**ADMINISTRATION OF PAVEMENT PERFORMANCE SPECIFICATIONS**

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| Special Provision No. BITU 0010 March 2021 |

**1.0 SCOPE**

This specification covers the administration of the pavement performance specifications in the Contract Documents, including repairs required as a consequence for non-conformance.

**2.0 REFERENCES**

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

**Ontario Provincial Standard Specifications, Construction**

OPSS 308 Tack Coating and Joint Painting

OPSS 313 Hot Mix Asphalt - End Result

OPSS 314 Untreated Granular, Subbase, Base, Surface, Shoulder, and Stockpiling

OPSS 341 Routing and Sealing Cracks in Hot Mix Asphalt Pavement

OPSS 366 Repairing Concrete Pavement and Concrete Base

OPSS 369 Sealing or Resealing of Joints and Cracks in Concrete Pavement and Concrete Base

OPSS 510 Removal

**Ontario Provincial Standard Specifications, Material**

OPSS 1010 Aggregates - Base, Subbase, Select Subgrade, and Backfill Material

OPSS 1101 Performance Graded Asphalt Cement

OPSS 1151 Superpave and Stone Mastic Asphalt Mixtures

**Ontario Ministry of Transportation Publications**

LS-100 Rounding-Off of Test Data and Other Numbers

MI-183 Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions

SP-024 MTO Manual for Condition Rating of Flexible Pavements

SP-026 MTO Manual for Condition Rating of Rigid Pavements

LS-296 Method of Test for Calibrating, Correlating, and Conducting Surface Smoothness Measurements using an Inertial Profiler

LS-800 Test Method for Conducting and Correlating Pavement Wheelpath Rut Depth Measurement using Automated Pavement Data Collection Equipment

**ASTM International**

E950-09 Standard Test Method for Measuring the Longitudinal Profile of Travelled Surfaces with an Accelerometer Established Inertial Profiling Reference

E1703-10 Standard Test Method for Measuring Rut-Depth of Pavement Surfaces Using a Straightedge

**American Association of State Highway and Transportation Officials**

GDPS-4-M AASHTO Guide for Design of Pavement Structures

MEPDG-3 Mechanistic-Empirical Pavement Design Guide: A Manual of Practice

**American Concrete Pavement Association (ACPA)**

StreetPave 12 Structural Design Software for Street and Road Concrete Pavements

Pavement Designer PavementDesign.org web-based pavement design tool

**3.0 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Acceptance Criteria** means objective values (numerical or descriptive) that are compared to performance measurements to assess conformance with performance requirements.

**Consequences for Non-conformance** means the repairs required such that acceptance criteria are met or exceeded.

**Concrete Pavement** means a rigid pavement structure with an exposed concrete surface, and may include concrete shoulders.

**Crack** means a break in the pavement surface, a separation of the pavement or aggregates at the surface of the pavement, and separation of pavement joints in HMA pavement, and includes breaks and separations previously repaired by sealing.

**Crossfall** means the average grade between edges of a cross-section element.

**Degree Days > 10 °C** means the number of degrees, in Celsius, that the mean temperature for a given day is above 10° Celsius. A day with a mean temperature of 15.5 °C has 5.5 Degree Days > 10 °C. A day with a mean temperature of 8.5 °C has 0 Degree Days > 10 °C.

**Discretionary Repairs** means preventive or repair work, not required by the Contract, completed by the Contractor to reduce the risk or costs of non-conformance.

**Hot Mix Asphalt (HMA)** means hot mixed and hot laid asphaltic concrete which also includes mix produced using Warm Mix Asphalt (WMA) technologies beneficiating HMA, HIR, and SMA. The terms are used interchangeably. HMA may include recycled mixes or specialty mixes.

**International Roughness Index (IRI)** means a specific mathematical transform of a true pavement profile by means of a Quarter Car Filter where the absolute values of the vertical vibration are accumulated and divided by the sublot length. IRI is expressed in m/km.

**Non-Conformance** means that performance measurements do not meet acceptance criteria.

**Pavement Structure** means layers of selected materials placed on the Subgrade and designed to resist surficial wear and frost action, provide a smooth travelling surface, support wheel loads and provide drainage.

