APPENDIX E:
SPECIAL ASPHALT PROVISIONS

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SPECIAL PROVISIONS – ASPHALT

REFERENCES

This specification refers to the following standards, specifications, and publications:

Ontario Provincial Standard Specifications (OPSS)
OPSS.MUNI 310 Hot Mix Asphalt
OPSS.MUNI 1101 Material Specification for Performance Graded Asphalt Cement

Ontario Ministry of Transportation Publications
LS-227 Determination of Ash Content
LS-299 Determining Asphalt Cement's Resistance to Ductile Failure Using Double Edge Notched Tension Test (DENT)
LS-308 Determination of Performance Grade of Physically Aged Asphalt Cement Using Extended Bending Beam Rheometer (BBR) Method
LS-319 Determining the Cross-Over Temperature of Asphalt Cement
LS-320 Determining the Low Temperature Critical Spread of Asphalt Cement
MERO Field Guide for the Acceptance of Hot Mix Asphalt and Bridge Deck Waterproofing
PH-CC-249 Recovered Asphalt Cement (RAC) Test Reporting Sheet
PH-CC-250 PGAC Test Reporting Sheet

ASTM International
D 3665-12 Standard Practice for Random Sampling of Construction Materials
D 7343-12 Standard Practice for Optimization, Sample Handling, Calibration, and Validation of X-Ray Fluorescence Spectrometry Methods for Elemental Analysis of Petroleum Products and Lubricants

American Association of State Highway and Transportation Officials (AASHTO)
M 320-10 Standard Specification for Performance Graded Asphalt Binder
M 332-14 Standard Specification for Performance Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test
R 29-14 Grading or Verifying the Performance Grade of an Asphalt Binder
T 40-02 Sampling Bituminous Materials
T 350-14 Standard Method of Test for Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)

Note: Always reference the latest version of the documents listed above.

DESIGN AND SUBMISSION REQUIREMENTS

PGAC Test Documentation

For each grade of PGAC specified in the Contract Documents, the Contractor shall supply the following items to the Town at least two (2) weeks prior to the use of each product:

a) The PGAC supplier, facility type, and location that the product shall be supplied from.
b) Applicable mixing and compaction temperatures for the product.
c) Documentation of construction, storage and handling requirements, including the Safety Data Sheets (SDS), re-compaction temperature, mix discharge temperature, and recommended extraction procedures.
d) When the asphalt cement contains any zinc oxide, iron carboxylates, or a combination, added as Hydrogen Sulfide (H2S) scavengers, they must be declared.
e) When the PGAC contains any polyphosphoric acid (PPA) and a liquid anti-stripping additive is incorporated into the PGAC at the PGAC supplier's depot, the documentation must include:
    i. Information on how much anti-stripping additive was added to the PGAC.
    ii. Documentation from the PGAC supplier stating that the PPA-modified PGAC, with the liquid anti-stripping additive added at the PGAC supplier's depot, shall meet all asphalt cement material requirements specified in the Contract Documents, including AASHTO M 320 for the PGAC grade specified.
f) A letter from the PGAC supplier declaring that the PGAC does not contain any of the banned materials listed in the “Materials” section below.

PGAC Supply Documentation

For each grade of PGAC specified, the following items shall be supplied to the Town prior to the commencement of HMA production:

a) All PGAC documentation from the PGAC supplier in the form of bill of lading and certificate of analysis, confirming the grade of PGAC. The bill of lading and certificate of analysis shall also be supplied for each subsequent delivery of PGAC that will be used for the HMA production.
b) Documentation identifying the PGAC storage tank at the HMA plant that will be supplying the PGAC during production of HMA for the project. The Town shall be notified and provided updated documentation prior to changing the storage tank that is being used to supply PGAC for the HMA production at the HMA plant.

Materials

PGAC shall comply with the requirements of OPSS.MUNI 1101.

PGAC shall be according to AASHTO M 320 for the performance grades specified in the Contract Documents when tested using the methods designated in AASHTO R 29.

PGAC shall be homogeneous, free of water and any contamination, and shall not foam when heated to the temperatures specified by the manufacturer for the safe handling and use of the product. Silicone oils are allowed as anti-foaming agents at less than five parts per million. Zinc oxide and iron carboxylates may be used as hydrogen sulfide (H2S) scavengers.

PGAC shall not contain more than 0.3% polyphosphoric acid (PPA) or 0.3% elemental sulfur (S) in addition to the typical sulfur that is naturally presence in the asphalt cement, and these shall only be used as catalysts for the purpose of modification with epoxy(E)-type or styrene-butadiene (SB)-type polymer modifiers. PGAC shall not contain any orthophosphoric acid.

PGAC shall not be air blown or catalytically oxidized in any manner. PGAC shall not contain any air blown or catalytically oxidized residues.

The asphalt cement shall not contain any of the following additives added for PGAC modification: atactic polypropylene; carbon black; polyisobutylene; polyisoprene; natural rubber; alkaline bases; insoluble particulates or fibres; salts of iron, copper, manganese and/or cobalt; silicates; styrene-butadiene rubber (random copolymer latex); synthetic waxes (paraffin waxes, naphthenic waxes); synthetic and saturated oils (including but not limited to the following: vegetable oils or modified vegetable oils, paraffin oils, polyalphaolefins (PAO), lube oils, and re-refined lube oils, waste oils (including but not limited to the following: cracked residues, re-refined high vacuum distillate oils; tall oils, vacuum tower asphalt extenders, waste cooking oils, waste engine oils, and waste engine oil residues).

If modifiers or additives other than styrene-butadiene (e.g., SB diblock, SBS triblock, SBS radial, SBS high vinyl, SB tapered, etc.) or epoxy-type polymers (e.g. reactive elastomeric terpolymers) are used for the modification of neat asphalt cement, pre-approval from the Owner is required.

