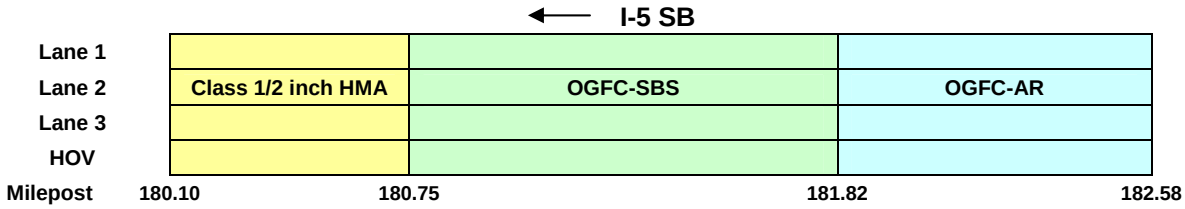
PROJECT LIMITS

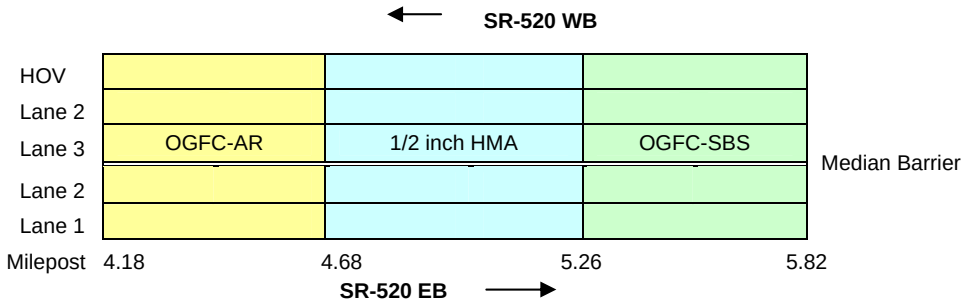
Contract 7134: I-5 / 52nd Avenue West to SR-526 – Southbound

The quieter pavement tests sections are located on southbound Interstate 5 between NE 44th (milepost 180.10) and Interstate 405 (milepost 182.58). The project included two OGFC test sections and a control section. When driving north to south the first test section is the OGFC-AR starting at the Interstate 405 undercrossing (milepost 182.58) and ends just after the off ramp to SR 524 / 196th St. SW (milepost 181.82). The OGFC-SBS section starts where the OGFC-AR section ends and continues to the pavement seat of the NE 44th overcrossing (milepost 180.75). The test sections encompassed all four lanes. The remainder of the project (Milepost 180.10 to 188.75) received a 0.15 foot mill and fill with Class ½ inch HMA.



Contract 7353: SR-520 / Eastside Quieter Pavement Evaluation Project

The paving limits extend from just east of the Evergreen Point Road undercrossing (milepost 4.18) to just west of the Bellevue Way / 104 Ave NE interchange (milepost 5.82). From west to east the first section was OGFC-AR beginning just past the Evergreen Point Way undercrossing (milepost 4.18) and extending to about 0.1 mile east of the 84th Ave NE undercrossing (milepost 4.68). A control section consisting of Class ½ inch HMA PG64-22 begins where the OGFC-AR left off and extends to about 0.1 mile east of the 92nd Ave NE undercrossing (milepost 5.26). The OGFC-SBS test section makes up the rest of the project ending just before the Bellevue Way / 104 Ave NE interchange (milepost 5.82). Each section encompassed all lanes in both directions.



WEATHER AND TEMPERATURE

Contract 7134: I-5 / 52nd Avenue West to SR-526 – Southbound

The paving of the OGFC test sections was completed at night during two consecutive weekend closures. The first closure occurred on the weekend of August 19-20, 2006, and the second occurred on the weekend of August 25-26, 2006. The IDR's recorded the weather on both weekends to be clear and warm. Temperature readings in Seattle (Sand Point) ranged from the mid 50's to the mid 80's during the weekend closures (see below). One additional paving day (September 23) was needed to replace a section of the OGFC-SBS that had a rough ride and was showing excessive raveling immediately after construction. Temperatures on September 23rd were cooler ranging from the high 40's to low 70's. There was no precipitation on any of the paving days.

Weather recorded at Seattle (Sand Point) weather station.		
Date	**Temperature Low - High**	**Precipitation**
August 19	55-80	none
August 20	54-84	none
August 25	53-79	none
August 26	55-83	none
September 23	49-71	none

Mix temperatures recorded in IDR's ranged between 260°F and 317°F. Temperatures were not taken every day and the locations of the readings were not recorded. Thermal images were taken on August 19th, 20th and 25th. Thermal images revealed that mix was delivered between 303°F and 333°F with an average delivery temperature of 314°F. Lay down temperatures ranged between 261°F and 324°F with an average of 298°F. No temperature readings were taken on September 23rd.

