SPS-9 Construction Report
I-43 Near Milwaukee, WI
Sections 55A901 to 55A909
and
Sections 55B901 to 55B909

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-9A project included the Wisconsin DOT standard mix, the SHRP SUPERPAVE mix, three SMA mix surface mixtures, and a mixture combining the SUPERPAVE aggregate blend with Wisconsin (unmodified) asphalt binder. Figure 1 shows the Wisconsin SPS-9A layout.

The Wisconsin SPS-9B project also included the Wisconsin DOT standard mix, the SHRP SUPERPAVE mix, three SMA mix surface mixtures, and a mixture combining the SUPERPAVE aggregate blend with Wisconsin (unmodified) asphalt binder. Figure 2 shows the Wisconsin SPS-9A layout.

Project Details

This Wisconsin SPS-9A and 9B projects were constructed in 1992 and are located in the northbound and southbound driving lanes of I-43 near Milwaukee, Wisconsin (see Figure 3 for project location). The project involved the overlay of a divided concrete roadway. The SPS experiments each consisted of six test sections as described above, and are built in the wet-freeze zone. Subgrade soils on the project are silty sand.

The typical sections for the project are shown in Figure 5. The concrete joints and cracks were repaired first, and the asphalt leveling, binder and surface mixtures placed in various thicknesses. Over the existing nine inches of reinforced concrete pavement, a leveling course varying in thickness from 0.95 to 2.39 inches was placed. Three inches of bituminous base course mixture and 1-1/4 inches of bituminous surface course mixture were placed over the leveling course for both the SPS-9A and 9B sections. Material was placed and compacted according to standard WisDOT specifications. The sections have ten foot bituminous-surfaced shoulders, with no edge drains.

? Not shown on Plans or Table 1

The SPS-9A is located on I-43 northbound, which carries an average ADT of 42,200 with 10 percent trucks. The estimated design traffic in the SHRP lane is 11,920,900 18K ESAL applications over the 20-year design period. The SPS-9B is located on I-43 southbound, which carries the same traffic: an average ADT of 42,200 with 10 percent trucks. The estimated design traffic in the SHRP lane is 11,920,900 18K ESAL applications over the 20-year design period.

There were no known deviations from project guidelines. All test sections were located between Highway 164 and County Road Y near Milwaukee. No weather station has been installed, but one is scheduled for installation in 1994. A Pat DAW 100 weigh-in-motion system was installed in November of 1992, and is operating near station at station 550+00, and was supplied by Pat Equipment Company in Milwaukee.

Project Coordination

The Wisconsin DOT conducted the materials sampling and testing, and also provided their own Resident Engineer. Ken Kolstad, from the Madison office of Mead and Hunt served as Construction Engineer and Dick Rutzen served as Project Engineer for the DOT. The following people were actively involved in the project:

Wisconsin Department of Transportation:

Steve Shober, SHRP Coordinator
Wisconsin DOT
3502 Kinsman Blvd
Madison, WI 53704
(608) 246-5395

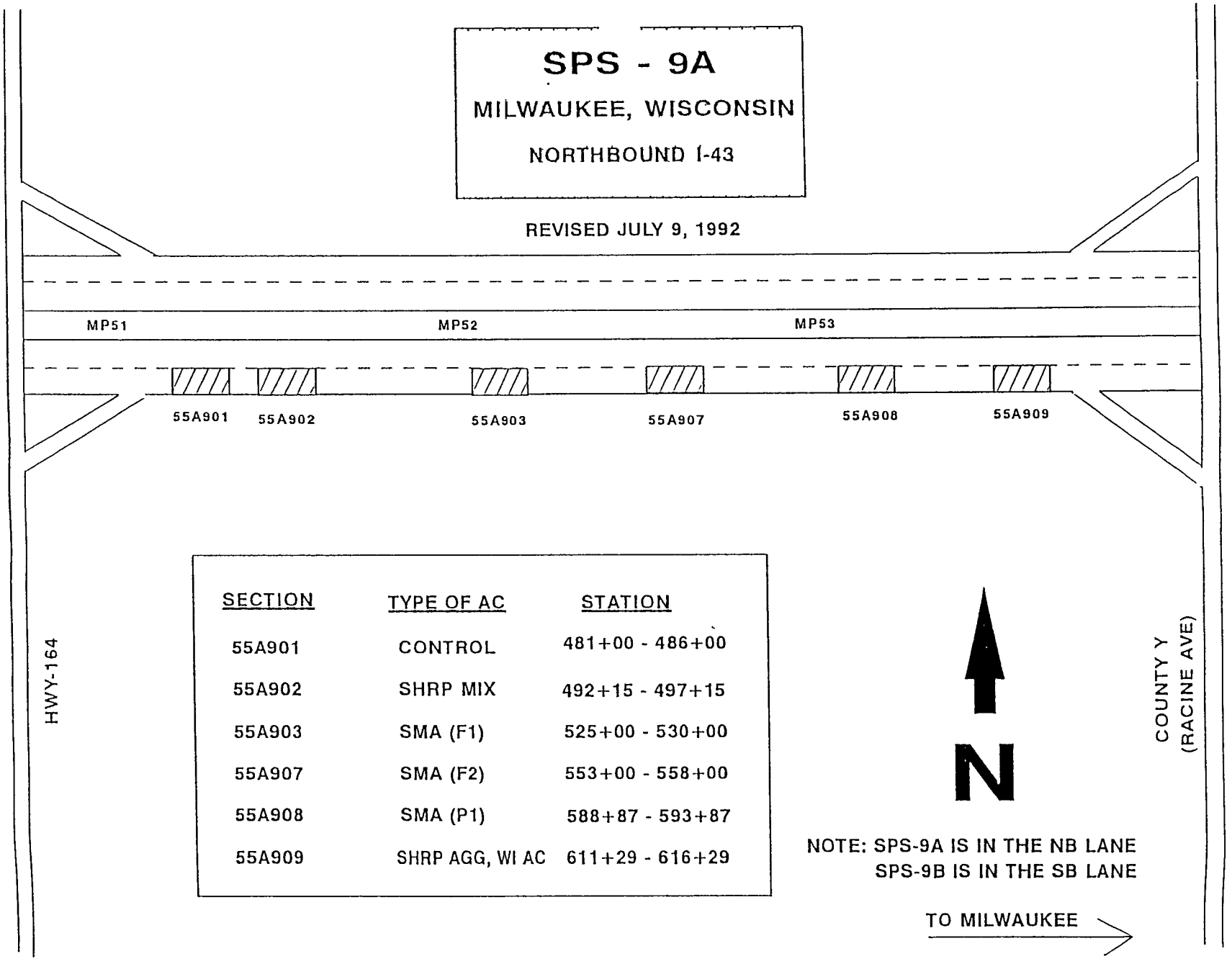
Ken Kolstad
Mead and Hunt, Inc.
6501 Watts Road - Suite 101
Madison, WI 53719-1361
(608) 273-6380

Dick Rutzen
Leonard Makowski
Wisconsin DOT - District 2
2000 Pewaukee Road
Suite A
Waukesha, WI 53188
(414) 548-5695

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



SECTION	TYPE OF AC	STATION
55A901	CONTROL	481+00 - 486+00
55A902	SHRP MIX	492+15 - 497+15
55A903	SMA (F1)	525+00 - 530+00
55A907	SMA (F2)	553+00 - 558+00
55A908	SMA (P1)	588+87 - 593+87
55A909	SHRP AGG, WI AC	611+29 - 616+29

Figure 1. SPS-9A Project Layout

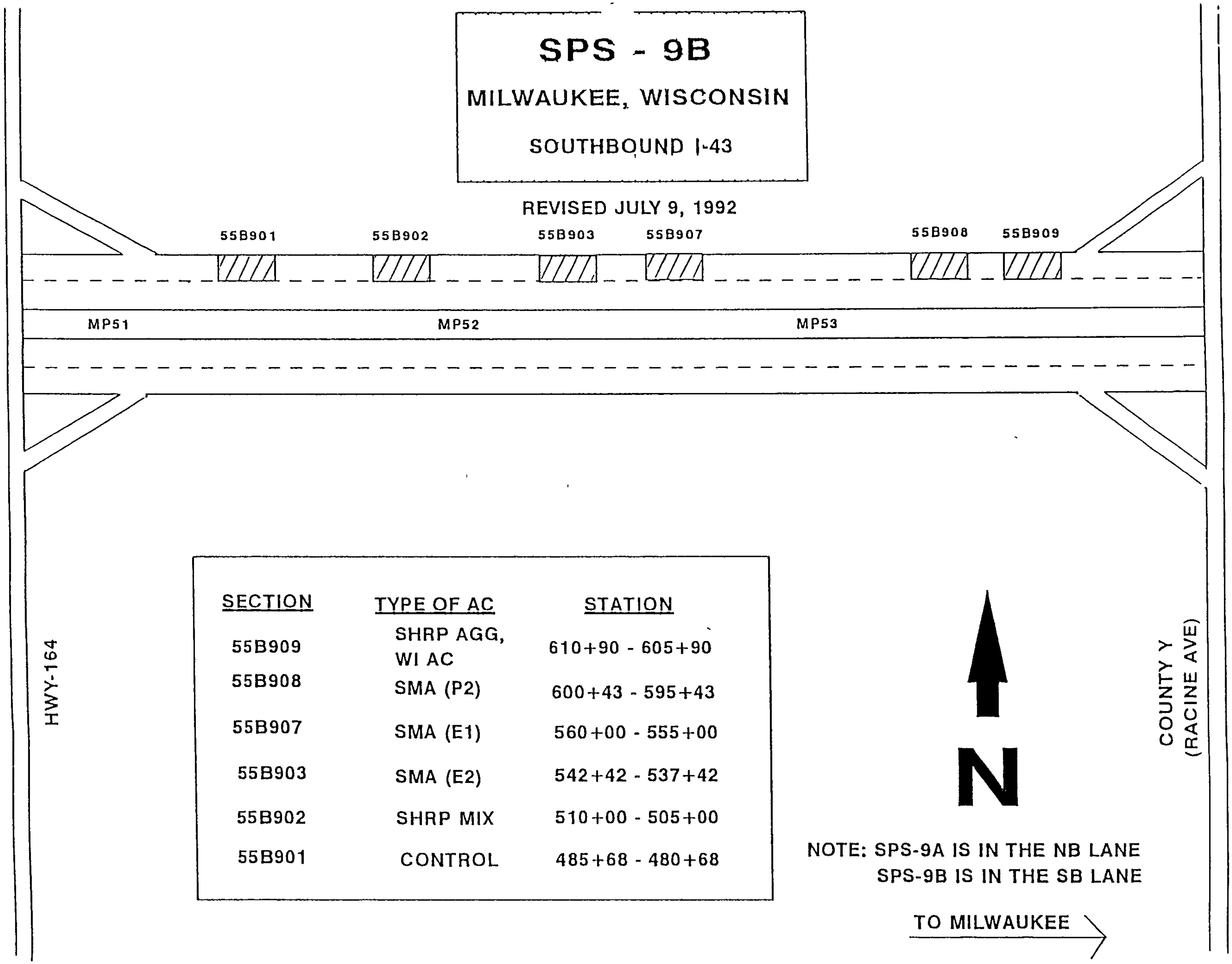


Figure 2. SPS-9B Project Layout

The general contractor for this project was:

Payne and Dolan Construction
P.O. Box 781
Waukesha, WI 53187
Phone: (414) 524-1732

Payne and Dolan Construction performed all of the work required for the construction of the SPS-9A and 9B projects. Jack Weigel, P.E. served as their project manager for the project.

Layout

Figures 1 and 2 shows the section layouts, and Tables 1 and 2 give a description of the sections.

Table 1. Wisconsin SPS-9A Section Layout

Construction Station	SHRP ID	Description	Base Thickness (in.)	Surface Thickness (in.)
481+00 - 486+00	55A901	WisDOT Mix	1-1/2 - 2	1-1/2
492+15 - 497+15	55A902	SHRP Mix	1-1/2 - 2	1-1/2
525+00 - 530+00	55A903	SMA (F1)	1-1/2 - 2	1-1/2
553+00 - 558+00	55A907	SMA (F2)	1-1/2 - 2	1-1/2
588+87 - 593+87	55A908	SMA (P1)	1-1/2 - 2	1-1/2
611+29 - 616+29	55A909	SHRP Agg, WI AC	1-1/2 - 2	1-1/2

Material Sampling and Testing

The Material Sampling and Testing Plan is shown in Figure 6. WisDOT personnel conducted all sampling and testing and data collection, with assistance from the LTPP North Central Regional Office. Table 3 gives a listing of all samples taken for the project.

Table 2. Wisconsin SPS-9B Section Layout

Construction Station	SHRP ID	Description	Base Thickness (in.)	Surface Thickness (in.)
610+90 - 605+90	55B909	SHRP Agg, WI AC	1-1/2 - 2	1-1/2
600+43 - 595+43	55B908	SMA (P2)	1-1/2 - 2	1-1/2
560+00 - 555+00	55B907	SMA (E1)	1-1/2 - 2	1-1/2
542+42 - 537+42	55B903	SMA (E2)	1-1/2 - 2	1-1/2
510+00 - 505+00	55B902	SUPERPAVE	1-1/2 - 2	1-1/2
485+68 - 480+68	55B901	WisDOT Mix	1-1/2 - 2	1-1/2

Construction

Construction of the SHRP portion of the project began in July of 1992. Joints and cracks in the underlying concrete surface were repaired, and the leveling course on all sections placed the week of July 21st. The binder course was placed beginning July 23rd, and the surface course placed the week of July 27th. The contractor experienced no problems during construction. All work was completed on the test sections, and the roadway opened to traffic in Fall of 1992.

