ATT- 16/04 ASPHALT RUBBER BLENDING EQUIPMENT INSPECTION, PRODUCTION RATE and PLANT CHECK

Part V, Drum Mix/Asphalt Rubber Plant

1.0 SCOPE

Part A - This method describes the procedure for taking temperatures of the asphalt cement and asphalt rubber binder, recording times at various stages of the blend and reaction process, testing the asphalt rubber binder viscosity in the field using a hand held viscometer and verifying the asphalt rubber crumb content on a batch and daily basis to verify the rubber blending equipment calibration.

Part B - This method describes the procedures for verifying the drum mix asphalt rubber plant calibration while the plant is operating and for determining the test series and daily totalizer asphalt rubber contents.

2.0 EQUIPMENT

2.1 Asphalt Rubber Blending Equipment Inspection

Hand Held Viscometer (Calibrated to the Manufacturer's Specifications and frequencies)
4 litre, round, wide mouth, metal can (clean and dry)
Calibrated Long stem thermometer
Stirring rod
Hot plate
Form: Asphalt Rubber Blending Equipment Inspection, ARCP1

2.2 Asphalt Rubber Drum Plant Inspection

calculator
tachometer
stop-watch
Form: Asphalt Rubber Drum Plant Inspection, ARCP2

3.0 PROCEDURE (Part A - Asphalt Rubber Blending Equipment Inspection)

3.1 Temperatures

1. Record the following temperatures from the calibrated tank thermometer, for each batch of asphalt rubber binder:

   The temperature readings of the Asphalt Cement prior to Rubber Crumb addition in Line"A", temperature readings of the Asphalt Rubber Binder at start time in reaction tank in Line"B" and temperature readings of the Asphalt Rubber Binder at end time in reaction tank in Line"C" of the form as shown in Figure 1.

3.2 Asphalt Rubber Reaction Times

1. Record the following times of the asphalt-rubber reaction process for each batch of asphalt rubber binder.

ASPHALT RUBBER BLENDING EQUIPMENT INSPECTION

SHEET____of_____

CONTRACT NO.	PROJECT NO.	CONTRACTOR	PRIME CONSULTANT	AC GRADE	DESIGN VISCOSITY RANGE(cP)
9999/99	Hw 99:12	Good Road Builder	Good Consultant	150-200A	1500-5000

LOT NO.	DATE	QC CONSULTANT	TECHNOLOGIST(S)	TYPE OF VISOMETER	RUBBER CRUMB SOURCE & GRADE
1	Sept.2	Good Consultant	B. Good	Haake Model 5000CP	Alberta Environment Products Edmonton

BATCH NO.			1	2	3	4	5	6	7
ASPHALT CEMENT AND ASPHALT-RUBBER TEMPERATURES									
A. TEMPERATURE OF ASPHALT CEMENT PRIOR TO RUBBER CRUMB ADDITION		°C	178	185	190	200	202		
B. TEMPERATURE OF ASPHALT RUBBER IN REACTION TANK AT START		°C	176	180	185	194	198		
C. TEMPERATURE OF ASPHALT RUBBER IN REACTION TANK AT END		°C	174	178	182	190	195		
ASPHALT RUBBER BLEND REACTION TIMES									
D. ASPHALT RUBBER BLEND REACTION START TIME		Hr-min	8:30	9:30	10:30	11:30	1:02		
E. ASPHALT RUBBER BLEND REACTION END TIME		Hr-min	9:22	10:32	11:45	12:56	2:12		
F. ASPHALT RUBBER BLEND TOTAL REACTION TIME	(D - E)	Hr-min	0:52	1:02	1:15	1:26	1:10		
ASPHALT RUBBER VISCOSITY TESTING									
G. TIME OF VISCOSIY TEST		Hr-min	9:22	10:32	11:45	12:56	2:12		
H. TEMPERATURE AT TIME OF VISCOSIY TEST		°C	175	175	176	174	176		
VISCOSITY TESTS	I. FIRST READING	cP	2200	2330	3000	3400	2500		
	J. SECOND READING	cP	2210	2310	3100	3350	2610		
	K. THIRD READING	cP	2230	2300	3120	3360	2630		
	L. AVERAGE READING	((I+J+K)/3) cP	2213	2313	3073	3370	2580		

