



4215-1 DESCRIPTION:

1.01 The work shall consist of hot poured rubber asphalt sealant placed in prepared transverse and longitudinal cracks at locations shown on the plans or designated by the Engineer.

1.02 The following definitions shall apply to this specification:

(a) Acceptance limit

The maximum or minimum value for a test result above or below which the subplot or lot shall be rejected.

(b) Acceptance testing

The testing performed by the Engineer to determine compliance with the specification requirements, limits and tolerances for the quality of materials and workmanship supplied.

(c) Lot

1 day's production.

(d) Sublot

1 500 m of crack. Where 1 day's production is less than 1 500 m, the work produced shall be included in the next day's lot. At the end of a control section, or at the end of the day, sections 750 m and greater shall be defined as a subplot and sections less than 750 m shall be incorporated into the previous subplot.

(e) Surface defects

Surface defects shall include but shall not be limited to the following:

- (i) Extensive overbanding of sealant (> 10 mm 1 side).
- (ii) Excessive debris or moisture in the rout.
- (iii) Charring of the asphalt in the crack.
- (iv) Obvious contamination of sealant.
- (v) Routed cracks not filled.
- (vi) Lack of bond to sides of rout.

4215- 2 MATERIALS

2.01 The Contractor shall select and pay for all materials including but not limited to the rubber asphalt sealant.

2.02 The Contractor shall select the rubber asphalt sealant from the products listed in the Special Provisions.

4215- 3 CONSTRUCTION

General

3.01 The Contractor shall rubber asphalt crack seal the entire road width, including shoulders. Railway crossings shall be rubber asphalt crack sealed to the edge of the planking. Bridges shall be rubber asphalt crack sealed to the edge of the abutment slabs.

3.02 The Contractor shall not rubber asphalt crack seal the following unless directed by the Engineer:

- (a) severely fatigue-blocked areas.
- (b) centreline cracks except on curves.
- (c) cracks less than 2 mm in width.
- (d) cracks in excess of 25 mm in width.

3.03 The Contractor shall construct the rubber asphalt crack seal as shown on the plan(s).

Routing

3.04 Routing shall be carried out by pavement routing equipment capable of following and cutting the cracks to the required dimensions. Each crack shall be routed to a width of 30 mm or greater and shall have both sides routed. All cracks shall be routed to a minimum depth of 15 mm.

Sealant Preparation

3.05 The rubber asphalt sealant shall be heated in a kettle of indirect heating, double boiler type. The kettle shall be equipped with:

- (a) Thermometric controls which automatically control the product temperature.
- (b) A built-in agitator capable of automatic operation.
- (c) Monitoring thermometers for the heat transfer oil and the sealing compound which are readable by Department personnel from the road surface.

3.06 The compound shall be melted slowly with constant agitation. The manufacturer's maximum safe heating temperature shall not be exceeded.

Cleaning And Treating The Routed Crack

3.07 Immediately prior to pouring the hot rubber asphalt sealant, the routed crack shall be cleaned of all loose material and treated with hot compressed air until the pavement in the routed crack is dry and darkened but not charred.

Placing Rubber Asphalt Sealant

3.08 Application of rubber asphalt sealant to routed cracks shall be by hose and wand at or above the manufacturer's recommended pour temperature. Manufacturer's minimum pour temperatures for the approved products shall be designated in the Special Provisions.

3.09 The Engineer may allow sealant temperatures lower than the manufacturer's recommended pour temperature if high ambient air temperatures and steep rout gradients cause the sealant to flow in the routed crack.

3.10 When filling routed cracks, the tip of the wand shall be placed close to the bottom of the routed crack to ensure uniform application.

3.11 The routed cracks shall be filled with sealant such that upon cooling the sealant has a cross-section as shown on the plan(s).

3.12 Contamination of the rubber asphalt seal by debris from the Contractor's routing operations shall be repaired by the Contractor to the satisfaction of the Engineer.

4215-4 SAMPLING AND TESTING

4.01 The failure of the Engineer to provide test results within the time provided in this specification shall not relieve the Contractor of his obligation to remedy any defect, but the Department shall be obligated to reimburse the Contractor for any additional costs incurred by the Contractor to remedy the defect if the additional costs are attributable to the delay in receiving results.

Acceptance Testing

4.02 Within this specification, certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied. Compliance with these requirements where so specified, shall be judged by testing as described in this section. These tests cannot be disputed on the grounds of statistical theory or a specified or implied Contractor's risk.

4.03 Sampling and acceptance testing for rubber asphalt sealant shall be in accordance with the following:

- (a) A random sample of virgin rubber asphalt sealant shall be selected from each lot. Testing frequency shall be determined by the Engineer but shall not be less than every third sample. The Contractor shall be notified of the results within 7 calendar days from when the sample was taken.
- (b) If the sample tested does not meet the acceptance limits stated in Table 1, the samples taken before and after the sample tested may also be tested. Pay factors for a lot shall be based on results of tests on that lot. A lot not tested shall be given a pay factor of 1. The Contractor shall be notified of these results within 7 calendar days of testing the new samples.
- (c) Rubber asphalt crack sealant shall be tested in accordance with ASTM D 3405 and ASTM D 3407
- (d) The maximum temperature of the heated sealant shall be the manufacturer's maximum safe heating temperature specified for the product used. One temperature reading shall be taken at the kettle for each subplot. The timing of the temperature reading shall be at the discretion of the Engineer. The average temperature for the lot shall be used to determine sealant pay factors as indicated in Table 1.

