

SECTION 332

HOT MIX ASPHALT CONCRETE – METHOD SPECIFICATION

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332.01 SCOPE

This specification covers the Department's requirements for the production, placing and compaction of hot mix, hot laid base course, surface course and leveling course asphalt concrete for pavement construction. In addition to all requirements contained within this specification Section 330 also applies.

Method specification projects are identified as projects where the Department conducts all materials testing and engineering services and the Contractor's payment is based upon tonnage of production for a specific project with some minimal performance criteria applied.

332.02 REFERENCES

Reference standards shall be the latest revision at the date of Tender closing. This specification refers to the following standards, specifications or publication:

- Asphalt Institute – Asphalt Mix Design Methods - MS-2
- AASHTO T329 “Standard Method of Test for Moisture Content of Asphalt Mixtures by Oven Method”
- ASTM D979 “Standard Practice for Sampling Bituminous Paving Mixtures”
- ASTM D995 “Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures”
- ASTM D2041 “Standard Test Method for Theoretical Maximum Specific Gravity and Density of Asphalt Mixtures”
- ASTM D2172 “Standard Test Methods for Quantitative Extraction of Asphalt Binder from Asphalt Mixtures”
- ASTM D3549, “Standard Test Method for Thickness or Height of Compacted Asphalt Mixture Specimens”
- ASTM D5361 “Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing”

332.03 DEFINITIONS

PGAC Content: This is the percentage of performance graded asphalt cement in the asphalt concrete mixture, determined in accordance with ASTM D2172.

Hot Mix Asphalt (HMA): means hot mixed, hot laid asphaltic concrete. The terms are used interchangeably. HMA may include recycled or specialty mixes.

Mix Property: Mix properties measured for product acceptance and price adjustments are for asphalt cement content, PGAC grade, thickness density and smoothness.

332.04 GENERAL

This item consists of supplying crushed aggregates, blending materials, anti-stripping additive, PGAC and the production, loading, hauling, placing and compaction of HMA concrete. The limits of placement, thickness and the asphalt concrete mixture type shall be as stated in the contract specifications. Production and placement of HMA will be subjected to various quality tests.

All aspects of the production and placement of the HMA will be supervised by the Department. All appropriate inspection and testing will be determined by the Department.

332.05 MATERIALS

All materials required to produce the asphalt concrete will be supplied by the Contractor. Details regarding the property requirements for the asphalt cement, coarse aggregate, fine aggregate, blending sand and anti-stripping additive are presented in Section 330.

HMA is a carefully controlled mixture of PGAC and mineral aggregates thoroughly mixed to be free from segregation, contamination and placed and compacted to a uniform density and smooth finish.

332.05.01 Testing and Inspection

The Contractor shall provide a field laboratory in accordance with the provisions of Section 111. The field laboratory shall be provided at the site of the asphalt mixing plant.

The requirements for pit and quarry sampling and processed material sampling and approval as set forth in Section 310 shall apply to this section. The Contractor shall send to the Department's Main Laboratory, samples of the proposed asphalt aggregates for testing as to quality, mix design and approval by the Materials Engineering Division. No samples will be accepted for mix design until 100% of the total aggregate required (including filler and blending sand) has been crushed, tested and properly stockpiled separately.

Quality control tests shall be performed, by the Department, on random samples taken either at the production or lay-down site.

332.05.02 Designation of Mixture

The Materials Engineering Division shall specify a job mixture within the required limits of grading and conforming to the Marshall Test requirements provided in Section 330 for each required mix. The Materials Engineering Division may select one or more mix proportions to suit job conditions. The actual grading of the job mix, when plotted, shall so range from coarse through fine sizes that it will approximate the shape of the plotted average grading for corresponding mix given in Section 330. For that portion of the aggregate passing the 4.75 millimetre sieve, gradients which range from the maximum of one sieve to the minimum of the next larger sieve, shall not be permitted.

The Contractor shall be notified of the designated composition of the mixture not later than 10 working days after the day on which all necessary samples have been received at the Department's Laboratory and shall not commence mix production before such notification.

332.05.03 Unauthorized Tampering with Plant Settings and Materials

Any person employed by the Contractor, who, in the opinion of the Owner's Representative, alters or causes to be altered, any settings or screens of an asphalt plant after it has been calibrated, or who adds or causes to be added, any unapproved material to a stockpile or aggregate, or in any way hampers the production of the mix as designed shall, at the written request of the Owner's Representative, be immediately removed from the project and shall not be employed in the work.

