CONSTRUCTION SPECIFICATION FOR SINGLE AND DOUBLE SURFACE TREATMENT

TABLE OF CONTENTS

304.01 SCOPE

This specification covers the requirements for surface preparation, application of bituminous binder, and application of aggregate for single and double surface treatment.

304.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material

OPSS 1006 Aggregates - Surface Treatment
OPSS 1103 Emulsified Asphalt

Ontario Ministry of Transportation Publications

MTO Forms:
PH-CC-349 Bituminous Material Product Sample Form

MTO Laboratory Testing Manual:
LS-100 Rounding-Off of Test Data and Other Numbers

Ontario Traffic Manual (OTM):
Book 7 - Temporary Conditions

304.03 DEFINITIONS

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

Appurtenances mean maintenance hole, catch basin, valve chamber, and water valve covers and similar Utility access covers located within the paved portion on the roadway.

Binder means an emulsified asphalt with or without polymer modification used to bind aggregates.

Double Lap means the coverage produced from the application of binder where the binder from each spray bar nozzle overlaps the binder application from the adjacent nozzle by one half.

Double Surface Treatment means two successive single surface treatments.

End Nozzle means a spray bar nozzle which delivers binder to the inside half of a standard spray pattern.

Single Surface Treatment means a single application of bituminous binder followed by a single application of Class 1, Class 2, Class 3, Class 4, Class 5, or Class 6 aggregate.

Triple Lap means the coverage produced from the application of binder where the binder from each spray bar nozzle overlaps the binder application from the adjacent nozzle by two thirds.

304.05 MATERIALS

304.05.01 Aggregates

Aggregates shall be according to OPSS 1006 and as specified in the Contract Documents.

304.05.02 Binders

Binders shall be according to OPSS 1103.

304.06 EQUIPMENT

304.06.01 Binder and Aggregate Application Rate

The following equipment shall be supplied for the determination of binder and aggregate application rates:

a) A portable electronic balance with the following characteristics:

   i. five digit display,
   ii. accuracy to 0.1%,
   iii. capacity 10 kg,
   iv. minimum platform size of 300 mm by 400 mm.

b) Sheet metal trays, each 500 mm x 500 mm inside dimension ±1 mm, with sides 7 mm in height ±1 mm. The sheet metal shall be a minimum of 18 gauge (approximately 1.3 mm) with soldered corners.

c) One 5 kg test mass.

d) A carpenter's level for levelling the balance.

304.06.02 Mechanical Aggregate Spreader

The mechanical aggregate spreader shall be designed and manufactured to be self-propelled and capable of continuously and uniformly distributing aggregate at the specified application rate.

304.06.03 Pilot Vehicle

The pilot vehicle shall be equipped according to the requirements of the OTM, Book 7.

304.06.04 Pressure Distributor

The pressure distributor shall be designed and manufactured to spray binder on the road surface. The pressure distributor shall be capable of applying binder at the specified rates and in a continuous and uniform manner both longitudinally and transversely for a full lane width at variable speeds.

304.06.05 Rollers

304.06.05.01 General

Rollers shall be ballasted according to the manufacturer's recommendations.

304.06.05.02 Pneumatic-Tired Rollers

Pneumatic-tired rollers shall be self-propelled and be according to Table 1. The wheels shall be mounted with smooth tread rubber tires. Tire inflation pressure shall be a minimum of 350 kPa when the tires are cold. All tires shall have equal pressure. Each roller shall be equipped with a suitable tire pressure gauge for checking tire inflation pressure.

304.06.05.03 Steel Drum Rollers

Steel drum rollers shall be single drum vibratory rollers according to Table 2 and shall be operated in the static mode, if the drum is not rubber coated. Drive wheels shall not mark the aggregate.

304.06.06 Rotary Power Brooms

Brooms shall be capable of cleaning gravel, sand, dirt, and other debris from the roadway surface.

304.07 CONSTRUCTION

304.07.01 Operational Constraints

Surface treating operations shall not be carried out when the ambient temperature at the work location is less than 10 °C or where climatic or site conditions preclude the curing of the binder.

The application of binder and aggregate shall terminate one hour before sunset.

Surface treatment shall not be carried out prior to May 15th south of a line through Pembroke, Magnetawan, and Pointe au Baril Station or prior to June 1st north of the line.

Surface treatment shall not be carried out after September 1st except with the approval of the Contract Administrator. Surface treatment may be extended to September 30th provided a high float emulsion is used.

304.07.02 Surface Preparation

Existing bituminous surfaces shall be clean and free of all debris and standing water before application of binder.

