

SECTION 333

HOT MIX ASPHALT CONCRETE – END PRODUCT SPECIFICATION

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333.01 SCOPE

This specification covers the Department's requirements for the production, placing and compaction of hot mix asphalt concrete mixtures, including material used for patching, for pavement construction. In addition to all requirements contained within this specification Section 330 also applies.

End product specification projects are defined as projects where the Contractor is solely responsible for the design, production, placement and all quality processes and quality control functions to ensure that all work meets the Department's specifications. The Department will perform quality assurance testing necessary to verify that the Contractor's work meets this specification. Payment to the Contractor is also based on tonnage of production with a more extensive price adjustment system which in turn is based upon the end product quality assurance verification test results carried out by the Department.

333.02 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 D2726 "Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted 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"
- ASTM E178, "Standard Practice for Dealing with Outlying Observations"

333.03 DEFINITIONS

End Product Specification (EPS): An end product specification is a specification under which the Contractor designs an asphalt job mix formula and has control and responsibility for the processes that produce the items of construction. The Department accepts or rejects the end product according to identified mix property performance measures. The Contractor is entirely responsible for ensuring the quality of the work. End product acceptance is the responsibility of the Department based on a program of quality assurance verification testing.

Design Mix Formula (DMF): The DMF is defined as the laboratory determination of the precise proportions of PGAB, additives and aggregates to be blended together to meet the specified properties for a given asphalt concrete mix.

Job Mix Formula (JMF): The JMF is the resultant establishment of the single definite percentage for each sieve fraction of aggregate and PGAB content that will produce the desired asphalt concrete mix properties under field conditions.

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

Stratified Random Sample: A stratified random sample is defined as a representative sample taken in an unbiased manner, by dividing a Lot into approximately equal segments. A random sample is taken from each area or segment.

Sample Mean: This is the arithmetic mean of the group of test results derived from the randomly selected samples.

Mean of the Deviations: This is the sum of the absolute values of the deviations divided by the number of tests in the Lot.

Mix Property: Mix properties measured for product acceptance and price adjustments are as follows:

Gradation passing 4.75 millimetre and 75 μm sieves, PGAB content, PGAB grade, thickness, material application rate, density and smoothness.

Referee Sample: A referee sample is defined as the portion of the loose or core sample that is set aside by the Owner's Representative's laboratory in the case of an appeal of PGAB content, gradation, thickness and/or density by the Contractor.

Lot - Quantities Greater than 4800 tonnes

For each mixture type specified, a Lot is defined as the quantity of asphalt concrete plant production, to a total of 2400 tonnes, where changes to the Job Mix Formula have not occurred. For loose samples, each Lot shall be divided into 4 approximately equal segments and one loose sample is randomly selected from each segment. For core samples, each Lot shall be divided into 4 approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

If it is the last time the mix is produced and this criterion cannot be met (i.e. less than 2400 tonnes of mix remain), the following shall apply:

If the remaining plant production is 600 tonnes or less, the production will be added to the previous Lot. The adjusted Lot shall be divided into 5 approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

If the remaining plant production is between 600 and 1200 tonnes, the production will be added to the previous Lot. The adjusted Lot shall be divided into 6 approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

If the remaining plant production is greater than 1200 tonnes, but less than 2400 tonnes, the production will be designated as a separate Lot. The separate Lot shall be divided into 4 approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

In all cases above, the lot size shall be equally segmented and random samples selected from each segment.

A separate Lot will be established at the discretion of the Owner's Representative if conditions of construction indicate that it is likely that a portion of the Lot production is significantly different from the remainder of the Lot production.

Lot - Quantities Greater than 800 tonnes and Less than and Equal to 4800 tonnes

For each mixture type specified, a Lot is defined as the quantity of asphalt concrete plant production, to a total of 1600 tonnes, where changes to the Job Mix Formula have not occurred. For loose samples, each Lot shall be divided into 4 approximately equal segments and one loose sample is randomly selected from each segment. For core samples, each Lot shall be divided into 4 approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

If it is the last time the mix is produced and this criterion cannot be met (i.e. less than 1600 tonnes of mix remain), the following shall apply:

If the remaining plant production is 400 tonnes or less, the production will be added to the previous Lot. The adjusted Lot shall be divided into 5 approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

If the remaining plant production is between 400 and 800 tonnes, the production will be added to the previous Lot. The adjusted Lot shall be divided into 6 approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

If the remaining (or original mixture type) plant production is greater than 800 tonnes, but less than 1600 tonnes, the production will be designated as a separate Lot. The separate Lot shall be divided into 4 approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

In all cases above, the lot size shall be equally segmented and random samples selected from each segment.

A separate Lot will be established at the discretion of the Owner's Representative if conditions of construction indicate that it is likely that a portion of the Lot production is significantly different from the remainder of the Lot production.

333.04 GENERAL

This item consists of supplying crushed aggregates, blending materials, anti-stripping additive, RAP, PGAB, and the production, loading, hauling, placing and compaction of HMA concrete, including material required for patching. The limits of placement, thickness and the asphalt concrete mixture type shall be as stated in the contract specifications. Areas constructed will be subjected to various quality assurance testing.

It is the Contractor's responsibility to provide an acceptable product as specified. In order to achieve this, the Contractor shall implement and maintain a quality control system that will provide assurance that all components, as well as end result products, submitted to the Department for acceptance, conform to the contract requirements. This is without regard to whether the products are manufactured by the Contractor or purchased from suppliers or subcontractors. The Contractor's Quality Control System proposed for each project shall be provided to the Department in the form of a written Quality Control plan.

Quality assurance tests shall be performed, by the Department, on random samples taken at the lay down site on a frequency determined by the Department. The Department may, at its sole discretion, examine, inspect or test any aspect of the Contractor's work as deemed appropriate. Such inspections and testing shall not relieve the Contractor of their responsibilities for quality control.

