

FORM 340



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 340

CHIP SEAL

INDEX

340.01 SCOPE

340.02 MATERIALS

340.02.01 Chip Seal Aggregate

340.02.02 Asphalt Emulsion

340.03 EQUIPMENT

340.03.01 Pressure Distributor

340.03.02 Mechanical Aggregate Spreader

340.03.03 Rollers

340.03.04 Mechanical Broom

340.04 CONSTRUCTION

340.04.01 Surface Preparation

340.04.02 Patching and Crack Filling

340.04.03 Application of Emulsion

340.04.04 Application of Aggregate

340.04.05 Rolling

340.04.06 Mechanical Brooming

340.04.07 Temperature and Weather

340.04.08 Protection of Work and Traffic Control

340.05 MEASUREMENT FOR PAYMENT

340.05.01 Measurement for Payment for Patching and Crack Filling

340.05.02 Measurement for Payment for Emulsion

340.05.03 Measurement for Payment for Chip Seal Aggregate by Weight

340.05.04 Measurement for Payment for Chip Seal Aggregate by Volume

340.06 BASIS OF PAYMENT

340.06.01 Basis of Payment for Patching and Crack Filling

340.06.02 Basis of Payment for Emulsion

340.06.03 Basis of Payment for the Application of Stockpile Supplied Chip Seal Aggregate

340.06.04 Basis of Payment for the Supply and Application of Chip Seal Aggregate

340.07 TEMPERATURE

340.01 SCOPE

This specification covers the requirements for single layer chip seal surface treatment of pavement, together with the requirements for patching and filling cracks in the pavement prior to the chip seal surface treatment operations.

340.02 MATERIALS

340.02.01 Chip Seal Aggregate

The chip seal aggregate must be crushed and shall be of a high quality and be free of soft disintegrated stone, clay, or other deleterious materials. The screening of natural gravel deposits to produce chip seal aggregate shall not be permitted.

The crushed aggregate shall be screened and washed over a 6.35 mm screen. Where the contract item specifies piling of the chip seal aggregate, then the aggregate shall be washed before stockpiling.

FORM 340

The aggregates shall meet the following requirements:

(i) Gradation Requirements

SIEVE	% PASSING
12.7 mm	100
9.51 mm	85-100
6.35 mm	20-60
4.76 mm	0-20
2.00 mm	0-5
0.075 mm	0-1

(ii) Physical Requirements

TEST	ACCEPTANCE REQUIREMENTS
LOS ANGELES ABRASION, LOSS % MAX.	35
MAGNESIUM SULPHATE SOUNDNESS 5 CYCLES	12
LESS % MAX.	1.75
ABSORPTION % MAX.	20
THIN AND ELONGATED PIECES % MAX.	60
CRUSHED MATERIAL % MIN.	135
PETROGRAPHIC NUMBER MAX.	20
MICRO-DEVAL TEST (% MAX.)	

The use of pits and quarries for the production of chip seal aggregate, together with the requirements for testing and stockpiling shall be carried out in accordance with the requirements of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor".

340.02.02 Asphalt Emulsion

Asphalt emulsion shall be RS-2k, or an approved equal, and shall meet the following requirements when delivered to the job site:

	Min.	Max.	TESTS ON RESIDUE	MIN.	MAX.
SAYBOLT VISCOSITY	150	400	PENETRATION AT 25°C, 100 g, 5 s DUCTIBILITY AT 25°C SOLUBILITY IN TRICHLOROETHYLENE	100 60 97.5	250 — —
RESIDUE BY DISTILLATION%	67	—			
SETTLEMENT IN 5 DAYS	--	5			
OIL PORTION OF DISTILLATE	--	3			
PARTICLE CHARGE	POSITIVE	POSITIVE			

340.03 EQUIPMENT

The Contractor shall supply all tools, machinery and equipment required in the execution of all phases of the work. Such equipment shall at all times be maintained in first class working condition and shall at all times be operated by skilled and experienced operators.

340.03.01 Pressure Distributor

The approved pressure distributor used for applying asphalt emulsion shall be capable of applying closely regulated quantities. It shall consist of a fully insulated tank permanently and rigidly mounted on a truck or trailer capable of accurately maintaining any speed required for spraying.