Contract 7353: SR-520 / Eastside Quieter Pavement Evaluation Project

Paving on SR 520 took place during a full closure on the weekend of July 14-15, 2007. Paving of the OGFC-AR began at 7:00 a.m. Saturday morning and was completed by 2:00 p.m. that afternoon. The control section of HMA was paved during the afternoon and evening on Saturday. The OGFC-SBS paving began at 12:30 a.m. on Sunday morning and was completed by 7:00 a.m. Weather recorded in the IDR's was inconsistent. Temperatures ranged between the upper 50's and mid 80's at the Sand Point weather station (see below). There was no precipitation recorded during the weekend.

Weather recorded at Seattle (Sand Point) weather station.		
Date	**Temperatures**	**Precipitation**
July 14	57-85	none
July 15	65-80	none

Lay down temperatures for the OGFC-AR ranged from 245°F to 297°F with an average temperature of 271°F. Lay down temperatures of the OGFC-SBS were between 247°F and 300°F with an average of 282°F. Delivery temperatures were not recorded.

TACK COAT

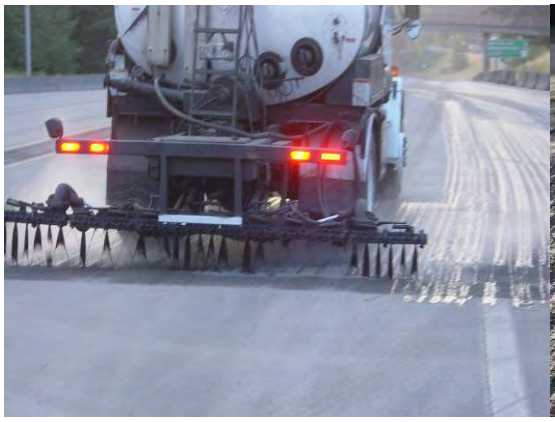
Contract 7134: I-5 / 52nd Avenue West to SR-526 – Southbound

Tack coverage was sporadic at startup but became more consistent coverage after approximately 500 feet of application. Tracking caused by the MTD and delivery truck tires occurred in the wheelpaths. This amount of tracking was minimal in areas of good coverage but was somewhat substantial in areas that received light coverage (startup locations).

Image of typical tack application with some pickup visible

Image of inconsistent tack coverage with small CRS-2P globules. (Photo taken when constructing the test section.)

Contract 7353: SR-520 / Eastside Quieter Pavement Evaluation Project
The tack application was sporadic with streaking in the eastbound lanes of the OGFC-AR but the application was fairly uniform on the westbound lanes. The tack applied on the OGFC-SBS was also erratic with streaking. Some tracking of the tack coat by the Shuttle Buggy and delivery trucks was observed in the wheelpaths but it was not as substantial as that which occurred on the OGFC project on I-5 near Lynnwood.



GRADATION AND ASHPALT CONTENT

Contract 7134: I-5 / 52nd Avenue West to SR-526 – Southbound
Gradation testing was within specification. Asphalt content testing was not required. The report states that it is not possible to test asphalt content in a asphalt rubber or SBS mix. The Contractor's production records were used to estimate the asphalt content in the tables below.

Gradation, percent asphalt and percent rubber results for OGFC-AR.

Sieve	Target	Date					Specification
		8/17	8/19	8/19	8/20	8/20	
3/8	100	99	100	100	100	100	**100**
#4	34	36	33	33	32	36	**30-38**
#8	8	8	8	7	7	8	**4-8**
#200	1.5	1.6	1.6	1.6	1.5	1.8	**0-2.5**
%AC	9.2	9.01	9.64		9.20		**9.2**
%CRM	22.0	22.0	22.0		22.0		**22.0**

Gradation and percent asphalt results for OGFC-SBS.						
Sieve	Target	Date				Specification
		8/17	8/25	8/26	9/22	
3/8	100	99	100	100	100	**100**
#4	37	35	37	40	41	**35-55**
#8	10	8	11	11	12	**9-14**
#200	2.1	0.8	2.3	2.5	2.0	**0-2.5**
%AC	8.3	8.2	-	8.3	-	**8.3**

Contract 7353: SR-520 / Eastside Quieter Pavement Evaluation Project
Gradation tests were within specification. Asphalt content was not tested and we were unable to obtain production records from the contractor.