**Pavement Surface** means the top of any permanent or temporary highway, road, ramp, turn lane, turn taper, cul-de-sac, or other facility that is within the designated lanes for vehicular travel.

**Performance Graded Asphalt Cement (PGAC)** means an asphalt binder that is produced from petroleum residue, either with or without the addition of non-particulate modifiers.

**Wheel Track Rutting** means longitudinal depression in the pavement wheel path.

**4.0 EMERGENCY REPAIRS**

Should any pavement distresses arise within an area subject to a pavement performance warranty prior to the date of the Certificate of Contract Completion, including during seasonal shutdown periods, or during the warranty period that are deemed by the Owner to impact the safety of the travelling public, the Contractor shall respond immediately to address the distresses upon notification by the Owner. Such distresses include but are not limited to any defect in a designated travel lane such as potholes, distortions, water ponding, or pavement edge surface loss that could cause instability in or loss of control of a vehicle.

Emergency repair work shall be performed within 24 hours of notification by the Owner. Should work not be performed within 24 hours, the Owner may have the work performed by others at the Contractor’s expense. For emergency repair work performed by others, the Owner shall determine the type and extent of the repair. Emergency repairs performed by the Contractor or others may be temporary in nature and may not meet the requirements for repairs specified in the Contract Documents.

When emergency repairs by the Contractor or by others do not meet the requirements for repairs specified in the Contract Documents, the Contractor shall make further repairs within 60 Days in order to meet the requirements.

**4.01 Pothole Repairs**

Regardless of the severity and extent of coarse aggregate loss, potholes with an area of 0.04 m² or greater shall be temporarily repaired with HMA or approved patching product:

a) Within 3 Days of notification by the Owner if the pothole depth is greater than 50 mm.

b) Within 7 Days of notification by the Owner if the pothole depth is less than 50 mm.

Potholes that have been temporarily repaired shall be maintained in good repair until final repairs are made.

**5.0 PERFORMANCE WARRANTY**

**5.01 General**

The Contractor shall be permitted to carry out on-site activities such as sampling, testing, inspection, and traffic surveys during the performance warranty period. The Contractor shall advise the Owner in writing at least 15 Business Days prior to the start of each period of on-site activity. Damaging or destructive sampling, testing or inspection shall include a repair proposal and shall not proceed without the prior approval of the Owner.

Prior to undertaking any discretionary repairs, the Contractor shall submit a proposal to undertake the discretionary repairs to the Owner for approval, at least 15 Business Days prior to the repairs. The Owner may deny approval at its sole discretion.

The Contractor may be required to attend meetings with the Owner or the Owner’s representative to review the work schedule, impacts on public traffic, and the Owner’s maintenance operations prior to commencing any sampling, testing, inspection, traffic survey, repair work, or other activity, including Work required to comply with the consequences for non-conformance to the performance requirements. The Contractor shall carry out these activities subject to all constraints and conditions that the Owner may impose.

When work is being performed by others in an area of planned Contractor activity during the warranty period, the Contractor shall schedule and conduct the activity so that there is no impact on the progress or completion of the work being performed by others. The Contractor shall have no claim against the Owner for any resulting inconvenience, delay, or loss.

The terms of this Contract, including insurance requirements and operational constraints affecting public traffic, businesses, and municipalities shall apply to any on-site activity undertaken by the Contractor during the performance warranty period except that traffic control and scheduling of the activities shall be conducted in accordance with the requirements specified by the Owner in writing prior to the on-site activity.

**5.02 Performance Warranty Period**

The performance warranty period shall commence on the date of issuance of the Certificate of Substantial Performance or earlier on portions of the Roadway meeting the conditions of the next paragraph, and shall continue for the duration specified elsewhere in the Contract Documents.

On Contracts lasting more than one construction season, the performance warranty period shall commence in a year prior to the year of issuance of the Certificate of Substantial Performance for a Roadway lane that has at least 5 continuous kilometres of surface course placed, is in use by public traffic, and upon Owner approval of a written request from the Contractor. The written request shall be submitted to the Contract Administrator no later than October 31. If a request is approved, the performance warranty period shall commence on November 15 of the year of the request.

