WI
SPS-9P

SPS-9 Construction Report
I-94 Near Tomah, WI
Sections 550901 to 550909

SHRP North Central Region

Report Prepared by:

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The SPS-9 Experimental Design and Research Plan

The SPS-9 experiment is entitled "Validation of SHRP Asphalt Specifications and Mix Design and Innovations in Asphalt Pavements." The SHRP asphalt research is focused on delivering two main products:

- Performance-based asphalt binder specification
- Performance-based asphalt-aggregate mixture specification including the mix design and analysis system

In addition, the SHRP Asphalt Research provides a forum for evaluating innovations in asphalt pavement, such as Stone Matrix Asphalt (SMA) and other materials.

The successful development and refinement of performance-based specifications for asphalt binder and asphalt-aggregate mixtures requires the validation of the binder and mixture properties as important determinants of in-place pavement performance. Also, the evaluation of innovative asphalt pavement materials requires in-service testing under actual traffic and climate conditions.

The SHRP asphalt research program is designed to develop performance-based specifications that address six pavement performance factors: permanent deformation, fatigue cracking, low-temperature cracking, moisture sensitivity, aging, and adhesion. With the results, it is hoped that the requirements for a new or reconstructed asphalt pavement may be defined in terms of the required levels of serviceability in each of these six areas for present and projected traffic loads and environmental conditions.

The SHRP asphalt research program was founded on the premise that asphalt concrete pavement performance is significantly influenced by the properties of the asphalt binder. To design a pavement that provides the performance dictated by its present and future environment, first consideration must be given to selecting an asphalt binder whose properties ensure the required performance levels.

After the influence of the asphalt binder on the performance is defined, the effect of its combination with aggregate must be considered. Some locally-available aggregates may actually detract from the performance-based response of the binder, necessitating a change in aggregate or binder. There is also the possibility that certain aggregates may enhance binder performance, allowing wider latitude in materials selection or pavement thickness.

The mixture specification is viewed as modulating the binder response in each performance area. The availability of both specifications allows a range of materials selection options to be considered for any particular paving project.

The performance-based specification limits and requirements are being developed from an extensive data base related to the types of pavement performance factors that can be defined quantitatively, as measured by accelerated, standardized tests using well-established performance prediction models and validated by correlation with in-place field pavement data.

The objectives of the SPS-9 study are as follows:

- To further validate the performance-based asphalt and asphalt-aggregate mixture specifications through controlled SPS projects;
- To provide for a direct comparison, in terms of measured performance and life-cycle costing analysis, between existing highway agencies' asphalt specifications, asphalt-aggregate mixture specifications, mix design procedures and SHRP's performance-based specifications and mix design and analysis system, stone matrix asphalt (SMA) mixtures, and other innovative features;
- To provide data collected over a long term from controlled field experiments and to provide for step-by-step procedures employing these data for modification of specification requirements at the local, regional or national level.

For the SPS-9 experiment, each test site includes the state's current mix design and the mix developed by SHRP's mixture design and analysis system. Other mixtures may be included along with these two sections. The Wisconsin SPS-9 project included the Wisconsin DOT standard mix, the SHRP SUPERPAVE mix, one SMA mix surface and one SMA full-depth, an SMA polymer mixture, and a mixture combining the SUPERPAVE aggregate blend with Wisconsin (unmodified) asphalt binder. Figure 1 shows the Wisconsin SPS-9 layout.

Project Details

This Wisconsin SPS-9 project was constructed in 1992 and is located in the eastbound driving lane of I-94 near Tomah (see Figure 2 for project location). The project involved the resurfacing of a divided concrete roadway. The SPS experiment consisted of six test sections as described above, and is built in the wet-freeze zone. Subgrade soils on the project are sand.

The typical sections for the project are shown in Figure 3. The concrete joints and cracks were repaired prior to placement of the asphalt base and surface mixtures in various thicknesses. Three inches of bituminous surface mixture were placed over the existing 9 inches of concrete pavement for the SPS-9 sections. Material was placed and compacted according to standard WisDOT specifications. The sections have 10-foot bituminous-surfaced shoulders, with no edge drains.

I-94 eastbound carries an average ADT of 12,200 with 36 percent trucks. The estimated design 18K ESAL in the SHRP lane is 11,813,600 18K ESAL applications over the 20-year design period.

There were no known deviations from project guidelines. All test sections were located between exit 135 and 143 near Tomah. There is one horizontal curve located in the SHRP areas and the vertical grade in the sections varies from -1.5 to +0.5 percent in the direction of travel. Three sections are located on fill sections, two on cut sections, and none contain underground structures.

No weather station has been installed, but one is scheduled for installation in 1994. An IRD weigh-in-motion system was installed and is operating near station 2655+00, and was supplied by a Minnesota contractor.

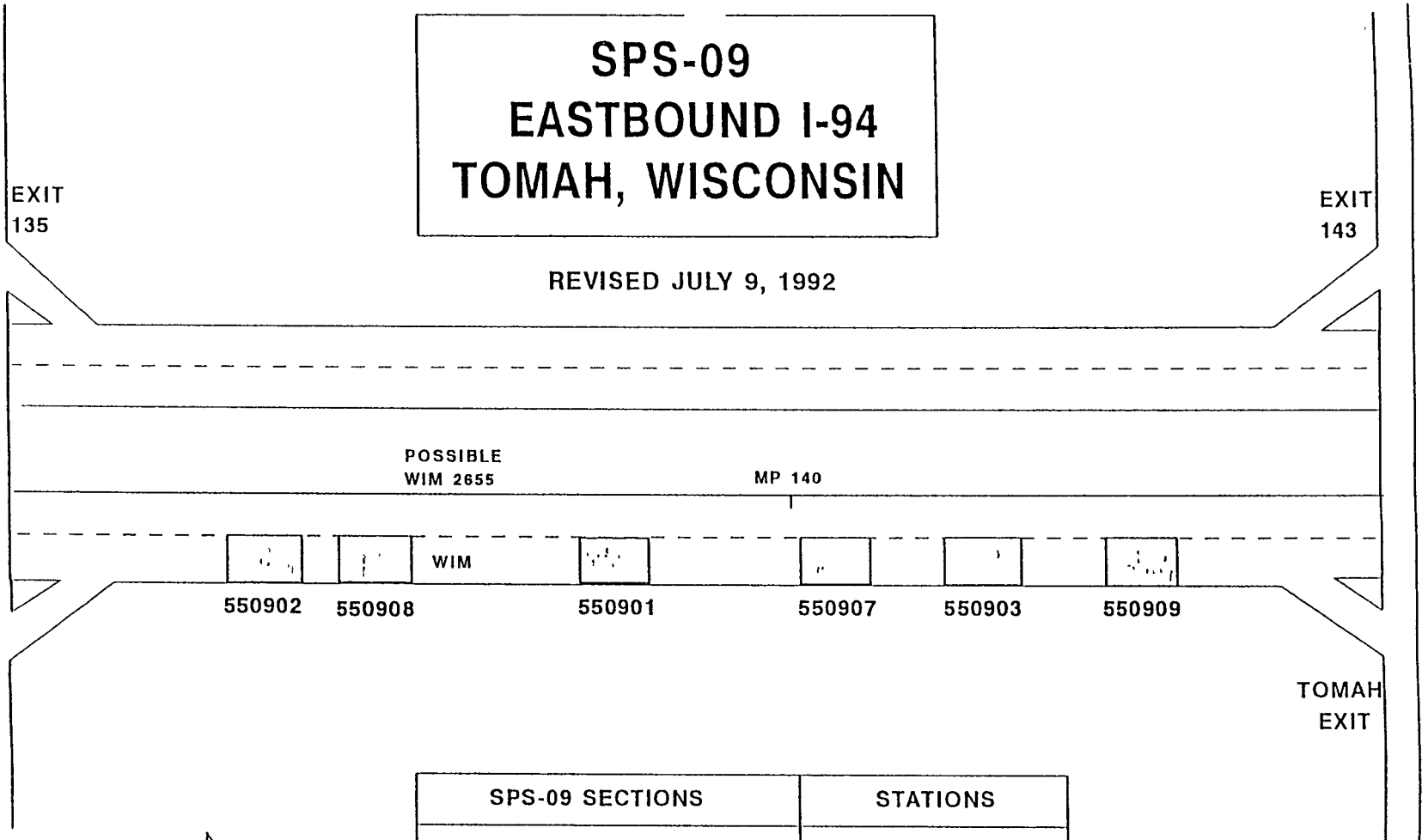


Figure 1. Project Layout

SPS-09 SECTIONS		STATIONS
550902	SHRP MIX	2624+83 - 2629+83
550908	SHRP AGG, WI AC	2646+70 - 2651+70
550901	WISCONSIN MIX	2720+34 - 2725+34
550907	SMA SURFACE	2768+00 - 2773+00
550903	FULL DEPTH SMA	2829+95 - 2834+95
550909	SMA POLYMER MIX	2882+20 - 2887+20

Project Coordination

The Wisconsin DOT conducted the materials sampling and testing, and also provided their own Resident Engineer. Jim Berg served as Construction Engineer and Bill Sheperd served as Project Engineer for the DOT. The following people were actively involved in the project:

Wisconsin Department of Transportation:

Steve Shober, SHRP Coordinator
Kevin McMullen
Bob Schmeidlen
Wisconsin DOT Materials Center
3502 Kinsman Blvd
Madison, WI 53704
(608) 246-5395

Jim Berg
Bill Sheperd
Wisconsin DOT District 5
3550 Mormon Coulee Rd
LaCrosse, WI 54601
(608) 785-9046

North Central Regional Coordination Office:

Gene Skok
Ann Johnson
Ron Urbach
Braun Intertec
1983 Sloan Place - Suite 10
St. Paul, MN 55117
(612) 776-7522

Richard Ingberg
Regional Engineer SHRP/LTPP/FHWA
1983 Sloan Place - Suite 10
St. Paul, MN 55117
(612) 776-2210

The general contractor for this project was:

Mathy Construction
915 Commercial Court
Post Office Box 189
Onalaska, WI 54650
Phone: (608) 783-6411

Mathy Construction performed all of the work required for the construction of the SPS-9 project.

An Open House was held July 8, 1992 at the Holiday Inn in Tomah. About 100 people from many states and Canadian provinces attended. This project represented the first complete, full-scale demonstration of the SHRP SUPERPAVE mix design system, and the Open House was sponsored by the Wisconsin DOT, Mathy Construction, the Wisconsin Paving Association, and the Federal Highway Administration.

Layout

Figure 1 shows the section layout, and Table 1 gives a description of the sections.

Table 1. Wisconsin SPS-9 Section Layout

Construction Station	SHRP ID	Description	Base Thickness (in.)	Surface Thickness (in.)
2624+83 - 2629+83	550902	SUPERPAVE	1-1/2 - 2	1-1/2
2646+70 - 2651+70	550908	SHRP Agg WI AC	1-1/2 - 2	1-1/2
2720+34 - 2725+34	550901	WisDOT Mix	1-1/2 - 2	1-1/2
2768+00 - 2773+00	550907	SMA Surface	1-1/2 - 2	1-1/2
2829+95 - 2834+95	550903	SMA Full Depth	1-1/2 - 2	1-1/2
2882+20 - 2887+20	550909	SMA Polymer	1-1/2 - 2	1-1/2

Material Sampling and Testing

The Material Sampling and Testing Plan is shown in Figure 4. WisDOT personnel conducted all sampling and testing and data collection, with assistance from the LTPP North Central Regional Office. Table 2 gives a listing of all samples taken for the project.