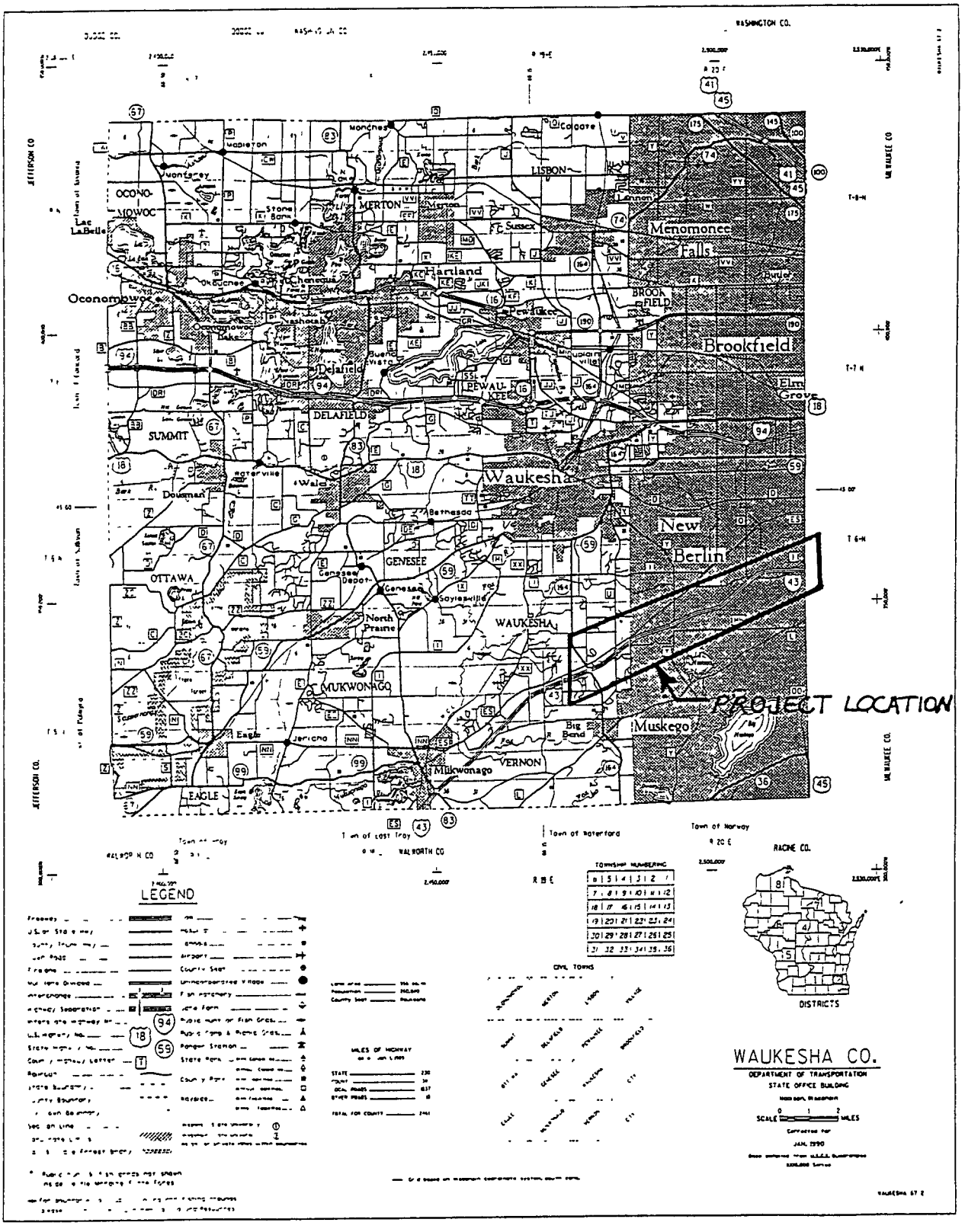


Figure 3. Project Location

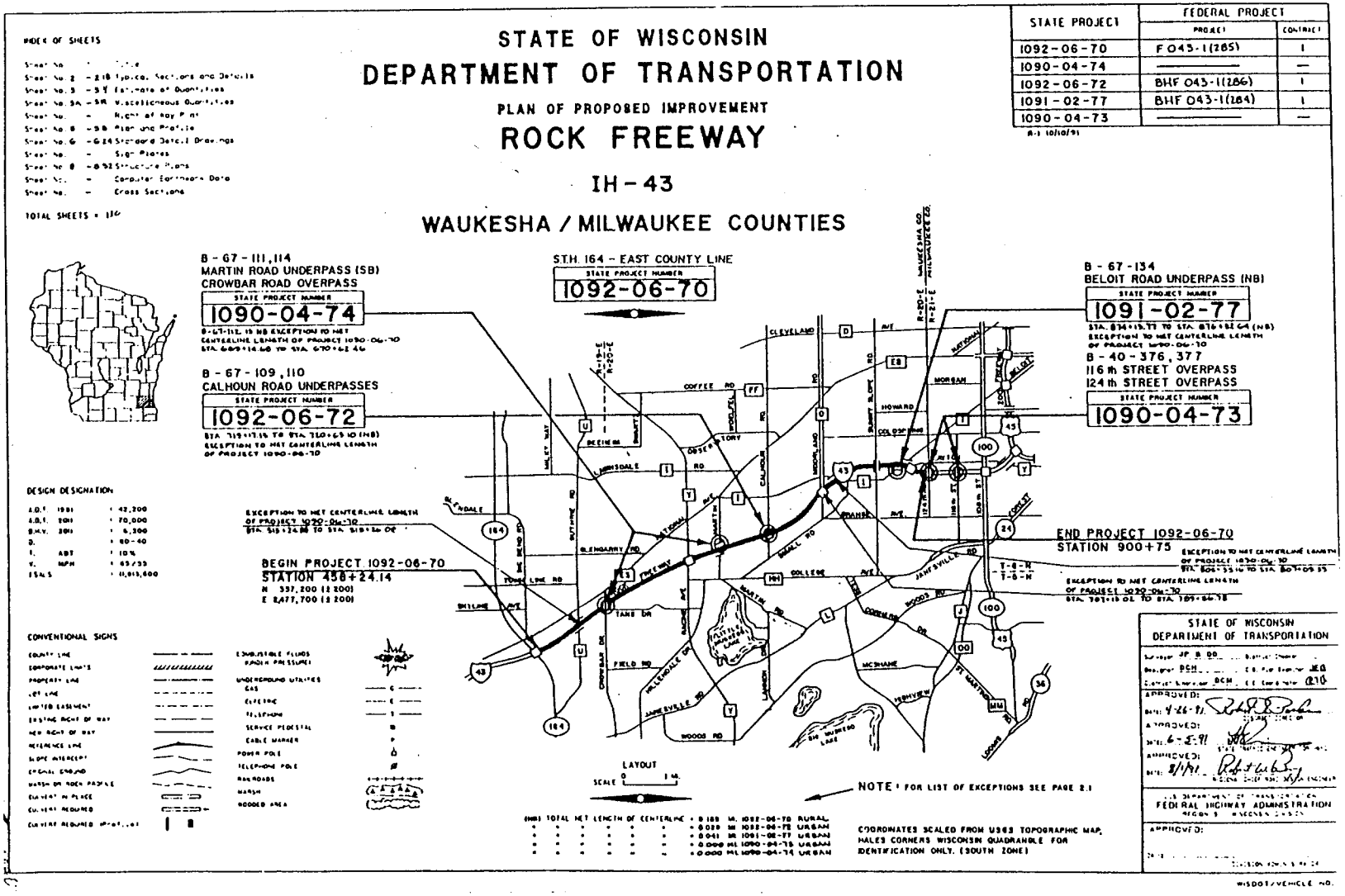


Figure 4. Project Details

Table 3. 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	2	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 SUPERPAVE surface mix design is given in Figure 7. Blend 2 was used for the surface mixture. 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. One unmodified and one 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.

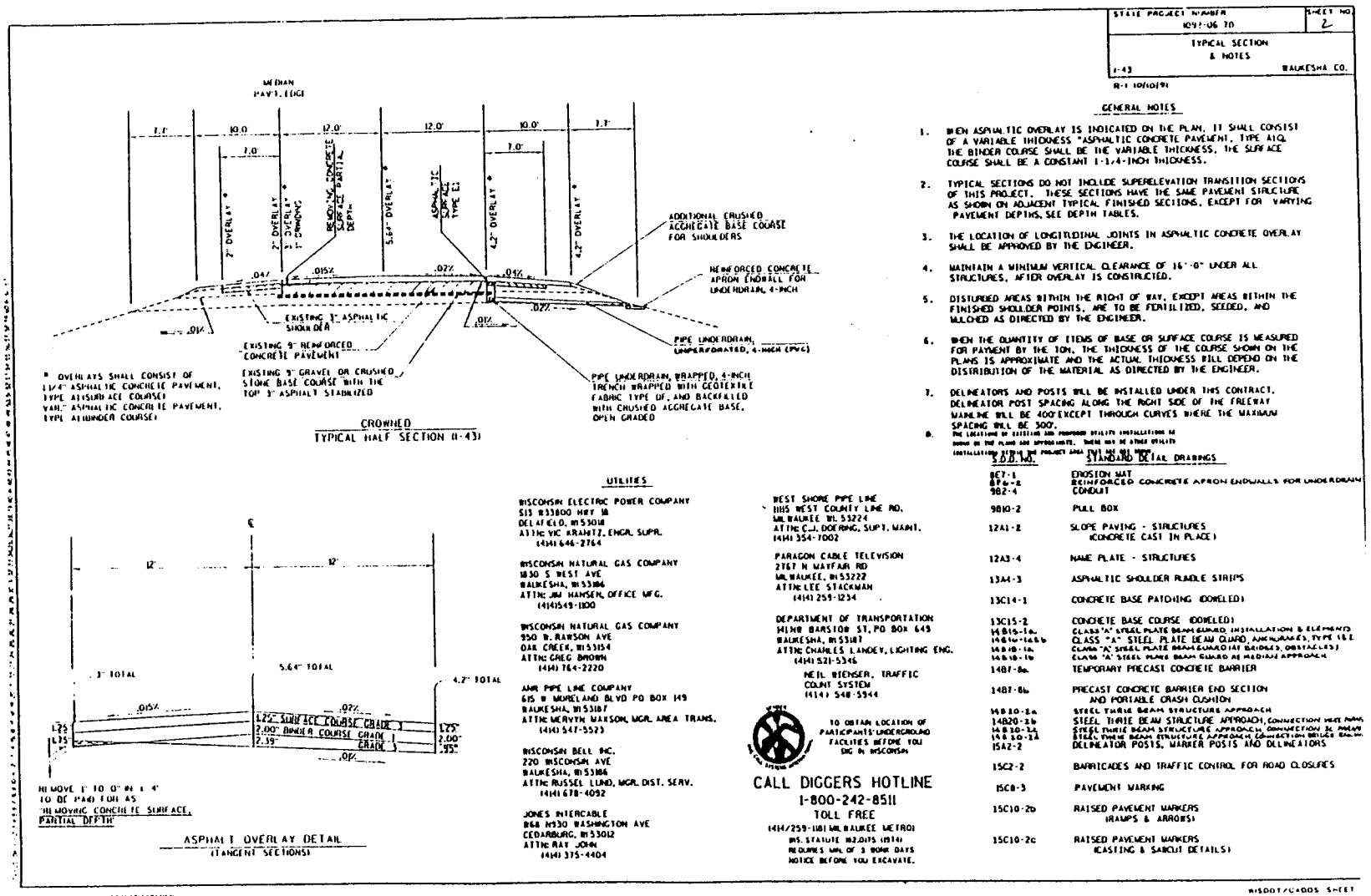


Figure 5. Typical Sections

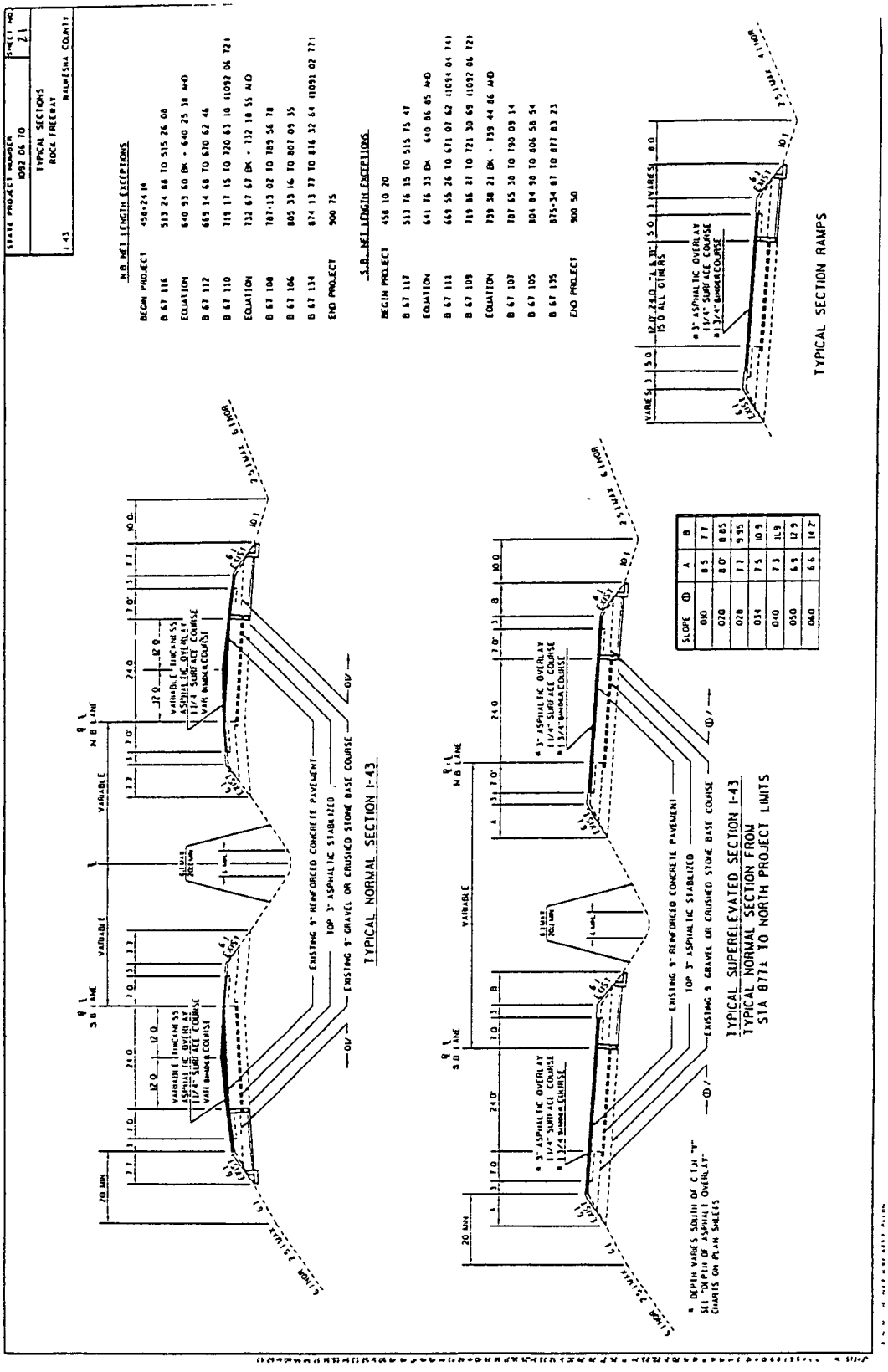
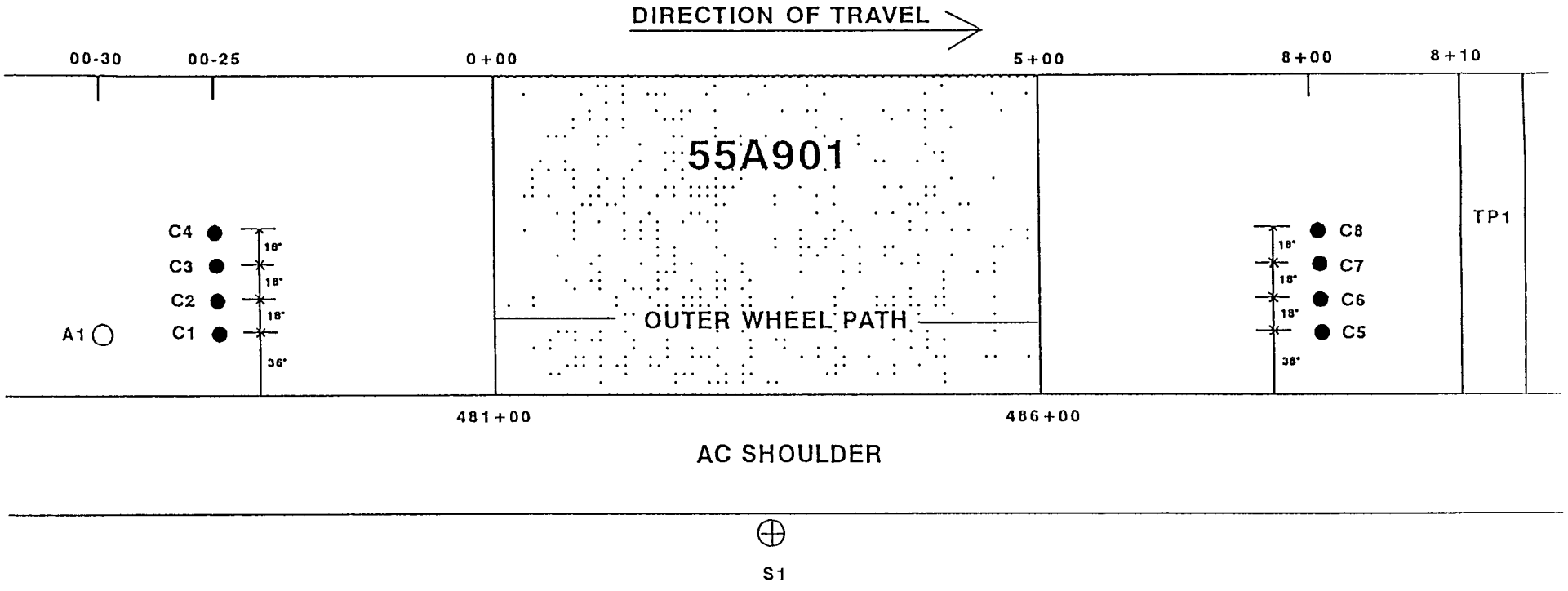


Figure 5. Typical Sections (continued)

Figure 6. Material Sampling and Testing Plan

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9A
MILWAUKEE, WISCONSIN
I-43 NORTHBOUND



● 4" OD CORE OF SURFACE AND UNDERLAIN BOUND BASE.