332.06 CONSTRUCTION

The Contractor is responsible to ensure all equipment is designed and operated to produce a product complying with the requirements of this specification and Section 330. Equipment used shall be of adequate rated capacity and shall be in good working order.

332.06.01 Preparation of Gravel Road Surface

Where paving is to take place directly on top of a gravel surface, the Contractor is responsible to prepare the road to the satisfaction of the Owner's Representative. Not less than 300 metres of prepared grade shall be maintained in front of the paver at all times, except at the end of the paving operation for that day.

Where the top layer of Granular "A" is placed under the same contract as the paving, then the preparation of the Granular "A" prior to paving shall be carried out in accordance with Section 315. However, where the paving is to take place directly on top of materials that were not placed in the paving contract, the Owner's Representative may require, preparation be carried out in accordance with Section 301.

332.06.02 Preparation of Paved Surface

When required by the Owner's Representative, the Contractor is responsible to ensure paved surfaces are cleaned and treated with tack coat prior to repaving with HMA. Such treatment with tack coat as may be required shall be carried out in accordance with Section 320.

332.06.03 Production

The asphalt mixing plant and its components shall meet the requirements of ASTM D995.

332.06.04 Placement

The Contractor shall not place asphalt concrete under the following conditions:

- When it is raining.

- When the surface is frozen.
- When the pavement surface shows signs of free-standing water.
- When the air temperature at surface is below 7°C.

Placement of asphalt concrete shall only be conducted during daylight hours, unless specifically noted otherwise in the contract specifications. No course shall be placed upon a previously laid course less than 12 hours after final compaction of the latter, except with the permission of the Owner's Representative.

Asphalt concrete shall be placed upon a prepared surface which is free of any loose or foreign material. The asphalt concrete shall be spread by a mechanical self-powered paver capable of achieving the specified grade, line and crown, in accordance with Section 330.

The temperature of the mixture immediately after spreading and prior to initial rolling shall not be less than 125°C. Immediately after any pavement course is laid and before roller compaction is started the surface and edges shall be checked and any irregularities adjusted by the addition or removal of mixture.

Contact edges of existing mats, milled asphalt pavements, perimeters of asphalt patches and contact faces of curbs, gutters, manholes, sidewalks bridge structures, etc. as well as any new mat joint shall be coated with a double application of tack coat before placing the asphalt concrete.

Mixtures may be spread by hand only in places inaccessible to the paver. Hand placing shall be from a steel dump board by means of hot shovels. Hand spreading shall be with rakes of suitable design. The mixture shall be spread to the depth required to give the compacted design thickness after rolling. No loads of mixture shall leave the plant so late in the day as to preclude the spreading and compacting of the mixture during daylight.

Fuel spills from the Contractor's equipment shall be immediately repaired by the Contractor to the satisfaction of any Environmental regulations and the Owner's Representative.

Paving of intersections, ramps and driveway tie-ins are integral with the work. No separate payment or compensation will be provided for this work.

332.06.05 Joints Construction

The Contractor is responsible to ensure all joints are constructed to form a dense, well-bonded, continuous seal and to provide a smooth riding surface.

All foreign material and all loose material shall be removed from all faces against which joints are to be made. All cold faces against which joints are to be made shall be cut back to full mat thickness to expose a fresh vertical face and coated with a double application of tack coat.

All joints shall be constructed such that any excess material is not scattered on the surface of the freshly laid mat. Such excess material shall be carefully removed and disposed of as directed.

332.06.05.01 Transverse Joints

Transverse joints shall be butt joints constructed at the end of each day's work and when paving is halted for any period of time which results in the asphalt concrete cooling to below 120°C. When paving resumes, temporary tapers or ramps from previously placed asphalt concrete shall be cut back to full mat thickness to expose fresh, straight vertical surfaces. Loose or broken material shall be removed and surfaces tacked, at the Contractor's expense, in accordance with all Contact Documents.

Transverse joints shall be checked with a straight edge immediately after initial rolling. Any irregularity in the pavement surface at the joint shall immediately be corrected by the addition of or removal of mixture. When possible, the transverse joints shall be initially rolled in a direction perpendicular to the direction of paving.

332.06.05.02 Longitudinal Joints

Longitudinal joints in the top lift shall not be constructed within a travel lane except when paving tapers and where it can not be avoided. In no case shall longitudinal joints be constructed in the wheel paths. Joints in preceding lifts shall be offset a minimum of 150 millimetres to 300 millimetres for the highway classifications.