333.05 MATERIALS

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

333.05.01 Mix Design Requirements

333.05.01.01 Establishing a Design Mix Formula (DMF)

Preparation and submission of the asphalt DMF for the Department's acceptance is the responsibility of the Contractor. The Contractor shall engage Professional Engineering services and a CCIL or AASHTO certified testing laboratory, to assess all materials including the aggregate gradations and physical properties, asphalt binders, blending sands, mineral fillers and anti-stripping additives proposed for use and to carry out the design of the asphalt concrete mix. Mix Design testing must be carried out by or under the supervision of a CCIL/AASHTO HMA certified technicians. Copies of technician

certifications must be submitted with the mix design. The submitted documentation shall be signed and sealed by a Professional Engineer registered to practice in Newfoundland and Labrador attesting to the validity of the material test data.

The HMA mix design must be completed within one calendar year from the date of submission. If the Contractor wishes to reuse a HMA mix design, within the calendar year and additional crushing is required, then aggregate must be produced within the production tolerance of the original material. Material that cannot be produced within tolerance will require a new HMA mix design. The additional crushing gradation results must be submitted to the Department for review and evaluation.

333.05.01.02 Requirements for Design Mix Formula

The asphalt mix design shall follow the Marshall method of the DMF as outlined in the MS-2 Manual. The mix design, at the design asphalt binder content, shall meet the requirements presented in Section 330 for each specified asphalt concrete mix. Mix designs shall be based on the PGAB content as a percentage of the mixture. As a minimum each mix design shall have:

- Five points of PGAB increasing in 0.5% increments.
- For all highway design classifications, the design air voids shall be chosen between 3.0 to 3.5%, such that all other mix design criteria are met.

333.05.01.03 Submission of Design Mix Formula

The Contractor's submission shall include the following information/materials:

- The specific gravity and the percentage by mass of each aggregate (including RAP, natural sand, lime) to be used in the mix.
- Individual asphalt aggregate gradations for coarse, fine and blend sand.
- The mix design gradation of the combined aggregate (including RAP, natural sand, lime).
- Physical properties of the aggregates specified, in accordance with Section 330.
- All Marshall mix design characteristics, including graphs used in arriving at the final mix design, the bulk relative density of the combined aggregates, and the asphalt absorption of the combined aggregates.
- Pit/Quarry identification consisting of its name, name of owner and public highway from which it is accessed.
- The Safety Data Sheets for the PGAB and any additive, if applicable.
- Viscosity-Temperature chart from the asphalt binder supplier determined by ASTM D2493.

- Mix Design and field technicians HMA and aggregate CCIL/AASHTO certificates.

333.05.01.04 Evaluation of Design Mix Formula and Aggregate Source

Evaluation of the aggregate source and DMF will be completed by the Materials Engineering Division. Sampling of the aggregates for the DMF/aggregate source evaluation will be completed for each DMF submitted, unless it is clearly indicated on the DMF submission it will be utilized for multiple projects. Sampling of the required stockpiles will only take place once a minimum of 30% of the aggregate is crushed, screened (blend sand) and stockpiled.

Sampling of all aggregate shall be done by the Contractor in the presence of an Owner Representative in accordance with ASTM D75 and delivered to the Materials Engineering Division in St. John's. Shipping is the responsibility of the Contractor, and they shall notify the Materials Engineering Division of the anticipated date of delivery. Samples of the aggregate (6) – 18 kg samples of coarse aggregate, (4) – 18 kg samples of fine aggregate, (2) – 18 kg samples of blend sand and 1 L of asphalt binder. More samples may be required if more than one DMF is required to be evaluated.

The Materials Engineering Division will require up to 14 days from time of receipt of the material to the date of notification to evaluate the aggregate source.

The Materials Engineering Division will require up to 10 working days from the time of receipt of the DMF, for evaluation. The DMF should not be submitted until all aggregates have been crushed or screened, tested and properly stockpiled separately. Evaluation will include verification of the asphalt mix design and specific gravity of each aggregate. The DMF must meet the requirements of Table 4 in Section 330. If the DMF does not meet the requirements of the Contract Documents, it shall be rejected. In case of discrepancies in the specific gravities values, results from the testing completed by Materials Engineering Division shall prevail.

The Owner's Representative shall provide a written explanation to the Contractor detailing why the DMF failed. The Contractor shall then provide another complete DMF and re-submit it to the Owner's Representative for evaluation. Each time a DMF is re-submitted, an additional 5 working days, from the time of receipt of the revised DMF, shall be required for evaluation.

The Owner's Representative will not accept any asphalt concrete mix produced, including materials required for patching, prior to the Contractor receiving written acknowledgement of receipt of all required documentation for the DMF from the Materials Engineering Division.

333.05.01.05 Establishing a Job Mix Formula (JMF)

The Contractor shall establish a JMF for each mix type by placing a specified quantity of HMA trial mix at a location designated by the Owner's Representative. Where the paving of base course is required within the project, the trialing of the surface course JMF shall be located within the designated base course at a location designated by the Owner's Representative. The maximum allotted quantity of HMA allowed for establishment of the JMF is as follows:

For Quantities greater than and equal to 4800 tonnes

- Base Course: 600 tonnes
- Surface Course: 600 tonnes
- Alternatively, the Contractor may elect to waive their trial mix option and submit their JMF (and supporting documentation) directly to the Owner's Representative for review.

For Quantities greater than 800 tonnes and less than 4800 tonnes

- Base Course: 200 tonnes
- Surface Course: 200 tonnes
- Alternatively, the Contractor may elect to waive their trial mix option and submit their JMF (and supporting documentation) directly to the Owner's Representative for review.