Construction

Construction of the SHRP portion of the project began in May 1992. Joints and cracks in the concrete surface were repaired first. Work on the bituminous base course placement began in June, and bituminous wearing course was placed during the Open House, held July 8. The remainder of the asphalt surface was placed shortly thereafter.

The contractor experienced no problems during construction. All work was completed on the test sections, and the roadway opened to traffic in early July 1992.

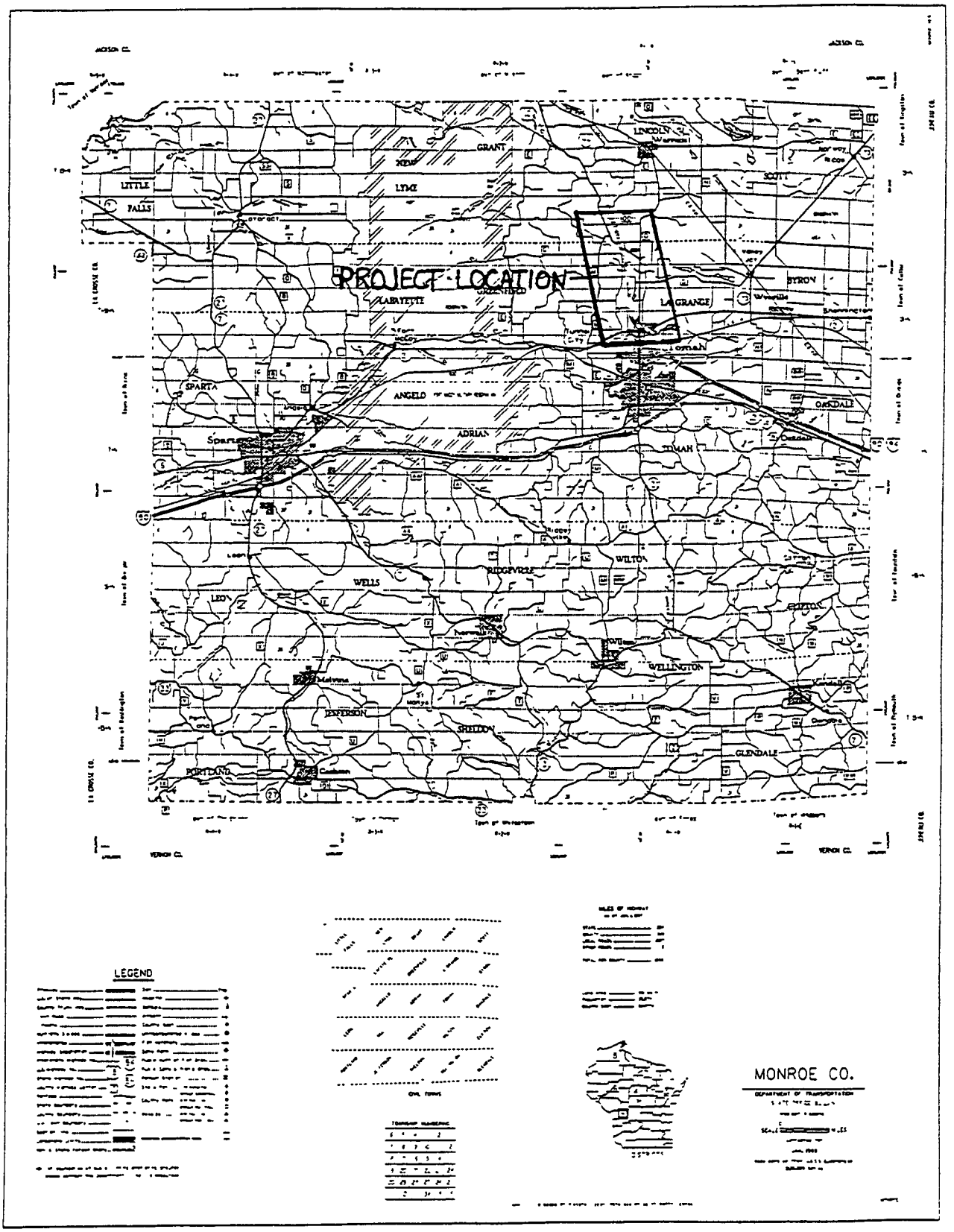


Figure 2. Project Location

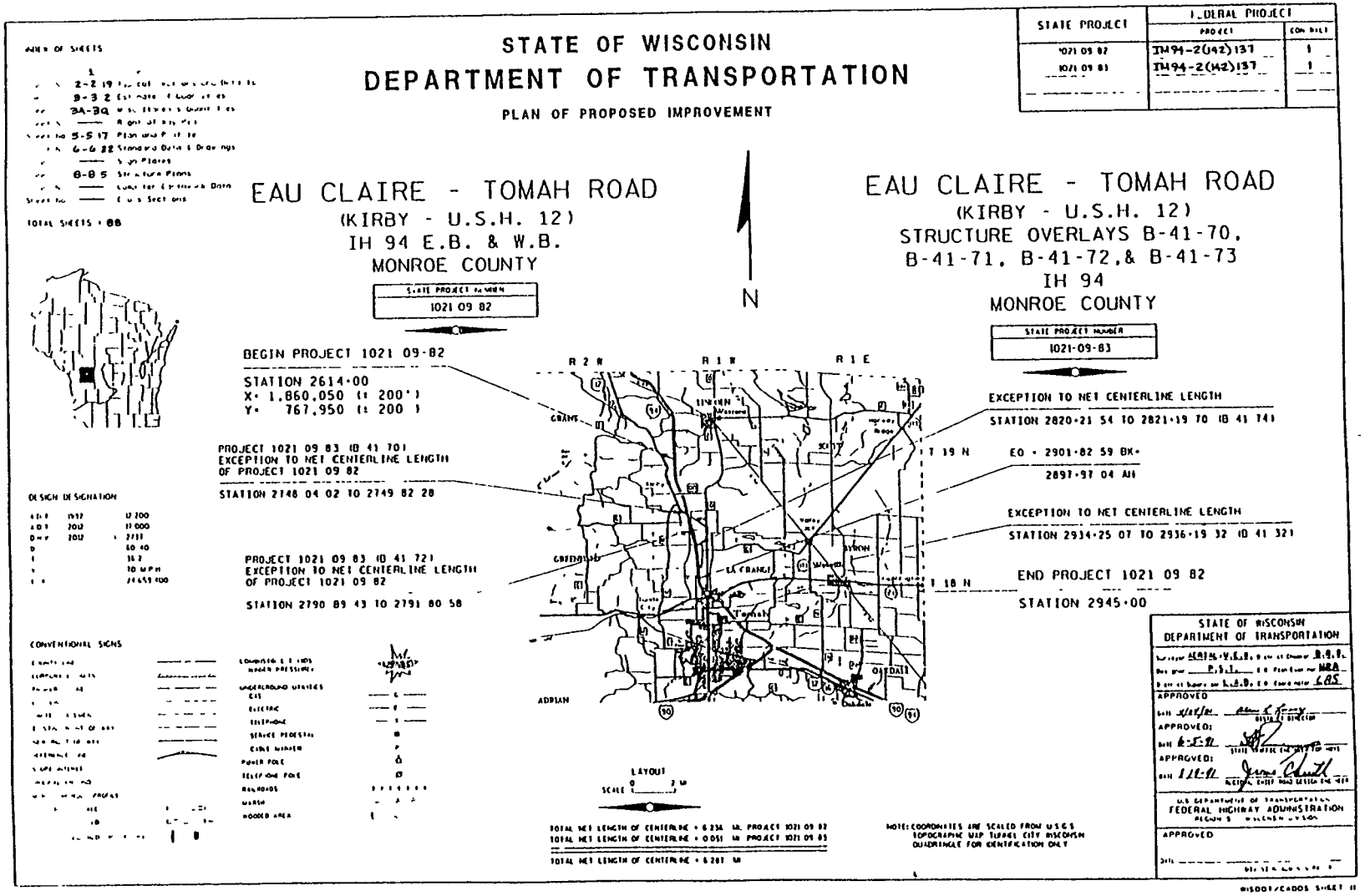


Figure 3. Project Details

Table 2. Bulk Material Sampling During Construction

Material and Sample Description	Number of Samples	Sample Location
Asphalt Concrete Coring - 4" Diam. Cores Bulk Sampling (100 lbs of each mix, uncompacted)	 21 3	 Regional Contractor Lab Minneapolis, MN
Asphalt Cement 5 gallons each sample	3	Regional Contractor Lab Minneapolis, MN
Materials Shipped to SHRP Asphalt Reference Library		
Asphalt Cement 5 gallon containers	22	SHRP Reference Library Reno, NV
Aggregate 55 gallon drums	4	SHRP Reference Library Reno, NV
Finished Asphaltic Concrete Mix 5 gallon containers	16	SHRP Reference Library Reno, NV
Mineral Filler for SMA Mix 5 gallon containers	1	SHRP Reference Library Reno, NV

Mix Designs and Paving

The SHRP mix designs for base and surface are given in Figure 5. WisDOT sent candidate aggregate materials to the Asphalt Institute laboratory where gradation and blending were done to identify several trial blends that fell within the recommended SUPERPAVE gradation limits. An unmodified and two polymer-modified binders were also sent to the Pennsylvania Transportation Institute to evaluate them in terms of the performance grade requirements in the current SHRP draft binder specification 7G. These requirements were determined by the environmental conditions at the I-94 project site, including the viscosity, the average 7-day maximum pavement temperature, estimated from weather data at 55°C or less and the minimum pavement temperature, estimated at -30°C or higher. These temperature data suggested a SHRP 55-30 grade of asphalt be used on the project.

The volumetric proportioning evaluation was conducted at the Asphalt Institute lab. Four trial aggregate blends were mixed with the unmodified PG 2-3 asphalt over a range of asphalt contents. Each mix specimen was compacted up to 230 gyrations with the SHRP gyratory compactor while the percent of maximum theoretical density of the specimen was continually monitored. A final volumetric mix design was selected that achieved air voids content of 4.0% at the design number of 100 gyrations while meeting a VMA requirement of 13 percent or higher. This final volumetric mix design had an asphalt content of 5.7 percent with an aggregate blend of 22 percent coarse limestone, 53 percent limestone fines and 25 percent washed fines. Specimens were then prepared for engineering property evaluation at three asphalt contents: the target content of 5.7 percent and 0.5 percent above and below the target.

Performance predictions were made for the project using the results of the accelerated performance tests. The calculations were performed at Texas A&M University with materials response and pavement performance prediction models developed for incorporation in the SUPERPAVE specification, design and support software.

The overlay was evaluated for permanent deformation performance and reflective cracking at the PCC joints. Weather data typical of the Tomah, Wisconsin region was used to generate an estimate of pavement temperatures throughout the year. Mixture behavior at service temperature during each season was determined from the results of the accelerated performance tests,and the effect of traffic expressed as standard equivalent axle loads was predicted. Both visco-elastic and visco-plastic behavior are modelled to determine the amount of unrecoverable deformation which occurs under traffic.