The distributor shall be provided with the following minimum equipment:

- (a) Proper hand spray attachments to uniformly apply emulsion to any areas missed by the distributor.
- (b) An efficient and positive means of heating emulsion uniformly to any temperatures up to 150°C, and maintaining the contents constantly at any selected temperature without any local overheating and including a satisfactory method of circulating the contents during the entire heating process.
- (c) An approved thermometer with a minimum range of 10°C-150°C graduated in intervals of not more than 10°C, with subdivisions at every 1°C, so placed as to accurately show the temperature of the distributor contents, and to be accessible to the Engineer.
- (d) An approved Tachometer, driven from a fifth wheel, mounted so that it is readily visible to the driver so that it clearly and accurately registers distances traveled when spraying emulsion, and so that it enables the driver to maintain the constant speed required to ensure the specified rate of application of the emulsion.
- (e) A pump tachometer which registers pump output.
- (f) A pressure gauge indicating the pressure in the spray bar.
- (g) A rear mounted spray bar set parallel to the surface to be sprayed, and capable of adjustment to

FORM 340

provide any required spraying widths from 2.5 m to 3.5 m. The distributor shall be equipped with a spray bar heating device, circulating a uniform viscosity and pressure of the emulsion at each nozzle, both before and during spraying operations. The circulating system shall also be provided with a strainer to prevent clogging of the bar and nozzles. The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlaps the spray fan from the adjacent nozzle by 50% for double-lap so that a uniformly sprayed surface will result. This adjustment shall be made by the height set when the distributor is one half full, and shall be changed only when so permitted by the Engineer.

- (h) Spray bar nozzles shall be designed and set as to ensure uniform fan shaped sprays. The nozzles shall not be such as to produce such a fine mist that the emulsion will blow away and so not provide an even emulsion coating. All spray nozzles shall be of the same manufacture, size, type and in good condition and shall be provided with valves capable of instant full opening and positive cut-off. All spray nozzles shall be set in the bar so that the nozzle slots make the same horizontal angle (30°) with the longitudinal axis of the bar. Before work commences, and periodically as required during spraying operations, the nozzles on the spray bar shall be removed, and immersed in a solvent for a period of time, sufficient to remove all congealed asphalt and to free the nozzle opening. Each nozzle shall be inspected and approved by the Engineer and reinstalled on the spray bar at the correct angle.
- (i) A strainer shall be provided in the filling line to prevent entry of foreign material into the tank.
- (j) A sampling cock fitted on the spray bar or circulating line, and readily accessible to allow samples of the emulsion to be obtained directly from the distributor.

340.03.02 Mechanical Aggregate Spreader

The approved self-propelled aggregate spreader shall be capable of continuously and uniformly spreading closely regulated quantities of aggregate at the application rates selected.

The spreader shall be equipped with a rear mounted hopper designed so that a loaded truck may supply aggregate to this hopper, while being towed by the spreader. The spreader shall be equipped with a front hopper and an approved means of transferring the aggregate to this hopper from the rear. The front hopper shall be equipped with an oversize reject screen and metering gates. The gates shall adjust the spreading width and be capable of individual adjustment to obtain a uniform flow of aggregate across the spreading width. These gates shall also be designed to provide simultaneous movement or closure from the operator's position. The flow of aggregate from the metering gates shall be further controlled by a spread roller, the rotation of which shall automatically commence when the metering gates are opened.

340.03.03 Rollers

Steel tired rollers shall have tandem wheels and weigh at least 7 tonnes. Pneumatic-tired rollers shall be self-propelled and have a minimum ballasted weight of 8 tonnes.

340.03.04 Mechanical Broom

The mechanical broom shall be of an approved type of power broom suitable for pavement use.

340.04 CONSTRUCTION

340.04.01 Surface Preparation

Before chip seal operations may begin, the Contractor shall completely clean the pavement of all dirt and other debris. Cleaning shall be by the use of a power broom. Should there be any depressions not completely cleaned with the power broom, then the Contractor shall clean such spots with a hand broom.

340.04.02 Patching and Crack Filling

Patching and crack filling shall be carried out to repair pavement pot holes and cracks prior to the carrying out of the chip seal surface treatment operations. The repair work involves localized single or multiple layer chip seal applications as required to fill cracks and pot holes.

