

**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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Table of Contents

SPS-9 Experimental Design and Research Plan	1
Project Details	2
Project Coordination	3
Layout	6
Material Sampling and Testing	6
Construction	7
Mix Designs and Paving	10
Photos	40

List of Figures

Figure 1. SPS-9A Project Layout	4
Figure 2. SPS-9B Project Layout	5
Figure 3. Project Location	8
Figure 4. Project Details	9
Figure 5. Typical Sections	11-12
Figure 6. Materials Sampling and Testing Plan	13-24
Figure 7. Superpave Mix Design	25-39

List of Tables

Table 1. Wisconsin SPS-9A Section Layout	6
Table 2. Wisconsin SPS-9B Section Layout	7
Table 3. Bulk Material Sampling During Construction	10

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

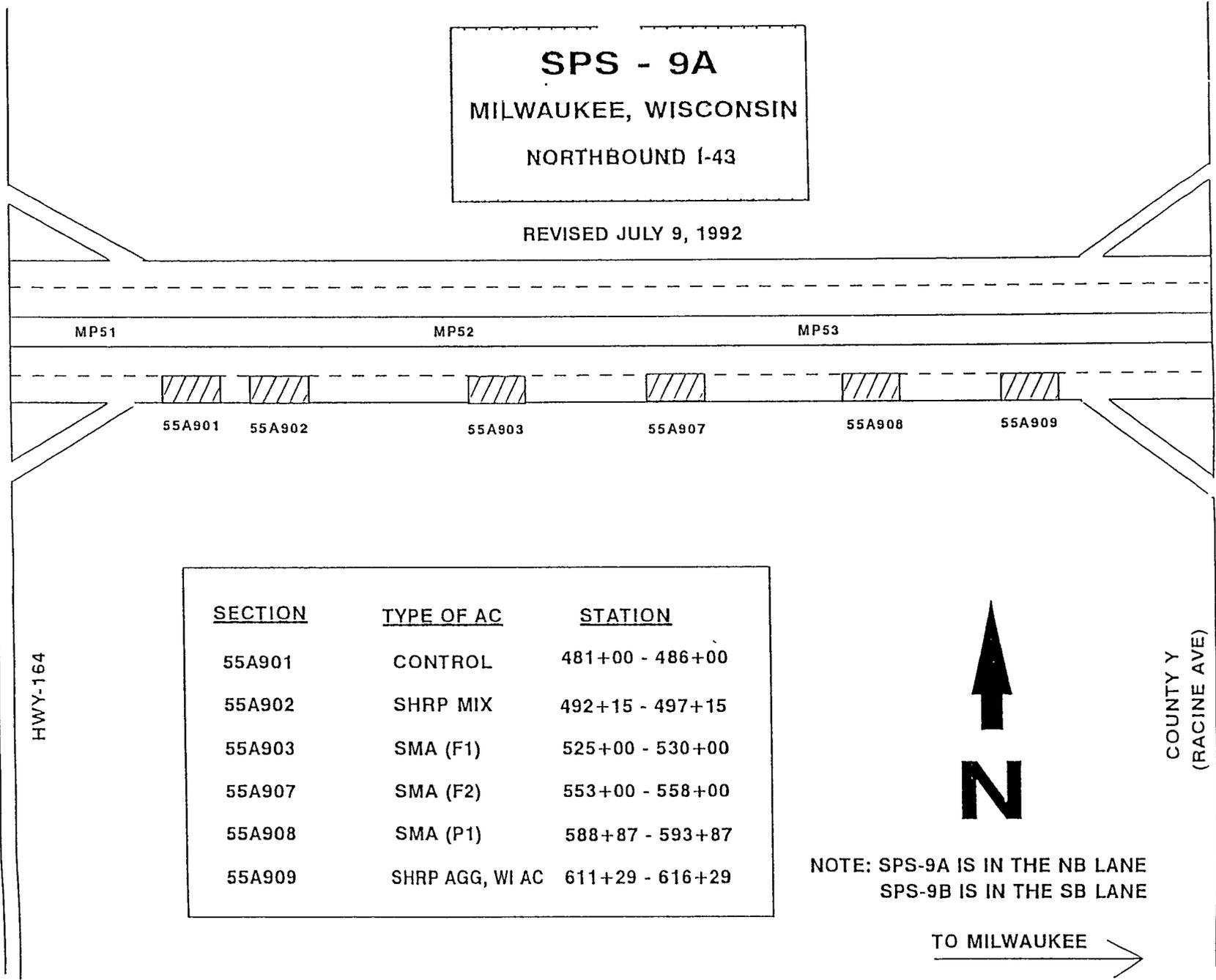
North Central Regional Coordination Office:

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

SPS - 9A
MILWAUKEE, WISCONSIN
NORTHBOUND I-43

REVISED JULY 9, 1992



<u>SECTION</u>	<u>TYPE OF AC</u>	<u>STATION</u>
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



NOTE: SPS-9A IS IN THE NB LANE
 SPS-9B IS IN THE SB LANE

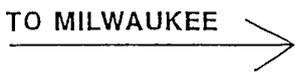


Figure 1. SPS-9A Project Layout

SPS - 9B
MILWAUKEE, WISCONSIN
SOUTHBOUND I-43

REVISED JULY 9, 1992

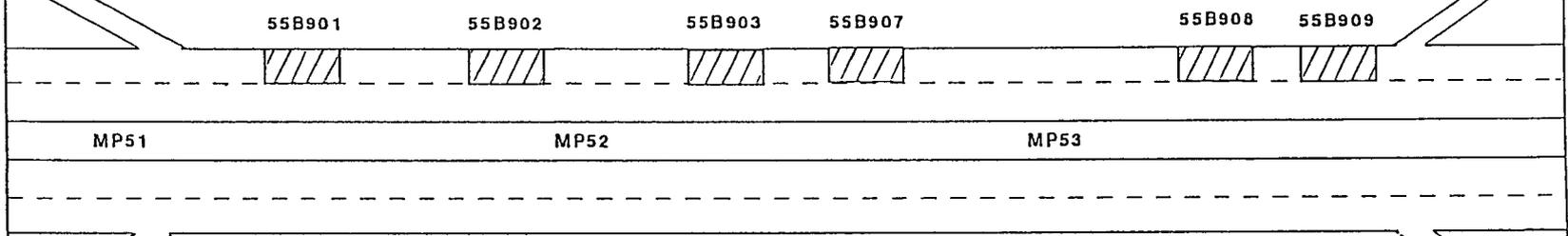


Figure 2. SPS-9B Project Layout

<u>SECTION</u>	<u>TYPE OF AC</u>	<u>STATION</u>
55B909	SHRP AGG, WI AC	610+90 - 605+90
55B908	SMA (P2)	600+43 - 595+43
55B907	SMA (E1)	560+00 - 555+00
55B903	SMA (E2)	542+42 - 537+42
55B902	SHRP MIX	510+00 - 505+00
55B901	CONTROL	485+68 - 480+68



NOTE: SPS-9A IS IN THE NB LANE
 SPS-9B IS IN THE SB LANE

TO MILWAUKEE →

HWY-164

COUNTY Y
 (RACINE AVE)

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.

INDEX OF SHEETS

- Sheet No. 1 - Title
- Sheet No. 2 - 218 Typical Sections and Details
- Sheet No. 3 - 317 Estimate of Quantities
- Sheet No. 3A - 3A Miscellaneous Quantities
- Sheet No. 4 - Right of Way Plan
- Sheet No. 5 - 508 Right of Way Profile
- Sheet No. 6 - 624 Standard Detail Drawings
- Sheet No. 7 - Sign Plans
- Sheet No. 8 - 825 Structure Plans
- Sheet No. 9 - Computer Equipment Data
- Sheet No. 10 - Cross Sections

TOTAL SHEETS = 110



STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
PLAN OF PROPOSED IMPROVEMENT
ROCK FREEWAY

IH-43

WAUKESHA / MILWAUKEE COUNTIES

STATE PROJECT	FEDERAL PROJECT	
	PROJECT NUMBER	CONTRACT
1092-06-70	FO43-1(285)	1
1090-04-74		
1092-06-72	BHF 043-1(286)	1
1091-02-77	BHF 043-1(284)	1
1090-04-73		

A-1 10/10/91

B - 67 - 111, 114
MARTIN ROAD UNDERPASS (SB)
CROWBAR ROAD OVERPASS

STATE PROJECT NUMBER
1090-04-74

EXCEPTION TO MET CENTERLINE LENGTH
OF PROJECT 1090-04-70
STA. 6+99+14.58 TO STA. 6+70+52.46

B - 67 - 109, 110
CALHOUN ROAD UNDERPASSES

STATE PROJECT NUMBER
1092-06-72

EXCEPTION TO MET CENTERLINE LENGTH
OF PROJECT 1090-06-70

STH. 164 - EAST COUNTY LINE

STATE PROJECT NUMBER
1092-06-70

B - 67 - 134
BELOIT ROAD UNDERPASS (NB)

STATE PROJECT NUMBER
1091-02-77

EXCEPTION TO MET CENTERLINE LENGTH
OF PROJECT 1090-04-70
STA. 8+34+15.75 TO STA. 8+16+18.64 (NB)

B - 40 - 376, 377
116 W STREET OVERPASS
124 W STREET OVERPASS

STATE PROJECT NUMBER
1090-04-73

DESIGN DESIGNATION

- A.D.T. 1991 + 42,200
- A.D.T. 20H + 70,000
- M.V. 20H + 6,300
- D. + 60-60
- V. 10%
- K. MPH + 65/55
- ISALS + 1,819,400

EXCEPTION TO MET CENTERLINE LENGTH
OF PROJECT 1092-06-70
STA. 515+124.80 TO STA. 516+08.00

BEGIN PROJECT 1092-06-70
STATION 488+24.14
N 337,200 (1200)
E 2,777,700 (1200)

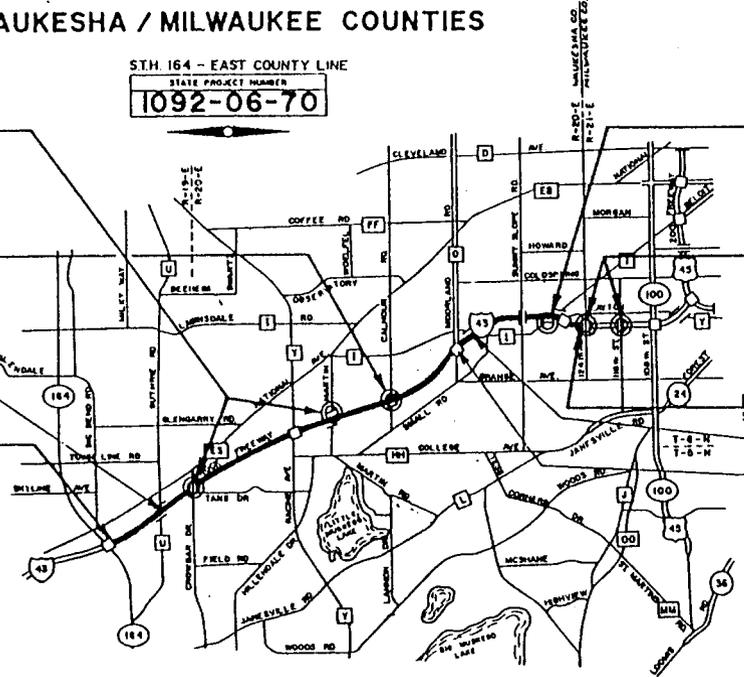
END PROJECT 1092-06-70
STATION 900+75

EXCEPTION TO MET CENTERLINE LENGTH
OF PROJECT 1090-04-70
STA. 806+55.16 TO STA. 807+05.55

CONVENTIONAL SIGNS

- COUNTY LINE
- CORPORATE LIMITS
- PROPERTY LINE
- LET LINE
- LIMITED EASEMENT
- EXISTING RIGHT OF WAY
- NEW RIGHT OF WAY
- REFERENCE LINE
- SLOPE INTERCEPT
- SPECIAL ENDING
- WASH OR ROCK PROFILE
- ELEVATION IN PLACE
- CURVEY REQUIRED
- CURVEY REQUIRED (P. 201)