Construction of the SUPERPAVE pavement did not pose problems for the contractor. The SUPERPAVE had a very stony appearance with some similarity to SMA . The mixture laid very well with no segregation or handling problems. The breakdown rollers were able to roll within 25 feet of the paver without any evidence of instability in the mixture. Compaction was accomplished with a vibratory, double-drum roller followed by a static, steel-wheeled, finish roller. Specified compaction was achieved in the pavement.

Predicted 20-year rut depths for the asphalt mixture compacted to 7% air voids after construction were 0.32, 0.43, and 0.51 inches for asphalt contents of 5.2, 5.7 and 6.2 percent. Reflective cracking results from stress concentrations at the PCC joints during cold weather. Results of the reflective cracking predictions indicate that all joints will be reflected through the overlay within four years. Based upon a consideration of both the volumetric mixture properties and the estimates of pavement performance, an asphalt content of 5.7 percent was selected for the SHRP mix design.

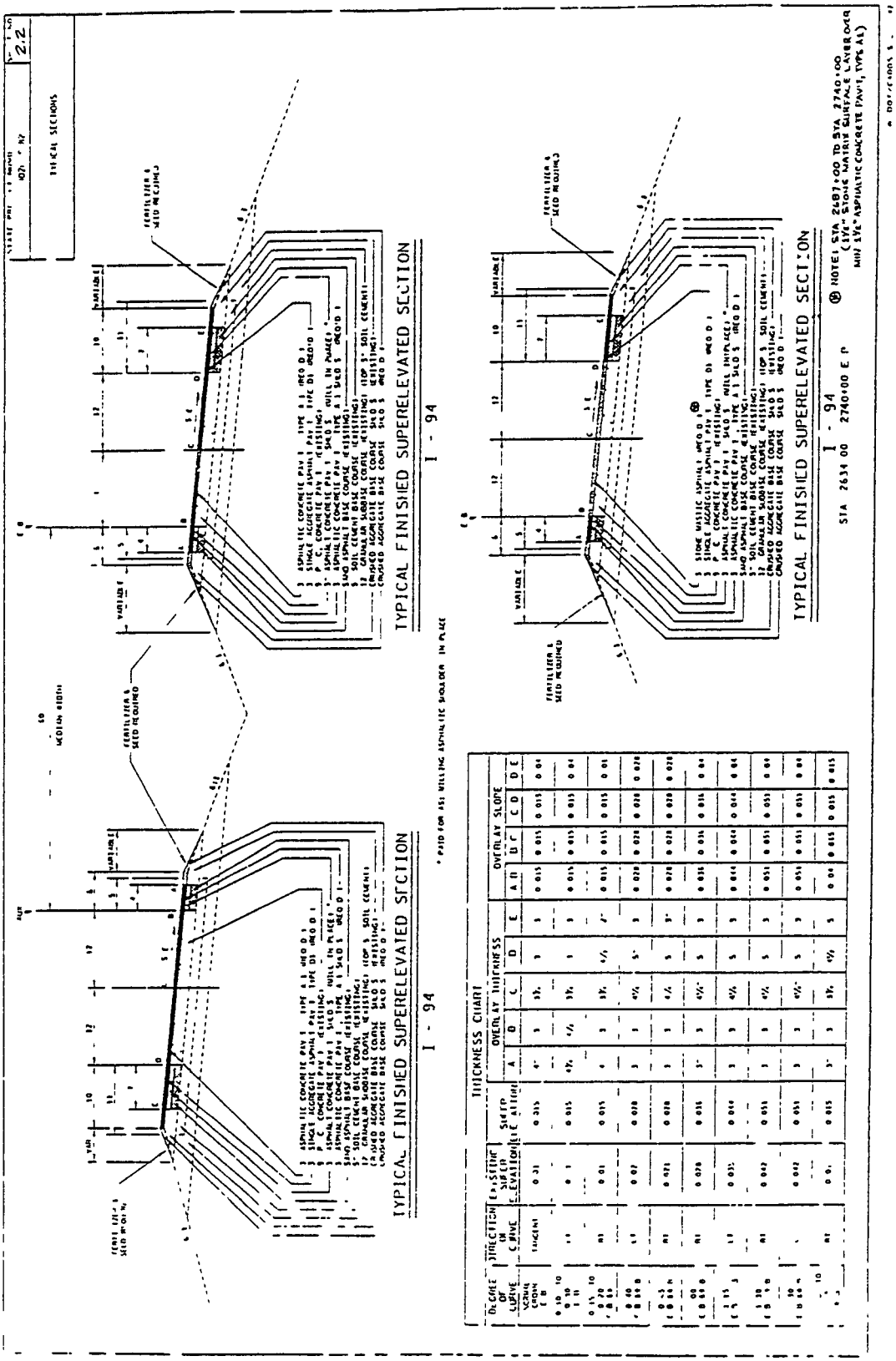


Figure 4. Typical Sections

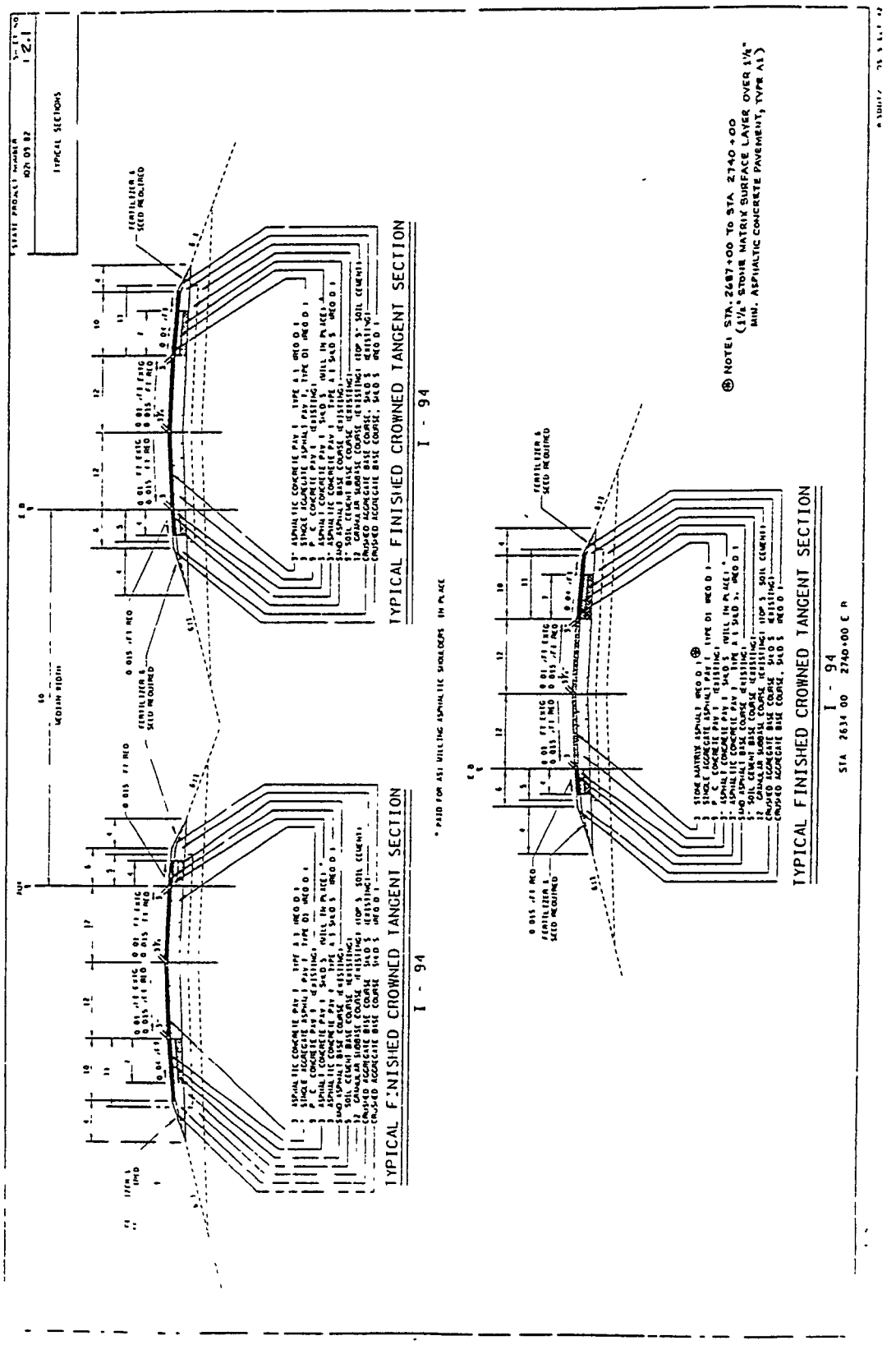
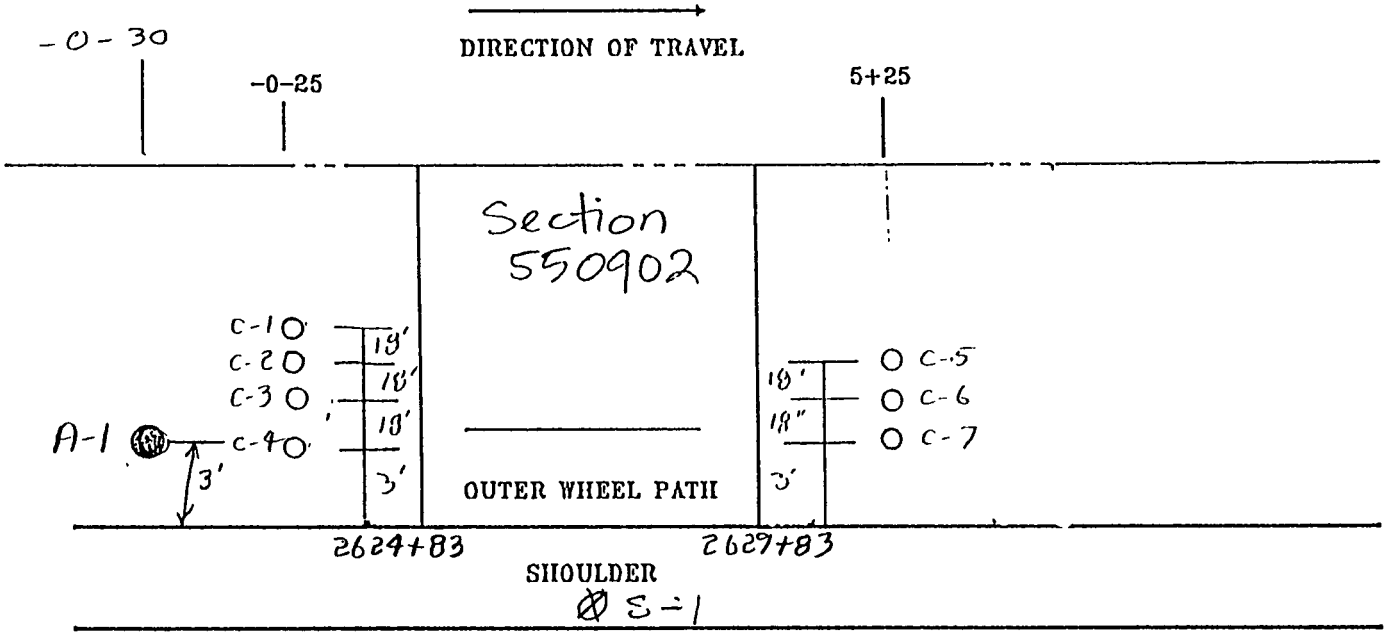