**5.03 Performance Warranty Limitations**

For HMA pavement, the flushing and wheel track rutting performance warranty requirements shall be null and void if, during any warranty period year, the total degree days > 10 ºC is greater than [\* Designer Fill-In, See Notes to Designer].

For HMA pavement, the cracking performance warranty requirement shall be null and void if, during any warranty period year, the annual lowest daily temperature is less than [\*\* Designer Fill-In, See Notes to Designer] ºC.

The annual highest and lowest daily temperature of each year of the warranty period shall be calculated as the average of the values from the [\*\*\* Designer Fill-In, See Notes to Designer] Environment Canada weather stations.

The performance warranty shall be null and void at pavement locations damaged or altered by:

a) Vehicular accident, fire, hazardous material, chemical, and fuel spill, military action, civil commotion, natural disasters, or other force majeure incidents. Incident information recorded by highway maintenance personnel will be relied on for this purpose,

b) The failure or deterioration of underlying Roadway elements such as drainage structures, or

c) Construction or non-routine maintenance carried out by others.

Voiding of the performance warranty or a specific performance requirement shall be effective on the date the voiding condition occurs. The consequences for non-conformances that are documented prior the date of voiding shall continue to apply.

The performance warranty shall be unaffected by routine maintenance to the Roadway, including snow plowing, application of winter sand and materials for de-icing or ice control, shoulder grading, erosion and roadside barrier repair, drainage cleanout and blockage removal, and pothole repairs.

**5.04 Performance Measurement Segments**

The Contract Administrator shall divide the pavement surface into segments of a single lane width. The segments shall generally be 500 m in length and no segment shall be greater than 500 m in length. Segments less than 500 m may occur where:

a) The last segment of a highway, road, or ramp is less than 500 m.

b) The Work includes discrete locations less than 500 m in length.

c) Locations exempted from the performance requirements cause a segment(s) to be less than 500 m.

The performance requirements for segment lengths less than 500 m shall be prorated as applicable based on the actual segment length.

Each individual segment shall comply with the performance requirements specified elsewhere in the Contract Documents.

**5.05 Performance Measurements**

Performance measurements shall be carried out by the Owner or the Owner’s representative, except where specified otherwise.

Performance measurement results shall be rounded off to the same number of decimal places used for the acceptance criteria according to LS-100.

The Owner will select segments for performance measurement at its sole discretion. Additional segments will be measured if there is evidence of non-conformance(s).

Where the frequency of the performance measurement is not specified, the frequency will be determined by the Owner. Performance measurement will be at the Owner’s expense, and the Owner will be responsible for arranging all traffic control and traffic protection, if required.

The Owner may issue a “Notice of Non-Conformance” when performance measurement results do not conform to acceptance criteria. The notice will include the performance measurement results and identify the location(s) and nature of the non-conformance(s).

The Clarifications and Claims sub-section of the MTO General Conditions of Contract shall apply to any dispute over responsibility for non-conforming performance measurement results.

The Contractor will be notified 15 days in advance of any performance measurements so that they may witness the measurements.

**5.05.01 Roughness Measurement**

For assessing compliance with the performance requirements for pavement roughness, the Owner shall obtain pavement roughness measurements, in terms of International Roughness Index (IRI) values.

The equipment to be used for roughness measurement shall be a Class 1 high-speed profiler according to the minimum requirements of ASTM E950 and shall be certified according to LS-296.

The following measurement procedure shall be followed:

a) The measurements shall be carried out in each through lane in the direction of travel.

b) Measurements shall be carried out at the posted speed unless the equipment operator determines that conditions warrant a different operating speed. The operating speed for the measuring equipment shall be according to the manufacturer’s requirements.

c) IRI shall be measured separately in each wheel path and recorded at 10 m intervals.

Unfiltered data files shall be processed using ProVAL software Version 3.6.

Unfiltered digital data files in a format suitable for processing by ProVAL 3.6 will be provided to the Contractor.

**5.05.02 Wheel Track Rut Depth Measurement**

For assessing compliance with the performance requirement for wheel track rutting, the Owner shall obtain rut depth data based on analysis of digital transverse pavement profiles.

The equipment to be used to create the digital transverse pavement profiles shall be as per Ministry’s automated equipment, vehicle mounted with a measurement system having a minimum 1 mm transversal accuracy measured across a 4 m width and minimum 1 mm depth accuracy.