- UNDERGROUND UTILITIES
- GAS
- ELECTRIC
- TELEPHONE
- SERVICE PEDESTAL
- CABLE MARKER
- POWER POLE
- TELEPHONE POLE
- RAILROADS
- WASH
- ROODED AREA



0.0000 MI 1090-04-74 URBAN

0.0000 MI 1090-04-75 URBAN

0.0000 MI 1091-02-77 URBAN

0.0000 MI 1092-06-70 URBAN

0.0000 MI 1092-06-72 URBAN

0.0000 MI 1092-06-70 RURAL

NOTE: FOR LIST OF EXCEPTIONS SEE PAGE 2.1

COORDINATES SCALED FROM USGS TOPOGRAPHIC MAP, HALE'S CORNER'S WISCONSIN QUADRANGLE FOR IDENTIFICATION ONLY. (SOUTH ZONE)

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

DESIGNED BY: J.P. B. DO...
CHECKED BY: DCM...
APPROVED BY: DCM...
DATE: 4-26-91
DATE: 6-5-91
DATE: 8/1/91

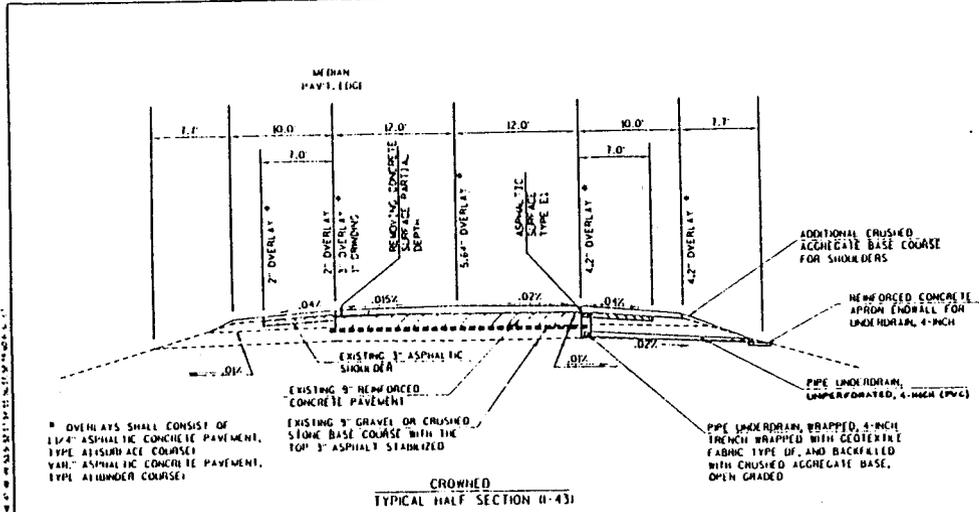
Figure 4. Project Details

Table 3. Bulk Material Sampling During Construction

Material and Sample Description	Number of Samples	Sample Location
Asphalt Concrete Coring - 4" Diam. Cores	21	Regional Contractor Lab Minneapolis, MN
Bulk Sampling (100 lbs of each mix, uncompacted)	3	
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

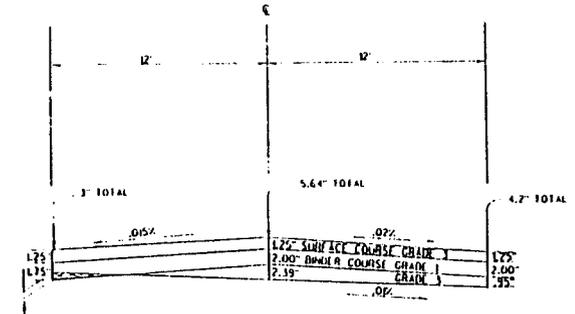
Mix Designs and Paving

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.



* OVERLAYS SHALL CONSIST OF
1 1/4" ASPHALTIC CONCRETE PAVEMENT,
TYPE AT(SURFACE COURSE)
1/4" ASPHALTIC CONCRETE PAVEMENT,
TYPE AT(UNDER COURSE)

CROWNED
TYPICAL HALF SECTION 0-43



HI MOVE 1" TO 0" IN 4'
TO BE PAID FOR AS
MOVING CONCRETE SURFACE.
FINISH DEPTH

ASPHALT OVERLAY DETAIL
(TANGENT SECTIONS)

UTILITIES

- WISCONSIN ELECTRIC POWER COMPANY
513 W 33800 HWY 18
DELAFIELD, WI 53008
ATTN: MIC. KRANTZ, ENGR. SUPR.
(414) 646-2764
- WISCONSIN NATURAL GAS COMPANY
1830 S. WEST AVE.
WALKESHA, WI 53094
ATTN: JIM HANSEN, OFFICE MFG.
(414) 459-1000
- WISCONSIN NATURAL GAS COMPANY
750 W. RAWSON AVE
OAK CREEK, WI 53054
ATTN: CRAIG BROWN
(414) 764-2220
- AAR PIPE LINE COMPANY
615 W MORELAND BLVD PO BOX 149
WALKESHA, WI 53087
ATTN: MERVYN WATSON, MGR. AREA TRANS.
(414) 547-5529
- WISCONSIN BELL INC.
220 WISCONSIN AVE
WALKESHA, WI 53094
ATTN: RUSSEL LUND, MGR. DIST. SERV.
(414) 678-4052
- JONES INTERCHANGE
268 W 300 WASHINGTON AVE
CEDARBURG, WI 53012
ATTN: RAY JOHN
(414) 375-4404

- WEST SHORE PIPE LINE
1105 WEST COUNTY LANE NO.
WALKESHA, WI 53224
ATTN: C.J. DOERING, SUPT. MAINT.
(414) 354-1002
- PARAGON CABLE TELEVISION
2767 N WATFAR RD
WALKESHA, WI 53222
ATTN: LEE STICKLEMAN
(414) 253-1234
- DEPARTMENT OF TRANSPORTATION
MINN BARS108 ST, PO BOX 649
WALKESHA, WI 53087
ATTN: CHARLES LANDER, LIGHTING ENGR.
(414) 521-5346
- NEIL WIENSER, TRAFFIC
COUNT SYSTEM
(414) 548-5944



TO OBTAIN LOCATION OF
PARTICIPANTS UNDERGROUND
FACILITIES BEFORE YOU
DIG IN WISCONSIN
CALL DIGGERS HOTLINE
1-800-242-8511
TOLL FREE
414/250-1801 WALKESHA METRO
WS STATUTE 18.02(15) (1974)
REQUIRES 90% OF 3 HOUR DAYS
NOTICE BEFORE YOU EXCAVATE.

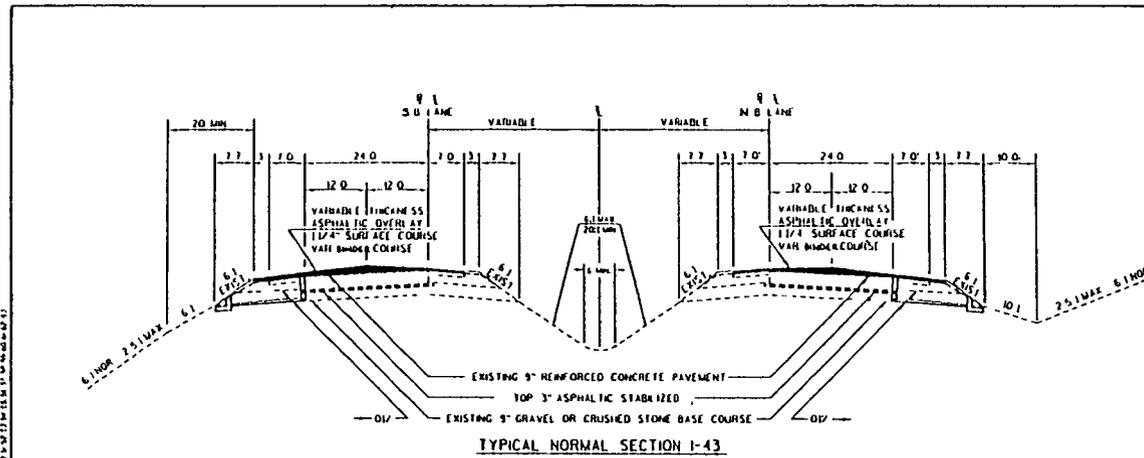
GENERAL NOTES

- WHEN ASPHALTIC OVERLAY IS INDICATED ON THE PLAN, IT SHALL CONSIST OF A VARIABLE THICKNESS ASPHALTIC CONCRETE PAVEMENT, TYPE AT(Q) THE BINDER COURSE SHALL BE THE VARIABLE THICKNESS, THE SURFACE COURSE SHALL BE A CONSTANT 1-1/4-INCH THICKNESS.
- TYPICAL SECTIONS DO NOT INCLUDE SUPERELEVATION TRANSITION SECTIONS OF THIS PROJECT. THESE SECTIONS HAVE THE SAME PAVEMENT STRUCTURE AS SHOWN ON ADJACENT TYPICAL FINISHED SECTIONS, EXCEPT FOR VARYING PAVEMENT DEPTHS, SEE DEPTH TABLES.
- THE LOCATION OF LONGITUDINAL JOINTS IN ASPHALTIC CONCRETE OVERLAY SHALL BE APPROVED BY THE ENGINEER.
- MAINTAIN A MINIMUM VERTICAL CLEARANCE OF 14'-0" UNDER ALL STRUCTURES, AFTER OVERLAY IS CONSTRUCTED.
- DISTURBED AREAS WITHIN THE RIGHT OF WAY, EXCEPT AREAS WITHIN THE FINISHED SHOULDER POINTS, ARE TO BE FERTILIZED, SEED, AND MULCHED AS DIRECTED BY THE ENGINEER.
- WHEN THE QUANTITY OF ITEMS OF BASE OR SURFACE COURSE IS MEASURED FOR PAYMENT BY THE TON, THE THICKNESS OF THE COURSE SHOWN ON THE PLANS IS APPROXIMATE AND THE ACTUAL THICKNESS WILL DEPEND ON THE DISTRIBUTION OF THE MATERIAL AS DIRECTED BY THE ENGINEER.
- DELIMITORS AND POSTS WILL BE INSTALLED UNDER THIS CONTRACT. DELIMITOR POST SPACING ALONG THE RIGHT SIDE OF THE FORELAY SHALL BE 100' EXCEPT THROUGH CURVES WHERE THE MAXIMUM SPACING WILL BE 300'.

THE LOCATION OF EXISTING AND PROPOSED UTILITY INSTALLATIONS IS SHOWN ON THE PLANS AND APPROVED. THERE WILL BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA. SEE THE STANDARD DETAIL DRAWINGS.

