CONSTRUCTION SPECIFICATION FOR ROUTING AND SEALING CRACKS IN ASPHALT PAVEMENT

TABLE OF CONTENTS

341.01 SCOPE

This specification covers the requirements of sealing cracks and joints with hot-poured rubberized asphalt joint/crack sealant compound in asphalt pavement.

341.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material

OPSS 1212 Hot-Poured Rubberized Asphalt Joint/Crack Sealant Compound

Ontario Ministry of Transportation Publications

SP-024 Manual for Condition Rating of Flexible Pavements – Distress Manifestations

341.03 DEFINITIONS

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

Overband means a routed groove or unrouted crack, which is sealed in such a way that the surface of the sealant is approximately 2 to 3 mm above the adjacent asphalt pavement surface at the centerline of the routed groove or unrouted crack and is feathered out to 0 mm, approximately 20 to 30 mm on either side of the routed groove or the edge of the unrouted crack.

Pavement Edge means where the outside edge of the asphalt pavement surface meets the gravel shoulder or concrete barrier.

Routing/Routed means cutting grooves in an asphalt pavement using either a router equipped with carbide cutting wheels or a random crack saw equipped with a series of diamond blades.

Skew Cracks means non-transverse cracks that exist within the lane and may cross pavement edge.

341.04 DESIGN AND SUBMISSION REQUIREMENTS

341.04.01 Submission Requirements

The following shall be submitted to the Contract Administrator at least 5 Business Days prior to the placement of sealant compound:

a) The following sealant compound information obtained from the manufacturer for every batch/lot of sealant compound which is likely to be used on the Contract:

   i) The batch number/lot or designation;
   ii) The size of the batch/lot;
   iii) Application recommendations;
   iv) Recommended heating time and temperature;
   v) Allowable storage time and temperature after initial heating;
   vi) Allowable reheating criteria;
   vii) Recommendations for continuous overnight heating, if the manufacturer allows such heating;
   viii) Application temperature range.

b) One copy of at least one set of test results that have been conducted for each batch of hot-poured rubberized asphalt joint/crack sealant compound used on the Contract. The testing shall be carried out according to OPSS 1212 by a certified Canadian Council of Independent Laboratories (CCIL) laboratory that is independent of both the manufacturer and the Contractor.

341.05 MATERIALS

341.05.01 Sealant Compound

The sealant compound shall be a hot poured rubberized asphalt sealant compound according to OPSS 1212.

341.05.02 Limestone Screenings

Limestone screenings used for dusting sealant shall have 100 percent passing the 1.18 mm sieve and not greater than 25 percent passing the 0.075 sieve. Other blotting materials may be used with written approval from the Contract Administrator.

341.06 EQUIPMENT

341.06.01 Routers and Random Crack Saws

All equipment used for routing shall consist of well-maintained mechanical routers or random crack saws capable of continually creating well-defined right-angled grooves with centrelines which are approximately coincident with the centerlines of their associated cracks to the tolerances stated within this specification. Such capability shall be successfully demonstrated to the Contract Administrator's satisfaction prior to its use.

341.06.02 Heating Kettle

The heating kettle for the sealant compound shall be a double boiler oil transfer type with built in agitator and equipped with calibrated thermometers to measure the temperature of both the heat transfer oil and the sealant compound. The heating kettle shall be equipped with a spigot.

The heating kettle shall have automatic thermometric controls used to prevent the overheating of the sealant compound.

341.06.03 Hot-Compressed Air Lance

The hot-compressed air lance shall have an air discharge temperature of approximately 500° C and an air exit velocity of at least 1000 metres per second.

341.06.04 Air Compressor

The air compressor used to supply the hot-compressed air lance shall be equipped with oil and moisture filters and providing a minimum pressure of 700 kPa at a minimum air volume of 4.25 cubic metres per minute (150 cubic feet per minute).

341.07 CONSTRUCTION

341.07.01 General

Routing and/or sealing shall not be carried out when the pavement is damp or wet, when water is migrating up into the routs or when the pavement surface temperature is greater than 50° C.

The conditions under which cracks shall be routed and sealed or sealed without routing, are specified elsewhere in the Contract Documents and based on the average widths of the cracks at the time that the work is done.

341.07.02 Crack Routing

Under no circumstances shall more cracks be routed during the day then can be sealed prior to shutting down operations each Day.

In addition, the routing operation shall not be so far ahead of the cleaning operation that dirt and debris left on the road is creating clouds of dust which is obscuring driver vision in adjacent traffic.

Cracks shall not be routed in locations where the centerlines of two or more parallel or sub-parallel cracks are within 75 mm of one another or the cracks are associated with alligator or map cracking as described in SP-024.

All transverse and skewed cracks shall be routed to within 25 mm of the pavement edge.