The HMA placed in the trial sections will be tested with a minimum of 3 QC tests and one set of cores to determine compliance with Section 330. One QA sample shall be taken by the Contractor and delivered to the Owner's Representative Laboratory for testing. Unit price adjustments and repair/replace/reject criteria will be applied to the Thickness and Density properties. The asphalt concrete shall be assessed for surface defects in accordance with 333.06.05.

333.05.01.06 Submission of Job Mix Formula

The Contractor shall submit the JMF in writing to the Owner's Representative for review. The Contractor's submission shall include the following information:

- The proposed lot upon which the change would be effective.
- New percentage by mass of each aggregate (including natural sand, lime) to be used in the mix.
- The JMF target asphalt binder content and new combined aggregate gradation.

- Predicted mix properties for air voids, voids in mineral aggregate and the dust to effective asphalt binder ratio. Include supporting test results (a minimum of 3 sets of QC results as per 333.05.01.05).

The Owner's Representative's acceptance of the JMF will allow the Contractor to start/continue production. Rejection of the JMF shall require the appropriate action based on the assessment.

333.05.01.07 Field Adjustments to the Job Mix Formula.

A field adjustment to the DMF or a JMF is defined as a change in the target gradation, asphalt binder content and/or proportioning of various aggregate sizes, within specified limits (when compared to the original DMF) as follows, without a redesign of the mix.

- $\pm 0.3\%$ in asphalt content
- $\pm 5.0\%$ in RAP proportion
- $\pm 5.0\%$ passing the 19.0 millimetre sieve
- $\pm 4.0\%$ passing the 12.7 and 9.5 millimetre sieves
- $\pm 3.0\%$ passing the 4.75 and 2.00 millimetre sieves
- $\pm 2.0\%$ passing the 0.425 and 0.150 millimetre sieves
- $\pm 1.0\%$ passing the 0.075 millimetre sieve

Upon acceptance by the Owner's Representative in writing, revisions to the JMF will be applied to subsequent Lots only. In no case will changes to the JMF be accepted during production of a Lot. The number of field adjustments to the original DMF or established JMF will be limited to two for quantities not exceeding 10 000 tonnes. For each additional 10 000 tonnes one additional field adjustment is permitted. Jurisdictional

The Contractor shall submit a new DMF, for the following changes:

- A change in the source of PGAB.
- A change in the source of the aggregate.
- A change in material (different aggregate sizes) from the same source.
- A change of the anti-strip additive.

333.06 CONSTRUCTION

The Contractor is responsible to ensure that equipment is designed and operated to produce an end 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.

333.06.01 Production

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

333.06.02 Placement

Placement conditions must follow all the requirements of Section 330.05.

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.

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.

Failed areas in existing surfaces (paved or gravel) as identified by the Owner's Representative shall be repaired. The remediation technique utilized to repair the identified areas shall be discussed and mutually agreed upon by the Contractor and the Owner's Representative. Irregularities in the horizontal alignment and grade along the outside edge of the asphalt concrete shall be corrected by the addition or removal of mix before the edge is rolled. Paving of intersections, extra widths and other variations from standard lane alignment and as defined in the contract, whether by hand spreading or machine laying, shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise authorized by the Owner's Representative.

Fuel spills from the Contractor's equipment must 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.

333.06.03 Joint 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.

333.06.03.01 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 Contractors 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.

333.06.03.02 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 PGAB 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 engineer 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.

333.06.03.03 Paving in Echelon

Where described in the contract specifications, pavers shall be used in echelon to lay the mat full width. Upon completion of each day's paving, the maximum length of exposed joint edge shall be 60 metres.

333.06.03.04 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.

333.06.04 Compaction

Compaction equipment shall consist of at least one of each of the following:

- Vibratory roller (a minimum of one roller must have double drum vibratory capacity)
- Pneumatic-tired roller
- Finish roller

Along curbs, manholes and similar structures and locations not accessible to full size rollers, the mix shall be compacted with smaller compaction equipment, such as vibrating plate tampers, or by hand tampers.

Based on plant output the minimum number of rollers to be supplied by the Contractor shall be as shown below unless the Contractor have proven the ability 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

333.06.05 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 rejection 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 in accordance with 333.10. Areas shall be constructed according to specifications and no additional compensation will be provided. No payment will be made for work in any lot 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 PGAB.
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.

333.07 QUALITY CONTROL

The Contractor is responsible for the quality process/program and quality control testing throughout every stage of the work from the crushing and production of aggregates to final product acceptance, to ensure materials and workmanship comply with the requirements of this specification. At no time, will the Owner's Representative issue instructions to the Contractor as to setting of dials, gauges, scales and meters. However, the Owner's Representative may advise the Contractor against the continuance of any operations or sequences of operations which will result in non-compliance with specification requirements.

The Contractor shall also be responsible for Quality Control testing of asphalt concrete patching mix used within the limits of the Contract. Asphalt concrete patching mix shall

not be considered as part of a Lot, however, QC records and documentation shall be made available.

333.07.01 Quality Control Inspection Testing Plan (ITP)

Following award of Contract, and at least 10 working days prior to commencement of asphalt concrete aggregate production, the Contractor shall submit, in writing to the Owner's Representative, an ITP covering all phases of the contract performance, including the name of the party retained to prepare the ITP. Failure to submit the ITP plan prior to the commencement of aggregate production will result in the application of liquidated damages in the amount of \$2500.

The ITP shall include, but not be limited to:

- Shall be sufficiently comprehensive and detailed to assure the Owner's Representative of the Contractor's willingness and ability to control the production, processes and construction.
- Identification and description of inspection and required test procedures to be utilized to fulfill the conditions of the Contract.
- Acceptance criteria applicable to each test.
- Inclusion of all reporting sheets.
- Identify and describe the process on how all non-conformances will be addressed. Include a non-conformance reporting template and a log to track all project non-conformances discussed with the Contractor.
- Include an organizational chart identifying all individuals working on the project and their respective responsibilities. The ITP must designate a Quality Control Manager who is Responsible for the development of the ITP. This person is responsible for signing off on all Quality Control testing and inspection records. Shall describe the sampling procedure in sufficient detail to ensure that a minimum area is affected. The method used to reinstate the sample area must be outlined such that the resulting mix is uniform, non-segregated, and well compacted.