- 807-1 EROSION MAT
- 808-2 REINFORCED CONCRETE APRON ENDWALLS FOR UNDERDRAIN CONDUIT
- 9810-2 PULL BOX
- 1241-2 SLOPE PAVING - STRUCTURES (CONCRETE CAST IN PLACE)
- 1243-4 NAME PLATE - STRUCTURES
- 1344-3 ASPHALTIC SHOULDER RAIBLE STRIPS
- 13C14-1 CONCRETE BASE PATCHING (DOELED)
- 13C15-2 CONCRETE COURSE (DOELED)
- 14B15-1a CLASS "A" STEEL PLATE BEAM GUARD, INSTALLATION & ELEVATION
- 14B15-1b CLASS "A" STEEL PLATE BEAM GUARD, APPROVED, TYPE 1 & 2
- 14B15-1c CLASS "A" STEEL PLATE BEAM GUARD (AT BORDERS, OBSTACLES)
- 14B15-1d CLASS "A" STEEL PLATE BEAM GUARD (AT MEDIAN APPROACH)
- 14B7-8a TEMPORARY PRECAST CONCRETE BARRIER
- 14B7-8b PRECAST CONCRETE BARRIER END SECTION AND PORTABLE CRASH CUSHION
- 14B20-2a STEEL THREE BEAM STRUCTURE APPROACH CONNECTION WITH MAIN
- 14B20-2b STEEL THREE BEAM STRUCTURE APPROACH CONNECTION WITH MAIN
- 14B20-2c STEEL THREE BEAM STRUCTURE APPROACH CONNECTION WITH MAIN
- 15A2-2 DELIMITOR POSTS, WARNER POSTS AND DELIMITORS
- 15C2-2 BARRICADES AND TRAFFIC CONTROL FOR ROAD CLOSURES
- 15C8-3 PAVEMENT MARKING
- 15C10-2b RAISED PAVEMENT WARNERS (RAMPS & ARROWS)
- 15C10-2c RAISED PAVEMENT WARNERS (CASTING & SARCOT DETAILS)

Figure 5. Typical Sections

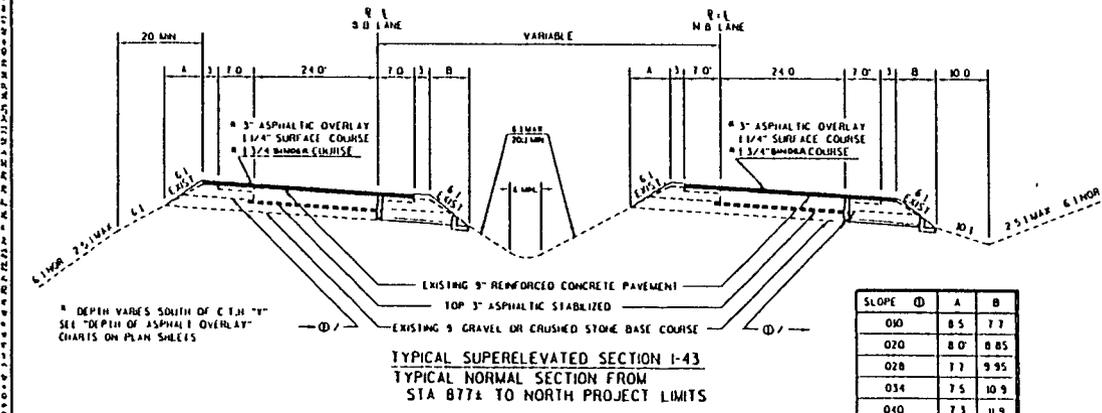


N.B. NET LENGTH EXCEPTIONS

BEGIN PROJECT	450+24.14
B 67 116	513 24 88 TO 515 26 08
EQUATION	640 93 60 BK - 640 25 38 A/D
B 67 112	665 14 68 TO 670 62 46
B 67 110	719 17 15 TO 720 63 10 (1092 06 72)
EQUATION	732 67 67 BK - 732 18 55 A/D
B 67 108	787-13 02 TO 789 56 78
B 67 106	805 33 16 TO 807 09 35
B 67 134	874 13 77 TO 876 32 64 (1091 02 77)
END PROJECT	900 75

S.B. NET LENGTH EXCEPTIONS

BEGIN PROJECT	458 10 20
B 67 117	513 76 15 TO 515 75 47
EQUATION	641 76 33 BK - 640 86 85 A/D
B 67 111	669 55 26 TO 671 07 62 (1094 04 74)
B 67 109	719 86 27 TO 721 30 69 (1092 06 72)
EQUATION	739 38 21 BK - 739 44 86 A/D
B 67 107	787 65 30 TO 790 09 14
B 67 105	804 84 90 TO 806 58 54
B 67 135	875-34 87 TO 877 83 23
END PROJECT	900 50



SLOPE (%)	A	B
0.0	8.5	7.7
0.20	8.0	8.85
0.28	7.7	9.95
0.34	7.5	10.9
0.40	7.3	11.9
0.50	6.9	12.9
0.60	6.6	14.2

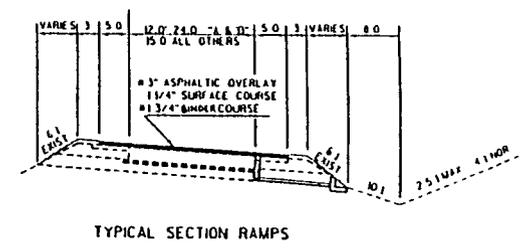


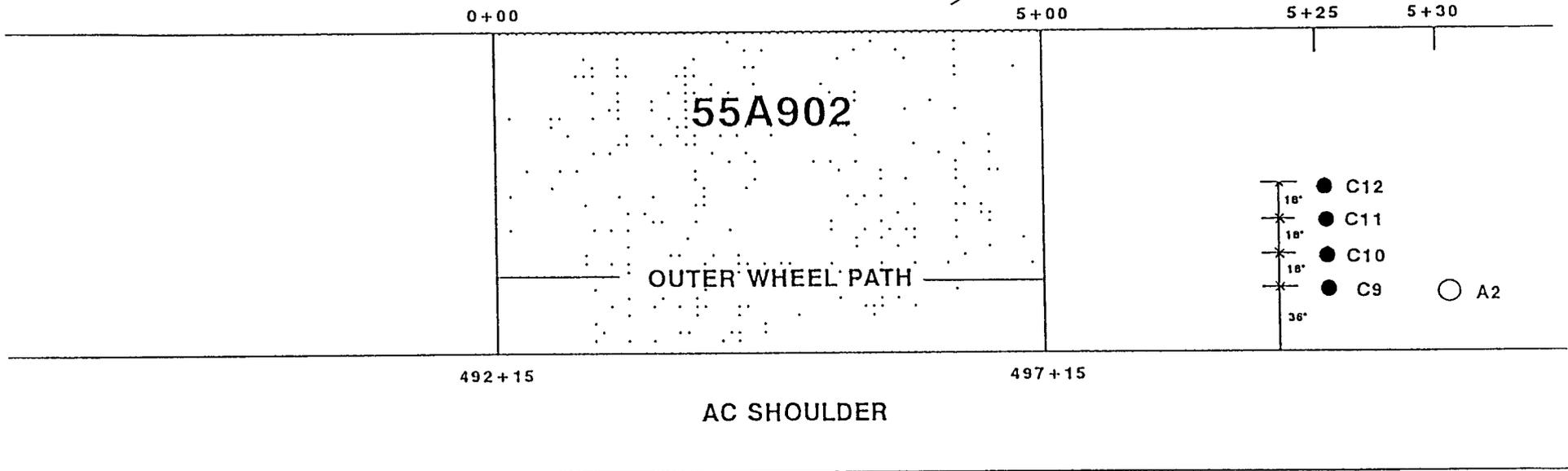
Figure 5. Typical Sections (continued)

Figure 6. Material Sampling and Testing Plan

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9A
MILWAUKEE, WISCONSIN
I-43 NORTHBOUND

DIRECTION OF TRAVEL →



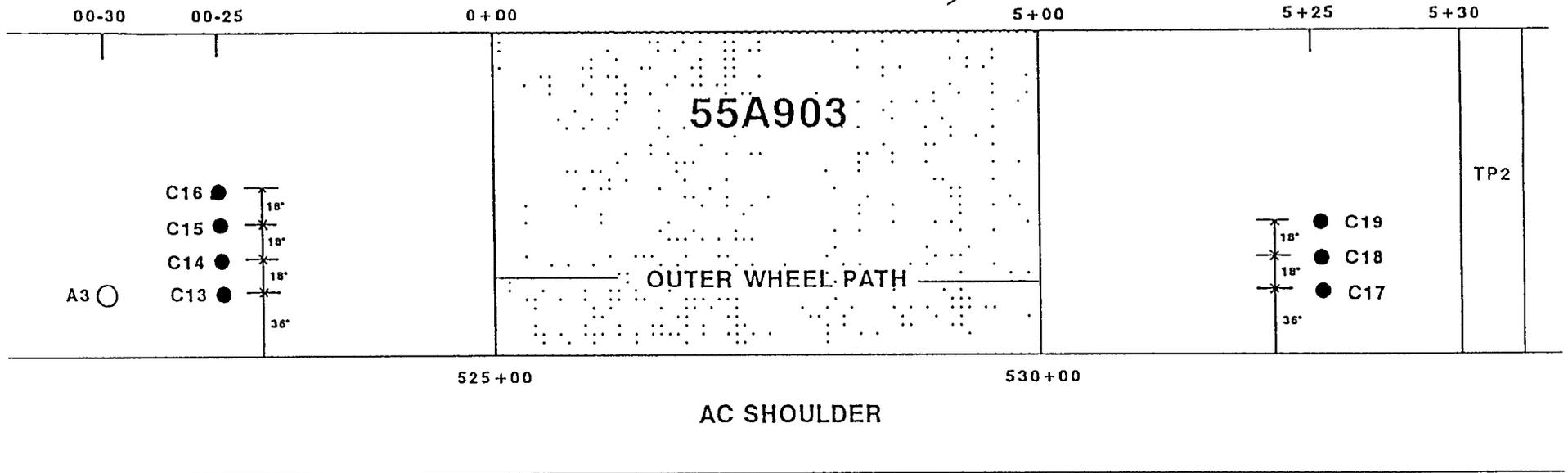
S2

- 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

SPS-9A MILWAUKEE, WISCONSIN I-43 NORTHBOUND

DIRECTION OF TRAVEL →



S3



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

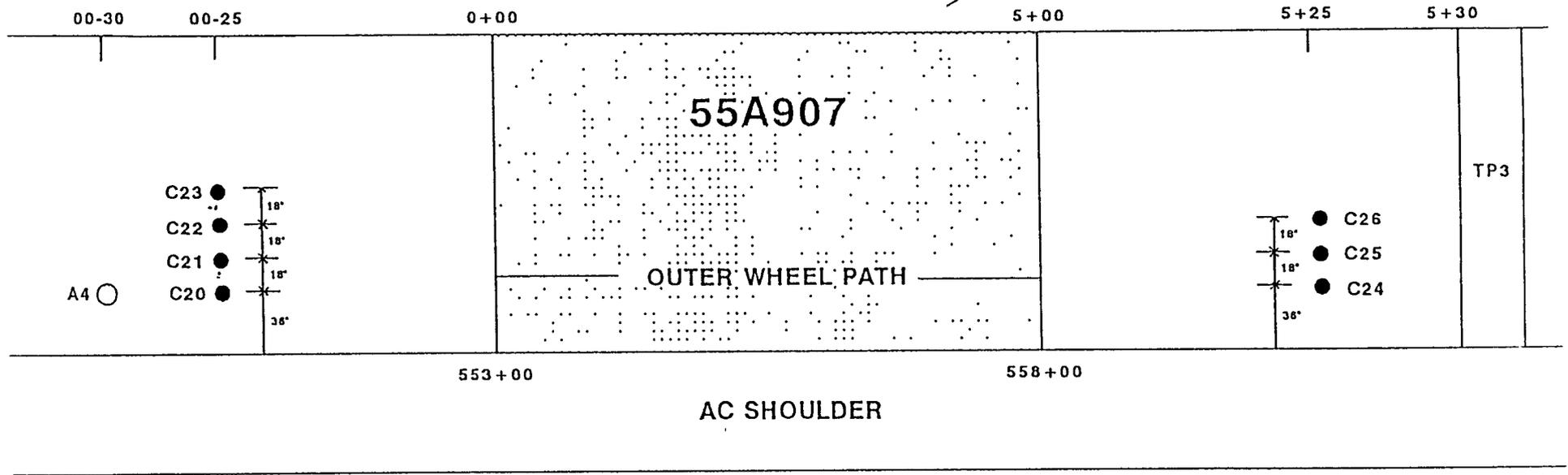


TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9A MILWAUKEE, WISCONSIN I-43 NORTHBOUND

