformity of the mix.

330-6 Preparation of the Mixture.

330-6.1 Batch Mixing:

330-6.1.1 Aggregates: Once the dried aggregates and mineral filler (if required) are prepared in the manner previously described and combined in batches to meet the verified mix design by weighing each separate bin size, convey them to the empty mixer.

330-6.1.2 Asphalt Binder: Introduce the accurately measured hot asphalt binder into the mixer simultaneously with, or after, the hot aggregates. Continue mixing until the mixture is thoroughly uniform with all particles fully coated.

330-6.1.3 Mixing Time: The mixing time begins when the measuring devices for both the asphalt and the aggregates indicate that all the material is in the

mixer, and continues until the material begins to leave the mixing unit. Since the mixing time varies in relation to the nature of the aggregates and the capacity of the mixer, the Engineer will designate the mixing time. In no case will the Engineer allow the mixing time to be less than 35 seconds.

330-6.2 Continuous Mixing: Introduce the dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the verified mix design, into the mixer in synchronization with the accurate feeding of the hot asphalt cement. Mix sufficiently to produce a thoroughly and uniformly coated mixture.

330-6.3 Mix Temperature: Heat and combine the ingredients of the mix in such a manner as to produce a mixture with a temperature, when discharged from the pugmill or surge bin, which is within the master range as defined below.

Determine the temperature of the completed mixture using a quick-reading thermometer through a hole in the side of the loaded truck immediately after loading. Locate the hole within the middle third of the length of the body, and at a distance from 6 to 10 inches [150 to 250 mm] above the surface supporting the mixture. If a truck body already has a hole located in the general vicinity of the specified location, use this hole. At the Engineer's discretion, the Contractor may take the temperature of the load over the top of the truck in lieu of using the hole in the side of the truck.

The normal frequency for taking asphalt mix temperatures will be for each day, for each design mix on the first five loads and once every five loads thereafter. Take the temperature of the asphalt mix at the plant and at the roadway before the mix is placed at the normal frequency. Record the temperature on the front of the respective delivery ticket. The Engineer shall review the plant and roadway temperature readings and may take additional temperature measurements at any time.

The master range for all mix designs will be the established temperature from the mix design $\pm 30^{\circ}\text{F}$ [$\pm 16^{\circ}\text{C}$]. Reject for use on the project any load or portion of a load of asphalt mix at the plant with a temperature outside of this master range. Reject any load or portion of a load of asphalt mix at the roadway with a temperature outside of this master range. The Engineer will be immediately notified of the rejection.

If any single load at the plant or at the roadway is within the master range but differs from the established mix temperature by more than $\pm 25^{\circ}\text{F}$ [$\pm 14^{\circ}\text{C}$] or if the average difference of the temperature measurements from the established mix temperature for five loads exceeds $\pm 15^{\circ}\text{F}$ [$\pm 8^{\circ}\text{C}$], the temperature of every load will be monitored until the temperature falls within the specified tolerance range in Table 330-2; at this time the normal frequency may be resumed.

Table 330-2	
Temperature Tolerance From Verified Mix Design	
Any Single Measurement	$\pm 25^{\circ}\text{F}$ [$\pm 14^{\circ}\text{C}$]
Average of Any Five Consecutive Measurements	$\pm 15^{\circ}\text{F}$ [$\pm 8^{\circ}\text{C}$]

330-6.4 Maximum Period of Storage: Allow the maximum time that any mix may be kept in a hot storage or surge bin to be 72 hours.

330-6.5 Contractor's Responsibility for Mixture Requirements: Produce a homogeneous mixture, free from moisture and with no segregated materials, that meets

all specification requirements. Also apply these requirements to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.

330-7 Transportation of the Mixture.

Transport the mixture in tight vehicles previously cleaned of all foreign material. After cleaning, thinly coat the inside surface of the truck bodies with soapy water or an asphalt release agent as needed to prevent the mixture from adhering to the beds. Do not allow excess liquid to pond in the truck body. Do not use diesel fuel or any other hazardous or environmentally detrimental material as a coating for the inside surface of the truck body. Cover each load during cool and cloudy weather and at any time there is a probability of rain.