TOTALIZER RUBBER CRUMB CONTENT

M. WT. OF ASPHALT CEMENT DELIVIERED FROM CALIBRATION

REVOLUTION OF PUMP _____ kg/rev. UNIT VOLUME _____ kg/l MASS FOW COUNT 1.023 kg/cnt

REVOLUTION, FLOW METER OR MASS FLOW COUNT	N. FINAL READING		29450	55012	80256	105420	130952		
	O. INITIAL READING		4379	29450	55012	80256	105420		
	P. COUNT O-N		25071	25562	25244	25164	25532		
Q. WT OF ASPHALT CEMENT PUMPED INTO MIXING VESSEL PM / 1000		t	25.65	26.15	25.82	25.74	26.12		
R. WT. OF CRUMB RUBBER FROM CALIBRATED HOPPER SCALE READING		t	6.02	6.12	6.01	6.03	6.08		
S. DESIGN OR TARGET RUBBER CRUMB CONTENT		%	19	19	19	19	19		
T. ACTUAL RUBBER CRUMB CONTENT	((100 R) /(Q + R))	%	19.01	18.97	18.88	18.98	18.88		

DAILY RUBBER CRUMB CONTENT

U. DAILY TOTAL WEIGHT OF RUBBER CRUMB(SUM of R)		t	30.26
V. DAILY TOTAL WEIGHT OF ASPHALT CEMENT (SUM of Q)		t	129.48
W. DAILY RUBBER CRUMB CONTENT	100 U / (U + V)	%	18.94

REMARKS:

FIGURE 1

The time at the start of the Asphalt Rubber reaction Line ”D”, the time at the end of the Asphalt Rubber reaction Line ”E” as shown in Figure 1.

2. Determine the Asphalt Rubber Blend Total Reaction Time in Line ”F” using the formula “D - E" of the form as shown in Figure 1.

3.3 Asphalt Rubber Sampling

1. Obtain a 4 litre sample of the reacted asphalt rubber binder as outlined in **ATT - 42 SAMPLING , Asphalt**, using the tank mounted sampling valve as outlined in 3.4 Sampling Asphalt Using the Sampling Valve. Bleed off about four litres of asphalt rubber into a separate container to clean out the line before taking a 3/4 full sample for testing.

2. Stir the sample thoroughly and place the calibrated long stem thermometer into the centre of the asphalt rubber binder.

3. Allow approximately one minute for the temperature to stabilize, then take a reading.

4. The temperature of the asphalt rubber binder shall be 175 °C +/- 2 °C during the viscosity testing.

5. Allow the sample to cool if required.

6. If the sample requires heating before testing, the open asphalt rubber binder sample container should be set on or over the hot plate as appropriate and the sample brought up to the required temperature while being stirred to prevent scorching or burning.

7. Repeat steps 2 and 3 prior to performing the viscosity testing to verify the temperature requirements.

4.0 Equipment Preparation and Viscosity Testing

1. Record the type of viscometer in heading area of the form.

2. Insert the appropriate viscometer spindle in the viscometer. The spindle size should be appropriate for taking measurements within the design viscosity range.

3. The viscosity spindle shall be inserted in the level hot binder sample near the edge of the can for about one minute to acclimatize, without plugging the vent holes.

4. The probe should then be moved to the center of sample to make the viscosity measurements.

5. Ensure the viscometer is level and at the proper immersion depth. The hand held viscometers should have a level bubble for proper orientation (probe shaft perpendicular to binder surface and viscometer level) and an immersion depth mark on the shaft.

6. Once level, begin probe rotation. The peak viscosity value is read from the scale with the corresponding spindle number.

7. Record the time the viscosity tests are taken in Line “G”, as shown in Figure 1.

8. Record the temperature of the asphalt rubber binder at the time of the viscosity test in Line “H”, as shown in Figure 1.

9. Take three measurements and record each peak viscosity value measured on Lines ”I”, “J” and “K” of the form, as shown in Figure 1.