Longitudinal joints shall be rolled immediately upon placement of the fresh mixture and before the adjacent strip has completely cooled. The joint shall be set up with the back of a rake or lute at proper height and grade to receive the required compression under rolling. The depth of the newly laid mat shall be adjusted to allow for compaction. The paver shall overlap the existing mat by approximately 25 to 40 millimetres.

Prior to placing the adjacent mat, the exposed edge of each longitudinal joint must be coated with a double application of tack coat. Upon completion of each day's paving, the maximum length of exposed joint edge shall be 60 metres.

Longitudinal joints shall be matched by the end of each day's operations. Unmatched asphalt longitudinal joints left exposed at the end of the day, or exposed to moisture, shall be cut back to full depth to expose a fresh vertical face, and coated with a continuous thin coating of hot asphalt cement to the full fresh vertical face.

Asphalt mat edges having companion longitudinal joints shall be matched within the maximum allotted time period as determined by the Owner's Representative. All longitudinal joints shall be matched by the spreader with ski.

The maximum allotted time period shall be restricted to a lower limit of one hour with an upper limit of two and one half hours. The allotted time limit will be proportioned on the paving lay-down conditions; with the lower time limit applied to least favorable placement conditions and the upper time limit applied to favorable placement conditions. Lay-down conditions considered by the Owner's Representative in establishing the time limit will include ground surface temperature, hot mix lay-down temperature, placement capacity, ultraviolet intensity, wind speed and air temperature.

In locations where cold planing and paving of adjacent lanes is required, sequential mill and fill for longitudinal joint construction and paving is to be followed. The first lane is to be completed (cold planed and paved) prior to cold planing of the adjacent second lane. Cold planing of the adjacent second lane must include the removal of the shared longitudinal joint by cold planing a minimum of 100 millimetres of the first paved lane. Cold planing and paving of the adjacent second lane is not to take place until the next day. All lane edges remaining in the work are to be clean and coated with a double application of tack coat.

332.06.05.03 Keyed Joints

When overlaying existing asphalt concrete pavement, keyed joints shall be constructed at both ends of the project, at all intersecting roads, ramps and at all bridge decks in the repaving area. The taper length for such keyed joints shall be a minimum of 15 metres. Keyed joints will only be required between the final lift of pavement and the existing pavement, unless otherwise directed by the Owner's Representative.

When existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a temporary (hot mix asphalt concrete ramp) taper at the joint area to a slope of at least 50 horizontal to 1 vertical (50H:1V). Temporary tapers (ramps) shall be installed immediately following milling of the keyed joint and prior to opening the area to traffic.

332.06.06 Compaction

Unless otherwise authorized by the Owner's Representative the Contractor shall supply a minimum of two vibratory rollers and one pneumatic tired roller.

The initial breakdown rolling by a steel wheel roller shall commence as soon after placing as the mixture will bear the roller without checking or undue displacement. Rolling shall start longitudinally at the lower edge and proceed towards the higher edge of the course, overlapping on successive passes. Alternate passes of the roller shall be staggered.

Intermediate rolling, using a pneumatic tire roller, shall follow the breakdown roller as closely as possible. Passes shall be so arranged as to ensure overlapping successive tire paths. The Contractor shall be responsible for ensuring that the tires are in proper condition at all times to prevent pick up of the mixture.

Finishing rolling, using a steel wheel roller, shall be accomplished with the minimum number of passes required to produce a satisfactory surface. Rolling shall start longitudinally at the higher edge and proceed towards the lower edge. Final rolling will be with a roller operating in static mode. Static rolling will be conducted only to remove any irregularities in the pavement surface.

While rolling longitudinal joints, steel drums or rubber tires shall extend 150 millimetres over the previously placed mat.

Based on plant output the minimum number of rollers to be supplied by the Contractor shall be as shown below unless the Contractor is able to achieve the required density, surface texture, and smoothness with fewer rollers.

Plant Output, t/h	Rollers (min)
120	3
180	4
240	5
300	6

It is an express condition of this specification that all mixtures be compacted to the specified density immediately following placement. If, during the course of the paving operation, measured insitu field densities fall below the specified minimum, the Contractor shall revise their compaction process by:

- Increasing the number of passes of the compaction train.
- Adjusting the frequency amplitude or tire pressure of individual rollers.

- Adding additional rollers to the compaction train.