Digital transverse pavement profiles and rut depths shall be collected as follows:

a) Profiles shall be collected in each through lane in the direction of travel.

b) The vehicle shall travel at the posted speed unless the equipment operator determines that conditions warrant a different operating speed. The operating speed shall not exceed 100 km/hr.

c) Rut depths shall be calculated for each wheel path from the transverse profiles using a 1.8 m baseline and the average depth for each 10 m pavement interval reported.

**5.05.03 Pavement Cracking Measurement**

For assessing compliance with the performance requirement for cracking, maximum crack width, and crack density, the Owner shall obtain crack data based on analysis of digital transverse pavement profiles.

The equipment to be used to create the digital transverse pavement profiles shall be vehicle mounted with a measurement system having a resolution capability of minimum 1 mm transverse accuracy measured across a 4 m width, minimum 1 mm depth accuracy, and minimum 2 mm crack width accuracy.

Digital transverse pavement profiles and crack data shall be collected as follows:

a) Profiles shall be collected in each through lane in the direction of travel.

b) The vehicle shall travel at the posted speed unless the equipment operator determines that conditions warrant a different operating speed. The operating speed shall not exceed 100 km/hr.

c) Crack data shall be calculated from the transverse profiles and reported for each 10 m pavement interval as follows:

i. Length of longitudinal cracking.

ii. Length of transverse cracking.

iii. Area of close spaced cracking.

Length of longitudinal and transverse cracking shall be reported in three width categories of slight, moderate, and severe. Slight cracks have a width of 0 to less than 10 mm. Moderate cracks have a width of 10 to less than 20 mm. Severe cracks have a width of 20 mm or greater. Reported lengths shall exclude:

a) Cracking within areas of alligator cracking, and

b) Longitudinal joint separation.

**5.05.04 Distress Survey**

For assessing compliance of HMA pavement with the performance requirements for coarse aggregate loss and flushing, the Owner shall carry out a distress survey according to SP-024.

For assessing compliance of concrete pavement with the performance requirements for coarse aggregate loss, polishing, scaling, blow-up, faulting, joint and crack spalling and joint sealant loss, the Owner shall carry out a distress survey according to SP-026.

**5.05.05 Crack Sealant Survey**

For assessing compliance with the performance requirements for sealed cracks, the Owner shall carry out a field survey.

**5.05.06 Joint Sealing Efficiency**

For assessing compliance of concrete pavement with the performance requirements for joint sealant placement efficiency, random coring of one joint per segment is required to assess if the joint sealant is sealing completely to the bottom of the joint.

**5.06 Challenging the Owner's Results During the Performance Warranty Period**

If the Contractor disagrees with any non-conformance identified by the Owner then both parties shall attempt to reconcile the differences. If there is a failure to reconcile differences, the Contractor may make a written request to challenge the results of the Owner’s original performance measurements. With the exception of a challenge of differential frost heaving results, the request shall be made within 15 Business Days of receiving the “Notice of Non-Conformance” or within the stipulated timeframe for completing repairs, whichever is less, and shall detail the measurements and corresponding locations that are being challenged. A request to challenge differential frost heaving results shall be made within 5 Business Days.

Upon receipt of the request, the Owner, or a party retained by the Owner, will re-measure the locations of the challenged results as soon as reasonably possible. The re-measurement shall take place in the same calendar year as the original measurement. No adjustments will be made to the re-measurement results for the time that has elapsed between the original results and re-measure results. The Contractor will be notified 15 days in advance of any performance re-measurements so that they may witness the measurements.

The re-measurement will be carried out using the same methods used for the original performance measurements, except where replaced or amended by the following:

a) Distress surveys according to SP-024 or SP-026, shall be carried out by a different individual,

b) The average wheel track rutting depth shall be re-measured by measuring the maximum rut depth in both wheel paths, according to ASTM E1703-10, at a minimum 3 m and maximum 5 m longitudinal spacing, and calculating the average of the measurements. The straightedge shall be 1.8 m in length and the gauge shall be 19 mm wide with 0.5 mm graduations,

c) The total length of sealed cracking shall be re-measured by rolling a calibrated measuring wheel along the length of each applicable crack,

d) Locations of cracking exceeding the maximum crack width acceptance criteria shall be re-measured by ten equally spaced direct crack width measurements over a 1 m crack length at the locations where the crack width is the widest, and the average crack width determined, and

e) Roughness and differential frost heaving shall be re-measured by a referee inertial profiler chosen from a list of certified profilers maintained by the Owner.