All cracks wider than 5 mm shall be treated. Should a single layer application be insufficient to fill the crack, then another application, or applications shall be applied as required until the crack is filled, to the satisfaction of the Engineer.

FORM 340

All pot holes shall be patched by means of multiple layer emulsion and chip seal aggregate applications to fill the hole level with the surrounding pavement.

The emulsion shall be applied at the proper temperature using hand spray attachments.

The aggregate shall be spread by hand over the emulsion and then compacted. In those cases, where due to the characteristics of the pot hole or crack, the roller cannot apply its weight to the chip seal, then tamping shall be provided by hand operated means. After the completion of each layer of chip seal treatment and compaction, any loose chips shall be removed by hand brooming. All places requiring patching or crack filling shall be treated to the satisfaction of the Engineer.

340.04.03 Application of Emulsion

All required patching and crack filling shall be carried out to the satisfaction of the Engineer, before the regular chip seal emulsion application operations may begin.

The emulsion shall be applied at a temperature in the range 60°C to 75°C.

The emulsion shall be applied at the rate as designed, (approximately 1.9 l per square metre) for single chip seal treatment. For possible second applications the rate will be different. The optimum rate of application is related to aggregate gradation and to the condition of the road surface. For any given area the emulsion shall be applied at the rate designed by the Contractor and approved by the Engineer.

During the application of the emulsion, the distributor shall be operated by a minimum of two men, one of whom shall be stationed on the rear platform, to control the application. The forward speed of the distributor shall not exceed 1.6 metres per second.

340.04.04 Application of Aggregate

The crushing and stockpiling of chip seal aggregates must be 100% complete prior to application of chip seal aggregates to the road surface.

For single chip seal treatment, the aggregate shall be uniformly distributed at the rate of approximately 16.0 kilograms per square metre (approximately 0.01 cubic metre per square metre). For possible second applications the rate may be different. The exact rates of the applications shall be determined by the Engineer.

The aggregate application operation shall be co-ordinated with the emulsion application so that no more than 15 m separates the emulsion application from the aggregate spreading.

Application of aggregate operations for the day, shall be completed at least two hours before sunset.

340.04.05 Rolling

Immediately after the application of the aggregate, pneumatic-tired rolling shall be carried out in such a manner that the entire treated area receives at least one coverage. Final rolling shall consist of one coverage with a steel wheel roller.

The minimum number of rollers required is one pneumatic-tired roller and one steel roller. If this combination of rollers is not sufficient to maintain the completed rate of progress, additional rollers shall be provided.

340.04.06 Mechanical Brooming

The chip seal treated surfaces shall be swept with a power broom. All excess aggregate shall be removed and disposed of by the Contractor, at his own expense. Sweeping shall not be carried out until the treatment has set up to a sufficient degree so that no damage will occur to the chip seal.

On chip seal treated surfaces open to use by public traffic, power brooming shall be carried out within 48 hours of the application of aggregate.

340.04.07 Temperature and Weather

Chip seal operations shall not be carried out when, in the opinion of the Engineer, road conditions, high humidity, imminence of rain, wetness or dampness are not conducive to successful results.

Asphalt emulsion application operations shall not be carried out when the air temperature at the work

FORM 340

location is less than 15°C.

Chip seal treatment shall not be carried out before June 15th or after September 1st, except by special permission of the Engineer.

340.04.08 Protection of Work and Traffic Control

Where possible, the traffic shall be kept off the treated surface until the chip seal is to the point where it is resistant to damage. Where traffic must go over the surface before it is fully cured, the Contractor shall control traffic speed by means of directing the traffic in convoys. The Contractor shall provide a lead vehicle to ensure that convoys proceed at low speed.

340.05 MEASUREMENT FOR PAYMENT

The chip seal emulsion, the chip seal aggregate and the combined work of patching and crack filling, will be considered separately for payment.

340.05.01 Measurement for Payment for Patching and Crack Filling

Measurement for payment for patching and crack filling shall be an inspection to see that all the required patching and crack filling over the entire project has been completed. The unit of payment shall be the lump sum contract price to complete all required patching and crack filling within the lengths of the roads to be chip sealed.

340.05.02 Measurement for Payment for Emulsion

The quantity of asphalt emulsion applied to the road, within the required limits, will be measured in litres, rounded to the nearest whole number.

