DIVISION 3

SPECIFICATIONS FOR PAVEMENT, SELECTED GRANULAR BASE COURSE AND RELATED MATERIALS

INDEX

SECTION 301

SCARIFYING AND RESHAPING

INDEX

301.01 SCOPE

This specification covers the requirements for the scarifying and reshaping of a road surface prior to the application of Selected Granular Base Course or Asphaltic Pavement.

301.02 OPERATIONS

Where directed by the Owner's Representative, the Contractor shall scarify and reshape a road surface prior to the application of Selected Granular Base Course or Asphaltic Pavement. The scarifying and reshaping shall be carried out within the lengths designated by the Owner's Representative, and within the width to be covered by the proposed pavement plus 0.3 metres on each side, or to such other width as the Owner's Representative may designate.

Where the road surface consists of Selected Granular Base Course of a particular type, the scarifying shall be to the full depth of the base course of that type or to a depth of 300 millimetres, whichever is less.

Where the subgrade consists of subgrade consisting of Other Material, then the scarifying shall be to a depth not less than 300 millimetres.

Where the road surface consists of subgrade consisting of rock, then scarifying as such will not be required and scarifying and reshaping operations shall simply consist of just reshaping the road surface.

Unsuitable roadbed materials, as determined by the Owner's Representative, which are encountered during the scarifying operation, shall be excavated to the lateral limits and depth directed by the Owner's Representative and shall be disposed of as directed. Such work shall be carried out in accordance with Section 206.

No boulders greater than 150 millimetres in diameter shall be left within 300 millimetres of the top of subgrade composed of Other Material. Such boulders over 150 millimetres in diameter which cannot be removed by the scarifying operation shall be removed by hand excavation, blasting or any other suitable method. All excavated boulders shall be removed and disposed of from the subgrade and ditches.

Excavations resulting from the removal of boulders or Unsuitable Material shall be backfilled with approved material to the specified grades, in accordance with Section 204.

Whenever the materials incorporated in the existing subgrade are insufficient to provide the required profile and cross section, the Contractor shall add additional approved material as directed by the Owner's Representative. Such work to be carried out in accordance with Section 204.

The maximum variation from the specified profile and cross section of the compacted, scarified and reshaped road surface shall be 30 millimetres unless paving is to take place directly on top of the scarified and reshaped material. In these situations, the finished surface shall not deviate by more than 10 millimetres at any place on a 3 metre straight edge.

Where, due to traffic use or for whatever other reason, the scarified and reshaped road surface no longer lies within the required tolerance, then before placing the next materials, the Contractor shall scarify and reshape the affected area again, all at their own expense.

301.03 COMPACTION

Road materials disturbed by the scarifying and reshaping shall be compacted.

Where subgrade is scarified and reshaped, the disturbed materials shall be compacted to not less than 95% of the maximum Standard Proctor Dry Density (ASTM D698).

Where select granular base course is scarified and reshaped, the disturbed materials shall be compacted to not less than 100% of the maximum Standard Proctor Dry Density (ASTM D698).

301.04 MEASUREMENT FOR PAYMENT

301.04.01 Measurement for Payment where subgrade and Select Granular Base Course are in the same contract.

Where subgrade was constructed under the same contract that also calls for the placing of selected granular base course, then any required scarifying and reshaping of the subgrade prior to placing granulars will not be measured for payment and no payment for the scarifying and reshaping will be made.

Boulders removed from the top 300 millimetres of Other Material subgrade, on a grading and placing selected granular base course job will not be measured for payment. However, boulders removed from the top 300 millimetres of subgrade in Other Material cuts will be measured for payment in accordance with Section 206.

Additional fill material shall be measured for payment in accordance with the provisions of Section 204, Section 206 or Section 207, as appropriate.

301.04.02 Measurement for Payment where road surface was constructed under a previous contract.

Where subgrade was constructed, or some selected granulars were placed under a previous contract, then such scarifying and reshaping of the road surface as the Owner's Representative requires shall be carried out and measured for payment. This measurement for payment shall be of the horizontal area actually scarified and reshaped from within the limits of length and width as designated by the Owner's Representative, and will be measured in square metres, rounded to the nearest whole number.

Boulders removed from the top 300 millimetres of Other Material subgrade, on a job where subgrade was constructed on a previous contract will be measured for payment in accordance with Section 206. The measurement for payment will be done in this case regardless of whether the boulders were from a cut or a fill.

The excavation of Unsuitable Material in the roadbed shall be measured for payment in accordance with the provisions of Section 206.

Additional fill material shall be measured for payment in accordance with the provisions of Section 204, Section 206 or Section 207, as appropriate.

301.05 BASIS OF PAYMENT

The basis of payment for any excavation of Unsuitable Material in the roadbed, and any additional fill material shall be in accordance with the provisions of Section 204, Section 206 or Section 207, as appropriate.

301.05.01 Basis of Payment where subgrade and Select Granular Base Course are in the same contract.

Where subgrade was constructed under the same contract that also calls for the placing of selected granular base course, no payment will be made for either the scarifying and reshaping or for the required compaction of the materials disturbed in the scarifying and reshaping operations.

For those boulders, removed from the subgrade in Other Material cuts, and which conform to the definition of Solid Rock as stated in Section 205, the basis of payment will be the contract unit price per cubic metre for Solid Rock hauled 1 kilometre or under. Such payment shall be full compensation for all labour, materials and equipment-use to excavate, handle, haul up to 1 kilometre and dispose of the boulders of individual size equal to or exceeding 0.5 cubic metres in measurement.

Where the Owner’s Representative requires that "Solid Rock" boulders from Other Material Cuts, be hauled in excess of 1 kilometre, additional payment for overhaul will be made in accordance with Section 215.

The cost of excavating and disposing of boulders greater than 150 millimetres in diameter and of carrying out the scarifying and reshaping and the compaction is considered compensated for as part of Section 206 and Section 207, as appropriate.

301.05.02 Basis of Payment where road surface was constructed under a previous contract.

Where subgrade was constructed or selected granulars were placed under a previous contract, payment shall be on the basis of the contract price for scarifying and reshaping and such payment shall be full compensation for all labour, materials and equipment-use to: scarify and reshape the roadbed, excavate, haul and dispose of all boulders greater than 150 millimetres in diameter but less then 0.5 cubic metres in volume which occur

within the required depth of scarifying in Other Material roadbed, and to compact the area disturbed by the scarifying and reshaping.

However, for those boulders removed from the required depth of scarifying, and which conform to the definition of Solid rock as stated in Section 205, the basis of payment will be the contract unit price per cubic metre for Solid Rock hauled 1 kilometre or under. Such payment shall be in full compensation for all labour, materials and equipment-use to excavate, handle, haul up to 1 kilometre and dispose of the "Solid Rock" boulders.

Where the Owner's Representative requires that "Solid Rock" boulders be hauled in excess of 1 kilometre, additional payment for overhaul will be made in accordance with Section 215.

No separate or additional payment will be made for second and subsequent scarifying or reshaping made necessary from any cause whatsoever.

SECTION 305

SUPPLY AND APPLICATION OF CALCIUM CHLORIDE

INDEX

305.01 SCOPE

This specification covers the requirements for the supply and application of a solution of calcium chloride in water to such areas of gravel roads that the Owner's Representative may designate.

305.02 MATERIALS

The calcium chloride shall be delivered to the site in the form of crystal flakes. Only calcium chloride flakes acceptable to the Owner's Representative shall be used. Water for forming the solution with the calcium chloride shall be clean water free of impurities.

The Contractor shall supply the calcium chloride and the water.

305.03 APPLICATION

The Owner's Representative will designate the limits between which the calcium chloride treatment is to be applied to the road.

The Contractor shall grade up the road to be treated to obtain a smooth grade prior to application of the calcium chloride.

The Contractor shall form a solution of calcium chloride and water of known proportions, so that the rate of application of calcium chloride is known and can be controlled by manipulation of the spreader.

The rate of application of the solution shall be such that the required weight of dissolved flakes is applied to each square metre of road surface. The rate of application shall be

0.9 kilograms of dissolved flakes per square metre, or such other rate of application of calcium chloride as the Owner's Representative may designate.

The calcium chloride treatment shall be applied uniformly using an approved spreader. The Contractor shall compact the treated gravel surface to 100% of Standard Proctor Dry Density.

Any spill of calcium chloride arising from broken bags or otherwise must be immediately cleaned up. Any quantity of calcium chloride that is recovered from a spill and cannot be utilized in the normal manner must be disposed of at an approved waste disposal site at the Contractor's expense. See Section 820 and the procedure for reporting spills as per the requirement of the Department of Digital Government and Service NL, Environmental Protection.

305.04 MEASUREMENT FOR PAYMENT

Measurement for payment shall be of the number of tonnes, rounded to two decimal places, of the calcium chloride flakes made into solution and applied within the required limits. This measurement will be made by computing the net weights of the sacks used.

305.05 BASIS OF PAYMENT

Payment at the contract price for calcium chloride shall be compensation in full for all labour, materials and equipment-use to supply the calcium chloride flakes at the site, supply the water, make up a calcium chloride solution, grade up the area to be treated, apply the calcium chloride solution and compact the road surface.

SECTION 310

USE OF PITS, QUARRIES AND STOCKPILES FOR PRODUCTION OF MATERIALS SUPPLIED BY CONTRACTOR

INDEX

310.01 SCOPE

This specification covers the Department's requirements for the use of pits and quarries for the production of materials to be supplied by the Contractor. Selected granular base courses, paving aggregates, winter sand, concrete aggregates, chip seal aggregate, armour stone, rip rap stone, select bedding for storm sewers, and such other materials

that may be specified to be supplied by the Contractor, together with Rock Fill In Place and Other Material Fill In Place where the contract item states "Supply Rock Fill In Place", or "Supply Other Material Fill In Place". Also included in this specification are the requirements for the stockpiling of aggregates, winter sand, and selected granular base courses.

However, this specification will not apply, but Section 207 will apply for the use of pits and quarries for the production of borrow, where the required borrow material is specified in the contract item as "Excavation Hauled 1 km or Under Solid Rock", "Excavation Hauled 1 km or Under Quarried Rock", "Excavation Hauled 1 km or Under Other Material", or "Excavation Hauled 1 km or Under Other Material Borrow".

310.02 PIT AND QUARRY INFORMATION

The Department will make available to the Contractor all information obtained by the Department as to sources of supply. Such information represents only the opinion of the Department as to the location, character or quantity of the material encountered and is available only for the convenience of the Contractor.

The Department assumes no responsibility whatever in respect to the sufficiency or accuracy of the information and there is no guarantee, either expressed or implied, that the conditions indicated are representative of those existing throughout the work or that unanticipated developments may not occur. It shall be the Contractor's responsibility to locate sources and to furnish and haul the aggregate and/or selected granular base course.

310.03 PIT AND QUARRY SAMPLING

The Department will make its testing facilities available to the Contractor for the purposes of testing the suitability of pits or quarries for the production of the required materials.

Preliminary approval of the quality and nature of the material submitted in samples will not constitute general acceptance of all the material in the source of supply.

310.03.01 Additional Pit and Quarry Sample Requirements for Selected Granular Base Courses, Winter Sand, and all Aggregates

The Contractor shall submit representative samples of all materials proposed for use as selected granular base courses, winter sand, paving aggregates, concrete aggregates, and chip seal aggregates. The Contractor shall deliver the samples to the Department's Materials Engineering Division in St. John's for approval of quality and nature prior to use in the work. Each sample shall contain not less than 25 kilograms of material.

Unless otherwise specified by the Owner's Representative, initial samples for quality testing may be of the materials in their natural state. The Contractor shall, at their own expense, sufficiently expose the proposed source of aggregates either by opening the face, by excavating test pits, or by core drilling so that representative samples of the material can be obtained. Subsequent and progress samples for quality testing shall be of the processed materials.

310.04 PERMITS AND AUTHORIZATIONS FROM OUTSIDE BODIES

310.04.01 Municipal or Local Government

The Contractor is responsible for ensuring their pit or quarry operations are carried out in conformity with all land-use or zoning regulations that may apply.

310.04.02 Department of Industry, Energy and Technology

Contractors are advised, that should the Contractor wish to carry out their pit or quarry operations on lands for which the mineral and quarry rights are vested in the crown, then the Department of Industry, Energy and Technology requires that prior approval be obtained before pit or quarry operations may begin. It is the responsibility of the Contractor to obtain the quarry permit from the Department of Industry, Energy and Technology.

310.04.03 Department of Fisheries, Forestry and Agriculture

Should the removal of trees be involved in the preparation of a pit or quarry, the Contractor is required to obtain a permit to cut the trees.

Application for a cutting or burn permit should be made to the local office of the Department of Fisheries, Forestry and Agriculture.

310.04.04 Department of Environment and Climate Change

Contractors wishing to set up an aggregate washing operation at a site must first obtain environmental approval before proceeding.

Contractors must apply in writing to the Department of the Environment and Climate Change. The following information must be supplied with the application:

1. Location of the proposed site.
2. Expected dates of operation of the washing plant including:
    - proposed starting date

- total days in operation
- hours in operation per day
- proposed completion date

3. Rate at which water is to be used (l/s).
4. Number and dimensions of settling ponds and the method of lining of the ponds.

310.05 CONTRACTOR'S NOTICE OF INTENT TO PRODUCE AGGREGATES, WINTER SAND, AND SELECTED GRANULAR BASE COURSES

Prior to the production of; aggregates, winter sand, and selected granular base courses, written notice of intent shall be provided to the Manager of Materials Engineering and to the appropriate Regional Engineer. Such notice of intent shall contain the scheduled starting date, pit or quarry location and processing equipment to be used and shall be received by the above-mentioned Department personnel at least 7 days prior to any production.

310.06 STRIPPING PITS AND QUARRIES

Prior to excavating materials, the area to be worked shall be cleared, grubbed and stripped of all unsuitable surface materials.

The topsoil shall be removed separately from the underlying materials and stockpiled. The Contractor shall ensure that the quality of the topsoil is not contaminated by mixing with other materials removed during the grubbing or stripping operations.

A sufficient area shall be opened ahead of the quarrying or pit excavating operation to prevent contamination by deleterious materials.

310.06.01 Additional Requirements for Stripping Pits and Quarries Intended for Aggregate, Winter Sand, and Selected Granular Base Course Production

Where the pit or quarry is intended for use in the production of aggregates, winter sand or selected granular base course, then the pit or quarry shall also be stripped of all weathered zones.

310.07 WORKING OF PITS SUITABLE FOR AGGREGATE OR SELECTED GRANULAR BASE COURSE PRODUCTION

The Contractor will not be permitted to work natural sand or gravel deposits in an indiscriminate manner that results in otherwise usable natural gravels being rendered unfit for future use in aggregate, winter sand or selected granular base course production.

In such pits, the Contractor will be required to use equipment that will excavate a vertical face extending from the floor of the pit to the surface of the deposit. The undermining of high faces will not be permitted. The use of scrapers, bulldozers, draglines and other types of equipment, which remove the deposit in more or less horizontal layers is prohibited, except for unique circumstances where it is demonstrated to the satisfaction of the Owner's Representative that an acceptable and consistent product can be obtained by this method.

310.08 PHYSICAL AND OTHER REQUIREMENTS

310.08.01 Physical and Other Requirements for Aggregates, Winter Sand and Selected Granular Base Courses

Paving aggregates, concrete aggregates, chip seal aggregate, winter sand and selected granular base courses shall conform to the appropriate physical and gradation requirements for that required type of material, as expounded in Section 330, Section 904, Section 340, Section 317 and Section 315, respectively.

Chip seal aggregate shall be screened and washed over a 6.35 millimetre screen. If the chip seal aggregate is to be stockpiled then screening and washing shall be performed before stockpiling.

310.08.02 Physical and Other Requirements for Armour Stone and Rip Rap Stone

Armour stone and rip rap stone shall conform to the requirements given in Section 615 and Section 610, respectively.

310.08.03 Physical and Other Requirements for Material to be used as "RockFill in Place"

Material to be used as "Rockfill in Place" shall only consist of quarry material that before it was excavated consisted entirely of Solid Rock as defined in Section 205.

The rockfill shall be thoroughly fragmented and well graded with fragments of greatest dimension not more than 500 millimetres. The rock fragments shall consist of hard, durable material.

The rockfill material shall not contain frozen lumps, weeds, sods, roots, logs, stumps or any other objectionable matter.

Material that is proposed to be used as rockfill material shall be subject to test by the Owner's Representative to determine its suitability for the portions of the work in which it

is proposed that it be placed. Only rockfill material approved by the Owner's Representative shall be placed in the work.

310.08.04 Physical and Other Requirements for Material to be used as "Other Material Fill in Place"

Material to be used as "Other Material Fill in Place" shall only consist of well graded other material that is approved for use by the Owner's Representative.

Other material containing stones larger than 150 millimetres will not be acceptable for use as "Other Material Fill in Place" unless the Contractor places the larger stones in accordance with the requirements of Section 204.

For the top 500 millimetres of fill immediately below the top of subgrade, the material for use as "Other Material Fill in Place" shall have no more than 12% passing the 75 µm sieve, unless otherwise specified.

The other material shall not contain frozen lumps, weeds, sods, roots, logs, stumps or any other objectionable matter.

Material that is proposed to be used as other material fill shall be subject to test by the Owner's Representative to determine its suitability for the portions of the work in which it is proposed that it be placed. Only Other Material Fill material approved by the Owner's Representative shall be placed in the work.

310.09 AGGREGATES AND SELECTED GRANULAR BASE COURSE SAMPLING AND APPROVAL

A field laboratory conforming to the requirements of Section 111 shall be set up on the site of the project and be ready for use, before any crushing of material may take place. The laboratory shall also be set up and be ready for use prior to any placing of selected granular base course.

All aggregates and selected granular base courses shall be subject to sampling and testing by the Owner's Representative at all times. The Owner's Representative shall be provided ample opportunity to sample any material at any time. Any material of a quality or nature not suitable for its intended use will be rejected.

Only materials approved by the Owner's Representative shall be incorporated in the work.

310.09.01 Selected Granular Base Course and Chip Seal Aggregate Sampling and Approval

Where selected granular base course or chip seal aggregate are taken from the crusher and placed in stockpiles, acceptance or rejection shall be decided on the basis of test results of samples taken from the stockpile as it is being constructed.

However, the Department reserves the right to terminate acceptance of material in stockpile at any time during the stockpiling operation regardless of test results. If acceptance of material in the stockpile is terminated, then material stockpiled previously and accepted for incorporation into the work will not be rejected.

310.09.02 Paving Aggregates Sampling and Approval

The Department will undertake preliminary testing at any time to assist the Contractor in locating and producing suitable aggregates. The tests will be carried out solely for the benefit and guidance of the Contractor and will not necessarily constitute acceptance of the aggregate.

The Contractor shall take great care in the crushing of aggregates to ensure the production of consistent and uniform material.

310.10 STOCKPILING OF AGGREGATES, WINTER SAND AND SELECTED GRANULAR BASE COURSES

Paving aggregate, chip seal aggregate, concrete aggregate, winter sand, and selected granular base course aggregate shall be handled, transported and stockpiled at all times in such a manner and with such equipment that will avoid segregation and/or contamination by any deleterious material. The Contractor will provide and ensure legal access for the Department or its agents to this stockpile area.

Materials shall be stockpiled on a flat, well draining area of sufficient size to accept the entire quantity to be produced. The area shall be free from all foreign material and be of adequate bearing capacity.

Materials shall be stockpiled in layers not exceeding 1 metre in depth. Each layer shall be completed over the entire area of the stockpile before beginning the next layer. The back layer of the stockpile shall be spread by a dozer, with a blade of suitable design, in such a manner that the materials are thoroughly mixed to a uniform consistency. Special attention should be given, that each metre layer is interlocking to the adjoining one. Materials delivered to the stockpile in trucks shall be uniformly spot-dumped and levelled,

complying to the method as specified above. Coning stockpiles or spilling material over the edges of the stockpiles will not be permitted under any circumstances.

It is the express responsibility of the Contractor to ensure that stockpiles, when constructed, contain material of acceptable quality that is uniformly distributed throughout. Aggregates that have become mixed with foreign matter of any description, segregated by any means, or have become mixed with each other, shall not be used and shall be removed from the stockpile immediately. Aggregates separated during processing, aggregates secured from different sources, and aggregates from the same source but of different gradations, shall be placed in individual stockpiles.

Individual stockpiles shall be either far enough apart or separated by substantial dividers to prevent cross contamination of materials.

Where stockpiles are constructed for use by others, the storage area shall be situated on solid ground with a suitable access road provided. Storage and access area must withstand working with heavy equipment and trucks. Such storage area and access road shall be subject to the approval of the Owner's Representative.

310.11 ENVIRONMENTAL REQUIREMENT OF PITS AND QUARRIES

310.11.01 Siting

Pits and quarries shall be hidden from view from the highway as much as possible. A buffer strip of 200 metres shall be maintained between the highway right of way and the pit or quarry.

The Contractor shall ensure that the pit or quarry is not subject to flooding. The bottom of the pit or quarry shall be drained to the nearest watercourse or culvert.

All access roads to the pit or quarry shall be bridged or culverted where watercourses are crossed.

310.11.02 Operation Requirements

Any topsoil or organic matter shall be removed from the underlying materials and stockpiled separately during the grubbing or stripping operations. The Contractor shall ensure that no silting of watercourses occurs due to erosion of the pit or as a result of washing operations.

Any discharge of water, including washing water, shall be done in accordance with the requirements of Section 180. Silt laden water shall be discharged to a vegetated area or

to a sedimentation basin for removal of excess silt, before being disposed of into a watercourse or water body.

Hydrocarbon storage shall be in accordance with Division 8.

310.11.03 Abandonment and Rehabilitation

Upon completion of operations, all equipment and unnatural features must be removed and the pit or quarry must be restored to the satisfaction of the Owner's Representative and the Department of the Environment. Depending on the location, this restoration will include any or all of the following:

- Pits and quarries shall be trimmed to smooth and stable grades with side slopes conforming to the requirements set forth in the quarry permit issued by the Department of Industry, Energy and Technology.
- Spreading over the side slopes of any topsoil or organic matter conserved during the stripping operation.
- Re-vegetation of newly opened pits and extensions of existing pits within one year
- Scaling down of quarry faces to remove all rocks and fragments liable to slide or roll down.
- Trenching or otherwise blocking off the entrance to the pit or quarry to prevent vehicular access. Entrance trenches or barriers shall be graded and trimmed to sightly proportions.
- Waste material shall be disposed of in accordance with Division 8.
- Draining and filling in of any settling ponds or depressions that may become a hazard.

310.12 MEASUREMENT FOR PAYMENT

310.12.01 Measurement for Payment for Paving Aggregates and Concrete Aggregates

For paving aggregates or concrete aggregates, no separate measurement for payment is normally made, since the paving aggregates or the concrete aggregates are usually paid for as part of the asphaltic mix or as part of the concrete, respectively.

However, should the contract item state; the supply of stockpiled paving aggregate, or the supply of stockpiled concrete aggregate then the material shall be measured for payment.

310.12.02 Measurement for Payment for Chip Seal Aggregate

For chip seal aggregate, measurement for payment may be by the amount of chip seal aggregate placed on the road, the area of treated road surface, or the amount of chip seal aggregate stockpiled in accordance with the provisions of Section 340.

310.12.03 Measurement for Payment for Selected Granular Base Courses

Measurement for payment for selected granular base courses may be by the actual amount of selected granular base course placed in the work, the nominal amount of selected granular base course placed in the work, or the amount of selected granular base course stockpiled in accordance with the provisions of Section 315.

