APPENDIX B: AGGREGATE GRADATIONS, BINDER CONTENTS, AND MAXIMUM SPECIFIC GRAVITIES PROVIDED BY LOOSE MIXTURES ACQUIRED DURING CONSTRUCTION AND FROM PAVEMENT CORES TAKEN AFTER PAVEMENT FAILURE

Laboratory Abbreviations:

SPC = Superior Paving Corporation; eight tests per lane during construction, 1993

EFLHD = Eastern Federal Lands Highway Division; one test per lane during construction, 1993

BML = Bituminous Mixtures Laboratory (FHWA); two tests on lanes 3, 6, and 8 during construction, and one test on lanes 7, 9, and 12 during construction, 1993. Four tests were performed after each site was tested by the ALF (two cores were each split to obtain four samples).

FHWA = Combined tests performed by EFLHD and BML during construction, 1993.

AAT = Advanced Asphalt Technologies, Sterling VA; four tests were performed after each site was tested by the ALF (two cores were each split to obtain four samples).

Notes for appendix B tables:

Lanes 1, 3, 9, and 11 contain AC-5, PG 58-34.
Lane 5 contains AC-10, PG 58-28.
Lanes 2, 4, 6, 10, and 12 contain AC-20, PG 64-22.
Lane 7 contains Styrelf, PG 82-22.
Lane 8 contains Novophalt, PG 76-22.

Lanes 1 through 10 contain the surface mixtures.
Lanes 11 and 12 contain the base mixtures.

Table 103. Aggregate gradations.

Lane 1, AC-5, PG 58-34

Sieve Size (mm)	Construction			Site 1 AAT Mar96	Site 3 BML Jun98	Site 4 BML Jun98	Site 3[2] BML Jul98	Site 4[2] BML Jul98
	SPC	EFLHD	Avg[1]					
25.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
19.0	98.7	100.0	98.7	98.0	99.3	98.6	100.0	99.4
12.5	76.4	79.0	76.0	73.6	80.1	75.1	79.8	80.4
9.5	62.6	63.0	62.0	59.3	67.1	61.6	65.7	67.4
4.75	44.3	42.0	44.0	41.4	48.1	43.9	48.7	48.8
2.36	**32.8**	**31.0**	**32.5**	**29.7**	**35.5**	**32.8**	**36.0**	**36.1**
1.18	--	23.0	23.5	22.8	26.5	24.7	27.1	27.2
0.600	17.2	17.0	17.5	17.2	19.4	18.1	20.0	20.3
0.300	11.4	11.0	11.5	11.9	13.6	12.5	13.7	14.2
0.150	--	7.0	8.0	8.4	9.7	8.8	9.7	10.1
0.075	**4.9**	**4.6**	**5.1**	**5.9**	**6.9**	**6.2**	**7.0**	**7.2**

Lane 2, AC-20, PG 64-22

Sieve Size (mm)	Construction			Site 1 AAT Mar96	Site 3 BML Jun98	Site 4 BML Jun98	Site 3[2] BML Jul98	Site 4[2] BML Jul98
	SPC	EFLHD	Avg[1]					
25.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
19.0	98.8	99.0	98.7	98.9	98.1	99.7	100.0	99.2
12.5	74.9	80.0	76.0	74.5	77.4	76.9	80.2	79.8
9.5	61.3	61.0	62.0	58.8	61.7	61.4	66.5	65.4
4.75	43.7	41.0	44.0	40.3	41.7	40.7	46.4	44.6
2.36	**33.2**	**30.0**	**32.5**	**29.7**	**30.7**	**29.6**	**34.0**	**31.8**
1.18	--	22.0	23.5	22.9	23.4	22.8	25.6	24.1
0.600	17.3	16.0	17.5	17.4	17.4	17.0	19.1	18.1
0.300	11.9	11.0	11.5	11.8	12.2	11.9	13.2	12.7
0.150	--	7.0	8.0	8.3	8.6	8.3	9.4	9.1
0.075	**5.4**	**4.5**	**5.1**	**5.7**	**6.1**	**5.8**	**6.8**	**6.4**

[1]Overall average for the 10 pavements with the surface mixtures.
[2]These cores were taken from wheelpath after completion of the ALF test.

Table 103. Aggregate gradations (continued).