Once accepted by the Owner's Representative the plan becomes part of the Contract and shall be enforced accordingly.

Test methods and minimum testing frequency the ITP must include are listed in Table 1.

The Owner's Representative will provide written acknowledgement of the ITP within 10 working days of receiving the same. The Contractor may be required to update and resubmit the ITP to the Owner's Representative, as conditions warrant.

TABLE 1
Quality Control Tests

Aggregate Characteristics/Mix Design	Standard	Minimum Frequency (A)
Sampling	ASTM D75	Preliminary aggregate testing
Sieve Analysis	ASTM C117, C136	Preliminary aggregate testing
Soundness (MgSO ₄)	ASTM C88	Preliminary aggregate testing
Los Angeles Abrasion	ASTM C131	Preliminary aggregate testing
Micro Deval	ASTM D6928, D7428	Preliminary aggregate testing
Freeze Thaw	CSA A23.2-24A	Preliminary aggregate testing
Petrographic Number (C)	CSA A23.2-15A	Preliminary aggregate testing
Flat & Elongated Particles (4:1)	ASTM D4791	Preliminary aggregate testing
Specific Gravity and Absorption, Coarse Aggregate	ASTM C127	Preliminary aggregate testing
Specific Gravity and Absorption, Fine Aggregate	ASTM C128 ⁽¹⁾	Preliminary aggregate testing
Fine Aggregate Angularity, Method A	ASTM C1252	Preliminary aggregate testing
Sand Equivalent	ASTM C2419	Preliminary aggregate testing
Crushed Particles	ASTM D5821	Preliminary aggregate testing
Stripping Test, Moisture Induced Damage	AASHTO T283 (and visual)	Preliminary aggregate testing
Boiling Water Test	ASTM D3625	One per mix design formula
Absorption	ASTM C127	Preliminary aggregate testing
Aggregate Production		
Sampling	ASTM D75	
Sieve Analysis (Crushed)	ASTM C136 & C117	Two coarse & two fine agg per lot
Sieve Analysis (Blending Sand)	ASTM C136 & C117	One per 300 tonnes
Fractured Particles (Coarse)	ASTM D5821	One per 1000 tonnes
Flat & Elongated (Coarse)	ASTM D4791	One per 5000 tonnes
Fine Aggregate Angularity, Method A	ASTM C1252	One per mix design formula
Sand Equivalent	ASTM D 2419	One per mix design formula
Cold Feed		
Sampling	ASTM D75	Two per lot
Sieve Analysis (Combined Gradation)	ASTM C136 & C117	Two per lot
Aggregate Moisture Content	ASTM D2216	Two per day
Hot Bin (Batch Plants)		
Sampling		
Sieve Analysis	ASTM C136 & C117	As required
Mix Testing		
Mix Asphalt Binder Content	ASTM D2172, D6307	Four tests per lot
Extracted Aggregate Sieve Analysis	ASTM D5444	Four tests per lot
Mix Moisture Content	AASHTO T329	Four tests per lot
Field Formed Marshall Briquettes	ASTM D6926	Four tests per lot

Flow & Stability	ASTM D6927	One per every two lots
Maximum Theoretical Density	ASTM D2041	Four tests per lot
Stripping Test, Moisture Induced Damage	AASHTO T283 (and visual)	One per 4800 tonnes
Boiling Water Test	ASTM D3625	One per 4800 tonnes
Other Related Tests		
Bulk Relative Density	ASTM D2726	Each core or briquette
Void Calculations, Cores or Formed Specimens (B)	ASTM D3203	Each core or briquette
Temperatures (plant and road)		Five per day per location
Sampling of Bituminous Mixes (Compaction/Height)	ASTM D5361 D3549	Four per lot
Density of Bituminous Concrete (by Nuclear Methods)	ASTM D2950	One per hour
Random Test Site Locations	ASTM D3665	Each lot
Correction Factors, Nuclear Moisture-Density	ASTM D2950	Once per contract or as req'd
Smoothness of Pavements	See Section 334	Top Lift

Notes:

- Conditions may require an increase in the frequency of any of the QC tests; the decision, arrangements and costs for which, are the responsibility of the Contractor.
- If two consecutive QC air void results fall outside the specified limits, the Contractor shall stop production. Prior to continuing production, the Contractor shall provide the Owner's Representative with written details of what measures have been taken to improve the properties of the mix. The Contractor shall not continue production until such time that the Owner's Representative has issued written authorization to do so. Failure on the part of the Contractor to adhere to this requirement, shall result in the portion of the Lot affected being ineligible for payment.
- Petrographic Number shall be accompanied with a breakdown of the geological constituents and shall be signed by a Professional Geologist registered to practice in Newfoundland and Labrador. Petrographic Analysis must be completed within one (1) calendar year from the submission of the Mix Design and be representative of the material produced for the respective project.

333.07.02 Sampling and Test Results

Where specified, random sampling procedures shall be followed, and where no specific random sampling procedure is specified, the sampling procedure shall be as identified by the Contractor in the ITP. The Contractor shall be responsible for the interpretation of the test results and the determination of any action to be taken to ensure that all materials and work conform to the requirements of the Contract.

The Contractor is responsible to maintain all QC records and documentation. Results of all QC testing carried out in accordance with Table 1 shall be provided to the Owner's Representative within 24 hours of sampling. Additionally, all QC documentation shall be made available for inspection by other Owner Representatives at all times. When requested, copies of the requested documentation shall be provided promptly. Failure to provide copies of the requested documentation within 24 hours shall result in the application of liquidated damages in the amount of \$250 per request, until the requested documentation is provided.