310.12.04 Measurement for Payment for Winter Sand

Winter sand shall be measured for payment in accordance with the provisions of Section 317.

310.12.05 Measurement for Payment for Armour Stone and Rip Rap Stone

Armour stone and stone used in rip rap shall be measured for payment in accordance with the provisions of Section 615 and Section 610, respectively.

310.12.06 Measurement for Payment for "Supply Rock Fill in Place", and "Supply Other Material Fill in Place"

Measurement for payment for "Supply Rock Fill in Place" and "Supply Other Material Fill in Place" shall be in accordance with the provisions of Section 204.

310.12.07 Stockpiled Materials Weight Measurement for Payment

Where on the contract unit price table it states that aggregate or selected granular base course materials are to be stockpiled and the unit of measurement is stated in tonnes, then such materials shall be weighed on scales before being placed in stockpiles. The weighing of materials shall be in accordance with the requirements of Section 501. Only loads certified by the Department personnel as being placed in the stockpile shall be included in the measurement for payment. The weight shall be computed in tonnes, rounded to one decimal place.

310.12.08 Stockpiled Materials Volume Measurement for Payment

Where the contract unit price table states that aggregate or selected granular base course materials are to be stockpiled and the unit of measurement is stated in cubic metres, then such stockpiles shall be cross sectioned and the volume computed in cubic metres rounded to the nearest whole number.

The quantity to be measured shall be the number of cubic metres of stockpiled material as shown on the cross section sheets between the graded base of the stockpile as cross sectioned before stockpiling begins and the cross sections made over the properly completed stockpile. The volume of this stockpile being computed by the average end area method of computation or as wedges or pyramids, as the case may be when terminating at grade points.

310.13 BASIS OF PAYMENT

310.13.01 Basis of Payment for Stockpiled Materials

Where a contract item in the Unit Price Table specifies that a material be stockpiled, payment shall be at the contract price per tonne or per cubic metre, as the case may be, for the appropriate type of stockpiled material. Such payment shall be full compensation for all labour, materials equipment-use and any other expenses to; provide a pit or quarry, obtain all required permits and approval, provide and transport pit or quarry samples to the Department's Materials Engineering Division in St. John's, clear, grub and strip the pit or quarry, process pit or quarry material to the required gradation and physical requirements, provide and maintain a field laboratory, provide scales if required, provide a site for the stockpile, provide an access road to stockpile, transport and place the material in the stockpile, clean up the pit or quarry, pay any royalties for the material, and provide such other restoration to the pit or quarry as may be required.

In the particular case of stockpiling chip seal aggregate the basis of payment shall also include washing the chip seal aggregate before it is placed in the stockpile.

310.13.02 Basis of Payment for Aggregates and Selected Granular Base Courses

Where paving aggregates, chip seal aggregates, concrete aggregates, selected granular base courses and select bedding for storm sewers is placed in the work, then payment will be in accordance with the provisions of the appropriate specification for the item.

310.13.03 Basis of Payment for Armour Stone and Rip Rap Stone

The basis of payment for armour stone and rip rap stone will be in accordance with the provisions of Section 615 and Section 610, respectively.

310.13.04 Basis of Payment for "Supply Rock Fill in Place" and "Supply Other Material Fill in Place"

The basis of payment for "Supply Rock Fill in Place" and "Supply Other Material Fill in Place" shall be in accordance with the provisions of Section 204.

SECTION 315

SELECTED GRANULAR BASE COURSE

INDEX

315.01 SCOPE

This specification covers the requirements for the supply and placing of Selected Granular Base Course Granular "A", Granular "B", Granular "C" and Maintenance Grades No. 1, No. 2 and No. 3, included as an integral part of these requirements are the provisions of Section 310.

315.02 MATERIALS

315.02.01 Physical and Gradation Requirements

The granular materials shall be composed of clean, hard, uncoated particles and shall be free from organic matter. **Material shall contain no more than 1.0% clay lumps nor 1.0% combined deleterious materials such as shale, slate, ochre and schists.**

Materials shall conform to the gradation requirements given in Table 1 and to the physical requirements given in Table 2. The gradation shall not show marked fluctuations from opposite extremes of the limiting sizes, and the plotted curve shall flow in a manner free from acute changes in direction. Granular "A", Granular "B" and all Maintenance Grades materials shall be processed by crushing and, when necessary to eliminate surplus fines passing the 4.76 millimetre sieve, be screened and washed.

Crushing of Granular "C" materials shall not be required except where the Contractor elects to crush any oversize particles as an alternative to screening.

Materials from deposits acceptable as to the quality of the particles, but deficient in sizes to provide the required gradation, may be accepted if the Contractor furnishes and satisfactorily incorporates into the material supplementary sizes from other sources to produce the required gradation. If the deficiencies occur in Granular "B" or Granular "C" materials, corrections may be attempted by crushing to a smaller maximum particle size. In that event, the Department will furnish special gradation limits based on the actual maximum particle size.

Materials shall be considered unsuitable, even though particle sizes are within the specified gradation limits, if particle shape or any other characteristic precludes satisfactory compaction or fails to provide a roadway suitable for traffic. If, in the opinion of the Owner’s Representative, an improved particle shape can be achieved by using a different crushing unit from that proposed by the Contractor, then the Contractor shall supply and use a crushing unit of the type directed by the Owner’s Representative.

315.02.02 Recycled Asphalt Pavement (RAP)

The Contractor will be permitted to use RAP in Granular “B”. The Recycled Asphalt in the mixture of virgin Granulars plus RAP will be limited to a maximum of 30% under the asphalt and 50% in the granular shoulders. The quality and gradation of the virgin Granulars and the mixture of RAP and virgin materials shall meet the requirements for Granular “B’, when tested individually. In areas where only surface course asphalt is to be applied, as an overlay, the Contractor will be permitted to use all RAP (100%) in the

granular shoulders. In this case, the RAP shall not contain material larger than 5 centimetres in diameter.

The Contractor shall provide the Department with a minimum 30 day notice of their intention to use RAP. The Department reserves the right to accept or reject any particular source of RAP, irrespective of its quality.

TABLE 1
Gradation Requirements

Percent Passing By Dry Weight				Maintenance Grades		
Sieve Sizes	**Granular "A"**	**Granular "B"**	**Granular "C"**	**No. 1**	**No. 2**	**No. 3**
101.6 mm			100			
76.1 mm						
50.8 mm		100	75-100			
25.4 mm		50-100			100	100
19.0 mm	100			100		
15.9 mm						
9.51 mm	50-80			55-80	55-80	55-80
4.76 mm	35-60	20-55	20-55	35-60	35-60	35-60
1.20 mm	15-35	10-35	10-35	15-35	15-35	15-35
300 µm	5-20	5-20	5-20	7-20	5-20	5-20
75 µm	2-6 (Pit Source)	2-6 (Pit Source)	0-12	6-10	3-10	6-10
	2-8 (Rock Source)	2-8 (Rock Source)				

1. 1 µm = 0.001 millimetres
2. If not available, the 80 µm sieve may be substituted for the 75 µm.
3. The percentage of material finer than the 75 µm sieve shall be determined by ASTM C117.
4. Where Granular "A" and Granular "B" materials are produced from natural gravel deposits, a maximum of 6% passing the 75 µm sieve shall be permitted.
5. Where Granular "A" and Granular "B" materials are produced from quarried rock, a maximum of 8% passing the 75 µm sieve shall be permitted.
6. Where 40% or more of other material is blended to a rock source for the production of granular materials, it shall then be treated as a pit source.

TABLE 2
Physical Requirements

Physical Test	Standards Designation	Granular "A"	Granular "B"	Granular "C"	Maintenance Grades		
					No. 1	No. 2	No. 3
Los Angeles Abrasion* (loss % Maximum)	C131 & C535	35	35	40	35	35	35
Percent Crushed (Minimum)**	D5821	50	50	-	50	50	50
Plasticity Index	D4318	0	0	0	0	0	0
Petrographic Number (Max.)	CSA 23.2	150	150	-	150	150	150
Micro-Deval Test for Fine Aggregate (% Maximum) – (EXCLUDING LABRADOR)	D7428	30	30	-	-	-	-
Micro-Deval Test for Fine Aggregate (% Maximum) – (LABRADOR ONLY)	***D7428***	***25***	***25***	***-***	***25***	***25***	***25***
Micro-Deval Test for Coarse Aggregate (% Max.) (EXCLUDING LABRADOR)	D6928	25	25	-	-	-	-
Micro-Deval Test for Coarse Aggregate (% Max.) (LABRADOR ONLY)	***D6928***	***25***	***25***	***-***	***25***	***25***	***25***

* For Granular "A", "B" and "C", the rates of the loss after 100 revolutions to the loss after 500 revolutions shall not exceed 0.280. **This physical property is not applicable to projects in Labrador.**

** The percent of crushed particles will be determined by examining the fraction retained on the 4.76 millimetre sieve and dividing the weight of the crushed particles by the total weight contained on the 4.76 millimetre sieve. Only pieces having one or more freshly fractured faces will be considered as crushed material. Pieces with only small chips removed will not be considered as crushed.

315.03 SAMPLING AND APPROVAL

In addition to the requirements for pit and quarry sampling and processed material sampling and approval, as set forth in Section 310, where materials are hauled directly from the source to the roadway, acceptance of the material, or rejection of the material shall be decided based on test results of samples taken from the roadways.

315.04 PREPARATION OF ROAD SURFACE

The Contractor shall prepare the road surface to the satisfaction of the Owner's Representative before commencing placement of any selected granular base course materials. Except for the special cases of preparation on an existing or a proposed shoulder, adjacent to existing pavement, the preparation of the road surface shall be carried out in accordance with Section 204, Section 206 and Section 301.

315.04.01 Preparation of Existing Shoulder When Recapping with Addition of Paved Shoulder

Where it is intended to recap existing pavement and simultaneously add a paved shoulder where a gravel shoulder existed before, then the Contractor shall prepare the existing shoulder prior to the placing of additional Granular "A" and paving. The preparation of the existing shoulder shall involve levelling followed by compaction.

315.04.02 Preparation of Existing Granulars Prior to Providing Gravel Shoulder on Previously Paved Area

Where existing pavement has been removed because it is intended to provide a gravel shoulder, the Contractor shall level off and compact the existing granulars prior to shouldering with additional selected granular base course.

315.04.03 Excavation of Existing Gravel Shoulder Prior to Butt Jointing Additional Pavement

Where it is intended to widen existing pavement by butt jointing new pavement against existing pavement, the existing gravel shoulder material shall be removed so that the new Granular "B" and Granular "A" may be placed in preparation for the new pavement.

The Contractor shall excavate the existing gravel shoulder to the depth needed to place the required thickness of Granular "B" and Granular "A". The excavated shoulder material shall be spread over the adjacent subgrade. The spread excavated shoulder material and the excavated shoulder shall be leveled and compacted.

315.05 PLACING SELECTED GRANULAR BASE COURSE ON ROAD

The Contractor shall place all granular bases in such a manner to prevent contamination by other materials and to prevent segregation. If, in the opinion of the Owner's Representative, the methods and techniques used by the Contractor cannot overcome contamination or segregation, then the Owner's Representative may direct a modification in the methods that may require the use of an approved spreader box or other acceptable device. All granular bases shall be placed in uniform layers such that the thickness of the compacted layer does not exceed 150 millimetres. This requirement may be waived if the Contractor can demonstrate to the complete satisfaction of the Owner's Representative, a method of placing and compacting thicker layers of materials such that the specified density is uniformly attained.

Prior to closing down operations for each working day, all granular materials shall be bladed and compacted to the specified compaction.

The materials shall be sprayed with water when and as directed by the Owner's Representative, either to aid compaction or reduce dust nuisance or both. When water is added to aid compaction, it shall be applied immediately ahead of the compacting unit.

Each layer of granular base shall be bladed, shaped and compacted as necessary to produce the required profile and cross section. The finished surface shall not deviate at any place on a 3 metre straight edge by more than 20 millimetres for Granular "B" and "C" and 10 millimetres for Granular "A". The upper layer shall be maintained to these tolerances and to the specified density upon completion of the contract, or until the surface is paved. This may require keeping the moisture content at the appropriate value during periods of dry weather in addition to regrading and recompacting as frequently as may be deemed necessary by the Owner's Representative.

Calcium chloride shall be applied uniformly by mechanical means when, and as directed by the Owner's Representative.

315.05.01 Special Requirement for Placing Granular Base Course Granular "A" on Paving Contracts

In paving contracts which also include the placing of Granular Base Course Granular "A", the Contractor shall so coordinate their granular base course Granular "A" placing operations and their paving operations such that, at any given time, no more than 3 km of granular base course Granular "A" treated unpaved road is subject to use by public traffic.

On roads used by public traffic where the Granular "B" was produced from a rock source, or if natural gravel source produced Granular "B" gives a rough driving surface, the Contractor shall place at least a portion of the Granular "A" over the Granular "B" to provide a smoother driving surface. The Contractor shall carry out their operations in such a way that no one place on the road has this type of Granular "B" left without a running surface of Granular "A", for more than 3 days.

315.06 SHOULDERING

The placing of granular materials for shoulder construction shall be carried out by means of an approved spreader. Spreaders shall consist of a box to hold shouldering material and a suitable mechanism to control the width and rate of application and to prevent materials getting onto the pavement.

Granular materials for shoulder construction shall be placed directly on the shoulder and any spillage and materials dragged onto the pavement surface shall be immediately removed, without damage to the pavement, and the area so affected shall be thoroughly cleaned by the use of a power broom or other suitable method.

The shoulders shall be sloped to the specified lines, grades and cross section.

Shouldering operations shall not commence along any section of pavement until 24 hours have elapsed from the time of completion of the final pavement course in that section, but the shouldering operations shall be completed within 7 days of the final pavement course on sections that are open to traffic.

315.07 COMPACTION

Compaction operations shall be carried out as closely as possible behind the placing and spreading operation. At the end of each working day, all materials placed shall be compacted to the specified density.

Material must be handled and compacted without segregating or adversely breaking down (such that its gradation falls outside the specified grading limits, as determine by sieve analysis on random samples of the compacted in place material). Frozen material shall not be incorporated into the work and material shall not be placed on a frozen roadbed.

Each layer of material shall be graded, compacted and verified prior to placing the next layer.

Water shall be applied as necessary to facilitate compaction in order to achieve the degree of compaction required. However, it shall not be added in such quantities that it seeps into the underlying subgrade or exceeds the optimum moisture content (as determine by ASTM D698 and ASTM D4718, as applicable) by 1.0%.

All Granular "A", Granular "B", Granular "C" and the Maintenance Grades materials placed on the roadway or on shoulders shall be based off the maximum dry density obtained by ASTM D698 and if applicable ASTM D4718 and shall be compacted to not less than 100% of the maximum Standard Proctor Dry Density.

Where necessary to obtain the required compaction, the Contractor shall apply sufficient water by means of an approved water truck with distributor.

315.08 MEASUREMENT FOR PAYMENT

Measurement for payment will only be made for those materials accepted for use under this specification.

Measurement for payment for Selected Granular Base Course materials may be by: the weight of material placed in the works, the nominal amount of the material placed in the works, or the amount of material stockpiled.

315.08.01 Weight Measurement for Payment

Where the unit of measurement for a particular type of Selected Granular Base Course material is stated in tonnes on the unit price table, then the material shall be weighed on scales. The weight shall be computed in tonnes, rounded to one decimal place.

The weighing of materials shall be in accordance with the requirements of Section 501. Only loads certified by the Department personnel as being placed in the works shall be included in the measurement for payment.

For quantities of Selected Granular Base Course material less than or equal to 1000 tonnes, the Department will measure the material in stockpile by cross sectioning, calculating the number of cubic metres and converting the quantities to tonnes if the Contractor so desires. A standard conversion factor of 2.0 tonnes per cubic metre will be applied for Selected Granular Base Course material measured in stockpile. For quantities of Selected Granular Base Course material greater than 1000 tonnes, the Contractor must provide weigh scales.

315.08.02 Volume Measurement for Payment

Where the unit of measurement for a particular type of Selected Granular Base Course material is stated in cubic metres on the unit price table, then the material shall be assessed for volume in accordance with the specification for stockpiling, select bedding or such other item as the case may be.

315.09 BASIS OF PAYMENT

Payment at the appropriate contract price for the particular type of Selected Granular Base Course shall be full compensation for all labour, materials, equipment-use and any other expenses. This may included expenses to provide a pit or quarry, obtain all required permits and approval, provide and transport pit or quarry samples to the Materials Engineering Division in St. John's, clear, grub and strip the pit or quarry, process pit or quarry materials to the gradation and physical requirements for the required type of material, provide and maintain a field laboratory, provide scales if required and construct and maintain access road to the source of the material. Also incidental is to provide for such prior reconditioning of the surface on which the selected granular base course is to be applied and which is required in accordance with Section 301, but which is not a pay item under that specification, provide all haulage of the material from the source to where the material is to be placed, place, spread, grade and compact the material, provide such watering of the material as is required, maintain the placed material to the required compaction and to the specified cross section and profile tolerances until completion of the contract, pay any royalties for the material, clean up and provide such other restoration to the pit or quarry and the stockpile site as may be required, together with any other work necessary to complete the contract item.

Moreover, where at shoulders minor grading work of the types described in 315.04.01, 315.04.02 and 315.04.03 is required, then payment at the contract unit price for Granular

"A" and Granular "B" shall also include compensation in full for all labour, materials and equipment-use to carry out the shoulder excavation, spreading, leveling and compaction as described.

Where instead of placing the required select granular materials, the Contractor had chosen, of their own choice, to place temporary fill material level with the finish grade, the Contractor shall excavate the fill material to make room for the select granulars, at their own expense. No payment will be made for the work of carrying out this excavation, or re-compacting the underlying materials. An example where this might occur would be in connection with the installation of a culvert across an existing paved road, and the Contractor chose in one operation to place temporary backfill right up the level of the pavement instead of placing backfill only to subgrade, and then placing the required select granulars.

SECTION 316

COMPACTION FOR GRANULAR AND OTHER MATERIAL

INDEX

316.01 SCOPE

This specification covers the requirements for the compaction of granular and other materials by the contractor unless otherwise identified in the Contract Documents. Where contract documents indicate otherwise, the Quality Control and Quality Assurance requirements of this specification shall be performed by Department Representatives. Use of this specification or any other specification referenced herein shall be in accordance with the Contract Documents.

316.02 REFERENCES

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

- ASTM D698 “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))”
- ASTM D4718 “Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles”
- ASTM D6938 “Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods”
- ASTM D7759 “Standard Guide for Nuclear Surface Moisture and Density Gauge Calibration”

316.03 DEFINITIONS

Control Strip: A single lift of material constructed and compacted to determine the control density. The strip shall be a minimum of 500 square metres.

Control Density: The maximum dry density attained on a “Control Strip”.

316.04 MATERIALS

All materials must conform to the requirements in the Contract Documents.

316.05 EQUIPMENT

Compaction Equipment: The type of compaction equipment used shall be suited to the material to be compacted, degree of compaction required and accessible area. Compaction equipment for control strips shall have a minimum vibratory roller not less than 9 tonnes with a vibratory capacity of at least 1500 VPM.

Nuclear Gauge: Gauges shall be capable of measuring moisture and density. Each nuclear gauge must have been calibrated within the last 12 months either by the

manufacturer or other qualified agent in accordance with ASTM D7759. Standard counts must be completed on site daily prior to testing. The density standard count must be within 1.0% of the most recent values and the moisture standard count shall be within 2.0% of the most recent values. The registered owner of the gauge shall maintain a valid Nuclear Substance and Radiation Device License and comply with the regulations outlined by the Canadian Nuclear Safety Commission.

316.06 CONSTRUCTION

316.06.01 General Construction

The Contractor is responsible to ensure granular and other material is placed according to lift thicknesses and cross section requirements as per the contract documents. Excavated materials shall also be in accordance with Section 204 and 205.

Material must be handled and compacted without segregating or adversely breaking down (such that its gradation falls outside the specified grading limits, as determined by sieve analysis on random samples obtained from the compacted in place material). Frozen material shall not be incorporated and material must not be placed on a frozen surface.

Compaction operations shall be carried out as closely as possible behind the placing and spreading operation. At the end of each working day, all materials placed shall have been compacted to the specified density.

Water can be applied as necessary to facilitate compaction in order to achieve the degree of compaction required. However, it must not be added in such quantities that it seeps into the underlying subgrade or exceeds the optimum moisture content (as determined by ASTM D698 and ASTM D4718, if applicable) by 1.0%.

Hand operated vibratory type compaction equipment shall be used behind all structures to compact fill material within restricted zones such as abutments, retaining walls, wingwalls, pipes, culvert, etc. Details of the restricted zones shall be as per the Contract Documents and any design recommendations.

Each layer of material shall be graded, compacted and verified prior to placing the next layer and have a finished surface free from loose material. Lifts shall be compacted to meet or exceed the requirements for the granular or other material in accordance with this specification.

316.06.02 Granular Compaction

Granular material shall be compacted to 100% Standard Proctor Density (ASTM D698) unless otherwise specified in the contract documents. Percent compaction shall be based off the maximum dry density obtained by ASTM D698 and ASTM D4718, if applicable. When field tests indicate that the required degree of compaction cannot be obtained with the equipment in use or the procedures being followed, the operations shall be modified so that the equipment will produce the required results.

316.06.02.01 Control Strip

As an alternative to using the maximum dry density obtained as per ASTM D698 and ASTM D4718, if applicable (as described above in 316.06.01), a control strip may be constructed at the beginning of the Work to determine a control density. Prior to construction of a control strip the Contractor shall:

- Give a minimum notice of 24 hours to the Owner's Representative.
- Determine the optimum moisture content as per ASTM D698 and ASTM D4718, if applicable.

The control strip shall be a minimum of 500 square metres constructed using the maximum thickness in accordance with Contract Documents. Additional control strips will be required if lift thicknesses change, the source of material changes or there is a change in the compaction equipment. No additional lifts shall be placed until the control density has been reviewed by the Owner's Representative.

Control strips shall not be constructed during freezing ambient temperatures, with frozen aggregate or on frozen subgrades.

The type and mass of the compaction equipment used shall be such that uniform density is obtained throughout the depth of the layer being compacted. Equipment shall be a vibratory roller not less than 9 tonnes with a vibratory capacity of at least 1500 VPM. After initial placement of the material, the compaction equipment shall make a full pass over the entire control strip in vibratory mode at a speed of no more than 5 km/h. After each pass moisture and density measurements shall be determined at 6 random locations using nuclear equipment. Test results will be averaged to determine the in-place dry density.

The control strip moisture content shall be adjusted to provide necessary compaction without inadvertently breaking down or segregating the material. Care must be taken to avoid saturating the granular material. The average field moisture content must be

maintained within the range of not less than 2.0% lower than and no more that 1.0% greater than the optimum moisture content of the control strip material as determined by ASTM D698 and ASTM D4718, if applicable.

Testing will continue after every pass until the average dry density either:

- Remains constant,
- Increases by less than 10 kilograms per cubic metre,
- Decreases.

The maximum dry density shall be the control density and used to determine percent compaction throughout the project.

Lifts shall be compacted to meet or exceed the requirements for the granular or other material as per the applicable Contract Documents. Percent compaction shall be based off the control density as determined from the control strip.