The results of the re-measurement will be sent to the Contractor within 15 Business Days of completion of the re-measurement.

When the re-measurement result for wheel track rutting or cracking is not more than 10% below the original measurement result, the original measurement result shall be deemed to be confirmed. When the re-measurement result for wheel track rutting or cracking is more than 10% below the original measurement result, the re-measurement result shall replace the original result and be binding on both the Owner and the Contractor.

When the re-measurement result for performance requirements other than wheel track rutting or cracking is not more than 3% below the original measurement result, the original measurement result shall be deemed to be confirmed. When the re-measurement result for performance requirements other than wheel track rutting or cracking is more than 3% below the original measurement result, the re-measurement result shall replace the original result and be binding on both the Owner and the Contractor.

When the original result is deemed to be confirmed, the Contractor shall reimburse the Owner for the cost of the re-measurement according to Table 1. When the re-measurement result replaces the original result, the Owner shall be responsible for the cost of the re-measurement.

No compensation shall be made to the Contractor for any costs incurred in observing re-measurements.

**TABLE 1**

**Cost of Re-Measurement**

| **Performance Requirement** | **Re-Measurement** | **Re-Measurement Cost** (Note 1) |
| --- | --- | --- |
| **Fixed** (Note 2) | **Hourly** (Note 3) |
| Coarse Aggregate Loss | SP-024 or SP-26 Distress Survey | $400 / $800 / $1600 | $100 / $400 |
| Flushing or Polishing | SP-024 or SP-026 Distress Survey | $400 / $800 / $1600 | $100 / $400 |
| Alligator Cracking | SP-024 Distress Survey | $400 / $800 / $1600 | $100 / $400 |
| Scaling | SP-026 Distress Survey | $400 / $800 / $1600 | $100 / $400 |
| Blow-up | SP-026 Distress Survey | $400 / $800 / $1600 | $100 / $400 |
| Faulting | SP-026 Distress Survey | $400 / $800 / $1600 | $100 / $400 |
| Cracking | MTO ARAN Survey | $1000 / $2000 / $4000 | $500 / $500 |
| Wheel Track Rutting | ASTM E1703 | $400 / $800 / $1600 | $100 / $400 |
| Roughness | Referee Inertial Profiler | $1000 / $2000 / $4000 | $500 / $500 |
| Differential Frost Heaving | Referee Inertial Profiler | $1000 / $2000 / $4000 | $500 / $500 |
| Joint Separation | Manual, Direct Measurement | $400 / $800 / $1600 | $100 / $400 |
| Joint Sealing Efficiency | Coring | $200 | N/A |
| Notes:1. Re-measurement cost shall be the applicable fixed cost plus the product of the applicable hourly rate and the time required to carry out the re-measurement at the challenged locations.2. The first value shall apply to re-measurement locations in MTO Central, West, and East Regions. The second value shall apply to re-measurement locations in MTO Northeastern Region. The third value shall apply to re-measurement locations in MTO Northwestern Region.3. The first value shall apply to highways with a posted speed of 90 km/hr or less. The second value shall apply to highways with a posted speed greater than 90 km/hr. |

**5.07 Repair Requirements**

**5.07.01 General**

For any non-conformances detailed in the “Notice of Non-Conformance”, the Contractor shall carry out the required repairs as specified in the performance specifications elsewhere in the Contract Documents.

All repairs, including materials used for repairs, shall be according to the Ontario Provincial Standard Specifications and the Owner’s standard special provisions amending OPSS 308, OPSS 313, OPSS 314, OPSS 341, OPSS 366, OPSS 369, OPSS 1010, OPSS 1101, and OPSS 1151 in effect at the date of the tender opening of the Contract, and Table 2. Payment adjustments that form part of the specifications and standard special provisions shall not be applicable.