Gradation and percent asphalt results for OGFC-AR.			
Sieve	Target	Average Test Result	Specification
3/8	100	99	**100**
#4	31	30	**27-35**
#8	8	7	**4-12**
#200	1.6	1.6	**0.1-3.1**

Gradation and percent asphalt results for OGFC-SBS.			
Sieve	Target	Average Test Result	Specification
3/8	100	99	**94.3-100**
#4	36	34	**30.5-41.5**
#8	12	11	**7.5-16.5**
#200	2.3	2.4	**0.3-4.3**

MIX DESIGNS

Contract 7134: I-5 / 52nd Avenue West to SR-526 – Southbound

Mix design for the OGFC-AR.			
Sieve Size	**Gradation**	**Specifications**	**Source/Supplier**
3/8”	100	100	B-335
#4	34	30-45	B-335
#8	8	4-8	B-335
#200	1.5	0–2.5	B-335
Binder Grade	**Percent Asphalt**		**Source/Supplier**
PG64-22	9.2		Tesoro, Anacortes, WA
Anti-Strip	**Percent**		
ARR-MAZ 6500	0.50		Arr-Maz Custom Chemicals, Mulberry, FL
Crumb Rubber	**Percent by Wt. of AC**		**Source/Supplier**
CRM	22		Crumb Rubber Manufacturers, Rancho Domingo, CA

Mix design for the OGFC-SBS.			
Sieve Size	**Gradation**	**Specifications**	**Source/Supplier**
3/8”	100	100	B-335
#4	37	35-55	B-335
#8	10	9-14	B-335
#200	2.1	0–2.5	B-335
Binder Grade	**Percent Asphalt**		**Source/Supplier**
PG70-22	8.3		US Oil, Tacoma, WA
Anti-Strip	**Percent**		**Source/Supplier**
ARR-MAZ 6500	0.25		Arr-Maz Custom Chemicals, Mulberry, FL
Stabilizing Additive	**Percent**		**Source/Supplier**
Processed recycled paper	0.30		Hi-Tech Asphalt Solutions

Contract 7353: SR-520 / Eastside Quieter Pavement Evaluation Project

Washington State Department of Transportation - Materials Laboratory
PO Box 47365 Olympia / 1655 S 2nd Ave. Tumwater / WA 98504
BITUMINOUS MATERIALS SECTION - TEST REPORT

TEST OF: OPEN GRADED FRICTION COARSE AR (OGFC-AR)
DATE SAMPLED: 6/18/2007
DATE RECVD HQS: 6/19/2007
SR NO: 520
SECTION: EASTSIDE QUIETER PAVEMENT EVALUATION PROJECT

WORK ORDER NO: 007353
LAB ID NO 0000333961
TRANSMITTAL NO: 333961
MIX ID NO: G71903
CONTRACTOR: WILDER

CONTRACTOR'S PROPOSAL

Mat'l:	3/8" CHIPS	#4-0	#4 - #8 SAND	COMBINED	SPECIFICATIONS
Source:	B-335	B-335	B-335		
Ratio:	70%	10%	20%		
3/8"	100.0	100.0	100.0	100	100
No. 4	7.0	94.5	80.5	31	30 – 45
No. 8	0.8	65.6	5.2	8	4 – 8
No. 200	0.6	11.5	0.3	1.6	0 – 2.5

VALID FOR 2007

LABORATORY ANALYSIS

		SPECIFICATIONS
L.A. ABRASION % @ 500 REVOLUTIONS*	16	40 MAX
SAND EQUIVALENT (AZ 242)	55	45 MIN.
FRACTURE, % (2 FACES) (AZ 212)	94	85 MIN.
FLAKINESS INDEX, % (AZ 238)	3.8	25 MAX
CARBONATES, % (AZ 238)	14	30 MAX
COMBNED SPECIFIC GRAVITY (AZ 210)	2.653	2.350 – 2.850
COMBINED WATER ABSORPTION, % (AZ 814)	1.28	2.50 MAX
Pba-ASPHALT ABSORPTION	0.49	1.00 MAX
Gsb – OF COARSE AGGREGATE BLEND	2.666	
Gsb – OF FINE AGGREGATE BLEND	2.507	
Gb – SPECIFIC GRAVITY OF BINDER	1.031	
Gmm – MAX S. G. FROM RICE @ 4.0% Pb	2.525	
Gmb – BULK S. G. OF MIX	122.5	

CONTRACT 7353 ONLY

RECOMMENDATIONS

SUPPLIER	PARAMOUNT RB	CRUMB RUBBER MODIFIER TYPE	B
GRADE	PG64-22	RUBBER SOURCE	CRM
% ASPHALT (BY TOTAL MIX)	9.0	CRM SPECIFIC GRAVITY	1.156
% ANTI-STRIP (BY WT. ASPHALT)	0.25	% BY WT. OF ASPHALT CEMENT	23.5
TYPE OF ANTI-STRIP	ARR-MAZ 6500		
MIX ID NUMBER	G71903		
MIXING TEMPERATURE	325°F		
COMPACTION TEMPERATURE	317°F		