316.06.02.02 Deficient Areas

Deficient areas shall be re-compacted with adjustments to the moisture content, as required, until satisfactory compaction is achieved. The re-compacted area is required to be retested.

316.06.03 Other Material Compaction - Oversize

Other material, oversize, shall be compacted to at least 95% Standard Proctor Density (ASTM D698) using approved compaction equipment unless otherwise specified in the contract documents. In oversize material where conventional compaction testing using a nuclear density gauge cannot be carried out, compaction shall continue until there is no visible movement of the material under an approved vibratory compactor which is vibrating. The vibratory compactor shall be of a type designed for fill compaction, weigh at least 9 tonnes and exert a load when vibrating of at least 4.5 tonnes per metre of wheel width.

316.06.03.01 Deficient Areas

Deficient areas shall be re-compacted with adjustments to the moisture content or removal and replacement of the material, as required, until satisfactory compaction is achieved. The re-compacted area is required to be retested.

316.07 QUALITY CONTROL

The Contractor is responsible to ensure Quality Control (QC) testing is carried out on granular and other material used in the work and compacted according to the requirements herein and as specified in the Contract Documents. The Contractor shall be responsible for the QC testing of compacted material and establishing the control density test strip, if applicable. All testing shall be carried out in the presence of the Owner's Representative.

316.07.01 Granular Submission Requirements

The following records must be submitted on behalf of the Contractor to the Owner's Representative and Materials Engineering Division 10 days in advance of testing:

- Name of professional engineering services licensed in practice in Newfoundland and Labrador.
- Copy of their Nuclear Substance and Radiation device license number.
- Copy of the nuclear gauge original certificate and calibration certificate.
- Copy of their CCIL certification for Type D Advanced Aggregate Quality testing.
- Identification of the nuclear gauge operator(s) and proof of training and proficiency as required below.
- A copy of all QC laboratory test results for ASTM D698 and D4718 (when required) used in determining optimum moisture and maximum dry density. Results must be reviewed, signed and stamped by a Professional Engineer.

All compaction results at the end of each days operations must be presented for review to a Department Representative prior to the application of any asphalt course. Information must include wet density, moisture content, dry density and percent compaction. Review of the field data does not alleviate the Contractor from submitting the compaction report below or the requirements of a control strip.

The following records must be submitted on behalf of the Contractor to the Owner's Representative and Materials Engineering Division within 48 hours after completion of testing:

- All documentation used to determine the control density for the control strip, if utilized, must be reviewed, signed and stamped by a Professional Engineer. Further, this must be reviewed by the Owner's Representative prior to the construction of additional lifts. No further compaction activities are to take place until this review has been completed.

- All field QC test results and associated information including date, station location, offset, lift thickness, probe depth, moisture content, wet density, dry density, percent compaction and any retests. Results must be reviewed, signed and stamped by a Professional Engineer prior to submission.
- The name of operator completing the testing, gauge serial number, test reading count time (must be greater than or equal to 60 seconds), daily moisture and density standard counts including the previous four standard counts.
- The compaction requirement and laboratory testing results utilized for density testing.

Failure to submit documentation, within the required time frame, will result in a $1,000 holdback and a $250 liquidated damage for each delayed test result.

QC records will be audited by the Owner's Representative for errors and missing test data. If errors or omissions are found that identify insufficiently compacted or improperly/untested areas, the Contractor shall make those areas available and re-compact or retest to ensure they comply with the specified compaction requirements.

316.07.02 Other Material Compaction - Oversize

All compaction results at the end of each days operations must be presented for review to a Department Representative prior to the application of any granular course tested using a nuclear density gauge. Information must include number of lifts witnessed, approximate elevation and observation of compaction. Review of the field data does not alleviate the Contractor from submitting the compaction report below.

The following records must be submitted on behalf of the Contractor to the Owner's Representative and Materials Engineering Division within 48 hours after completion of testing:

- Area tested and description of material placed
- Compaction equipment utilized for testing
- Lift thickness and lift number including elevations
- The rolling pattern, including number of passes with direction
- Observations of the compacted surface
- Additional observations including deficient areas

Results must be reviewed, signed and stamped by a Professional Engineer prior to submission.

Failure to submit documentation, within the required time frame, will result in a $1,000 holdback and a $250 liquidated damage for each delayed test result.

QC records will be audited by the Owner's Representative for errors and missing test data. If errors or omissions are found that identify insufficiently compacted or improperly/untested areas, the Contractor shall make those areas available and re-compact or retest to ensure they comply with the specified compaction requirements.

316.07.03 Equipment and Personnel

316.07.03.01 Granular Material

Field density and moisture measurements for QC compaction testing must be carried out by means of nuclear testing equipment. The Contractor shall utilize professional engineering services licensed to practice in Newfoundland and Labrador. The laboratory must be CCIL certified for Type D advanced aggregate testing and must include ASTM D698.

The Contractor shall ensure the records as outlined in 316.07.01 are submitted to the Owner's Representative prior to use of the nuclear gauge. If the nuclear gauge does not meet the requirements of this specification or exhibits malfunctions of any kind it must be replaced.

Only qualified operators using properly calibrated gauges shall conduct QC compaction testing. Each nuclear gauge operator must be trained in the safe operation, transportation and handling of the gauge. The operator must provide acceptable proof of training and proficiency in the use of the gauge to the Owner's Representative prior to any compaction testing. Proof of training must include a copy of a valid certificate from an acceptable training program. Proof of proficiency must be a signed document from the qualified testing firm that the operator has demonstrated proficiency in utilizing the gauge on other projects. The name of the project including the operator's role and responsibilities must be included.

316.07.03.02 Other Material - Oversize

Visual observation of oversize material for QC compaction testing must be carried out by qualified personnel. The Contractor shall utilize professional engineering services licensed to practice in Newfoundland and Labrador.

Qualified personnel shall have experience in visual compaction testing and proof of proficiency must be provided. Proof of proficiency must be a signed document from the

qualified testing firm that the operator has demonstrated proficiency in visual compaction testing on other projects. The name of the project including the operator's role and responsibilities must be included.

316.07.04 Testing

316.07.04.01 Granular Material

The Contractor is responsible to ensure that prior to on site compaction the QC representative has completed testing as per ASTM D698 and ASTM D4718, if applicable, or the control strip, to determine the maximum dry density and optimum moisture content. The results of this testing must be submitted to the Department prior to commencing any onsite testing.

Once the control/maximum dry density has been established all further compaction testing will occur at a minimum frequency of one nuclear gauge tests every 40 metres in each lane. Locations must be randomly selected across the entire width of the lane, including the shoulder. Conditions may require an increase in the frequency of compaction testing, the decision, arrangements and cost for which are the responsibility of the Contractor.

The QC representative must utilize the direct transmission method and ensure that the gauge probe extends the full depth of the lift but not beyond. Results must be available at any time for review and submitted to the Owner's Representative prior to the placement of any subsequent lift and within 48 hours following testing. Failure to do so may result in a stoppage of work.

The Contractor and their QC Consultant must ensure that the established rolling pattern is followed and the entire cross section is compacted uniformly throughout the project. This includes warranting compaction requirement are met at centerline and edge locations. Care must be taken to ensure no bridging of the roller during compaction operations.

Previously accepted compacted materials left open for more than 7 days or damaged by traffic, rainfall or other means shall be restored and retested prior to placement of any overlying material. Restoration of the compacted materials must be in accordance with Section 301. Any costs for making the materials acceptable again will be at the Contractor's expense.

316.07.04.02 Other Material - Oversize

The Contractor and their QC Consultant must ensure that the established rolling pattern is followed and the entire cross section is compacted uniformly throughout the project. This includes warranting compaction requirement are met under all granular windrows, at centerline and edge locations. Care must be taken to ensure no bridging of the roller during compaction operations.

Previously accepted compacted materials damaged by traffic or other means shall be restored and retested prior to placement of any overlying material. Any costs for making the materials acceptable again will be at the Contractor's expense.

316.08 QUALITY ASSURANCE

Quality Assurance (QA) verification testing will be randomly carried out by the Department who at its sole discretion can examine, inspect or test any aspect of the Contractor's work as deemed appropriate. Such inspection or testing shall not in any way relieve the Contractor of their QC responsibilities. The Department may verify any aspect of control strip including the control density established.

Areas found to be deficient shall require immediate remedial action at the Contractor's expense and may include removal and replacement. Subsequent lifts may not be placed until QA testing has been conducted or as instructed by the Owner's Representative.

316.09 BASIS OF PAYMENT

Payment is considered incidental to the tender item requiring compaction and includes all labour, equipment and material to complete the work in accordance with this specification including the supply and application of water for compaction purposes.

Any work required to be repaired or removed shall be at no additional cost to the Department.

Replacement of a gauge shall be at no additional cost to the Department.

SECTION 317

WINTER SAND

INDEX

317.01 SCOPE

This specification covers the requirements for the supply, delivery and acceptance of winter sand.

317.02 PHYSICAL AND GRADATION REQUIREMENTS

Materials shall be natural or manufactured from natural aggregates and consist of sound, durable and predominately angular particles completely resistant to breakdown under traffic and freezing conditions.

Sand particles shall be clean, hard and free from organic matter, clay and deleterious materials such as shale, salts, ochre and schists.

Materials shall conform to the gradation requirements as given in Table 1. The gradation shall not show marked fluctuations from opposite extremes of the limiting sizes and the plotted curve shall flow in a manner free from acute changes in direction.

TABLE 1

GRADATION REQUIREMENTS

SIEVE SIZE	% PASSING BY DRY WEIGHT
6.35 mm	100*
4.76 mm	70 – 95
2.00 mm	50 – 80
0.420 mm	5 – 25
0.075 mm	0 - 6

*In excess of 2.0% of the material retained on the 6.35 millimetre sieve will be cause for rejection of the material.

317.03 SAMPLING AND INSPECTION

Materials will be sampled and inspected by the Department at the designated stockpile locations. This acceptance shall not preclude further stockpile sampling, which may or may not lead to material rejection. Materials will not be sampled at the source.

When delivered, the maximum allowable moisture content for winter sand shall not be greater than 7%, when tested in accordance with ASTM D2216.

The quantity of these tests shall be determined by the Owner's Representative. They shall be sufficient in number to ensure an acceptable product.

317.04 USE OF PITS AND STOCKPILES

The use of pits for the production of winter sand, together with the requirements for the stockpiling of the winter sand, shall be in accordance with the provisions of Section 310.

317.05 ENVIRONMENTAL PROVISIONS

The work shall be carried out in accordance with the environmental provisions of Section 310.

317.06 MEASUREMENT FOR PAYMENT

The measurement for payment will only be for those materials accepted for use under this specification.

317.06.01 Volume Measurement for Payment

Where the contract unit price table states that winter sand is to be stockpiled and the unit of measurement is stated in cubic metres, then such stockpiles shall be cross sectioned and the volume computed in cubic metres rounded to the nearest whole number.

The quantity to be measured shall be the number of cubic metres of stockpiled winter sand as shown on the cross section sheets between the graded base of the stockpile as cross sectioned before stockpiling begins and the cross sections made over the completed stockpile. The volume of this stockpile being computed by the average end area method of computation or as wedges or pyramids, as the case may be when terminating at grade points.

In the event cross sections determine excess material has been placed in the stockpile, the Contractor has 5 days after this determination is made to remove the sand if they so desire. The Department reserves the right to complete do a final cross section.

Engineering costs will be free on first quantity measurement and charged to the Contractor for additional engineering quantity measurements.

317.06.02 Weight Measurement for Payment

Where the contract unit price table states that winter sand is to be stockpiled and the unit of measurement is stated in tonnes, then the material shall be weighed on scales.

The weighing of materials shall be in accordance with the requirements of Section 501. Only loads certified by the Department personnel as being placed in the works shall be included in the measurement for payment. The weight shall be computed in tonnes, rounded to one decimal place.

For quantities of winter sand less than or equal to 10000 tonnes, the Department will measure the material in stockpile by cross sectioning, calculating the number of cubic metres and converting the quantities to tonnes if the Contractor so desires. A standard conversion factor of 1.8 tonnes per cubic metre will be applied for winter sand measured in stockpile.

For quantities of winter sand greater then 10000 tonnes, the Contractor **must** provide weigh scales.

317.07 BASIS OF PAYMENT

Payment at the contract price per cubic metre for winter sand shall be full compensation for all labour, materials, equipment-use and any other expenses to; provide a pit, obtain environmental approval, provide and transport pit samples to the Department's Materials Engineering Division in St. John's, clear, grub and strip the pit, process pit material to the required gradation and physical requirements, transport and place the material in the

stockpile, clean up the pit, pay any royalties for the material, and provide such other restoration to the pit as may be required, together with the provision of scales if required.

SECTION 320

TACK COAT

INDEX

320.01 SCOPE

This section covers the requirements for the supply and application of Tack Coat to pavement surfaces prior to repaving with asphaltic concrete.

320.02 REFERENCES

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

- ASTM D997 “Standard Specifications for Emulsified Asphalt”
- ASTM D2397 “Standard Specifications for Cationic Emulsified Asphalt”
- ASTM D140 “Standard Practice for Sampling Bituminous Materials”
- ASTM D6997 “Standard Test Method for Distillation of Emulsified Asphalt”

320.03 DEFINITIONS

Tack Coat: An emulsified asphalt that is applied to pavement surfaces prior to repaving to aid in bonding asphalt lifts to form a monolithic pavement structure.

320.04 MATERIALS

Tack Coat shall consist of RS-1 emulsified asphalt conforming to ASTM D977 or CRS-1 emulsified asphalt conforming to ASTM D2397 or a non-tracking emulsion. The non-tracking emulsion shall be a Clean Bond Coat, or equivalent, applied un-diluted or diluted with a maximum of 40% water and shall meet the requirements of **Table 1** and **Table 2**. Dilution of the emulsion shall be permitted provided the Manufacturer's dilution process is followed.

Table 1:Non-Tracking Emulsion Requirements (Prior to Dilute)

Test Type	Specification Range	
	Minimum	Maximum
Tests on Emulsions		
SF Viscosity, 25ºC, SFs	20	-
Sieve Test, 850µm, %	-	0.1
Residue by Distillation, 260ºC, %	55	-
Oil Portion of Dist, %	-	Trace
Particle Charge	(-) or (+)	
Test on Residue		
Penetration, 25ºC, dmm	20	55
Ash Content,%	-	1.0

Table 2: Non-Tracking Emulsion Requirements (Diluted)

Test Type	Specification Range	
	Minimum	Maximum
Tests on Emulsions		
Residue by Distillation, 260ºC, %	39.3	-
Test on Residue		
Penetration, 25ºC, dmm	20	55
Ash Content,%	-	1.0

Should the Contractor wish to use an alternate product, then prior written authorization of the Owner's Representative must first be obtained. A written request must be submitted to the Owner's Representative a minimum of 14 days prior to the intended use of the alternate product. The Contractor's request must include reasons for the use of the alternate product, manufacturer's product literature, including testing reports and required application rates as well as applicable Safety Data Sheets.

The Contractor shall collect samples of emulsified asphalt as required by the Owner's Representative. The Owner's Representative may opt to request one random sample per day. Samples shall be taken from the Contractor's storage tank in accordance with ASTM D140. The sample size shall be at least eight litres placed in two separate four litre containers. Collection of the asphalt binder sample shall be witnessed by the Owner's Representative. The sample shall be appropriately identified including the time and date of sampling, type of emulsified asphalt, manufacturer, and refiner. If the sample is Clear Bond Coat it should also be recorded if the sample is un-diluted or diluted and the percentage of water added. The sample shall be immediately forwarded to the witnessing Owner's Representative.

It shall be the Department's responsibility to submit emulsified asphalt samples for quality assurance testing.

320.05 EQUIPMENT

Tack Coat shall be applied by means of an approved pressure distributor designed and equipped so that the emulsion may be applied uniformly at even heat on variable widths at easily determined and controlled application rates under uniform pressure. The distributor shall maintain a constant height of the spray bar as the tank is unloaded.

The distributor shall be equipped with a suitable thermometer with a minimum range from 10°C to 150°C placed to accurately show the temperature of the contents. The approved pressure distributor shall be equipped with a tachometer measuring speeds in meters per minute that is visible to the truck driver so as to maintain constant application speeds at specified rates. The distributor's pump shall be equipped with a tachometer registering liters per minute that is visible to the truck driver. The distributor shall be equipped with a hose and nozzle attachment to be used for spraying by hand, areas inaccessible to the spray bar.

All spray nozzles shall be in good condition and of the same type, orifice size and manufacturer and capable of producing a uniform fog-type spray without streaking. Prior to spraying the Contractor shall check with the Manufacturer to ensure the correct spray nozzles are being utilized. Clogged nozzles shall be removed and cleaned with solvent. The slot of each nozzle shall be set at 30 degrees to the axis of the spray bar and the spray bar shall be set at a height above the existing pavement that will permit the fan from each nozzle to overlap its neighbouring fan by exactly half. The spray bar shall be provided with a positive shut-off to prevent dribbling.

320.06 APPLICATION

Tack Coat shall only be placed on surfaces that are clean and dry, with no threat of precipitation or fog and then only when the atmospheric temperature is at least 10°C. The emulsion shall not be applied to a prepared surface when the surface temperature is less than 2°C.

Should the surface to be treated be dirty, then the Contractor shall thoroughly clean the surface by means of a power broom, or equivalent to ensure bonding of the Tack Coat.

Tack Coat shall only be placed on surfaces that are to the satisfaction of the Owner's Representative.

The Contractor shall plan their work so that no more Tack Coat than is necessary for the days paving operation is applied at one time.

To avoid nuisance and possible property damage to the traveling public, the Contractor shall install portable traffic lights or other means of directing one-way traffic while the Contractor is working on the adjacent part of the road. All other means of traffic control must be in accordance with Division 7 of the Specifications Book, Temporary Condition Signs and Devices and the latest version of the Departments Traffic Control Manual.

The spraying temperature shall be between 20°C and 70°C for RS-1 and Clean Bond Coat, 60°C and 80°C for CRS-1, or the temperature recommended by the manufacturer. This recommendation from the manufacturer shall be provided in writing to the Owner's Representative. Application rates shall meet the requirements of **Table 3**. On pavement which was placed during the previous construction season, the rate of application shall be as directed by the Owner's Representative. This rate will not exceed the rates provided in **Table 3**.

Table 3: Tack Coat Application Rates

Emulsion Type	Application Range
RS-1	0.15 to 0.25 l/m2*
CRS-1	
Clean Bond Coat Un-diluted	0.15 to 0.25 l/m2*
Clean Bond Coat diluted (40%)	0.25 to 0.35 l/m2*

* Or the Department approved application rate as recommended from the Manufacturer.

Tack Coat application shall be visually uniform. Areas of insufficient or non-uniform Tack Coat coverage shall be re-sprayed by the Contractor at no additional cost.

320.07 ENVIRONMENTAL PROVISIONS

The Contractor shall follow the requirements of Section 820, and the procedure for reporting spills.

320.08 CURING

No Hot Mix shall be placed upon the Tack Coat until it has dried to a proper condition of tackiness, as determined by the Owner's Representative. The Contractor is advised that the period required for such drying will depend upon weather conditions; generally it can be 1 hour or more.

Where appropriate, the Contractor shall keep traffic off the Tack Coat to maximize product performance.

320.09 QUALITY ASSURANCE

Quality assurance (QA) is the responsibility of the Department. In addition to QA testing used to determine unit price adjustment, the Department may, at its sole discretion, examine, inspect or test any aspect of the Contractor's work as deemed appropriate. Tack coat must be reapplied in areas deemed insufficient by the Owner's Representative and in areas where tack coat is picked up by the wheels of vehicular/construction traffic at no additional cost to the Department.

A price adjustment shall be applied to areas where testing indicates the actual residual asphalt content present in the Tack Coat fails to meet the requirements of ASTM D997/D2397 or the requirements of this specification. Residual asphalt content will be determined by ASTM D6997. Where testing indicates the actual residual asphalt content is lower than required, the unit price bid for Tack Coat will be reduced based upon the ratio of actual to required contents. There will be no additional compensation where testing indicates a residual asphalt content higher than the required amount.

320.10 MEASUREMENT FOR PAYMENT

Measurement for payment shall be by means of the horizontal area actually treated with Tack Coat lying within the area designated by the Owner's Representative for treatment. The area shall be computed in square meters, rounded to the nearest whole number.

320.11 BASIS OF PAYMENT

Payment at the contract price for Tack Coat shall be compensation in full for all labour, materials and equipment-use to; clean the existing surface, supply and apply the Tack

Coat, together with the provision of all required traffic control necessary.

SECTION 330

HOT MIX ASPHALT CONCRETE - GENERAL

INDEX

330.01 SCOPE

This specification covers the Department's requirements for all materials used in the production of hot mix, hot laid base course, surface course and leveling course asphalt concrete for pavement construction. This specification provides materials, equipment and general requirements that are common to both method and end product specification projects. Section 332 provides specifications specific to method projects, while Section 333 details the specifications for end product projects. Unless otherwise directed in the Contract Documents, projects shall follow the requirements of Section 332.

The base, surface and leveling course asphaltic concrete pavement shall consist of PGAB, coarse and fine mineral aggregates, blending sand, mineral filler if required and additives combined as hereinafter specified, placed and compacted on a prepared base in conformity with the lines, grades, dimensions and cross sections, as staked by the Owner's Representative.

Any project paving work (base, levelling and surface coarse) with a truck haul time to the laydown location exceeding 90 minutes will require a Warm Mix Asphalt (WMA) mix design in accordance with Section 337, for the entirety of the paving work. No additional payment will be made for this requirement.

The paving of bridge decks and approach slabs shall be in accordance with Section 922.

330.02 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 T283 "Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage"
- ASTM D140, "Standard Practice for Sampling Bituminous Materials"
- ASTM D242 "Standard Specification for Mineral Filler for Bituminous Paving Mixtures"
- ASTM D995 "Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures"
- ASTM D3625 "Standard Practice for the Effect of Water on Bituminous-Coated Aggregate Using Boiling Water"

330.03 DEFINITIONS

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

Performance Graded Asphalt Binder (PGAB): means an asphalt binder that is an asphalt-based cement produced from petroleum residue, either with or without the addition of non-particulate modifiers.

Recycled Asphalt Pavement (RAP): Processed HMA material that is recovered by partial or full depth removal.

330.04 MATERIALS

330.04.01 Performance Graded Asphalt Cement (PGAB)

PGAB shall meet the requirements of Section 331.

330.04.02 Crushed Aggregates

Additional to all other requirements, the designated aggregates shall be split on the 4.75 millimetre screen during crushing operations, and each material shall be stockpiled separately such that intermixing of each size and type does not occur.

Where aggregates are processed from pits the naturally occurring fines shall be pre-screened prior to crushing, individually stockpiled and referenced as "naturally occurring fine aggregate". No more than 5% naturally occurring fine aggregate passing the 4.75 millimetre screen shall be permitted with the retained naturally occurring screened coarse aggregate prior to crushing. Naturally occurring coarse aggregate must be stockpiled separately prior to crushing. Fine aggregate sizes generated during the crushing phase shall also be individually stockpiled and identified as "crushed fines". In no cases shall the fine aggregate stockpiles be combined or mixed with other aggregate types. For all mixes the maximum percentage passing the 75 µm sieve is limited to 10% for naturally occurring fine aggregate.