The corners of all routed grooves shall be right-angled with no more than 10° of deviation from one corner to the other and with its centreline no more than 4 mm from the centreline of its associated crack.

Any portion of a crack that meanders outside of the cross section of a routed groove shall be considered unacceptable for payment purposes.

When it cannot be demonstrated to the satisfaction of the Contract Administrator that the specified dimensions and shape of the routed groove can be maintained, then the equipment being used shall be adjusted and/or replaced so that the shape and dimensions of the routed groove meet all specified tolerances. All carbide cutters in the router's cutting head shall be replaced at the completion of 2500 linear metres of routing. The Contract Administrator shall be notified prior to the correction of all equipment used for routing.

Two or more cracks shall not be joined up by routing through pavement that is not cracked and under no circumstances shall grooves be cut in areas where a crack does not exist.

341.07.03 Sealant Preparation

The sealant compound shall be slowly melted with constant agitation until it is in a lump-free, free-flowing state, within the application temperature range recommended by the manufacturer for application.

Temperature gauges for both the heating oil and sealant compound on the kettle melter shall be properly calibrated at all times.

The Contract Administrator shall be informed at least 24 hours prior to the charging of the kettle with sealant compound. The initial charge of sealant shall be placed in an empty kettle at the work site in the presence of the Contract Administrator.

341.07.04 Cleaning and Drying Routed Grooves and Cracks and Removal of Debris

Immediately prior to placing the sealant compound, all routed grooves, all unrouted cracks and the surface of the asphalt 50 mm on either side of the grooves and unrouted cracks where an overband is to be constructed, shall be cleaned and dried using a hot compressed air lance. The use of a hot compressed air lance shall not result in the charring or burning of the asphalt surface.

Hot compressed air shall be applied to ensure that all moisture and loose debris have been removed and fractured aggregate surfaces have been scaled from all routed grooves or unrouted cracks.

Before applying sealant compound, all loose debris from the routing and cleaning operation shall be completely removed from the adjacent asphalt roadway.

341.07.05 Placing Sealant Compound

341.07.05.01 General

After each routed or unrouted crack has been cleaned and dried, hot-poured rubberized asphalt sealant compound shall be uniformly placed without the formation of entrapped air, using either a manual pouring cone filled from a spigot located on the heating kettle itself or by using a hose and wand fitted with the proper sized shoe which allows the sealant compound to be pumped directly from the heating kettle into the routed or unrouted crack. Sealant compound shall only be placed if the pavement temperature at the surface is less than or equal to 50° C.

341.07.05.02 On Surfaces to Receive an Asphalt Overlay

For pavements which are being covered with an asphalt overlay all routed and unrouted cracks shall be immediately filled after cleaning and drying with sealant compound as specified in the Contract Documents.

341.07.05.03 On Existing Surfaces Without an Asphalt Overlay

For all existing pavements that are not being covered with an asphalt overlay, all routed and unrouted transverse or skewed cracks as well as any unrouted longitudinal cracks within 150 mm of the pavement edge shall be immediately filled with sealant compound after cleaning and drying so that upon complete cooling, the sealant compound forms a well-defined overband as specified in the Contract Documents.

All routed longitudinal cracks shall be immediately filled with sealant compound after cleaning and drying so that upon complete cooling, the sealant compound is at or slightly above the adjacent asphalt pavement surface, as specified in the Contract Documents.

Where an overband is being constructed, a rubber or plastic squeegee with its bottom edge trimmed slightly larger than the specified dimensions of the overband shall be used to strike off the sealant compound after it is poured into the routed or unrouted transverse or skewed crack.

For routed or unrouted transverse or skewed cracks, the sealant compound shall be struck off by starting from the end of the routed groove or unrouted crack closest to the pavement edge and working towards the center of the road.

Upon complete cooling of the sealant to the ambient temperature, the minimum elevation of the sealant compound shall, in all cases, shall be at or above the adjacent asphalt pavement surface as specified in the Contract Documents. If, during the application the sealant compound is contracting such that this requirement is not likely to be met, then sealant compound shall be applied as many times as is necessary to meet this requirement, before being dusted.

Before leaving the site at the end of each day, the heating kettle shall be completely drained of any remaining sealant compound. However, if a situation arises and the work has to stop before the sealant has been completely used, then the Contract Administrator may require that all remaining sealant be drained from the kettle. In this case, the Contract Administrator shall be informed when the kettle is being drained to allow the Contract Administrator sufficient opportunity to witness it.

Under no circumstances shall the sealant compound be heated continuously overnight without providing the Contract Administrator with a written declaration from the manufacturer clearly stating under what conditions this can be safely done without causing degradation of the sealant. If this written declaration has not been provided to the Contract Administrator and the heating kettle is not completely empty at the beginning of any Day, then the Contract Administrator may require that the heating kettle be completely drained and the wasted sealant compound be replaced before continuing work on the Contract.