○ 6" OD CORE OF SURFACE AND UNDERLAIN BOUND LAYER THIN-WALLED TUBE AND/OR SPLITSPOON SAMPLING 4' BELOW TOP OF SUBGRADE.

⊕ SHOULDER PROBE 20' BELOW TOP OF SHOULDER

▭ TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

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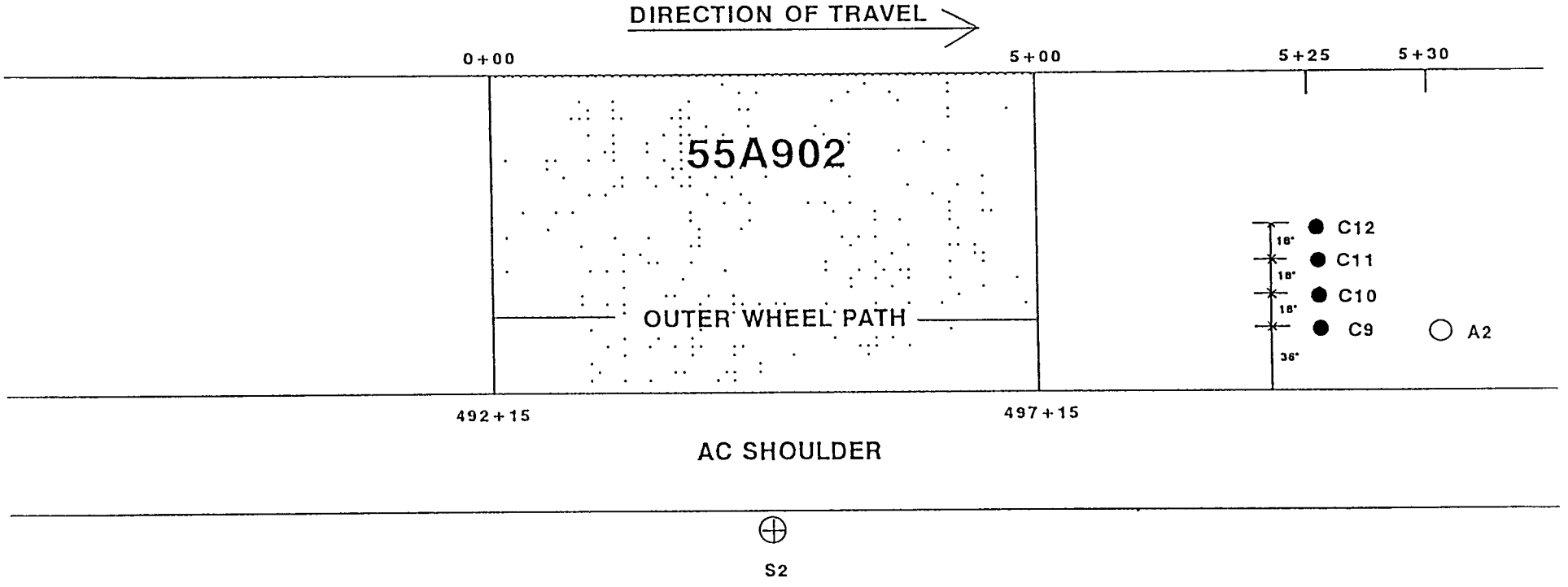
MILWAUKEE, WISCONSIN
I-43 NORTHBOUND



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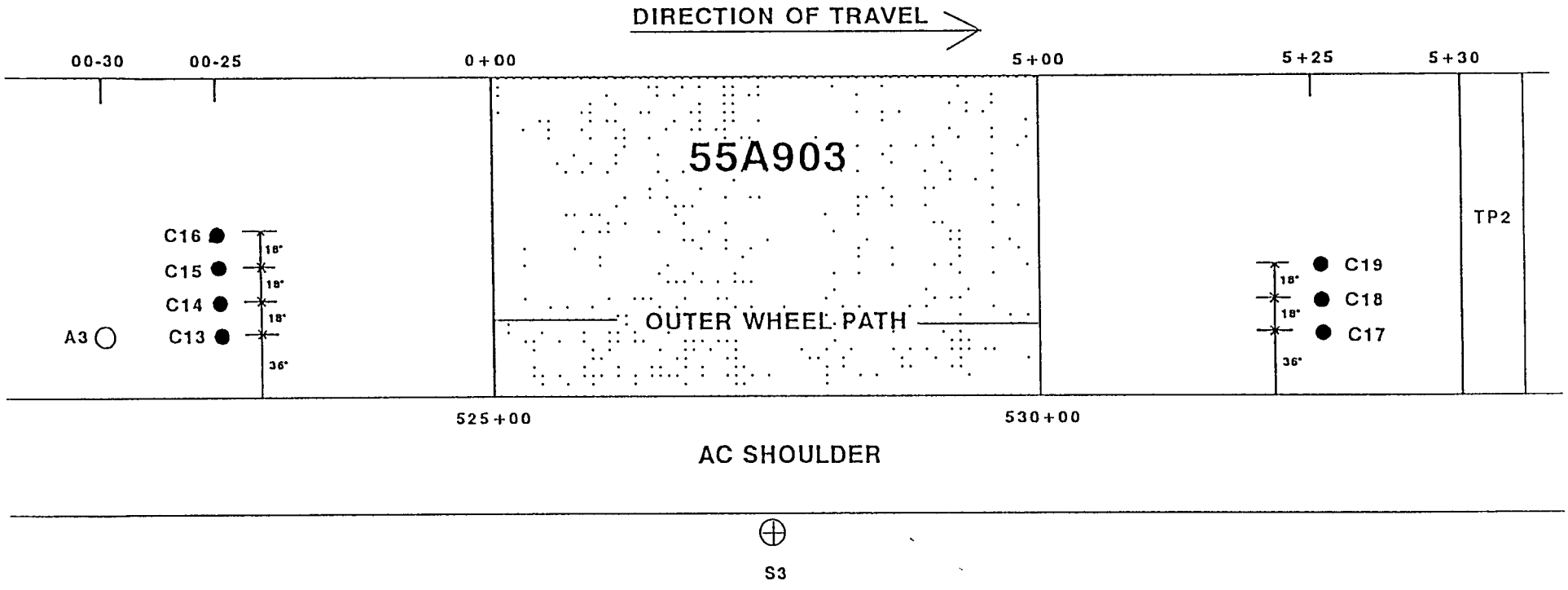

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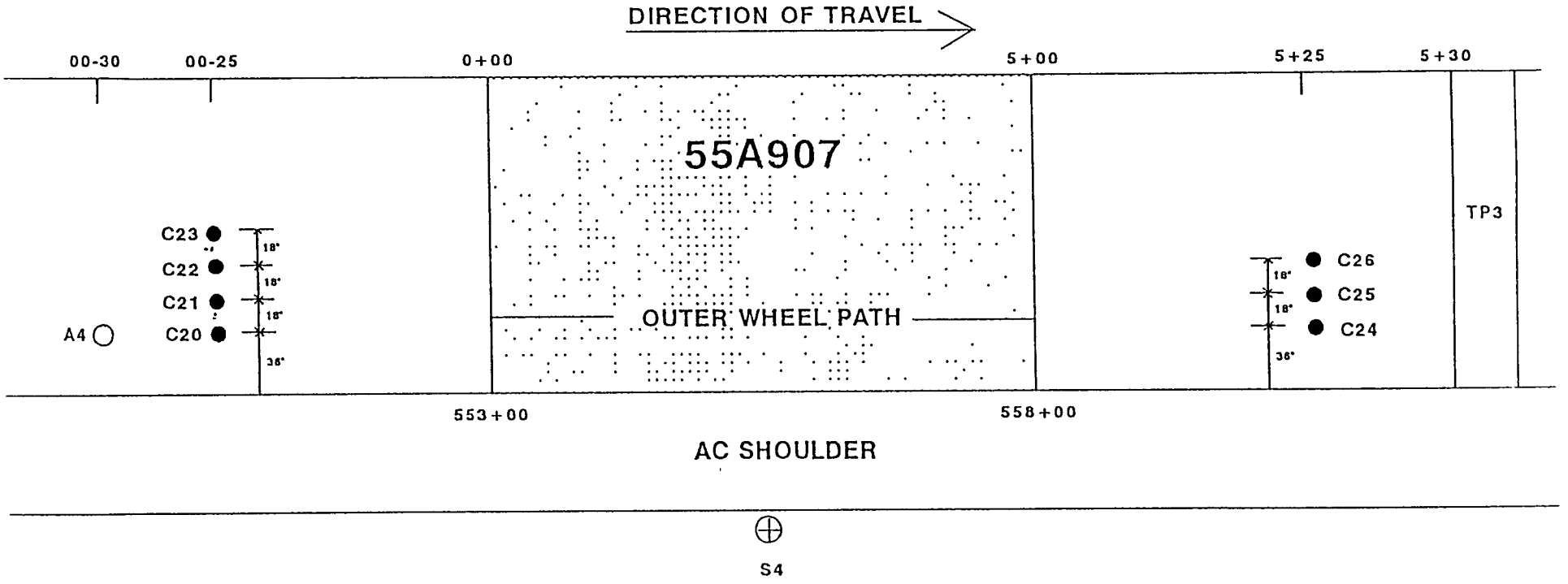

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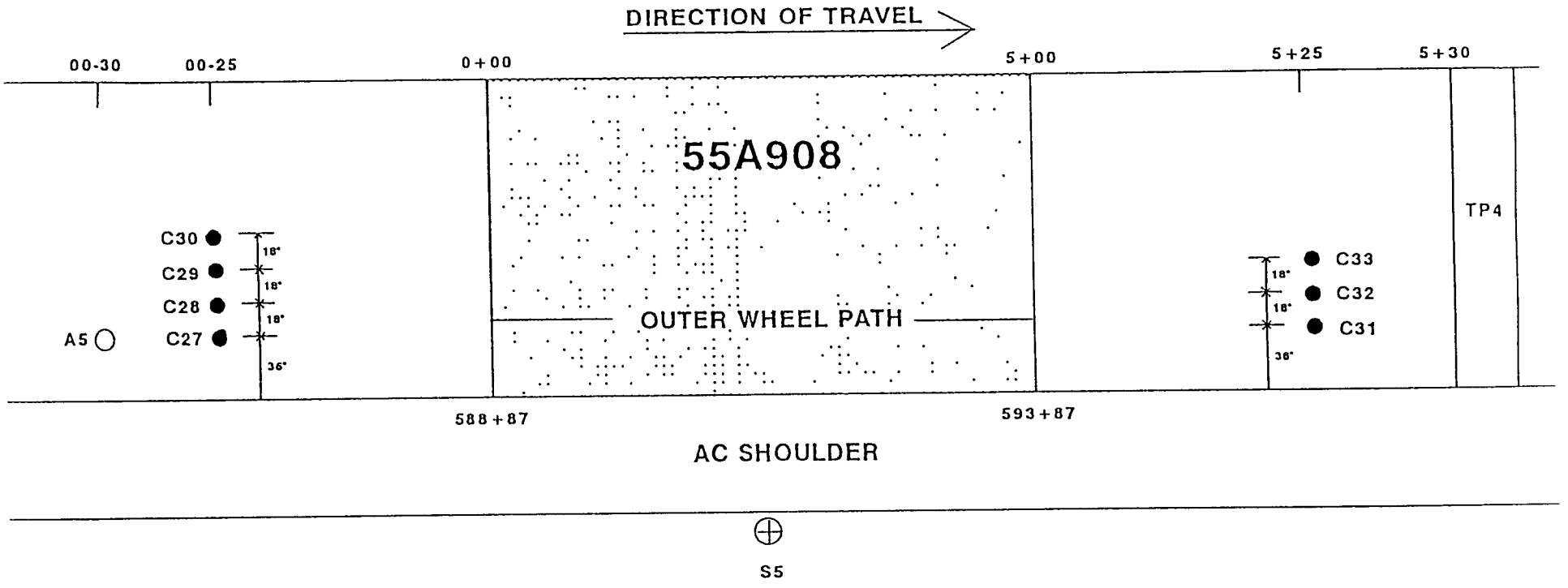

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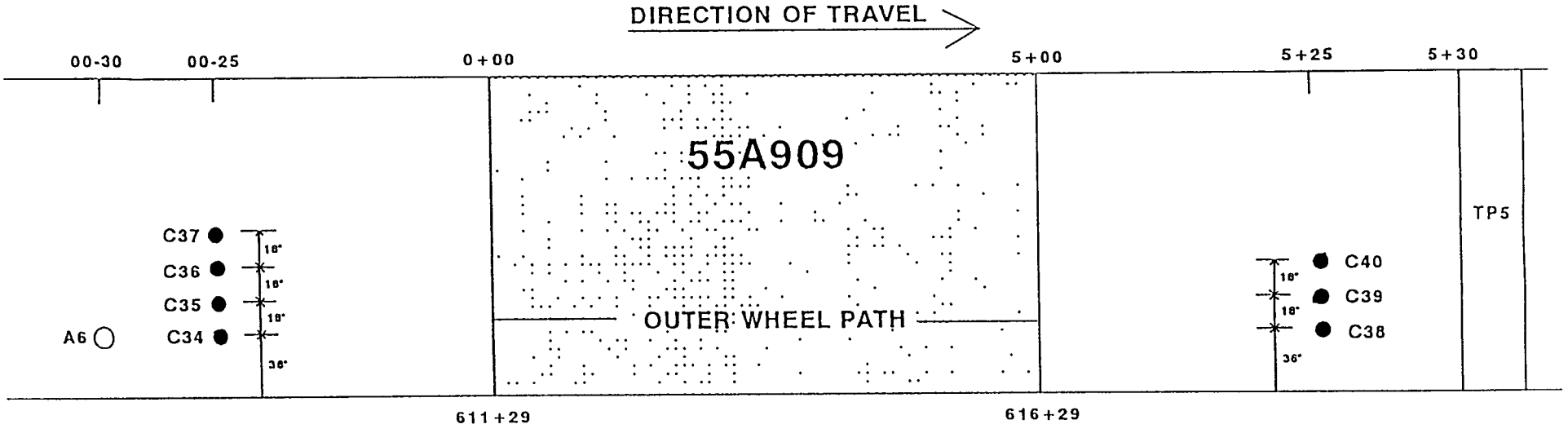

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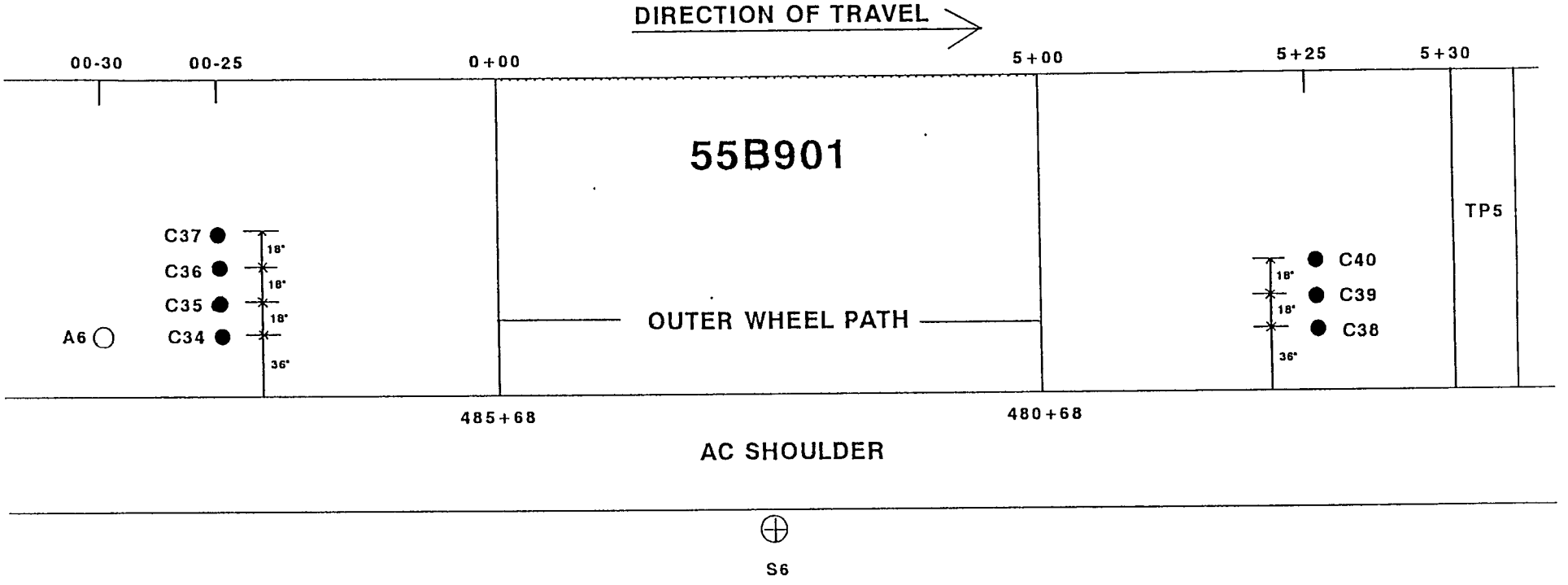