As an alternative to the above pre-screening on the 4.75 millimetre screen, where aggregates are processed from pits, contractors may choose to pre-screen with a 19 millimetre or larger screen size provided that no more than 10% of the retained material for aggregate production passes the 19 millimetre sieve. For this pre-screening operation a completely safe means of accessing the retained material for sampling is to be provided by the Contractor. The Department shall have full control over the time of sampling. If the Contractor chooses to pre-screen with a 19 millimetre or larger screen size, material

passing the 19 millimetre or larger screen size can not be utilized as a naturally occurring fine aggregate.

330.04.02.01 Coarse Aggregate

Coarse Aggregate shall consist of hard, durable crushed stone or crushed gravel particles, uniform in quality and free of deleterious materials. The portion of material retained on the 4.75 millimetre sieve shall be known as coarse aggregate. The coarse aggregate stockpile shall contain no more than 10% passing the 4.75 millimetre screen.

Coarse Aggregates shall be washed if necessary to have clean surfaces free from coatings of foreign matter. Coarse Aggregates shall conform to the physical requirements shown in Table 1.

TABLE 1
Physical Requirements for Coarse Aggregates

TEST METHOD	TEST NO.	HIGHWAY CLASSIFICATION		
		RAU & RAD-100 RAU & RAD-90, RCU-80		RLU-60, RLU-70 RLU-80
		SURFACE	BASE	ALL COURSES
LOS ANGELES ABRASION - % MAXIMUM (A)	ASTM C131	35	35	35
ABSORPTION - % MAXIMUM	ASTM C127	1.75	2	2
MAGNESIUM SULPHATE - SOUNDNESS - 5 CYCLES - % MAXIMUM (B)	ASTM C88	12	12	12
PETROGRAPHIC NUMBER - MAXIMUM	CSA A23.2-15A	135	135	135
FREEZE-THAW TEST - 5 CYCLES - % MAXIMUM	CSA A23.2-24A	8	10	10
CRUSHED PARTICLES -% MINIMUM (C)	ASTM D5821	90	90	70
FLAT & ELONGATED PARTICLES - % MAXIMUM (D)	ASTM D 4791	20	20	20
LOSS BY WASHING - % MAXIMUM PASSING (E)	ASTM C117	1.75	1.75	1.75
MICRO DEVAL - % MAXIMUM (EXCLUDING LABRADOR)	ASTM D6928	18	20	20
MICRO DEVAL - % MAXIMUM (LABRADOR ONLY)	ASTM D6928	16	16	16
CLAY LUMPS -% MAXIMUM	CSA A23.2-3A	1	1	1
LOW DENSITY PARTICLES - % MAXIMUM	CSA A23.2-4A	1	1	1
FRIABLE OR SLATEY SILTSTONE - % MAXIMUM	CSA A23.2-15A	1	1	1

Notes:

a) The ratio of the loss after 100 revolutions to the loss after 500 revolutions shall not exceed 0.265. This Physical Property is not applicable to projects in Labrador.
b) Test to be conducted on basalt rich or highly absorptive (> 1.5%) aggregates.
c) Pieces must have a minimum of two freshly fractured faces. Pieces with only small chips removed will not be considered as crushed.
d) Flat and elongated pieces are those whose greatest dimension exceeds four times their least dimension.

e) When only quarried rock is used as a source of coarse aggregate, a maximum of 2 percent passing the 75 µm sieve shall be permitted.

Irrespective of compliance with the physical requirements of Table 1, any coarse aggregate may be accepted or rejected on the basis of past field performance at the discretion of the Department.

The Contractor is responsible for ensuring the combination of aggregate for HMA conforms to the grading requirements of Table 3. The Contractor must meet all the requirements above, while the guidelines below are provided for information purposes.

Guidelines for Coarse Aggregate Gradation

Sieve Size	Surface Course & Levelling Course Type I	Base Course
22.0 mm	100	100
19.0 mm	100	85-100
12.5 mm	85-100	50-80
9.5 mm	45-75	25-60
4.75 mm	0-10	0-10

330.04.02.02 Fine Aggregate

Fine aggregate shall consist of clean, tough, rough-surfaced grains, free from clay, loam and other foreign matter. The fine aggregate stockpile shall contain no more than 20% retained on the 4.75 millimetre screen. Fine Aggregates shall conform to the physical requirements shown in Table 2.

TABLE 2
Physical Requirements for Fine Aggregates

TEST METHOD	TEST NO.	HIGHWAY CLASSIFICATION		
		RAU & RAD-100, RAU & RAD-90, RCU-80		RLU-60, RLU-70, RLU-80
		SURFACE	BASE	ALL COURSES
MICRO-DEVAL TEST FOR FINE AGGREGATE - % MAXIMUM (EXCLUDING LABRADOR)	ASTM D7428	18	20	20
MICRO-DEVAL TEST FOR FINE AGGREGATE - % MAXIMUM (LABRADOR ONLY)	ASTM D7428	17	17	17
PLASTICITY INDEX	ASTM D4318	0	0	0
SAND EQUIVALENT - % MINIMUM	ASTM D2419	50	50	50

TEST METHOD	TEST NO.	HIGHWAY CLASSIFICATION		
		RAU & RAD-100, RAU & RAD-90, RCU-80		RLU-60, RLU-70, RLU-80
		SURFACE	BASE	ALL COURSES
FINE AGGREGATE ANGULARITY - % MINIMUM (A)	ASTM C1252	45	45	45

Note:

a) FAA tests shall be conducted on a representative sample of the total fine aggregate inclusive of all fine aggregate materials as indicated in the mix design including blending sand. The test will be conducted in accordance with Standard Graded Sample Method A

Irrespective of compliance with the physical requirements of Table 2 any fine aggregate may be accepted or rejected on the basis of past field performance at the discretion of the Department.

The Contractor is responsible for ensuring the combination of aggregate for HMA conforms to the grading requirements of Table 3. For all HMA mixes the fine aggregates maximum percentage passing the 75 µm sieve is limited to 8% prior to mix production at the asphalt plant. Contractors should also be aware of material breakdown after crusher production testing for the material being utilized and their plants capabilities in producing the mixture in accordance with Table 3.

The Contractor must meet all the requirements above, while the guidelines below are provided for information purposes.

Guidelines for Fine Aggregate Gradation

Sieve Size	Percent Passing by Dry Weight	
	Surface Course & Levelling Course Type I	Base Course
9.5 mm	100	100
4.75 mm	90-100	85-100
2.00 mm	40-60	40-90
0.425 mm	15-30	20-55
0.150 mm	5-16	10-25
0.075 mm	2-6	2-7

330.04.02.03 Crushing Tolerances

After the Contractor starts crushing, an average grading will be determined and tolerances will be applied to subsequent production. The average grading will be determined by averaging at least six washed sieved results on a minimum of 1500 tonnes or 30% of the required amount.

The tolerances for subsequent production are as follows:

Tolerance for Production of Asphalt Aggregate

Aggregate Passing 25.0 mm to 9.5 mm sieves	± 6%
Aggregate Passing 4.75 mm sieve	± 5%
Aggregate Passing 2.00 mm sieve	± 4%
Aggregate Passing 425 µm sieve	± 4%
Aggregate Passing 150 µm sieve	± 3%
Aggregate Passing 75 µm sieve	± 2%

330.04.03 Blending Sand

Blending sand shall be supplied by the Contractor and consist of clean, tough, rough surfaced grains, free from clay, loam, or any other foreign matter. Blending sand is considered as a fine aggregate and thus must meet the requirements of Table 2. Blending sand may be either a naturally occurring screened sand or a manufactured sand added to the mix for the purposes of enhancing mix properties.

The gradation of the blending sand shall be such that when used in the asphalt mix, the resulting mix shall meet the requirements of Tables 3. In any case, the blending sand shall have 100% (by dry weight) passing the 9.5 millimetre sieve and at least 80% (by dry weight) passing the 4.75 millimetre sieve.

For RCU-80 and above highway classifications the maximum allowable percentage in total of all natural occurring fine aggregates plus blending sand in the total combined aggregate shall be 15% (by dry weight). For RLU-80 and below highway classifications the maximum allowable percentage in total of all natural occurring fine aggregates plus blending sand in the total combined aggregate shall be 20% (by dry weight).

330.04.04 Mineral Filler

Material Filler shall meet the requirements of ASTM D242. Where filler is required, it shall be supplied by the Contractor.

330.04.05 Anti-Stripping Additive

An approved anti-stripping additive shall be added to all HMA. The anti-stripping additive may be either an approved liquid anti-stripping additive or hydrated lime (Ca(OH)2) with each meeting the requirements outlined as follows.

Organosilane liquid anti-stripping agents are to be added at standard dosage rate of 0.125% additive by weight of asphalt cement. All other amine based liquid anti-stripping agents are to be added at a standard dosage rate of 0.5% additive by weight of asphalt cement. The anti-stripping agent dosage rate shall be increased as necessary to meet a minimum requirements below. Approved liquid anti-stripping additives include the following products:

- AD-here LOF 6500
- AD-here 77-00
- Evotherm M1
- Evotherm P25
- Redicote C-3082
- Rediset LQ-1102C
- Warmgrip N1
- ZycoTherm SP2

All other products must be approved by the Department's Materials Engineering Division.

Suppliers of PGAB and anti-stripping additives shall provide in writing all mixing requirements and proof of product compatibility. Treated asphalt PGAB's must meet the relevant performance grade specifications. Some of the additives noted above at various dosage rates are understood to lower the required mixing and compaction temperature of the asphalt mixture. All information in this regard shall be provided 10 working days prior to mix design. This information shall also be made available for proper production, laydown and field testing.

Contractors must inform the Owner's Representative and advise workers of the proper procedures, use of protective clothing and equipment when handling anti-stripping additives. HMA produced with liquid anti-strip additives are known to produce strong odours. Contractors must ensure the mix materials are used under proper environmental conditions to guarantee the safety and comfort of construction personnel and the public.

Modified Lottman tests in accordance with AASHTO T283 shall be completed within the mix design procedure to confirm if the minimum application rate is sufficient. An additional rate of anti-strip and/or an alternate anti-stripping additive will be required if any one of the following conditions occurs as determined by AASHTO T283:

- The tensile strength ratio of the HMA is less than 0.80

- There is visual evidence of stripping. Acceptable specimens shall have a visual stripping rating of 1.0 or lower based on a scale from 0 to 10 (with 0 being no visual stripping and 10 being fully stripped).
- The results of the mix utilizing neat HMA (or with no anti-stripping additive) significantly exceed the performance of the mix with the anti-stripping additive.

In addition to AASHTO T283 requirements, the HMA containing the anti-stripping additive shall pass a boiling water test in accordance with ASTM D3625 within the mix design procedure. The pass criterion for ASTM D3625 is 95% or greater retained bitumen coating of aggregate.

An additional rate of anti-strip and/or an alternate anti-stripping additive may be required if the aggregate is known to be prone to stripping from past performance and the minimum application rate was insufficient.

If additional or alternative anti-stripping additives are required, a further 10 working days will be required after the Contractor has advised the Department of its new anti-strip proposal and all materials have been received by the Materials Engineering Division. The Contractor and their supplier shall provide sample materials, any technical information and Manufacturer's recommended application rates.

AASHTO T283 and ASTM D3625 shall also be conducted on field produced samples of HMA. All field produced samples shall also pass the requirements above.

Where hydrated lime is used as an anti-strip additive the dosage requirement shall be the greater of 0.5% by mass of total dry aggregate, or the recommended percentage as determined from AASHTO T283 and ASTM D3625.

Where hydrated lime is utilized the hydrated lime shall be added to all aggregates by either of the following methods:

a) Hydrated lime slurry shall be homogeneously mixed with the aggregate in a pug-mill or tumble mixer prior to entering the asphalt plant (the hydrated lime slurry shall be produced at the approximate rate of 1 part lime to 3-4 parts water).
b) Dry hydrated lime shall be homogeneously mixed with wetted aggregate in a pug-mill or tumble mixer prior to entering the asphalt plant. The wetted aggregate shall have a minimum moisture content of 2% by weight for coarse aggregate and 3% by weight for fine aggregate.

Hydrated lime shall be mixed with the aggregate at least 4 hours prior to entering the asphalt plant. Aggregate treated with hydrated lime shall be used within the same construction season. Treatment shall include both coarse and fine aggregate components of the asphalt aggregate.

Where hydrated lime is to be utilized, the Contractor shall provide the Department with complete information on how the hydrated lime is to be used in the treatment of aggregates. HMA produced containing hydrated lime, shall conform to all requirements of the contract before acceptance. The design amount of hydrated lime will be added as a percentage of the total dry aggregate weight.

The cost of all anti-stripping additives (including hydrated lime) will be borne by the Contractor no separate or additional payment will be made.

330.04.06 Recycled Asphalt Pavement (RAP)

If the Contractor wishes, RAP may be permitted in levelling or base course asphalt. The amount of RAP in the pavement mixture will be limited to 20% and subject to the following conditions:

Preparation and submission of a Marshall Asphalt Design Mix Formula (including all supporting documentation) for the asphalt mixture containing RAP, to be submitted to the Materials Engineering Division for review, is the responsibility of the Contractor. The Contractor shall engage professional engineering services and a CCIL or AASHTO certified testing laboratory, to assess the aggregate materials, asphalt binders, blending sands, mineral fillers, anti-stripping agents and PGAB rejuvenation agents proposed for use and to carry out the design of the asphalt concrete mix. No compensation will be provided to the Contractor, for the production of the asphalt design mix formula for the asphalt mixture containing RAP.

The asphalt mixture containing RAP shall be designed in accordance with the Ontario Ministry of Transportation, Design Procedure for Recycled Hot Mix Asphalt, latest edition, except that all test methods referred to shall be replaced with the appropriate ASTM Standards.

RAP percentages may require the use of a rejuvenation agents to ensure the overall PGAB characteristics meet the specified requirements. Testing to confirm the rheological characteristics of the combined PGAB and the RAP asphalt cement shall be supplied as part of the Marshall Mix Design. In all cases the PGAB shall meet the project specifications.

RAP shall be comprised of asphalt millings and be free of uncoated particles. The use of non-milled reclaimed asphalt pavement is subject to the Department's discretion.

The quality of the aggregate in the RAP and the quality of the final pavement mixture shall meet all requirements set forth in this specification.

Where RAP is included in base or levelling course mixes the following process will be followed:

- RAP shall be fractionated into a minimum of three separate sizes.
- The gradation of the individual fractionated RAP shall be:
  - 9.5 millimetres and above
  - 4.75 millimetres to 9.5 millimetres
  - minus 4.75 millimetres
- The asphalt plant must be equipped with a metering system that allows the fractionated RAP to be added in a controlled manner acceptable to the Department.

The Contractor shall provide the Department with a minimum 30 day notice of their intention to use RAP. The Department reserves the right to accept or reject any particular source of RAP, irrespective of its quality.

330.04.07 Composition of Pavement Mixture

330.04.07.01 General Requirements for Pavement Mixture

The mixture shall consist of suitably graded fine and coarse aggregate thoroughly mixed with PGAB as specified. Blending sand, filler and chemical additives shall be added when required.

Unless otherwise specified, the aggregates shall be combined to produce a mixture conforming to the grading requirements of Table 3.

TABLE 3
Asphalt Aggregate Mixtures

	Percent Passing by Dry Weight			
Sieve Sizes	**Surface Course RCU 80 and above**	**Surface Course RLU 80 and below**	**Levelling Course Type I**	**Base Course**
22.0 mm	100	100	100	100
19.0 mm	100	100	100	90-100
12.5 mm	93-100	93-100	75-100	75-90

	Percent Passing by Dry Weight			
Sieve Sizes	**Surface Course RCU 80 and above**	**Surface Course RLU 80 and below**	**Levelling Course Type I**	**Base Course**
9.5 mm	75-92	75-92	63-95	63-84
4.75 mm	45-60	50-65	35-78	35-55
2.00 mm	32-55	32-55	20-55	20-42
0.425 mm	16-25	16-25	10-25	10-25
0.150 mm	5-12	5-12	5-12	5-12
0.075 mm	2-5*	2-5*	2-5*	2-6*
Asphalt Cement (% By Weight of Total Mixture)	4.5 – 7.0	4.5 – 7.0	4.5 – 7.0	4.5 – 7.0

Notes:

* The dust/effective asphalt ratio of all mixtures shall be between 0.6 and 1.2. Dust is defined as material passing the 0.075 millimetre sieve. For surface course mixtures on roads of less than 500 vehicles per day the upper gradation limit on the 0.075 millimetre sieve can be increased to 6% passing by dry weight. Commercial truck traffic will also be considered in identifying the roadways applicable to the modification of the gradation limit on the 0.075 millimetre sieve. Road sections will be identified in the project tender documents with the surface courses applicable to the modification of the gradation limit on the 0.075 millimetre sieve.

Once a mix design has been designated or recognized by the Materials Engineering Division, the Contractor shall be required to produce a HMA mixture conforming to the following mix control tolerances. The mix must still fall inside the gradation envelopes of Table 3.

Individual Sample Tolerance for Production of Combined HMA

Aggregate Passing 19.0 mm sieve	± 5%
Aggregate Passing 12.5 mm sieve	± 5%
Aggregate Passing 9.5 mm sieve	± 5%
Aggregate Passing 4.75 mm sieve	± 5%
Aggregate Passing 2.00 mm sieve	± 4%
Aggregate Passing 425 µm sieve	± 3%
Aggregate Passing 150 µm sieve	± 2%
Aggregate Passing 75 µm sieve	± 1%

During the HMA production the maximum mixing temperature shall be the lower of either; the high end temperature for recommended mixing from the temperature viscosity chart provided by manufacturer/supplier or 165°C. HMA exceeding a temperature of 165°C at any point of the operation shall be cause for rejection.

330.04.07.02 Physical Requirements for Mixture

The aggregates and the PGAB shall be mixed in such proportions as to satisfy the criteria contained in Table 4. These criteria are based on the Standard Marshall Test Procedures using a compactive effort of 75 blows on each face of the specimen.

All test procedures utilized shall be the latest versions of ASTM or AASHTO standards.

All parameters must not exceed minimum or maximum values as outlined in Table 4 during HMA production. At the discretion of the Owner's Representative, production may be delayed and the Contractor will be required to make changes and provide testing results that HMA production meets the requirements outlined.

TABLE 4
Physical Requirements for Asphaltic Concrete Mixture (All Courses)

	Minimum	Maximum
MARSHALL STABILITY N. AT 60^{O}C (I) FOR HIGHWAY CLASSIFICATIONS RLU-60, RLU-70, RLU-80 (II) FOR HIGHWAY CLASSIFICATIONS RAU & RAD-100, RAU & RAD-90, RCU-80	 5 400 8 000	 --- ---
MARSHALL FLOW INDEX MM	2.5	4.25
% AIR VOIDS (A) (I) FOR All HIGHWAY CLASSIFICATIONS RLU-60, RLU-70, RLU-80, RAU & RAD-100, RAU & RAD-90, RCU-80	2.5	4.5
% VOIDS IN COMPACTED MINERAL AGGREGATES (I) LEVELING & BASE COURSE (II) SURFACE COURSE	 14.0 15.0	 --- ---
MODIFIED LOTMAN AASHTO T283 - TENSILE STRENGTH RATIO (PLUS VISUAL) 330.02.01.05	0.8	---
% RETAINED COATING OF AGGREGATE - BOILING WATER TEST ASTM D3625	95	---
MOISTURE CONTENT OF HOT MIX ASPHALT BY OVEN METHOD, AASHTO T329 AS PERCENT OF HMA	---	0.3

330.05 PAVING OPERATAIONS PLACEMENT AND TIMING RESTRICTIONS

The cut off dates for laying asphalt shall be as follows:

TABLE 5
Cut-Off dates for Roadway Paving

Location	Surface Mix	Base Mix
Labrador	October 14	October 22
Northern Peninsula*	October 22	October 31
All Others	October 31	November 7

*The Northern Peninsula region is considered all highways North of the Gros Morne National Park Boundary.

TABLE 6
Cut-Off Dates for Bridge Deck Paving

All Locations	Polymer Modified Asphalt	September 30
Labrador and Northern Peninsula	52S-34	October 7
All Others	58S-28	October 22

Placement shall not take place during rain, snow or any surface that has ponded water or is frozen. Asphalt cannot be placed when the ambient temperature and surface temperature of the material to be overlaid is below 5°C. A combination of ambient air temperature and wind speed (and resulting wind chill) must be taken into consideration.

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.

No Traffic shall be permitted on the newly placed asphalt concrete until finish rolling is completed and the surface temperature of the finished mat has cooled to 60°C.

The Contractor may request to pave when ambient air temperature or surface temperature of the material to be overlaid is below 5°C, however WMA is required, at no added cost to the Department. This request must be made in writing seven days in advance and must be accompanied by a WMA mix design. Regardless if the job is End Product or Method the Contractor will be responsible and bear all costs associated with the new mix design.

WMA shall not be placed when the ambient air temperature or surface temperature of the material to be overlaid is below 0°C. When the ambient air temperature or surface temperature of material to be overlaid is greater than 0°C and less than 5°C, the Contractor shall detail a method (charts and/or software (example: MnDOT PaveCool))

of determining compaction time(s) based on production temperatures, delivery times and temperature, lift thickness, base material temperature, weather conditions (ambient temperatures and wind chill) and paving location. The Contractor must show daily, to the satisfaction of the Department, based on charts and/or software there is sufficient compaction time(s) to achieve the minimum compaction requirements specified by the Department.

Using WMA does not provide any exemption to the specified cut-off dates.

330.06 USE OF PITS, QUARRIES AND STOCKPILES

The use of pits and quarries for the production of the aggregates, together with the requirements for the stockpiling of the aggregates shall be in compliance with the provisions of Section 310.

330.07 EQUIPMENT

All manufacturing of asphalt concrete shall be conducted using batch, drum or continuous mixing plants. All plants shall conform to the requirements of ASTM D995 and as specified herein.

330.07.01 Mixing Plants

330.07.01.01 Cold Bins

All plant types shall be equipped with operational cold bins capable of being calibrated. Cold bins shall be divided into not less than three compartments, each to be equipped with individual gate controls, so as to enable accurate and positive proportioning of each aggregate size. Partitions of sufficient height to prevent intermingling of the aggregate shall be provided between adjoining bins, if the bins are being fed with a front-end loader the width of each bin must be at least 500 millimetres wider than the width of the loader bucket.

330.07.01.02 Dryer

A rotary dryer, of satisfactory design, for drying and heating the aggregate shall be provided. Dryer units shall be of sufficient capacity to uniformly heat the aggregate and reduce the moisture content to the specified level. Upon request the asphalt Contractor shall make available to the Owner's Representative the following information:

- The specified rate of production in tonnes per hour versus aggregate moisture content.

- Within drum plants the specified location and length of the of the PGAB delivery pipe.

330.07.01.03 Screens

Plant screens on batch and continuous mix plants shall have adequate capacity and size range to properly separate all of the aggregate into the sizes required for proportioning so that they may be recombined consistently within the specification limits.

All screens shall have square openings and be free any rips or holes. Screen decks shall be stacked in such a manner that cross contamination of aggregates is prevented.

330.07.01.04 Hot Aggregate Storage Bins

Batch and continuous mix plants shall have hot bin storage of sufficient capacity to ensure uniform and continuous operation. Bins shall be divided into compartments arranged to ensure separate and adequate storage of appropriate fractions of the aggregate. Each compartment shall be provided with an overflow pipe of such size and at such a location to prevent any backing up of material into other bins or into contact with the screen. Adequate and convenient facilities shall be provided for obtaining aggregate samples from each hot bin.