10. Between measurements , the viscometer probe should be moved away from the center, without removing it from the sample and the sample thoroughly stirred again.

11. Determine the average viscometer reading of the Asphalt Rubber Blend, and record on Lines”L” of the form as shown in Figure 1.

5.0 Totalizer Rubber Crumb Content

1. Obtain from the rubber blending equipment calibration data the weight of asphalt delivered per revolution of pump, the weight of asphalt per unit volume or the weight of asphalt delivered per mass flow and record it where applicable in line "M".

2. Record the initial reading on the flow meter, revolution or mass flow counter and record it in line "O".

3. Record the final reading on the flow meter, revolution or mass flow counter and record it in line "N".

4. Determine the flow meter, revolution or mass flow total count using the formula “O - N" of the form and record on line “P” , as shown in Figure 1.

5. Calculate the weight in tonnes of asphalt pumped into the mixing vessel (line "Q") in Tonnes using the following formula, “((PM)/ 1000)".

6. Obtain from the total weight of rubber crumb added to the batch from the calibrated hopper scale reading and record it in line of "R".

7. Record the Design or Target Rubber Crumb Content by total weight of rubber asphalt binder in Line "S".

8. Calculate the Actual Rubber Crumb Content by total weight of asphalt rubber binder (line "T") using the formula”((100R)/(Q+R))”.

9. The Design or Target Rubber Crumb Content and Actual Rubber Crumb Content should be within ±1%.

6.0 Daily Rubber Crumb Content

1. Determine the Daily Total Weight of Rubber Crumb used in the production day using the following formula, “(SUM of R) and record in Line "U".

2. Determine the Daily Total W eight of Asphalt Cement used in the production day using the following formula, “(SUM of Q) and record in Line "V".

3. Calculate the Daily Rubber Crumb Content (line "W") using the formula”((100U)/(U+V))”.

7.0 PROCEDURE (Part B, Asphalt Rubber Drum Plant Inspection)

The methods and procedures in **ATT-17, PLANT CALIBRATION** and **ATT-16, PRODUCTION RATE AND PLANT CHECK** for Drum Mix Asphalt Plants is followed except the calibration of the asphalt system is done with asphalt rubber binder instead of virgin asphalt cement. The drum plant system checks are done with a weight of asphalt rubber binder delivered into the plant as established during the calibration.

An example Asphalt Rubber Drum Plant Inspection form ARCP2 is shown in figure 2.

8.0 HINTS AND PRECAUTIONS

1. Observe and follow the safety precautions outlined in ATT - 42, when sampling and handling asphalt and asphalt rubber binder.

2. Calibrate the thermometers as directed by the equipment manufacturer.

ASPHALT RUBBER DRUM PLANT INSPECTION

SHEET____of_____

CONTRACT NO.	PROJECT NO.	CONTRACTOR	PRIME CONSULTANT
9999/99	Hw 99:12	Good Road Builder	Good Consultant

LOT NO.	DATE	QC CONSULTANT	TECHNOLOGIST(S)	PLANT TYPE
1	Sept.2	Good Consultant	B. Good	Boeing 400

A WT. OF ASPHALT-RUBBER DELIVIERED FROM CALIBRATION

REVOLUTION OF PUMP 2.27 kg/rev. UNIT VOLUME _____ kg/l MASS FOW COUNT _____ kg/cnt

TIME	7:30	9:55	13:15	16:05			
TEST NO.	1	2	3	4	5		

PLANT SETTINGS

B RELATIVE DENSITY DIAL SETTING			9.44	9.44	9.44	9.44			
C TEMPERATURES	ASPHALT RUBBER BINDER	°C	198	205	202	195			
	PLANT MIX	°C	164	160	155	148			
D TOTALIZER SPAN SETTING			544	544	544	544			
E TOTALIZER ZERO SETTING			505	505	505	505			
F REVOLUTION OR FLOW COUNTER CALIBRATION FACTOR			0.2187	0.2187	0.2187	0.2187			

