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3.30 ASPHALT PAVEMENT CRACK ROUTING AND SEALING

3.30.1 GENERAL

The purpose of crack sealing is to prolong the life of existing pavements by preventing moisture from penetrating the roadway structure, and by preventing the spalling of material from the edges of the cracks.

The Work shall consist of routing, cleaning and drying cracks and sealing them with crack sealant between the limits shown on the plans or as directed by the Consultant.

3.30.2 MATERIALS

3.30.2.1 **Crack Sealant**

The Contractor shall choose and supply the crack sealant material from the following list of products:

HOT POUR RUBBERIZED CRACK SEALANTS
APPROVED PRODUCTS, TYPICAL RESULTS AND SPECIFICATIONS

MANUFACTURER		**HUSKY**	**KOCH**	**CRAFCO**
SUPPLIER		**HUSKY**	**KOCH**	**LAFRENTZ**
PRODUCT NAME		**1611**	**9030**	**ROAD SAVER 522**
ASTM D 3405 SPECIFICATION				
Flow Test @ 60°C	Max. 3.0 mm	3	1	2 (10 max.)
Cone Test @ 25°C	Max. 90 dmm	115 (140 max.)	120 (110-150)	127 (100-150)
Bond Test @ -29°C	Pass 3 cycles	Pass	Pass	Pass
Resilience @ 25°C	Min. 60 %	30 (mod)	80	58 (30-60)
Compatibility	Pass	Pass	Pass	Pass
OTHER				
Pour Point	°**C**	150-165	188	193
Safe Heating	°**C**	200	199	210

Note: ASTM D3405 specification limits apply except as noted.

The Contractor shall provide the Consultant with the following information five days prior to commencing the Work:

- Name and mailing address of crack sealant supplier and manufacturer
- Name of crack sealant product to be supplied
- Written confirmation from the manufacturer that the crack sealant to be supplied meets all specified requirements along with test results that demonstrate that the product meets all specified requirements.

The Contractor shall verify that all crack sealant delivered and used in the Work is the type and grade ordered.

The Contractor shall supply the Consultant with the manufacturer's quality control test results (indicating at the minimum cone penetration and flow) for each batch of crack sealant. These test results shall be supplied at the time of delivery of each batch of crack sealant to the Work.

All crack sealant supplied shall be subject to inspection, sampling and testing by the Department and the Contractor shall cooperate in the inspection and sampling process. When directed by the Consultant, the Contractor shall obtain representative samples of the crack sealant delivered to the Work.

3.30.2.2 **Blotting Agents**

When necessary, the Contractor shall supply one of the following blotting agents:

- screened sand with a maximum topsize of 2 mm
- cement
- flyash

The use of other products shall be subject to the approval of the Consultant.

3.30.3 EQUIPMENT

The Contractor shall supply all equipment necessary for completion of the Work including but not limited to the melting kettle, air compressor unit, hot compressed air lance, routing and crack sealing equipment and all related equipment such as fork lifts, hoists, and transport vehicles.

The melting kettle shall consist of a double jacketed oil bath kettle with thermometric controls which automatically control the product temperatures and with continuous agitation equipment to prevent localized variations in temperature. The kettle shall be equipped with two calibrated thermometers to monitor the temperature of the crack sealant and the temperature of the heat transfer oil.

The mechanical router shall be capable of producing the specified rout cross-section.

The compressed air unit shall be equipped with water and oil traps and must produce sufficient air volume and pressure to remove all debris from the cracks. It shall be capable of delivering a continuous stream of clean, dry air at 600 kPa and 4.5 m^3 /min.

Application equipment shall be capable of regulating the application of crack sealant directly to the road and shall be equipped with a thermometer to monitor the temperature of the material as it is applied.

The hot compressed air lance shall be capable of providing a continuous hot, high pressure air stream (1000^{o}C at a rate of 1000 m/sec) with no flame at the exit nozzle.

3.30.4 CRACK ROUTING AND SEALING

All Work shall be performed during daylight hours only. No Work shall be performed if the visibility is less than 700 metres. No Work shall be performed during rain or snow or when the pavement surface is wet. The maximum work area shall be 3 km in length.

The crack sealant shall not be applied when the pavement temperature is below 10° Celsius.

