

PERFORMANCE GRADED ASPHALT
WATERFORD VT. ROUTE 18

INITIAL REPORT 95-4
JULY 1995

REPORTING ON WORK PLAN 94-R-4

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

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Materials and Research Engineer

Date: 15 Jun 95

PERFORMANCE GRADED ASPHALT
WATERFORD VT. ROUTE 18

INTRODUCTION:

The Strategic Highway Research Program (SHRP) has invested 50 million dollars in researching performance based specifications for bituminous concrete mixtures used in flexible pavements. Both the specifications for asphalt binder properties as well as the tests utilized to control asphalt cement quality were developed by SHRP and reflect the suitability of the material for a designated temperature range.

Since there is a nationwide effort to switch to SHRP performance graded (PG) asphalt cements in the near future, the Vermont Agency of Transportation initiated the experimental use of PG asphalt on one or more projects during the 1994 construction season. The Waterford project CM - RS 0225(3) was selected for this experiment.

The asphalt selected was PG 52-40. This classification indicates that the material can perform satisfactorily at high temperatures of 52° C (126° F), and low pavement surface temperatures of -40° C (-40° F). This location was selected due to problems with low temperature thermal cracking on that section of VT Route 18. The PG grade was determined from low and high temperatures recorded in a SUPERPAVE weather data base, taken from the North Danville weather station. The high temperature in the database is derived from the air temperature during the seven hottest consecutive days in an average year. This temperature is then converted to maximum pavement temperature at the 20 mm (0.79 in) depth in degrees C. The low design temperature in the database is the minimum temperature at the pavement surface in degrees C. The SHRP binder is formulated to provide satisfactory performance within these limits.

DESCRIPTION OF THE PROJECT:

The project began at a point on VT Rte. 18, 0.058 km (0.034 mi) north of the New Hampshire state line and extended north along VT Rte. 18 for 4.561 km (2.834 mi) to km 4.615 (mm 2.868).

Project work included drainage improvements, full depth reclaimed base stabilization and resurfacing of travel lanes and shoulders with two courses of bituminous concrete pavement. No stabilizing agent was utilized with the reclaimed base, but optimum compaction was assured through a test section and a moisture-density evaluation. The first pavement course of the experimental section was placed as a medium duty, 44.5 mm (1.75 in) Type II binder course and the second was a 31.8 mm (1.25 in) Type III wearing course, both using PG asphalt in the hot mix.

The project also included two control sections. At the easterly end of the project the first section was 0.846 km (0.526 mi) in length and at the westerly terminus the second section was 1.068 km (0.664 mi) long. The control sections were paved with two courses, equal in thickness to those of the experimental section, i.e. binder was 44.5 mm(1.75 in) thick

and wearing course was 31.8 mm (1.25 in) thick, but with standard hot mix using AC 20 instead of the PG asphalt. Traffic was maintained throughout the construction period. The project work began on 20 Jun 94 and was completed on 16 Aug 94.

VT 18 PRIOR TO CONSTRUCTION:

Within the project limits, VT Route 18 has 3.35 m (11 ft) wide travel lanes and shoulder widths which vary from 0.91 m (3.0 ft) to 1.83 m (6.0 ft). This secondary highway carried an ADT of 2830 vehicles in 1982, just prior to the completion of Interstate Route I 93, which parallels VT Route 18. When I 93 opened, traffic on VT Route 18 decreased significantly, and ADT is now approximately 750 vehicles. The pre-construction pavement exhibited significant distress with transverse thermal cracking and load stress cracking.

EXPERIMENTAL AND CONTROL TEST SECTIONS:

The PG asphalt overlay will be periodically evaluated using three standard performance measures, i.e., rutting, cracking and International Roughness Index (IRI). The location of the test sites as well as pre-construction measurements for the three performance indicators are shown below.