DIRECTION OF TRAVEL →

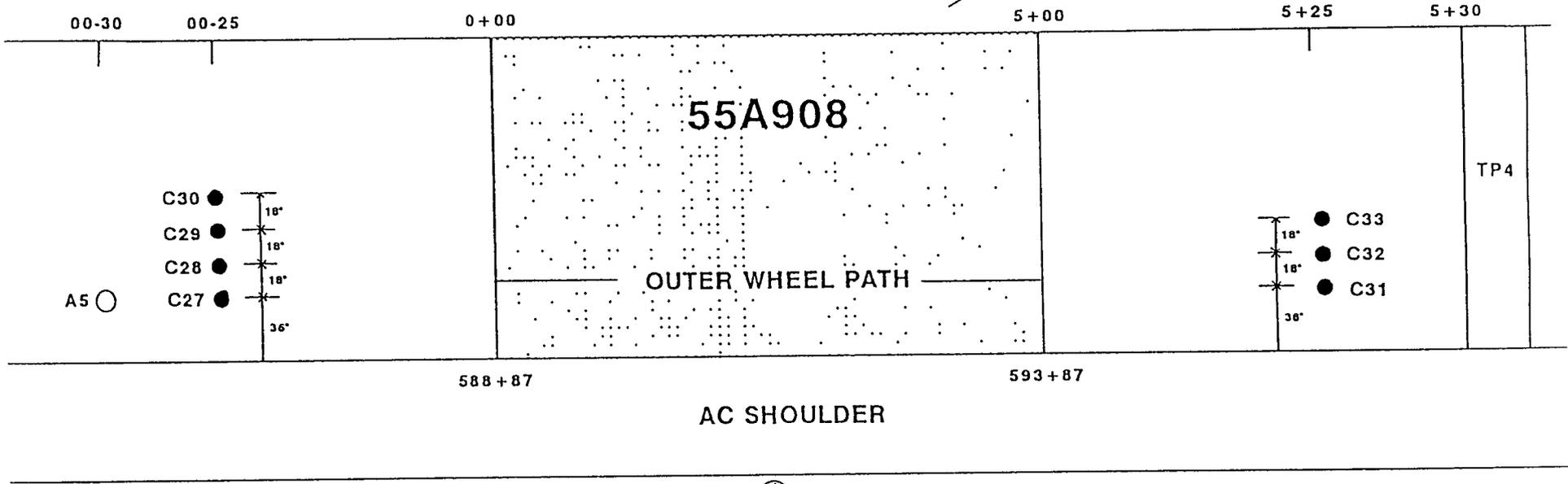


- 4" OD CORE OF SURFACE AND UNDERLAIN BOUND BASE.
- 6" OD CORE OF SURFACE AND UNDERLAIN BOUND LAYER
THIN-WALLED TUBE AND/OR SPLITSPOON SAMPLING 4' BELOW TOP OF
SUBGRADE.
- ⊕ SHOULDER PROBE 20' BELOW TOP OF SHOULDER
- ▭ TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9A MILWAUKEE, WISCONSIN I-43 NORTHBOUND

DIRECTION OF TRAVEL →

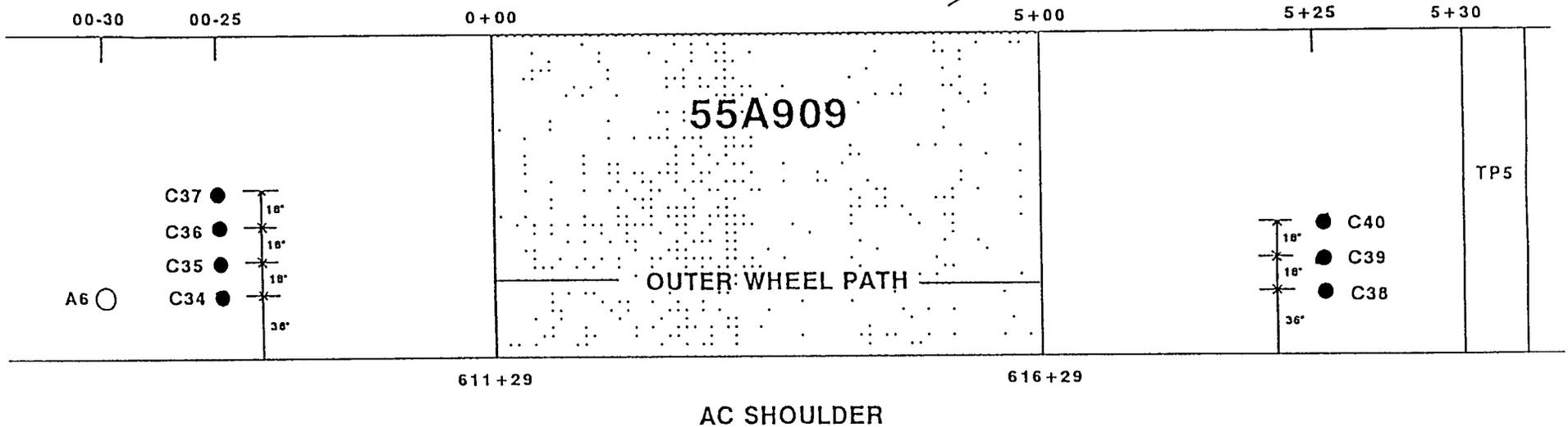


- 4" OD CORE OF SURFACE AND UNDERLAIN BOUND BASE.
- 6" OD CORE OF SURFACE AND UNDERLAIN BOUND LAYER
THIN-WALLED TUBE AND/OR SPLITSPOON SAMPLING 4' BELOW TOP OF
SUBGRADE.
- ⊕ SHOULDER PROBE 20' BELOW TOP OF SHOULDER
- ▭ TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9A MILWAUKEE, WISCONSIN I-43 NORTHBOUND

DIRECTION OF TRAVEL →

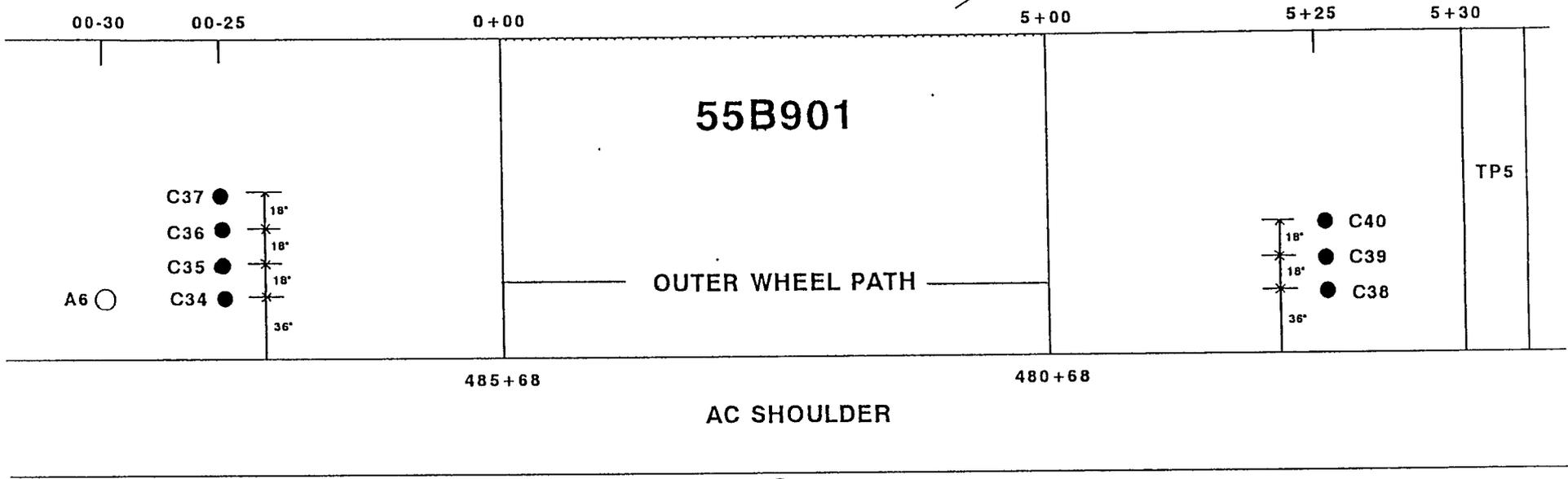


- 4" OD CORE OF SURFACE AND UNDERLAIN BOUND BASE.
- 6" OD CORE OF SURFACE AND UNDERLAIN BOUND LAYER THIN-WALLED TUBE AND/OR SPLITSPOON SAMPLING 4' BELOW TOP OF SUBGRADE.
- ⊕ SHOULDER PROBE 20' BELOW TOP OF SHOULDER
- ▭ TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9B
MILWAUKEE, WISCONSIN
I-43 SOUTHBOUND

DIRECTION OF TRAVEL →

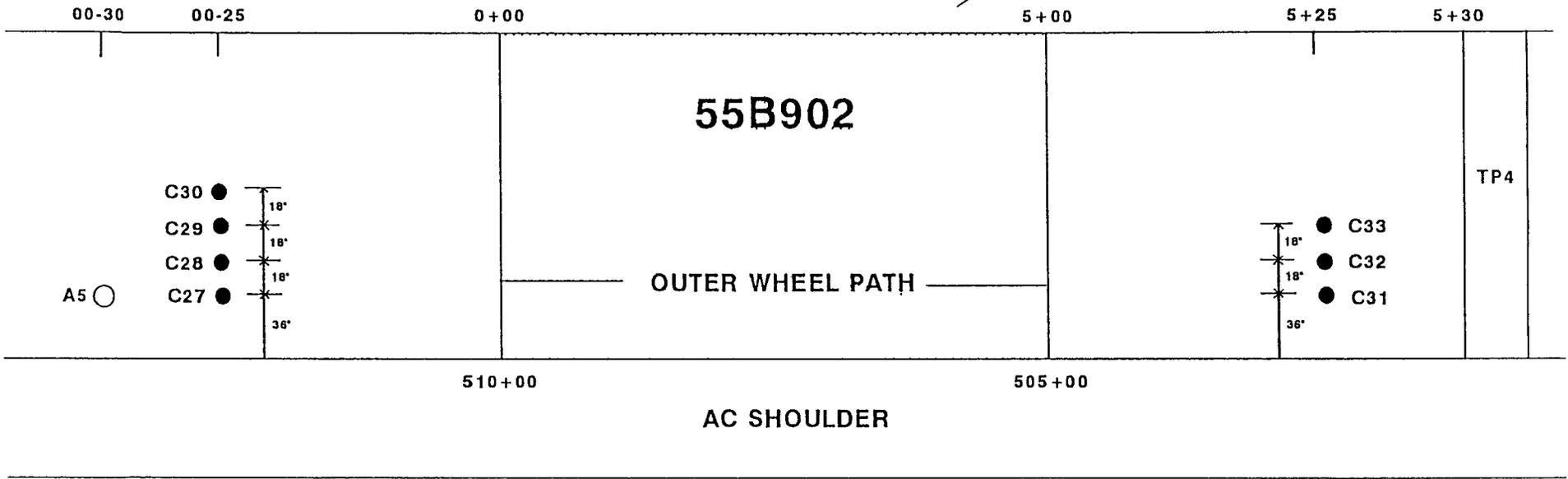


- 4" OD CORE OF SURFACE AND UNDERLAIN BOUND BASE.
- 6" OD CORE OF SURFACE AND UNDERLAIN BOUND LAYER THIN-WALLED TUBE AND/OR SPLITSPOON SAMPLING 4' BELOW TOP OF SUBGRADE.
- ⊕ SHOULDER PROBE 20' BELOW TOP OF SHOULDER
- ▭ TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9B
MILWAUKEE, WISCONSIN
I-43 SOUTHBOUND