Where a binder is to be applied on a granular surface, the surface shall be free of standing water and shall be prepared by dampening, fine grading, and compacting immediately prior to the application of the binder. The surface shall be finish rolled to ensure a compacted smooth and float free surface.

304.07.03 Binder Application Temperatures

Binder application temperatures shall be according to OPSS 1103.

304.07.04 Application of Binder

After the surface has been prepared, the binder shall be uniformly sprayed on the road surface at the specified application rate. When binder is to be applied to two adjacent lanes, the application of binder on the initial pass shall be done without the use of an end nozzle. When binder is applied to the adjacent lane, the nozzle positioned closest to the first application of binder shall be an end nozzle.

The spray bar height shall be adjusted to ensure that there is triple lap of the binder application. A written request may be submitted to the Contract Administrator to allow the use of a double lap application.

Longitudinal joints shall be constructed to ensure full coverage on the centreline.

The application of binder shall terminate at the same station for both lanes at the end of each Day.

All Roadway appurtenances within the area to be surfaced shall be properly covered and protected immediately prior to the surface treatment.

304.07.05 Application of Aggregate

Aggregate shall be uniformly applied at the rate specified. The distance between the pressure distributor and the spreader shall be less than or equal to 30 m.

If excess aggregate is present when constructing a double surface treatment, the excess shall be removed prior to the second application of binder.

304.07.06 Rolling

Immediately after spreading, the aggregate shall be rolled with a minimum of two pneumatic-tired rollers. The entire treated area shall receive two passes from each pneumatic-tired roller.

When the surface treatment is placed on a prepared granular grade, one pneumatic-tired roller shall be replaced by a steel drum roller. The entire treated area shall receive two passes from the pneumatic-tired roller and one pass from the steel drum roller.

Rollers shall be operated at such a speed as to prevent aggregate pick-up, but in no case shall the speed of rollers exceed 10 km/h.

All rolling shall be completed within 300 m of the aggregate spreader. When the combination of rollers is not sufficient to maintain the completed rate of progress, additional rollers shall be used.

304.07.07 Traffic Convoy

When as specified in the Contract Documents, traffic shall be convoyed according to the OTM, Book 7.

The pilot vehicle shall guide one-way traffic through or around construction. The maximum speed of the convoy shall be 30 km/h. Convoying shall be maintained until such time as the surface treatment is able to carry traffic without damage.

304.07.08 Protection of the Work

Signs indicating fresh surface treatment, or similar wording, shall be erected at the limits of the Working Area and any intersections throughout the Working Area immediately after placement of surface treatment and shall remain in place for a minimum of 72 hours.

304.07.09 Material Sampling and Testing

304.07.09.01 Binder

Binder field samples shall be obtained and provided for testing purposes as specified in the Contract Documents.

The work shall include sampling, labelling, packaging, and making arrangement with Contract Administrator for delivery of samples to the laboratory designated in the Contract Documents within 2 Business Days of sampling.

A lot shall be deemed to be the quantity of work completed with a shipment (truck tank) of binder. A sample of binder shall be taken at the job site from each shipment of binder and this sample shall represent the lot.

Each binder sample shall consist of a minimum size of two full 4-litre samples of material. The sample containers shall be new triple tight cans with lids or suitable plastic containers of similar capacity which can be closed to prevent any leakage.

Sample containers shall be supplied and filled, leaving only sufficient space to allow for liquid expansion. The sample shall be taken from a sampling spigot on the transfer line, or, if one is not available, from the end of the transfer line. Each sample shall be taken after sufficient material has been drawn from the truck tank to purge the transfer line.

The sample shall be identified using a MTO PH-CC-349, Bituminous Material Product Sample Form, obtained from the Contract Administrator. In addition, the form shall be placed on each pail and labelled as “A1 of 2" or "A2 of 2". The form is only for use by the Owner in the identification of the sample for Contract administration purposes.

304.07.09.02 Aggregates

Aggregate samples shall be provided for testing purposes as specified in the Contract Documents.

304.07.09.03 Determination of Binder and Aggregate Application Rates

The application rate for the binder and the aggregate shall be as specified in the Contract Documents.

Compliance to the specified application rates of binder and aggregate shall be demonstrated to the Contract Administrator. At the Contract Administrator's option, this compliance may include a minimum 300 m one lane width trial section to ensure that the binder and aggregate are applied at the specified rate.

304.07.09.03.01 Sampling Frequency

Field sampling shall be carried out in the presence of the Contract Administrator to determine the binder application rates:

a) at the start of each Day's work. If two distributors are provided, the binder application rate of one distributor shall be determined at this time.

b) when approximately half of the total Day's production is completed. If two distributors are provided, the binder application rate of the second distributor shall be determined at this time.