Test Section I.D.	Cracking M/100m(ft/100ft)	Rutting mm(1/16 in)	IRI mm/km(in/mi)	Section
TS km 0.241(0.15 MM)	297 (297)	11 (7)	190 AVE	Control
TS km 0.499(0.31 MM)	424 (424)	5 (3)	190 AVE	Control
TS km 0.643(0.40 MM)	562 (562)	7 (4)	190 AVE	Control
TS km 1.046(0.65 MM)	602 (602)	6 (4)	191 Ave	PG Asph
TS km 1.448(0.90 MM)	497 (497)	6 (4)	191 Ave	PG Asph
TS km 1.786(1.11 MM)	585 (585)	10 (6)	191 Ave	PG Asph
TS km 2.575(1.60 MM)	828 (828)	11 (7)	191 Ave	PG Asph
TS km 2.784(1.73 MM)	897 (897)	11 (7)	191 Ave	PG Asph
TS km 3.300(2.05 MM)	864 (864)	5 (3)	191 Ave	PG Asph
TS km 3.540(2.20 MM)	722 (722)	6 (4)	225 Ave	Control
TS km 3.862(2.40 MM)	903 (903)	6 (4)	225 Ave	Control
TS km 4.184(2.60 MM)	327 (327)	6 (4)	225 Ave	Control
TS km 4.506(2.80 MM)	412 (412)	2 (1)	225 Ave	Control

Cracking and rutting data were taken on 8 Jun 94, shortly before construction began. There was no recent and complete pre-construction IRI information for the specified test and control site locations. The data shown above were taken on 11 Feb 92, and only the northbound lane was surveyed at that time. Similarly, there are no recent falling weight deflectometer (FWD) data available and none have been taken for the test sections shown above. The following FWD data are included only for comparison purposes if and when more relevant information becomes available. These data were taken on 9 Aug 90.

<u>Station</u> <u>km (MM)</u>	<u>Structural No.</u>
1.93 (1.20)	3.60
2.82 (1.75)	3.50
3.62 (2.25)	3.90
4.43 (2.75)	4.15

MIX PRODUCTION AND TESTING:

For optimum performance, PG asphalt should be used in mix designs that are specifically formulated to take advantage of the special properties of the binder. Computer software for design and testing procedures in the will soon be available to accomplish this in the context of a system called "SUPERPAVE". SUPERPAVE is a comprehensive mix design system, including all appropriate binder, mix and supporting software parameters. Neither the software nor the associated testing equipment for SUPERPAVE mix design were available to the VAOT for this project. Although superior performance is anticipated due to the use of PG asphalt, less than optimum results are possible since the performance grade material was not used in the SUPERPAVE context.

Paving of the Type II binder course began on 25 Jul 94 and was completed on 2 Aug 94. Type III wearing course paving began on 3 Aug 94 and was completed on 15 Aug 94. The binder for the Type II and Type III control mixes was AC 20, supplied by Petro Canada of Montreal while the binder for the PG Type II and Type III mixes was certified by the manufacturer, Bitumar of Montreal, Canada, to be Ecoflex PG 58-40, exceeding the specified PG 52-40. Production quantities are shown in the table on the following page.

Manufacturer/Binder	Type II, t (tn)	Type III, t (tn)	Totals, t (tn)
Bitumar/Ecoflex 52-40 (Cert. 58-40 by Manuf.)	2894.66 (3191.36)	1946.36 (2145.86)	4841.02 (5337.22)
Petro-Canada/AC-20	1913.07 (2109.16)	1509.82 (1664.58)	3422.89 (3773.74)
Totals	4807.73 (5300.52)	3456.18 (3810.44)	8263.91 (9110.96)

All of the required mix was produced during eight days within the paving period cited above. Average daily production was 1033 t (1139 tn). Both mixes were produced at Pike Industry's Waterford plant using Waterford crushed stone and sand from the Norris pit, located at St. Johnsbury, Vt.

Each batch was checked with a battery of tests including sieve analysis, percent air voids, AC content, voids in the mineral aggregate and specific gravity of the mix. Fourteen batches of the PG asphalt mix were tested and 5 of these failed in percent air voids (one high and four low). There were 2 failures within the 10 batches made with AC 20 asphalt, both due to low air voids. Necessary corrections were made in all cases. A computerized summary of the test results and copies of the approved mix designs are appended to this report.

COSTS:

The project was paved with 4841 t (5337 tn) of hot mix with PG 52-40 at a cost of \$41.07/t (\$37.25/tn) and 3423 t (3774 tn) of hot mix with AC 20 with a cost of \$35.56/t (\$32.25/tn). The construction costs for the control section included \$6.42/m² (\$5.37/SY) for the 76 mm (3 in) overlay of standard mix with AC 20, \$1.42/m² (\$1.19/SY) for reclaimed stabilized base (mod.) and \$0.05/m² (\$0.04/SY) for the tack coat of emulsified asphalt, for a total of \$7.91/m² (\$6.61/SY). Costs for the experimental section include \$7.43 m² (\$6.21/SY) for the 76 mm (3 in) overlay of hot mix with PG 52-40 asphalt as well as identical costs for the reclaimed stabilized base (mod.) and tack coat, for a total of \$8.90 m² (\$7.44/SY).