Organic bases may be contained in the PGAC provided they are used as anti-stripping or warm mix additives or both. If organic bases are present in anti-stripping and/or warm mix asphalt additives, they shall be declared at the time of mix submission.

PGAC grades shall meet the additional requirements shown in Table 1.

QUALITY ASSURANCE

Sampling

Unless otherwise specified in the Contract Documents, the Town shall determine the frequency of sampling and testing based on Random Sampling Procedures. Lot and sublot sizes for each grade of PGAC shall be communicated with the Contractor during the Pre-Pave Meeting. The Town retains sole discretion to select lot and sublot sizes and the frequency of sampling.

Samples used for testing the original asphalt cement shall be obtained during the production of the asphalt mix from the storage tank which is directly feeding the production of the asphalt mix. All test samples shall be obtained by the Contractor in the presence of the Town according to AASHTO R 66, ASTM D 3665, and the asphalt plant's health and safety plan. The asphalt plant's health and safety plan and procedure for sampling shall be reviewed at the pre-pave meeting.

Sample Containers shall be supplied by the Contractor. QA and Referee samples shall be obtained at the same time and shall be a minimum of 2 litres each.

Quality Assurance Testing

When the QA and Referee samples arrive at the QA Laboratory, a representative from the QA Laboratory shall randomly select one sample for testing. The additional sample shall be retained for possible Referee Testing.

Test results shall be categorized as Acceptable or Rejectable based on performance grading requirements. “Borderline” results as per OPSS will be considered Rejectable and in most cases will require full removal and replacement of the HMA.

Test results shall be reported on MTO Form PH-CC-250 PGAC Test Reporting Sheet. Other forms are acceptable but must include the Complex Shear Modulus (G*) and Phase Angles (δ) for all DSR test results. The Cross Over Temperature (LS-319) and Low Temperature Critical Spread (LS-320) shall also be reported for information purposes only. Testing of 40 hour PAV residue is not required unless specified in the Contract Documents.

Referee Testing

Referee testing may be invoked within 5 business days of the Contractor receiving QA test results. Referee testing shall be completed by a mutually agreed-upon, third-party laboratory. The same requirements for testing and reporting apply as stated above in Quality Assurance Testing.

Referee testing will be completed in the presence of the Town. The Contractor may observe the testing, however, there will be no cost to the Town stemming from the Contractor’s observation.
When referee testing shows that the PGAC is Rejectable, the HMA containing the Rejectable PGAC shall be fully removed and replaced from the work area.

Payment for referee testing and any associated construction or administrative costs shall be made in accordance with the Contract Documents.

Recovered Asphalt Cement (RAC)

Recovered Asphalt Cement (RAC) means the asphalt cement extracted from an asphalt mix.

Sampling for RAC shall be in accordance with typical sampling procedures for loose HMA samples. The frequency of RAC sampling shall be in accordance with the Town’s PGAC sampling procedures. RAC samples shall be used in place of rolling thin film oven (RTFO) residue and only aged in a pressure aging vessel (PAV) as required for the requirements listed in this specification.

Extraction of asphalt cement samples shall be carried out in accordance with MTO LS-284 from loose HMA samples or sawcut samples from the finished pavement. Fines shall be removed using a high-speed centrifuge prior to recovery.

Extraction must be completed using reagent grade trichloroethylene or toluene. The extraction solvent used must be reported on the RAC test reporting sheet.

Test results shall be categorized as Acceptable or Rejectable based on performance grading requirements. The RAC must also meet the additional requirements of Table 1. “Borderline” results as per OPSS will be considered Rejectable and in most cases will require full removal and replacement of the HMA.

Test results shall be reported on MTO Form PH-CC-249 Recovered Asphalt Cement (RAC) Test Reporting Sheet. Other forms are acceptable but must include the Complex Shear Modulus (G*) and Phase Angles (δ) for all DSR test results. The Cross Over Temperature (LS-319) and Low Temperature Critical Spread (LS-320) shall also be reported for information purposes only. Testing of 40 hour PAV residue is not required unless specified in the Contract Documents.

Table 1
Testing Requirements and Acceptance Criteria for PGAC Grades 58-34 and 64-34

PGAC Grade XX-YY	Property and Attributes (Unit)	Test Method	Results Reported Rounded to the Nearest	Acceptance Criteria	Rejectable
All PGAC Grades	Ash Content, % by mass of residue (%)	LS-227	0.1	≤ 0.6	> 0.6
	Low temperature limiting grade (LTLG) (°C)	LS-308	0.1	≤ (-YY + 1.5)	> (-YY + 1.5)
	Grade Loss (°C)	LS-308	0.1	≤ 6.0	> 6.0
	Non-recoverable creep compliance at 3.2 kPa ($J_{nr-3.2}$) (kPa^{-1})	Multiple Stress Creep and Recovery (MSCR) testing according to AASHTO TP 70 testing conducted at a temperature of 58 °C	0.01	< 4.0	≥ 4.0
	Average percent recovery at 3.2 kPa ($R_{3.2}$) (%)		0.1	> the lesser of [(29.371) $(J_{nr-3.2})^{-0.2633}$] or 55	≤ the lesser of [(29.371) $(J_{nr-3.2})^{-0.2633}$ - 10] or 50
	Average critical crack tip opening displacement (δ_t) (mm)	LS-299	0.1	> 12.0	< 12.0
	Cross-Over Temperature ($T_{\delta 45}$), °C	LS-319	0.1	For Information	
	Low Temperature Critical Spread (ΔTC), °C	LS-320	0.1	For Information	

Note – For Recovered Asphalt Cement, the Ash Content must be < 1%