4.04 Sampling and acceptance testing for length of cracks missed and rout cross section shall be in accordance with the following:

(a) Twenty 1 m samples shall be located randomly in the routed crack in each subplot.

(b) Each 1 m sample shall be assessed for the following:

(i) Length of crack missed entirely such that neither side of the crack is routed :

The segments of missed crack are measured in millimetres accumulated and recorded for the sample.

(ii) Length of crack routed on one side only:

The segments of crack routed on one side only are measured in millimetres and accumulated for the sample.

(iii) Width of rout:

The clear width is measured at the 8 mm depth from the surface. Segments of measured width in each range are measured in millimetres and accumulated for the sample. Rout width is measured in millimetres and grouped into the following ranges:

$W > 25$

$25 \geq W \geq 15$

$W < 15$

(iv) Depth of rout

The depth of rout is measured by a template equal to the top width of the rout but not greater than 30 mm. Segments of measured depth in each range are measured in millimetres and accumulated for the sample. Rout depth is measured in millimetres and grouped into the following ranges :

$D > 13$

$13 \geq D \geq 10$

$D < 10$

4.05 Sampling and acceptance testing for depth of routed crack filled shall be in accordance with the following:

- (a) A minimum of 5 - 1 m sites shall be located randomly in each subplot.
- (b) Each 1 m sample shall be assessed for the depth of underfilling. The depth of underfilling is measured from the top of the routed crack.
- (c) The depth of crack underfilled for the sample is measured in millimetres and is grouped into the following ranges:

Depth underfilled ≤ 5 mm

Depth underfilled > 5 mm

- (d) Measurements of depth of routed cracks filled shall be taken on the following working day.

4.06 Areas of surface defects shall be excluded from random sampling. Each crack shall be inspected for surface defects.

4.07 The Engineer shall provide test results within 2 working days.

4.08 The results for the acceptance testing for the following 4 properties shall be used to accept or reject the subplot and /or lot:

- (a) Rubber asphalt sealant material.
- (b) Percent of length of cracks missed entirely.
- (c) Rout cross section.
- (d) Depth of routed crack filled.

4.09 The results for the acceptance testing for the following 4 properties shall be used to establish the extent of pay factors as defined in Tables 1, 2 and 3:

- (a) Rubber asphalt sealant material.
- (b) Percent of length of cracks missed entirely.
- (c) Rout cross section.
- (d) Depth of routed crack filled.

Appeal of Acceptance Test Results and Appeal Testing

4.10 Appeal of acceptance test results for rubber asphalt sealant shall be in accordance with the following:

- (a) Within 2 days of receipt of the acceptance test results for a lot the Contractor may appeal the test results and request a verification test.
- (b) The verification test shall be carried out on comparison of split samples obtained from the virgin sealant. The average of the original test and the verification test shall be used for acceptance and pay factors determination for the lot.

4.11 Appeal of acceptance test results for rout cross section shall be in accordance with the following:

(a) Within 2 days of receipt of the acceptance test results for a subplot/lot the Contractor may appeal the test results and request a verification test.

(b) For subplot retesting, the 5 highest and the 5 lowest results of the original samples shall be rejected and replaced by retest results taken from alternate samples in the subplot. The new subplot average shall be used for acceptance and pay factors determination for the lot.

(c) For lot retesting, each subplot shall be retested as specified in 4.10 (b). The new lot averages shall be used for acceptance and pay factors determination for the lot.

4.12 Appeal of acceptance test results for the depth of routed crack filled shall be in accordance with the following:

(a) Within 2 days of receipt of the acceptance test results for a subplot/lot the Contractor may appeal the test results and request a verification test.

(b) The verification test shall be carried out on the same sample as the original acceptance test. The average of the original test and the verification test shall be used for acceptance and pay factors determination for the lot.

4.13 For all appeal testing, the Contractor shall prepare the retest sample by removing the sealant and cleaning the sample to an acceptable condition for remeasuring; provide an acceptable backfill for the sealant and provide all necessary traffic accommodation as described in Specification 8400 For Traffic Accommodation And Safety.

4.14 If the verification testing does result in a decrease of the pay factors, all testing costs incurred during the appeal procedure shall be paid by the Contractor. The rate for Department testing shall be as designated in the Special Provisions.

4.15 If the appeal testing results in the lot being accepted at full payment, then the Contractor shall be reimbursed for all direct retesting costs incurred for sealant removal and restoration, sample preparation and traffic accommodation. The Department shall not accept any claims for any other expenses that the Contractor may have encountered.