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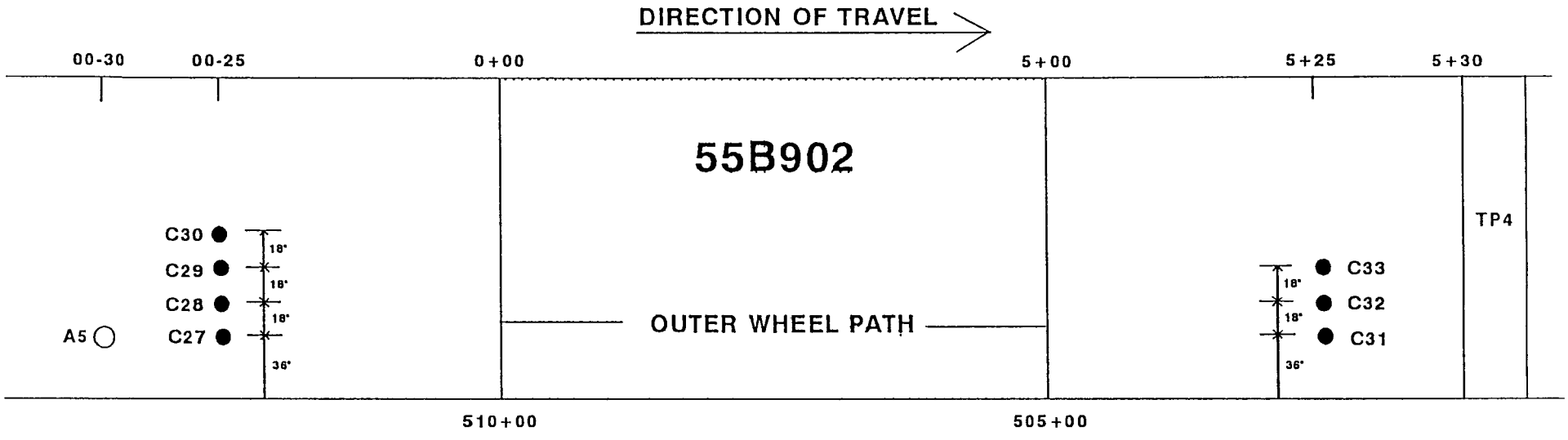

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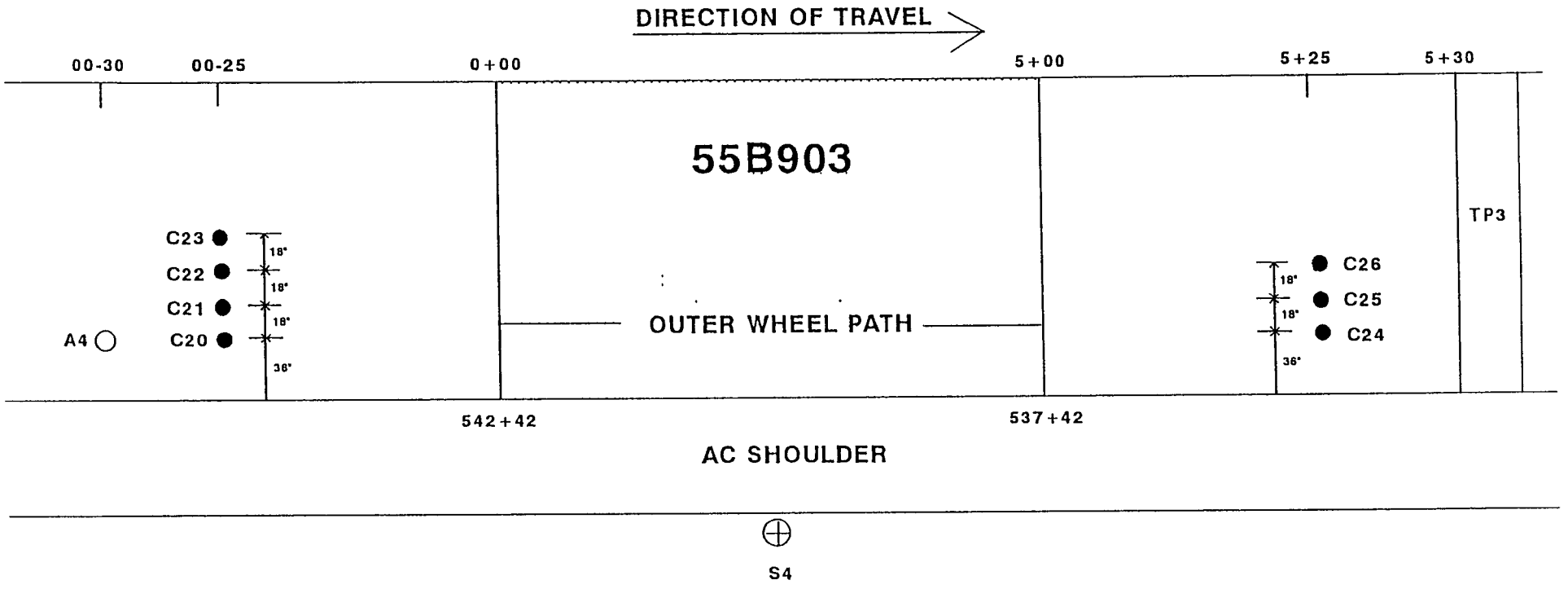

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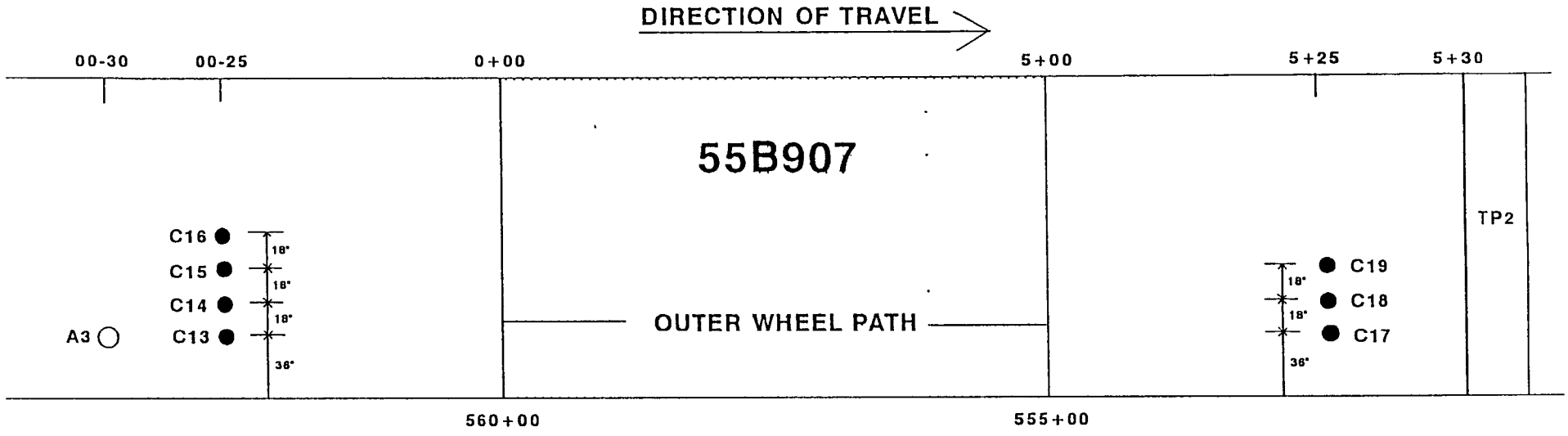

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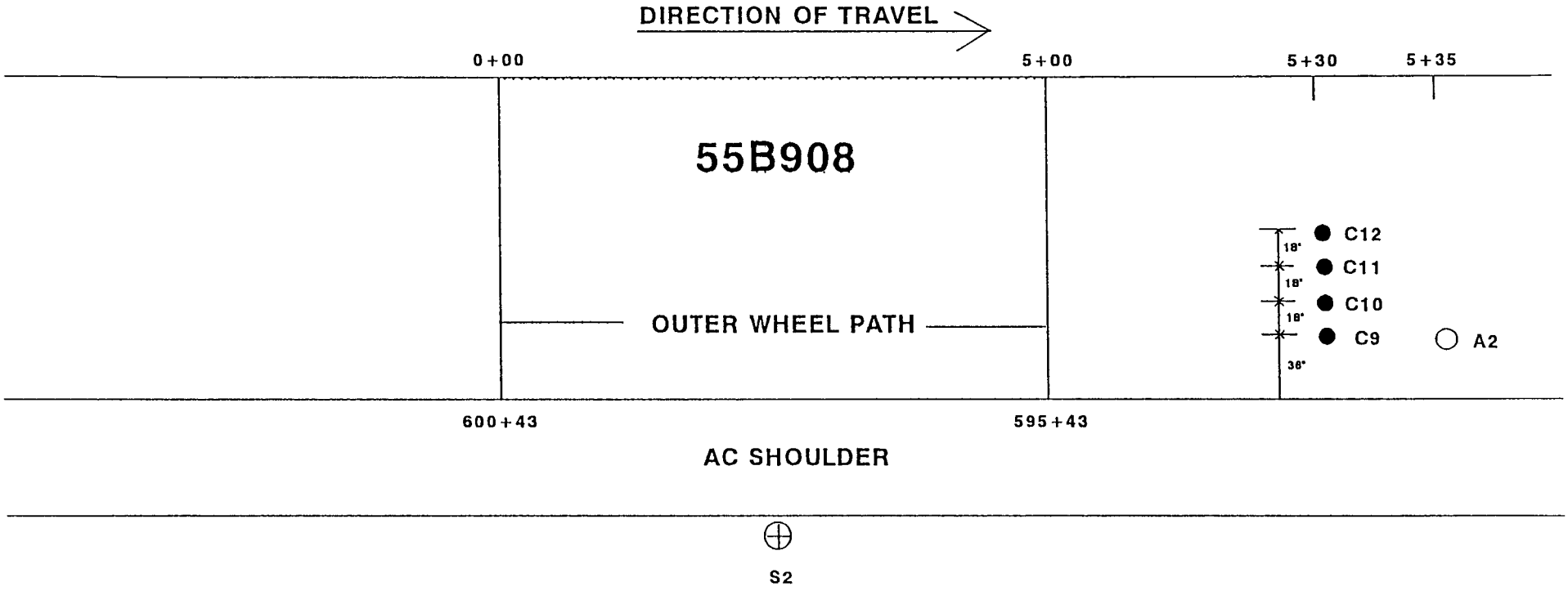

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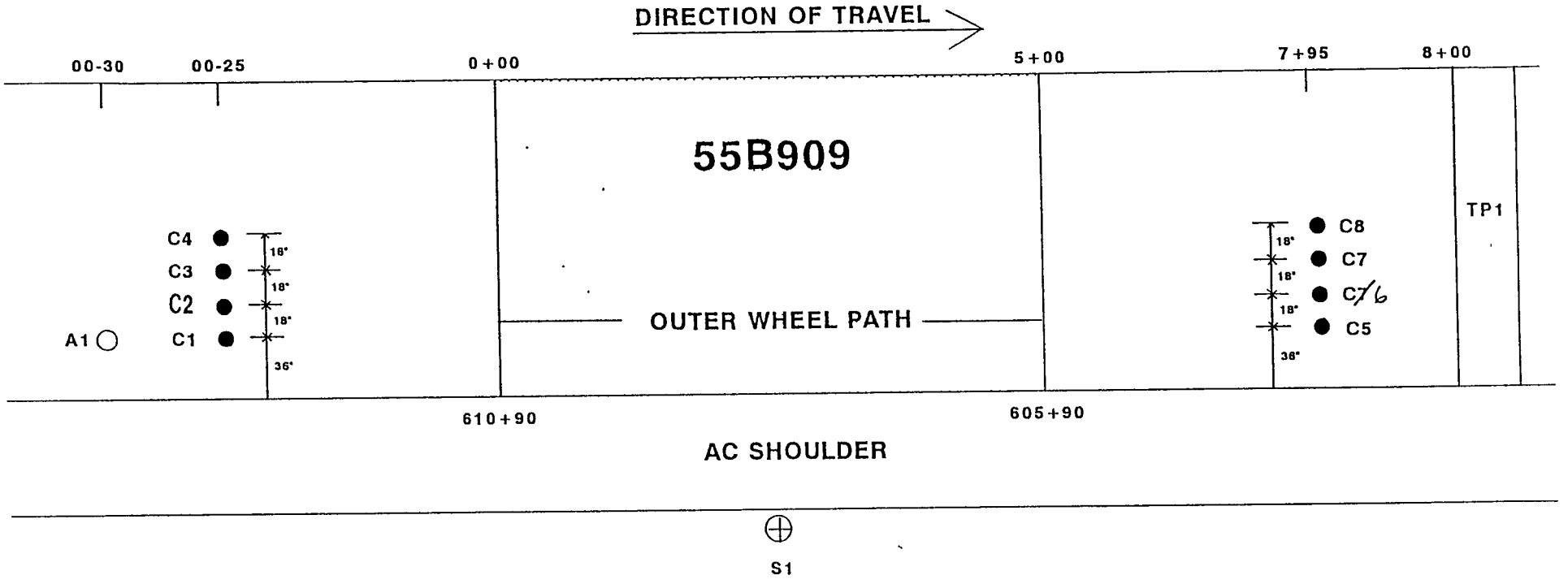

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Figure 7. SUPERPAVE Surface Mix Design