Repaired areas that the Owner determines are rejectable based on these standard specifications and standard special provisions shall be repaired as many times as necessary until the Materials and Work are acceptable to the Owner.

[\*\*\*\* Designer Fill-In for Table 2, See Notes to Designer]

**TABLE 2**

**Repair Materials**

| **Parameter** | **Specification** | **Requirement** |
| --- | --- | --- |
| Surface Course Mix Type | OPSS 313 | \*\*\*\* |
| Binder Course Mix Type | OPSS 313 | \*\*\*\* |
| Mix Design Traffic Category | OPSS 1151 | \*\*\*\* |
| PGAC Grade | OPSS 1101 | \*\*\*\* |
| Surface Course PGAC Content, minimum | OPSS 1151 | \*\*\*\* |
| Base Type | OPSS 314 | \*\*\*\* |
| Subbase Type | OPSS 314 | \*\*\*\* |
| Concrete Pavement and Concrete Base | OPSS 366 | \*\*\*\* |
| Sealing of Concrete Joint or cracks | OPSS 369 | \*\*\*\* |

Tack coat shall be applied according to OPSS 308.

Pre-approved materials listed in the MTO DSM shall be used, where applicable.

Removals shall be according to OPSS 510.

Management of excess material shall be according to the Contract Documents.

For HMA pavement, when the end of a repair area is less than 100 m from the start of the next repair area in the same lane, the repair shall include both repair areas and the area between them. This requirement does not apply to full depth HMA crack repairs, HMA joint strip repairs, or to HMA joint sealing where there is no separation of the joint between repair areas.

All repairs, except for routing and sealing cracks, full depth crack repairs, temporary repair of potholes, and reconstruction, shall be for the full width of the lane or paved Shoulder that requires repair and be a minimum length of 5 m for HMA pavement, and one slab length for concrete pavement. The limits of reconstruction shall be as specified in the Owner approved Pavement Reconstruction Design Report.

The surface course in all repair areas shall be placed flush against adjacent unrepaired pavement, and shall be constructed adjacent to curb and gutter, concrete barrier, catchbasins, manholes, and other Roadway elements according to the applicable Ontario Provincial Standard Drawing or Ministry of Transportation Drawing.

All repairs shall be completed within 60 Days of receiving the “Notice of Non-Conformance”, unless specified otherwise in the applicable pavement performance specification. All repairs required during the performance warranty period shall be completed prior to the end of the calendar year in which the “Notice of Non-Conformance” was received, except when a deferral is approved by the Owner. The Contractor may request a deferral of the repairs in writing. The request shall include the reason(s) for the request and shall be submitted within 10 Business Days of receipt of the “Notice of Non-Conformance”. The Owner, at its sole discretion and without obligation, shall determine if a deferral is warranted and advise the Contractor of the decision in writing within 10 Business Days of receiving the Contractor’s request.

Failure to complete the required repairs within the specified time period may result in repairs being completed by forces designated by the Owner at the Contractor’s expense. Repair work performed by other forces may be temporary in nature and may not meet the requirements for repairs specified in this subsection “Repair Requirements”.

The Owner may carry out sampling, testing, measurements or inspections or any combination of these during the construction of repairs and after repairs are made to verify that materials for repairs conform to the Ontario Provincial Standard Specifications and the Owner’s standard special provisions in effect at the time of tender opening of this Contract and that the requirements specified in the applicable pavement performance specifications elsewhere in the Contract Documents have been met.

The requirements specified below for granular shouldering, guide rail adjustment, and pavement markings and symbols shall apply to all repair areas.

**5.07.02 Diamond Grinding**

Diamond grinding shall be by power-driven, self-propelled, and designed for grinding HMA or concrete pavement, where applicable. It shall be equipped with a grinding head with at least 50 diamond blades per 300 mm of shaft. The grinding head shall be at least 1.2 m wide. The grinder shall be equipped with the capability to adjust the depth, slope and crossfall to remove HMA or concrete to the required profile and shall also include a slurry pick-up system.

Diamond grinding shall not be used in any area of the surface course where that area:

a) Consists of a single lift of hot mix placed on a granular, stabilized granular, or full depth reclaimed granular surface; or

b) Will be reduced by more than 5 mm below the general profile of the surrounding pavement surface after the repair.