At least once each hour, the temperature of the sealant compound shall be measured in the presence of the Contract Administrator using a calibrated thermometer and recorded along with the date and time of the measurement. The temperature record shall be made available to the Contract Administrator upon request.

If, at any time the Contract Administrator finds that the temperature of the sealant compound is not within the manufacturer's recommended range, then, at the discretion of the Contract Administrator, sealant compound that was placed in the roadway since the last acceptable temperature that was verified by the Contract Administrator shall either be removed, repaired or, in lieu of repairs, the affected sealed cracks shall receive a payment adjustment as specified in the Basis of Payment section. If the sealant has been overheated, then any sealant compound remaining in the heating kettle shall be rejected, and drained out and replaced with acceptable material. All rejected sealant compound shall be removed from the Working Area.

Sealant compound damaged by construction operation and any damage caused by the lane being opened to traffic before the sealant has sufficiently cooled, shall be removed and replaced.

341.07.06 Sealant Dusting For Cracks/Routs Treated in Pavements Not Being Covered by an Asphalt Overlay

Where traffic is to be maintained during crack sealing, the surface of the sealant shall be dusted with limestone screenings prior to allowing any traffic, including construction vehicles, on the sealed cracks. Portland cement shall not be used.

At all locations, the sealant compound shall be dusted only after it has cooled so that that the final elevation of the sealant compound is at or slightly above the pavement surface as specified in the Contract Documents and, a skin has formed on the sealant which is tacky enough to allow the dust to stick to it.

341.07.07 Management of Excess Material

Management of excess material shall be as specified in the Contract Documents.

341.08 QUALITY ASSURANCE

341.08.01 Sampling and Testing Sealant Compound

341.08.01.01 Unheated (as Delivered) Sealant Compound

When requested by the Contract Administrator, the Contractor shall provide samples of batches of sealant compound used on the Contract. Each sample shall be approximately 4 litres in volume. All samples of unheated sealant compound shall be placed in security bags, sealed with security seals in the presence of the Contract Administrator, and delivered in a suitable box, clearly marked with the sampling identification information, as specified elsewhere in the Contract Documents, along with the following additional information:

a) The designated trade name and designation # of the compound;

b) The manufacturer;

c) The manufacturer's batch number; and

d) The size of the applicable batch.

Samples shall be delivered to the following address:

Bituminous Section
Ontario Ministry of Transportation
Room 15,
145 Sir William Hearst Avenue
Downsview, Ontario M3M 0B6

341.08.01.02 Samples during Sealant Placement

The Contractor at the direction of and in the presence of the Contract Administrator shall take samples of hot-poured rubberized asphalt joint/crack sealant compound directly from the heating kettle, while the sealant compound is being placed,. A minimum of either three samples at points when approximately 1/4, 1/2, and 3/4 of the tender quantity number of linear metres has been placed or a minimum of one sample for each 25,000 linear metres placed, whichever is greater, shall be taken. Additional samples shall be taken when requested by the Contract Administrator.

Each sample shall be placed in a triple-tight single metal container (e.g. paint can) with a wire handle and with a minimum volume of 4 litres. The side and top of each metal container shall be clearly marked with the following information:

a) Contract number;

b) Designated trade name and designation # of the compound;

c) Manufacturer;

d) Manufacturer's batch number; and

e) The point in the Contract at which the sample was taken, e.g., the percentage of the work completed.

An accompanying tag shall also be firmly affixed to the wire handle of the metal container showing all of the sampling identification information listed above, all other sampling information specified elsewhere in the Contract Documents as well as the following additional information:

a) The station and offset in the roadway where the sample was taken;

b) The temperature of the sealant compound when the sample was taken; and the

c) Weather conditions (ambient temperature and precipitation).

The samples shall be delivered to the following address:

Bituminous Section
Ontario Ministry of Transportation
Room 15,
145 Sir William Hearst Avenue
Downsview, Ontario, M3M 0B6

341.08.02 Deficiencies and Repairs during Construction

If any of the deficiencies listed under various categories in Table 1 are found during construction, then, at the discretion of the Contract Administrator, the sealed crack or routed groove shall be repaired by the Contractor as specified or, in lieu of repairs, a payment adjustment shall be applied as specified in the Basis of Payment section.

A repair proposal shall be submitted to the Contract Administrator for all repairs. Repairs shall not commence until approval of the proposal has been received from the Contract Administrator.

Any materials, equipment or procedures used in the repair or replacement of routing and sealing shall be the same as those specified for the original work.