POST CONSTRUCTION SURVEY:

Post construction roughness was measured via Mays Meter on 29 Aug 94. The overall (northbound and southbound) roughness averaged 1247 mm/km (79 in/mi) in the sections overlaid with standard asphalt hot mix and 1231 mm/km (78 in/mi) within the PG asphalt hot mix section. The Waterford, Vt Route 18 project was surveyed for post construction cracking and rutting after one winter of service on 9 May 95 and no cracking or rutting was detected at that time.

SUMMARY:

1. No significant problems were noted during mix production or lay down of either the mix with PG asphalt or the standard mix.

2. Although SUPERPAVE software was not employed for optimum mix design, it is anticipated that the use of a PG 52-40 binder on the Waterford CM-RS0225(3) project will result in very good performance. This project has provided good experience with a new product and performance should be monitored closely.

3. One post-construction performance evaluation has been conducted. After one winter there was no evidence of cracking or pavement distress of any kind.

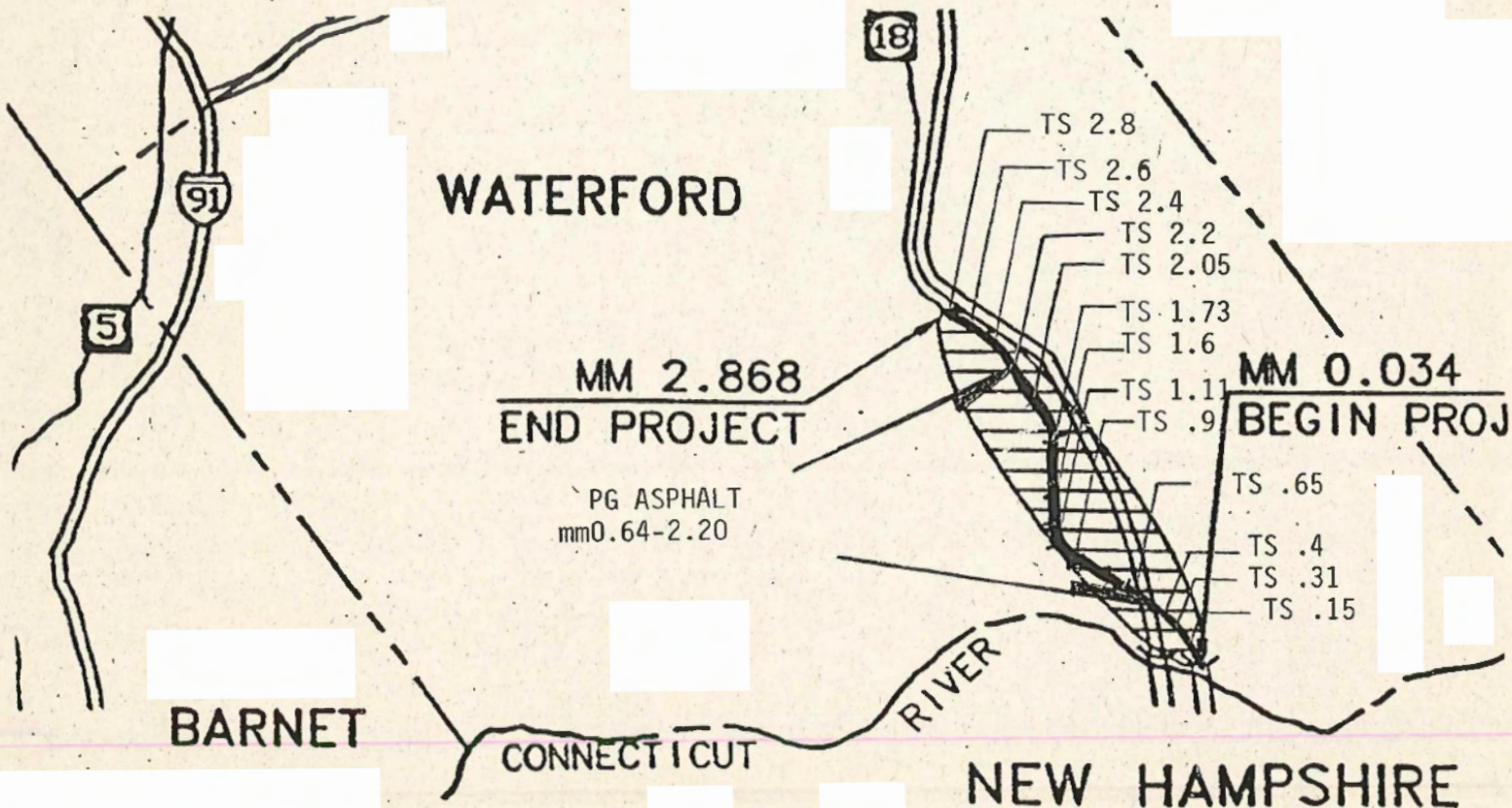
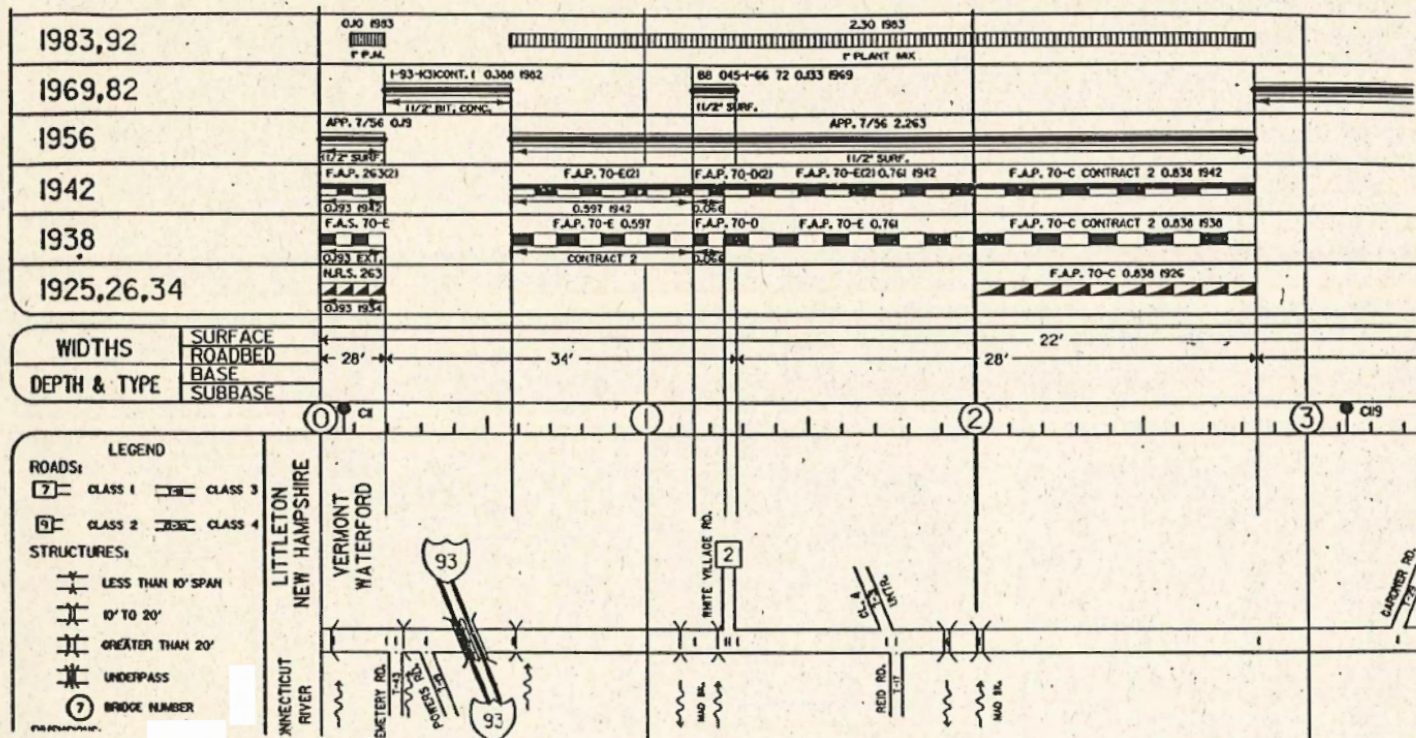
FOLLOW - UP:

Performance monitoring will be maintained on this project on an annual basis with emphasis on the differences between the standard and PG asphalt pavements.