4.16 The new retesting results shall be binding on the Contractor and the Department.

4215-5 END PRODUCT ACCEPTANCE OR REJECTION

End Product Acceptance

5.01 Acceptance of a lot at full payment shall occur if it contains no surface defects and if:

(a) The rubber asphalt sealant in the lot meets the Acceptance Limits At Full Payment requirements for each property outlined in Table 1.

(b) The rout cross section of each subplot meets the following requirements:

- (i) both sides of the crack are routed;
- (ii) the rout width exceeds 25 mm; and
- (iii) the rout depth exceeds 13 mm.

(c) The rout underfilling of each subplot does not exceed 5 mm.

(d) All repairs have been completed and accepted by the Engineer.

5.02 Acceptance of a lot at reduced payment shall occur if it contains no surface defects and if :

(a) The rubber asphalt sealant in the lot meets the Acceptance Limits At Reduced Payment requirements for each property outlined in Table 1.

(b) The rout cross section of each subplot does not meet the requirements of 5.01 (b).

(c) The rout underfill of each subplot does not meet the requirements of 5.01 (c)

(d) All repairs have been completed and accepted by the Engineer.

End product rejection

5.03 The subplot and /or lot shall be rejected as unacceptable work if :

(a) There are any surface defects.

(b) The rubber asphalt sealant in the lot meets the Reject Limits for any property outlined in Table 1.

Repairs:

5.04 Defective work which has been rejected due to surface defects or due to the rubber asphalt sealant being within the reject limits for any property outlined in Table 1; shall be promptly repaired, removed, replaced or remedied in a manner that is acceptable to the Engineer.

5.05 The Contractor shall not be required to repair, replace or remedy other lots of work which does not meet the specified acceptance limits.

4215-6 MEASUREMENT:

6.01 Rubber asphalt crack sealing shall be measured in metres.

4215-7 PAYMENT:

7.01 Payment for Rubber Asphalt Crack Sealing shall be at the contract unit price per metre less the pay factors for rubber asphalt sealant, rout cross section and depth of routed crack filled.

7.02 The unit price per lot of Rubber Asphalt Crack Sealing shall be calculated as follows:

Lot unit price per metre = $P \times (1 - P_{mc}) \times (\text{Contract Unit Price per metre})$ where:

$$P = P_M (0.85 \times P_R + 0.15 \times P_F)$$

P_M = Pay Factors for the Rubber Asphalt Sealant as per Table 1

P_{mc} = % of cracks missed entirely less 5%

P_R = Pay Factors for the rout cross section as per Table 2

P_F = Pay Factors for depth of routed crack filled as per Table 3

7.03 The contract unit price shall be full compensation for completing the work except for those activities for which specific provision for payment is made in this section.

7.04 If any subplot has been rejected payment shall not be made for the lot until the rejected subplot has been remedied.

7.05 All remedial work shall be performed at the Contractor's expense.

TABLE 1

LOT PAY FACTORS FOR RUBBER ASPHALT SEALANT (P_M)

PROPERTY	Acceptance Limits At Full Payment	Acceptance Limits At Reduced Payment	Reject Limits
Penetration at 25°C, dmm	≤ 90	$> 90 - \leq 100$	> 100
Flow, mm	≤ 3	$> 3 - \leq 5$	> 5
Resilience at 25°C	$\geq 60\%$	$\geq 55\% - < 60\%$	< 55
Temperature at the kettle °C	MMSHT +5 °C	MMSHT + 25 °C	$> \text{MMSHT} + 25\text{ °C}$
Pay Factors (P_m)	1.0	0.80	0.0

where: MMSHT is the Manufacturer's Maximum Safe Heating Temperature.

TABLE 2

SUBLOT PAY FACTORS FOR ROUT CROSS SECTION (P_R)

Lot Average Measurements		Weighting	Weighted Deviation
(a)	% of length that is routed one side only	Multiplied by 0.15	
(b)	Rout width (W) mm		
(i)	% of length that $W > 25$	Multiplied by 0.00	
(ii)	% $25 \geq W \geq 15$	Multiplied by 0.25	
(iii)	% $W < 15$	Multiplied by 1.00	
(c)	Rout depth (D) mm		
(i)	% of depth that $D > 13$	Multiplied by 0.00	
(ii)	% $13 \geq D \geq 10$	Multiplied by 0.20	
(iii)	% $D < 10$	Multiplied by 1.00	
Total Weighted Deviation			
The lot pay factors for rout cross section (P_R) is: $P_R = 1 - \text{Total Weighted Deviation}$			

TABLE 3

SUBLOT PAY FACTORS FOR DEPTH OF ROUTED CRACK FILLED (P_F)

Lot Average Measurement		Weighting	Weighted Deviation
% of length that cracks are underfilled, mm			
(a)	Underfilling ≤ 5	Multiplied by 0.00	
(b)	Underfilling > 5	Multiplied by 1.00	
Total Weighted Deviation			
The lot pay factors for depth of routed crack filled (P_F) is: $P_F = 1 - \text{Total Weighted Deviation}$			