Steel drum rollers should operate with the drive wheel forward in the direction of paving. In all cases, the production and placing of the pavement mixture shall be controlled so that all rolling shall be completed before the pavement mat temperature falls below 80°C. The compaction process shall be completed before sunset.

332.06.06.01 Compacting With Static Wheel Rollers

In areas where a vibratory roller cannot operate (i.e. shallow utilities and bridge decks) compaction shall be obtained using suitable oscillatory or static steel wheel rollers but only when authorized by the Owner's Representative. To compact the mixture using static wheel rollers, a minimum of 2 steel wheel and 1 pneumatic tire rollers will be required to operate with each paver used. The operating speed of static steel wheel rollers shall not exceed 5 km/h and shall be slow enough to avoid displacement of the mix.

332.06.07 Surface Defects

The Contractor is responsible to ensure the finished surface of any pavement course shall have a uniform texture and be free of visible signs of defects. The Owner's Representative will identify surface defects and will be cause for automatic rejections of the asphalt pavement regardless of the value of any other acceptance parameter. The minimum area of rejection will be the actual length of the defect for the full width of the driving lane in which the defect exists. Rejected work shall be promptly repaired and the remediation technique utilized to repair the identified areas shall be discussed and mutually agreed upon by the Contractor and the Owner's Representative. Areas shall be constructed according to specifications and no additional compensation will be provided. No payment will be made for daily production which includes surface defects until all defects have been remedied. At the discretion of the Owner's Representative surface defects may be left in the work, however those areas will be subjected to a 50% unit price reduction. Such defects shall include, but not necessarily be limited to, the following:

1. Areas that exhibit bleeding/flushing or insufficient asphalt cement.
2. Roller marks.
3. Cracking or tearing.
4. Improper matching of longitudinal and transverse joints.
5. Tire marks.
6. Improperly repaired asphalt.
7. Improper cross slope.
8. Fuel spills on the mat.

Areas that exhibit segregation will be addressed as per below. Segregation is defined here as areas with predominantly coarser texture than that of the surrounding pavement, and can be first identified visually.

Slight Segregation:

Area where the matrix is in place between the stones but there is slightly more stone in comparison with the surrounding acceptable mix. Slight segregation may be left in place without price adjustment. The severity of segregation can be determined through a number of test methods, as specified by the Owner's Representative.

Medium Segregation:

Area has significantly more stone than the surrounding acceptable mat and usually exhibits some lack of surface matrix. Medium segregation in surface-courses will be subject to a price reduction of \$25 per square metre for the area in question, but for base-courses may be left in place with no price reduction. However, any areas of medium segregation that deteriorate prior to being overlaid by another pavement course must be repaired at the Contractor's cost.

Severe Segregation:

Area appears very stony, with stone against stone and little or no matrix. All areas of severe segregation in any pavement course will require removal and repair across the full lane width.

Defects as determined by the Owner's Representative, which occur in the finished surface of any pavement course during the two year warranty period resulting from poor workmanship, shall be repaired by the Contractor. No additional compensation will be provided.

332.07 QUALITY

332.07.01 Gradation

Hot mix asphalt shall be produced within the gradation envelope of Table 3 in Section 330. Cold feed sampling will be required when the daily average gradation is outside the specified limits on the 4.75 mm and/or 0.075 mm sieve sizes. The Owner's Representative will not accept any asphalt concrete produced without cold feed results demonstrating compliance.

332.07.02 Asphalt PGAC Content

Performance for PGAC content will be evaluated for unit price adjustment in accordance to Tables 1 and 2 utilizing the results representing the individual sample.

The following acceptance criteria shall apply for all mixes:

TABLE 1
PGAC Content Acceptance Criteria

TYPE OF TEST	ACCEPTABLE ZONE (%)	PENALTY ZONE (%)	REJECTABLE ZONE (%)
INDIVIDUAL SAMPLE	± 0.30	-0.30 TO - 0.50 +0.30 TO +0.50	<-0.50 OR >+0.50

TABLE 2
Unit Price Adjustment for PGAC Content for Individual Samples

Penalty Zone AC Content Deviation %	Unit Price Payment Adjustment Factor %	Penalty Zone AC Content Deviation %	Unit Price Payment Adjustment Factor %	Penalty Zone AC Content Deviation %	Unit Price Payment Adjustment Factor %
0.30	0.0	0.37	7	0.44	14
0.31	1	0.38	8	0.45	15
0.32	2	0.39	9	0.46	16
0.33	3	0.40	10	0.47	17
0.34	4	0.41	11	0.48	18
0.35	5	0.42	12	0.49	19
0.36	6	0.43	13	0.50	20
				> 0.50	Reject

332.07.03 Asphalt Density

The Contractor is responsible for the compaction stage of the work to ensure that the density conforms to requirements.