Lane 3, AC-5, PG 58-34

Sieve Size (mm)	Construction				Site 1 AAT Nov96	Site 2[2] BML Aug97	Site 2[3] BML Aug97	Site 3 BML Oct97	Site 3 BML Repeat	Site 4
	SPC	EFLHD	BML	Avg[1]						
25.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	Not Tested by the ALF
19.0	98.1	99.0	97.0	98.7	99.1	100.0	98.6	98.9	99.4	
12.5	76.7	71.0	78.1	76.0	81.2	79.6	78.4	79.6	81.6	
9.5	62.5	56.0	60.5	62.0	63.9	63.7	64.6	64.3	64.7	
4.75	43.9	37.0	41.6	44.0	42.1	42.5	46.5	40.2	41.0	
2.36	**32.3**	**24.0**	**30.0**	**32.5**	**31.6**	**31.8**	**33.6**	**28.8**	**29.6**	
1.18	--	18.0	22.8	23.5	24.5	24.5	25.1	21.8	22.4	
0.600	17.1	13.0	16.6	17.5	18.6	18.4	18.2	16.4	16.8	
0.300	11.3	9.0	11.1	11.5	12.7	12.8	12.3	11.6	11.8	
0.150	--	6.0	7.6	8.0	8.6	8.9	8.4	8.2	8.4	
0.075	**4.8**	**3.9**	**5.1**	**5.1**	**5.5**	**6.1**	**5.8**	**5.9**	**5.8**	

[1]Overall average for the 10 pavements with the surface mixtures.
[2]Top Lift.
[3]Bottom Lift.

Table 103. Aggregate gradations (continued).

Lane 4, AC-20, PG 64-22

Sieve Size (mm)	Construction			Site 1 AAT Nov96	Site 2 BML Aug97	Site 3	Site 4
	SPC	EFLHD	Avg[1]				
25.0	100.0	100.0	100.0	100.0	100.0	Not Tested by the ALF	Not Tested by the ALF
19.0	98.7	99.0	98.7	98.5	99.2		
12.5	76.2	78.0	76.0	78.5	76.3		
9.5	62.9	62.0	62.0	60.8	60.8		
4.75	44.3	43.0	44.0	41.2	42.2		
2.36	**32.9**	**29.0**	**32.5**	**32.0**	**33.0**		
1.18	--	22.0	23.5	25.0	25.6		
0.600	17.4	16.0	17.5	19.1	19.4		
0.300	11.6	10.0	11.5	13.2	13.6		
0.150	--	7.0	8.0	9.3	9.9		
0.075	**5.0**	**4.4**	**5.1**	**6.4**	**7.0**		

Lane 5, AC-10, PG 58-28

Sieve Size (mm)	Construction			Site 2 AAT Aug95	Site 1 BML Aug97	Site 4 BML Oct97	Site 3
	SPC	EFLHD	Avg[1]				
25.0	100.0	100.0	100.0	100.0	100.0	100.0	Not Tested by the ALF
19.0	98.4	98.0	98.7	99.6	99.6	100.0	
12.5	76.0	72.0	76.0	79.0	79.6	81.7	
9.5	62.0	58.0	62.0	61.0	62.0	66.0	
4.75	43.5	41.0	44.0	36.4	38.0	42.6	
2.36	**32.3**	**30.0**	**32.5**	**26.3**	**27.6**	**30.8**	
1.18	--	23.0	23.5	20.1	20.9	22.8	
0.600	17.4	17.0	17.5	15.3	15.5	17.2	
0.300	11.5	11.0	11.5	10.5	10.9	11.0	
0.150	--	8.0	8.0	7.3	7.8	7.8	
0.075	**5.0**	**5.2**	**5.1**	**4.9**	**5.6**	**5.6**	

[1]Overall average for the 10 pavements with the surface mixtures.

Table 103. Aggregate gradations (continued).

Lane 6, AC-20, PG 64-22

Sieve Size (mm)	Construction				Site 1 AAT Jul97	Site 2 BML Aug97	Site 3	Site 4
	SPC	EFLHD	BML	Avg[1]				
25.0	100.0	100.0	100.0	100.0	100.0	100.0	Not Tested by the ALF	Not Tested by the ALF
19.0	98.8	99.0	97.8	98.7	98.7	100.0		
12.5	76.0	75.0	77.1	76.0	77.6	78.0		
9.5	62.4	58.0	60.6	62.0	61.7	61.0		
4.75	44.9	41.0	41.4	44.0	41.6	40.3		
2.36	**34.4**	**30.0**	**29.8**	**32.5**	**30.3**	**30.0**		
1.18	--	23.0	22.3	23.5	23.2	23.0		
0.600	17.3	17.0	16.3	17.5	17.4	17.4		
0.300	11.9	11.0	11.2	11.5	11.9	12.2		
0.150	--	8.0	8.0	8.0	8.3	8.8		
0.075	**5.0**	**5.2**	**5.6**	**5.1**	**5.6**	**6.3**		