The quantity of emulsion shall be by means of metering the emulsion as it is being applied from the distribution truck. The metering shall be done by means of gauges located on the distribution truck. The gauges must be checked and approved by Calibration Canada before being used on each job. The Department Engineer shall have the authority to check the accuracy of gauges by weighing the truck and using the emulsions specific gravity to compute the volume of emulsion.

The pay volume of emulsion applied shall be the volume measured by gauges corrected to the basis of 15.6°C by using the temperature volume correction. Coefficients provided in Section 340.07 "Temperature" shall be observed at the time of the gauge reading.

340.05.03 Measurement for Payment for Chip Seal Aggregate by Weight

Where the unit of measurement for chip seal aggregate is stated in tonnes in the unit price table, then the material shall be weighed on scales.

The scales shall be provided by the Contractor and they shall conform with the requirements of Section 501 "Weighing of Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker as being placed in the works shall be included in measurement for payment.

The weight shall be computed in tonnes, rounded to one decimal place.

340.05.04 Measurement for Payment for Chip Seal Aggregate by Volume

When the unit of measurement for chip seal aggregate is stated in cubic metres on the unit price table, then the aggregate shall be measured for payment by means of the volume of material.

Where the requirement is for the stockpiling of chip seal aggregate, then the required volume shall be measured for payment in accordance with the requirements of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor".

Where the requirement is for the volume of chip seal aggregate used in the treatment, the volume of material taken from the stockpile and placed on the road shall be computed in cubic metres rounded to the nearest whole number. The quantity to be measured shall be the number of cubic metres of material removed from the stockpile, as shown on the cross section sheets between the cross sections taken over the stockpile before material was removed and the cross sections taken after the material was removed. The volume of this excavation being computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

FORM 340

340.06 BASIS OF PAYMENT

340.06.01 Basis of Payment for Patching and Crack Filling

Payment at the lump sum contract price for patching and crack filling shall be full compensation for all the additional work involved in the patching and crack filling operations that is not compensated for in the contract prices for chip seal emulsion and chip seal aggregate.

Quantities of chip seal emulsion and chip seal aggregate used in the patching and crack filling shall be paid for at the appropriate contract prices for chip seal emulsion and chip seal aggregate.

340.06.02 Basis of Payment for Emulsion

Payment at the contract price for emulsion shall be compensation in full for all labour, materials and equipment used to clean the road surface, and to supply, haul, heat and apply the emulsion to the road surface at the specified temperatures and for all other work necessary to complete the application, except where payment is otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the re-treatment of any areas, as required by the Engineer.

340.06.03 Basis of Payment for the Application of Stockpile Supplied Chip Seal Aggregate

Payment at the contract price for application of stockpile supplied chip seal aggregate shall be compensation in full for all labour, materials, equipment-use and any other expenses for; handling the aggregate, providing scales if required, providing all haulage of the aggregate from the stockpiles (the locations of which are stated in the contract documents) to where the aggregate is to be spread, spreading the aggregate, rolling, power brooming, providing and using the lead vehicle for traffic control, and cleaning up the stockpile site as may be required, together with all other operations necessary to complete the work, in accordance with this specification and for which payment is not otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the retreatment of any areas, as required by the Engineer.

340.06.04 Basis of Payment for Supply and Application of Chip Seal Aggregate

Payment at the contract price for the supply and application of chip seal aggregate shall be compensation in full for all labour, materials, and equipment-use and any other expenses for; providing a pit or quarry, obtaining environmental approval, providing and transporting pit or quarry samples to the Department's Soils Laboratory in St. John's, clearing, grubbing and stripping the pit or quarry, processing pit or quarry material to the required gradation and physical requirements, washing the aggregate, providing and maintaining a field laboratory, paying any royalties for the material, constructing and maintaining an access road to the source of material, providing scales if required, handling the aggregate, providing all haulage of the aggregate from the source to where the aggregate is to be spread, spreading the aggregate, rolling, power brooming, providing and using the lead vehicle for traffic control, and cleaning up and providing such other restoration to the pit or quarry and the stockpile site as may be required, together with all other operations necessary to complete the work, in accordance with this specification and for which payment is not otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the retreatment of any areas, as required by the Engineer.