Compaction testing and unit price adjustments shall be based on daily production. Daily production is defined as the production and placement of 200 tonnes or more of HMA. If the daily production is less than 200 tonnes, the quantity for that day will be added to the next day or days in accordance with Table 3. If it is the last day of production for the project, the quantity for that day will be added to the previous day's production. If the total

quantity of asphalt mix is less than 200 tonnes for the project, two cores will be used to determine asphalt core density.

Test coring must be completed prior to placement of the next lift of asphalt concrete. If the Contractor believes that certain areas to be tested should be excluded from unit price adjustments, then those areas should be identified and submitted to the Department in writing prior to the pre-paving meeting with the Department.

Pavement samples will be taken on the road by an Owner’s Representative at random sample locations. Cores shall be a nominal 100 millimetres diameter. Sample locations will be determined by the Owner’s Representative using random sampling procedures, in which the daily production is divided into segments as shown in Table 3. A random sample is taken from each segment.

TABLE 3
Number of Segments per Daily Production

DAILY PRODUCTION OF ASPHALT CONCRETE	NUMBER OF SEGMENTS
200 to 500 t	2
500 to 1000 t	3
1000 to 1500 t	4
More than 1500 t	5

Segments shall be of approximately equal length. In each segment, a test site will be located by using random numbers to determine the longitudinal distance from the end of the segment and the lateral distance from the edge of the segment.

Cores for density price adjustments according to Table 4 shall not be taken within:

- Within 0.15 metres of the pavement edge or longitudinal joint.
- Closer than 6 metres to a transverse joint.
- Small areas such as tapers, bullnoses, aprons, bridge approaches, bridge decks, areas of handwork, and HMA used for isolated leveling.

Cores shall be obtained in accordance with ASTM D5361 after a minimum of 12 hours from mix laydown. Typically cores will be sampled within 24 hours after mix laydown. However, the length of time to core the pavement may be extended as authorized by the Owner’s Representative in order to exclude Saturdays, Sundays and holidays unless the Contractor is placing asphalt concrete on either day or to meet the minimum 200 tonne production requirement described above.

If the Contractor would like to have the cores removed immediately upon completion of their compaction process (and therefore avail of normal paving construction signage), the Contractor may supply dry ice at their expense for this purpose. With the application of approximately 1.5 kilograms of dry ice, coring can typically be completed within 20 minutes. Traffic control must be in place prior to and throughout the application of the dry ice, as this area must be protected from traffic.

During the coring operation, the Contractor must provide all traffic control in the form of flag persons and signs which conforms to Division 7 as well as the latest edition of the Department's Traffic Control Manual and amendments. Coring will not be permitted until all traffic control devices are erected and flag persons are in position.

Immediately following each coring operation, the Contractor shall reinstate the pavement at the core sample location in conjunction with removal of the core by dewatering the core hole and filling it with hot mixed asphalt concrete in 50 millimetre lifts to the pavement surface elevation, compacting each lift with 25 blows using a standard Marshall hammer. Each coring operation and the reinstatement of core hole is to be conducted during a single traffic control and flag person set up.

Failure to meet the time requirements for core hole repair may result in delayed paving of any subsequent asphalt production. In addition, if late on the repairing of core holes all bonuses will be void based on the results from these cores and a \$250 deduction per core location per day will be applied.

The percent compaction will be determined by comparing the core bulk densities, in accordance with ASTM D2726 with the average theoretical maximum density of the loose mix samples corresponding with the daily production of these cores, in accordance with ASTM D2041.

The Owner's Representative will provide the Contractor with a copy of the results of acceptance tests within three working days of their availability. For asphaltic base and leveling courses unit price adjustments will be applied utilizing Table 4 to each tonne of asphalt mix for the day (or days if daily production is less than 200 tonne) represented by the segments cored and the percent compaction averaged. For asphaltic surface courses unit price adjustments will be applied utilizing Table 4 for each individual core's percent of maximum theoretical, and the unit price adjustment will be applied to each tonne of asphalt mix for the day divided by the daily segments cored (or days if daily production is less than 200 tonne).