Field sampling shall be carried out to determine the aggregate application rates at the start of each Day's work.

304.07.09.03.02 Procedure

Each section of road used to obtain the application rates shall be a maximum of 50 m in length. Field sampling shall be conducted in the presence of the Contract Administrator to determine the binder and aggregate application rates as follows:

a) Set up and level the balance in a firm location protected from the wind.

b) Check the tolerance of the balance with the 5 kg test mass.

c) Obtain the tare mass (in kg to three decimal places) of two clean trays and record.

d) Place the two trays in the centre of the lane being treated approximately 30 cm apart and parallel to the centreline.

e) Remove the first tray after the binder has been sprayed and before the aggregate has been applied.

f) Remove the second tray after the binder and aggregate have been applied and before rolling.

g) Obtain and record the gross mass (in kg to three decimal places) of each tray.

h) Carefully patch the marks left by the trays using the binder and aggregate as specified in the Contract Documents. The patches shall be rolled.

i) Clean the trays for reuse.

304.07.09.03.03 Calculations

The calculations specified in Table 3 shall be performed in the presence of the Contract Administrator:

304.07.10 Remedial Work

Damaged areas shall be repaired until such time as the work has been accepted by the Contract Administrator.

304.07.11 Management of Excess Material

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

304.08 QUALITY ASSURANCE

304.08.01 Acceptance

304.08.01.01 Binder

Acceptance of the binder shall be based on testing conducted by the Owner or the Owner's agent according to OPSS 1103.

The Contract Administrator shall determine the acceptability of each lot according to OPSS 1103. Lots that are not acceptable shall be removed and replaced or accepted with a payment adjustment.

If the Contractor elects to repair the lot in lieu of a payment adjustment, the lot shall be repaired and re-evaluated to the satisfaction of the Contractor Administrator.

304.08.01.02 Binder Application Rate

The binder application rate is acceptable when the rate is within a tolerance of + 5% of the specified rate. Otherwise, the binder application rate is unacceptable, and work shall stop. Field sampling shall be repeated in a maximum of 50 m sections until one of the following is obtained:

a) When two consecutive acceptable binder test results are obtained, work may proceed.

b) When four unacceptable binder test results are obtained before two consecutive acceptable test results, the pressure distributor shall be permanently removed from the Working Areas.

304.08.01.03 Aggregate Application Rate

The aggregate application rate is acceptable when the rate of aggregate application is within a tolerance of +10% of the specified rate. Otherwise, the aggregate application rate is unacceptable and work shall stop. Work may proceed when the application rate has been adjusted to the desired rate.

304.09 MEASUREMENT FOR PAYMENT

304.09.01 Actual Measurement

304.09.01.01 Binder

Measurement of binder shall be by mass in kilograms.

304.09.01.02 Class 1, 2, 3, 4, 5 or 6 Aggregate

Measurement of aggregate shall be by mass or volume as specified in the Contract Documents

304.09.01.02.01 By Mass

Measurement of aggregate shall be by mass in tonnes.

304.09.01.02.02 By Volume

Measurement of aggregate shall be by volume in cubic metres, loose, by predetermined truck capacities. The predetermined capacity of each truck shall be that computed from its box dimensions.

Loading of each truck shall be kept to not less than the predetermined capacity. It is not permitted to load trucks in excess of this capacity to allow for bulking, and no deduction shall be made for any settlement of the load during transportation, provided that such settlement is not caused by spillage or leakage.

Each truck shall be uniquely and readily identifiable.

304.09.01.03 Traffic Convoy

Measurement for traffic convoy shall be in hours based on the number of hours that the pilot vehicle is convoying traffic.

304.10 BASIS OF PAYMENT

304.10.01 Binder *"type*" - Item
Class 1 Aggregate - Item
Class 2 Aggregate - Item
Class 3 Aggregate - Item
Class 4 Aggregate - Item
Class 5 Aggregate - Item
Class 6 Aggregate - Item
Class 1 Aggregate, From Stockpile - Item
Class 2 Aggregate, From Stockpile - Item
Class 4 Aggregate, From Stockpile - Item
Class 6 Aggregate, From Stockpile - Item
Traffic Convoy - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Payment for any lot of binder which does not meet all Contract requirements shall be subject to a payment adjustment, except when the lot sample has been arranged for delivery within 2 Business Days of sampling and testing is not started within 14 Days of sampling.