330.07.01.05 PGAB Control Unit

Satisfactory means, either by weight, metering or volumetric measurements, shall be provided to obtain the proper amount of PGAB. All measuring devices shall prove accurate to within ±2.0% when tested for accuracy.

330.07.01.06 Thermometric Equipment

An armoured thermometer of suitable range shall be fixed in the PGAB feed line at a convenient location near the discharge of the mixer unit. The plant shall be further equipped with approved recording thermometers, pyrometers, or other approved recording thermometric instruments at the discharge chute of the dryer and in the hot fines bin to register and record automatically the temperature of the heated aggregate.

330.07.01.07 Dust Collectors

Dust collectors shall be provided where required under the provisions of Section 330.08.01. Provision shall be made to waste the material collected, or to return all or any part uniformly to the aggregate mixture.

330.07.01.08 Safety Requirements

Adequate and safe stairways to the mixer platform shall be provided, and guarded ladders to other plant units shall be located where requested.

All gears, pulleys, chains, sprockets, and other dangerous moving parts shall be thoroughly protected. Ample unobstructed passage shall be maintained at all times in and around the truck-loading space. This space shall be kept free of drippings from the mixing platform. A ladder or platform shall be located at the truck-loading space to permit easy and safe inspection of the mixture as it is delivered into the trucks.

A suitable sampling platform with stairs or ramp access including railing shall be provided for sampling material in the truck bed. The height of the platform shall be adequate to prevent the personnel from having to climb up on to the truck in order to obtain a sample. The platform shall be constructed such that the truck is able to park on either side. If it is not possible for the platform to be constructed in such a manner, then two separate platforms shall be provided or the truck will be required to reverse direction so that a sample may be obtained. Overhead protection shall be provided where necessary.

330.07.01.08.01 Capacity

Unless indicated otherwise asphalt mixing plants must have a minimum rated capacity of 120 tonnes per hour delivered to the spreader, with a production history to support this requirement.

330.07.02 Special Requirements for Batching Plants

330.07.02.01 Weigh Box or Hopper

The equipment shall include a means for weighing each bin size of aggregate into a weigh box or hopper, suspended on scales, and ample in size to hold a full batch without running over. The weigh box or hopper shall be supported on fulcrums and knife edges that will not easily be thrown out of alignment or adjustment. Gates both on the bins and the hopper shall be constructed to prevent leakage when closed.

330.07.02.02 Plant Scales

Scales shall be of the dial or digital type and of a standard make and design. Scales for weighing aggregates shall be accurate and sensitive to 0.5% of the maximum loading required. All scales shall provide a positive means of balancing the tare weight of the hopper or asphalt bucket. After each plant set-up and prior to batching any materials, and whenever deemed necessary by the Owner's Representative, the Contractor shall, at their own expense, have the plant scales tested to the satisfaction of the Owner's Representative.

330.07.02.03 Mixer Unit

The plant shall include a batch mixer of an approved twin shaft pug mill type capable of producing a uniform mixture within the permissible job mix tolerances. The clearance between the mixer blades and liner plates shall not exceed 20 millimetres. The mixer shall be constructed to prevent leakage of the contents. Mixer discharge shall not cause appreciable segregation. The mixer shall be fitted with separate dry and wet mixing cycle timers and locking devices so that PGAB cannot be discharged and the pug mill gate cannot be opened until the desired mixing times have elapsed.

330.07.03 Special Requirements for Continuous Mixer Plants

330.07.03.01 Gradation Control Unit

The plant shall include means for accurately proportioning by volumetric measurement the aggregate discharged from each hot bin. The unit shall include a feeder, mounted under the compartment bins. Each bin shall have an accurately controlled individual gate to form an orifice for volumetrically measuring the material drawn from each respective bin compartment. The orifice shall be rectangular with dimension adjustable by positive mechanical means. Indicators shall be provided on each gate to show the gate opening in millimetres. Each gate will be provided with a lock.

330.07.03.02 Weight Calibration of Material Feed

The plant shall include a means for calibration of gate openings by weighted test samples. The equipment shall include a method of obtaining hot aggregates from the bins fully representative of the flow from the specific gate openings. It shall also include platform scales capable of accurately weighing test samples of aggregates and PGAB.

All calibration equipment, including revolution counters, shall be kept in good operating order at all times and records shall be available whenever required.

330.07.03.03 Synchronization of Aggregate and Asphalt Feed

In order to ensure the correct flow of aggregate from the bins and the flow of asphalt from the meter or other proportioning sources, satisfactory means shall be provided to afford positive interlocking control between the flow of aggregate from the bins and the flow of asphalt from the meter or other proportioning sources. In order to ensure the correct flow of PGAB to the mixer at all times, the plant shall be equipped with means of maintaining a constant head of PGAB to the metering device. A satisfactory pressure gauge shall be installed on the asphalt line between the metering device and the spray bar.

330.07.03.04 Mixer Unit

The plant shall include a continuous mixer of an approved twin shaft pug mill type that shall be capable of producing a uniform mixture within the specified tolerances. The clearance of the blades from the inner surfaces of the pug mill liners shall not exceed 20 millimetres. The paddles shall be of a type adjustable for angular position on the shafts and reversible to retard the flow of the mixture. The mixer shall be equipped with an adjustable dam gate at the discharge end to control the level of the material. The mixer shall carry a manufacturer's plate giving the net volumetric contents of the mixer at several heights.

Unless otherwise required, determination of mixing time shall be by weight method under the following formula. The weights shall be determined for the job by tests made by the Owner's Representative.

$$\text{Mixing time in seconds} = \frac{\text{Pug mill capacity in kilograms}}{\text{Pug mill output in kilograms per second}}$$

330.07.03.05 Discharge Hopper

All continuous mix plants shall be equipped with a controlled discharge storage hopper. The minimum capacity of the hopper in tonnes shall be equal to 1.5% of the hourly production rate of the plant but shall not be less than one tonne. This hopper shall be kept in satisfactory operating condition at all times and operated to prevent segregation of the mixture.

330.07.03.06 Material Level Indicators

Material level indicators shall be installed in each hot aggregate bin at the one-third full level and at the two-thirds full level and they shall be connected to remote high-low indicator lights mounted at the operator's station. Operation of the mixer shall not be permitted when the low-level indicator shows any bin to be less than one-third full.

330.07.04 Special Requirements for Drum Mixer Plants

330.07.04.01 Aggregate Feed

Aggregates shall be fed to the dryer drum by means of a multi bin (minimum 3 or 4 bins) cold feed unit and shall be blended to meet the design mix proportions by adjustment of variable speed feed belts and gates on each bin. There shall be no overflow from one bin to another.

A reliable moisture probe shall be installed in the fine aggregate cold feed bin with a meter mounted in the plant control panel.

The total flow of aggregate shall be metered by an electronic weigh belt system with an indicator that can be monitored by the plant operator and which is interlocked with a variable speed asphalt pump so that the proportions of aggregate and PGAB entering the mixer remain constant.

Cold feed calibration and PGAB pump calibration shall be performed at the start of each contract and whenever deemed necessary by the Owner's Representative. The calibration shall be done in the presence of the plant inspector. The cold feed shall be recalibrated whenever the weighing conveyor is moved.

A positive interlocked automatic shut off shall be provided so that the plant shuts down automatically if there is any disruption in the flow of aggregate or PGAB.

A vibrating screen of adequate capacity shall be provided to remove oversize from the combined cold feed.

An aggregate sampling device shall be provided which will divert a representative combined aggregate sample of adequate size into a container or hopper for the purposes of gradation testing. The sampling device shall be located after the cold feed aggregates have passed through the vibrating screen and prior to mixing with PGAB.

330.07.04.02 PGAB Feed

The PGAB feed system shall be equipped with a calibration system which will enable approximately 200 litres of PGAB to be by-passed into a container which can be weighed. Adequate scales shall be provided by the Contractor.

A temperature gauge, showing the temperature of the PGAB at the metering pump, shall be provided in the control trailer. The gauge shall be graduated to cover at least the range 100°C to 200°C with increments of not more than 2.5°C.

A temperature compensating system shall be installed in the PGAB metering system designed to provide a volume of PGAB which will be constant when referenced to 15°C regardless of variations in the temperature of the PGAB from the storage tank.

330.07.04.03 PGAB Mixing

The heating, coating and mixing of the HMA shall be accomplished in an approved parallel flow dryer-mixer. The aggregate and PGAB shall enter the drum at the burner end and travel parallel to the flame and exhaust gas stream. Heating shall be controlled to prevent fracture of the aggregate or excessive oxidization of the HMA. The system shall be

equipped with automatic burner controls and shall provide for continuous temperature sensing of the bituminous mixture of discharge, with a printing recorder that can be monitored by the plant operator. The printed record of mix temperatures shall be available to the Department for inspection.

The method used to transfer the mixture from the drum mixer to the haulage units shall be designed, constructed and operated so that there shall be no segregation of, or damage to, the HMA.

A system for wasting unacceptable asphalt aggregate mixture shall be provided between the drum mixer discharge and holding bin.

The plant shall not be operated below 50% of the rated capacity of the belt scale.

330.07.05 Truck Weigh Scales

The scales shall be in accordance with Section 501.

330.07.06 Haulage Equipment

Trucks for hauling HMA shall be of the metal box type in good working order and their use shall be authorized by the Owner's Representative. The metal box shall be in smooth condition with no rust scales or foreign materials. Where ever possible trucks shall be loaded such that the front and back of the truck body are loaded prior to placement of asphalt in the middle section.

Vehicles shall be equipped with tarpaulins of water repellent material (no open mesh types) of sufficient size to completely cover the truck box and overhang the box on all sides by a minimum of 150 millimetres. The tarpaulins shall have sufficient tie-down points so that they can be properly secured, and shall be in good condition and be free of holes and tears. They shall be securely tied down as an effective barrier against rain infiltration and air flow over the HMA mixture.

Tarpaulins are to be used at all times for protection of the load of HMA Tarpaulins shall be rolled back to uncover the hot mix for inspection immediately prior to dumping the load into the paver. Trucks will stop ahead of the paver and allow the paver to smoothly pick up the truck.

The use of hydrocarbon fuels or solvents to lubricate the truck bodies or to clean tools or equipment, will not be permitted. A biodegradable release agent shall be supplied by the Contractor to clean or lubricate tools, equipment and truck bodies.

330.07.07 Spreading Equipment

Mechanical self-powered pavers shall be used which are capable of spreading the mixture true to line, grade and crown as specified and as directed by the Owner's Representative.

Pavers shall be equipped with hoppers and reversing distributing screws to place the mixture evenly in front of the screed. The distributor screws shall always be kept 1/3 to 2/3 covered.

Asphalt concrete shall be dumped into the middle of the paver hopper. The hopper shall not be emptied to less than 25% of its capacity when moving except when the spreading operation is suspended. All cold or segregated asphalt must be shovelled out and wasted. In no case shall cold asphalt be allowed in the pavement mix.

Pavers shall be equipped with heated vibrating screeds and shall be capable of spreading the mixture, without segregation, in thickness from 10 millimetres to 200 millimetres and in widths of from 2500 millimetres to the greater of the maximum width of the project travel lane and paved shoulder combined or 4000 millimetres, in increments of 150 millimetres.

There should be no allowance for pavers with non- vibratory screeds. All mechanical apparatus designed to aid compaction of the mixture shall have such devices operating continuously when the mixture is being placed unless otherwise directed by the Owner's Representative. Where screed extensions are used, such extensions shall be designed so that the tamping or vibratory action of the screed is effectively transferred to the extensions in such manner as to provide a uniform degree of initial compaction across the full width of the freshly laid mat.

To ensure continuous operation of the pavers, they shall operate at whatever speed necessary to match the output of the plant provided that a consistent and satisfactory mat is being laid. However, in no case shall the speed of the paver exceed 0.7 kilometres per hour.

The Contractor shall provide on each paver a 3 metre straight edge with a level recessed in its upper surface parallel to the lower face and capable of detecting a variation from the horizontal of 3 millimetres in 1000 millimetres.

The term "screed" shall mean any strike-off device operated by cutting, crowding, or other practical action which is effective on the mixture and which produces a finished surface of the evenness and texture required. The screed shall have an approved vibratory

application and be adjustable as to level and crown and shall be heated in an approved manner.

Pavers shall be equipped with automatic screed controls, as recommended by the paver manufacturer, for the control of longitudinal grade and transverse slope. The longitudinal grade control shall be equipped to operate from a joint matching shoe except when a spreader with ski is required by the specifications. Longitudinal joints shall be matched by the spreader with ski where ever a spreader with ski is required or specified. The transverse slope control shall be capable of operating from either side of the paver.

A paver with a ski shall be required for paving base course and surface course on the Trans Canada Highway. On other projects, a paver with a ski will also be required where the contract item description includes the phrase "Spreader with Ski".

The paver with a ski shall be equipped with an authorized 12 metre ski. Where such a ski is a flexible unit, it shall be equipped with a spring tensioned wire extending between brackets fitted on and slightly above each end of the ski. The sensing grid shall ride on the wire, not on the ski.

When two or more pavers are in echelon in order to match longitudinal joints, pavers following the lead paver shall use joint matching shoes, or a satisfactory 12 metre ski as per the contract requirements, designed for the purpose, which shall ride on the previously placed undisturbed mat. Pavers are considered to be paving in echelon when the lead paver is not more than 60 metres in advance of an adjacent succeeding paver.

330.07.08 Rollers

All rollers shall be of the types specifically designed for asphalt compaction.

All rollers shall be in good condition and capable of reversing without backlash. They should be operated at all times by competent and experienced operators.

All rollers shall be weighed in the presence of the Owner’s Representative and ballasted, if required, immediately before commencing work and whenever subsequently required by the Owner’s Representative. There shall be no additional cost to the Department for meeting these requirements.

Steel drum rollers shall be equipped with satisfactory means to supply sufficient water to the drum to prevent adhesion of asphalt mixture. The rear wheels of combination rollers shall each be not less than 450 millimetres in width, drums of tandem rollers shall each be not less than 1250 millimetres in width. Steel drum rollers shall weigh at least 12

tonnes and shall exert a load on the compression roll of at least 6 tonnes per metre of wheel width. All pneumatic tired rollers shall be self-propelled and shall have not less than nine wheels revolving on two axles. The tires on the front and rear axles shall be staggered to cover the entire area over which the roller travels with a minimum overlap of 15 millimetres. Under working conditions, the roller shall exert a load of not less than 5 tonnes per metre of tire width on the asphalt surface. The tires shall be inflated to an air pressure of not less than 400 kPa. The roller shall be equipped with an adequate scraping or cleaning device on each tire to prevent the bituminous mixture from accumulating on the tires. The roller shall be equipped with a water system which will keep all tires uniformly wet, and which will have a capacity that will provide not less than two hours continuous operations without refilling.

330.07.09 Material Transfer Device/Vehicle

Unless otherwise noted within the tender documents for all highway classifications, a Material Transfer Device/Vehicle shall be used at no extra cost to transfer the project's top lift of asphalt mixture (base, leveling or surface material) from the transport vehicles to the asphalt spreader. The purpose of the Materials Transfer Device is to minimize segregation during placement of the asphalt pavement and to increase the smoothness of the pavement surface by reducing the number of stops and starts during the placement of the asphalt pavement. The Material Transfer Device shall be utilized in conjunction with a hopper insert in the asphalt spreader. The hopper insert on the asphalt paver shall be kept full at all times. Cycling the hopper wings of the asphalt paver shall be kept to a minimum.

When required to pave on granulars, a self-propelled transfer vehicle is required.

Prior to being utilized the Material Transfer Device/Vehicle shall be authorized for use by the Owner's Representative.

Locations where it is deemed by the Owner's Representative that it is not practical to maneuver and/or safe to utilize a Material Transfer Device/Vehicle shall be identified within the tender documents. For such pre-identified locations no price adjustments to the various hot mix asphalt unit prices will be applied. However, if a Contractor still chooses to proceed with the use of their Material Transfer equipment in a safe manner no additional or other compensation will be applied.

Locations as noted by the Contractor and subsequently agreed with by the Owner's Representative as not practical to maneuver and/or safe to utilize a Material Transfer Device/Vehicle and which were not pre-identified within the tender documents shall have a 5% unit price reduction applied. The price reduction will apply to the various hot mix

asphalt unit prices of the material quantities where the Material Transfer Device/Vehicle was not utilized.

The Contractor will be responsible for all surface defects or any other pavement defect irrespective of the utilization or not of a Material Transfer Device/Vehicle.

330.08 ENVIRONMENTAL PROVISIONS

Pits and quarries shall be stripped, worked and at the completion of the work restored, all in compliance with the provisions of Section 310.

The Contractor shall ensure that an insurance policy is in place in accordance with the Tender insurance policy requirements.

Out of specification asphalt shall be disposed of in accordance with Division 8.

330.08.01 Environmental Requirements for Asphalt Mixing Plants

Any asphalt plant being operated within a radius of 1.5 kilometres of a regularly used building, either residential or commercial, or an organized recreational area, must control their dust emissions such that compliance is obtained with the air standards enforced by the Department of Environment, Climate Change and Municipalities. In order to comply, the efficient operations of either a bag house dust collector or a water scrubber on the dryer emissions would be necessary.

These controls may be waived in an area where there are three or less regularly used buildings if the Contractor makes satisfactory arrangements with the owners and occupiers of all buildings. Under such circumstances, a written agreement between the Contractor and owner/occupier, signed by both parties, must be submitted to both the Department of Transportation and Infrastructure and the Department of Environment, Climate Change and Municipalities.

Contractors are referred to the "Environmental Code of Practice for Asphalt Plant Operations" prepared by the Department of Environment, Climate Change and Municipalities (Latest Edition). The link can be found here: https://www.gov.nl.ca/dgsnl/licenses/env-protection/asphalt/. Hydrocarbon storage shall be in accordance with Section 820. The Contractor shall follow the procedure for spill reporting.

All sections of the asphalt plant which could contribute to air or water pollution must be maintained in efficient operating condition.

Where a water scrubber is used, the scrubber effluent must be given retention time in suitably sized artificial settling ponds. Such ponds must be sufficiently impermeable to enable seepage water to meet the Environment Control (water and sewage) Regulations, 2003.

All storage tanks for fuel must be drained within one week after production has been completed. Fuel oil must not remain in tanks over the winter.

330.08.02 Environmental Approval

Contractors wishing to set up an asphalt mixing plant at a site must first obtain environmental approval before proceeding.

Contractors must apply in writing to the Digital Government and Service NL for a Ministerial Approval as required under the Environmental Protection Act SNL 2002. The following information must be supplied with the application:

1. Location of the proposed site and description of its surroundings within a radius of 1.5 kilometres.
2. Soil type and particulars of protective dyking near storage tanks.
3. Sieve analysis of cold feed aggregate or at least the percentage of minus 75 µm sieve.
4. Description of the plant and associated equipment to reduce air contaminants (plans if available).
5. Capacity of plant in tonnes per hour.
6. Source of heat (and sulphur content if it is oil).
7. Rate of air flow through the dryer at operating conditions and diameter of the dryer.
8. Relevant operation details of air pollution control equipment (ie. Pressure drop across cyclones or scrubbers).
9. Air to cloth ratio if baghouse filter is used.
10. Height of exhaust stacks.
11. Temperature and velocity of exhaust gases from dryer and/or stack.
12. Expected dates of operation of the plant including:
    - Proposed starting date
    - hours in operation per day
    - proposed completion date
    - total days in operation
13. If using a water scrubber, the rate of use of water (litres per second), the number and dimensions of settling ponds and the method of lining of the ponds.

For inspection purposes, the Contractor shall notify the Department of Environment, Climate Change and Municipalities at least 5 days prior to site closure.

Should the Contractor wish to leave their equipment at the site beyond the completion of their work for the Department, or beyond the proposed completion date as stated in their application, the Contractor shall state in writing their commitment to undertake the clean-up and restoration requirements of this section and those of Section 310, and also state the updated proposed completion date. Copies of this letter shall be sent to both the Department of Transportation and Infrastructure and the Department of Environment, Climate Change and Municipalities.

SECTION 331

PERFORMANCE GRADED ASPHALT BINDER

INDEX

331.01 SCOPE

This specification applies to Performance Based Asphalt Binder (PGAB) that are graded by performance using the Multiple Stress Creep Recovery (MSCR) test. It shall include the supply and transportation of PGAB to the Contractor's plant that will be used in the manufacturing of asphalt concrete.

Final acceptance of the product shall be determined by QA testing by the Department to confirm that the specified asphalt binder grade was supplied. Testing will be performed on random samples taken from the Contractor's binder storage tank(s) located at the asphalt plant.

331.02 REFERENCES

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

- AASHTO M332 "Standard Specification for Performance-Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test"

- AASHTO R29 “Standard Practice for Grading or Verifying the Performance Grade (PG) of an Asphalt Binder”
- AASHTO T350 “Standard Method of Test for Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)”
- AASHTO T111 “Standard Method of Test for Mineral Matter or Ash in Asphalt Materials”
- ASTM D140 “Standard Practice for Sampling Asphalt Materials”
- ASTM D3665 “Standard Practice for Random Sampling of Construction Materials”

331.03 DEFINITIONS

Performance Graded Asphalt Binder (PGAB): means an asphalt binder that is an asphalt-based cement produced from petroleum residue, either with or without the addition of non-particulate modifiers.

331.04 SUBMISSIONS REQUIREMENTS

Initial acceptance of the PGAB will be based on the QC test results submitted by the Contractor showing conformance to the requirements here within. Samples of PGAB for QC and QA testing are to be taken after the addition of any anti-stripping or WMA additive has been added.

The Laboratory conducting the QC testing shall have participated in the most recent AASHTO/CCIL proficiency sample correlation program for PGAB. Documentation of the Laboratory’s participation and proficiency shall be provided to the Department prior to any testing being undertaken.

Prior to the start of and throughout pavement production current copies of PGAB property certification shall be provided to the Department. Safety Data Sheets for the PGAB and any chemical additives must also be submitted.

The Contractor shall supply a temperature viscosity chart from the manufacturer/supplier for each source or type of PGAB provided. The Contractor shall also request of the manufacturer/supplier any information or recommendations regarding the production and handling of the mix relating to the PGAB. All such requested information shall be available in advance of the pre-paving meeting for discussion and review during the meeting.

331.05 MATERIALS

PGAB material shall conform to the latest edition of AASHTO M332 and tested in accordance with AASHTO R29 for the specified performance grade, except for clause 7.5 where the RTFO residue will be tested via MSCR per AASHTO T350 at the test

temperature indicated by the high temperature grading. The PGAB shall be PG 58S-28 unless otherwise specified in the contract documents.

When higher traffic grade designations are required Polyphosphoric Acid (PPA) modified asphalt binders or asphalt binders containing waste engine oils are not permitted.

The PGAB shall be homogenous and free from water and any contamination.

Irrespective of the binder specified, the ash content must be less than 0.50% when tested in accordance with AASHTO T111.

331.06 EQUIPMENT

Tankers and storage tank(s) used to transport and store PGAB shall be free from hydrocarbon fuels and solvents. They shall have a sampling spigot per ASTM D140 and be equipped with thermometers, accurate and capable of reading to the nearest 2°C.

Storage tank(s) shall be equipped with a suitably sized circulating system to thoroughly mix and provide continuous circulation of the PGAB between the storage tank and proportioning units for the entire operation period.

Any PGAB other than that specified must be removed from the Contractor's tanks to prevent contamination.