Figure 4. Typical Sections (continued)

Figure 5. Material Sampling and Testing Plan

SPS-9 WISCONSIN I-94 EB

PRE-CONSTRUCTION SAMPLING AND TESTING



○ 4" OD CORE PCC AND STABILIZED BASE

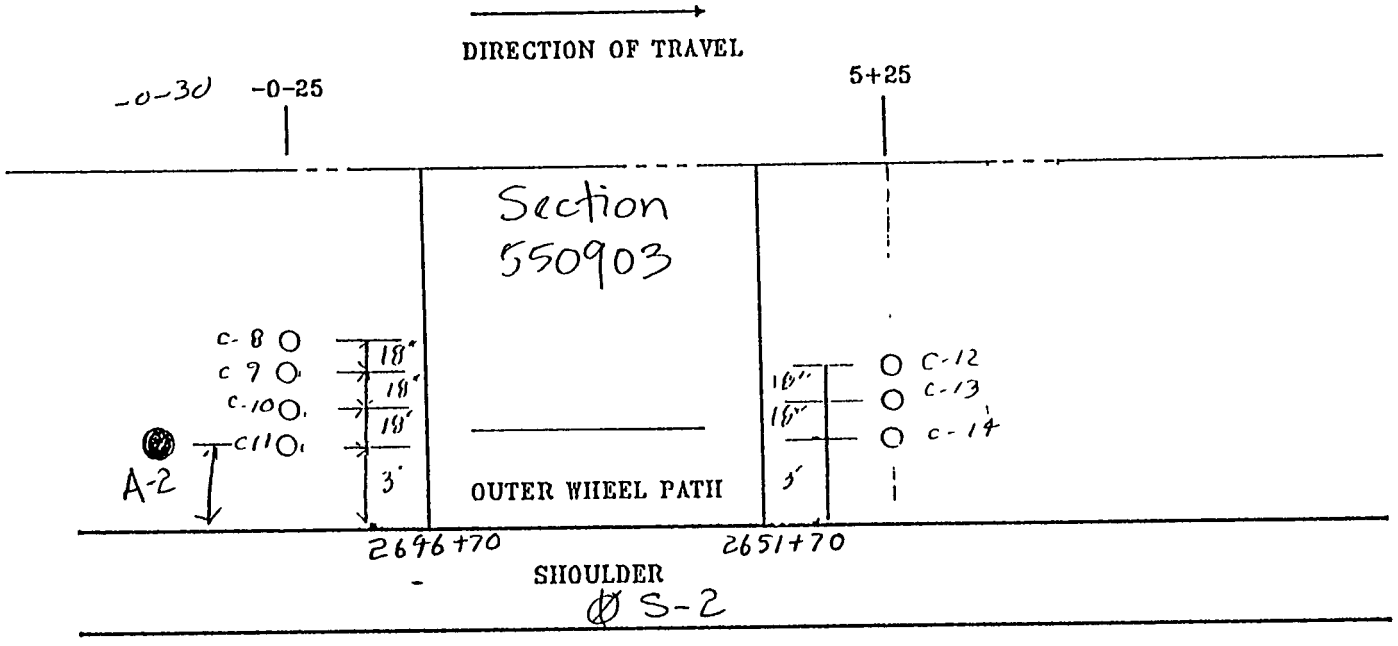
● 6" OD CORE AND AUGER BORING

TEST PIT↑ DONE IN FULL DEPTH REPAIR AREA 1
10M

Ⓐ SHOULDER PROBE

SPS-9 WISCONSIN I-94 EB

PRE-CONSTRUCTION SAMPLING AND TESTING



○ 4" OD CORE PCC AND STABILIZED BASE

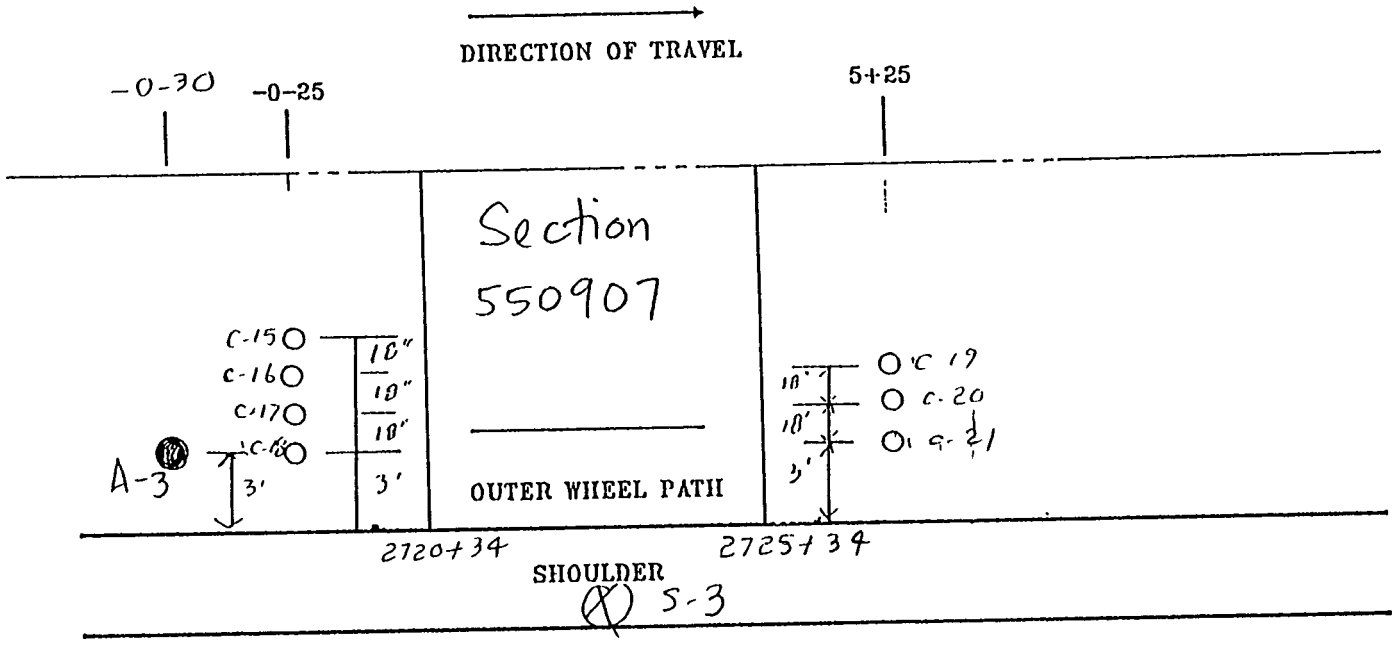
● 6" OD CORE AND AUGER BORING

TEST PIT TO BE DONE IN FULL DEPTH REPAIR AREA

Ⓧ SHOULDER PROBE

SPS-9 WISCONSIN I-94 EB

PRE-CONSTRUCTION SAMPLING AND TESTING



○ 4" OD CORE PCC AND STABILIZED BASE

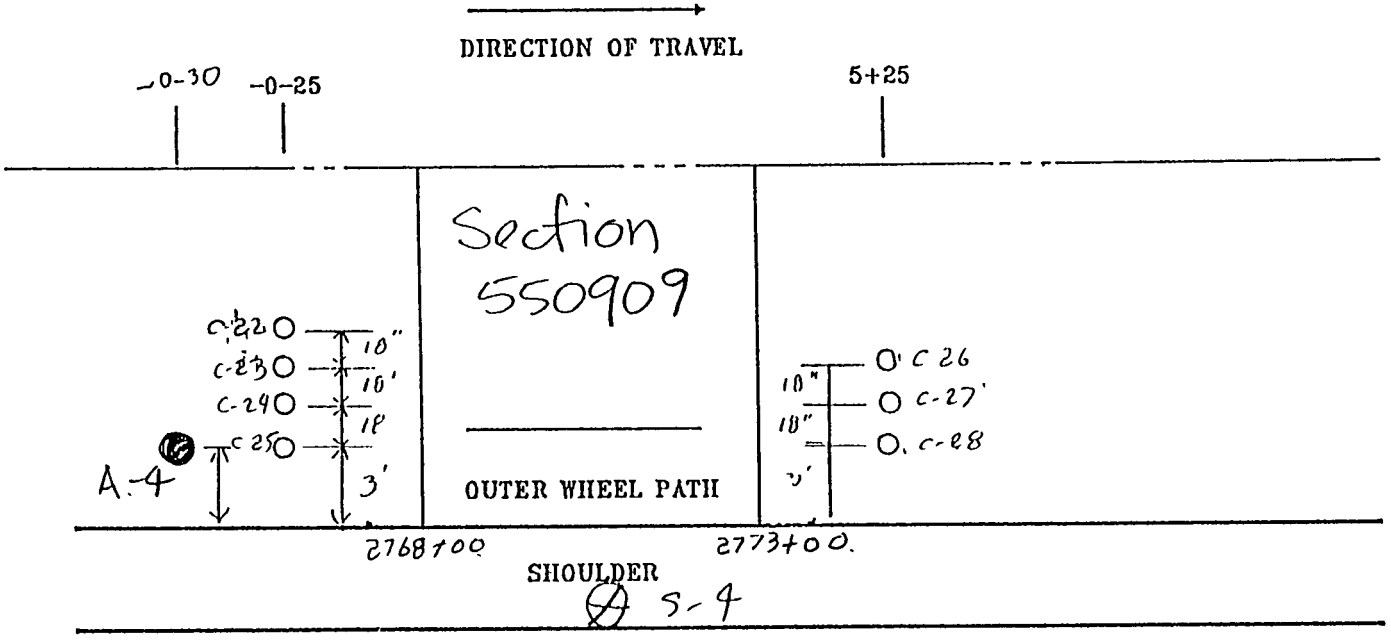
● 6" OD CORE AND AUGER BORING

TEST PIT TO BE DONE IN FULL DEPTH REPAIR AREA

⊗ SHOULDER PROBE

SPS-9 WISCONSIN I-94 EB

PRE-CONSTRUCTION SAMPLING AND TESTING



○ 4" OD CORE PCC AND STABILIZED BASE

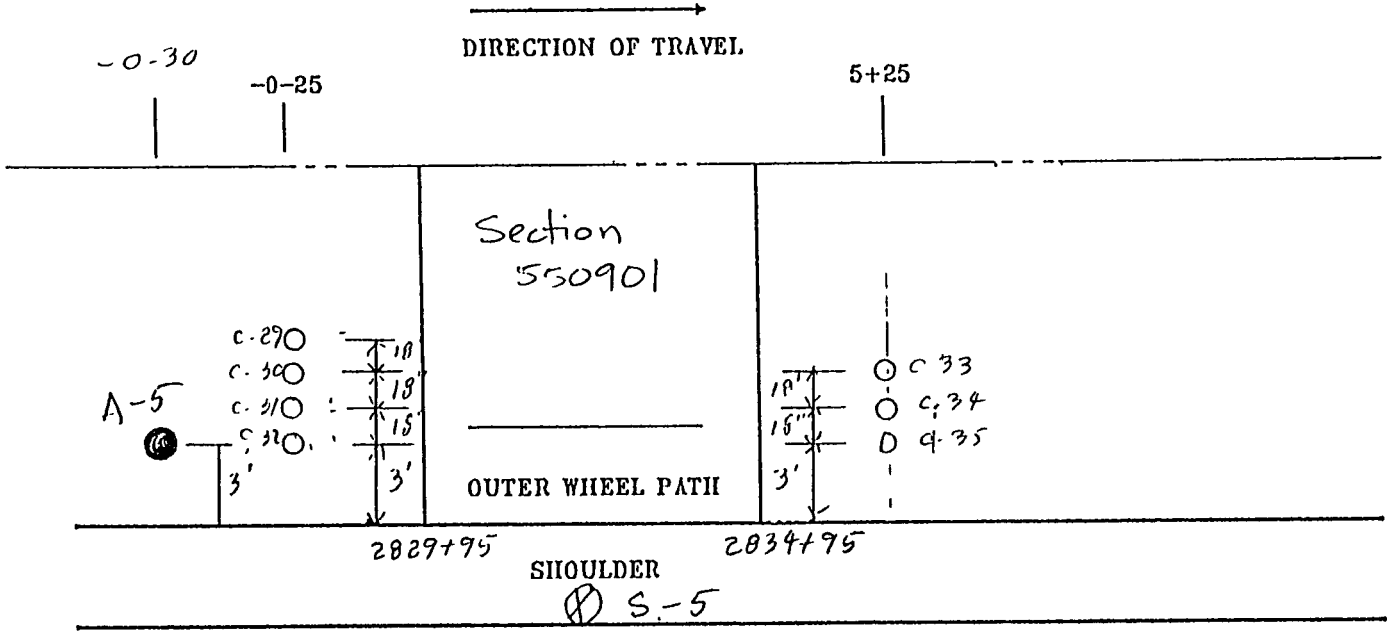
● 6" OD CORE AND AUGER BORING

TEST PIT TO BE DONE IN FULL DEPTH REPAIR

⊗ SHOULDER PROBE

SPS-9 WISCONSIN I-94 EB

PRE-CONSTRUCTION SAMPLING AND TESTING



○ 4" OD CORE RCC AND STABILIZED BASE

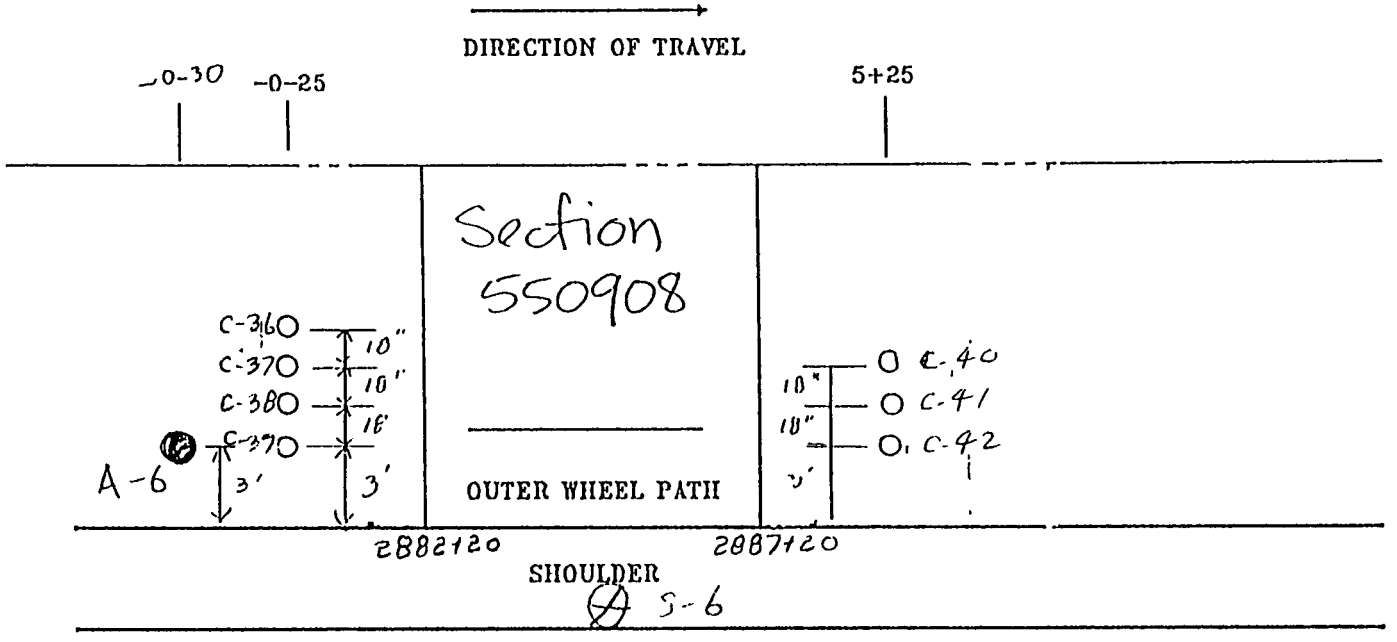
● 6" OD CORE AND AUGER BORING

TEST PIT TO BE DONE IN FULL DEPTH REPAIR AREA

⊗ SHOULDER PROBE

SPS-9 WISCONSIN I-94 EB

PRE-CONSTRUCTION SAMPLING AND TESTING



○ 4" OD CORE PCC AND STABILIZED BASE

● 6" OD CORE AND AUGER BORING

TEST PIT TO BE DONE IN FULL DEPTH REPAIR AREA

Ⓐ SHOULDER PROBE

Figure 6. Mix Design

6/16/92 MATERIALS LAB TESTING SYSTEM Screen 1 IMTMAM1
Prj. ID 1021 - 09 - 82 ASPHALT MIX DESIGN TEST NO. 250 - 2056 - 92
IH 94 EAU CLAIRE - TOMAH RD KIRBY - USH 12, IH 94 EB & WB
District 5 MONROE Course BINDER Smpl. By MATHY Smpl. Date 6/04/92
Matl. CRUSHED STONE & BLEND SAND/ASPHALTIC CONC. PVMNT Test Date 6/10/92
#1 CSE ST BORNTREGER QUARRY NW SW Section 10 T 16 N R 1 W MONROE
#2 FINE LIMESTONE (SAME AS ABOVE)
#3 WASHED LIMESTONE FINES (SAME AS ABOVE)
#4 BLEND SAND - GERKE
#5

SIEVE ANALYSIS: (Percent Passing)					Type 1 SP	
Sample Number	1	2	3	4	JOB MIX	Spec. 401 A1
Sieve 1"					100	95-100
Size 3/4"					93	80-95
1/2"					77	65-85
3/8"					69	50-75
# 4					58	35-60
# 8					42	20-45
# 30					27	10-25
# 50					16	7-20
# 200					3.8	3-7

Final Blend, % #1: 35 #2: 17 #3: 35 #4: 13 #5:

ENTER -Screen 2 PF2 -Prim Menu PF3 -Prev. Screen PF12 -Logoff PA2 -Cancel
4BÜ Aa A0--Host A R 2 C 71 - 02 6:52 6/16/92

6/16/92 MATERIALS LAB TESTING SYSTEM Screen 2 IMTMAMD
Prj. ID 1021 - 09 - 82 ASPHALT MIX DESIGN TEST NO. 250 - 2056 - 92