DIRECTION OF TRAVEL →



S5



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

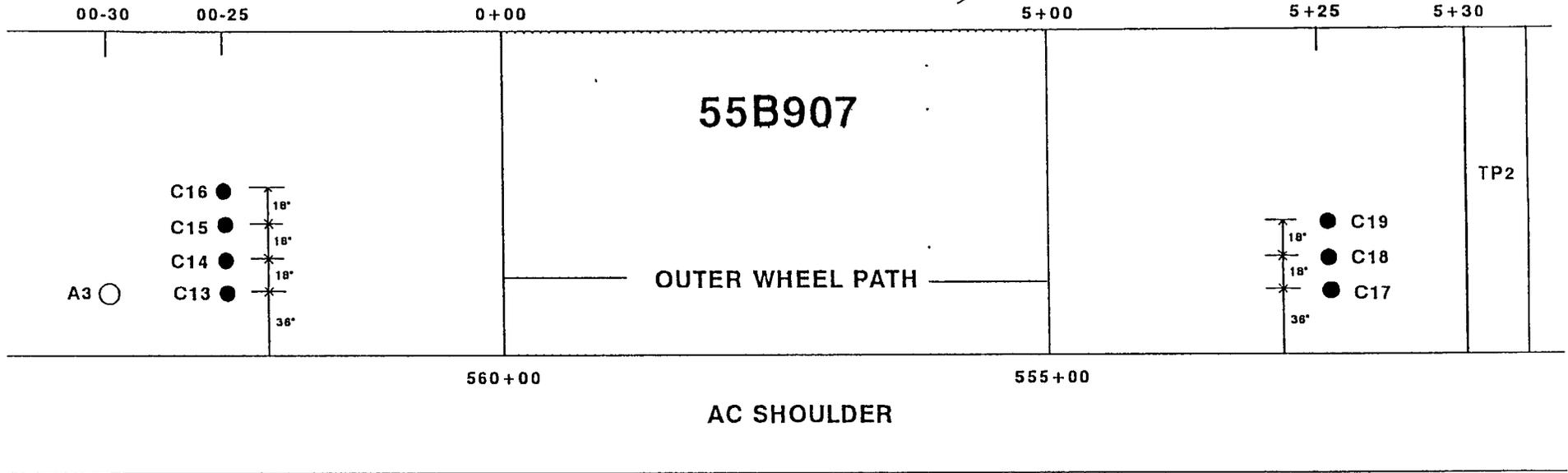


TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9B MILWAUKEE, WISCONSIN I-43 SOUTHBOUND

DIRECTION OF TRAVEL →



S3



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

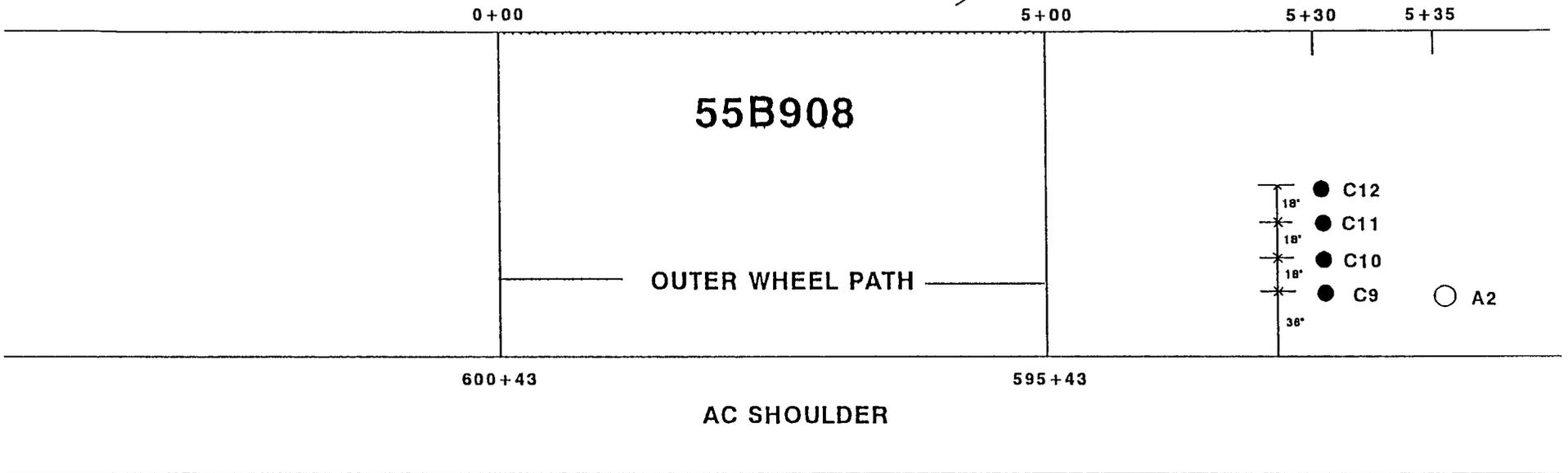


TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9B
MILWAUKEE, WISCONSIN
I-43 SOUTHBOUND

DIRECTION OF TRAVEL →



S2



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.



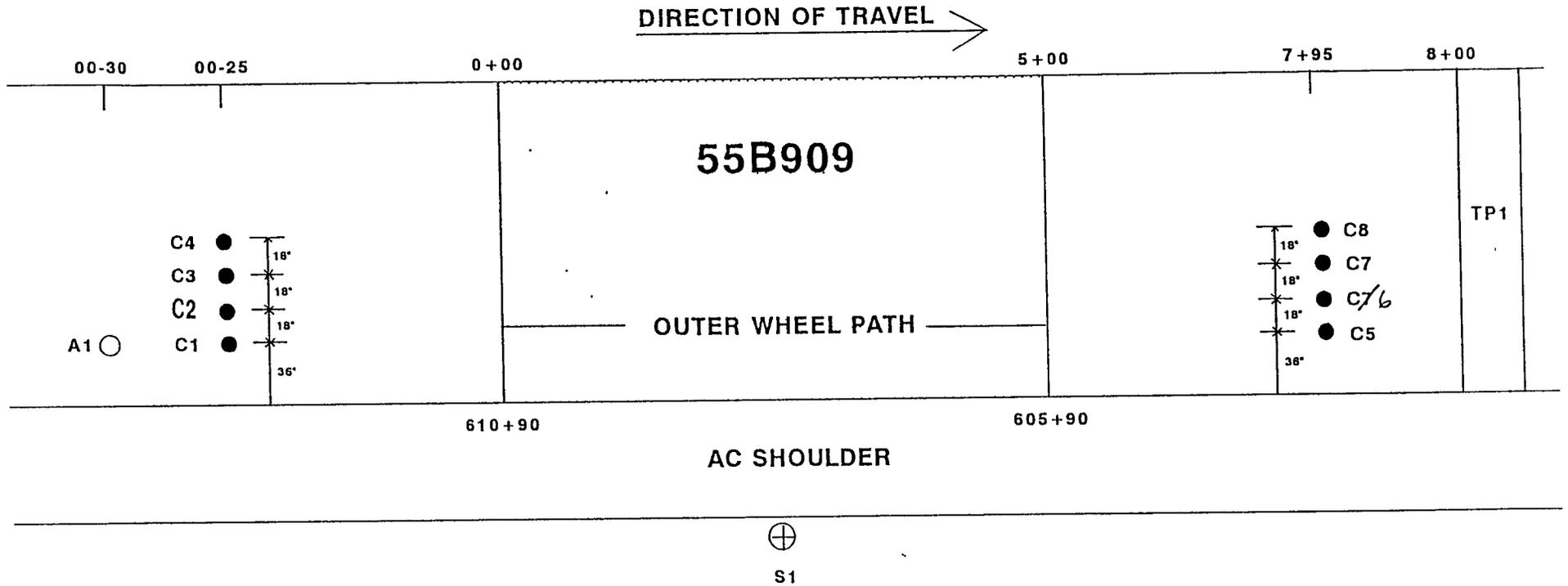
SHOULDER PROBE 20' BELOW TOP OF SHOULDER



TEST PIT TO OBTAIN NUCLEAR DENSITY AND BULK SAMPLES.

PRE-CONSTRUCTION SAMPLING AND TESTING

SPS-9B MILWAUKEE, WISCONSIN I-43 SOUTHBOUND



- 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.