SUMMARY OF TRIAL BLENDS

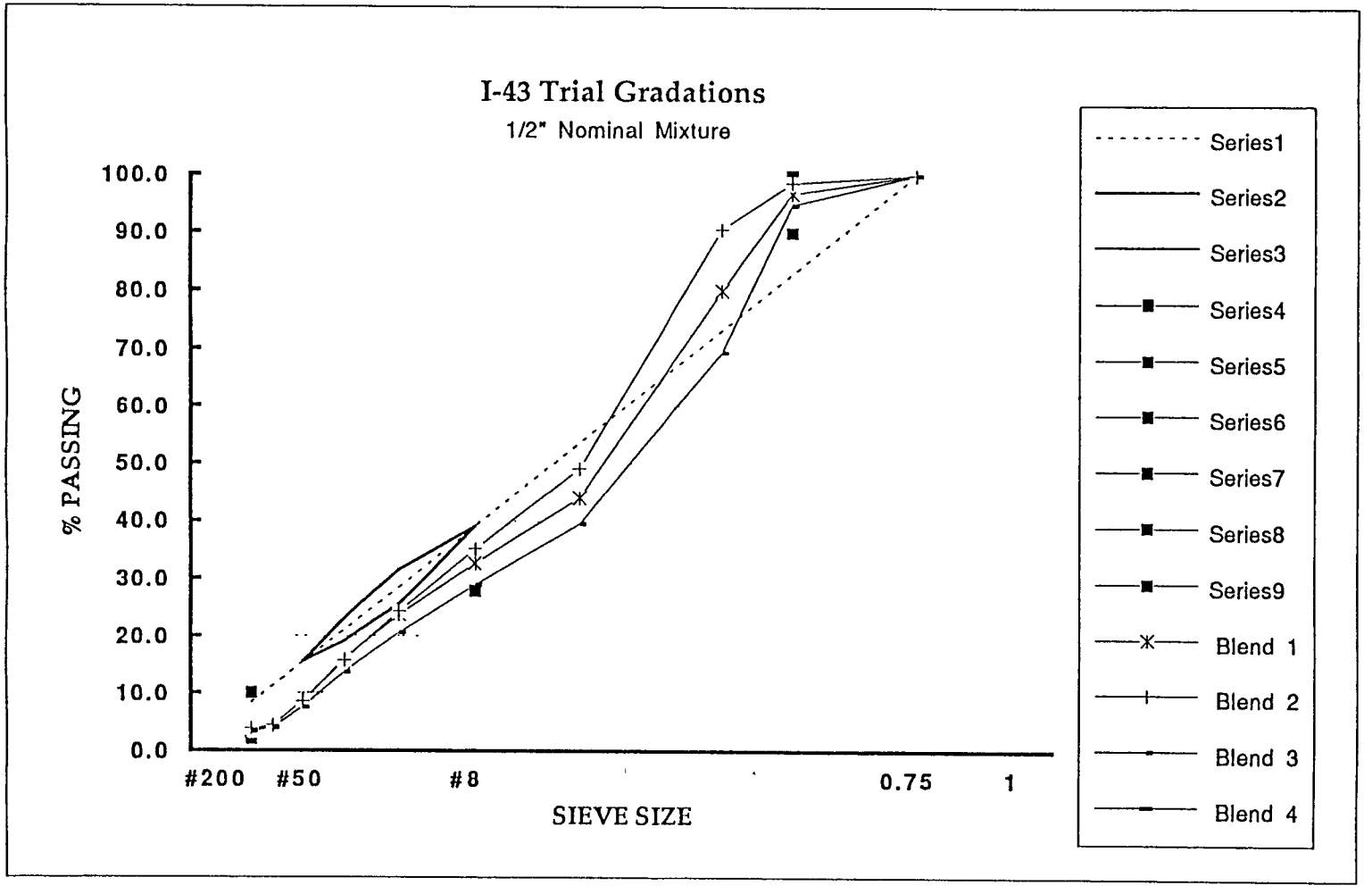
Blend	%AC	%Gmm @ N=10	%Gmm @ N=230	%Gmm @ N=100	%Air Voids	%VMA	%VMA @ 4%Air	Required VMA
1	4.4%	87 4%	97.3%	95.0%	5 0%	13 7%		13.0%
2	4.4%	86 2%	96.1%	93.8%	6 2%	14 8%		13 0%
3	4.4%	87 1%	98.3%	95.7%	4 3%	13.7%		13.0%

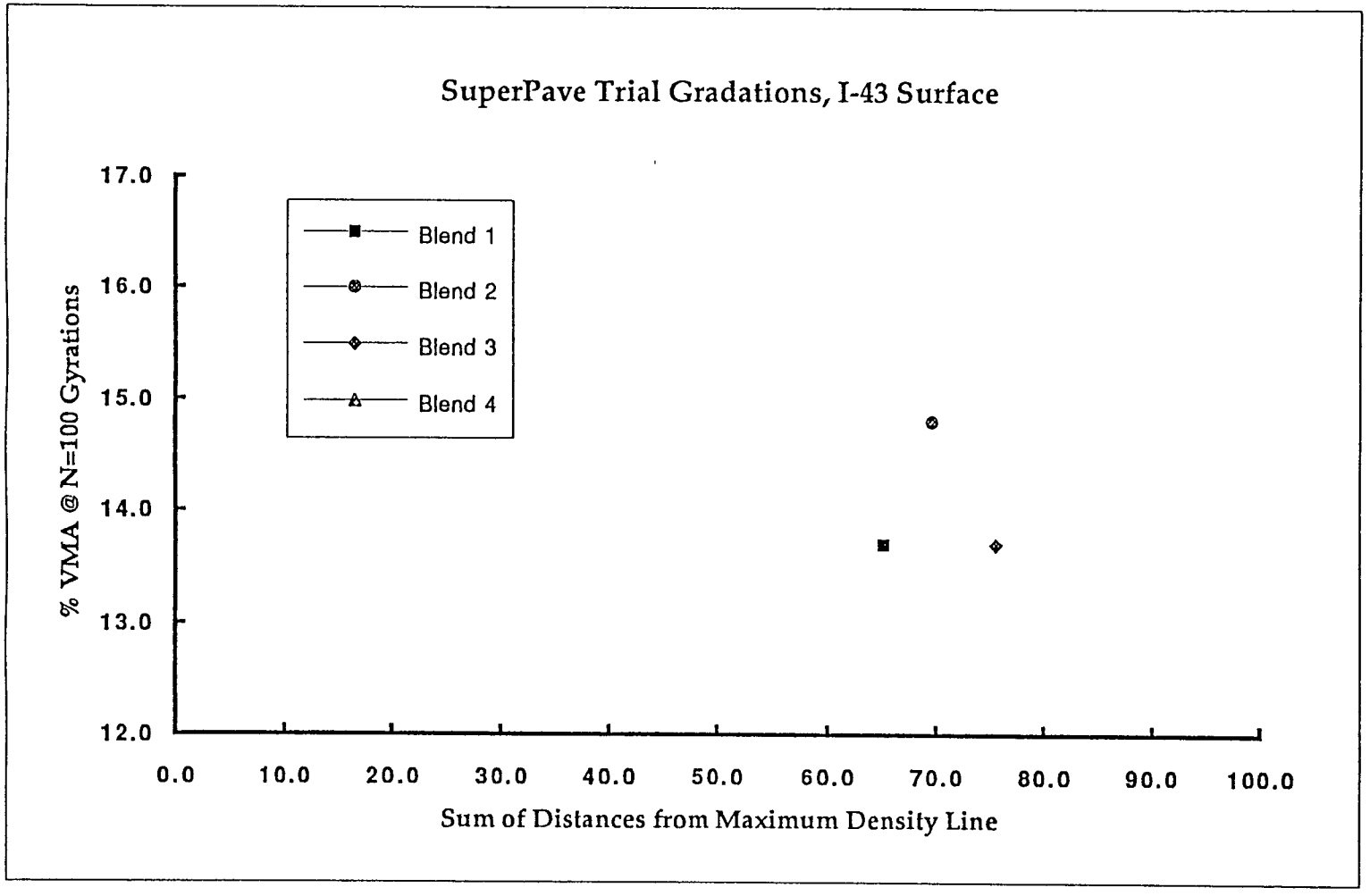
Blend 2 choosen for full mix design

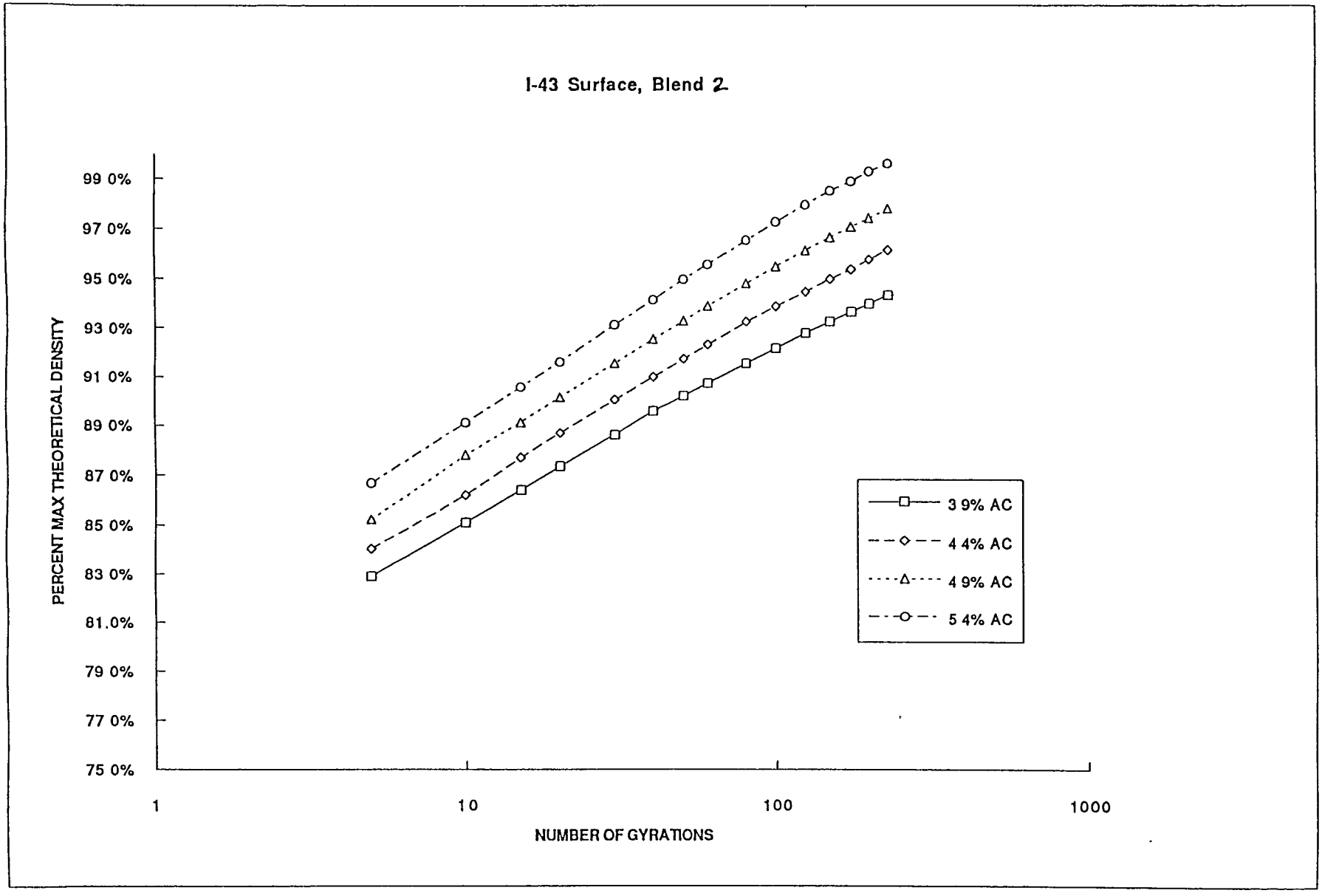
AGGREGATE BLENDING

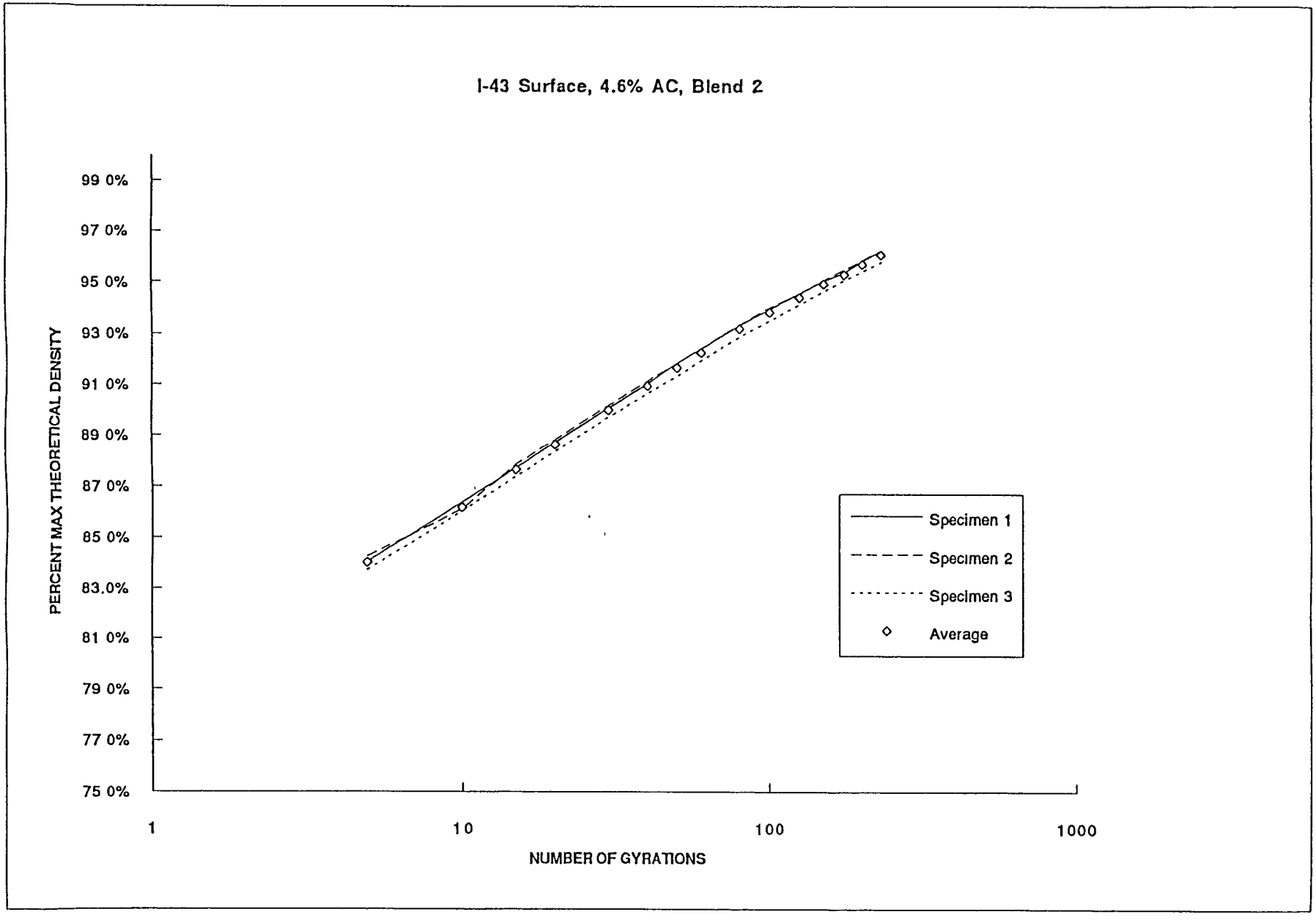
	#1 Stone	1/2" chip	3/8" chip	Mfg sand	Screen sand	
Blend 1	0.0%	25.0%	30.0%	25.0%	20.0%	0.0%
Blend 2	0.0%	10.0%	40.0%	35.0%	15.0%	0.0%
Blend 3	0.0%	40.0%	20.0%	25.0%	15.0%	0.0%
Blend 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