330-8 Preparation of Application Surfaces.

330-8.1 Cleaning: Prior to the laying of the mixture, clean the surface of the base or pavement to be covered of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

330-8.2 Patching and Leveling Courses: Where an asphalt mix is to be placed on an existing pavement or old base which is irregular, and wherever the plans indicate, bring the existing surface to proper grade and cross-section by the application of patching or leveling courses.

330-8.3 Application Over Surface Treatment: Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep and dispose of all loose material from the paving area.

330-8.4 Coating Surfaces of Contacting Structures: Paint all structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb and gutter, with a uniform coating of asphalt cement to provide a closely bonded, watertight joint.

330-8.5 Tack Coat:

330-8.5.1 Tack Coat Required: Apply a tack coat, as specified in Section 300, on existing pavement structures that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes.

330-8.5.2 Tack Coat at Engineer's Option: Apply a tack coat on the following surfaces only when so directed by the Engineer:

1. Freshly primed bases.
2. Surface treatment.

330-9 Placing Mixture.

330-9.1 Requirements Applicable to All Types:

330-9.1.1 Alignment of Edges: Lay all asphaltic concrete mixtures, including leveling courses, other than adjacent to curb and gutter or other true edges, by the stringline method to obtain an accurate, uniform alignment of the pavement edge.

330-9.1.2 Temperature of Spreading: Maintain the temperature of the mix at the time of spreading within the master range as defined in 330-6.3. The minimum

frequency for taking mix temperatures on the roadway will be as indicated in 330-6.3. Any load or portion of a load of asphalt mix on the roadway with a temperature outside of the master range shall be rejected for use on the project. The Engineer will be immediately notified of the rejection.

330-9.1.3 Rain and Surface Conditions: Immediately cease transportation of asphalt mixtures from the plant when rain begins at the roadway. Do not place asphalt mixtures while rain is falling, or when there is water on the surface to be covered. Once the rain has stopped and water has been removed from the tacked surface to the satisfaction of the Engineer and the temperature of the mixture caught in transit still meets the requirements as specified in 330-9.1.2, the Contractor may then place the mixture caught in transit. The Engineer will determine the final disposition of the material based on the engineering analysis submitted by the Contractor.

The Engineer may, at his sole option, perform an engineering evaluation to determine if the material is suitable to remain in place with a composite pay factor as determined by the specifications or shall be removed and replaced at no cost to the Department.

In the event that the material is removed and replaced, the newly constructed section shall be tested, accepted and paid for separately in accordance with the applicable specifications. The amount of asphalt placed the first time, as determined by multiplying the area and the average spread rate for the LOT, shall not be paid for.

330-9.1.4 Speed of Paver: Establish the forward speed of the asphalt paver based on the rate of delivery of the mix to the roadway but not faster than the optimum speed needed to adequately compact the pavement.

330-9.1.5 Number of Crews Required: For each paving machine operated, use a separate crew, each crew operating as a full unit. The Contractor's CTQP Paving Level II technician in charge of the paving operations may be responsible for more than one crew but must be physically accessible to the Engineer at all times when placing mix.

330-9.1.6 Checking Depth of Layer: Check the depth of each layer at frequent intervals, and make adjustments when the thickness exceeds the allowable tolerance. When making an adjustment, allow the paving machine to travel a minimum distance of 32 feet [10 m] to stabilize before the second check is made to determine the effects of the adjustment.

330-9.1.7 Hand Spreading: In limited areas where the use of the spreader is impossible or impracticable, the Contractor may spread and finish the mixture by hand.

330-9.1.8 Straightedging and Back-patching: Straightedge and back-patch after obtaining initial compaction and while the material is still hot.

330-9.2 Requirements Applicable to Courses Other Than Leveling:

330-9.2.1 Spreading and Finishing: Upon arrival, dump the mixture in the approved mechanical spreader, and immediately spread and strike-off the mixture to the full width required, and to such loose depth for each course that, when the work is completed, the required weight of mixture per square yard [square meter], or the specified thickness, is secured. Carry a uniform amount of mixture ahead of the screed at all times.