Headquarters:
Construction Engineer----------X
Materials File----------X
General File----------X
Bituminous Section---------- X
Region: Northwest
Construction Office- 41 ----------X
Materials Eng------- 41 ----------X
P.E.: D. HAIGHT --X(2)

T152 - 3
T153 -
T166 - 3
T172 -
T175 -
T178 - 1

REMARKS: *L.A. ABRASION ONLY RUN @ 500 REVOLUTIONS
**THIS DESIGN IS ACCEPTABLE ON THE CONDITION THAT 3/8" CHIPS ARE SCALPED TO REMOVE MATERIAL ON 3/8" SIEVE.

THOMAS E. BAKER, P.E.
Materials Engineer
By: Joseph R. DeVol
(360)709-5421
Date: 7 / 11 / 2007

Washington State Department of Transportation - Materials Laboratory
PO Box 47365 Olympia / 1655 S 2nd Ave. Tumwater / WA 98504
BITUMINOUS MATERIALS SECTION - TEST REPORT

TEST OF: OPEN GRADED FRICTION COARSE (OGFC)
DATE SAMPLED: 6/18/2007
DATE RECVD HQS: 6/21/2007
SR NO: 520
SECTION: EASTSIDE QUIETER PAVEMENT EVALUATION PROJECT

WORK ORDER NO: 007353
LAB ID NO 0000333958
TRANSMITTAL NO: 333958
MIX ID NO: G71900
CONTRACTOR: WILDER

CONTRACTOR'S PROPOSAL

Mat'l:	3/8" CHIPS	#4-0	#4 - #8 SAND	COMBINED	SPECIFICATIONS
Source:	B-335	B-335	B-335		
Ratio:	63%	16%	21%		
3/8"	100.0	100.0	100.0	100	100
No. 4	7.0	94.5	80.5	36	35 – 55
No. 8	0.8	65.6	5.2	12	9 – 14
No. 200	0.6	11.5	0.3	2.3	0 – 2.5

VALID FOR 2007

LABORATORY ANALYSIS — SPECIFICATIONS

ASPH% BY TOTAL WT OF MIX:	7.8	8.3	8.8	
% VOIDS @ Ndes: 50	23.2	20.8	19.5	15.0 Min.
% VMA @ Ndes: 50	35.1	34.4	34.1	24.0 Min.
% Gmm @ Ndes: 50	76.9	79.2	80.6	82.0 Max.
Draindown @ 339°F	0.0	0.0	0.1	0.3 Max.
Stabilizing Additive	0.3	0.3	0.3	0.2 – 0.5
Gmm – MAX S. G. FROM RICE	2.432	2.402	2.384	
Gmb – BULK S. G. OF MIX	1.870	1.902	1.921	
Gsb – OF AGGREGATE BLEND	2.658	2.658	2.658	
Gsb – OF FINE AGGREGATE	2.615	2.615	2.615	
Gb – SPECIFIC GRAVITY OF BINDER	1.022	1.022	1.022	

CONTRACT 73353 ONLY

LOTTMAN STRIPPING EVALUATION

% ANTI-STRIP	0.0%	1/4 %	1/2 %	3/4 %	1.0%
Visual Appearance:	MODERATE	NONE	NONE	NONE	NONE
% Retained Strength:	58	88	98	73	83

RECOMMENDATIONS

SUPPLIER	U.S. OIL
GRADE	PG70-22
% ASPHALT (BY TOTAL MIX)	8.8
% ANTI-STRIP (BY WT. ASPHALT)	0.25
TYPE OF ANTI-STRIP	ARR-MAZ 6500
MIX ID NUMBER	G71900
MIXING TEMPERATURE	346°F
COMPACTION TEMPERATURE	317°F

AGGREGATE TEST DATA

TEST	VALUE	SPECIFICATIONS
FRACTURE	100	85 Min. (2 FACES)
SAND EQUIVALENT	68	45 Min.

Headquarters:
Construction Engineer----------X
Materials File----------X
General File----------X
Bituminous Section---------- X
Region: Northwest
Construction Office- 41 ----------X
Materials Eng------- 41 ----------X
P.E.: D. HAIGHT --X(2)

T152 - 3
T153 -
T166 - 3
T172 -
T175 -
T178 - 1

REMARKS:

THOMAS E. BAKER, P.E.
Materials Engineer
By: Joseph R. DeVol
(360)709-5421
Date: 7 / 13 / 2007