For all asphalt courses, in addition to the requirements noted above, if an individual core's percent of maximum theoretical falls below 93.5% or above 97.5% no bonuses will be paid for the paving day for that mixture.

Also, irrespective of the paving day, the average of any four consecutive samples of the same asphalt course shall have a reject limit of 92.0 % based on the four individual core's percent of maximum theoretical. The rejected material represented by the averaged four cores will be the sum of the four units of material represented by each core defined as the tonnes of the asphalt mixture type for the day divided by the daily segments cored (or days if daily production is less than 200 tonne). Units of rejected material will not be rejected twice or more.

TABLE 4
Unit Price Adjustment for Density

% OF MAXIMUM THEORETICAL DENSITY	UNIT PRICE ADJUSTMENT (\$ PER TONNE)
> 97.5	0
>97.0 to ≥ 97.5	+0.50
>95.0 to ≥ 97.0	+1.50
>94.5 to ≥ 95.0	+0.50
>94.0 to ≥ 94.5	0
>93.5 to ≥ 94.0	-0.50
>93.0 to ≥ 93.5	-1.00
>92.5 to ≥ 93.0	-2.00
>92.0 to ≥ 92.5	-4.00
>91.5 to ≥ 92.0	-6.00
>91.0 to ≥ 91.5	-10.00
>90.5 to ≥ 91.0	-15.00
>90.0 to ≥ 90.5	-20.00
≤90.0	REJECT

332.07.04 Requirement for Asphaltic Leveling Course

Asphaltic Leveling Course shall be used to fill surface depressions on old pavement, to restore the surface to the original profile and cross section. Surface preparation shall following the requirements of Section 320. Patching and leveling shall not be carried out simultaneously at the same place. The patch shall be placed and fully compacted before leveling operations may proceed over the patch.

332.07.05 Requirements for Completed Asphaltic Base and Surface Courses

Each course, after final compaction shall be smooth, true to the established crown and grade, shall have the thickness specified, and at no point shall any one core vary from the specified thickness as indicated in the table below.

TABLE 5
Thickness Tolerance and Payment/Rejection Criteria

Project Design Lift thickness	Prescribed Calculated thickness tolerance
50 mm	±8 mm
60 mm	±9 mm

Individual core samples that do not satisfy the prescribed thickness tolerances of Table 5 shall be rejected. Rejected work shall be promptly repaired and the remediation technique utilized to repair the identified areas shall be discussed and mutually agreed upon by the Contractor and the Owner’s Representative. Areas shall be constructed according to specifications and no additional compensation will be provided. No payment will be made for daily production which includes deficient thickness until remedied. The area should be tacked and allowed to cure prior to the placement of any new asphalt. The new asphalt shall immediately be compacted to conform to the surrounding area and be thoroughly bonded.

Individual core samples that do not satisfy the prescribed minimum thickness tolerances above shall be rejected. At the discretion of the Owner’s Representative, the asphalt may be left in place provided there were no density penalties or surface defects present in the sample area. However payment for the rejected components will be at 50% of the various contract unit prices. The area to be rejected/price reduced will correspond to the tonnage associated with the failed core.

Individual core samples that do not satisfy the prescribed maximum thickness tolerances above shall be rejected. At the discretion of the Owner’s Representative, the asphalt may be left in place provided there were no density penalties or surface defects present in the sample area. However, the asphalt left in place shall be subjected to an adjustment of the mix components, based on the ratio of actual thickness to the maximum allowable thickness in accordance with the formula below or 5%, whichever is greater. The asphalt quantity to be adjusted will correspond to the tonnage associated with the failed core.

$$\text{Unit Price Reduction, \%} = \frac{T_{\text{Field}} - T_{\text{Maximum}}}{T_{\text{Maximum}}} \times 100$$

Where: T_{Field} = Field core thickness, millimetres
 T_{Maximum} = Maximum allowable core thickness, millimetres

332.07.06 Pavement Smoothness

Asphalt Pavement Smoothness will be in accordance with Section 334.

The surfaces of each base course, and any surface not subjected to smoothness testing under Section 334, shall be free from deviations exceeding 3 millimetres as measured with a 3 metre straight edge paralleling the centerline of the roadway.

332.08 ASPHALTIC PATCHING

Asphaltic patching involves patching pot holes in bituminous pavement, patching cuts for culverts, repairs for surface defects or patching transverse cracks with HMA.