330-9.2.2 Thickness of Layers: Construct each course of Type SP mixtures in layers of the thickness shown in Section 334.

330-9.2.3 Laying Width: If necessary due to the traffic requirements, lay the mixture in strips in such a manner as to provide for the passage of traffic. As an option, where the road is closed to traffic, lay the mixture to the full width with machines traveling in echelon.

330-9.2.4 Correcting Defects: Before starting any rolling, check the surface; correct any irregularities; remove all drippings, fat sandy accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

330-9.3 Requirements Applicable Only to Leveling Courses:

330-9.3.1 Patching Depressions: Before spreading any leveling course, fill all depressions in the existing surface more than 1 inch [25 mm] deep by spot patching with leveling course mixture, and then compact them thoroughly.

330-9.3.2 Spreading Leveling Courses: Place all courses of leveling by the use of two motor graders, equip one with a spreader box. Use other types of leveling devices after they have been approved by the Engineer.

330-9.3.3 Rate of Application: When using Type SP-9.5 (fine graded) for leveling, do not allow the average spread of a layer to be less than 50 lb/yd² [27 kg/m²] or more than 75 lb/yd² [40 kg/m²]. The quantity of mix for leveling shown in the plans represents the average for the entire project; however, the Contractor may vary the rate of application throughout the project as directed by the Engineer. When leveling in connection with base widening, the Engineer may require placing all the leveling mix prior to the widening operation.

330-9.3.4 Placing Leveling Course Over Existing Pavement: When the Contract Documents specify a leveling course to be placed over cracked concrete pavement, including existing concrete pavement covered with an asphaltic surface, place the first layer of leveling course as soon as possible but no later than 48 hours after cracking the concrete.

330-9.3.5 Removal of Excess Joint Material: Where placing a leveling course over existing concrete pavement or bridge decks, trim the excess joint filler in the cracks and joints flush with the surface prior to placing the first layer of the leveling course.

330-10 Compacting Mixture.

330-10.1 Provisions Applicable to All Types:

330-10.1.1 Equipment and Sequence: For each paving or leveling train in operation, furnish a separate set of rollers, with their operators.

When density testing for acceptance is required, select equipment, sequence, and coverage of rolling to meet the specified density requirement. The coverage is the number of times the roller passes over a given area of pavement. Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

330-10.1.2 Standard Rolling Procedure: Meet the following equipment, sequence, and coverage requirements:

1. Seal Rolling: Provide two coverages with a tandem steel-wheeled roller (either vibratory or static), weighing 5 to 12 tons [4.5 to 11 metric tons], following as close behind the spreader as possible without pick-up, undue displacement, or blistering of the material. Use vibratory rollers in the static mode for layers of 1 inch [25 mm] or less in thickness.

2. Intermediate rolling: Provide five coverages with a self-propelled pneumatic-tired roller, following as close behind the seal rolling operation as the mix will permit.

3. Final rolling: Provide one coverage with a tandem steel-wheeled roller (static mode only), weighing 5 to 12 tons [4.5 to 11 metric tons], after completing the seal rolling and intermediate rolling, but before the surface pavement temperature drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

The Contractor may use equipment, sequences, or coverages other than those specified in the standard rolling procedure if so authorized by the Engineer.

330-10.1.3 Compaction at Crossovers, Intersections, etc.: When using a separate paving machine to pave the crossovers, compact the crossovers with one, 8 to 12 ton [7 to 11 metric ton] tandem steel roller. If placing crossovers, intersections, and acceleration and deceleration lanes with the main run of paving, also use a traffic roller to compact these areas.

330-10.1.4 Rolling Procedures: Ensure that the initial rolling is longitudinal. Where the lane being placed is adjacent to a previously placed lane, pinch or roll the center joint prior to the rolling of the rest of the lane.