341.09 MEASUREMENT FOR PAYMENT

341.09.01 Actual Measurement

Where a crack is being routed and sealed, measurement for payment shall be in linear metres along the sealed crack, but excluding any portions of the sealed crack where the crack migrates away from the routed groove.

Where a crack is being sealed without routing, measurement for payment shall be in linear metres along the sealed crack.

Separate measurements shall be made for:

a) Cracks that are routed and sealed with no deficiencies (i.e. L1);

b) Cracks that are routed and sealed that are deficient, as specified in Table 1, but are left unrepaired (i.e. L2);

c) Cracks that are sealed without routing and with no deficiencies (i.e. L3); and

d) Cracks that are sealed without routing that are deficient, as specified in Table 1, but are left unrepaired (i.e. L4).

341.09.02 Plan Quantity

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

341.10 BASIS OF PAYMENT

The removal, disposal, and/or replacement of any sealant, according to the Contract Documents, shall be at no additional cost to the Owner.

341.10.01 Routing and Sealing Cracks in Asphalt Pavement – Item

Payment at the Contract price for routing and sealing cracks shall be full compensation for all labour, Equipment and Material required to do the work. No additional payment shall be made for overruns in sealant compound quantity.

341.10.01.01 Payment Adjustment

When the Contract Administrator allows a payment adjustment in lieu of repairs for a routed and sealed crack which exhibits one or more of the deficiencies listed in Table 1, then a payment reduction of 50% of the Contract price shall be applied for each linear metre exhibiting such deficiencies.

Payment for routed and sealed cracks shall be made in accordance with the following equation:

(1) Payment = Contract Price x (L1 + 0.5 x L2)

Where: Contract Price = the Contract price for this tender item

L1 = the total length in linear metres of the measured cracks that are routed and sealed with no deficiencies;

L2 = the total length in linear metres of measured cracks that are routed and sealed but are deficient, as specified in Table 1 and are left unrepaired.

341.10.02 Sealing Cracks in Asphalt Pavement– Item

Payment at the Contract price for sealing cracks without routing shall be full compensation for all labour, Equipment and Material required to do the work. No additional payment shall be made for overruns in sealant compound quantity.

341.10.02.01 Payment Adjustment

When the Contract Administrator allows a payment adjustment in lieu of repairs for a crack that is sealed without routing and exhibits one or more of the deficiencies listed in Table 1, then a payment reduction of 50% of the Contract price shall be applied for each linear metre exhibiting such deficiencies.

Payment for cracks that are sealed without routing shall be made in accordance with the following equation:

(2) Payment = Contract Price x (L3 + 0.5 x L4)

Where: Contract Price = the Contract price for this tender item

L3 = the total length in linear metres of the measured cracks that are sealed without routing and have no deficiencies;

L4 = the total length in linear metres of measured cracks that are sealed without routing but are deficient, as specified in Table 1 and are left unrepaired.

Table 1
Deficiencies and Repairs during Construction

Categories	Deficiencies	Repairs
Routed Groove	a) Two intersecting sides deviating by more than 10° from a right-angle. b) Its centerline more than 4 mm from the centerline of its associated crack. c) A width less than 36 mm or more than 44 mm. d) A depth less than 10 mm or more than 12 mm, when the groove is in a pavement not being covered by an asphalt overlay. e) A depth less than 15 mm or more than 19 mm, when the groove is in a pavement that is being covered with an asphalt overlay.	Remove sealant and reroute groove to no more than 50 mm wide, clean and then seal. or Re-route to no more than 50 mm wide, clean, and then re-seal.
Sealant Compound Material Used	a) Does not meet the material quality requirements specified in the Contract Documents. b) Contains: i. imbedded foreign material (other than limestone screenings) ii. entrained bubbles c) Has debonded or pulled away from the routed, unrouted sealed crack d) Has been excessively heated.	Complete removal and replacement of the sealant compound and pickup and disposal of any debonded or pulled away sealant compound. Note: If removal of the sealant damages the rout or deficiencies are identified with the rout cross section, the Contract Administrator may instruct that the crack be re-routed.
Pavement not being covered with an asphalt overlay after Sealing.	Upon complete cooling: a) Sealant compound is no longer above the pavement surface when an overband is specified. b) Sealant compound has subsided by more than 1 mm below the adjacent pavement surface when an overband is not specified.	The method of repair for unacceptable contraction of the sealant compound below the elevation of the pavement surface within an unrouted or routed sealed crack shall be at the direction of the Contract Administrator and, depending upon the condition of the sealant compound, may involve either: a) Washing and cleaning the existing sealant compound of debris from the top of the rout with clean water using a low-pressure washer and then topping-up with sealant compound when completely dry; or b) Complete removal and replacement of the sealant compound.
Pavement being covered with an asphalt overlay after Sealing.	a) Upon complete cooling, subsided to more than 7 mm below the existing pavement surface.	