Unless otherwise directed by the Consultant, all transverse cracks between 2 mm and 25 mm in width and longitudinal cracks between 2 mm and 12 mm in width which are within the driving lanes of the pavement surface shall be routed and sealed. Routing and sealing shall extend 0.5 m into the pavement shoulders.

Cracks shall be routed to the applicable cross-section shown on Drawing CB6-10.6M1, keeping the crack in the centre of the rout cross-section.

Prior to the application of crack sealant, the road surface adjacent to the cracks shall be cleaned and all loose material and moisture shall be removed from the routed cracks. All debris resulting from the cleaning and routing operation shall be removed from the road surface. The routed cracks shall be treated with the hot compressed air lance until the pavement in the routed crack is dry and slightly darkened. There shall be a maximum time period of 2 minutes between cleaning and drying the routed cracks and the application of the crack sealant.

Crack sealant shall be heated and applied within the applicable specified temperature ranges and in accordance with the manufacturer's recommendations. The heat transfer oil in the melting kettle shall not be heated in excess of 50°C above the safe heating temperature.

Routed cracks shall be filled with crack sealant such that upon cooling, the filled crack is as shown on the drawings.

Excessive crack sealant shall be removed from the pavement surface immediately following application.

Traffic shall be kept off sealed cracks until the crack sealant has cured. At locations such as intersections where this is not practical, the Contractor shall prevent tracking by applying a blotting agent to the crack sealant. When a blotting agent is used, it shall not be applied until the sealant has cooled sufficiently to prevent inclusion of the blotting agent into the sealant.

Fuel, asphalt and any other spills shall be cleaned up to the satisfaction of the Consultant at the Contractor's expense.

3.30.5 SAMPLING AND TESTING

3.30.5.1 **General**

Within this specification, certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship supplied. Compliance with these requirements where so specified shall be judged by sampling and testing as described in this section.

Acceptance testing is the responsibility of the Consultant.

Quality control, including the provision of quality control test results for the crack sealant materials, is the responsibility of the Contractor.

Accommodation of traffic for all sampling and testing is the responsibility of the Contractor.

3.30.5.2 **Definitions**

LOT - a day's production of at least 1500 linear metres of crack. If a day's production is less than 1500 linear metres, it shall be added to the production of subsequent days until a minimum of 1500 linear metres is obtained for the Lot. If the last day's production is less than 1500 linear metres of crack, it shall be added

to the previous Lot.

3.30.5.3 **Test Methods**

The latest edition of the following standard Alberta Transportation test methods (ATT) will be used for acceptance sampling and testing.

TABLE 3.30.5.3 TEST METHODS

Test Description	Test Method
1. Sampling Crack Sealant	ATT-42
2. Measurement of Rout Cross-section	ATT-73
3. Measurement of Sealant Filling	ATT-73
4. Measurement of Crack Missed	ATT-73
5. Appeal of Quality Assurance Results	ATT-73
6. Random Test Site Selection	ATT-56 Part III

3.30.5.4 **Acceptance Sampling and Testing of Crack Sealant Material**

The Consultant will obtain a sample of crack sealant material for each Lot in accordance with ATT-42. Testing of crack sealant material will be in accordance with the procedures established for the specific materials being used. The Department will determine the frequency of testing of sealant. Sealant test results will be reported within seven days of sampling. Materials that do not conform to the stated tolerance shall result in a unit price adjustment for the linear metres of crack sealant for the Lot, or rejection as specified in Table 3.30.6.

The Consultant will measure the sealant temperatures. Temperatures measured in excess of 10°C above the manufacturer's specified safe heating temperature will result in the rejection of the material in use and the Contractor shall dispose of the overheated materials in a manner acceptable to the Consultant.

3.30.5.5 **Acceptance Sampling and Testing of Routing and Sealing**

The Consultant will measure sections of routed transverse and longitudinal cracks to determine compliance to the specified rout cross-section and the conformance of the rout to the path of the crack being routed. If the existing crack is partially or entirely outside the rout cross-section or is within the rout cross-section but touching the side edge of the rout, it shall be considered "crack missed." The Consultant will measure sections of sealed crack to determine compliance with the specified filling requirements. All sample locations will be determined on the basis of stratified random sampling in accordance with ATT-56 Part III.