Roll across the mat, overlapping the adjacent pass by at least 6 inches [150 mm]. Roll slowly enough to avoid displacement of the mixture, and correct any displacement at once by the use of rakes and the addition of fresh mixture if required. Continue final rolling to eliminate all roller marks.

330-10.1.5 Number of Pneumatic-tired Rollers Required: Use a sufficient number of self-propelled pneumatic-tired rollers to ensure that the rolling of the surface for the required number of passes does not delay any other phase of the laying operation and does not result in excessive cooling of the mixture before completing the rolling. In the event that the rolling falls behind, discontinue the laying operation until the rolling operations are sufficiently caught up.

330-10.1.6 Compaction of Areas Inaccessible to Rollers: Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, headers, gutters, bridges, manholes, etc.

330-10.1.7 Rolling Patching and Leveling Courses: Use self-propelled pneumatic-tired rollers to roll all patching and leveling courses. Where placing the initial leveling course over broken concrete pavement, use a pneumatic-tired roller that weighs at least 15 tons [14 metric tons].

330-10.1.8 Correcting Defects: Do not allow the rollers to deposit gasoline, oil, or grease onto the pavement. Remove and replace any areas damaged by such deposits as directed by the Engineer. While rolling is in progress, test the surface continuously, and correct all discrepancies to comply with the surface requirements. Remove and replace all drippings, fat or lean areas, and defective construction of any description. Remedy depressions that develop before completing the rolling by loosening

the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface. Correct all high spots, high joints, and honeycombing as directed by the Engineer. Remove and replace any mixture remaining unbonded after rolling. Correct all defects prior to laying the subsequent course.

330-10.1.9 Use of Traffic Roller on First Overbuild Course: Use a self-propelled pneumatic-tired roller on the first overbuild course. Compact with a minimum of five coverages.

330-10.1.10 Use of Traffic Roller or Vibratory Roller on First Structural Layer Placed on a Milled Surface: Use a self-propelled pneumatic-tired roller or vibratory roller on the first structural layer placed on a milled surface.

330-10.1.11 Use of Traffic Roller or Vibratory Roller on First Structural Layer Placed on an Asphalt Rubber Membrane Interlayer (ARMI): Use a self-propelled pneumatic-tired roller or a vibratory roller on the first structural layer placed on an ARMI.

330-11 Joints.

330-11.1 Transverse Joints: Place the mixture as continuously as possible. Do not pass the roller over the unprotected end of the freshly laid mixture except when discontinuing the laying operation long enough to permit the mixture to become chilled. When thus interrupting the laying operation, construct a transverse joint by cutting back on the previous run to expose the full depth of the mat.

330-11.2 Longitudinal Joints: For all layers of pavement except the leveling course, place each layer so that longitudinal construction joints are offset 6 to 12 inches [150 to 300 mm] laterally between successive layers. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

330-11.3 General: When laying fresh mixture against the exposed edges of joints (trimmed or formed as provided above), place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

330-11.4 Placing Asphalt Next to Concrete Pavement: When placing asphalt next to concrete pavement, construct the joint in accordance with Section 350.

330-12 Surface Requirements.

330-12.1 Contractor's Responsibility: Furnish a 15 foot [4.572 m] manual and a 15 foot [4.572 m] rolling straightedge. Make them available at the job site at all times during the paving operation for checking joints and surface irregularities. Obtain a smooth surface on all pavement courses placed, and then straightedge all intermediate and final courses with a 15 foot [4.572 m] rolling straightedge.

When the intermediate layer will be opened to the traffic, the Engineer reserves the right to require the Contractor to straightedge the layer with a 15 foot [4.572 m] rolling straightedge to ensure that no smoothness deficiency is in excess of 3/8 inch [10 mm]. When the intermediate layer is straightedged, correct all deficiencies in excess of 3/8 inch [10 mm] as approved by the Engineer, before placing the next course.

Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Plans. Furnish a level with a minimum length of 4 feet [1.2 m] or a digital measuring device approved by the Engineer for the control of cross slope. Make this level or measuring device available at the jobsite at all times for the measurement of cross slope during paving operations.