Results from AASHTO T283 and ASTM D3625 shall be provided within 14 days after sampling. Failure to meet the 14 day time requirement for test results will result in a \$2,000 holdback in payment as well as a \$1,000 liquidated damage being applied for each delayed test result.

At the end of the project, the Contractor shall provide a final report detailing **ALL** Quality Control data to the Owner's Representative as well as the Materials Engineering Division. A holdback of \$30,000 against project payment shall occur until the entire final report has been submitted and accepted by the Department.

333.08 QUALITY ASSURANCE

The Department will perform quality assurance (QA) verification to determine appropriate unit price adjustments. In addition to QA testing used to determine unit price adjustments, the Department may, at its sole discretion, examine, inspect or test any aspect of the Contractor's work at a frequency that the Department deems appropriate. Such inspections and testing shall not relieve the Contractor of their responsibilities for quality control and does not relieve the Contractor of their responsibility to deliver a quality product.

The Contractor shall supply a field laboratory for Quality Assurance purposes only as per Section 111. The laboratory will be located and setup to the satisfaction of the Owner's Representative at the nearest highway depot or another location as mutually agreed upon with the Owner's Representative. The Contractor will make separate arrangements for QC testing.

333.08.01 Sampling

All QA samples shall be taken from the roadway and labeled by the Contractor in the presence of the Owner's Representative. The label must include project number, lot and sample number, date, time, tonnage, mix type, sample method, location/station and HMA temperature. Random sample locations (loose samples and core samples) for QA testing

shall be generated by the Owner's Representative for each Lot and trial mix at the prescribed frequency dictated by lot tonnage.

Neither loose nor core samples will be taken from small areas such as tapers, aprons, bridge approaches, areas of handwork, and asphalt mix used for isolated leveling and repair of failed areas, however, the tonnage contained therein will be included in the Lot. Random samples will not be taken in areas of obvious surface defects as indicated in 333.06.05. These areas will be marked and repaired in accordance with 333.10.

The Contractor is responsible for transporting samples to the Owner's Representative laboratory immediately after sampling. Samples will be transported in locked transport boxes provided by the Department. At any time the Department may choose to transport any sample.

333.08.01.01 Loose Mix Sampling

The Owner's Representative will provide the Contractor with approximately 30 minutes advance notice of loose sampling requirements. Each loose sample will be split into 3 portions. One sample portion will be used for QC testing; another for QA and a third portion will be set aside by the Owner's Representative in the event it is required for appeal testing.

Loose samples can be obtained either from the discharge belt of the MTV or from the uncompacted mat behind the paver using plates, as per ASTM D979. If the Contractor opts to sample from the MTV, the MTV discharge belt must be discharged into a sampling cone of sufficient size and must avoid material spilling over the hopper. The material collected in the cone's collection pan must be transferred to an approved splitter, such as a quartermaster or approved equivalent. Portions collected on diagonally opposite corners of the quartermaster will be for QA and referee samples. Referee samples must be collected in sample boxes and delivered to Owner's Representative Laboratory.

333.08.01.02 Core Sampling

Lots and trial mix areas will be divided into 4 segments of approximately equal quantity. Three core samples will be taken at each location designated by the Owner's Representative. One core sample will be used for QC testing; another for QA and a third sample will be set aside in the event it is required for appeal testing. Cores shall be a nominal 100 millimetres diameter. Coring locations for each Lot will be selected as follows:

The Owner's Representative shall provide the Contractor with sample locations (station and offset) following placement of all asphalt concrete within a given Lot or trial mix area.

Where traffic control conditions warrant, consideration shall be given to providing random core sample locations for a given mat (i.e. before all asphalt concrete for the Lot has been placed).

Cores for density price adjustments according to Table 5 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.
- Within 10 metres of a loose sample location.

The Owner's Representative may use discretion in relocating random core locations that fall within areas of severe vertical curvature or grade (i.e. base or crest of a hill).

Cores shall be obtained in accordance with ASTM D5361 within a minimum of 12 hours and a maximum 24 hours after the placement of the asphalt concrete. The Contractor shall have the option of using dry ice to obtain the cores earlier than 12 hours after placement.

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 sampling and the core hole repair may result in delayed paving of any subsequent asphalt production. In addition, if late on the sampling of cores or repairing of core holes all bonuses will be void based on the results from these cores and a \$250 deduction per core location (per sub lot or set of three cores, QC/QA/referee) per day will be applied.

Cores damaged during sampling or handling shall be discarded and new samples shall be taken immediately adjacent (within 0.3 metres) to the original sample location. For the trial mix, a minimum of 1 random loose sample shall be taken for QA testing (i.e. for

determination of maximum theoretical density). Cores must be transported in sample boxes with flat bottoms, top side down and not double stacked.

333.08.02 Asphalt PGAB Content, Gradation

Performance for PGAB content and gradation will be evaluated for unit price adjustment in accordance to Tables 2 to 4 utilizing the mean of deviations for the lot.