IH 94 EAU CLAIRE - TOMAH RD KIRBY - USH 12, IH 94 EB & WB
District 5 MONROE Course BINDER Smpl. By MATHY Smpl. Date 6/04/92
Matl. CRUSHED STONE & BLEND SAND/ASPHALTIC CONC. PVMNT Test Date 6/10/92
Frac Part, % 100 Elong Part, % 0 Dolo Part, % LL NON-COH PI N.P.

	%Wear	%100W	%SDS	Test Number	Design Asphalt:
#1:	36.4	8.8		247-0191-91	Type AC 85 - 100 Source KOCH
					Test 250-2252-91 Sp. Gr. 60/60F 1.028

Comb. BULK Sp. Gr. 2.644

Asph. Content		% Air		Flow .01"	Dens.	Stab.,140F(lbs)
Totl,%	MSG	Voids	VMA,%		PCF	
5.20	2.505	4.3	14.0	9	149.3	3909

Traffic Max Compacted Lab Density... PCF @ % A.C.
Class ESAL TSR,% 91 @ 5.2 % A.C. @ 33 Blows Per End
Remarks THE ABOVE DATA VERIFIES MATHY MIX DESIGN 8752B, DATED 6/4/92. TSR TEST PERFORMED USING ASPHALT WITH 0.75%. KLING BETA ADDED, DATA TO DIST. OFFICE, MATHY 6/15/92. VER BY LLL

ENTER TO RETURN PF7 or 19 for Screen 1 PF3 or PF Prev Screen
PA2 to cancel PF2 or 14 to primary menu PF12 or 24 to logoff
4BÜ Aa A0--Host A R 6 C 15 02 6:52 6/16/92

MATHY CONSTRUCTION CO.
GENERAL CONTRACTORS

915 COMMERCIAL COURT • POST OFFICE BOX 189 • ONALASKA, WISCONSIN 54650

PHONE 608-783-6411 • FAX 608-783-4311

250-2056-92

Report of Bituminous Mix Design

Test #.....: 8752B
Date.....: June 4, 1992
Project Number...: 1021-09-82
Project Name.....: KIRBY-USH 12
County.....: MONROE
Specification....: A1 BINDER GRADE #1

ACGREGATE SOURCES

Percent	Material	Supplier\Source	SpG
1: 35.00	: LIMESTONE COARSE	: BORNTREGER 10 16 1W MONROE	: 2.648
2: 17.00	: LIMESTONE FINE	: BORNTREGER	: 2.631
3: 35.00	: WASH LIME FINES	: BORNTREGER	: 2.641
4: 13.00	: BLEND SAND	: GERKE 2 18 4E ADAMS	: 2.609
Total : 100.00		Spg Total :	2.638

AGGREGATE GRADATIONS

Gradations						
	#1	#2	#3	#4	Job Mix	Spec.
1" :	100.0 :	100.0 :	100.0 :	100.0 :	100.0 :	95-100
3/4 :	80.0 :	100.0 :	100.0 :	100.0 :	93.0 :	80-95
1/2 :	34.0 :	100.0 :	100.0 :	100.0 :	76.9 :	65-85
3/8 :	16.0 :	100.0 :	100.0 :	99.0 :	70.5 :	50-75
#4 :	3.5 :	55.0 :	100.0 :	98.0 :	58.3 :	35-60
#8 :	3.1 :	18.0 :	73.0 :	96.0 :	42.2 :	20-45
#16 :	2.9 :	14.0 :	48.0 :	91.0 :	32.0 :	
#30 :	2.8 :	10.0 :	37.0 :	72.0 :	25.0 :	10-25
#50 :	2.5 :	8.8 :	25.0 :	23.0 :	14.1 :	7-20
#100:	2.0 :	6.5 :	10.0 :	2.0 :	5.6 :	
#200:	1.7 :	5.4 :	4.5 :	1.3 :	3.3 :	3-7

MATHY CONSTRUCTION CO.
GENERAL CONTRACTORS

915 COMMERCIAL COURT • POST OFFICE BOX 189 • ONALASKA, WISCONSIN 54650

PHONE 608-783-6411 • FAX 608-783-4311

250 - 2056-9

BINDER

3/4

Report of Bituminious Mix Design
Test # : 8752B
Project # : 1021-09-82
Project Name: KIRBY-USH 12