330-12.2 Texture of the Finished Surface of Paving Layers: Produce a finished surface of uniform texture and compaction with no pulled, torn, crushed or loosened portions and free of segregation, sand streaks, sand spots, or ripples. Correct any area of the surface that does not meet the foregoing requirements in accordance with 330-12.4.

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface in sections less than 1 mile [1.5 km] in length and across the full width of the roadway unless approved by the Engineer.

330-12.3 Acceptance Testing for Surface Tolerance:

330-12.3.1 General: Notify the Engineer of the location and time of testing a minimum of 48 hours before beginning testing. Perform acceptance testing for surface tolerance on all pavement lanes and ramps where the width is constant, and document all deficiencies on a form approved by the Engineer. Perform all testing with a CTQP Asphalt Paving Level I technician.

Do not perform acceptance testing for surface tolerance with the rolling straightedge as provided below at intersections, tapers, crossovers, transitions at beginning and end of project, parking lots and similar areas. However, correct any individual surface irregularity in these areas that deviates from plan grade in excess of 3/8 inch [10 mm] as determined by a 15 foot [4.572 m] manual straightedge, and that the Engineer deems to be objectionable, in accordance with 330-12.4.

Provide traffic control in accordance with the Design Standards Index No. 627 during all testing. When traffic control can not be provided in accordance with Index 627, submit a Traffic Control Plan for the Engineer's written approval. Include the cost of this traffic control and testing in the Contract bid prices for the asphalt items.

330-12.3.2 Test Method: Perform acceptance testing with one pass of a standard 15 foot [4.572 m] rolling straightedge operated along outside wheel path of each lane tested. This does not preclude the Engineer from requiring additional acceptance testing at other locations within the lane being tested.

330-12.3.3 Acceptance Criteria for Last Layer Prior to Friction

Course: Furnish and operate an approved 15 foot [4.572 m] rolling straightedge for testing of the last layer prior to the friction course as directed and supervised by the Engineer. Correct all deficiencies in excess of 3/16 inch [5 mm] in accordance with 330-12.4, and retest the last layer prior to placement of the friction course. Where the final surface is not a friction course, meet acceptance criteria in accordance with 330-12.3.4.

330-12.3.4 Acceptance Criteria for Final Surface or Friction Course:

Upon completion of the final surface or friction course, perform acceptance testing for surface tolerance on the finished surface with a 15 foot [4.572 m] rolling straightedge. Correct all deficiencies in excess of 3/16 inch [5 mm] in accordance with 330-12.4, except do not correct by overlaying when the final surface is a friction course. For bicycle paths, correct all deficiencies in excess of 3/8 inch [10 mm] in accordance with 330-12.4.

330-12.3.5 Adjustment of Pay Item Quantity: The Engineer may waive corrections specified above if an engineering determination indicates that the deficiencies are sufficiently separated so as not to significantly affect the ride quality of the pavement and corrective action would unnecessarily mar the appearance of the finished pavement.

Where the Engineer elects to waive correction and the finished pavement surface is a friction course, the Department will reduce the pay quantity for Asphaltic Concrete Friction Course by the amount of friction course that the Contractor would have removed and replaced if the Contractor had made the correction.

Where the Engineer elects to waive a correction and the finished pavement surface is other than a friction course, the Department will reduce the appropriate pay quantity for Asphaltic Concrete by the equivalent quantity of materials that the Contractor would have removed and replaced if the Contractor had made the correction.

a. Where the pay quantity is in tons [metric tons], the Department will base the reduction on the volume that the Contractor would have removed (100 feet by lane width by layer thickness [30 m by lane width by layer thickness]) multiplied by the laboratory density for the mix.

b. For open-graded friction courses, the Department will base the reduction on the area that the Contractor would have removed (100 feet by lane width) [(30 m by lane width)] multiplied by the following spread rates:

1. for FC-2 with conventional aggregate, use 55 lb/yd² [30 kb/m²].
2. for FC-2 with lightweight aggregate use 32 lb/yd² [17 kg/m²].
3. for FC-5, use 75 lb/yd² [41 kg/m²].