Holes to be patched shall have all loose material removed and be cleaned of dirt and gravel.

Tack coat shall be applied to all edges to be repaired. Surfaces shall be thoroughly dry before tack coat is applied.

Asphaltic concrete for use in patching shall conform to the requirements of Asphaltic Surface Course or Asphaltic Leveling Course Type I, including the grade of PGAC specified in the contract documents, unless otherwise specified.

Asphaltic concrete shall be placed and leveled in the area in one or more lifts as determined by the Contract Documents, or as directed by the Owner's Representative. Once compacted, the patch must be level with the surrounding pavement and have a smooth driving surface. The patches shall be compacted in accordance with the requirements of 332.07.03.

332.09 MEASUREMENT FOR PAYMENT

332.09.01 Measurement for Payment for HMA

The quantity of asphalt concrete to be measured for payment shall be the number of tonnes of mix placed and accepted in accordance with this specification. Unit price adjustments calculated in accordance with Tables 1 to 4 and Section 332.07.05 shall apply.

332.09.02 Measurement for Payment for Asphaltic Patching

Measurement for payment shall be by the square metre of that material placed, rounded to the whole number. Unit price adjustments calculated in accordance with Tables 1 to 4 shall apply.

332.09.03 Measurement for Payment for PGAC

Unit price adjustments calculated in accordance with Tables 2 and Section 332.07.05 shall apply. The asphalt cement will be measured in tonnes, rounded to two decimal places. Payment for Asphalt Cement shall be as per the percentage (%) of asphalt cement required in the Design Mix Formula specified by the Materials Engineering Division. However, where Asphalt Cement contents are found to be deficient to the point of being in the "Penalty Zone" subsequently described, Asphalt Cement will be paid on actual content only, as determined by ASTM D2172. Any moisture content in the hot mix asphalt will be determined and deducted. The method of determination of this moisture content will be in accordance with AASHTO 329. The design mix formula may be revised, as required, by the Department throughout the project and at any point throughout production during the day.

For mixtures that contain RAP, the actual asphalt cement content in the RAP will be deducted from the extraction results obtained.

Samples of HMA shall be taken randomly, throughout each day of production, and tested to ensure conformance with the specifications stated herein. Sampling and testing shall be performed in accordance with ASTM D979 and ASTM D2172. Additional samples may also be taken and tested in accordance with ASTM D2172, for verification purposes.

If the test results representing the individual sample for asphalt cement content falls into the above-stated "Penalty Zone", the payments for both Asphalt Cement and HMA shall be adjusted by deducting a percentage from the unit prices per Table 2 for the Individual Sample. These adjustments shall apply to the areas of pavement represented by these samples.

If the test results representing the individual sample fall into the above-stated "Rejectable Zone", then no payment will be made for either the asphalt cement or hot mix asphalt represented by those samples.

In the event of any and all disputes over asphalt content, the asphalt contents as determined by the Owner's Representative, in accordance with the above stated method, shall govern in all cases.

332.09.04 Measurement for Payment for Blending Sand

The blending sand will be measured in tonnes, rounded to the nearest whole number. Unit price adjustments calculated in accordance with Section 332.07.05 shall apply.

Measurement for blending sand shall be determined on the basis of the computed quantity calculated from the percentage of blending sand specified in the mix design and the total tonnage of asphalt mix of that design used by the Department.

332.09.05 Measurement for Payment for the Cutting and Removal of Asphaltic Pavement

The cutting and removal of pavement in connection with the preparation of joints, as required in Section 332.06.05, shall be measured for payment in accordance with Section 510, and Section 520, except where the preparation of joints is required as the result of a break in the paving operations, in which case no measurement for payment will be made for either cutting asphaltic pavement or storage or disposal of old asphaltic pavement.

332.10 BASIS OF PAYMENT

332.10.01 Basis of Payment for HMA

Payment at the contract price for asphaltic base course, asphaltic surface course, asphaltic leveling course Type I or asphaltic leveling course, Type II as appropriate, shall be full compensation for:

1. The supply of all materials with the exception of asphalt cement and blending sand. The asphalt cement and the blending sand shall be paid for separately under other contract items.
2. The use of the required equipment, including a paver with a ski for base and surface course application on the TCH on other projects, where the contract item description, in the unit price table, includes the phrase "spreader with ski" then a ski attached to the lead spreader will be included as well.
3. The handling, storing, crushing, hauling, stockpiling, and preparation of all materials with the exception of blending sand and asphaltic cement.
4. The preparation of all joints with hot asphalt cement, together with the cutting and removal of pavement where a joint is required as the result of a break in the paving operations.
5. The mixing, placing and compacting of the asphaltic mixture, together with all haulage of the mixture to places within the contract.
6. All other costs arising from the requirements of the section for which payment is not otherwise specifically provided, including all keyed joints and the paving required for tie-ins at intersections, ramps and driveways.