A calculated payment adjustment shall be determined, through a system of adjustment points based on test results for any lot sample when tested providing the sample remains in a condition suitable for testing. Where more than one test result is available on any one sample, the test result with the least deviation from the specification limit shall be used to calculate the payment adjustment. The payment adjustment percentage for the lot is the total number of adjustment points for each sample divided by 25.

A fixed payment adjustment of 20% of the Contract price shall be made for lots for which the following conditions apply:

a) The lot sample contains insufficient material for testing; or

b) The lot sample does not remain in a condition suitable for testing within 14 Days after sampling (e.g., broken emulsion or foam-over during distillation).

304.10.02 Adjustment Points for Emulsified Asphalt Binders

The total number of adjustment points shall be equal to the summation of the number of units that each test deviates from the specification limits times the multiplier as specified in Table 4, plus:

a) 1000 adjustment points for failure of the particle charge test when the binder type is RS-2, CRS-2, RS-2P, or CRS-2P, HFMS-2(ON) and;

b) 200 adjustment points for failure of the coating ability and water resistance test when the binder type is HF-100S, HF-150S, HF-250S, HFMS-2(ON), HF-100SP, HF-150SP or HFMS-2P(ON).

Prior to the summation, all adjustment points shall be rounded to one decimal place according to LS-100.

TABLE 1
Requirements for Pneumatic-Tired Rollers

Roller Class	Minimum Mass t	Minimum Mass per Tire kg
R1	8	900
R2	18	2500
R3	25	3600

TABLE 2
Requirements for Steel Drum Rollers

Minimum Drum Diameter mm	Minimum Drum Width mm	Minimum Static Mass per mm of Drum Width kg
1500	2100	2

TABLE 3
Determination of Aggregate Application Rate

Steps	Name	Descriptions	Calculations
1	NMB	**Net Mass of the Binder** Obtain the net mass of the binder applied to the **first tray**	NMB = Gross Mass – Tare Mass
2	BAR	**Binder Application Rate** Calculate the binder application rate to two decimal places (kg/m2)	BAR = NMB x 4
3	NMBA	**Net Mass of Binder and Aggregate** Obtain the net mass of binder and aggregate on the **second tray**	NMBA = Gross Mass – Tare Mass
4	NMA	**Net Mass of Aggregate** Obtain the net mass of aggregate on the second tray	NMA = NMBA - NMB
5	AAR	**Aggregate Application Rate** Calculate the aggregate application rate to one decimal place (kg/m^2)	AAR = NMA x 4

TABLE 4
Tests, Units and Multipliers for Emulsified Asphalt Binder

Test	Unit	Multiplier
Residue by Distillation	%	200
Viscosity (less than minimum)	SFs	30
Viscosity (greater than maximum)	SFs	5
Demulsibility (Note 1)	%	50
Residue Penetration @ 25°C	0.1 mm	15
Settlement (Note 2)	%	30
Storage Stability (Note 3)	%	50
Oil Portion of Distillate, by Volume of Emulsion (Note 4)	%	50
Sieve Test	%	1000
Residue Float Test @ 60°C	s	2
Ash Content of Residue, by Mass	%	1000
Residue Elastic Recovery @ 10°C (Note 5)	%	30
Residue Force Ductility @ 800% Elongation, 5 cm/min. pull rate @ 4°C (Note 6)	kg	1000
Residue Apparent Viscosity @ 60°C (Note 7)	Pa.s	10 (Note 8)
Residue Ductility @ 25°C (Note 9)	cm	10

Notes:

1. For all emulsified asphalt binder types except HF250S.
2. For emulsified asphalt binder types RS-2 and CRS-2 only.
3. For emulsified asphalt binder types HF-100S, HF-150S, HF-250S, HFMS-2(ON), HF-100SP, HF-150P, HFMS-2P(ON), HFRS-2, RS-2P, and CRS-2P only.
4. For emulsified asphalt binder types CRS-2, HF-100S, HF-150S, HF-250S, HFMS-2(ON), CRS-2P, HF-100SP, HF-150SP, and HFMS-2P(ON) only.
5. For emulsified asphalt binder types RS-2P, CRS-2P, HF-100SP, HF-150SP and HFMS-2P(ON) only.
6. For emulsified asphalt binder types RS-2P, CRS-2P, HF-100SP and HFMS-2P(ON) only.
7. For emulsified asphalt binder types HF-100S, HF-150S, and HF-250S only.
8. The multiplier will be used when the apparent viscosity of distillation residues falls below the minimum requirement according to OPSS 1103.
9. For emulsified asphalt binder types RS-2, CRS-2 and HFRS-2 only.