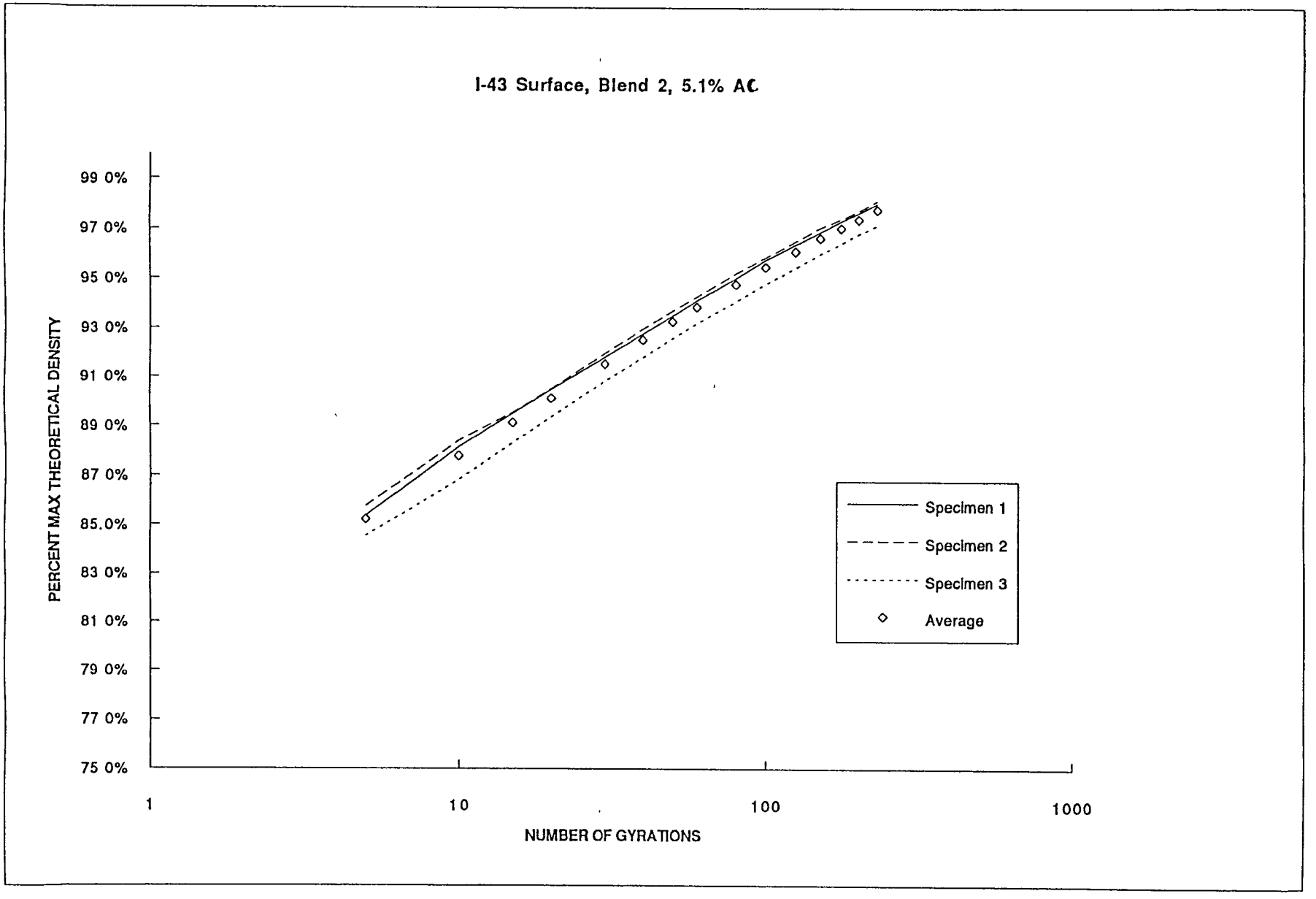
Sieve #	Blend 1 Gradation	Blend 2 Gradation	Blend 3 Gradation	Blend 4 Gradation	Max Dens Gradation
1 in	100.0	100.0	100.0	0.0	100.0
3/4 in	100.0	100.0	100.0	0.0	100.0
1/2 in	96.8	98.7	94.8	0.0	82.8
3/8 in	79.9	90.5	69.4	0.0	73.2
No. 4	44.0	49.1	39.5	0.0	53.6
No. 8	32.8	35.2	29.0	0.0	39.1
No.16	23.8	24.4	20.7	0.0	28.6
No.30	16.0	15.8	13.8	0.0	21.1
No.50	8.7	8.5	7.6	0.0	15.5
No.100	4.4	4.4	4.0	0.0	11.3
No.200	3.5	3.8	3.3	0.0	8.3

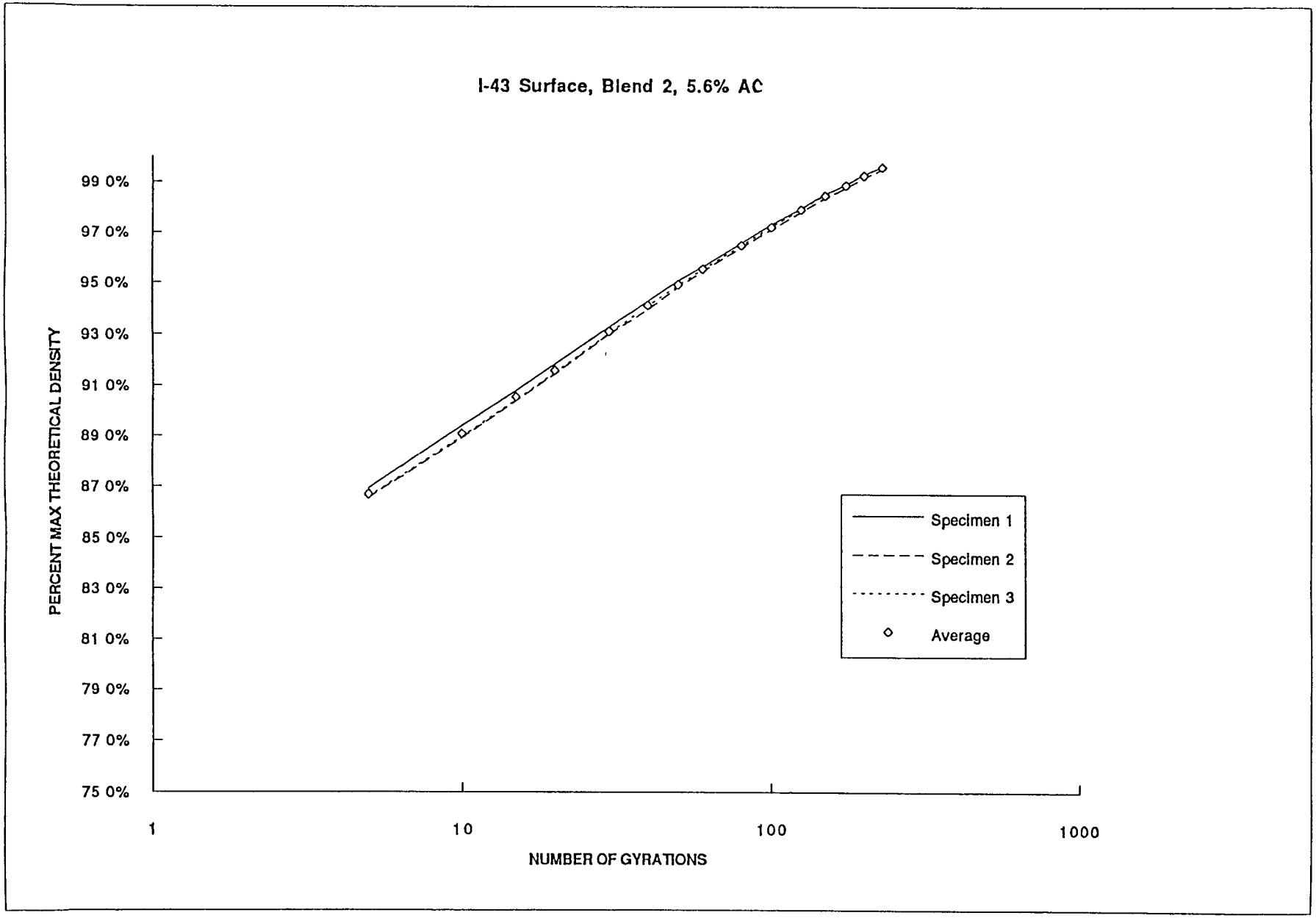

I-43 Trial Gradations
1/2" Nominal Mixture
% PASSING
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
#200
#50
#8
0.75
1
SIEVE SIZE
Series1
Series2
Series3
Series4
Series5
Series6
Series7
Series8
Series9
Blend 1
Blend 2
Blend 3
Blend 4

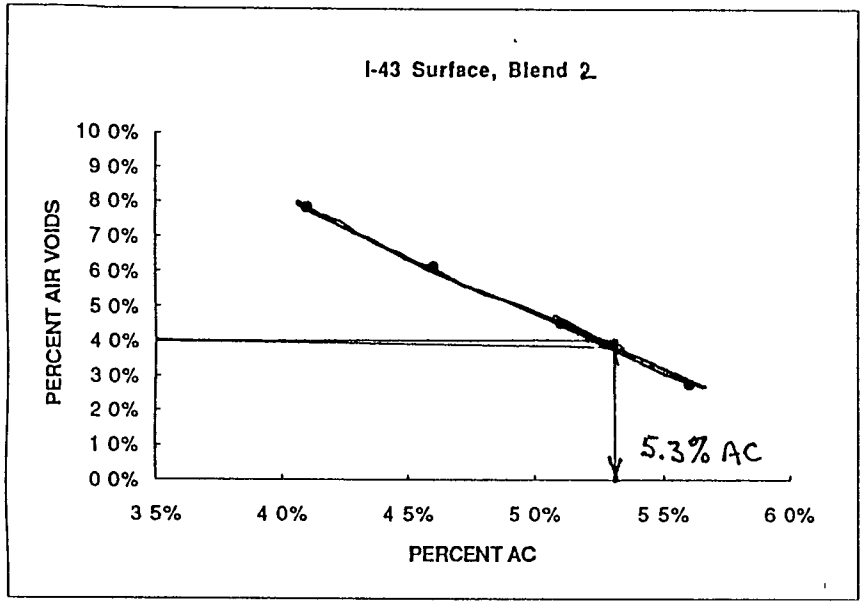

SuperPave Trial Gradations, I-43 Surface
% VMA @ N=100 Gyrations
17.0
16.0
15.0
14.0
13.0
12.0
Blend 1
Blend 2
Blend 3
Blend 4
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
Sum of Distances from Maximum Density Line

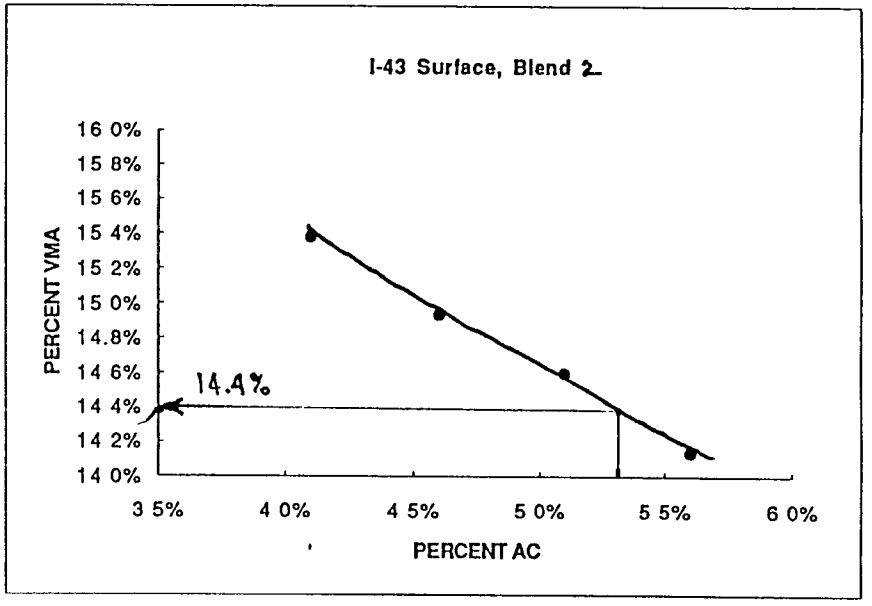

I-43 Surface, Blend 2
PERCENT MAX THEORETICAL DENSITY
99 0%
97 0%
95 0%
93 0%
91 0%
89 0%
87 0%
85 0%
83 0%
81.0%
79 0%
77 0%
75 0%
1
10
100
1000
NUMBER OF GYRATIONS
3 9% AC
4 4% AC
4 9% AC
5 4% AC

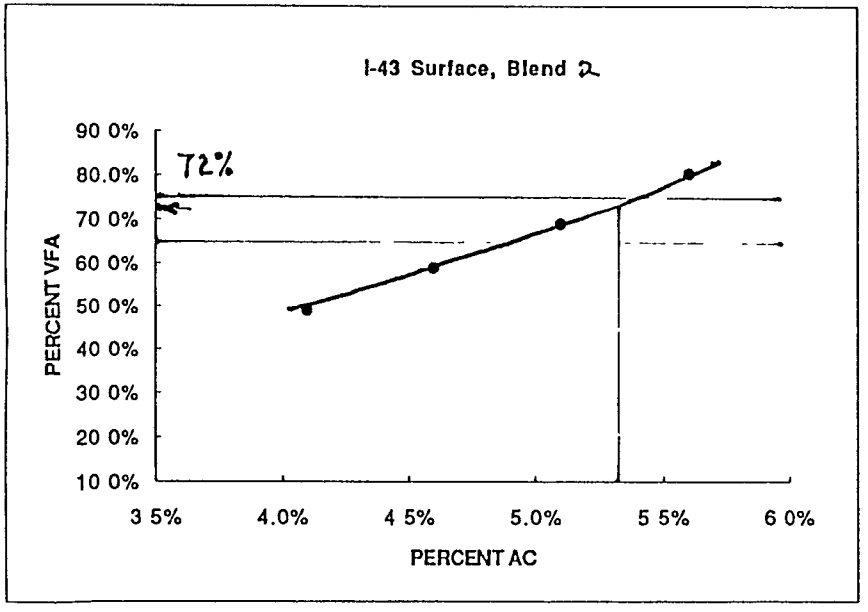

I-43 Surface, 4.6% AC, Blend 2
PERCENT MAX THEORETICAL DENSITY
99 0%
97 0%
95 0%
93 0%
91 0%
89 0%
87 0%
85 0%
83.0%
81 0%
79 0%
77 0%
75 0%
1
10
100
1000
NUMBER OF GYRATIONS
Specimen 1
Specimen 2
Specimen 3
Average

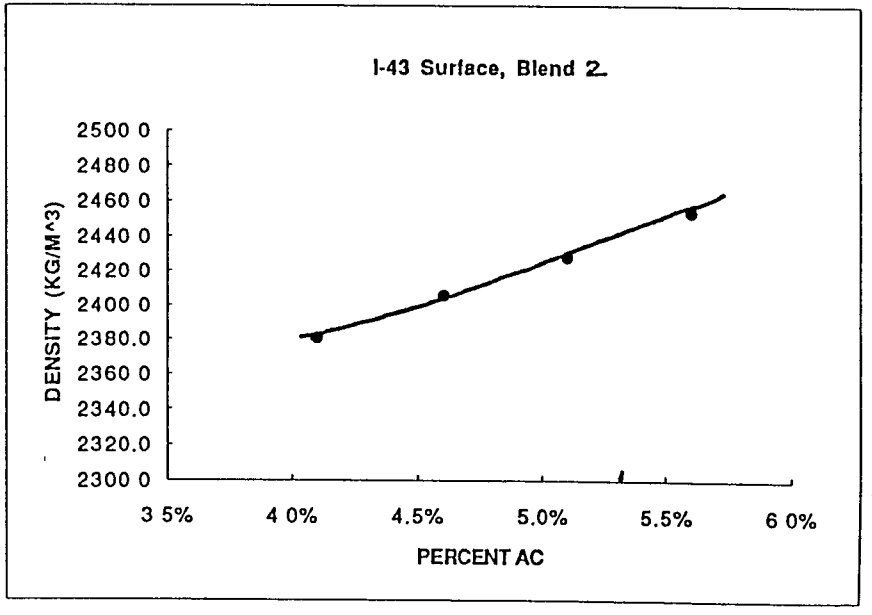

I-43 Surface, Blend 2, 5.1% AC
PERCENT MAX THEORETICAL DENSITY
99 0%
97 0%
95 0%
93 0%
91 0%
89 0%
87 0%
85.0%
83 0%
81 0%
79 0%
77 0%
75 0%
1
10
100
1000
NUMBER OF GYRATIONS
Specimen 1
Specimen 2
Specimen 3
Average


I-43 Surface, Blend 2, 5.6% AC
PERCENT MAX THEORETICAL DENSITY
99 0%
97 0%
95 0%
93 0%
91 0%
89 0%
87 0%
85 0%
83 0%
81 0%
79 0%
77 0%
75 0%
1
10
100
1000
NUMBER OF GYRATIONS
Specimen 1
Specimen 2
Specimen 3
Average


I-43 Surface, Blend 2
PERCENT AIR VOIDS
10 0%
9 0%
8 0%
7 0%
6 0%
5 0%
4 0%
3 0%
2 0%
1 0%
0 0%
5.3% AC
3 5%
4 0%
4 5%
5 0%
5 5%
6 0%
PERCENT AC


I-43 Surface, Blend 2
PERCENT VMA
16 0%
15 8%
15 6%
15 4%
15 2%
15 0%
14.8%
14 6%
14 4%
14 2%
14 0%
14.4%
3 5%
4 0%
4 5%
5 0%
5 5%
6 0%
PERCENT AC


I-43 Surface, Blend 2
PERCENT VFA
90 0%
80.0%
70 0%
60 0%
50 0%
40 0%
30 0%
20 0%
10 0%
72%
3 5%
4.0%
4 5%
5.0%
5 5%
6 0%
PERCENT AC


I-43 Surface, Blend 2
DENSITY (KG/M^3)
2500 0
2480 0
2460 0
2440 0
2420 0
2400 0
2380.0
2360 0
2340.0
2320.0
2300 0
3 5%
4 0%
4.5%
5.0%
5.5%
6 0%
PERCENT AC