Lane 7, Styrelf, PG 82-22

Sieve Size (mm)	Construction				Site 2 AAT Aug95	Site 1 AAT Mar96	Site 3 BML Jan98	Site 3 BML Repeat	Site 4
	SPC	EFLHD	BML	Avg[1]					
25.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	Not Tested by the ALF
19.0	99.5	100.0	98.6	98.7	97.5	98.4	98.6	99.2	
12.5	76.2	80.0	77.5	76.0	75.4	78.1	78.4	80.0	
9.5	22.5	62.0	63.4	62.0	60.4	61.8	62.0	66.0	
4.75	44.4	46.0	46.0	44.0	42.4	43.9	43.4	46.8	
2.36	**32.7**	**35.0**	**33.4**	**32.5**	**31.4**	**33.4**	**32.8**	**34.7**	
1.18	--	26.0	24.5	23.5	23.7	25.3	24.6	25.6	
0.600	17.9	19.0	17.7	17.5	17.2	18.7	18.0	18.2	
0.300	11.8	12.0	11.9	11.5	10.7	12.0	12.0	11.6	
0.150	--	8.0	8.3	8.0	6.6	7.7	8.0	7.4	
0.075	**5.1**	**4.7**	**6.0**	**5.1**	**3.7**	**4.7**	**5.2**	**4.6**	

[1]Overall average for the 10 pavements with the surface mixtures.

Table 103. Aggregate gradations (continued).

Lane 8, Novophalt, PG 76-22

Sieve Size (mm)	Construction				Site 2 AAT Aug95	Site 1 AAT Mar96	Site 3 BML Jan98	Site 3 BML Repeat	Site 4
	SPC	EFLHD	BML	Avg[1]					
25.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	Not Tested by the ALF
19.0	98.7	99.0	99.0	98.7	98.4	99.5	99.2	99.7	
12.5	76.0	76.0	78.3	76.0	77.1	75.5	79.2	81.3	
9.5	61.7	53.0	58.9	62.0	60.0	59.1	61.1	65.0	
4.75	43.9	31.0	38.9	44.0	40.3	40.4	36.6	39.2	
2.36	**32.8**	**21.0**	**28.0**	**32.5**	**30.7**	**31.1**	**26.1**	**27.4**	
1.18	--	17.0	21.2	23.5	24.0	24.3	20.2	20.6	
0.600	17.5	12.0	15.4	17.5	18.5	18.5	15.2	15.5	
0.300	11.7	8.0	10.2	11.5	12.9	12.7	10.4	10.6	
0.150	--	6.0	6.9	8.0	8.9	8.8	6.8	6.8	
0.075	**5.0**	**3.5**	**4.5**	**5.1**	**5.5**	**5.4**	**4.2**	**3.9**	

[1]Overall average for the 10 pavements with the surface mixtures.

Table 103. Aggregate gradations (continued).

Lane 9, AC-5, PG 58-34

Sieve Size (mm)	Construction				Site 2 AAT Aug95	Site 1 AAT Mar96	Site 2[2] BML Jan98	Site 3 BML Feb98	Site 3 BML Repeat	Site 4 BML Sep98	Site 4[2] BML Sep98
	SPC	EFLHD	BML	Avg[1]							
25.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
19.0	98.9	100.0	97.4	98.7	97.8	99.0	99.1	98.9	99.7	100.0	100.0
12.5	75.5	82.0	75.9	76.0	77.4	76.6	79.5	79.6	79.4	78.6	78.6
9.5	62.7	66.0	62.2	62.0	61.3	60.9	65.8	64.7	64.4	63.1	64.0
4.75	44.6	48.0	45.6	44.0	41.2	41.0	46.2	44.8	44.7	44.0	44.6
2.36	**33.9**	**35.0**	**33.6**	**32.5**	**30.2**	**30.8**	**34.6**	**33.0**	**33.3**	**32.4**	**33.2**
1.18	--	26.0	25.2	23.5	23.1	23.7	25.6	24.6	24.8	24.8	25.5
0.600	17.6	19.0	17.8	17.5	17.3	17.7	18.9	17.9	18.2	18.0	18.6
0.300	11.5	12.0	11.6	11.5	11.5	11.9	12.8	11.8	12.2	12.0	12.4
0.150	--	8.0	7.8	8.0	7.8	8.0	8.9	8.0	8.6	8.2	8.7
0.075	**4.9**	**5.1**	**5.4**	**5.1**	**5.1**	**5.3**	**6.2**	**5.5**	**5.9**	**5.7**	**6.0**

[1]Overall average for the 10 pavements with the surface mixtures.
[2]These cores were taken from wheelpath after completion of the ALF test.