Severe low temperature thermal stress cracking on VT Route 18 in Waterford

WATERFORD CMRS 0225(3)
PG ASPHALT CONST. 1994





Gouvernement du Québec
Ministère des Transports
Direction Laboratoire des chaussées



WATFORD

SHRP Testing

Supplier : Bitumar Inc.
Location : Montréal Québec
Supplier grade : Ecoflex
SHRP grade : PG 58-40
Tested by : Daniel Ferland t.l.
Supervised by : Jean-Claude Moreux Ph.D.



Mass loss % RTFOT residue	-0.292
Flash point °C	
Brookfield vis. cP	531.9
Kinematic vis. 135°C, cSt	589.8
Penetration at 25°C (100/5)	164
Test number	58

D.S.R. Tank						D.S.R. RTFOT					
Test temp. °C	Plate diam. mm	Strain %	G* kPa	Phase angle degrees	G*/sinδ kPa	Test temp. °C	Plate diam. mm	Strain %	G* kPa	Phase angle degrees	G*/sinδ kPa
58	25 mm	11.00	1.11	71.7	1.17	58	25 mm	10.14	2.30	66.2	2.61
58	"	11.99	1.08	71.4	1.14	58	"	10.00	2.44	65.8	2.66
64	"	11.63	0.64	73.0	0.67	64	"	9.73	1.38	66.7	1.46
						64	"	9.80	1.38	66.6	1.40

D.S.R. PAV						BBR PAV			DT PAV		
Test temp. °C	Plate diam. mm	Strain %	G* MPa	Phase angle degrees	G*/sinδ MPa	Test temp. °C	Stiffness MPa	m	Temp. °C	Avg. failure strain %	Avg. failure stress MPa
7	8 mm	0.99	5.17	36.9	3.10	-24	107	.333			
7	"	1.01	6.08	36.6	3.04	-24	108	.325			
						-30	220	.302			
						-30	209	.302			

Service des Produits Industriels

Parc Technologique du Québec Métropolitain, 2700, rue Einstein, Sainte-Foy, (QC) G1P 3W8
Tél.: (418) 643-3178 • Télécopieur (Fax): (418) 646-6692

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - BITUMINOUS CONCRETE SUBDIVISION
Design of Bituminous Concrete Mixtures

6345

Town MASTER

Project No.

Gentlemen:

In accordance with the specification requirements for the above project I submit the following job mix formula:

Pavement Type FF Produced By: Pike Ind's Inc. Plant Location Waterford VTBlows per Side.....50..... Stockpile Gradations — % Passing

Size	% Used	1 1/2	1	%	3/4	%	4	8	16	30	50	200
Norris Dry	6			100	100	99	96	89	79	58	35	7.2
WA ST SC	36			100	100	100	100	73	44	28	17	4.1
3/8" L	28			100	100	99	36	6	1	1	1	.3
1/2" L	5			100	95	43	4	2	1	1	1	.2
3/4" L	25		100	97	89	1	1	0	0	0	0	0
Resultant	100		100	99	82	72	52	34	21	14	9	2.0

Hot Bin Gradation — % Passing

Bin	% Used	1 1/2	1	%	3/4	%	4	8	16	30	50	200
S	38						100	86	55	37	24	7.1
2	30				100	96	44	3				
3	12			100	95	38	3	2				
4	20			98	13	3	2	1				
5												
Resultant	100		100	99	82	72	52	34	21	15	9	2.7

Batch Weights	Bin S	Bin No. 2	Bin No. 3	Bin No. 4	Bin No. 5	AC	Total
	1439	1136	454	759		212	4000

		1 1/2	1	%	3/4	%	4	8	16	30	50	200	AC
Job Mix Formula			100	99	82	72	52	34	21	15	9	2.7	5.3
Job Aim			100	95	76	66	46	30	17	11	5	2.0	
				100	88	78	58	38	25	19	13	3.7	
Specification Limits			100	95	64	50	32	22	15	10	4	2	3
				100	88	82	62	45	35	27	20	6	7

Source of Materials

Aggregates	Asphalt
Coarse: Waterford Crushed Stone	AC-10
Waterford VT.	
Fine: Dry Se Sand - Norris Pit, St Johnsbury VT.	AC-20
Washed Stone Screenings, Waterford Crushed Stone, Waterford VT.	Other: Echiflex 52-40 (Bitumen) Montpelier, VT.