331.07 SAMPLING

The Contractor shall collect samples of PGAB as required by the Owner's Representative. At least one sample shall be collected per project as well as for every 5000t of asphalt produced. The Owner's Representative may opt to request one random sample per day. Samples shall be taken from the Contractor's storage tank(s) in accordance with ASTM D140. The sample size shall be at least two litres placed in one litre containers, one to be kept in the event an appeal of the test results is requested by the Contractor.

Collection of the PGAB sample shall be witnessed by the Owner's Representative. The sample shall be appropriately identified including the time and date of sampling, grade and type of binder, supplier, refinery and the name including proportions of any additives added. The sample shall be immediately forwarded to the witnessing Owner's Representative.

The Department will submit PGAB samples for quality assurance testing for price adjustment purposes.

331.08 QUALITY ASSURANCE

QA testing will be carried out by the Department for the purpose of ensuring materials used in the work conform to the requirements of AASHTO M332 and this specification. All PGAB material will be subject to testing for acceptance prior to and during use. Samples that are non-compliant with the specification will require further classification testing. Tests will determine the actual low temperature, rounded to the nearest 0.5 degrees Celsius and the $J_{nr3.2}$, J_{nrdiff}, and $R_{3.2}$ (where applicable) at the test temperatures indicated by the high temperature and traffic grading designations of the PGAB, rounded to the nearest 0.01kPa^{-1} and 0.1%, as applicable.

331.08.01 Price Adjustments

Price adjustments, where applicable, will be cumulative and will be expressed as a percentage of the Contractor's unit bid price for the PGAB. Projects with only one PGAB sample collected and not meeting the specified grade will have price adjustments applied to all the unit prices of the entire quantity of asphalt concrete. Projects with multiple samples of PGAB will have the price adjustment applied proportionally to the affected asphalt.

PGAB's with lower than the minimum design temperature will not be subject to a price adjustment however bonuses will not be applied to any asphalt produced/placed using this material.

Low Temperature Deficiency (°C) Price Adjustment

Low Temperature Deviation (All Grades)	Price Adjustment (% of PGAB)
0.5°C to 1.0°C	-10%
1.5°C to 2.0°C	-20%
2.5°C to 3.0°C	-50%
Greater than 3.5°C of Specified Grade	Rejection

$J_{nr3.2}$ (kPa^{-1}) Price Adjustments

Traffic Level	Price Adjustment (% of PGAB Price)					
	+10.0 %	0%	-10.0%	-25.0%	-50.0%	Reject
S	NA	2.00 kPa^{-1} to 4.50 kPa^{-1}	4.51 kPa^{-1} to 4.73 kPa^{-1}	4.74 kPa^{-1} to 4.95 kPa^{-1}	4.96 kPa^{-1} to 6.75 kPa^{-1}	>6.75 kPa^{-1}

H	<1.00 kPa^{-1}	1.00 kPa^{-1} to 2.00 kPa^{-1}	2.01 kPa^{-1} to 2.10 kPa^{-1}	2.11 kPa^{-1} to 2.20 kPa^{-1}	2.21 kPa^{-1} to 3.00 kPa^{-1}	>3.00 kPa^{-1}
V	<0.50 kPa^{-1}	0.50 kPa^{-1} to 1.00 kPa^{-1}	1.01 kPa^{-1} to 1.05 kPa^{-1}	1.06 kPa^{-1} to 1.10 kPa^{-1}	1.11 kPa^{-1} to 1.50 kPa^{-1}	>1.50 kPa^{-1}
E	NA	0.10 kPa^{-1} to 0.50 kPa^{-1}	0.51 kPa^{-1} to 0.53 kPa^{-1}	0.53 kPa^{-1} to 0.55 kPa^{-1}	0.56 kPa^{-1} to 0.75 kPa^{-1}	>0.75 kPa^{-1}

$R_{3.2}$ (%) Price Adjustment

Traffic Level	Price Adjustment (% of PGAB Price)				
	0%	-5%	-10.0%	-25.0%	-50.0%
All (minimum values indicated in Note)	≥ 100% of min value	95.0% to 99.9% of the min value	90.0% to 94.9% of the min value	75.0% to 89.9% of the min value	<75.0% of the min value

Note: The following minimum percent recovery values shall be provided for asphalt binders:

- *Heavy Traffic "H": $R_{3.2} \geq 30.0\%$*
- *Very Heavy Traffic "V": $R_{3.2} \geq 35.0\%$*
- *Extremely Heavy Traffic "E":*
  - *For 0.25 $kPa^{-1} < J_{nr3.2} \leq 0.50\ kPa^{-1}$, $R_{3.2} \geq 45.0\%$*
  - *For $J_{nr3.2} \leq 0.25\ kPa^{-1}$, $R_{3.2} \geq 55.0\%$*

331.08.02 Appeal Testing

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. Appeal testing may be carried out only if the cost of the impact of non-compliance, as determined by the Owner's Representative, exceeds of cost of re-testing. The outcome of the testing is binding on the Department and the Contractor.

If the appeal test results indicate that a price adjustment no longer applies, the testing costs incurred by the Department during the appeal process shall be borne by the Department. The Contractor shall be responsible for any other costs that 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 shipping and testing costs incurred by the Department during the appeal procedure shall be charged to the Contractor.

331.09 MEASUREMENT OF PAYMENT

The asphalt binder will be measured in tonnes, rounded to two decimal places.

Price adjustments, where applicable, will be cumulative and will be expressed as a percentage of the Contractor's unit bid price for the PGAB. Additional price adjustments as per Section 332 or Section 333 will also apply.

331.10 BASIS OF PAYMENT

Payment at the contract price for Asphalt Binder 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

SECTION 332

HOT MIX ASPHALT CONCRETE – METHOD SPECIFICATION

INDEX

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

PGAB Content: This is the percentage of performance graded asphalt binder 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, PGAB grade, thickness density and smoothness.

332.04 GENERAL

This item consists of supplying crushed aggregates, blending materials, anti-stripping additive, PGAB 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 PGAB 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

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.

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 well 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 PGAB Content

Performance for PGAB 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
PGAB 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 PGAB 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 by 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.

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

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 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 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 PGAB

Unit price adjustments calculated in accordance with Tables 2 and Section 332.07.05 shall apply. The asphalt binder will be measured in tonnes, rounded to two decimal places. Payment for Asphalt binder shall be as per the percentage (%) of asphalt binder required in the Design Mix Formula specified by the Materials Engineering Division. However, where Asphalt Binder contents are found to be deficient to the point of being in the "Penalty Zone" subsequently described, Asphalt Binder 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 Binder 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, or asphaltic leveling course Type I 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 PGAB

Payment at the contract price for Asphalt Binder shall be compensation in full for all labor, materials, and equipment to supply the PGAB 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'.

SECTION 333

HOT MIX ASPHALT CONCRETE – END PRODUCT SPECIFICATION

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

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 asphalt cement, 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 asphalt cement 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, asphalt cement 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 asphalt cement, 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 asphalt cement content as a percentage of the mixture. As a minimum each mix design shall have:

- Five points of asphalt cement 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 that details 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.

- ± 0.3% in asphalt content
- ± 5.0% in RAP proportion
- ± 5.0% passing the 19.0 millimetre sieve
- ± 4.0% passing the 12.7 and 9.5 millimetre sieves
- ± 3.0% passing the 4.75 and 2.00 millimetre sieves
- ± 2.0% passing the 0.425 and 0.150 millimetre sieves
- ± 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 in the source 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 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 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 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.

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	
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:

a) 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.

b) 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.

c) 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 un-compacted 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
	> 10.00	> 9.00	REJECT
Passing 75µm (#200)	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	0.61to 0.70	-2.00
	00.81 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 ≥ 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

% OF MAXIMUM THEORETICAL DENSITY	UNIT PRICE ADJUSTMENT ($ PER TONNE)
>91.0 to ≥ 91.5	-10.00
>90.5 to ≥ 91.0	-15.00
>90.0 to ≥ 90.5	-20.00
≤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	
105.0 – 105.9		-$4.00
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 sublot that is represented by that core shall be rejected. At the discretion of the Owner's Representative the sublot 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 asphalt binder will be measured in tonnes, rounded to two decimal places. Payment for Asphalt Binder shall be as per the percentage (%) of asphalt binder required in the Job Mix Formula. However, where Asphalt Binder contents are found to be deficient to the point of being in the “Penalty Zone” subsequently described, Asphalt Binder 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 T329.

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

If the test results representing the Lot mean of deviations for asphalt cement 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 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.

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 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.

333.13.03 Basis of Payment for PGAB

Payment at the contract price for Asphalt Cement 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

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.

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’.

APPENDIX A: Schedule of EPS Submittals

Requirement	Timeline	Implications	Responsibility
Quality Control Inspection and Test Plan (QCITP)	10 days in advance of crushing	$ 2500.00 LD	Contractors QC Consultant
Asphalt Design Mix Formula	10 working days in advance of paving 5 additional working days for each resubmission	-	Contractors QC Consultant
QC Testing Documentation – Lot Summaries	24 hours after sampling	-	Contractors QC Consultant
Any QC documentation during production	24 hours after request	$250.00 LD per request	Contractors QC Consultant
Lottman and Boil Water Testing Results (AASHTO T283 & ASTM D3625)	14 days after sampling	$2000.00 Holdback per sample + $1000.00 LD for each delayed result	Contractors QC Consultant
Final Report	End of Project	$30,000.00 Holdback	Contractors QC Consultant

LD – Liquidated Damage

SECTION 334

PAVEMENT SMOOTHNESS

INDEX

334.01 SCOPE

This specification applies to the final lift of newly placed asphalt concrete pavement. Smoothness requirements and Basis of Payment shall conform to the following specification unless otherwise indicated in the contract documents.

334.02 REFERENCES

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

- ASTM E950 “Standard Test Method for Measuring the Longitudinal Profile of Travelled Surfaces with an Accelerometer Established Inertial Profiling Reference”

334.03 DEFINITIONS

Roadway Smoothness Category: The smoothness category that applies for a particular section of roadway will be classified as either Category A, Category B or Category C. The category will be defined in the tender documents and are determined based on a number of factors, including but not limited to: roadway classification, geometry, access points (intersections, driveways), and the presence of other physical features that may influence the ability to achieve pavement smoothness as determined by the Owner’s Representative.

International Roughness Scale (IRI): IRI is a statistical measurement used to determine the amount of roughness in a measured longitudinal profile. IRI shall be measured in mm/m and reported to two decimal places for all procedures relating to this specification.

Reporting Interval: The reporting interval for this specification shall be 100 metres for overall IRI and 10 metres for localized roughness.

Localized Roughness: Localized roughness is reported in 10 metre intervals where the IRI exceeds an established value as set out in Table 2, for a particular category.

Segment: A segment of roadway shall be defined by the full lane width (including paved shoulders) over a defined length. The segment length shall be 10 metres for localized roughness. The segment length shall be 100 metres for overall IRI, however, shorter segment length may exist as outlined in Section 334.06.04.

Project Chainage: The distance measured by the High Speed Profiler will be the only chainage deemed accurate and acceptable for the smoothness specification. This distance will be referenced to project chainage for informational purpose only.

334.04 EQUIPMENT

A Class 1 Inertial Laser Profiler, with moving average filter (high pass 90 metre and low pass 0.3 metre), shall be used for all smoothness measurements. The equipment will be installed and operated in accordance with the manufacturer’s recommendations and ASTM E950.

334.05 PROCEDURES

334.05.01 Smoothness Testing

The Department will conduct smoothness testing in accordance with ASTM E950. The Department's smoothness testing results will be used in determining payment adjustments and areas requiring Corrective Work.

Smoothness testing will be carried out as soon as possible upon completion of the paving operation.

334.05.02 Profile Measurements

The Profiler will record the right and left wheel path IRI values simultaneously at 10 metre intervals. The final IRI readings will be the average of the left and right wheel path values reported at 10 metre intervals. The 100 metre interval averages will then be computed from the 10-metre interval average IRI values.

The profile measurements shall be collected in the direction of traffic. The start and end location of the measurement for each lane shall be 10 metres from the transverse construction joint. In the case of a tapered lane measurement shall commence at the location by which the full lane width occurs.

334.05.03 Exclusions

The 10 metre segment at the beginning and end of each test section will be excluded from the smoothness calculations. Bridges, underpass and overpass structures located within any 10 metre segment, including the 10 metre segments immediately before and after the structure shall be excluded from the payment adjustments.

Areas requiring handwork, tapers, intersections, gore areas, aprons, etc. shall be excluded.

Individual 10 metre segments exhibiting roughness, which can be directly attributed to physical features including iron works or curb/gutter match-ins, may be excluded from payment adjustment at the discretion of the Owner's Representative.

334.06 MEASUREMENT FOR PAYMENT ADJUSTMENT

The Owner's Representative will provide the Contractor with a copy of the smoothness test results, including detailed payment adjustment summaries and Compulsory Corrective Work requirements.

334.06.01 100 Metre Segment

Payment adjustment for 100 metre segments shall be calculated based on the overall average IRI in mm/m for each 100 metre segment in each lane in accordance with Table 1.

334.06.02 Localized Roughness

With the exception of areas described in Section 334.05.03, each 10 metre segment with an IRI value greater that those shown in Table 2 shall be defined as localized roughness, resulting in negative payment adjustments. The total localized roughness payment adjustment shall be the numerical summation of all the individual localized roughness payments adjustments for the defined section of roadway.

334.06.03 Total Payment Adjustment

The total payment adjustment shall be the summation of all the individual payment adjustments for each 100 metre segment in each lane, including all localized roughness payment adjustments. If the total 100 metre segment payment adjustment is a positive value (bonus), the Contractor will be assessed the total 100 metre segment payment adjustment, and the total localized roughness payment for the defined section of roadway.

If the total 100 metre segment payment adjustment is a negative value (penalty), the Contractor will be assessed by either the total 100 metre segment payment adjustment or the total localized roughness payment adjustment, whichever results in a greater penalty to the Contractor. The two penalties shall not be applied in summation.

Example 1: 100 metre Segment (Station 7+700 – 7+800) Category B Exclusions apply in four (4) of the individual 10 metre segments (20 metre bridge + 10 metre at each end)

10 Metre Segment	IRI (mm/m)	Exclusion Applied (Y/N)	Localized Roughness Payment Adjustment (Table 2)	Average IRI over 60 metre Segment	IRI Payment Adjustment (Table 1)	Total Adjustment (for this 60m Segment)
7+700 – 7+710	0.53	N	$0	(0.53 + 0.39 + 0.34 + 0.23 + 0.28 + 1.42)/6=	$470 x 6/10= **+$282.00**	+$282.00-$250.00= **+$32.00 (Bonus)**
7+710 – 7+720	0.39	N	$0			
7+720 – 7+730	0.34	N	$0			

10 Metre Segment	IRI (mm/m)	Exclusion Applied (Y/N)	Localized Roughness Payment Adjustment (Table 2)	Average IRI over 60 metre Segment	IRI Payment Adjustment (Table 1)	Total Adjustment (for this 60m Segment)
7+730 – 7+740	0.23	N	$0	**0.53 AVG**		
7+740 – 7+750	0.28	N	$0			
7+750 – 7+760	1.14	Y (Bridge)	$0			
7+760 – 7+770	1.86	Y (Bridge)	$0			
7+770 – 7+780	2.43	Y (Bridge)	$0			
7+780 – 7+790	0.91	Y (Bridge)	$0			
7+790 – 7+800	1.42	N	-$250.00			

334.06.04 Segments Less Than 100 Metres

For segments less than 100 metres in length, price adjustments shall be determined from 10 metre segments that are not subject to exclusions as described in Section 334.05.03. Payment adjustments under Sections 334.06.01 and 334.06.02 shall apply to these areas based on the actual number of 10 metre segments that are not excluded. Price adjustments shall be prorated base on the number of non-excluded 10 metre segments in the 100 metre segment, as detailed in Table 1.

Example 2: 30 Metre Segment (Station 6+420 – 6+450) at the end of paving section Exclusion applied in one (1) of the individual 10 metre segment. The roadway is Category B.

10 Metre Segment	IRI (mm/m)	Exclusion Applied (Y/N)	Localized Roughness Payment Adjustment (Table 2)	Average IRI over 30 metre Segment	IRI Payment Adjustment (Table 1)	Total Adjustment (for this 60m Segment)
6+420 – 6+430	0.88	N	$0	(0.88 + 1.45)/2= **1.16 AVG**	-$190 x 2/10= **-$38.00**	**-$250.00* (Penalty) *take whichever**
6+430 – 6+440	1.45	N	-250.00			

10 Metre Segment	IRI (mm/m)	Exclusion Applied (Y/N)	Localized Roughness Payment Adjustment (Table 2)	Average IRI over 30 metre Segment	IRI Payment Adjustment (Table 1)	Total Adjustment (for this 60m Segment)
6+440 – 6+450	1.65	Y (Manhole)	$0			**value is the greater penalty**

Table 1
Average IRI Payment Adjustment - 100 Metre Segments

	Payment Adjustment for each 100 metre segment in each Lane		
IRI (mm/m)	**Category A**	**Category B**	**Category C**
0.00 – 0.10	+$750.00	+$950.00	+$1010.00
0.11 – 0.20	+$670.00	+$860.00	+$920.00
0.21 – 0.30	+$580.00	+$770.00	+$830.00
0.31 – 0.40	+$490.00	+$670.00	+$740.00
0.41 – 0.50	+$400.00	+$570.00	+$650.00
0.51 – 0.60	+$305.00	+$470.00	+$560.00
0.61 – 0.70	+$205.00	+$370.00	+$460.00
0.71 – 0.80	+$100.00	+$270.00	+$350.00
0.81 – 0.90	-$20.00	+$160.00	+$260.00
0.91 – 1.00	-$250.00	+$50.00	+$150.00
1.00 – 1.10	-$490.00	-$70.00	+$50.00
1.11 – 1.20	-$760.00	-$190.00	-$60.00
1.21 – 1.30	-$1040.00	-$320.00	-$190.00
1.31 – 1.40	-$1350.00	-$450.00	-$310.00
1.41 – 1.50	-$1700.00	-$590.00	-$440.00
1.51 – 1.60	-$2110.00	-$740.00	-$570.00
1.61 – 1.70	-$2630.00	-$900.00	-$720.00
1.71 – 1.80	-$3800.00	-$1070.00	-$870.00
1.81 – 1.90	-$4690.00	-$1260.00	-$1040.00
1.91 – 2.00	-$4700.00	-$1480.00	-$1220.00
2.01 – 2.10	-$4700.00	-$1720.00	-$1430.00
2.11 – 2.20	-$4700.00	-$2040.00	-$1670.00
2.21 – 2.30	-$4700.00	-$2750.00	-$1980.00
2.31 – 2.40	-$4700.00	-$3290.00	-$2670.00
2.41 – 2.50	-$4700.00	-$3300.00	-$3190.00
2.51 – 3.00	-$4700.00	-$3300.00	-$3200.00

Table 2
Localized Roughness Payment Adjustment - 10 Metre Segments

Roadway Classification	Localized Roughness IRI (mm/m) for 10 Metre Segment	Payment Adjustment (for each occurrence)
Category A	> 1.10	-$250.00
Category B	> 1.40	-$250.00
Category C	> 1.50	-$250.00
All Categories	>3.00	-$2500.00 or Compulsory Corrective Work

334.07 CORRECTIVE WORK

With the exception of areas defined in Section 334.05.03, all 10 metre segments with an IRI >3.00 mm/m shall be subjected to Compulsory Corrective Work or a Mandatory Penalty.

334.07.01 Mandatory Penalty

The Contractor shall be subjected to a mandatory penalty of -$2,500.00 for each 10 metre segment with an IRI > 3.00 mm/m irrespectively of roadway classification.

The Owner's Representative reserves the right to require Compulsory Corrective Work on any of the sections with an IRI > 3.0 mm/m. In sections where Compulsory Corrective Work is required the Mandatory Penalty of -$2,500.00 will be waived by the Department.

Based on overall smoothness results, the Department reserves the right to waive any or all Compulsory Corrective Work and enforce the Mandatory Penalty.

The Owner's Representative shall notify the Contractor of areas where Compulsory Corrective Work is required.

334.07.02 Compulsory Corrective Work Procedure

Corrective work shall consist of Removal and Replacement of the surface course of asphalt concrete. The minimum length of any repair area shall be 10 metres.

Removal and Replacement: On each of the 10 metres segments affected, the contractor shall remove (by cold planning) and replace the full width of the lane and the full depth of the surface course of asphaltic concrete pavement affected, including paved shoulders.

Asphalt Concrete Mix Requirements: The asphalt concrete mix used to construct the surface course shall conform to Sections 330, 332 and 333, as appropriate.

Incidental Corrective Work: Corrective Work may result in additional costs, including but not limited to: cold planning, tack coat, additional shouldering, guide rail adjustments, re-application of pavement markings, etc. Such work shall be carried out in accordance with the Department's Specification Book and at the Contractor's expense.

Disposal of Asphaltic Concrete: Asphaltic concrete that has been removed as a result of Corrective Work undertaken by the Contractor shall become the property of the Contractor to haul, stockpile or otherwise dispose of in an environmentally acceptable manner, at the Contractor's expense.

Time Limit for Corrective Work: Corrective work shall be completed within 30 calendar days of receipt of smoothness test results, including any appeal test results. Corrective work not completed within the 30 calendar days will automatically be subjected to the Mandatory Penalty as stated in Section 334.07.01 and is still be required to complete the Compulsory Corrective Work. For each 30 calendar days thereafter the mandatory penalty will be applied.

334.07.02.01 Retesting Following Corrective Work

Retesting Following Corrective Work: After corrective work has been completed, each of the 100 metre segments containing the corrective work shall be retested, using the same profiler used in the original testing. The new IRI values will be evaluated in accordance with Section 334.06 and results shall be binding. Should the new IRI values result in another Mandatory Penalty as outlined in Section 334.07.01 the Owner's Representative still reserves the right to require Compulsory Corrective Work or can apply the mandatory penalty of -$2,500.00 for each 10 metre segment.

Costs for Corrective Work: All costs associated with Corrective Work shall be the responsibility of the Contractor.

SECTION 337

WARM MIX ASPHALT

INDEX

337.01 SCOPE

This section covers the requirements for the use of Warm Mix Asphalt in lieu of Hot Mix Asphalt per Section 330, 332 and 333, as appropriate, Hot Mix Asphalt Concrete of the Department's Specification Book. If there are any direct conflicts, this specification will govern. All other requirements of Section 330, 332 and 333, as appropriate, of the specification are applicable.

337.02 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.

337.03 DEFINITIONS

Warm Mix Asphalt (WMA): Means warm mixed, warm laid asphaltic concrete produced using technologies that allow for the mixing, handling and compaction of the asphaltic concrete mixture at a temperature 20ºC to 50ºC lower than conventional hot mix asphalt.

Hot Mix Asphalt (HMA): Means hot mixed, hot laid asphaltic concrete and includes mixes produced using WMA technologies. The terms are used interchangeably. HMA may include recycled or specialty mixes.

Design Mix Formula (DMF): The DMF is defined as the laboratory determination of the precise proportions of asphalt binder, 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 asphalt binder content that will produce the desired asphalt concrete mix properties under field conditions.