4.1%

Gmm=	2 583									
Number of	SPECIMEN 1			SPECIMEN 2			SPECIMEN 3			AVERAGE
Gyrations	Height (mm)	%Gmm	%Gmm (corr)	Height (mm)	%Gmm	%Gmm (corr)	Height (mm)	%Gmm	%Gmm (corr)	%Gmm (corr)
5	130 3	80 1%	81 9%	127.8	81.7%	83 3%	127 2	81.7%	83 6%	82.9%
10	126 8	82.3%	84 1%	124 5	83.8%	85 5%	123 9	83.9%	85.8%	85.1%
15	124 9	83 5%	85 4%	122.7	85 1%	86 8%	122.1	85.1%	87.1%	86.4%
20	123 5	84.5%	86 4%	121.4	86 0%	87.7%	120 8	86 0%	88 0%	87.4%
30	121.8	85 7%	87 6%	119.7	87.2%	89 0%	119 1	87.3%	89 2%	88.6%
40	120 4	86 6%	88 6%	118.5	88.1%	89 8%	117.7	88 3%	90 3%	89 6%
50	119 5	87 3%	89.3%	117.6	88 7%	90 5%	117.1	88 8%	90 8%	90.2%
60	118 8	87 8%	89 8%	116.9	89 3%	91 0%	116 4	89 3%	91.3%	90.7%
80	117.6	88.7%	90 7%	115 9	90.1%	91 8%	115 4	90.0%	92.1%	91.5%
100	116 8	89.3%	91 3%	115.2	90 6%	92 4%	114 6	90 7%	92 7%	92.2%
125	116 0	89 9%	92 0%	114 4	91 3%	93 1%	113 9	91.3%	93 3%	92 8%
150	115 5	90 3%	92 4%	113 8	91.7%	93 5%	113 3	91.7%	93 8%	93.2%
175	114.9	90 8%	92 8%	113 3	92 1%	93 9%	112 9	92 1%	94 2%	93.6%
200	114 5	91 1%	93 2%	113 0	92 4%	94 2%	112 5	92.4%	94 5%	94.0%
230	114 1	91 4%	93 5%	112 5	92 7%	94 6%	112 0	92 8%	94 9%	94 3%
Gmb	2 415	93 5%		2 443	94 6%		2 451	94 9%		

4.6%

Gmm=	2 563									
Number of	SPECIMEN 1			SPECIMEN 2			SPECIMEN 3			AVERAGE
Gyrations	Height (mm)	%Gmm	%Gmm (corr)	Height (mm)	%Gmm	%Gmm (corr)	Height (mm)	%Gmm	%Gmm (corr)	%Gmm (corr)
5	128 0	82 4%	84 1%	127.7	82 7%	84 3%	128 2	82.0%	83 8%	84.1%
10	124 5	84 6%	86 4%	125 0	84 5%	86 2%	124 8	84 3%	86 1%	86.2%
15	122 6	86 0%	87 8%	122.5	86 2%	87 9%	122 9	85 6%	87 4%	87.7%
20	121 2	86 9%	88 8%	121 2	87.1%	88 9%	121 5	86 5%	88 4%	88.7%
30	119.4	88 3%	90 1%	119 3	88 5%	90 2%	119 7	87.9%	89.7%	90.0%
40	118 2	89 2%	91 1%	118.1	89.4%	91 2%	118 4	88 8%	90 7%	91 0%
50	117 1	90 0%	91 9%	117 2	90 1%	91 9%	117 6	89 5%	91.4%	91.7%
60	116 4	90 6%	92 5%	116 4	90 7%	92 5%	116 8	90.1%	92 0%	92.3%
80	115 2	91 5%	93 4%	115.3	91.6%	93 4%	115 6	91.0%	92 9%	93.2%
100	114.5	92.1%	94 0%	114.5	92 2%	94 1%	114 8	91.6%	93 5%	93.9%
125	113.7	92.7%	94 6%	113.8	92.7%	94 6%	114.1	92 2%	94 2%	94 4%
150	113.2	93 1%	95.1%	113.2	93.3%	95 1%	113 4	92.7%	94 7%	95.0%
175	112 8	93 5%	95 4%	112 7	93 7%	95 5%	112 9	93.1%	95 1%	95.4%
200	112 2	93 9%	95 9%	112 3	94 0%	95 9%	112.5	93.5%	95 5%	95.8%
230	111.8	94 3%	96 3%	111 8	94 4%	96 3%	112.1	93 8%	95 8%	96.1%
Gmb	2 467	96 3%		2.468	96 3%		2 456	95 8%		

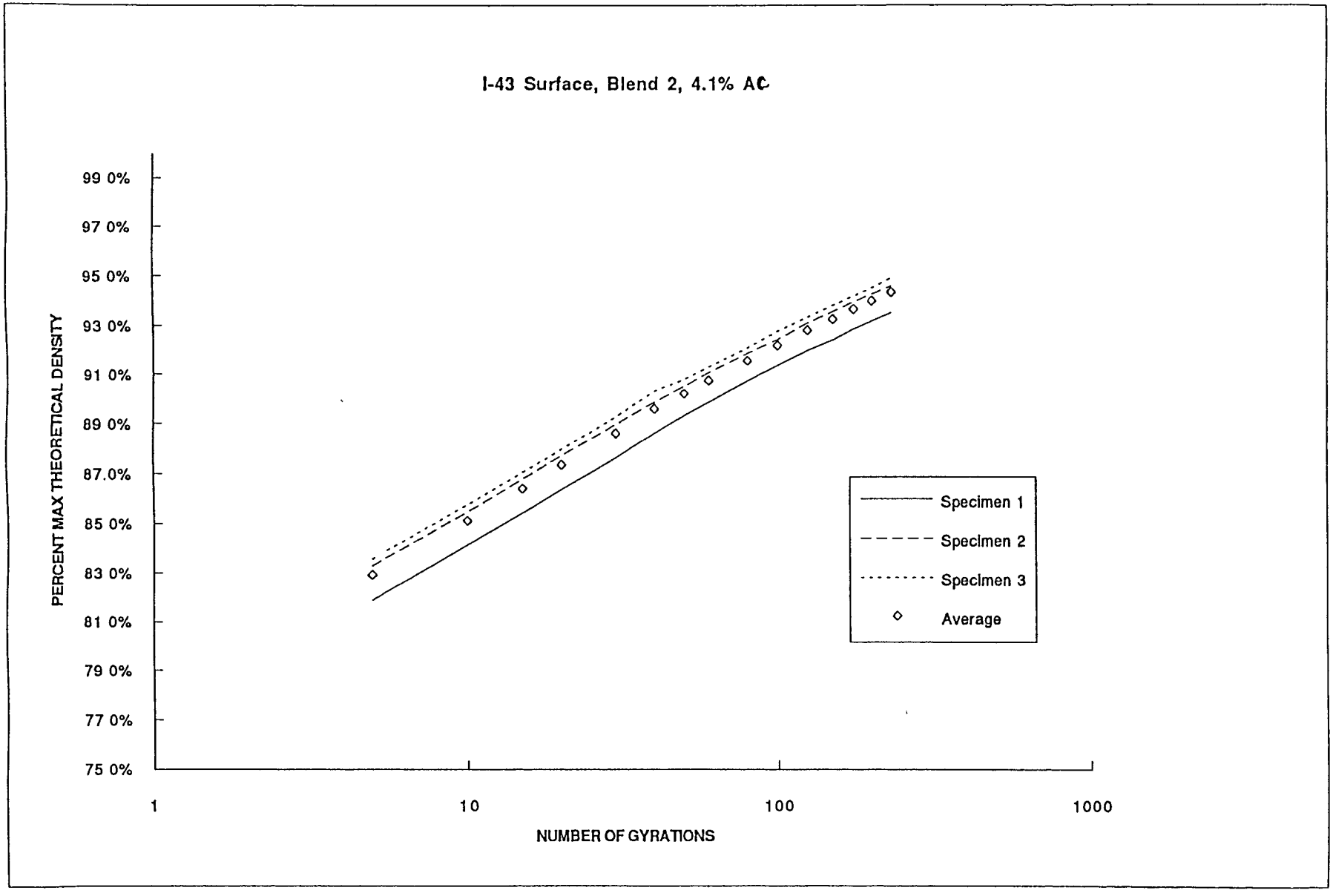
5.1%

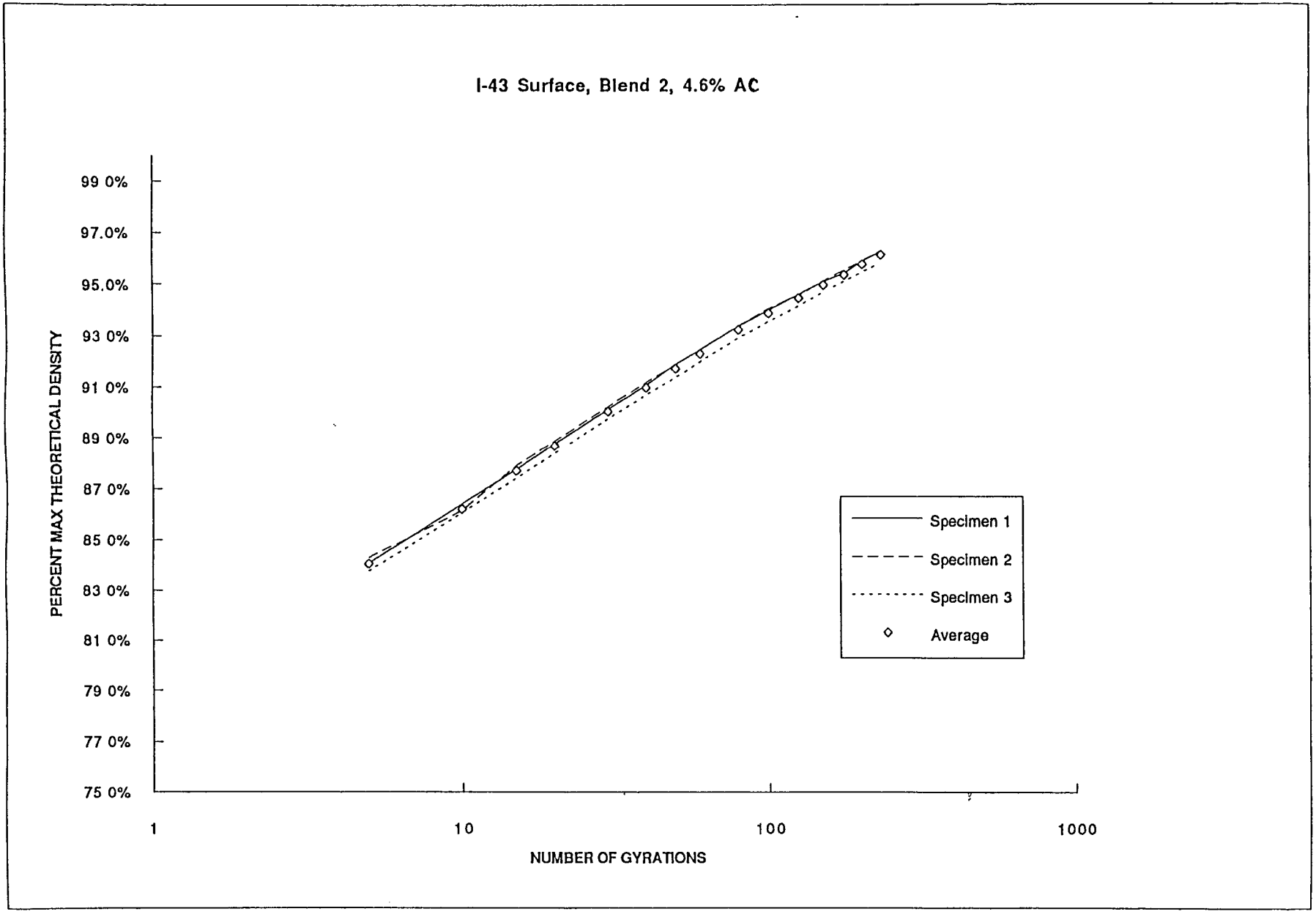
Gmm=	2.543									
Number of	SPECIMEN 1			SPECIMEN 2			SPECIMEN 3			AVERAGE
Gyrations	Height (mm)	%Gmm	%Gmm (corr)	Height (mm)	%Gmm	%Gmm (corr)	Height (mm)	%Gmm	%Gmm (corr)	%Gmm (corr)
5	127.9	83.6%	85.4%	126.8	84.0%	85.8%	128.8	82.7%	84.6%	85.3%
10	123.9	86.2%	88.1%	123.1	86.6%	88.4%	125.4	84.9%	86.8%	87.8%
15	122.0	87.6%	89.5%	121.5	87.7%	89.6%	123.3	86.4%	88.3%	89.1%
20	120.7	88.5%	90.5%	120.2	88.6%	90.5%	121.9	87.4%	89.4%	90.1%
30	118.9	89.8%	91.8%	118.3	90.0%	92.0%	119.9	88.9%	90.8%	91.5%
40	117.7	90.8%	92.8%	117.0	91.0%	93.0%	118.6	89.8%	91.8%	92.5%
50	116.8	91.5%	93.5%	116.1	91.7%	93.7%	117.6	90.6%	92.6%	93.3%
60	116.0	92.1%	94.1%	115.4	92.3%	94.3%	116.8	91.2%	93.2%	93.9%
80	114.9	93.0%	95.0%	114.2	93.2%	95.2%	115.7	92.0%	94.1%	94.8%
100	114.0	93.7%	95.8%	113.5	93.9%	95.9%	114.9	92.7%	94.8%	95.5%
125	113.3	94.3%	96.4%	112.7	94.5%	96.5%	114.1	93.4%	95.5%	96.1%
150	112.7	94.8%	96.9%	112.1	95.0%	97.1%	113.4	93.9%	96.0%	96.7%
175	112.2	95.2%	97.3%	111.7	95.4%	97.4%	113.0	94.3%	96.4%	97.1%
200	111.8	95.6%	97.7%	111.3	95.7%	97.7%	112.5	94.7%	96.8%	97.4%
230	111.4	95.9%	98.0%	110.8	96.1%	98.2%	112.1	95.0%	97.2%	97.8%
Gmb	2.493	98.0%		2.496	98.2%		2.471	97.2%		