MIX PROPERTIES

	#1	#2	#3	#4	#5
AC Content % By Weight :	4.5	5.0	5.5	6.0	6.5
Rice SpG.....:	2.525	2.506	2.487	2.469	2.451
Air Voids %.....:	5.9	4.5	2.9	1.9	1.0
Density Lbs.....:	147.8	149.0	150.2	150.7	151.1
Stability @ 140 Deg F..:	3800	4067	3967	3850	3617
Flow 0.01 In.....:	7.5	8.0	10.7	11.3	12.8
VMA.....:	14.0	13.8	13.5	13.7	14.0

Asphalt Material.....: 85-100
Asphalt Source.....: KOCH
Specific Gravity.....: 1.031
Recommended AC Binder : 5.2
Recommended AC Surface:
Density lbs/cu ft.....: 149.4
Density Max Spg.....: 2.498
TSR @ Blow Count.....: 95 @ 33 0.75 KLING BATA ADDED
Blow/Side (Beveled)...: 75
Mix Temp/Degrees F....: 275 - 310

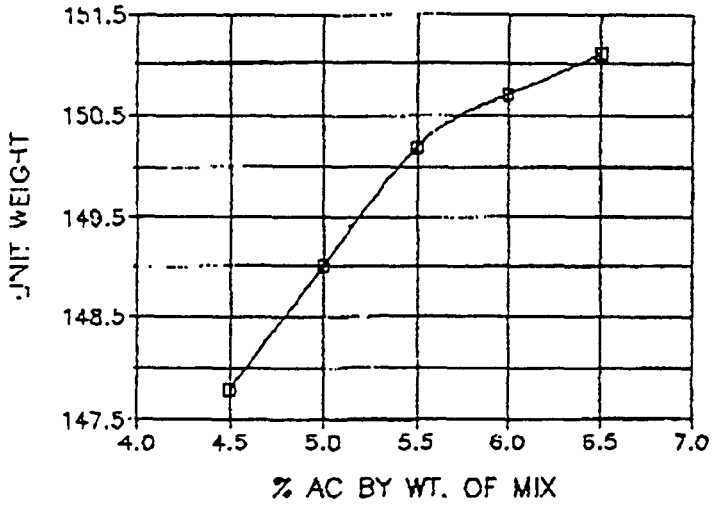
* Since this design is material specific, the conclusions and recommendatio contained within are obtained from material submitted to and subjected to observations under laboratory conditions. Adjustments may become necessary when field laboratory data is obtained from plant produced mix. No guarante or warranty is implied or offered.

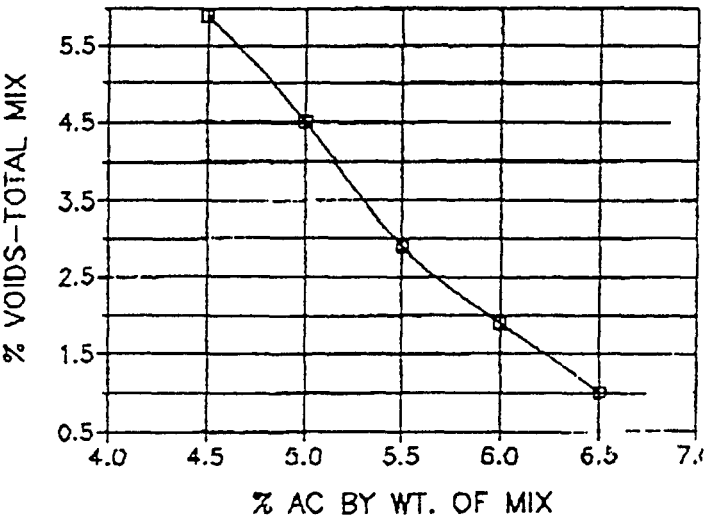
Gail D. Jensen PE
Materials Engineer.

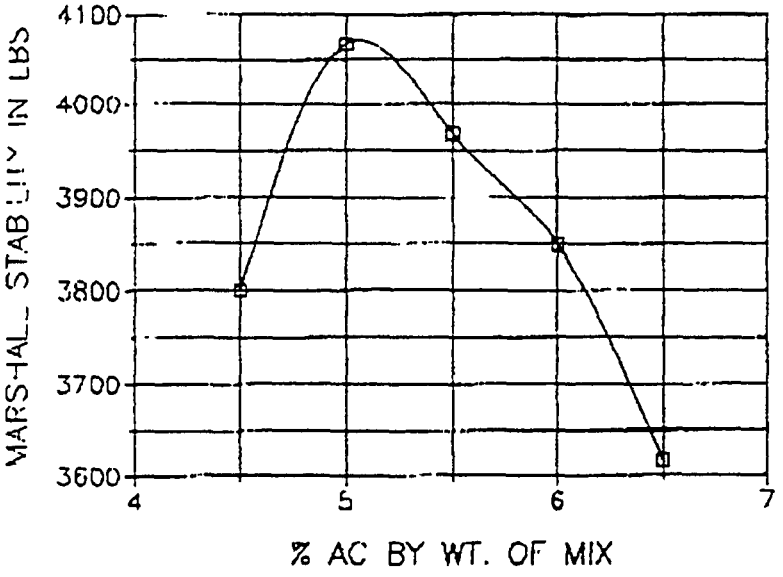
BITUMINOUS MIX DESIGN PRESENTATION REPORT DATE: 06/09/92

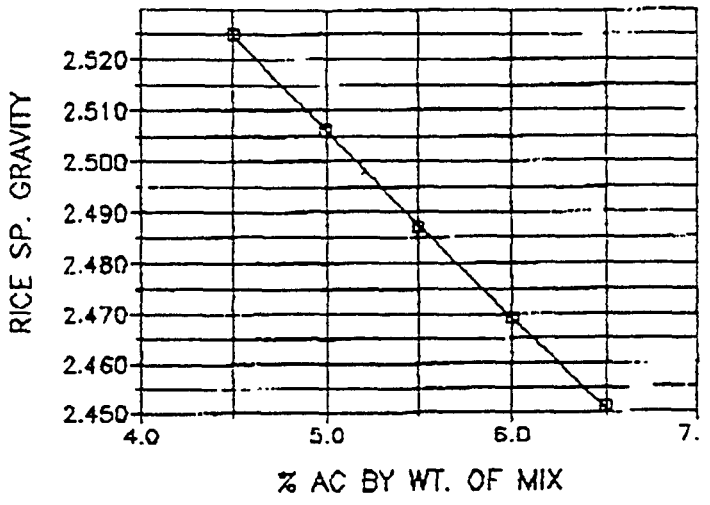
KIRBY-HWY12 1021-09-82 BINDER GRADE #1

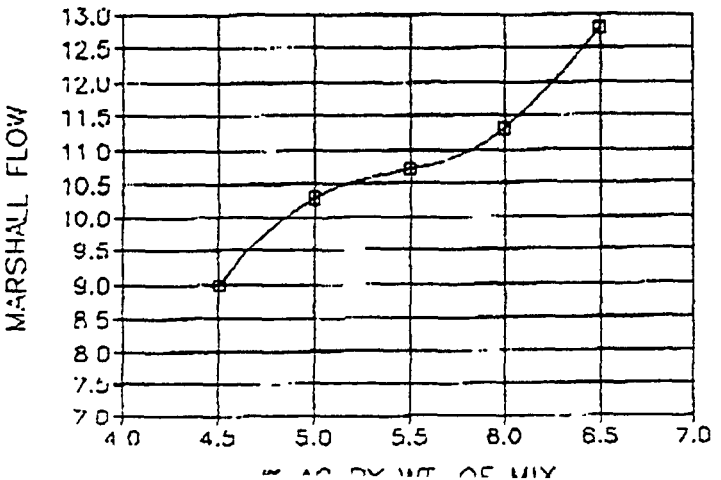
4/4

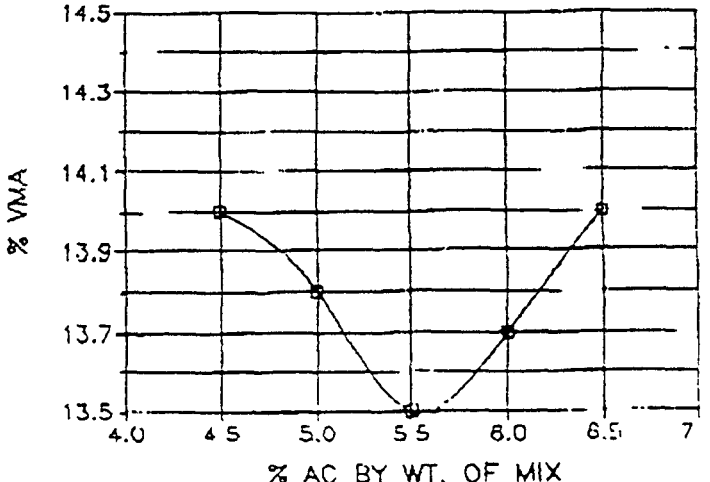












6/29/92 MATERIALS LAB TESTING SYSTEM Screen 1 IMTMAM1
Prj. ID 1021 - 09 - 82 ASPHALT MIX DESIGN TEST NO. 250 - 2062 - 92
IH 94 EAU CLAIRE - TOMAH RD KIRBY - USH 12, IH 94 EB & WB
District 5 MONROE Course SURFACE Smpl. By MATHY Smpl. Date 6/10/92
Matl. CR ST AND BL SAND/ASPHALTIC CONC. PAV'T Test Date 6/11/92
#1 CR ST BORNTREGER QUARRY NW SW Section 10 T 16 N R 1 W MONROE
#2 FINE LIMESTONE (SAME AS ABOVE)
#3 WASHED LIME FINES (SAME AS ABOVE)
#4 BLEND SAND - GERKE PIT, SEC. 2, T18N, R4E, ADAMS CO.
#5

SIEVE ANALYSIS: (Percent Passing)

Sample Number	1	2	3	4	Type 3 SP BLEND	Spec. 401A1
Sieve 1"						
Size 3/4"					100	100
1/2"					95	90-97
3/8"					89	75-95
# 4					73	45-75
# 8					52	30-55
# 30					31	15-35
# 50					16	10-25
# 200					4.1	3-7

Final Blend, % #1: 15 #2: 30 #3: 35 #4: 20 #5:

ENTER -Screen 2 PF2 -Prim Menu PF3 -Prev. Screen PF12 -Logoff PA2 -Cancel
4BŬ Aa A0--Host A R 2 C 71 - 02 14:40 6/24/92

6/29/92 MATERIALS LAB TESTING SYSTEM Screen 2 IMTMAMD
Prj. ID 1021 - 09 - 82 ASPHALT MIX DESIGN TEST NO. 250 - 2062 - 92
IH 94 EAU CLAIRE - TOMAH RD KIRBY - USH 12, IH 94 EB & WB
District 5 MONROE Course SURFACE Smpl. By MATHY Smpl. Date 6/10/92
Matl. CR ST AND BL SAND/ASPHALTIC CONC. PAV'T Test Date 6/11/92
Frac Part, % 98 Elong Part, % 2 Dolo Part, % 100 LL NON-COH PI N.P.