337.04 MATERIALS

337.04.01 Anti-Strip Additive

Section 330.04.05 is amended by the addition of the following:

An Anti-Strip additive is to be incorporated into the WMA, the Contractor shall consult with the WMA technology supplier to determine whether or not the proposed additive is compatible with the WMA. In those cases where the supplier deems the anti-stripping additive incompatible, the anti-stripping additive shall not be used and another shall be chosen and identified to the WMA technology supplier until a compatible additive is agreed upon. The Contractor shall provide a copy of the correspondence with the WMA technology supplier to the Materials Engineering Division detailing the compatibility with the proposed anti-stripping additive at least 21 days prior to paving.

337.05 WARM MIX ASPHALT

337.05.01 Mix Design Requirements

The Contractor shall be responsible for the following:

1. Obtaining all materials, production of WMA, transportation, storage, and use of all materials.
2. Identifying and using a facility capable of producing the mix in accordance with the WMA technology supplier’s instructions for the use of their WMA technology.
3. Obtaining from the WMA technology supplier any and all information required for the proper preparation, handling, storage and use of the WMA material, including Safety Data Sheets.
4. Ensuring the WMA technology is produced in accordance with the WMA technology supplier’s recommendations to prevent any deleterious effects to the finished product.

5. Notifying the Owner's Representative and Materials Engineering Division in writing, identifying the WMA technology (complete name and address of the supplier) that will be used.

Below is a list of WMA technologies that are permitted for use:

- Advera®
- Astec-Double Barrel Green
- Cecabase RT
- Evotherm M1
- Evotherm P25
- Evotherm DAT
- Gencor Ultrafoam
- Rediset TM
- WarmGrip N1
- ZycoTherm SP2

If preparation and submission of the WMA mix design at the anticipated WMA production temperature is the responsibility of the Contractor than the following additional items are required.

The Contractor shall use professional engineering services and a CCIL or AASHTO certified testing laboratory to assess and carry out the design of the WMA mix design. During the development and verification of the WMA mix design the laboratory must ensure that WMA technology does not adversely affect the asphalt cement performance grade and WMA mixture performance. 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 asphalt mix design shall follow the Marshall method as outlined in the latest edition of the Asphalt Institute – Asphalt Mix Design Method - MS-2. The WMA materials and mix design shall meet the requirements of Section 330.04. Mix designs shall be based on asphalt cement content as a percentage of the mixture. As a minimum, each mix design shall have five points of asphalt cement content increasing by 0.5% increments

The mix design must also include:

- Pit/quarry identification (Name, location, route and reference distance).
- The specific gravities and the percentage of aggregate by mass of each aggregate to be used in the mix.
- The mix design gradation of the combined aggregate.
- Fine Aggregate Angularity (FAA) tests shall be conducted on a representative sample of the total fine aggregate inclusive of all fine aggregate materials as

indicated in the mix design including blending sand. The test will be conducted in accordance with ASTM C1252 Standard Graded Sample Method A.

- All Marshall mix design characteristic, including summary table, graphs, bulk relative densities of the combined aggregates and asphalt absorption of the combined aggregates.
- Dosage rate of WMA additive and how it will be incorporated to produce the WMA.
- WMA mixing and compaction temperatures as recommended by the manufacturer and used during the mix design process.
- The most current version of the Safety Date Sheet (SDS) for the WMA technology used.
- Identification of the anti-strip additive used in the WMA and current SDS.
- Modified Lottman and boiling water test results as per Section 330.04.05. Both tests must be completed on neat asphalt samples as well as samples including WMA additive with anti-strip.

The Materials Engineering Division will require up to ten (10) working days from the time of receipt of the WMA mix design for evaluation by the Department and/or the Department Representative's laboratory. The Materials Engineer will advise the Contractor of receipt of the required documentation. If the WMA mix design does not meet the requirements of Section 330.04, it shall be rejected. The Materials Engineer shall provide a written explanation to the Contractor that details why the DMF failed. The Contractor shall then provide another complete WMA mix design and re-submit it to the Materials Engineering Division for evaluation. Each time a WMA mix design is re-submitted, an additional five (5) working days, from the time of receipt of the revised WMA mix design, shall be required for evaluation by the Department and/or the Department's representative's laboratory. The Owner's Representative will not accept any asphalt concrete mix produced prior to the Contractor receiving written acknowledgement of receipt of all required documentation for the WMA mix design from the Materials Engineer.

337.05.02 WMA Cement Mixing

The WMA shall be produced within the temperature range recommended by the WMA technology supplier or as approved by the Owner's Representative (a minimum 20℃ temperature decrease is required). The Contractor shall maintain the mixing temperature of the WMA within ± 5ºC of the recommended temperature and shall provide the printed plant production temperatures, as required in section 330.07.04.03, at the end of each days production to the Department Representative and MED for review, or upon request. During daily start up, a temporary increased of 15℃ above the maximum mixing temperature are allowed for a maximum period of 1 hour. The temperature and time of each batch at discharge shall be recorded.

Failure to produce WMA within the allowable tolerances shall result in the following daily liquidated damages:

- 1st occurrence, $1000.00 liquidated damage
- 2nd occurrence, $2000.00 liquidated damage
- Each occurrence thereafter, $5000.00 each occurrence.

An occurrence shall be defined as when the WMA is produced outside the tolerances as indicated above. If the plant operator fails to make a temperature change within 30 minutes of the first occurrence then this will be treated as a separate occurrence. If there are two (2) or more consecutive occurrences within the same day, with no visible attempts to rectify the temperature issue, than production or any subsequent production must cease immediately. Production will only restart once the Contractor can prove that WMA can be produced consistently within the required temperatures.

337.05.03 Placing WMA Concrete

The Contractor shall provide notice of their intent to pave in writing to the Owner's Representative and Materials Engineering Division, a minimum of 7 days prior to placing WMA.

The WMA Technology supplier's recommendations for placing the WMA mix shall be followed. The temperature of the WMA immediately after spreading shall be within the limits identified in Table A below:

Table A
Allowable Temperature limits for WMA Compaction

Maximum Temperature behind the Screed
The lower of 125ºC or the maximum temperature recommended by the WMA technology supplier.

- When paving a bridge deck, the maximum temperature shall be adjusted to match the waterproofing manufacturer's recommendations and the requirements of Section 922.
- All rolling must be completed before the pavement mat temperature falls below 60℃.
- There shall be an increase to 135℃ behind the screed should the binder have a traffic designation of "H" or higher.

The Contractor shall measure and record the temperature of the WMA immediately after spreading using an infrared thermometer gun at wheel paths and midlane, once every 250 lane-metres during the WMA paving. The Contractor shall submit WMA temperature records to the Owner's Representative for compliance verification no later than 7 days from the date of measurement.

The Contractor shall utilize appropriate paving and compaction equipment to avoid mix segregation, roller pickup and/or any other surface defects.

No traffic shall be permitted on the newly placed surface mat until finish rolling is completed and the finished mat has been allowed to cool, as recommended by the WMA additive supplier. A transverse construction joint in the asphalt mat shall be constructed at the end of each day's work, and at other times when paving is halted for a period of time to permit the asphalt concrete to cool as recommended by the WMA technology supplier.

SECTION 340

CHIP SEAL

INDEX

340.06.03 Basis of Payment for the Application of Stockpile Supplied Chip Seal Aggregate

340.06.04 Basis of Payment for Supply and Application of Chip Seal Aggregate

340.07 TEMPERATURE

340.01 SCOPE

This specification covers the requirements for single layer chip seal surface treatment of pavement, together with the requirements for patching and filling cracks in the pavement prior to the chip seal surface treatment operations.

340.02 MATERIALS

340.02.01 Chip Seal Aggregate

The chip seal aggregate must be crushed and shall be of a high quality and be free of soft disintegrated stone, clay, or other deleterious materials. The screening of natural gravel deposits to produce chip seal aggregate will not be permitted.

The crushed aggregate shall be screened and washed over a 6.35 millimetre screen. Where the contract item specifies piling of the chip seal aggregate, then the aggregate shall be washed before stockpiling.

The aggregates shall meet the following requirements:

GRADATION REQUIREMENTS

SIEVE SIZE	% PASSING
12.7mm	100
9.51mm	85 – 100
6.35mm	20 – 60
4.76mm	0 – 20
2.00mm	0 – 5
0.075mm	0 – 1

PHYSICAL REQUIREMENTS

TEST	ACCEPTANCE REQUIREMENTS
LA Abrasion, Loss % max	35
Magnesium Sulfate Soundness 5 Cycles Less % max	12
Absorption % max	1.75
Thin and Elongated Pieces % max	20
Crushed Material % min	60
Petrographic Number max	135
Micro-Deval Test % max	20

The use of pits and quarries for the production of chip seal aggregate, together with the requirements for testing and stockpiling shall be carried out in accordance with the requirements of Section 310.

340.02.02 Asphalt Emulsion

Asphalt emulsion shall be RS-2k, or an approved equal, and shall meet the following requirements when delivered to the job site:

	Min	Max	Tests on Residue	Min	Max
Saybolt Viscosity	150	400	Penetration @ 25°C, 100g, 5s	100	250
Residue by Distillation %	67	---	Ductibility @ 25°C,	60	---
Settlement in 5 Days	---	5	Solubility in Trichloroethylene	97.5	---
Oil Portion of Distillate	---	3			
Particle Charge	+ive	+ive			

340.03 EQUIPMENT

The Contractor shall supply all tools, machinery and equipment required in the execution of all phases of the Work. Such equipment shall be maintained in excellent working condition and shall at all times be operated by skilled and experienced operators.

340.03.01 Pressure Distributor

The approved pressure distributor used for applying asphalt emulsion shall be capable of applying closely regulated quantities. It shall consist of a fully insulated tank permanently

and rigidly mounted on a truck or trailer capable of accurately maintaining any speed required for spraying.

The distributor shall be provided with the following minimum equipment:

a) Proper hand spray attachments to uniformly apply emulsion to any areas missed by the distributor.
b) An efficient and positive means of heating emulsion uniformly to any temperatures up to 150°C, and maintaining the contents constantly at any selected temperature without any local overheating and including a satisfactory method of circulating the contents during the entire heating process.
c) An approved thermometer with a minimum range of 10°C to 150°C graduated in intervals of not more than 10°C, with subdivisions at every 1°C, so placed as to accurately show the temperature of the distributor contents and be accessible to the Owner's Representative.
d) An approved Tachometer, driven from a fifth wheel, mounted so that it is readily visible to the driver so that it clearly and accurately registers distances traveled when spraying emulsion, and so that it enables the driver to maintain the constant speed required to ensure the specified rate of application of the emulsion.
e) A pump tachometer that registers pump output.
f) A pressure gauge indicating the pressure in the spray bar.
g) A rear mounted spray bar set parallel to the surface to be sprayed, and capable of adjustment to provide any required spraying widths from 2.5 to 3.5 metres. The distributor shall be equipped with a spray bar heating device, circulating a uniform viscosity and pressure of the emulsion at each nozzle, both before and during spraying operations. The circulating system shall be provided with a strainer to prevent clogging of the bar and nozzles. The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlaps the spray fan from the adjacent nozzle by 50% for double-lap so that a uniformly sprayed surface will result. This adjustment shall be made by the height set when the distributor is one half full, and shall be changed only when so permitted by the Owner's Representative.
h) Spray bar nozzles shall be designed and set as to ensure uniform fan shaped sprays. The nozzles shall not be such as to produce such a fine mist that the emulsion will blow away and not provide an even emulsion coating. All spray nozzles shall be of the same manufacturer, size, type and in good condition and shall be provided with valves capable of instant full opening and positive cut-off. All spray nozzles shall be set in the bar so that the nozzle slots make the same horizontal angle (30°) with the longitudinal axis of the bar. Before work commences, and periodically as required during spraying operations, the nozzles

on the spray bar shall be removed, and immersed in a solvent to remove all congealed asphalt and to clear the nozzle opening. Each nozzle shall be inspected and approved by the Owner's Representative and reinstalled on the spray bar at the correct angle.

i) A strainer shall be provided in the filling line to prevent entry of foreign material into the tank.

j) A sampling cock fitted on the spray bar or circulating line, and readily accessible to allow samples of the emulsion to be obtained directly from the distributor.

340.03.02 Mechanical Aggregate Spreader

The approved self-propelled aggregate spreader shall be capable of continuously and uniformly spreading closely regulated quantities of aggregate at the application rates selected.

The spreader shall be equipped with a rear-mounted hopper designed so that a loaded truck may supply aggregate to this hopper, while being towed by the spreader. The spreader shall be equipped with a front hopper and an approved means of transferring the aggregate to the hopper from the rear. The front hopper shall be equipped with an oversize reject screen and metering gates. The gates shall adjust the spreading width and be capable of individual adjustment to obtain a uniform flow of aggregate across the spreading width. These gates shall also be designed to provide simultaneous movement or closure from the operator's position. A spread roller, the rotation of which shall automatically commence when the metering gates are opened, shall further control the flow of aggregate from the metering gates.

340.03.03 Rollers

Steel tired rollers shall have tandem wheels and weigh at least 7 tonnes. Pneumatic-tired rollers shall be self-propelled and have a minimum ballasted weight of 8 tonnes.

340.03.04 Mechanical Broom

The mechanical broom shall be of an approved type of power broom suitable for pavement use.

340.04 CONSTRUCTION

340.04.01 Surface Preparation

Before chip seal operations may begin, the Contractor shall completely clean the pavement of all dirt and other debris. Cleaning shall be by the use of a power broom. Should there be any depressions not completely cleaned with the power broom, the Contractor shall clean such spots with a hand broom.

340.04.02 Patching and Crack Filling

Patching and crack filling shall be carried out to repair pavement potholes and cracks prior to the carrying out of the chip seal surface treatment operations. The repair work involves localized single or multiple layer applications of chip seal as required to fill cracks and potholes.

All cracks wider than 5 millimetres shall be treated. Should a single layer application be insufficient to fill the crack, then another application, or applications shall be applied as required until the crack is filled to the satisfaction of the Owner's Representative.

All potholes shall be patched by means of multiple layer emulsion and chip seal aggregate applications to fill the hole level with the surrounding pavement.

The emulsion shall be applied at the proper temperature using hand spray attachments.

The aggregate shall be spread by hand over the emulsion and then compacted. In those cases, where due to the characteristics of the pothole or crack, the roller cannot apply its weight to the chip seal then tamping shall be provided by hand operated means. After the completion of each layer of chip seal treatment and compaction, any loose chips shall be removed by hand brooming. All places requiring patching or crack filling shall be treated to the satisfaction of the Owner's Representative.

340.04.03 Application of Emulsion

All required patching and crack filling shall be carried out to the satisfaction of the Owner's Representative before the regular chip seal emulsion application operations may begin.

The emulsion shall be applied at a temperature in the range of 60°C to 75°C.

The emulsion shall be applied at the rate as designed, (approximately 1.9 litres per square metre) for single chip seal treatment. For possible second applications, the rate will be different. The optimum rate of application is related to aggregate gradation and to the condition of the road surface. For any given area, the emulsion shall be applied at the rate designed by the Contractor and approved by the Owner's Representative.

During the application of the emulsion, the distributor shall be operated by a minimum of two operators, one of whom shall be stationed on the rear platform to control the application. The forward speed of the distributor shall not exceed 1.6 metres per second.

340.04.04 Application of Aggregate

The crushing and stockpiling of chip seal aggregates must be 100% complete prior to application of chip seal aggregates to the road surface.

For single chip seal treatment, the aggregate shall be uniformly distributed at the rate of approximately 16 kilograms per square metre. For possible second application, the rate may be different. The Owner's Representative shall determine the exact rates of the applications.

The aggregate application operation shall be co-ordinated with the emulsion application so that no more than 15 metres separates the emulsion application from the aggregate spreading.

Application of aggregate operations for the day shall be completed at least 2 hours before sunset.

340.04.05 Rolling

Immediately after the application of the aggregate, pneumatic-tired rolling shall be carried out in such a manner that the entire treated area receives at least one coverage. Final rolling shall consist of one coverage with a steel wheel roller.

The minimum number of rollers required is one pneumatic-tired roller and one steel roller. If this combination of rollers is not sufficient to maintain the completed rate of progress, additional rollers shall be provided.

340.04.06 Mechanical Brooming

The chip seal treated surfaces shall be swept with a power broom. All excess aggregate shall be removed and disposed of by the Contractor, at their own expense. Sweeping shall not be carried out until the treatment has set up to a sufficient degree so that no damage will occur to the chip seal.

On chip seal treated surfaces open to use by public traffic, power brooming shall be carried out within 48 hours of the application of aggregate.

340.04.07 Temperature and Weather

Chip seal operations shall not be carried out when, in the opinion of the Owner's Representative, road conditions, high humidity, imminence of rain, wetness or dampness are not conducive to successful results.

Asphalt emulsion application operations shall not be carried out when the air temperature at the work location is less than 15°C.

Chip seal treatment shall not be carried out before June 15th or after September 1st, except by special permission of the Owner's Representative.

340.04.08 Protection of Work and Traffic Control

Where possible, the traffic shall be kept off the treated surface until the chip seal is to the point where it is resistant to damage. Where traffic must travel over the surface before it is fully cured, the Contractor shall control traffic speed by means of directing traffic in convoys. The Contractor shall provide a lead vehicle to ensure that convoys proceed at low speed.

340.05 MEASUREMENT FOR PAYMENT

The chip seal emulsion, the chip seal aggregate and the combined work of patching and crack filling, will be considered separately for payment.

340.05.01 Measurement for Payment for Patching and Crack Filling

Measurement for payment for patching and crack filling shall be an inspection to see that all the required patching and crack filling over the entire project has been completed. The unit of payment shall be the lump sum contract price to complete all required patching and crack filling within the lengths of the roads to be chip sealed.

340.05.02 Measurement for Payment for Emulsion

The quantity of asphalt emulsion applied to the road, within the required limits, will be measured in litres, rounded to the nearest whole number.

The quantity of emulsion shall be by means of metering the emulsion as it is being applied from the distribution truck. The metering shall be done by means of gauges located on the distribution truck. The gauges must be checked and approved by Measurement Canada before being used on the project. The Owner's Representative shall have the authority to check the accuracy of gauges by weighing the truck and using the emulsions specific gravity to compute the volume of emulsion.

The pay volume of emulsion applied shall be the volume measured by gauges corrected to the basis of 15.6°C by using the temperature volume correction table provided in Section 340.07. Coefficients shall be determined based upon the temperature observed at the time of the gauge reading.

340.05.03 Measurement for Payment for Chip Seal Aggregate by Weight

Where the unit of measurement for chip seal aggregate is stated in tonnes in the unit price table, the material shall be weighed on weigh scales.

Weigh scales shall be provided by the Contractor and they shall conform to the requirements of Section 501. The weighing of materials shall be in accordance with the requirements of Section 501. Only loads certified by the Department personnel as being placed in the works shall be included in the measurement for payment. The weight shall be computed in tonnes, rounded to one decimal place.

340.05.04 Measurement for Payment for Chip Seal Aggregate by Volume

When the unit of measurement for chip seal aggregate is stated in cubic metres in the unit price table, the aggregate shall be measured for payment by means of the volume of material.

Where the requirement is for the stockpiling of chip seal aggregate, the required volume shall be measured for payment in accordance with the requirements of Section 310.

Where the requirement is for the volume of chip seal aggregate used in the treatment, the volume of material taken from the stockpile and placed on the road shall be computed in cubic metres rounded to the nearest whole number.

The quantity to be measured shall be the number of cubic metres of material removed from the stockpile, as shown on the cross section sheets between the cross sections taken over the stockpile before material was removed and the cross sections taken after the material was removed. The volume of this excavation being computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

340.06 BASIS OF PAYMENT

340.06.01 Basis of Payment for Patching and Crack Filling

Payment at the lump sum contract price for patching and crack filling shall be full compensation for all the additional work involved in the patching and crack filling operations that is not compensated for in the contract prices for chip seal emulsion and chip seal aggregate.

Quantities of chip seal emulsion and chip seal aggregate used in the patching and crack filling shall be paid for at the appropriate contract prices for chip seal emulsion and chip seal aggregate.

340.06.02 Basis of Payment for Emulsion

Payment at the contract price for emulsion shall be compensation in full for all labour, materials and equipment used to clean the road surface, and to supply, haul, heat and apply the emulsion to the road surface at the specified temperatures and for all other work necessary to complete the application, except where payment is otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the re-treatment of any areas, as required by the Owner's Representative.

340.06.03 Basis of Payment for the Application of Stockpile Supplied Chip Seal Aggregate

Payment at the contract price for application of stockpile supplied chip seal aggregate shall be compensation in full for all labour, materials, equipment-use and any other expenses for; handling the aggregate, providing scales if required, providing all haulage of the aggregate from the stockpiles (the locations of which are stated in the contract documents) to where the aggregate is to be spread, spreading the aggregate, rolling, power brooming, providing and using the lead vehicle for traffic control, and cleaning up the stockpile site as may be required, together with all other operations necessary to complete the work, in accordance with this specification and for which payment is not otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the retreatment of any areas, as required by the Owner's Representative.

340.06.04 Basis of Payment for Supply and Application of Chip Seal Aggregate

Payment at the contract price for the supply and application of chip seal aggregate shall be compensation in full for all labour, materials, and equipment-use and any other expenses for; providing a pit or quarry, obtaining environmental approval, providing and transporting pit or quarry samples to the Department's Soils Laboratory in St. John's, clearing, grubbing and stripping the pit or quarry, processing pit or quarry material to the required gradation and physical requirements, washing the aggregate, providing and maintaining a field laboratory, paying any royalties for the material, constructing and maintaining an access road to the source of material, providing scales if required, handling the aggregate, providing all haulage of the aggregate from the source to where the aggregate is to be spread, spreading the aggregate, rolling, power brooming,

providing and using the lead vehicle for traffic control, and cleaning up and providing such other restoration to the pit or quarry and the stockpile site as may be required, together with all other operations necessary to complete the work, in accordance with this specification and for which payment is not otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the retreatment of any areas, as required by the Owner's Representative

340.07 TEMPERATURE

Temperature-Volume Correction for Emulsified Asphalts

°C	M*	°C	M*	°C	M*	°C	M*	°C	M*
10.0	1.00250	25.0	0.99575	40.0	0.98900	55.0	0.98225	70.0	0.97550
10.6	1.00225	25.6	0.99550	40.6	0.98875	55.6	0.98200	70.6	0.97525
11.1	1.00200	26.1	0.99525	41.1	0.98850	56.1	0.98175	71.1	0.97500
11.7	1.00175	26.7	0.99500	41.7	0.98825	56.7	0.98150	71.7	0.97475
12.2	1.00150	27.2	0.99475	42.2	0.98800	57.2	0.98125	72.2	0.97450
12.8	1.00125	27.8	0.99450	42.8	0.98775	57.8	0.98100	72.8	0.97425
13.3	1.00100	28.3	0.99425	43.3	0.98750	58.3	0.98075	73.3	0.97400
13.9	1.00075	28.9	0.99400	43.9	0.98725	58.9	0.98050	73.9	0.97375
14.4	1.00050	29.4	0.99375	44.4	0.98700	59.4	0.98025	74.4	0.97350
15.0	1.00025	30.0	0.99350	45.0	0.98675	60.0	0.98000	75.0	0.97325
15.6	1.00000	30.6	0.99325	45.6	0.98650	60.6	0.97975	75.6	0.97300
16.1	0.99975	31.1	0.99300	46.1	0.98625	61.1	0.97950	76.1	0.97275
16.7	0.99950	31.7	0.99275	46.7	0.98600	61.7	0.97925	76.7	0.97250
17.2	0.99925	32.2	0.99250	47.2	0.98575	62.2	0.97900	77.2	0.97225
17.8	0.99900	32.8	0.99225	47.8	0.98550	62.8	0.97875	77.8	0.97200
18.3	0.99875	33.3	0.99200	48.3	0.98525	63.3	0.97850	78.3	0.97175
18.9	0.99850	33.9	0.99175	48.9	0.98500	63.9	0.97825	78.9	0.97150
19.4	0.99825	34.4	0.99150	49.4	0.98475	64.4	0.97800	79.4	0.97125
20.0	0.99800	35.0	0.99125	50.0	0.98450	65.0	0.97775	80.0	0.97100
20.6	0.99775	35.6	0.99100	50.6	0.98425	65.6	0.97750	80.6	0.97075
21.1	0.99750	36.1	0.99075	51.1	0.98400	66.1	0.97725	81.1	0.97050
21.7	0.99725	36.7	0.99050	51.7	0.98375	66.7	0.97700	81.7	0.97025
22.2	0.99700	37.2	0.99025	52.2	0.98350	67.2	0.97675	82.2	0.97000
22.8	0.99675	37.8	0.99000	52.8	0.98325	67.8	0.97650	82.8	0.96975
23.3	0.99650	38.3	0.98975	53.3	0.98300	68.3	0.97625	83.3	0.96950
23.9	0.99625	38.9	0.98950	53.9	0.98275	68.9	0.97600	83.9	0.96925
24.4	0.99600	39.4	0.98925	54.4	0.98250	69.4	0.97575	84.4	0.96900

°C	M*	°C	M*	°C	M*	°C	M*	°C	M*
								85.0	0.96875

Legend: °C = Observed temperature in degrees Celsius
M* = Multiplier for correcting volumes to the basis of 15.6°C
* Multiplier (M) for °C is a close approximation.