The following acceptance criteria shall apply for all mixes:

TABLE 2
PGAB Content Acceptance Criteria

TYPE OF TEST	ACCEPTABLE ZONE (%)	PENALTY ZONE (%)	REJECTABLE ZONE (%)
Lot Mean of Deviations	± 0.30	-0.30 TO -0.50 +0.30 TO +0.50	<-0.50 OR >+0.50

TABLE 3
Unit Price Adjustment for PGAB Content for Lot Mean of Deviations

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

TABLE 4
Unit Price Adjustment for Gradation

Unit Price Adjustment for Gradation SIEVE SIZE (DESIGNATION)	AVERAGE DEVIATION OF THE GRADATION FROM THE JOB MIX FORMULA		UNIT PRICE ADJUSTMENT (\$ PER TONNE)
	Base Course	Surface & Levelling Type I Course	
Passing 4.75mm (#4)	0.00 to 6.00	0.00 to 5.00	0.00
	6.01 to 6.20	5.01 to 5.20	-0.50
	6.21 to 6.40	5.21 to 5.40	-1.00
	6.41 to 6.60	5.41 to 5.60	-1.50
	6.61 to 6.80	5.61 to 5.80	-2.00
	6.81 to 7.00	5.81 to 6.00	-2.50
	7.01 to 7.20	6.01 to 6.20	-3.00
	7.21 to 7.40	6.21 to 6.40	-3.50
	7.41 to 7.60	6.41 to 6.60	-4.00
	7.61 to 7.80	6.61 to 6.80	-4.50
	7.81 to 8.00	6.81 to 7.00	-5.00
	8.01 to 9.00	7.01 to 8.00	-10.50
	9.01 to 10.00	8.01 to 9.00	-15.00
Passing 75µm (#200)	> 10.00	> 9.00	REJECT
	0.00 to 0.60	0.00 to 0.50	0.00
	0.61 to 0.70	0.51 to 0.60	-1.00
	0.71 to 0.80	0.61 to 0.70	-2.00
	0.81 to 0.90	0.71 to 0.80	-3.00
	0.91 to 1.00	0.81 to 0.90	-5.00
	1.01 to 1.10	0.91 to 1.00	-7.50
	1.11 to 1.30	1.01 to 1.20	-12.00
	> 1.30	> 1.20	REJECT

In addition to the acceptance/rejection requirements for gradation, the following shall apply:

1. The Lot will be rejected if the average of the Lot test results from the 4.75 millimetre sieve size falls outside the gradation limits specified in Section 330 Table 3.
2. The Lot payment will be reduced by \$5.00 per tonne if the average of the Lot test results for the 75µm sieve size exceeds the upper gradation limit specified in Section 330 Table 3 for averages up to the maximum of 1.0% in excess.

3. The Lot will be rejected if the average of the Lot tests results from the 75µm sieve size exceeds the upper gradation limit specified in Section 330 Table 3 by more than 1.0% in excess.

333.08.03 Asphalt Density

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 for the Lot, in accordance with ASTM D2041. For asphaltic base and leveling courses unit price adjustments will be applied utilizing Table 5 to each tonne of asphalt mix for the Lot represented by the segments cored and the percent compaction averaged. For asphaltic surface courses unit price adjustments will be applied utilizing Table 5 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 Lot divided by the segments cored for the Lot.

For each asphaltic base, leveling and surface course mixture type per Lot, 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 entire Lot for that mixture. Also, irrespective of the Lot, the average of any four consecutive samples of a mixture type (base, leveling or surface) 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 Lot divided by the segments cored for the Lot.

TABLE 5
Unit Price Adjustment for Density

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

% OF MAXIMUM THEORETICAL DENSITY	UNIT PRICE ADJUSTMENT (\$ PER TONNE)
>90.5 to \geq 91.0	-15.00
>90.0 to \geq 90.5	-20.00
\leq 90.0	REJECT

333.08.04 Material Application Rate

The specified material application rate will be based on the specified asphalt design thickness as per the highway classification. The specified material application rate (MAR) will be calculated in accordance with the following formula:

$$MAR = T_D \times BD$$

Where: T_D = Specified Asphalt Design Thickness, metres
 BD = Bulk Density of the JMF, kilograms per cubic metre

For instance, a 50 millimetre asphalt mat thickness shall have a specified material application rate of 117.5 kilograms per square metre while a 60 millimetre asphalt mat thickness shall have a specified material application rate of 141.0 kilograms per square metre, based on a theoretical asphalt bulk density of 2350 kilograms per cubic metre.

On new construction and rehabilitated pavements, HMA shall be applied to the roadway at the rate or rates as specified by the Contractor and calculated as indicated above. Material application rates will be determined by the daily tonnage delivered to the paver as recorded by weigh tickets generated by automated scales, divided by the area covered the same day after allowance has been made for entrances and/or intersections. The Contractor shall provide the material application rates to the Owner's Representative at the completion of each day. The appropriate backup information (including calculations) for determining the material application rate shall be provided and include paving start and end stations, pavement widths, intersection areas, etc.

The payment adjustment for material application rate is shown in the following table. The acceptance limit is the limiting value of the actual material application rate, expressed as a percentage of the specified material application rate for each day. If the material application rate of a days production is outside the acceptance limits, the days production is rejected automatically regardless of the values of other acceptance parameters. Rejection for actual material application rates above the 110% or 106% will be applicable to the tonnage of HMA PGAB and blend sand that is in excess.

TABLE 6

Daily Adjustments for Material Application Rate

Actual Application Rate Expressed as % of Specified Application Rate*	Unit Price Adjustment (\$ per tonne) for all material daily	
	Lower Lift or Single Lift	Top Lift of Multiple Lifts
≥ 110	-\$6.00 for all material in the day up to 110% and no payment for product in excess of 110.0%	-\$6.00 for all material in the day up to 106% and no payment for product in excess of 106.0%
106.0 – 109.9	-\$4.00	-\$4.00
105.0 – 105.9		
104.0 – 104.9	\$0.00	-\$2.00
96.0 – 103.9	+\$0.50	+\$0.50
94.0 – 95.9	-\$1.00	-\$1.00
92.0 – 93.9	-\$2.00	-\$2.00
90.0 – 91.9	-\$3.00	-\$3.00
85.0 – 89.9	-\$5.00	-\$5.00
< 84.9	Rejected, Mill and Fill and/or rejected with no remedial work required at the discretion of the Owner's Representative	Rejected, Mill and Fill, Overlay and/or rejected with no remedial work required at the discretion of the Owner's Representative

*The specified material application rate will be calculated based on the asphalt mat thickness as per the highway classification and the asphalt bulk density of the JMF.