	%Wear	%100W	%SDS	Test Number	Design Asphalt:
#1:	38.1	9.1	0.1	267-0192-91	Type AC 85 - 100 Source KOCH
					Test 250-2252-91 Sp. Gr. 60/60F 1.028

Comb. BULK Sp. Gr. 2.646

Asph. Content		% Air	Flow .01"	Dens.	Stab.,140F(lbs)
Totl,%	MSG	Voids VMA,%		PCF	
6.00	2.469	3.0 14.9	9	149.1	3174

Traffic Max Compacted Lab Density... PCF @ % A.C.
Class ESAL TSR,% 88 @ 6.0 % A.C. @ 34 Blows Per End
Remarks ABOVE DATA VERIFIES MATHY MIX DESIGN 8752, DATED 6/10/92.
TSR WITH 0.75% KLING BETA. REPORT FAXED TO DIST. 5, MATHY 6/26/92.
VER BY LLL

MATHY CONSTRUCTION CO.
GENERAL CONTRACTORS

915 COMMERCIAL COURT • POST OFFICE BOX 189 • ONALASKA, WISCONSIN 54650

PHONE 608-783-6411 • FAX 608-783-4311

250-2062-92

6/10/92

Page 2 of 4

Report of Bituminous Mix Design

Test #.....: 8752
Date.....: June 10, 1992
Project Number...: 1021-09-82
Project Name.....: KIRBY-USH 12 I94
County.....: MONROE
Specification....: A1 SURFACE GRADE #3

AGGREGATE SOURCES

	Percent	Material	Supplier\Source	SpG
1:	15.00	LIMESTONE COARSE	BORNTREGER 10 16 1W MONROE	2.640
2:	30.00	LIMESTONE FINE	BORNTREGER	2.631
3:	35.00	WASH LIME FINES	BORNTREGER	2.641
4:	20.00	BLEND SAND	GERKE 2 18 4E ADAMS	2.609
Total :	100.00		Spg Total :	2.631 ✓

AGGREGATE GRADATIONS

Gradations						
	#1	#2	#3	#4	Job Mix	Spec.
1" :	100.0	100.0	100.0	100.0	✓100.0	100
3/4 :	100.0	100.0	100.0	100.0	100.0	100
1/2 :	62.0	100.0	100.0	100.0	94.3	90-97
3/8 :	28.0	100.0	100.0	99.0	89.0	75-95
#4 :	4.4	55.0	100.0	98.0	71.8	45-75
#8 :	3.6	18.0	73.0	96.0	50.7	30-55
#16 :	2.9	14.0	48.0	91.0		
#30 :	2.8	10.0	37.0	73.0	31.0	15-35
#50 :	2.5	8.8	25.0	24.0	16.6	10-25
#100:	2.0	6.5	10.0	2.0		
#200:	1.7	5.4	4.5	1.3	3.7	3-8

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250-2062-92
SURFACE
3/4

Report of Bituminious Mix Design
Test # : 8752
Project # : 1021-09-82
Project Name: KIRBY-USH 12 I94

MIX PROPERTIES

	#1	#2	#3	#4	#5
AC Content % By Weight :	4.5	5.0	5.5	6.0	6.5
Rice SpG.....:	2.542	2.523	2.504	2.485	2.466
Air Voids %.....:	8.0	6.8	5.4	4.1	3.1
Density Lbs.....:	145.5	146.4	147.4	148.4	148.7
Stability @ 140 Deg F..:	2908	2842	2900	3125	3013
Flow 0.01 In.....:	6.8	7.3	8.0	9.2	10.7
VMA.....:	15.1	15.1	15.0	14.8	15.1

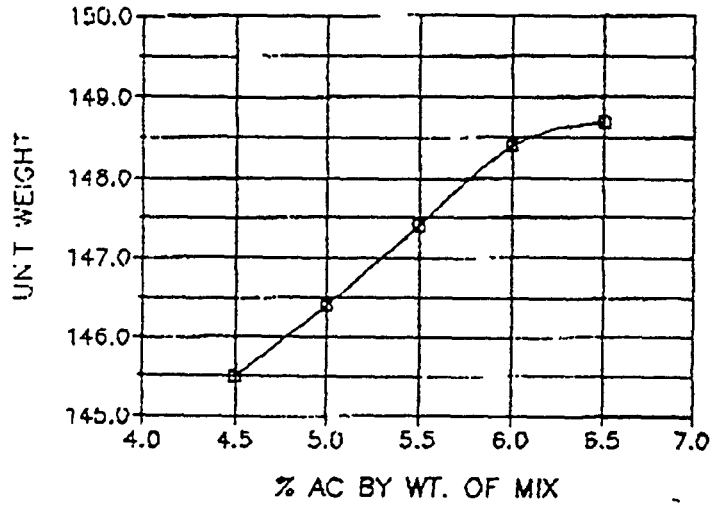
Asphalt Material.....:	85-100	
Asphalt Source.....:	KOCH	
Specific Gravity.....:	1.031	
Recommended AC Binder :		
Recommended AC Surface:	6.0	
Density lbs/cu ft.....:	148.4	
Density Max Spg.....:	2.485	
TSR @ Blow Count.....:	98 @ 34	0.75% KLING BATA ADDED
Blow/Side (Beveled)...:	75	
Mix Temp/Degrees F....:	275-310	

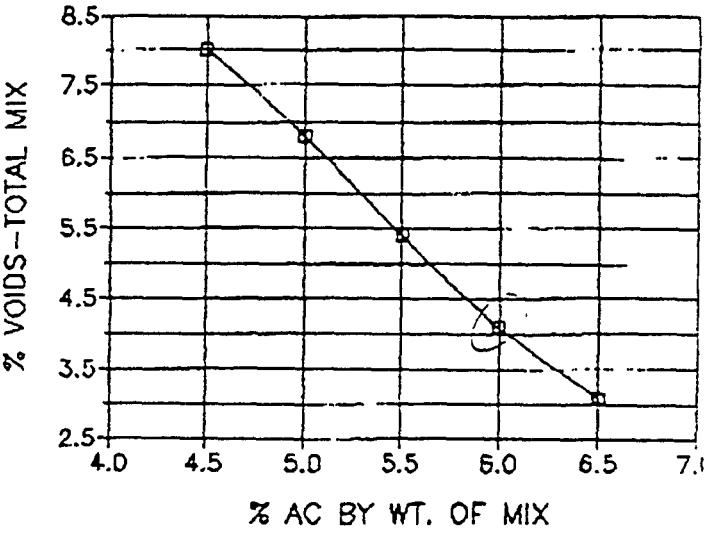
* Since this design is material specific, the conclusions and recommendatio
contained within are obtained from material submitted to and subjected to
observations under laboratory conditions. Adjustments may become necessary
when field laboratory data is obtained from plant produced mix. No guarante
or warranty is implied or offered.

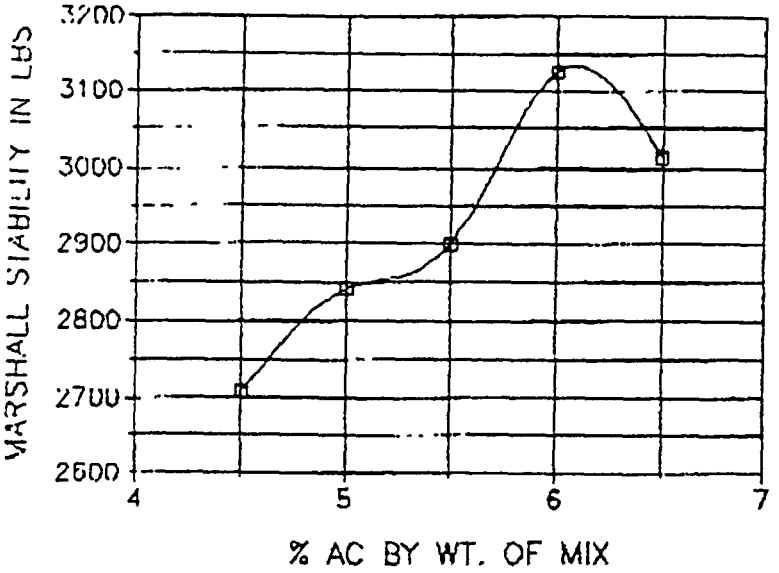
Gail D. Jensen PE
Materials Engineer.

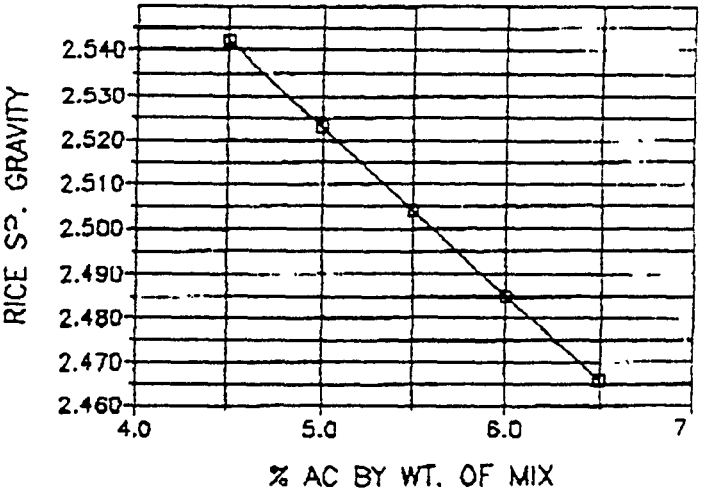
BITUMINOUS MIX DESIGN PRESENTATION REPORT DATE: 06/10/92

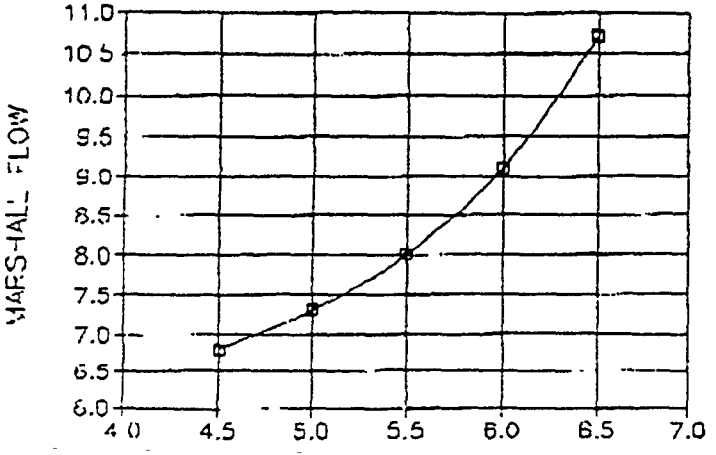
KIRBY--HWY12 1021-09-82 SURFACE GRADE #3