332.10.02 Basis of Payment for Asphaltic Patching

Payment at the contract price for Asphaltic Patching shall be full compensation for:

1. The supply of all materials including asphalt cement and blending sand.
2. The use of the required equipment.
3. The handling, storing, crushing, hauling, stockpiling and preparation of all materials.
4. The clearing of all holes to be patched, together with the removal of loose material from the holes.
5. The supply and application of tack coat to the edges of the holes.
6. The mixing of the asphaltic mixture, and placing and compacting of the asphaltic mixture in the holes.
7. All other costs arising from the requirements of the section for which payment is not otherwise specifically provided.

332.10.03 Basis of Payment for PGAC

Payment at the contract price for Asphalt Cement shall be compensation in full for all labor, materials, and equipment to supply the PGAC including the purchase, loading, transportation, unloading and storage at the asphalt plant.

332.10.04 Basis of Payment for Blending Sand

Payment at the contract price for Blending Sand shall be compensation in full for all labor, materials, equipment-use and all other expenses to: provide a pit, obtain all required permits and approvals, excavate, load and provide all haulage from the source to the asphalt plant, stockpile the sand at the asphalt plant, pay any royalties for the material, clean up and restore the pit as may be required.

332.10.05 Basis of Payment for the Cutting and Removal of Asphaltic Pavement

Where cutting and removal of pavement is carried out in order to prepare a joint resulting from a break in the paving operations, then no payment will be made for the cutting and removal of the pavement since such work is considered part of the basis of payment for asphaltic base and surface courses.

However, where other asphaltic pavement is cut and removed then payment will be in accordance with Section 510 and Section 520.

332.10.06 Basis of Payment for Asphaltic Mix for Department's Maintenance Division

The Department's Maintenance Division may, on occasion have need for asphalt in the areas of a project. The Contractor will allow Department trucks along with their own trucks to pick up asphalt from the plant as required. Payment will be made to the Contractor by the tonne weighed over the scales and invoiced to the Department based on the tendered unit price in the Contract except in cases where the Contractor has a Standing Offer Agreement with the Department for supply of asphalt and the Unit Price in the Standing Offer Agreement is less than the Unit Price Table in the highway contract, then the Unit Price in the Standing Offer Agreement will apply.

332.10.07 Basis of Payment for Rejected Mix

The Department will pay for only the original mix quantity. The Contractor is fully responsible to bear all costs associated with repair of rejected areas, including all materials, equipment, plant, labour, traffic control and incidentals necessary to complete the work to the satisfaction of Owner's Representative.

If the Department determines the rejected material may remain in the work, and the Contractor elects not to repair the affected area, payment for the rejected mix components will be at 50% of the various contract unit prices.

332.10.08 Basis of Payment on Account of Asphalt Density or IRI Smoothness

No payment shall be made to the Contractor pursuant to Sections 332.07.03 and Section 334 before the end of the warranty period provided for in GC 31. If a warranty claim has not been made under GC 31, or if a warranty claim has been made under GC 31 and resolved, all payment(s) due to the Contractor pursuant to the above stated sections of the Specifications Book shall be made within 3 days of the later of the resolution of the warranty claim or the expiration of the warranty period referenced in GC 31.

If a warranty claim has been made under GC 31, no payment shall be issued until that warranty claim has been resolved. The Owner shall notify the Contractor in writing of any claims, within the warranty period, or no later than 10 business days from the expiration of the warranty period, based on results of an inspection completed within the warranty period. The Contractor must respond within 30 days of notification with an acceptable schedule to complete repairs. If after 30 days the Owner does not receive an acceptable schedule, the Contractor will be notified one additional time with another 30 day period to reach an acceptable schedule to rectify any claims. Thirty days after this second attempt, if there is no satisfactory resolution, and the warranty claims have not been resolved, the

Owner will consider any payments under Sections 332.07.03 and Section 334 to be forfeited by the Contractor. Forfeiting of these payments does not relieve the Contractor of their warranty obligations as defined in GC 31.1 'Warranty'.