Figure 7. SUPERPAVE Surface Mix Design

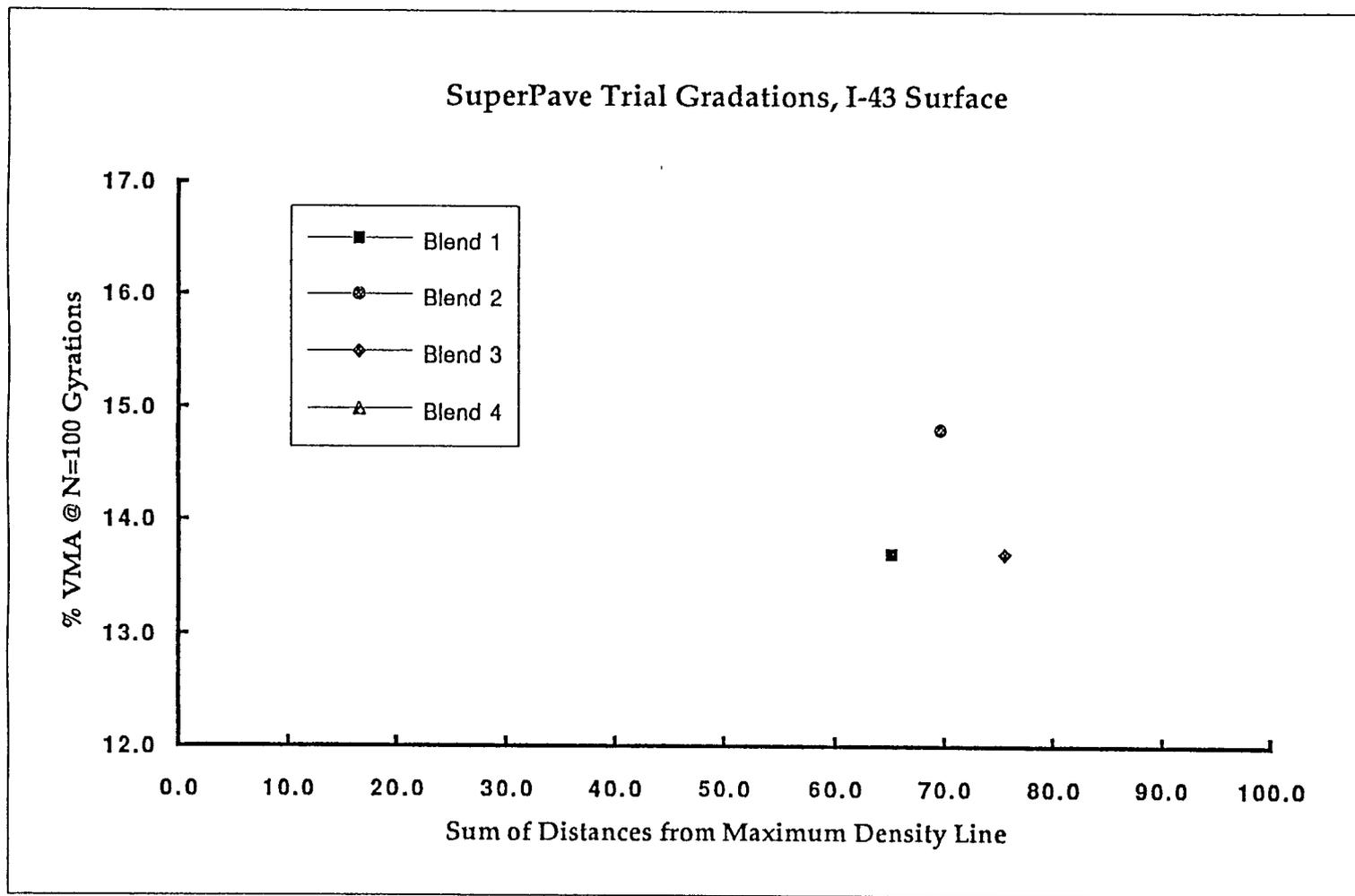
SUMMARY OF TRIAL BLENDS

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%

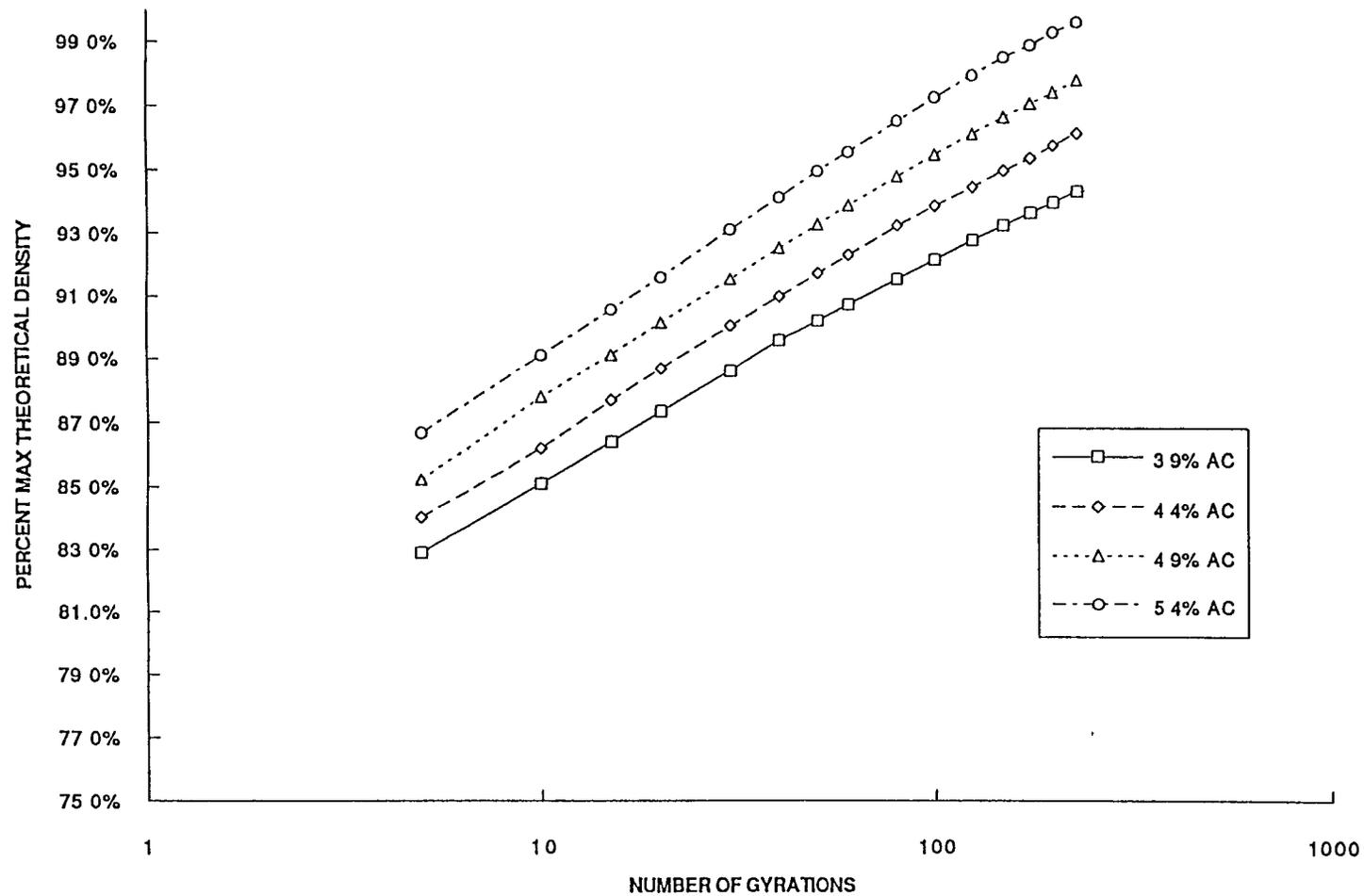
Blend 2 chosen
for full mix design

AGGREGATE BLENDING

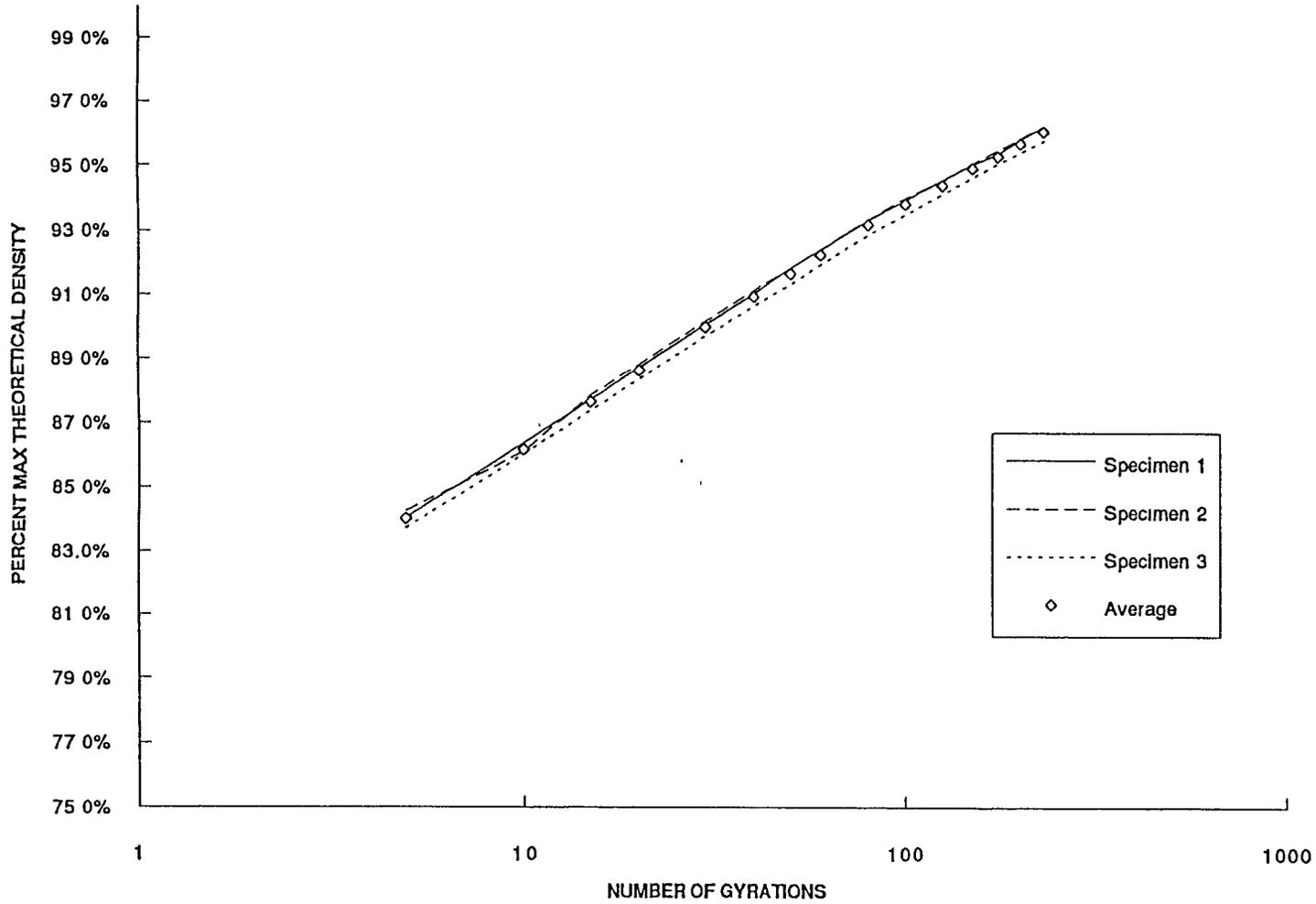
	#1 Stone	1/2" chip	3/8" chip	Mfg sand	Screen sand						
Blend 1	0.0%	25.0%	30.0%	25.0%	20.0%	0.0%					
✱ Blend 2	0.0%	10.0%	40.0%	35.0%	15.0%	0.0%					
Blend 3	0.0%	40.0%	20.0%	25.0%	15.0%	0.0%	Blend 1	Blend 2	Blend 3	Blend 4	Max Dens
Blend 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Gradation	Gradation	Gradation	Gradation	Gradation
Sieve #											
1 in	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	0.0	100.0
3/4 in	76.1	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	0.0	100.0
1/2 in	14.3	87.1	100.0	100.0	100.0	0.0	96.8	98.7	94.8	0.0	82.8
3/8 in	3.8	26.0	94.9	100.0	99.8	0.0	79.9	90.5	69.4	0.0	73.2
No. 4	2.1	3.1	4.8	95.5	89.5	0.0	44.0	49.1	39.5	0.0	53.6
No. 8	1.9	2.6	3.0	63.5	76.7	0.0	32.8	35.2	29.0	0.0	39.1
No.16	1.9	2.4	2.8	38.6	63.5	0.0	23.8	24.4	20.7	0.0	28.6
No.30	1.8	2.3	2.6	21.9	45.6	0.0	16.0	15.8	13.8	0.0	21.1
No.50	1.8	2.2	2.5	11.0	23.1	0.0	8.7	8.5	7.6	0.0	15.5
No.100	1.7	2.1	2.4	5.7	8.4	0.0	4.4	4.4	4.0	0.0	11.3
No.200	1.6	1.9	2.2	5.7	4.7	0.0	3.5	3.8	3.3	0.0	8.3