Mixing Times — Dry: 6 Wet: 36 Total: 42 Temperature: 285°-10°
 Submitted by: Philip M. ... (signature) Date: 7-19-94
 Company: Pike Ind's Inc. Title: Quality Control Tech

FOR STATE OF VERMONT USE ONLY

Comments: This design is approved as submitted based on Marshall design and trial drop. Minor adjustments may be required. Continued use is contingent on further testing meeting all specifications.
 Signature: Charles E. Jera Title: Bituminous Concrete Supervisor
 Date: July 27, 1994



STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - BITUMINOUS CONCRETE SUBDIVISION
Design of Bituminous Concrete Mixtures

6343

Town MASTER

Project No.

Gentlemen:

In accordance with the specification requirements for the above project I submit the following job mix formula:

Pavement Type III Produced By: Ppke Ind's Inc. Plant Location Waterford, VT.Blows per Side.....50..... Stockpile Gradations — % Passing 706

Size	% Used	1 1/2	1	3/4	3/8	3/16	4	8	16	30	50	200
Sc Sand	11				100	98	91	82	68	45	14	1.9
WA ST SC	48				100	100	100	73	44	28	17	4.1
3/8" L	17				100	98	36	6	1	1	1	.5
1/2" L	24				100	95	35	4	2	1	1	.2
Resultant	100				100	99	84	65	46	29	19	3.0

Hot Bin Gradation — % Passing

Bin	% Used	1 1/2	1	3/4	3/8	3/16	4	8	16	30	50	200
S	50						100	89	58	38	22	6.0
2	31				100	100	97	47	3			
3	19				100	97	21	3	2			
4												
5												
Resultant	100				100	99	84	65	46	29	19	3.0

Batch Weights	Bin S	Bin No. 2	Bin No. 3	Bin No. 4	Bin No. 5	AC	Total
	1882	1167	715			236	4000

			1 1/2	1	3/4	3/8	3/16	4	8	16	30	50	200	AC
Job Mix Formula					100	99	84	65	46	29	19	11	3.0	5.9
Job Aim					100	95 100	78 90	59 71	42 50	25 33	15 23	7 15	2.0 4.0	
Specification Limits						95 100	70 90	42 75	28 56	18 41	11 31	4 22	2 6	

Source of Materials

Aggregates	Asphalt
Coarse: <u>WATERFORD CRUSHED STONE</u>	AC-10
<u>Waterford VT</u>	
Fine: <u>WA ST SC WATERFORD CRUSHED STONE</u>	AC-20 Petro 20 Montreal Canada
<u>Coventry Dry Screened Sand</u>	
<u>Ppke Coventry VT.</u>	Other:

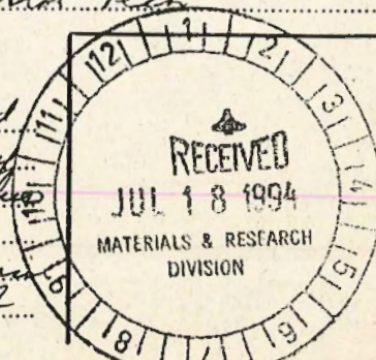
Mixing Times — Dry: 6 Wet: 36 Total: 42 Temp: 285 +/- 10°
 Submitted by: Philip Gust (signature) Date: 7-7-94
 Company: Ppke Ind's Inc. Title: Quality Control Tech

FOR STATE OF VERMONT USE ONLY

Comments: This design is approved as submitted based on Marshall design and trial drops. Minor adjustments may be required. Continued use is contingent on further testing meeting all specifications.

Signature: Charles E. Jerd Title: Bituminous Concrete Supervisor

TA 556

Date: July 22, 1994

VERMONT AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

06/14/95 1

BITUMINOUS CONCRETE SUBDIVISION

REPORT ON BITUMINOUS CONCRETE PAVEMENT

PROJECT NAME: WATERFORD

PROJECT NUMBER: CM-RS0225(3)

PMS CODE:

SOURCE: PIKE-WATERFORD

PAY ITEM NUMBER: 406.27

PROJECT CODE NUMBER: 94024

MIX DESIGN NUMBER: 6425 *BITUMAR P.G.*

TYPE: 3

YEAR: 1994

JOB AIM

LAB NO.	I.D.	DATE	NO.	1-1/4	1	3/4	1/2	3/8	#4	#8	#16	#30	#50	#200	EXT. SLIP EFF.				BULK		MAX	R/A
															AC.	AC.	AC.	AIR VMA	STAB FLOW	SP.GR		
D940690	W005T	08-12		100.0	100.0	85.0	61.1	45.7	31.7	21.6	11.5	3.3	6.21	5.75	5.54	2.5	16.2	2510	12	2.542	2.608	R
D940691	W006T	08-12		100.0	99.3	84.6	63.1	46.8	32.3	21.8	10.8	2.1	5.84	5.68	5.48	5.3	18.5	1772	12	2.471	2.610	R
D940582	W001T	08/03		100.0	99.3	82.9	61.1	43.9	30.2	19.8	10.0	2.9	6.02	5.80		3.2		1917	10	2.503	2.587	A
D940649	W002T	08/08		100.0	99.0	80.2	60.9	43.9	30.7	20.8	10.7	3.2	6.12	5.77	5.71	2.7	16.9	1775	10	2.528	2.598	R
D940650	W003T	08/08		100.0	100.0	87.5	65.5	47.8	34.0	23.3	11.7	2.8	6.25	5.71		3.8		1585	10	2.497	2.595	A
D940651	W004T	08/08		100.0	99.1	85.1	61.7	45.2	32.1	22.0	11.1	2.7	6.03	5.71	5.69	3.4	17.4	1885	11	2.510	2.598	A
AVERAGE				100.0	99.4	84.2	62.2	45.5	31.8	21.5	10.9	2.8	6.07	5.73	3.73	3.4	11.5	1907	10	2.508	2.599	

VERMONT AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

06/14/95 1

BITUMINOUS CONCRETE SUBDIVISION

REPORT ON BITUMINOUS CONCRETE PAVEMENT

PROJECT NAME: WATERFORD

PROJECT NUMBER: CM-RS0225(3)

PMS CODE:

SOURCE: PIKE-WATERFORD

PAY ITEM NUMBER: 406.27

PROJECT CODE NUMBER: 94024

MIX DESIGN NUMBER: 6345 *BITUMAR P.G.*

TYPE: 2

YEAR: 1994

JOB A1K

LAB NO.	I.D. NO.	DATE	100	95	76	66	46	30	17	11	5	2.0	EXT. SLIP EFF.						BULK MAX			
			100	100	88	78	58	38	25	19	13	3.7	AC.	AC.	AC.	AIR	VMA	STAB	FLOW	SP.GR	SP.GR	R/A
D940530	W004B	07/29	100.0	100.0	82.2	71.5	48.2	33.0	23.2	16.5	10.4	3.3	5.40	5.21	2.1	2189	12	2.572	2.628	R		
D940531	W005B	07/29	100.0	98.3	81.4	70.8	54.4	34.1	21.7	14.3	8.8	2.7	5.59	5.21	5.19	4.1	17.0	1751	10	2.531	2.640	A
D940532	W006B	07/29	100.0	96.9	78.9	67.7	49.4	32.5	21.3	14.4	9.0	2.9	5.42	5.20	3.1	1428	10	2.554	2.637	A		
D940573	W007B	08/01	100.0	100.0	85.9	72.5	52.2	33.6	21.9	15.1	9.5	3.1	5.72	5.21	5.04	2.7	15.5	2135	10	2.582	2.655	R
D940574	W008B	08/01	100.0	100.0	82.9	69.9	51.1	31.7	20.4	13.9	8.9	3.0	5.29	5.11	4.71	4.1	16.0	1976	11	2.566	2.675	A
D940575	W009B	08/01	100.0	98.7	80.7	69.3	50.6	32.7	21.0	14.3	9.1	2.8	5.28	5.12	5.02	3.4	16.0	2059	10	2.564	2.654	A
D940576	W010B	08/01	100.0	100.0	88.4	72.4	52.3	33.0	20.9	14.3	9.1	3.0	5.44	5.11	5.03	3.7	16.3	2307	10	2.555	2.653	A
D940577	W011B	08/02	100.0	100.0	81.9	70.5	51.8	31.3	19.5	13.2	8.4	2.7	5.34	5.09	4.94	3.8	16.2	1991	10	2.559	2.659	A
AVERAGE			100.0	99.2	82.7	70.5	51.2	32.7	21.2	14.5	9.1	2.9	5.43	5.15	3.74	3.3	12.1	1979	10	2.560	2.650	

VERMONT AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

06/14/95 1

BITUMINOUS CONCRETE SUBDIVISION

REPORT ON BITUMINOUS CONCRETE PAVEMENT

PROJECT NAME: WATERFORD

PROJECT NUMBER: CM-RS0225(3)