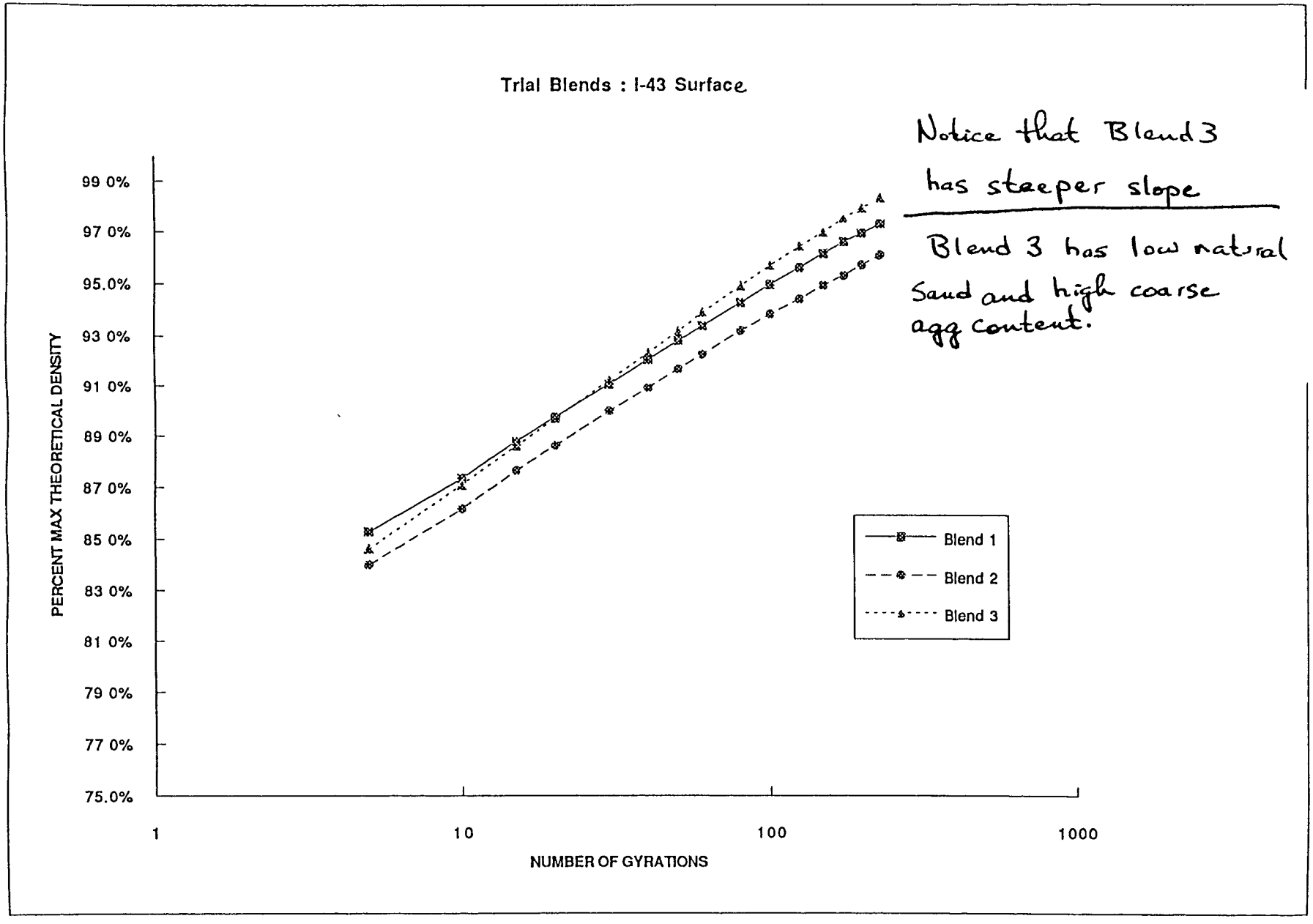
5.6%

Gmm=	2.524									
Number of	SPECIMEN 1			SPECIMEN 2			SPECIMEN 3			AVERAGE
Gyrations	Height (mm)	%Gmm	%Gmm (corr)	Height (mm)	%Gmm	%Gmm (corr)	Height (mm)	%Gmm	%Gmm (corr)	%Gmm (corr)
5	126.8	85.4%	86.9%	127.1	85.0%	86.6%	127.1	85.0%	86.6%	86.7%
10	123.3	87.8%	89.4%	123.7	87.3%	88.9%	123.7	87.4%	89.0%	89.1%
15	121.4	89.2%	90.8%	121.7	88.8%	90.4%	121.7	88.8%	90.4%	90.6%
20	120.1	90.2%	91.8%	120.3	89.8%	91.5%	120.3	89.9%	91.5%	91.6%
30	118.2	91.6%	93.3%	118.3	91.4%	93.0%	118.3	91.4%	93.1%	93.1%
40	117.0	92.6%	94.3%	117.1	92.3%	94.0%	117.0	92.4%	94.1%	94.1%
50	116.0	93.4%	95.1%	116.0	93.2%	94.8%	116.0	93.2%	94.9%	94.9%
60	115.3	93.9%	95.7%	115.2	93.8%	95.5%	115.2	93.8%	95.6%	95.6%
80	114.1	94.9%	96.6%	114.1	94.7%	96.4%	114.0	94.8%	96.5%	96.5%
100	113.3	95.6%	97.3%	113.3	95.4%	97.1%	113.2	95.5%	97.2%	97.2%
125	112.5	96.2%	98.0%	112.4	96.1%	97.8%	112.3	96.2%	98.0%	97.9%
150	111.9	96.8%	98.6%	111.8	96.6%	98.4%	111.7	96.8%	98.5%	98.5%
175	111.5	97.1%	98.9%	111.4	97.0%	98.8%	111.2	97.2%	99.0%	98.9%
200	111.0	97.5%	99.3%	110.9	97.4%	99.2%	110.8	97.6%	99.3%	99.3%
230	110.7	97.8%	99.6%	110.5	97.8%	99.5%	110.4	97.9%	99.7%	99.6%
Gmb	2.514	99.6%		2.512	99.5%		2.515	99.7%		

0.0%


I-43 Surface, Blend 2, 4.1% AC
PERCENT MAX THEORETICAL DENSITY
99 0%
97 0%
95 0%
93 0%
91 0%
89 0%
87.0%
85 0%
83 0%
81 0%
79 0%
77 0%
75 0%
1
10
100
1000
NUMBER OF GYRATIONS
Specimen 1
Specimen 2
Specimen 3
Average

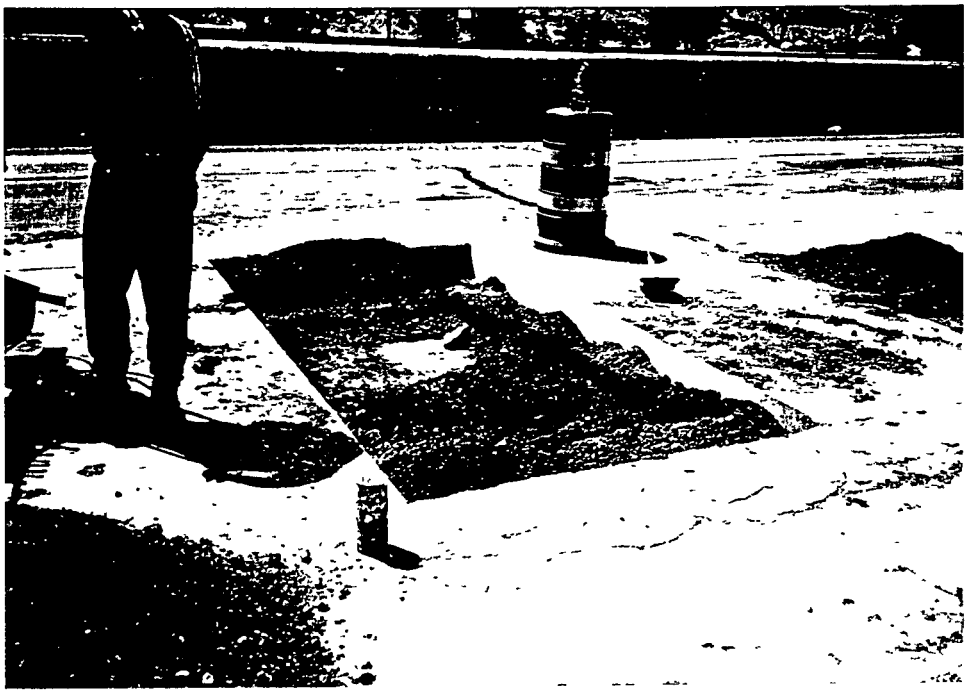

I-43 Surface, Blend 2, 4.6% AC
99 0%
97.0%
95.0%
93 0%
91 0%
89 0%
87 0%
85 0%
83 0%
81 0%
79 0%
77 0%
75 0%
PERCENT MAX THEORETICAL DENSITY
1
10
100
1000
NUMBER OF GYRATIONS
Specimen 1
Specimen 2
Specimen 3
Average



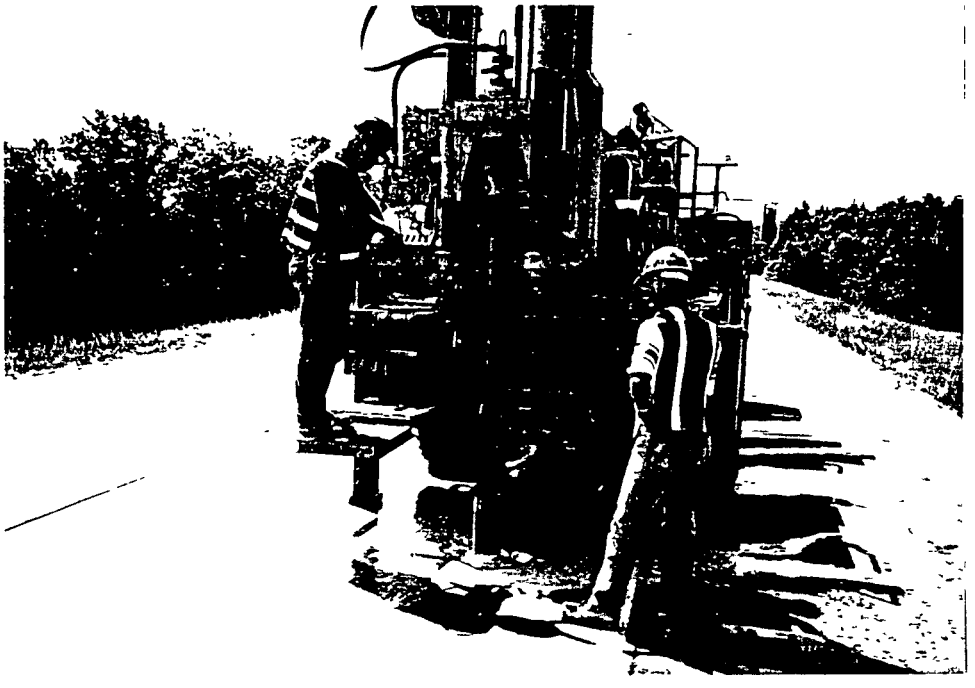
Notice that Blend 3 has steeper slope

Blend 3 has low natural sand and high coarse agg content.

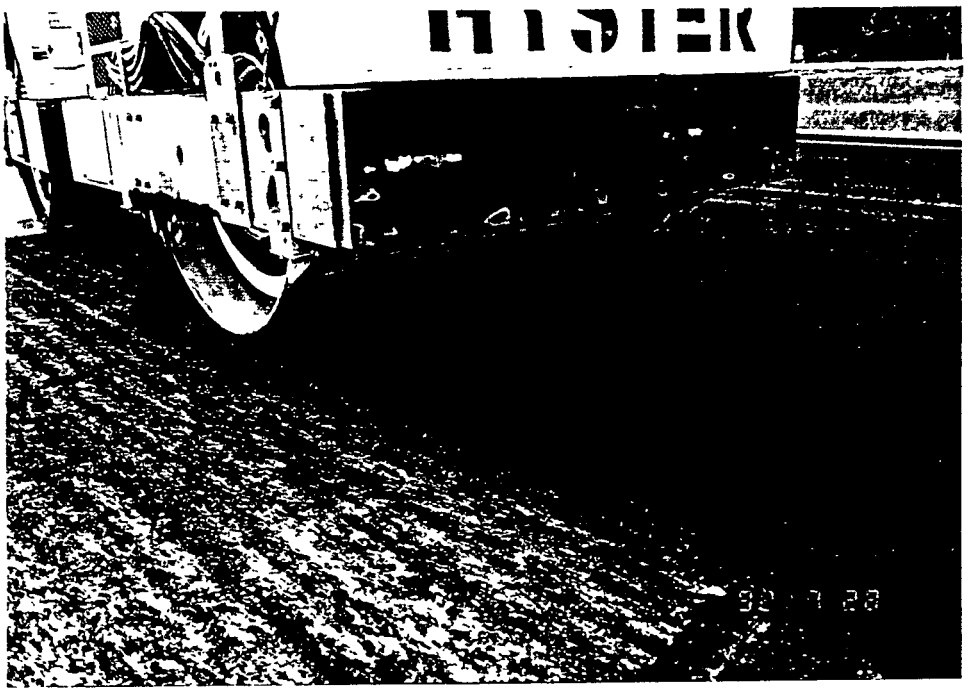
Photos



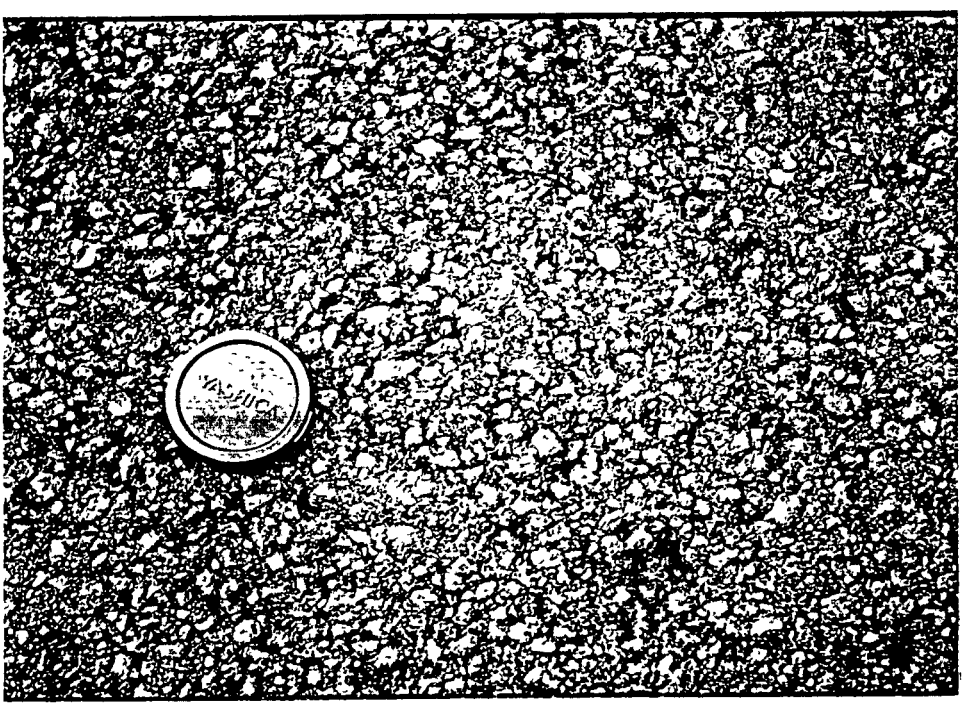
Test Pits in Joint Repair Area



Sampling and Testing Prior to Overlay

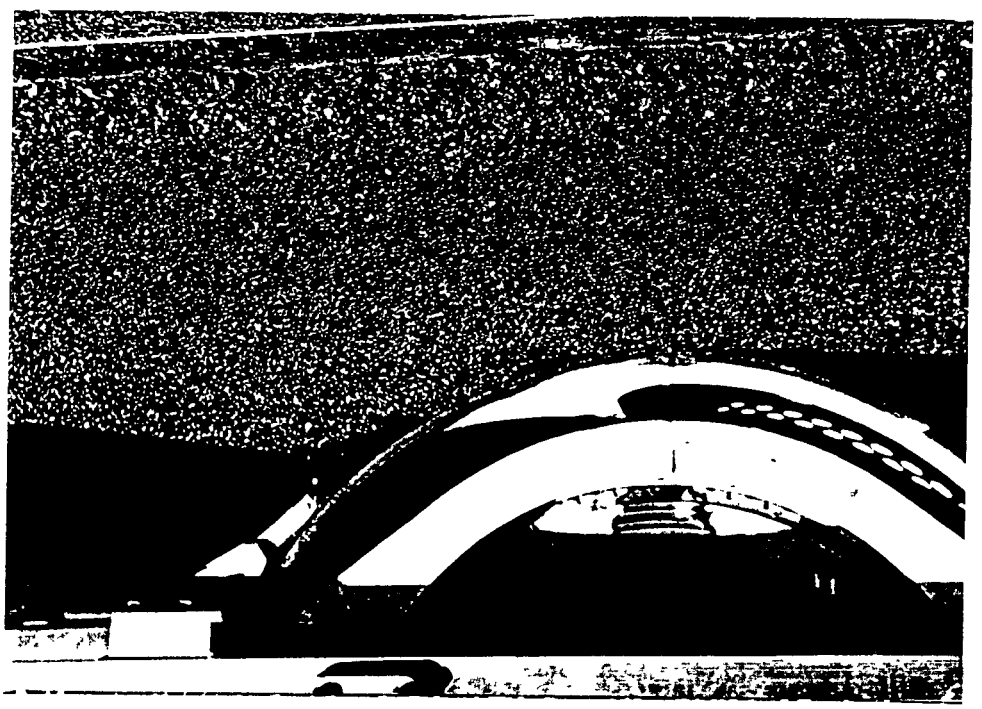


Placement of SHRP SUPERPAVE Mix



Close Up of SUPERPAVE Mix

Fibers Used in SMA F-2 Mix
Section 55A907



SMA F1 Mix
Section 55A903