The random sites inspected by the Consultant will be a minimum of 1 m in length and, for the purpose of price adjustment, there will be a minimum of 6 sites measured per lot for rout cross-section, crack missed and for filling of the rout with sealant. Sites will be inspected for rout cross-section after routing and before sealant is placed. Sites will be inspected for filling a minimum of 1 hour after the cracks are filled. Inspection for rout cross-section, crack missed and rout filling shall be performed in accordance with ATT-73.

The Contractor shall cooperate with the Consultant obtaining test measurements and the Department will not be responsible for any costs due to delays in the Contractor's operation due to testing activities.

3.30.5.6 **Appeal of Acceptance Test Results and Appeal Testing**

The following procedures will apply for an appeal:

(i) Appeals will only be considered if the Contractor can demonstrate to the satisfaction of the Consultant that there is sufficient cause to support the appeal.

(ii) Acceptance test results for any rejected or penalized Lot may be appealed only once.

(iii) The Contractor shall serve notice of an appeal to the Consultant, in writing, within 24 hours of receipt of the test results.

(iv) For an appeal of the rout cross-sections, the Contractor shall locate and prepare the appeal sites at the locations determined by the Consultant. The cracks shall be cleaned to an acceptable condition to allow for the measurement of the rout cross-section and the percent of the crack missed. When the Consultant has completed the measurements, the Contractor shall immediately reseal the test sites. No separate payment will be made for site preparation for retesting and the resealing of cracks.

(v) For an appeal of the percent of crack filled, the Consultant will determine new test sites and evaluate the filling of the routed crack at these new sites. The Contractor shall provide assistance as required for this appeal testing.

(vi) For an appeal of the materials characteristics testing, the Consultant will conduct a retest on the original material sample for the Lot.

(vii) The results of the original measurements will be averaged with the results of the new tests and the new averages shall form the basis for payment except for Compatibility and Bond tests, where a single acceptable test result will be considered sufficient for acceptance of the applicable characteristic.

If the new averages indicate that a penalty or rejection still apply for the Lot or sublot then the Contractor shall be responsible for the costs of the retesting. The costs for retesting of crack sealant or rout cross-sections shall be $500.00 per Lot. The cost of retesting for the percent of crack filled shall be $100.00 per Lot. If the results of retesting indicate that the subject lot has a reduced penalty then the Department will be responsible for the cost of retesting.

3.30.6 MEASUREMENT AND PAYMENT

Measurement will be made in metres of the length of cracks on which crack routing and sealing has been performed.

Payment will be made at the unit price bid per metre for "Crack Routing and Sealing" subject to the unit price adjustments specified in this section. This payment will be full compensation for routing, cleaning and drying the cracks, cleaning the pavement surface, supplying and applying the crack sealant, quality control and traffic accommodation.

When payment adjustments equal 100% or greater, the Contractor may be required to remedy the Lot to

meet specified tolerances. This shall include removing all sealant, preparing the routs and resealing. Payment for the Lot shall be based on the new work.

TABLE 3.30.6
LOT UNIT PRICE ADJUSTMENTS

Parameter	Limits	Adjustment Factor
Crack Sealant Material	**(based on material specification for each product)**	**100% penalty if all 5 material parameters exceed specified requirements**
Flow	+ 25%	No individual penalty
Cone Penetration	+ 20%	1% per dmm outside limit
Bond Test	Pass	No individual penalty
Resilience	- 20%	1% per point outside limit
Compatibility	Pass	No individual penalty
Rout Cross-section, Crack Missed and Crack Filled	**(Function of the specified rout cross-section)**	
Width	Maximum of 10% deviation from the specified width	Penalty equal to 0.5 times the % of crack with ≥10% deviation less than the specified width
Depth	Maximum of 20% deviation from the specified depth	Penalty equal to 0.5 times the % of crack with ≥20% deviation less than the specified depth
% of crack missed	maximum 5% missed	Penalty equal to the total % of crack missed when >5% has been missed
Filling of routed crack	maximum 30 % subsidence from flush fill	Penalty equal to 0.5 times the % of crack underfilled

The unit price applicable to each Lot quantity of "Crack Routed and Sealed" shall be as follows:

LU = BP - (BP * (AF + CA))

Where LU is the Lot Unit Price per lineal metre;
BP is the Contract Bid Price per lineal metre for "Crack Routing and Sealing";
AF is the Sum of the Adjustment Factors for the Crack Sealant; and
CA is the Sum of the Adjustments for Crack Missed, Crack Filled and Cross-section deviations.