PMS CODE:

SOURCE: PIKE-WATERFORD

PAY ITEM NUMBER: 406.27

PROJECT CODE NUMBER: 94024

MIX DESIGN NUMBER: 6348

PETRO AC

TYPE: 2

YEAR: 1994

JOB A1M

LAB NO.	I.D.	DATE	NO.	1-1/4	100	95	76	66	47	30	18	10	4	2.0	EXT. SLIP BFF.								BULK MAX	
					100	100	88	78	59	38	26	17	12	4.0	AC.	AC.	AC.	AIR	VMA	STAB	FLOW	SP.GR	SP.GR	R/A
D940496	W001B	07/25			100.0	100.0	81.0	68.1	50.9	32.7	20.7	13.2	7.8	2.8	5.84	5.28	5.26	3.1	16.2	1915	10	2.561	2.642	A
D940497	W002B	07/25			100.0	98.9	87.2	71.0	50.0	33.9	22.2	13.9	7.8	2.9	5.99	5.21	2.5		1988	11	2.568	2.634	R	
D940498	W003B	07/25			100.0	100.0	87.0	72.9	49.4	34.0	22.5	14.2	8.0	2.8	6.00	5.23	3.2		1905	10	2.554	2.638	A	
D940578	W012B	08/02			100.0	100.0	80.0	67.1	49.2	31.6	20.7	13.5	7.2	2.4	5.37	5.08	4.94	4.7	16.9	2363	12	2.534	2.659	A
D940579	W013B	08/02			100.0	100.0	85.1	70.6	50.9	32.6	21.4	14.2	7.9	2.9	5.71	5.10	4.94	3.5	15.8	1947	11	2.568	2.660	A
AVERAGE					100.0	99.7	84.0	69.9	50.0	32.9	21.5	13.8	7.7	2.7	5.78	5.18	3.02	3.4	9.7	2023	10	2.557	2.646	

VERMONT AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

06/14/95 1

BITUMINOUS CONCRETE SUBDIVISION

REPORT ON BITUMINOUS CONCRETE PAVEMENT

PROJECT NAME: WATERFORD

PROJECT NUMBER: CM-RS0225(3)

PMS CODE:

SOURCE: PIKE-WATERFORD

PAY ITEM NUMBER: 406.27

PROJECT CODE NUMBER: 94024

MIX DESIGN NUMBER: 6343

PETRO AC

TYPE: 3

YEAR: 1994

JOB A1K

LAB NO.	I.D.	DATE													EXT. SLIP EFF.			BULK MAX						
			NO.	1-1/4	1	3/4	1/2	3/8	#4	#8	#16	#30	#50	#200	AC.	AC.	AC.	AIR VMA	STAB	FLOW	SP.GR	SP.GR	R/A	
D940688	W003T	08-12				100.0	100.0	86.5	64.4	47.9	31.7	21.0	11.4	3.2	6.16	6.12	5.73	3.0	17.1	2165	12	2.535	2.612	A
D940687	W004T	08-12				100.0	100.0	86.2	63.0	46.5	31.0	20.5	10.7	2.2	6.07	6.00	5.67	3.9	17.8	2295	10	2.511	2.613	A
D940707	W005T	08-15				100.0	99.1	84.5	62.0	45.8	30.1	19.9	10.5	2.6	6.24	6.00	5.71	3.2	17.3	2343	13	2.534	2.618	A
D940580	W001T	08/03				100.0	99.3	82.0	57.7	41.9	28.4	18.2	8.9	2.2	8.36	5.86	1.9		2396	11	2.531	2.581	R	
D940581	W002T	08/03				100.0	98.4	84.1	59.4	43.6	30.5	20.1	1.0	1.2	9.61	3.58	5.80	3.4	17.6	2402	10	2.518	2.606	A
AVERAGE						100.0	99.3	84.6	61.3	45.1	30.3	19.9	8.5	2.2	7.28	5.51	4.58	3.0	13.9	2320	11	2.525	2.606	
D940689	W001D	08-12				100.0	99.4	87.0	65.1	49.9	37.6	26.2	12.9	2.7	5.90	5.74	5.28	5.5	18.2	1869	13	2.481	2.625	R
AVERAGE						100.0	99.4	87.0	65.1	49.9	37.6	26.2	12.9	2.7	5.90	5.74	5.28	5.5	18.2	1869	13	2.481	2.625	