333.08.05 Thickness

The asphalt concrete will be placed in lifts at the thickness as per the contract specifications unless otherwise directed by the Owner's Representative. Asphalt cores will be evaluated for thickness on an individual basis for Acceptance and Rejection requirements as indicated in the table below.

TABLE 7
Thickness Tolerance and Payment/Rejection Criteria

New Paving All Lifts (i.e. On gravel or pulverized surfaces)

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

Repaving (i.e. First lift over existing asphalt)

Project Design Lift thickness	Prescribed Calculated thickness tolerance
50 mm	±10 mm
60 mm	±12 mm

Repaving (i.e. Second lift, subsequent lifts including milled surface)

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

If the thickness for the first lift of asphalt is less than the tolerance and a second lift of asphalt is to be placed under the contract, the Contractor shall place the second lift for asphalt to achieve a thickness equivalent to the total combined thickness required. The total first lift thickness shall be verified, for the deficient lot, by the cores taken from the second lift.

Payment/Rejection Criteria

If any individual core falls outside of the thickness limits as specified, the subplot that is represented by that core shall be rejected. At the discretion of the Owner's Representative the subplot may be left in place, however it will be subjected to a 50% price reduction.

Rejection of cores in a lot that exceed the maximum thickness tolerance may be waived at the discretion of the Owner's Representative pending there were no density penalties or surface defects in that lot.

333.08.06 Pavement Smoothness

Asphalt Pavement Smoothness will be in accordance with Section 334.

333.08.07 Reporting

QA test results for a given Lot will not be reported to the Contractor until the QC results for that Lot have been reported to the Owner's Representative. Further to this Contractors are advised the QA test results will not be available when the Contractor's QC testing is provided to the Owner's Representative. Any affect to the Contractors operations resulting from the QA testing timelines are considered incidental to the work and will not be subject to claims for delay or damages resulting from this practice. Tests performed by the Owner's Representative are not to be considered QC tests. If the Lot results for any one of the QA properties are outside the acceptance limits as listed in Tables 2 to 7, the Lot may be evaluated in accordance with 333.09.

333.09 APPEALS

The Contractor may appeal the results of QA testing for density, asphalt binder content, gradation and thickness for any rejected or penalized Lot/sublot. The Contractor may appeal the results of QA testing for density and thickness for any rejected or penalized trial mix. In the event of an appeal, the Contractor shall serve notice of appeal to the Owner's Representative, in writing, **within 48 hours of receipt** of the QA test results. If the Owner's Representative is in agreement to conduct appeal testing such testing shall be started within 7 days from the time of notification to the Contractor of an agreement to conduct the appeal. A short extension of the 7 day period for recognized operational concerns may be permitted by the Owner's Representative.

The Contractor may have a representative present during appeal testing. During the period of the testing, the Contractor's representative shall comment on anything concerning the testing which he or she does not consider to be valid and the Owner's Representative shall respond to all comments in order to resolve them.

Prior to leaving the testing laboratory any unresolved comments regarding the testing procedures are to be given to the Owner's Representative in writing. Any comments, with respect to the testing procedures, which are made subsequent to the Contractor's representative leaving the laboratory, will not be considered. The new Sample Result, Mean or Mean of the Deviations, whichever the case may be, so obtained shall be binding on both the Contractor and the Department.

333.09.01 Appeal of Individual Test Results

The Contractor may appeal individual results of acceptance testing for the asphalt binder content, gradation and thickness properties only. Appeal of individual results for density will not be permitted. When an individual test result from a Lot is challenged, the validity of the test result in question will be determined in accordance with ASTM E178, using a "t"-test at a 5 (five) percent significance level. If the outlier test procedure shows that the challenged test result is valid, then it will be used in the calculations. If the outlier test procedure shows that the challenged test result is not valid, then the test result will be discarded. The referee sample will be tested by the Owner's Representative. Regardless of the presence of outlying observations in the re-tested sample and remaining original results, the results from the referee sample will be binding on both the Contractor and the Department and will be used in the calculations. The results from the outlier testing will be used for any subsequent appeals. The referee sample shall be tested for the following mix properties: asphalt binder content, gradation, and maximum density, in the event that the results are needed for additional appeals, if required. A new Mean or Mean of the Deviations, for the combined test results, will be determined and this value will be used for acceptance and unit price adjustments.

333.09.02 Appeal of Test Results for the Entire Lot

The Contractor may appeal the entire Lot QA test results for the density, binder content, and gradation for any rejected or penalized Lot only once. Appeal of test results for the entire Lot will only be considered if just cause can be shown by the Contractor that the acceptance test results are not representative of the product placed. If the Contractor's quality control test results indicate greater deviations from the JMF than the quality assurance test results, no appeal will be allowed.

333.09.02.01 Appeal of PGAB Content, Gradation and Thickness

If the individual sample or Lot PGAB content, the individual sample or Lot gradation and/or the individual sample thickness are appealed, the Owner's Representative will submit the referee samples obtained in 333.08.02. for testing at the Owner's Representative laboratory. All original test results of the property appealed will not be considered. Only the new test results from the appeal will be used.

333.09.02.02 Appeal of Lot or Trial Mix Density

If the Lot or Trial Mix density is appealed, the Owner's Representative will submit the appeal core samples obtained in 333.08.03. Only the new test results from the appeal will be used.

333.09.02.03 Payment of Appeal Testing Costs

If the new test results after the appeal process indicate that a price adjustment no longer applies, then the testing costs incurred by the Department during the appeal process for that Lot shall be borne by the Department. The Contractor shall be responsible for any other costs that they may incur.