If the Engineering determination indicates that the deficiencies on the bicycle path are due to field geometrical conditions, the Engineer will waive correction with no deduction on pay quantity.

330-12.4 Correcting Unacceptable Pavement: The Contractor may select one of the following methods, unless 330-12.3.4 prohibits overlaying:

a. Removing and Replacing: If correction is made by removing and replacing the pavement, remove the full depth of the course and extend at least 50 feet [15 m] on either side of the defective area for the full width of the paving lane.

b. Overlaying: If correction is made by overlaying, cover the length of the defective area and taper uniformly to a featheredge thickness at a minimum distance of 50 feet [15 m] on either side of the defective area. Extend the overlay the full width of the roadway. Maintain the specified cross slope. The Engineer may adjust, as necessary, the mix used for the overlay for this purpose.

c. Other Methods: For parking lots as well as bicycle paths and courses which will not be the final pavement surface, correct minor straightedge deficiencies by methods other than specified above as approved by the Engineer.

Perform all corrective work, at no cost to the Department.

330-12.5 Control of Cross Slope: Equip the paving machine with electronic transverse screed controls to obtain accurate transverse slope of the pavement surface. Measure the cross slope of pavement surface by placing an approved measuring device

perpendicular to the roadway centerline and calculate the cross slope in percentage to the nearest 0.01% and round it to the nearest 0.1%.

Measure the cross slope with a minimum frequency of one check every 100 feet [30 m] during paving operations to ensure that the slopes are uniform and in compliance with the designed slope. When the difference between the measured cross slope and the designed cross slope exceeds $\pm 0.2\%$ for travel lanes including turn lanes and $\pm 0.5\%$ for shoulders, make all corrections immediately to bring the cross slope into an acceptable range. The Engineer will periodically verify the Contractor's measurements at the job site. Record all the measurements performed by the Contractor on an approved form and submit to the Engineer for documentation.

When the variance of cross slope measurements are consistently within the acceptance range, the frequency of cross slope checking can be reduced to one measurement every 250 feet [70 m] during paving operations.

The Engineer will randomly take ten measurements of the cross slope per day for the first two days of construction. If the average cross slope of the ten random measurements per day varies more than the required tolerance (0.2% for travel lanes including turn lanes and 0.5 % for shoulders), the paving operation shall be stopped until appropriate corrective actions are made to bring the cross slope into an acceptable range. Approval of the Engineer will be required prior to resuming paving operations. A recheck of ten random measurements will be made afterward. If the recheck indicates that the cross slope is still out of control, the deficient section shall be corrected in accordance with Section 330-12.4. During production, the Engineer reserves the right to take ten measurements of cross slope for any paving day. If the average cross slope of the ten measurements varies more than the required tolerance, the paving operation will be stopped until appropriate corrective actions are made to bring the cross slope into acceptable range.

The Engineer may waive the corrections specified above if an engineering determination indicates that the deficiencies are sufficiently separated so as not to significantly affect the ride quality and the surface drainage of pavement and corrective action would unnecessarily mar the appearance of the finished pavement.

For intersections, tapers, crossovers, transitions at beginning and end of project and similar areas, the cross slope shall be adjusted as directed by the Engineer to match the actual site conditions.

330-13 Protection of Finished Surface.

Keep sections of newly compacted asphaltic concrete, which are to be covered by additional courses, clean until the successive course is laid.

Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

Equip blade graders operating adjacent to the pavement during shoulder construction with a 2 by 8 inch [50 by 200 mm] or larger board, or other attachment providing essentially the same results, attached to their blades in such manner that it extends below the blade edge in order to protect the pavement surface from damage by the grader blade.

To prevent rutting or other distortion, protect sections of newly finished dense-graded friction course and the last structural layer prior to the friction course from traffic until the surface temperature has cooled below 160°F [70°C].

The Contractor may use artificial methods to cool the pavement to expedite paving operations. The Department may direct the Contractor to use artificial cooling methods when maintenance of traffic requires opening the pavement to traffic at the earliest possible time.