Table 103. Aggregate gradations (continued).

Lane 10, AC-20, PG 64-22

Sieve Size (mm)	Construction			Site 2 AAT Aug95	Site 1 AAT Mar96	Site 2[2] BML Feb98	Site 4 BML Aug98	Site 4 BML Aug98	Site 3 BML Sep98	Site 3[2] BML Sep98
	SPC	EFLHD	Avg[1]							
25.0	100.0	99.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
19.0	98.6	99.0	98.7	98.3	99.2	98.9	98.4	99.1	100.0	100.0
12.5	75.8	79.0	76.0	83.4	76.0	78.8	78.3	77.6	77.2	80.7
9.5	62.4	64.0	62.0	67.1	59.9	64.0	61.2	61.3	61.8	61.8
4.75	44.9	47.0	44.0	46.3	40.8	46.0	39.8	41.4	40.4	40.8
2.36	**34.2**	**34.0**	**32.5**	**34.4**	**30.2**	**35.1**	**29.3**	**30.6**	**29.5**	**30.0**
1.18	--	26.0	23.5	26.4	23.1	26.6	22.6	23.6	23.0	22.3
0.600	18.1	18.0	17.5	19.9	17.2	19.8	17.0	17.8	17.1	17.5
0.300	12.1	12.0	11.5	13.4	10.9	13.4	11.8	12.4	11.8	12.2
0.150	--	8.0	8.0	9.3	7.0	9.5	8.3	8.8	8.4	8.8
0.075	**5.0**	**5.0**	**5.1**	**6.2**	**4.1**	**6.6**	**5.9**	**6.3**	**6.0**	**6.3**

[1]Overall average for the 10 pavements with the surface mixtures.
[2]These cores were taken from wheelpath after completion of the ALF test.

Table 103. Aggregate Gradations (continued).

Lane 11, AC-5, PG 58-34

Sieve Size (mm)	Construction			Site 2 AAT Aug95	Site 1 AAT Mar96	Site 3 BML May97	Site 4 BML May97	Site 2[2] BML Feb98	Site 3 BML Aug98	Site 3[2] BML Aug98	Site 4
	SPC	EFLHD	Avg[1]								
37.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	Not Tested by the ALF
25.0	85.7	90.0	85.6	90.1	84.3	90.4	85.0	87.4	85.2	87.4	
19.0	73.0	75.0	73.9	78.8	76.0	80.5	72.4	75.4	72.8	77.3	
12.5	64.3	64.0	65.1	70.3	65.7	69.6	63.6	67.1	62.1	68.2	
9.5	--	--	59.0	64.8	53.3	64.4	59.4	63.2	56.8	63.3	
4.75	47.3	45.0	47.6	50.2	47.7	50.5	47.2	50.4	44.3	49.4	
2.36	**--**	**29.0**	**32.5**	**34.6**	**33.0**	**35.6**	**32.6**	**35.0**	**31.3**	**34.7**	
1.18	--	22.0	24.0	24.9	23.8	25.6	23.3	24.8	22.8	25.0	
0.600	17.2	16.0	17.4	18.3	17.6	19.0	17.3	18.2	16.9	18.4	
0.300	12.4	12.0	12.3	12.4	12.1	13.4	12.0	12.6	12.0	13.0	
0.150	--	9.0	8.0	8.6	8.5	9.6	8.6	9.0	8.5	9.2	
0.075	**5.6**	**6.3**	**5.7**	**5.5**	**5.7**	**6.7**	**5.9**	**6.3**	**5.9**	**6.5**	

[1]Overall average for the two pavements with the base mixtures.
[2]These cores were taken from wheelpath after completion of the ALF test.

Table 103. Aggregate gradations (continued).

Lane 12, AC-20, PG 64-22

Sieve Size (mm)	Construction				Site 1 AAT Aug95	Site 3 BML May97	Site 4 BML May97	Site 3
	SPC	EFLHD	BML	Avg[1]				
37.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	Not
25.0	85.6	88.0	82.4	85.6	80.8	85.6	86.7	Tested
19.0	74.8	76.0	74.4	73.9	67.1	74.0	79.0	by the
12.5	65.9	68.0	67.2	65.1	56.1	66.8	70.2	ALF
9.5	--	--	62.7	59.0	51.9	62.9	66.6	
4.75	47.9	48.0	48.1	47.6	40.1	50.7	53.6	
2.36	**--**	**32.0**	**31.0**	**32.5**	**28.3**	**35.2**	**37.2**	
1.18	--	23.0	22.4	24.0	21.2	25.3	26.6	
0.600	17.3	17.0	18.4	17.4	16.2	18.8	19.6	
0.300	12.2	11.0	11.7	12.3	11.6	13.2	13.9	
0.150	--	8.0	8.4	8.0	8.3	9.4	10.0	
0.075	**5.5**	**5.1**	**5.9**	**5.7**	**5.6**	**6.6**	**7.2**	

[1]Overall average for the two pavements with the base mixtures.