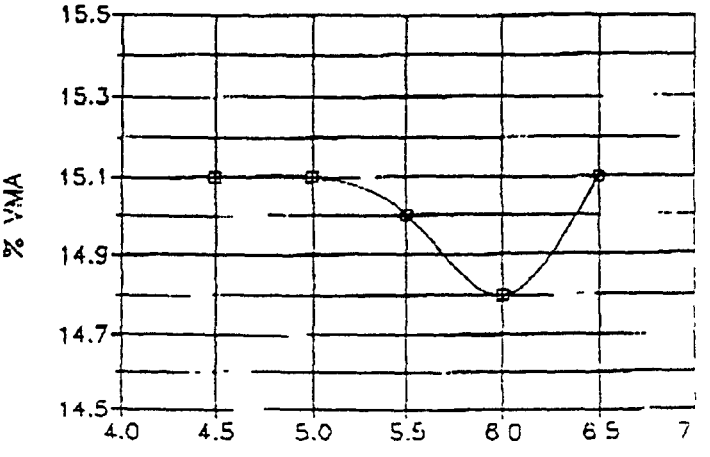








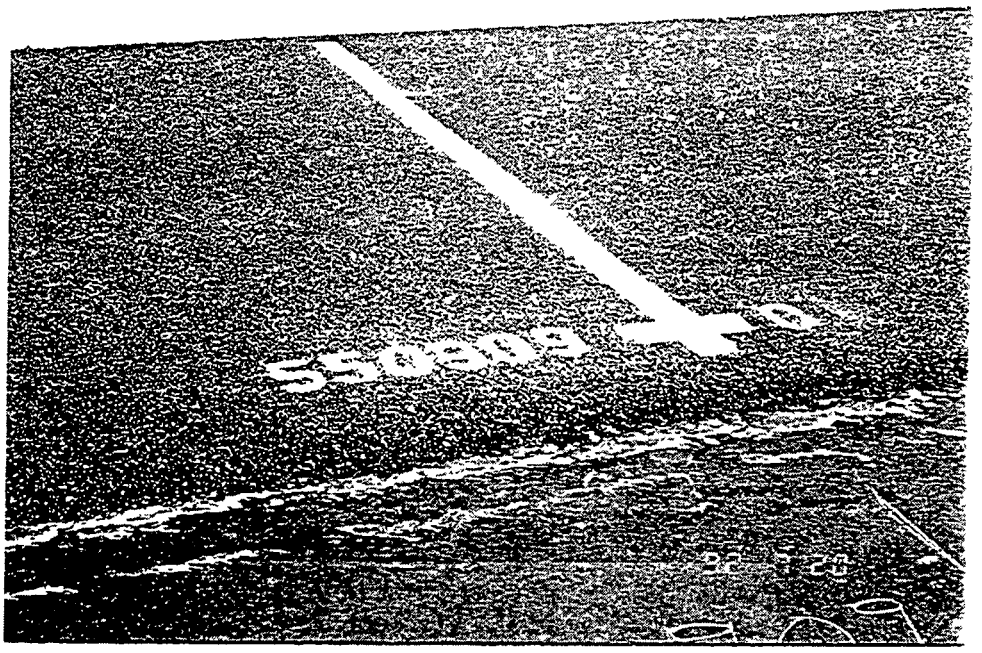




Photos

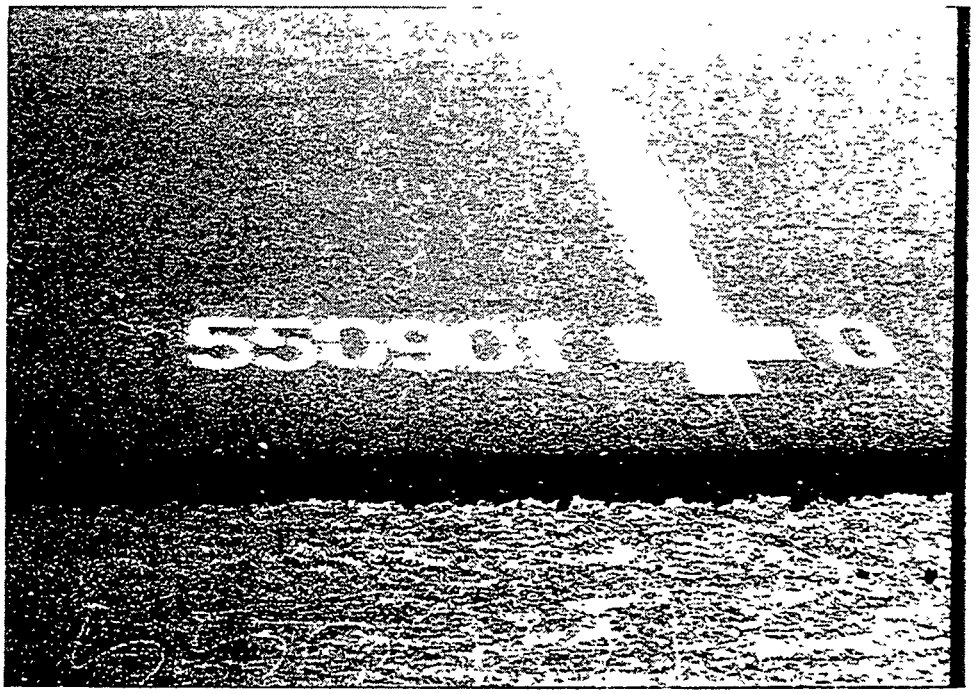
Section 550902
Nuclear Density Testing in test pit

Section 550902
Joint Repair in Passing Lane Prior to Overlay

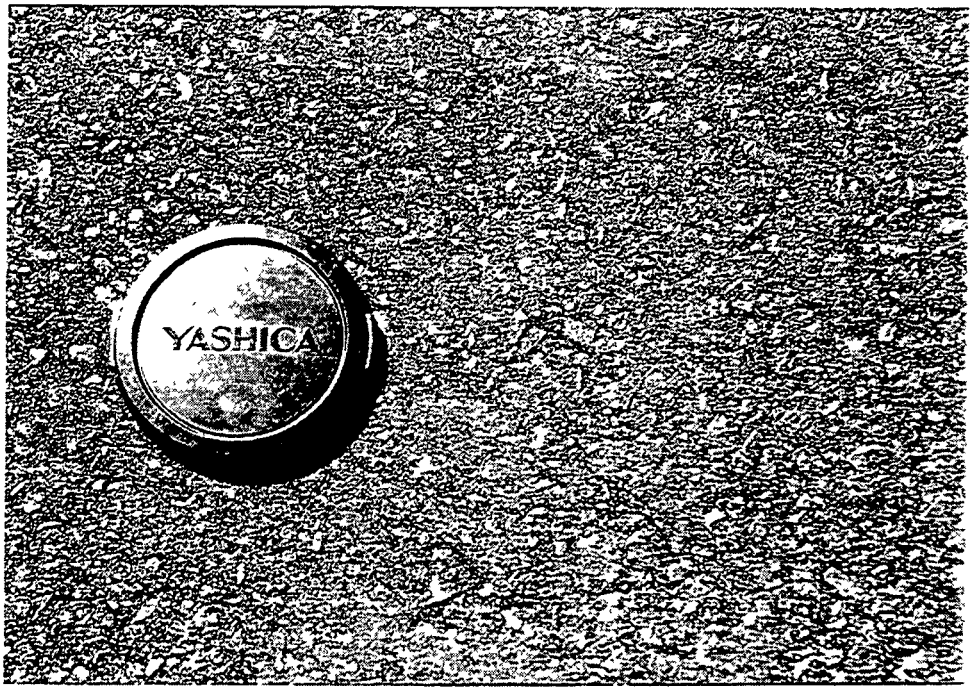


Section 550909
SMA Polymer Modified Mix

Section 550907
SMA Surface Mix



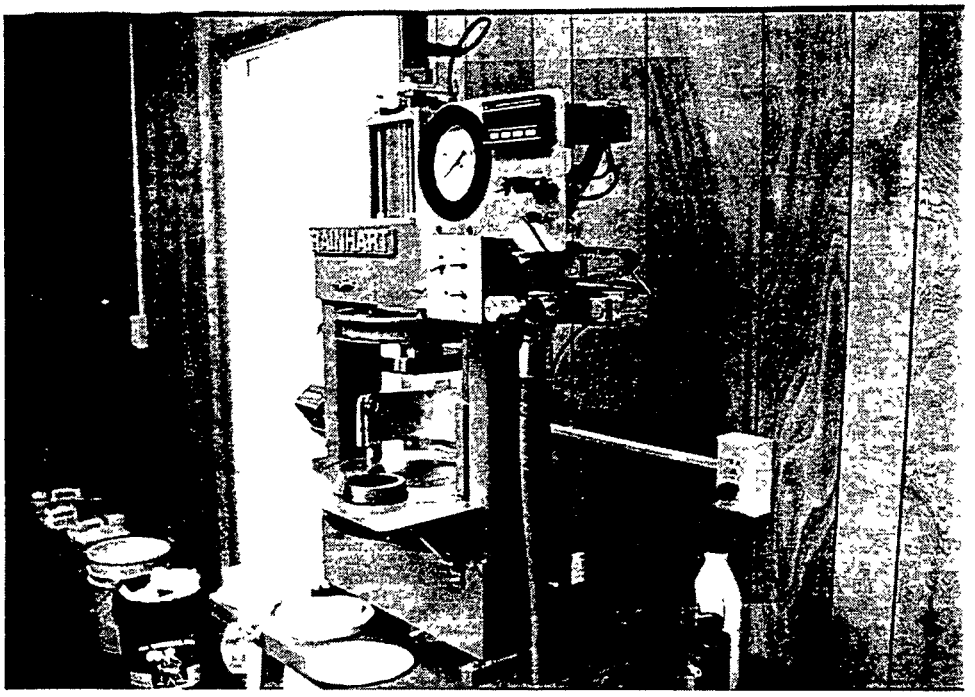
Section 550901
Wisconsin Standard Mix



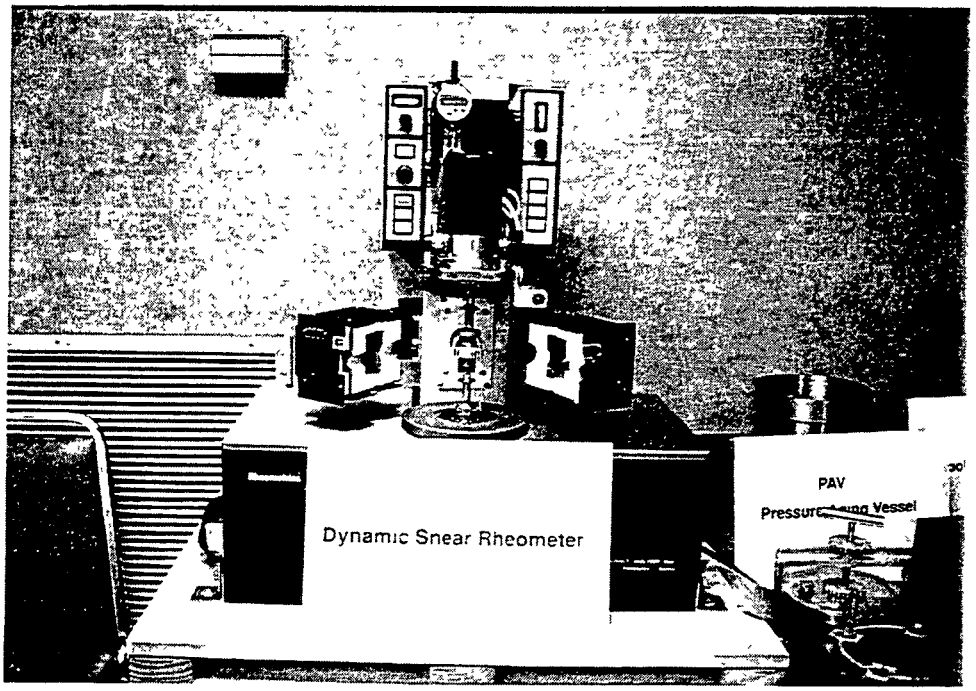
Section 550901
Wisconsin Standard Mix

Section 550902
SHRP SUPERPAVE Mix

Section 550902
SHRP SUPERPAVE Mix



Gyratory Compactor at Open House



Dynamic Shear Rheometer at Open House