AGGREGATE TOTALIZER SYSTEM

G ELAPSED TIME		s	178	180	182	180		DAILY AVERAGE	DAILY TOTALIZER
AGGREGATE TOTALIZER	**H** FINAL READING	t	37589	38332	39377	40254			40320
	I INITIAL READING	t	37569	38312	39357	40234			37475
	J COUNT (H-I)	t	20	20	20	20			2845
K AGGREGATE MOISTURE CONTENT DIAL SETTING		%	5.6	5.6	5.6	5.6		5.6	5.6
L DRY AGGREGATE TOTALIZER COUNT 100J/(100 + K)		t	18.94	18.94	18.94	18.94			2694.13
DRY AGGREGATE PRODUCTION RATE	**M** METER READING	t/h	382	378	376	380		379	
	N ACTUAL 3600 L/G	t/h	383	379	375	379		379	

ASPHALT RUBBER TOTALIZER SYSTEM

REVOLUTION, FLOW METER OR MASS FLOW COUNT	**O** FINAL READING		11847	30132	56541	78875			110000
	P INITIAL READING		11100	29380	55800	78130			8974
	Q COUNT O-P		747	752	741	745			101026
SPEED OF ASPHALT RUBBER PUMP	**R** METER READING	r/m	252	251	245	248		248	
	S ACTUAL 60Q/G	r/m	251.8	250.7	244.3	248.3		248	
T WT OF ASPHALT RUBBER PUMPED QA\1000		t	1.69569	1.70704	1.68207	1.69115			229.33
ASPHALT RUBBER PRODUCTION RATE	**U** METER READING	t/h	34	34	33	34		34	
	V ACTUAL 3600T\G	t/h	34.3	34.1	33.3	33.8		34	
ASPHALT RUBBER CONTENT	**W** DIAL SETTING	%	8.5	8.5	8.5	8.5		8.5	
	X ACT. SETTING(FROM GRAPH)	%	8.5	8.5	8.5	8.5		8.5	
	Y ACTUAL 100T\L	%	8.5	8.5	8.4	8.5		8.5	

DAILY TOTALIZER ASPHALT RUBBER CONTENT

AA	TRUCK SCALE TOTAL WEIGHT OF MOIST MIX		t	2940
BB	MIX MOISTURE CONTENT		%	0.4
CC	WEIGHT OF DRY MIX	100AA / (100 + BB)	t	2928.29
DD	WEIGHT OF DRY AGGREGATE	CC - T	t	2698.96
EE	BELT SCALE ERROR	100(DD - L) / DD	%	0.2
FF	DAILY TOTALIZER ASPHALT RUBBER CONTENT	100 T / DD	%	8.50

AGGREGATE BIN PROPORTIONING SYSTEM

BIN MOTOR SPEED	**GG** BIN NUMBER 1	r/m	1410	1400	1390	1420		MATERIAL TYPE	BIN NO.
	HH BIN NUMBER 2	r/m	690	680	720	730		Coarse	1
	II BIN NUMBER 3	r/m	510	560	530	540		N. F.	2
	JJ BIN NUMBER 4	r/m	400	390	430	400		M. F.	3
DRY AGGREGATE PRODUCTION RATE (FROM CALIBRATION GRAPH)	**KK** BIN NUMBER 1	t/h	210	209	207	212		B.S.	4
	LL BIN NUMBER 2	t/h	84	82	86	87		Other_____	NA
	MM BIN NUMBER 3	t/h	56	56	52	53			
	NN BIN NUMBER 4	t/h	30	29	33	30			
OO TOTAL BIN DRY AGG. PROD. RATE KK+LL+MM+NN		t/h	380	376	378	382		DAILY AVERAGE	DESIGN OR TARGET
PERCENT SPLIT	**PP** BIN NUMBER 1 100KK/OO		55.3	55.3	54.8	55.5		55.3	56
	QQ BIN NUMBER 2 100LL/OO		22.1	21.8	22.8	22.8		22.4	22
	RR BIN NUMBER 3 100MM/OO		14.7	14.9	13.7	13.9		14.3	14
	SS BIN NUMBER 4 100NN/OO		7.9	7.7	8.7	7.8		8	8

REMARKS:

FIGURE 2