SECTION 350

CRACK SEALING

INDEX

350.01 SCOPE

This specification covers the work of sealing pavement cracks with a crack sealant compound. The purpose of crack sealing is to prevent moisture from penetrating the roadway structure, to prevent the intrusion of incompressible material into the cracks and to prevent the spalling of material from the edges of the cracks.

This specification covers two methods of sealing pavement cracks. During the periods of spring and/or fall, a Blow & Go method involving no routing will be conducted. During the

summer months, crack sealing work will include a combination of Blow & Go method and a Rout & Seal method whereby cracks are cut using a router and sealed.

350.02 MATERIALS

350.02.01 General

The crack sealing material shall be hot-poured, rubberized joint and crack sealing conforming to ASTM D6690 or an approved equivalent.

The crack sealing material shall meet Type IV classification of the specification, capable of maintaining an effective seal in climates experiencing very cold temperatures. Crack sealing material having a lower resilience modulus may be acceptable if it can be shown that the product has been used successfully in similar climatic conditions. Final approval and acceptance of the crack sealing material will be at the Department's discretion.

Portland cement or agricultural lime will be required to sprinkle over sealed cracks to prevent tacking.

The use of any controlled products must be in accordance with the Workplace Hazardous Materials Information System (WHMIS). Workers should become familiar with the Safety Data Sheets (SDS) for these products.

350.02.02 Samples

The Contractor shall be prepared to submit either a 1 kilogram or 1 litre sample of crack sealing material to the Department of Transportation and Infrastructure at least 2 weeks prior to commencing work.

During the process of placing, the Owner's Representative may require the Contractor to take samples of the crack sealing material directly from the heating kettle.

350.03 EQUIPMENT

All equipment shall be safety approved.

350.03.01 Router

Routing equipment shall consist of mechanical routers capable of continually creating well-defined right angle routs. The routing equipment shall be sufficiently portable and flexible to accurately follow wandering cracks without tearing, chipping or spalling the crack edges. Equipment must produce a clean, neat square cut with vertical sidewalls.

The router shall be guided so that the crack lies entirely within the routed channel. Vertical sides of the cut shall be perpendicular to the pavement surface. The router must be capable of cutting a groove as shown in Form 1215. Open “V” shaped grooves are not permitted

Bits used to rout the cracks must be kept sharp and replaced promptly when dull.

350.03.02 Compressor

Compressed air equipment is required to effectively clean the cracks. The compressor, which may be attached to the hot air lance, shall provide a clean oil-free air jet of a minimum flow of 4 cubic metres per minute, a minimum velocity of 990 metres per second and a minimum pressure of 600 kilopascals.

350.03.03 Hot Air Lance

A hot air lance is required to dry and pre-heat cracks prior to applying crack sealing material. The hot air lance must be used at all times to warm the crack and remove moisture. It is acceptable to use the compressor and air lance simultaneously. Tiger torches are not permitted.

350.03.04 Heating Kettle

The heating kettle shall be a double-jacketed melting boiler capable of providing indirect heating and constant agitation of the crack sealing material. The kettle must be equipped with positive thermostatic temperature controls that will prevent overheating of the crack sealing material and heat transfer oil.

A calibrated thermometer capable of +/- 5˚C from 100˚C to 400˚C will be located so that the workers may safely and frequently check and record the temperature of the crack seal material.

A heated sealant applicator wand shall be attached to a heated hose and attached to a heated sealant chamber. Temperature controls will be capable of maintaining the temperature of the sealant within manufacturer’s tolerances.

350.04 TRAFFIC CONTROL

During the crack sealing operation, the Contractor must provide all traffic control in the form of flag persons and signs that conforms to Division 7 as well as the latest edition of the Department’s Traffic Control Manual and amendments.

Treated areas shall be protected from vehicle traffic for 30 minutes after the crack sealing material has been poured or in accordance with the manufacturer's specifications, whichever is longer.

Where traffic is to be maintained during crack sealing, the surface of the crack sealing material shall be dusted with Portland cement or agricultural lime prior to allowing traffic on the sealed areas.

Each vehicle used by the Contractor for the application of crack sealing material shall be equipped with a clearly visible flashing amber light.

350.05 PREPARATION OF UNCUT CRACKS (BLOW AND GO METHOD, NO ROUTING)

Crack sealing shall be limited to sealing uncut cracks (Blow & Go Method) during the periods of spring (April 01 to June 01) and fall (September 15 to November 30). Pavement surfaces and crack edges must be dry and the air temperature must be above 2˚C.

Crack sealing will include cleaning and sealing open cracks greater than 3 millimetres wide and less than 25 millimetres wide during the spring and fall seasons.

The cleaning operation shall consist of high compressed air free of oil to rid cracks of debris and/or moisture. The hot air lance will be used to warm the cracks and to remove any remaining moisture. The operation of the compressed air and hot air lance may be conducted in combination or separately. All cracks shall be dry (exhibiting no evidence of moisture) prior to sealing.

The Contractor shall remove all dirt, dust and debris from the pavement and this shall be considered incidental to the Work.

350.06 PREPARATION OF CUT CRACKS (ROUT AND SEAL METHOD INCLUDES ROUTING)

During the summer season, all cracks greater than 3 millimetres wide and less than 10 millimetres wide will be routed and cleaned. All cracks greater than 10 millimetres wide and less than 25 millimetres wide shall be sealed according to the Blow & Go method. The standard dimension of the cut crack (rout) is 20 millimetres wide by 20 millimetres deep or as directed by the Owner's Representative.

The cracks shall be routed taking care to follow the crack precisely. Avoid leaving small islands of pavement, which are or could be broken loose. Two or more cracks shall not

be joined by routing through uncracked pavement or routed in areas where a crack does not exist.

Following routing, the pavement surface and the routed crack shall be cleaned with high compressed air free of oil to rid cracks of debris and/or moisture. Ensure that no debris or moisture enters the routed crack before sealing. All routed cracks shall be sealed within 4 hours of routing.

The hot air lance will be used to warm the cracks and to remove any remaining moisture. All cracks shall be dry (exhibiting no evidence of moisture) prior to sealing.

The routing operation shall be periodically checked for cleanliness using duct tape by pressing 1 metre of the adhesive surface of the tape into the rout and inspecting it. After proper cleaning, there should be very little, if any residue on the tape.

The Contractor shall remove all dirt, dust and debris from the pavement. This shall be considered incidental to the work.

350.07 MELTING AND PREPARING HOT CRACK SEALING MATERIAL

The Contractor shall fully comply with the crack sealing material manufacturer's instructions for heating and preparing sealant for application using the specified equipment.

The crack sealing material shall be heated and melted in the melting kettle. The kettle should be charged by adding a few units of crack sealing material at a time. When the compound has reached a fluid condition, additional material can be added until the kettle is full.

The crack sealing material shall be subjected to continuous and positive agitation. The temperature used in melting the compound will be in accordance with the manufacturer's recommendation. Overheated, burned or under heated material shall not be used. If applied, it shall be removed and replaced at the Contractor's expense, as directed by the Owner's Representative.

When the pouring temperature has been reached, the crack sealing material shall be maintained at this temperature until it is placed in the crack. In no case, shall the material be held at fluid temperatures for more than 3 hours.

The Contractor shall ensure that crack sealing material packaging or other foreign material does not get into the melting unit.

350.08 HOT SEALANT APPLICATION

All cracks shall be thoroughly dried and cleaned of all residual dust and debris with high compressed air followed by the heating of the crack or rout with the hot air lance. The compressor and hot air lance may be used in combination or separately.

The hot air lance should be used at all times and kept moving at a pace that will avoid burning the surrounding pavement. A qualified operator should be used to adjust the cleaning speed, flame size and the distance of the heat lance tip from the road.

All cracks shall be carefully inspected prior to sealing to ensure they are thoroughly dry, clean and free from dust and debris. Adjacent pavement surface must also be clean and dry. The sealant compound shall not be applied with evidence of any dampness on or within the pavement or in the pavement pores.

The crack sealing material shall not be applied when the ambient temperature is below 2˚C or according to the sealant manufacturer's instructions.

No sealing shall proceed under unfavorable conditions having regard to the foregoing stipulations, until the conditions have been rectified to the satisfaction of the Owner's Representative.

The crack sealing material shall be applied by the heated sealant applicator wand. The crack sealing material shall be placed within 2 minutes after heating of the crack with the hot compressed air lance. Care should be taken to avoid spillage of the material onto the pavement. Should spillage occur, then the Contractor shall clean it up at their own expense.

Pour pots shall not be allowed unless they are used to seal cracks or routs which were previously sealed by the heater kettle and only need a second application to be topped up.

The crack sealing material is placed into the prepared crack or rout, and the material is spread over the crack with a squeegee or with the wand. The crack sealing material centered over the crack or rout shall be shaped with a squeegee or wand as thin as possible into an overband approximately 50 millimetres wide.

Following the application of the crack sealing material and before the area is open to traffic, all treated areas will be thoroughly checked for areas exhibiting adhesion failure, damage to the sealant, missed cracks, foreign objects in the sealant or other problems.

All areas not meeting the acceptable criteria shall be prepared and resealed until satisfactory. To prevent tacking prior to curing, the Contractor shall sprinkle the sealant with Portland cement, neat cement or agricultural lime as traffic warrants.

350.09 WARRANTY

The Contractor shall guarantee that subject to normal wear and tear, all work performed under this contract will remain in acceptable condition for a period of 12 months from the date of acceptance of all work by the Owner's Representative.

An acceptable condition would be when 95% of the crack seal performs as required over the 12 month period. If the less than 95% of the crack sealant performs as required, the Contractor will have to repair all failed areas within the contract at the Contractor's expense. All material, haul, traffic control and related work shall be paid by the Contractor.

The Contractor shall, within 14 days after receiving written notice from the Owner's Representative (or an agreed upon date), make good at their expense, in a manner satisfactory to the Owner's Representative, any imperfections due to faulty materials or workmanship discovered in the Work.

The Performance Bond will be held and retained by the Department until the 12 month period has expired. This will be held to ensure that sufficient funds will be available to the Department in the event of non-performance of the crack sealing.

350.10 MEASUREMENT FOR PAYMENT

Measurement for payment for crack sealing will be by means of the required completed and accepted crack seal, measured in metres rounded to 1 decimal place. The crack sealing of cracks which the Owner's Representative did not require to be treated, will not be included in measurement for payment.

350.11 BASIS OF PAYMENT

Payment at the contract price for crack sealing shall be compensation in full for all labour, materials and equipment-use to : supply samples of sealant to the Department, clean out and/or rout the cracks that the Owner's Representative requires to be treated, clean the routed cracks, dry the cracks, supply and apply sealant to the required depth, clean up all sealant spillage on the pavement, supply and apply cement or lime to the treated cracks to prevent tacking, together with that portion of the cost of providing all required traffic control.

SECTION 360

COLD PLANING

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360.01 SCOPE

This specification covers the requirements for cold planing existing pavement. The cold planing shall expose sufficient curb and gutter to allow full curb height restoration after eventual resurfacing, and shall extend to a width sufficient to restore an acceptable cross section.

360.02 EQUIPMENT

The cold planing shall be accomplished using a cold planing machine. The cold planing machine shall be a self-driven rotating drum type, capable of removing asphalt 100 millimetres thick and at least 1.2 metres wide in a single pass. Cutting depth shall be adjustable from 0 to 100 millimetres over the length of the drum. The machine shall have automatic grade control and be able to load milled material directly into trucks, or be able to windrow the material for subsequent pick-up by other equipment.

360.03 OPERATIONS

The existing pavement shall be removed to the depth specified in the contract documents or as directed by the Owner's Representative. If the required depth is not removed in the first pass, the Contractor shall return to mill down the pavement to the required depth.

Removal may be required across the full width of the road, one lane width, one lane and shoulder width or in tapered strips along the curb, depending upon the suitability of the resulting cross section. In areas where the cold planing equipment cannot remove the

pavement to the depths required, such pavement shall be removed to the required depth using other means acceptable to the Owner's Representative.

Except as otherwise provided in Sections 360.04 or 360.05, all asphalt millings shall become the property of the Contractor and shall be disposed of at an approved waste disposal location provided by the Contractor. The Contractor shall obtain all applicable permits and provide copies to the Owner's Representative prior to any milling operations commencing on the project.

Prior to paving operations commencing a transverse butt joint must be constructed. If a transverse vertical cut is milled in the existing pavement at the limit of the work area the Contractor shall immediately construct with hot mix asphalt concrete a temporary smooth 1.5 metre long taper. The temporary taper must be removed prior to paving of the milled area. The Contractor is advised the Department will apply liquidated damages in the amount of $1000 per day, per joint for any joint where a temporary taper is not constructed on the project. Liquidated Damages will be deducted from the Monthly Progress Estimate.

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.

All residue left by the cold planing process shall be removed immediately from the road. Mechanical sweeping shall be performed at the end of each day's operations. Low points in the asphalt because of cold planing operations, at the end of each day's operation, where water ponding may occur shall have the shoulder milled for draining rainfall. Any guide rail contaminated as a result of cold planing or sweeping operations shall be cleaned to the satisfaction of the Owner's Representative. Any milled material that is lost over the shoulder shall be immediately retrieved and disposed of in an approved manner.

The Contractor shall continuously maintain the work site free of potholes and standing water and in a condition providing for a safe and efficient flow of traffic, from the time of removal, until such time as the new asphalt concrete is placed. Hot mix asphalt concrete shall be placed in the potholes; cold mix or RAP are acceptable only as a temporary repair. Areas cold planed must be paved within 7 days of the cold planing operation.

Signage indicating the driving condition of the milled surface shall be posted (I.e. Construction Signs TC-47 and TC-49). Milled and aged asphalt concrete surfaces shall be treated with tack coat in accordance with Section 320 prior to the placing of asphalt concrete.

Unless otherwise identified in the Contract Documents or as directed by the Owner's Representative, the maximum length of cold planed areas left exposed shall not exceed 8 lane kilometres over the entire project.

360.04 USE OF MILLED MATERIAL FOR SHOULDERING

For projects where milled material is identified for use as shouldering material, the following conditions apply:

a) The milled material is to be placed on the shoulder using an approved shouldering machine. Direct placement from the conveyor of the milling machine onto the shoulder will not be permitted.
b) The material must be graded and compacted immediately after placing.
c) Milled material shall not be placed on shoulders within 15 meters of a body of water.
d) Milled material shall not be placed on shoulders near guide rail nor guide posts.
e) Excess milled material that cannot be used for shoulders will become the property of the Contractor and disposed of accordingly.

Any millings placed on roadway shoulders shall be neatly trimmed and compacted to ensure positive drainage from the adjacent pavement. The Contractor shall not place millings on the shoulder of the road without prior permission from the Owner's Representative, and under no circumstances shall millings be placed on the median shoulders along a divided highway. Areas where millings are placed on the shoulder without the permission of the Department, shall have the associated milling and asphalt quantities deducted from the progress payments and will not be paid until the millings are cleaned up from the shoulder and hauled away to the satisfaction of the Owner's Representative. No additional payment shall be made for placing and compacting millings on shoulders.

Milling depth shall be a nominal 50mm, except in areas where milling will be done to re-establish the cross section of the existing asphalt. Milling depths in those areas will vary and may be less than or greater than 50mm as directed by the Owner's Representative. All milled edges shall be treated, 100% coverage, with two coats of tack coat. All costs associated with the supply and application of tack coat on the milled edges shall be incidental to the asphalt unit price.

All work shall follow the environmental guidelines set out in the document “Guideline for Waste Asphalt Reuse in New Pavement or in Roadbed Construction of Paved Roads; and/or Storage and Final Disposal” issued by the Department of Environment and Climate Change. The document can be found at the following URL: https://www.gov.nl.ca/ecc/env-protection/waste/

360.05 USE OF MILLED MATERIAL FOR STOCKPILING FOR DEPARTMENT DESIGNATED AREA

For projects where milled material is identified for use by the Department the material shall be loaded and hauled to a stockpile site as indicated in the contract document or as directed by the Owner’s Representative.

If the Contractor removes the specified thickness in more than one layer, then material from each layer must be stockpiled separately, unless otherwise indicated in the contract documents.

Proper stockpiling procedures must be used and care shall be taken not to contaminate or consolidate the reclaimed asphalt concrete stockpile.

If a potential for contamination of the RAP exists due to ground conditions at the stockpile site a layer of clean, fine grained material shall be evenly distributed as a base for the stockpiles. The cost of preparing and providing the layer of clean, fine grained material as a base for the stockpiles shall be included in the unit price bid for cold planing asphalt.

The height of the RAP stockpiles shall be a maximum of 3 meters to limit the consolidation of the stockpile material and no loaders, excavators, dozers, trucks or other equipment shall be permitted to travel on the stockpile.

360.06 MEASUREMENT FOR PAYMENT

Measurement for payment shall be on the basis of the required surface area subject to cold planing to the required depth. The area shall be computed in square metres, rounded to the nearest whole number.

360.07 BASIS OF PAYMENT

Payment at the contract unit price shall be compensation in full for all labour, materials and equipment use to; carry out the cold planing to the required depth, load and haul away and dispose of the millings at a waste disposal site provided by the Contractor at their own expense, or a site designated by the Owner’s Representative, and sweep the

planed surface. All work associated with loading, transporting, placing, grading and compacting milling materials along shoulders shall be considered incidental to this item.

SECTION 370

PULVERIZE EXISTING ASPHALT

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370.01 DEFINITION

Full depth asphalt reclamation, often referred to as pulverizing, is a recycling technique in which existing asphalt pavement is crushed in place and mixed with a portion of the underlying granular base to form a homogeneous, blended mixture. The recycled mixture is then shaped and compacted for use as granular base in the new road structure.

370.02 PROCEDURE

The Contractor shall pulverize the existing asphalt pavement and underlying granulars to a total depth equivalent to twice the existing asphalt thickness. If underlying granular layers have insufficient thickness the Owner's Representative must be notified immediately. The depth of pulverizing for determining payment at the contract unit price shall be 220 millimetres, unless otherwise noted in the contract documents. Areas requiring a pulverizing depth greater than 220 millimetres (or as specified in the supplementary general condition) shall be compensated for at the prorated rate as described in Section 370.04.

The pulverized material shall have 100% passing a 40 millimetre sieve and shall be blended uniformly. Any material larger than 40 millimetre in dimension shall be removed from the surface of the Work. Pulverized material shall contain no more than 50% asphalt coated particles when tested in accordance with the latest version of MTO LS-621.

The pulverizing process shall be performed using a self-propelled machine specifically manufactured for full depth recycling work and capable of reducing the material to the specified size. It shall pulverize to a specified depth with standard depth control (as shown on a working gauge) and must maintain a consistent cutting depth and width.

After the pulverizing operation has been completed, the Contractor shall prepare the roadway for Hot or Warm Mix Asphalt Paving. This shall include saw cutting the asphalt, rough grading and addition of new granular “A” as directed by the Owner’s Representative, fine grading and compaction. The grading and compaction shall be in accordance with Section 315 and 316, as appropriate.

Should the Owner’s Representative require the gradation of the pulverized material to be adjusted, thorough mixing of new granular “A” with the pulverized material will be required. The new road profile and cross section shall be restored to the satisfaction of the Owner’s Representative. Work under this item shall also include the excavation and removal of pulverized materials from the transitions areas to permit a suitable transition to match into the existing asphalt as directed by the Owner’s Representative.

The Contractor shall be responsible for maintaining the gravel surface in a condition acceptable to the Owner’s Representative throughout the entirety of the project. The Contractor is reminded that Section 840 applies to this item. Prior to termination of daily operations, all open pulverized sections shall be graded, shaped and compacted leaving it suitable for a driving surface. The roadway shall not be left unpaved more than 10 days after pulverization of the old asphalt and the pulverized or unpaved work area shall not be greater than 4 kilometres in road length.

370.03 MEASUREMENT FOR PAYMENT

Measurement for payment shall be in square metres of actual area of roadway pulverized, rounded to one decimal place.

The measurement calculations shall be based on actual existing asphalt width determined from field measurements and the length of the actual horizontal distance pulverized as determined by the Owner’s Representative. Unless indicated otherwise in the contract documents, any area pulverized at a depth greater than 220 millimetres, and verified by the Owner’s Representative at the request of the Contractor prior to completing the work, will be measured separately for payment at a prorated amount as defined below.

370.04 BASIS OF PAYMENT

Payment at the contract price for full depth asphalt reclamation will be considered compensation in full for all labour, material and equipment use to saw cut asphalt at the limits of pulverizing, pulverize the existing asphalt and granulars to a total depth of 220 millimetres or as specified in the contract documents, rough and fine grading including blending of new granular “A”, compaction, and dust control as deemed necessary by the Owner’s Representative. Payment for the new granular “A” will be made according to Section 315.

In the event the Contractor encounters areas of significant length (greater than 100 metres) where the actual depth of pulverizing may exceed 220 millimetres or the stipulated depth in the contract documents, the Contractor shall notify the Owner's Representative of such locations prior to proceeding with the work. The Contractor shall allow the Owner's Representative time to investigate such areas as necessary to determine the need to exceed the prescribed depth. In the event the Owner's Representative determines the need to increase the pulverizing depth beyond the contract requirements, the unit price bid per square metre shall be adjusted in accordance with the requirements below. Only areas authorized by the Owner's Representative after receiving notification from the Contractor will be eligible for the unit price adjustment.

Unit Price Prorated Factor

Prorating Factor (PRF) = 1+0.75(A-B)/B

A = Actual Depth B = Stipulated Contract Depth PRF > 1.0

Example of Prorated Unit Price for area with depth greater than 220mm:

A – 250mm (this would indicate existing asphalt at 125mm and underlying granulars at 125mm)

B – 220mm (stipulated contract depth)

PRF = 1+0.75[(250-220)/220]

PRF = 1.102