FORM 340

340.07 TEMPERATURE

Temperature-volume Correction for Emulsified Asphalts

°C	°F	M*	°C	°F	M*	°C	°F	M*	°C	°F	M*	°C	°F	M*
10.0	50	1.00250	25.0	77	0.99575	40.0	104	0.98900	55.0	131	0.98225	70.0	158	0.97550
10.6	51	1.00225	25.6	78	0.99550	40.6	105	0.98875	55.6	132	0.98200	70.6	159	0.97525
11.1	52	1.00200	26.1	79	0.99525	41.1	106	0.98850	56.1	133	0.98175	71.1	160	0.97500
11.7	53	1.00175	26.7	80	0.99500	41.7	107	0.98825	56.7	134	0.98150	71.7	161	0.97475
12.2	54	1.00150	27.2	81	0.99475	42.2	108	0.98800	57.2	135	0.98125	72.2	162	0.97450
12.8	55	1.00125	27.8	82	0.99450	42.8	109	0.98775	57.8	136	0.98100	72.8	163	0.97425
13.3	56	1.00100	28.3	83	0.99425	43.3	110	0.98750	58.3	137	0.98075	73.3	164	0.97400
13.9	57	1.00075	28.9	84	0.99400	43.9	111	0.98725	58.9	138	0.98050	73.9	165	0.97375
14.4	58	1.00050	29.4	85	0.99375	44.4	112	0.98700	59.4	139	0.98025	74.4	166	0.97350
15.0	59	1.00025	30.0	86	0.99350	45.0	113	0.98675	60.0	140	0.98000	75.0	167	0.97325
15.6	60	1.00000	30.6	87	0.99325	45.6	114	0.98650	60.6	141	0.97975	75.6	168	0.97300
16.1	61	0.99975	31.1	88	0.99300	46.1	115	0.98625	61.1	142	0.97950	76.1	169	0.97275
16.7	62	0.99950	31.7	89	0.99275	46.7	116	0.98600	61.7	143	0.97925	76.7	170	0.97250
17.2	63	0.99925	32.2	90	0.99250	47.2	117	0.98575	62.2	144	0.97900	77.2	171	0.97225
17.8	64	0.99900	32.8	91	0.99225	47.8	118	0.98550	62.8	145	0.97875	77.8	172	0.97200
18.3	65	0.99875	33.3	92	0.99200	48.3	119	0.98525	63.3	146	0.97850	78.3	173	0.97175
18.9	66	0.99850	33.9	93	0.99175	48.9	120	0.98500	63.9	147	0.97825	78.9	174	0.97150
19.4	67	0.99825	34.4	94	0.99150	49.4	121	0.98475	64.4	148	0.97800	79.4	175	0.97125
20.0	68	0.99800	35.0	95	0.99125	50.0	122	0.98450	65.0	149	0.97775	80.0	176	0.97100
20.6	69	0.99775	35.6	96	0.99100	50.6	123	0.98425	65.6	150	0.97750	80.6	177	0.97075
21.1	70	0.99750	36.1	97	0.99075	51.1	124	0.98400	66.1	151	0.97725	81.1	178	0.97050
21.7	71	0.99725	36.7	98	0.99050	51.7	125	0.98375	66.7	152	0.97700	81.7	179	0.97025
22.2	72	0.99700	37.2	99	0.99025	52.2	126	0.98350	67.2	153	0.97675	82.2	180	0.97000
22.8	73	0.99675	37.8	100	0.99000	52.8	127	0.98325	67.8	154	0.97650	82.8	181	0.96975
23.3	74	0.99650	38.3	101	0.98975	53.3	128	0.98300	68.3	155	0.97625	83.3	182	0.96950
23.9	75	0.99625	38.9	102	0.98950	53.9	129	0.98275	68.9	156	0.97600	83.9	183	0.96925
24.4	76	0.99600	39.4	103	0.98925	54.4	130	0.98250	69.4	157	0.97575	84.4	184	0.96900
												85.0	185	0.96875

Legend: C[□] (F[□]) = observed temperature in degrees Celsius (Fahrenheit)
M = Multiplier for correcting volumes to the basis of 15.6[□]C (60[□]F)
* Multiplier (M) for C[□] is a close approximation.