Slurry produced from diamond grinding shall be removed from the Working Area and managed as specified in the Contract Documents.

**5.07.03 Remove and Replace Hot Mix Asphalt - Uniform Depth**

The asphalt pavement shall be removed to a uniform partial depth equal to the design HMA surface course depth or 40 mm, whichever is greater. HMA shall be placed to a compacted thickness equal to the depth of asphalt removal.

The placement of new HMA without partial depth asphalt removal may be permitted on a location specific basis with prior approval by the Owner. In these locations, the HMA shall be placed to a compacted thickness of 50 mm.

**5.07.04 Remove and Replace Hot Mix Asphalt - Variable Depth**

Where the repair requires the correction of pavement profile or cross-fall or both, the pavement shall be removed partial depth. The depth of removal shall be 40 mm minimum and vary in depth as required to correct the pavement profile or cross-fall or both. HMA to a minimum depth of 40 mm and maximum depth of 60 mm shall be placed such that the top of pavement elevations after compaction are at minimum equal to the original designed top of pavement elevations, and at maximum 25 mm higher than the original designed top of pavement elevations.

**5.07.05 Hot Mix Asphalt Replacement**

Where the total existing thickness of the asphalt layer is less than 140 mm, the asphalt pavement shall be removed full depth. Where the total thickness of the asphalt layer exceeds 140 mm, the asphalt pavement shall be partially removed to a depth of 100 mm.

Where the HMA removal extends to the underlying granular layer, the granular layer shall be fine graded and compacted according to OPSS 313 immediately prior to placing HMA.

HMA binder and surface course shall be placed to a compacted thickness equal to the depth of asphalt removal.

**5.07.06 Reconstruction**

An Engineer shall investigate the pavement area requiring reconstruction by borehole drilling, material sampling and testing, and non-destructive methods such as falling weight deflectometer, and design a new reconstructed flexible or concrete pavement structure using GDPS-4-M, StreetPave 12, Pavement Designer and MI-183, or MEPDG-1, for a 15 year design life for HMA and 28 year design life for concrete pavements. The design shall be documented in a detailed Pavement Reconstruction Design Report specifying the complete requirements for the reconstruction, including the OPSS standards and Owner’s standard special provisions that apply, and bearing the seal and signature of an Engineer. The report shall be submitted to the Owner for approval. The reconstruction shall not commence until the Owner has provided written approval of the design. The required timeframe for the reconstruction applies from the date of Owner approval of the design.

**5.07.07 Full Depth Hot Mix Asphalt Crack Repair**

All cracks requiring full depth repair shall be repaired according to the Ontario Provincial Standard Specifications and the Owner’s standard special provisions in effect at the date of the tender opening of the Contract.

**5.07.08 Hot Mix Asphalt Joint Strip Repair**

The asphalt pavement shall be removed to a width of 500 mm centred over the joint and to a uniform partial depth equal to the design HMA surface course depth or 40 mm, whichever is greater. New HMA shall be placed within the milled strip to a compacted thickness equal to the depth of asphalt removal.

**5.07.09 Crack Sealing and Joint Sealing**

All cracks and pavement joints requiring sealing shall be sealed according to the Ontario Provincial Standard Specifications and the Owner’s standard special provisions in effect at the date of the tender opening of the Contract.

**5.07.10 Remove and Replace Sealant**

Sealant that has failed, does not meet surface elevation requirements, has been unacceptably damaged by tracking, or has accumulated, shall be removed by any suitable method that does not damage the surrounding pavement. The resulting rout or crack shall be prepared, and new sealant shall be placed, according to OPSS 341 for HMA pavement, and OPSS 369 for concrete pavement.

**5.07.11 Remove Tracked Material**

Sealant material that has tracked onto adjoining pavement surfaces shall be removed by high pressure water blasting methods that do not damage the underlying or surrounding pavement.

**5.07.12 Granular Shouldering**

Where a repair results in granular Shoulder disturbance or an increase in pavement elevation, Granular A shall be applied to the shoulder according to OPSS 314, and graded to design cross-fall.