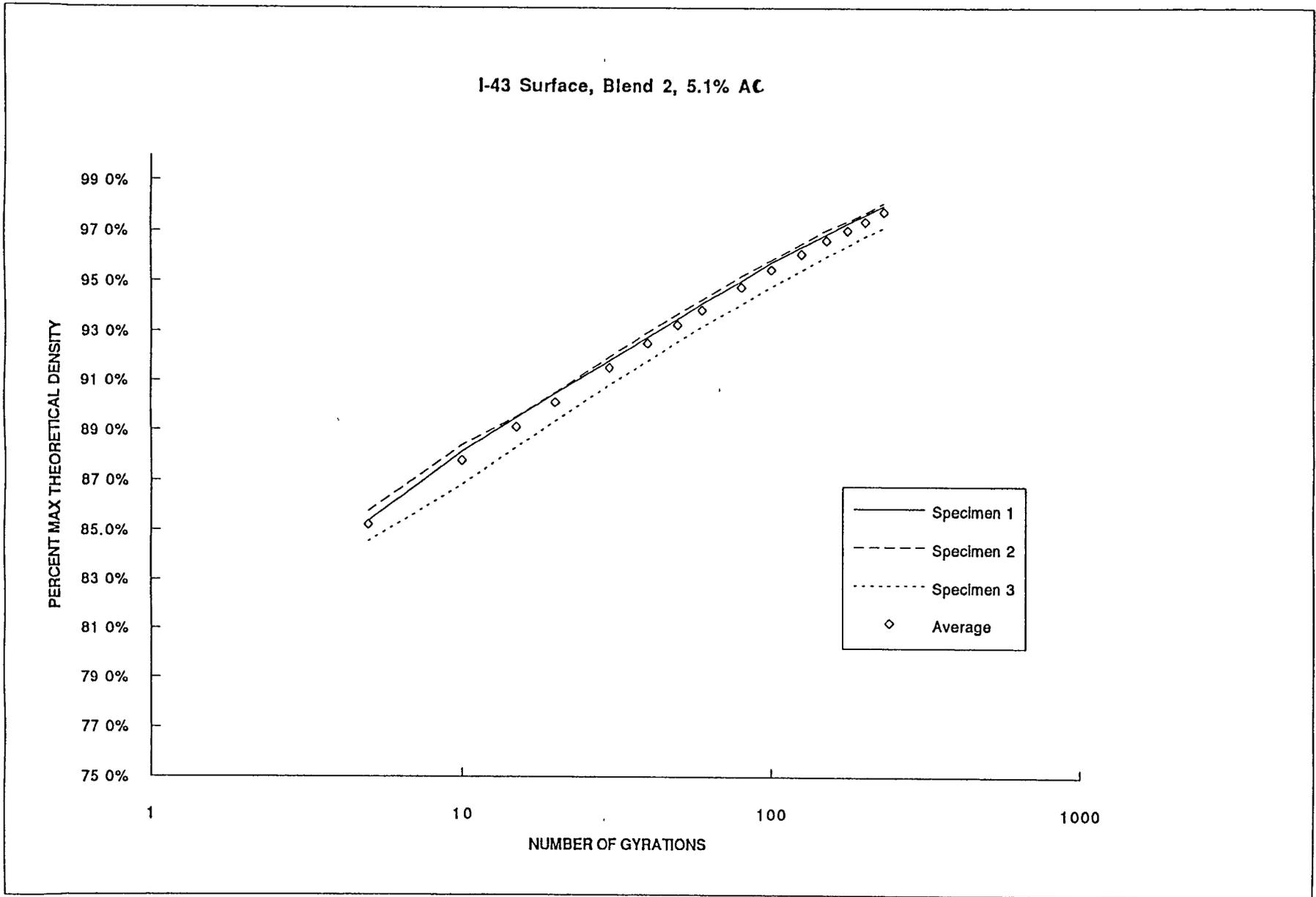


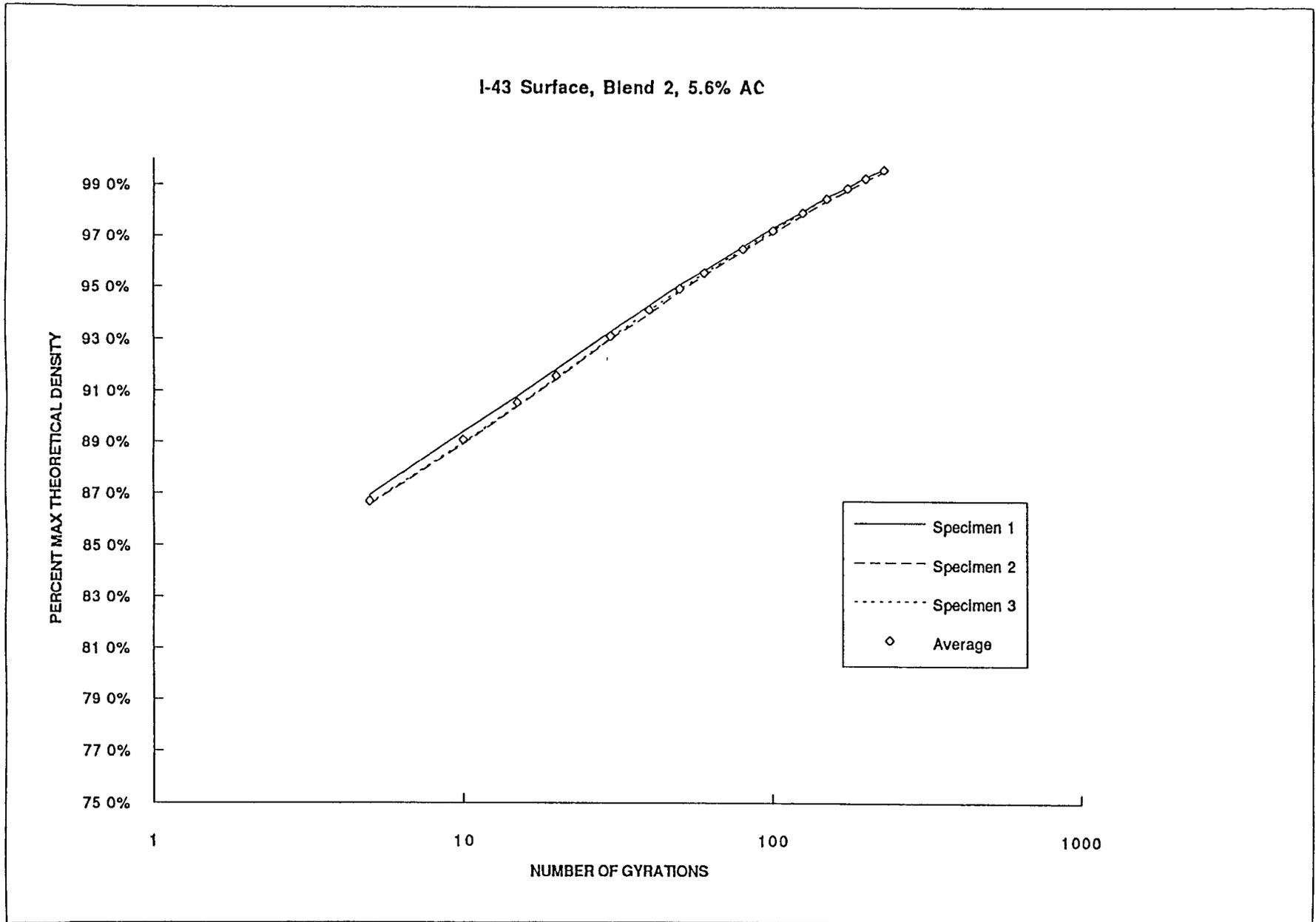
I-43 Surface, Blend 2

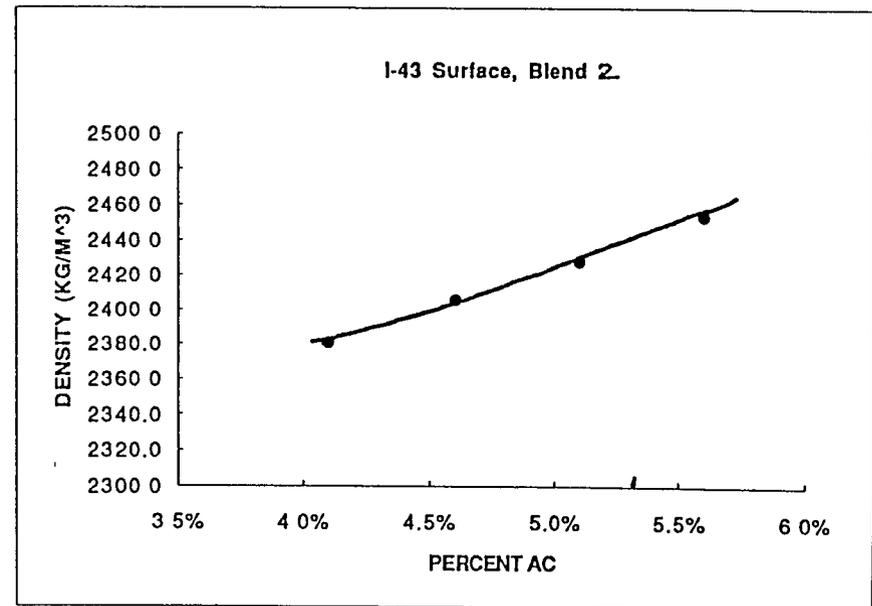
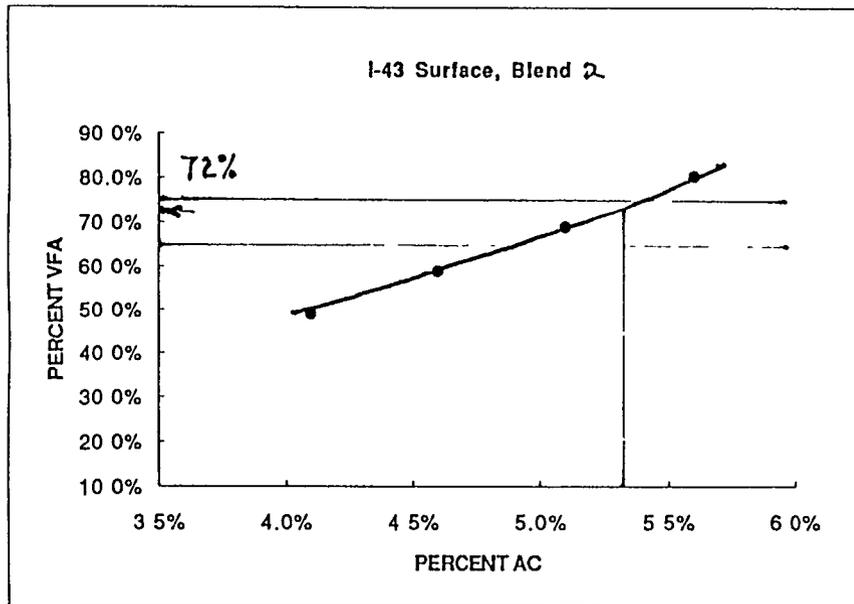
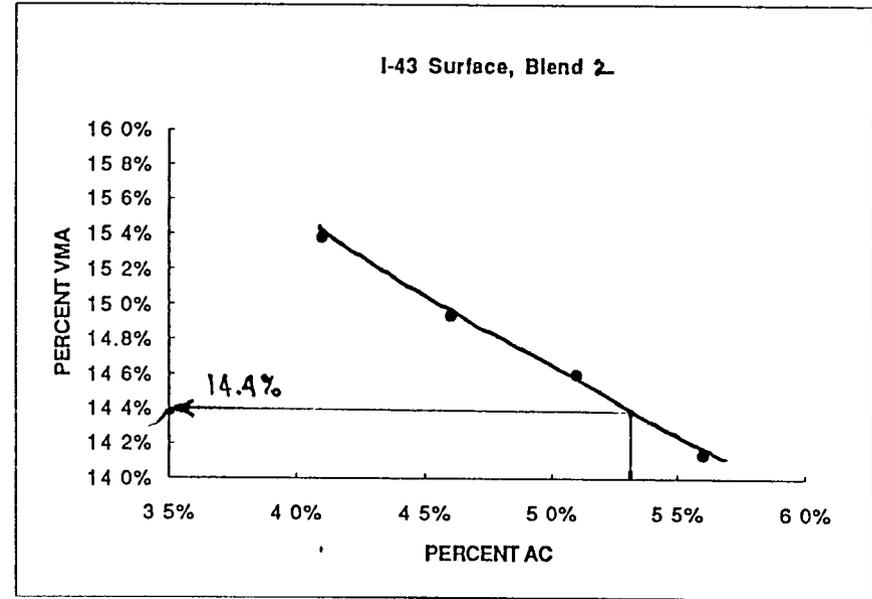
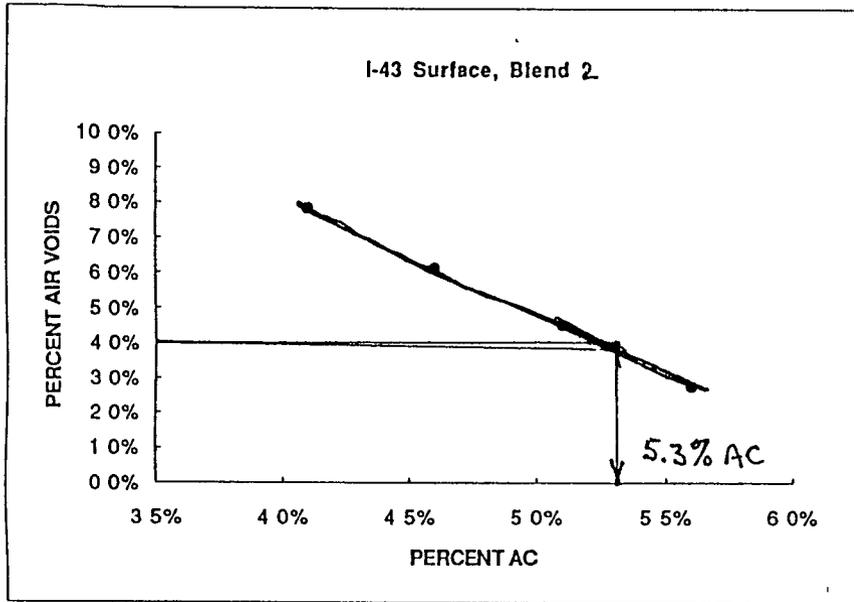