Table 104. Binder contents.

Lane	Construction SPC[1]	Construction FHWA	AAT Aug95	AAT Mar95	AAT Nov96	BML May97	AAT Jul97	BML Aug97	BML Aug97	BML Oct97
1	4.7	4.9 (1)[2]	---	4.6	---	---	---	---	---	---
2	4.8	5.0 (1)	---	4.5	---	---	---	---	---	---
3	4.8	4.8 (3)	---	---	5.2	---	---	5.0[3]	5.6[4]	5.1
4	4.9	4.9 (1)	---	---	4.9	---	---	4.8	---	---
5	4.8	4.9 (1)	4.8	---	---	---	---	4.8	---	5.1
6	4.9	4.8 (3)	---	---	---	---	4.8	4.8	---	---
7	4.9	4.85(2)	4.9	4.6	---	---	---	---	---	---
8	4.7	4.6 (3)	4.9	4.8	---	---	---	---	---	---
9	4.9	5.1 (2)	4.8	4.7	---	---	---	---	---	---
10	4.9	4.9 (1)	5.0	4.8	---	---	---	---	---	---
11	4.0	4.2 (1)	4.1	3.8	---	4.0	---	---	---	---
12	4.1	4.15(2)	3.4	---	---	4.1	---	---	---	---

	BML Jan98	BML Feb98	BML Jun98	BML[5] Jul98	BML[5] Jul98	BML Aug98	BML[5] Aug98	BML Sep98	Core AVG[6]
1	---	---	5.0	5.1	4.9	---	---	---	4.9
2	---	---	4.8	5.0	5.0	---	---	---	4.8
3	---	---	4.9	---	---	---	---	---	5.2
4	---	---	5.0	---	---	---	---	---	4.9
5	---	---	---	---	---	---	---	---	4.9
6	---	---	---	---	---	---	---	---	4.8
7	4.8	---	---	---	---	---	---	---	4.8
8	4.8	---	---	---	---	---	---	---	4.8
9	4.9	5.0	---	---	---	---	---	5.3	4.9
10	---	5.1	---	---	---	4.9	5.1	5.2	5.0
11	---	4.3	---	---	---	3.8	4.2	---	4.0
12	---	---	---	---	---	---	---	---	3.8

[1]Average of 10 replicate tests per lane.
[2]Indicates the number of samples tested per lane: 1, 2, or 3 samples.
[3]Top lift.
[4]Bottom lift. This lift was tested because it appeared to be high in binder content when cored.
[5]These cores were taken from wheelpath after completion of the ALF test.
[6]Average from cores taken after construction.

Table 105. Maximum specific gravities of the mixtures.

Lane Number	FHWA Const	AAT Aug95	AAT Mar95	AAT Nov96	BML May97	AAT Jul97	BML Aug97	BML Oct97	BML Jan98	BML Jun98	BML Aug98	BML Sep98	Core AVG[1]
1	2.686	---	2.679	---	---	---	---	---	---	2.671	---	---	2.679
2	2.686	---	2.677	---	---	---	---	---	---	2.686	---	---	2.683
3	2.678	---	---	2.678	---	---	2.676	2.678	---	2.684	---	---	2.679
4	2.692	---	---	2.680	---	---	2.686	---	---	2.679	---	---	2.684
5	2.691	2.688	---	---	2.688	---	2.696	2.675	---	---	---	---	2.688
6	2.686	---	---	---	2.690	2.666	2.692	---	---	---	---	---	2.684
7	2.684	2.694	2.701	---	2.681	---	---	---	2.682	---	---	---	2.690
8	2.686	2.700	2.695	---	2.682	---	---	---	2.698	---	---	---	2.694
9	2.684	2.680	2.681	---	2.657	---	---	---	2.674	---	---	2.668	2.672
10	2.680	2.688	2.686	---	2.692	---	---	---	---	---	2.687	2.675	2.686
11	2.746	2.724	2.753	---	2.717	---	---	---	---	---	2.756	---	2.738
12	2.755	2.774	---	---	2.728	---	---	---	---	---	---	---	2.752

[1]Average from cores taken after construction. Did not use law of partial fractions.