If the new test results after the appeal process verify that a unit price adjustment or rejection remains valid for that Lot, the sampling and testing costs incurred by the Department during the appeal procedure shall be charged to the Contractor.

333.09.03 Analysis of Rejected Lots

Following an appeal of the entire Lot, if the new test results continue to indicate rejection, the new test results will be analyzed, at the discretion of the Owner's Representative, to determine whether or not a portion of the Lot is acceptable. An analysis, as determined by the Owner's Representative, will be carried out to determine which segments may be acceptable. If the analysis indicates partial Lot acceptance, only those areas corresponding to the sample segment(s) in which rejected material placement occurred shall be subject to 333.10. Any and all price adjustments corresponding to the recalculated test results (excluding those in the rejected segment(s)) shall apply.

333.10 REPAIRS

Rejected work shall be repaired, remedied, overlaid, or removed and replaced at the Contractor's expense. The asphalt concrete replacement or overlay shall be the same asphalt concrete mix designation as that which is removed or overlaid. All joints and the underlying asphalt concrete mat shall be tack-coated prior to repair.

The mix tonnage associated with the repair shall be produced in accordance with this specification. The repair tonnage shall be sampled in accordance with 333.03. Asphalt concrete comprising repaired areas shall be subject to testing in accordance with 333.08 and unit price adjustments calculated in accordance with Tables 2 to 7.

The cost of retesting shall be borne by the Contractor. All costs associated with repairs, removal and replacement, or overlays are the responsibility of the Contractor.

333.10.01 Removal and Replacement

Rejected Lots or segments of Lots shall be removed by cold milling the full width of the affected mat and full depth of the lift in which the work is being performed.

Material removed shall become the property of the Contractor, to haul and stockpile or otherwise dispose of in an environmentally acceptable manner, at the Contractor's expense.

333.10.02 Overlaying

Overlaying as a method of repair will only be considered in areas designated by the Owner's Representative, for Lots or segments of Lots which are subject to rejection based on thickness or smoothness. The asphalt concrete mix used to construct the overlay shall meet the same requirements as the pavement which is overlaid. The overlay shall extend the full width of the underlying pavement surface and have a finished compacted thickness of not less than 40 millimetres.

A keyed joint shall be constructed at each end of the overlaid section as per 333.06.03.04. If an acceptable grade and cross slope cannot be achieved, the Contractor shall repair the area in accordance with 333.10. If an overlay results in the need for additional shouldering material or adjustments to guide posts and guardrail, this work shall be carried out, at the Contractor's expense, in accordance with the applicable items as per the Standard Specification.

333.11 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.

If the project contains patching, the QCITP shall outline sample frequency of the asphalt, specific to that project. This should be based on the quantity of patches and if they will remain in the finished work. Sampling shall be done in accordance with Section 333.08.01.

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 PGAB 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 Owners 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 333.08.03.

333.12 MEASUREMENT FOR PAYMENT

333.12.01 Measurement for Payment for HMA

The quantity of HMA 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 2 to 7 shall apply.

333.12.02 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 2 to 5 shall apply.

333.12.03 Measurement for Payment for PGAB

The quantity shall be the number of tonnes of asphalt binder incorporated and accepted into the work as determined by ASTM D2172 by the Department. The asphalt binder will be measured in tonnes, rounded to two decimal places calculated based on the average percentage (%) of asphalt binder content measured on a Lot basis. 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 T329.

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

The maximum amount of PGAB eligible for payment shall be the mix design PGAB content plus 0.3% with the following exception. Should the average asphalt test results on a Lot basis exceed the values in Table 4 in Section 330, payment for PGAB will be capped at the mix design PGAB content.

If the test results representing the Lot mean of deviations for PGAB content falls into the above-stated "Penalty Zone", the payments for both Asphalt Binder and HMA shall be adjusted by deducting a percentage from the unit prices per Table 3 and Table 6 for the Lot mean of deviations as appropriate. These adjustments shall apply to the areas of pavement represented by these samples.

If the test results representing the Lot mean of deviations fall into the above-stated "Rejectable Zone", then no payment will be made for either the PGAB 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.

333.12.04 Measurement for Payment for Blending Sand

The blending sand will be measured in tonnes, rounded to the nearest whole number.

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.

333.13 BASIS OF PAYMENT

333.13.01 Basis of Payment for HMA

Asphalt concrete will be paid for at the contract unit price per tonne for mix incorporated and accepted in the work, which price shall be full compensation for furnishing and transporting of all materials including aggregates, natural blending sand, PGAB, heating, handling, mixing, placing and compacting the mix, the supply of all equipment, plant, labour, traffic control and incidentals necessary to complete the work.

All price adjustments determined in accordance with this specification will be calculated on the final progress estimate.

333.13.02 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 PGAB 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.

333.13.03 Basis of Payment for PGAB

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

333.13.04 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.

333.13.05 Basis of Payment for Rejected Mix

A rejected mix shall be defined as any asphalt where a test result falls within the rejection zone for any test parameter.

Where the Department determines rejected material cannot remain in the work, the Contractor is fully responsible to bear all costs associated with the repair/replacement of rejected areas. This includes: all materials, equipment, plant, labour, traffic control and incidentals necessary to complete the work to the satisfaction of Owner's Representative. The Department will pay for only the original mix quantity.

Where the Department determines the rejected material cannot remain in the work, and the Contractor refuses to repair/replace the affected area, there will be no payment made for the rejected mix components

If the Department determines that rejected material may remain in the work, payment for the rejected mix components will be at 50% of the various contract unit prices.

333.13.06 Basis of Payment on Account of Asphalt Density, IRI Smoothness or Material Application Rate

No payment shall be made to the Contractor pursuant Sections 333.08.03, 333.08.04 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 333.08.03, 333.08.04 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'.