**5.07.13 Guide Rail Adjustment**

Where the mounting height of guide rail systems, end treatments, and terminals exceed acceptable tolerances following pavement warranty repairs, mounting height adjustment shall be completed according to the Ontario Provincial Standard Specifications and the Owner’s standard special provisions in effect at the date of the tender opening of the Contract. Where mounting height adjustment is not possible, the guide rail system, end treatments, and terminals shall be removed and replaced with a new guide rail system in accordance with ministry standards and specifications.

**5.07.14 Sideroads and Entrances**

Where a repair results in a change in pavement elevation, the elevation of any sideroad and entrances intersecting the repair shall be adjusted to match. For granular surfaced sideroads and entrances, existing granular shall be graded and removed and/or Granular A applied to the sideroads and entrances to transition the difference in elevation at a slope no steeper than 10:1. For paved sideroads and entrances, the asphalt on the sideroad or entrance shall be removed full depth or partial depth as required, and HMA placed to transition the difference in elevation at a slope no steeper than 10:1.

**5.07.15 Pavement Markings and Symbols**

Prior to the grinding or removal of pavement, the location and configuration of the existing pavement markings and symbols shall be documented through field measurements. The recorded documentation shall be used to re-establish the pavement markings and symbols upon completion of pavement repairs.

The documentation shall be submitted to the Owner prior to commencing pavement repairs.

Short term and permanent pavement markings and symbols shall be placed according to the Ontario Provincial Standard Specifications and the Owner’s standard special provisions in effect at the date of the tender opening of the Contract during and after the completion of pavement repairs.

Pavement markings and symbols applied at incorrect locations shall be removed by compressed air abrasive blasting, and the pavement markings and symbols re-applied at the correct locations.

**5.08 Performance Requirements after Repair**

The performance warranty shall apply to repaired segments and areas until the “Release from Performance Warranty” is issued by the Owner. Where the performance requirements differ based on year, the requirements shall be based on the elapsed time from the commencement of the performance warranty, and not the elapsed time from the repair of the segment or area.

The one-year general warranty as specified in the MTO General Conditions of Contract shall apply to repairs carried out in the final 12 months of the performance warranty period, with the one-year general warranty period commencing on the date the repairs are completed.

**5.09 Termination of the Performance Warranty**

The Owner shall terminate the performance warranty by issuing the “Release from Performance Warranty” notice when the Owner has verified that the Contractor has met the Contract requirements. The performance warranty shall remain in effect beyond the performance warranty period as specified elsewhere in the Contract Documents as long as any Contract requirements are not met.

NOTES TO DESIGNER:

\* Insert the mean + 2 standard deviation degree days > 10 ºC value for the project location. The value can be estimated from LTTPBind software (select “5 Closest Weather Stations” from the “Report” menu). Care should be taken to ensure that the weather stations chosen are representative of local conditions.

 The software shows the data for each station in the format eg. 1569 (157, 33). 1569 is the average degree days > 10 ºC in a year, 157 is the standard deviation, and 33 is the number of years of data. For this example the mean + 2 standard deviation value is 1569 + (2 x 157) = 1883.

\*\* Insert the mean - 2 standard deviation lowest annual daily temperature value for the project location. The value can be estimated from LTTPBind software (select “5 Closest Weather Stations” from the “Report” menu). Care should be taken to ensure that the weather stations chosen are not representative of local conditions.

 The software shows the data for each station in the format eg. ‑37.3 (26, 34). ‑37.3 is the average annual low air temperature, 26 (should be read as 2.6) is the standard deviation, and 34 is the number of years of records. For this example the mean - 2 standard deviation value is ‑37.3 - (2 x 2.6) = ‑42.5.

 Note there is a glitch with the LTTPBind software, the standard deviation value for low temperature is missing a decimal (ie. read ‘26’ as ‘2.6’).

\*\*\* Insert the names of the closest Environmental Canada operating weather stations, a minimum of two and a maximum of five stations. Can also use LTPPBind Online.

\*\*\*\* Insert the applicable type or value and unit where applicable for each parameter, as recommended by the Regional Geotechnical Section.

WARRANT: Always with NSSP BITU0012 or BITU0015 or PVMT0005 or PVMT000X (Concrete Perf Spec).

CUSTODIAN: Seyed Tabib, EMO - Bituminous Section.