I-43 Surface, 4.6% AC, Blend 2









MIDAS-143S

4.1%

Gmm= 2 583		SPECIMEN 1			SPECIMEN 2			SPECIMEN 3			AVERAGE
Number of Gyration	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		SPECIMEN 1			SPECIMEN 2			SPECIMEN 3			AVERAGE
Number of Gyration	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%			

MIDAS-I43S

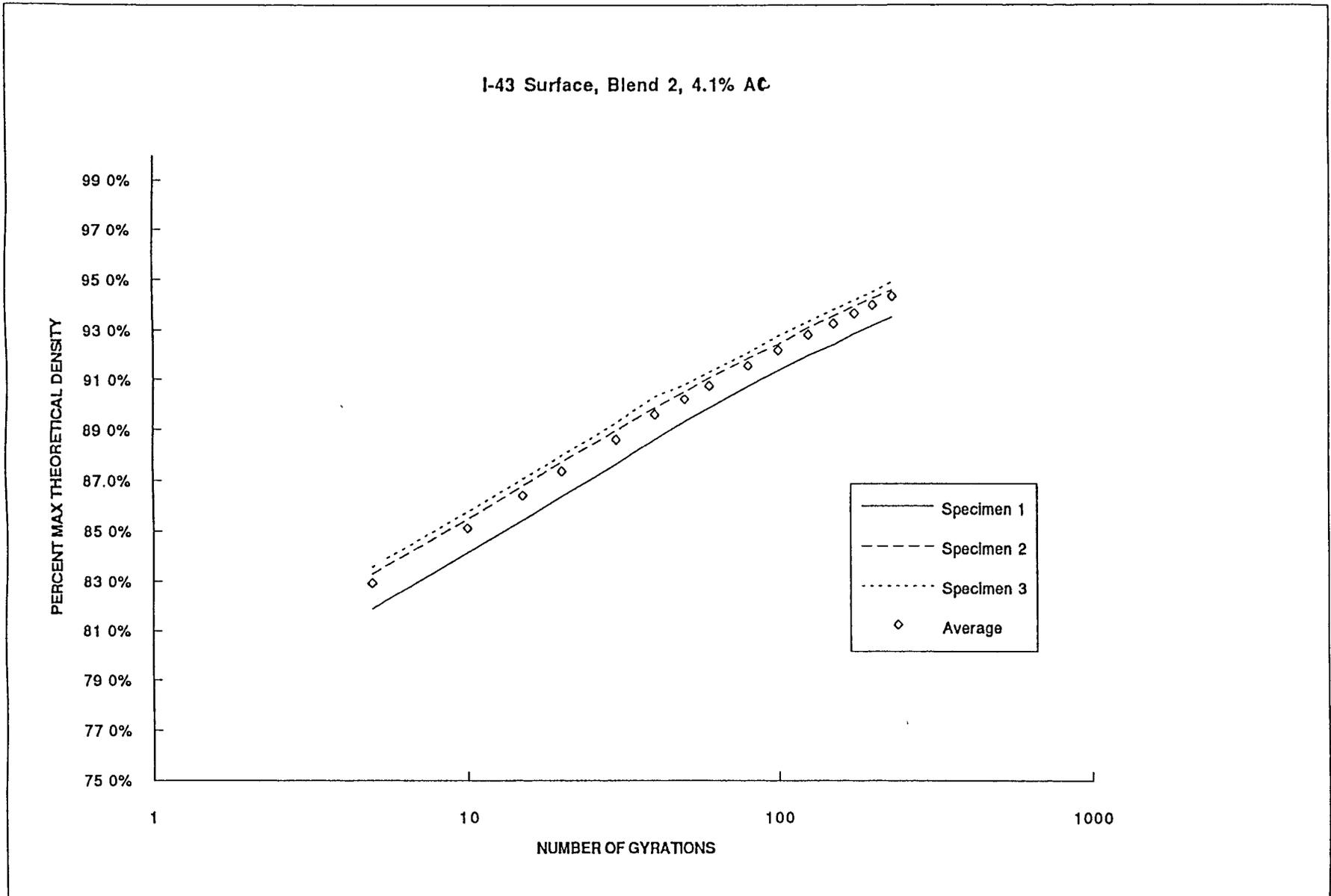
5.1%

Gmm= 2.543		SPECIMEN 1		SPECIMEN 2			SPECIMEN 3			AVERAGE
Number of Gyration	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%		

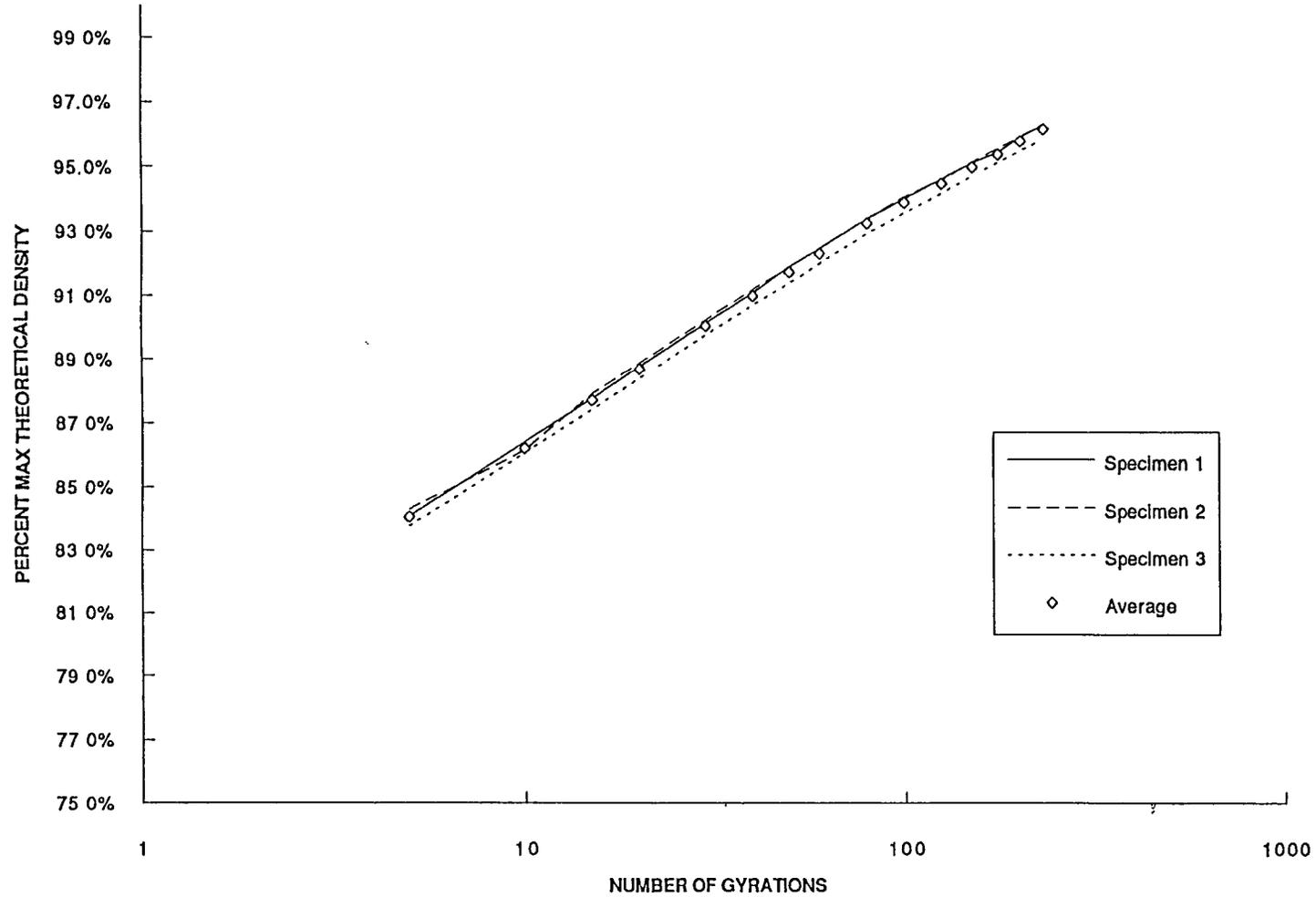
5.6%

Gmm= 2.524		SPECIMEN 1		SPECIMEN 2			SPECIMEN 3			AVERAGE
Number of Gyration	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%		

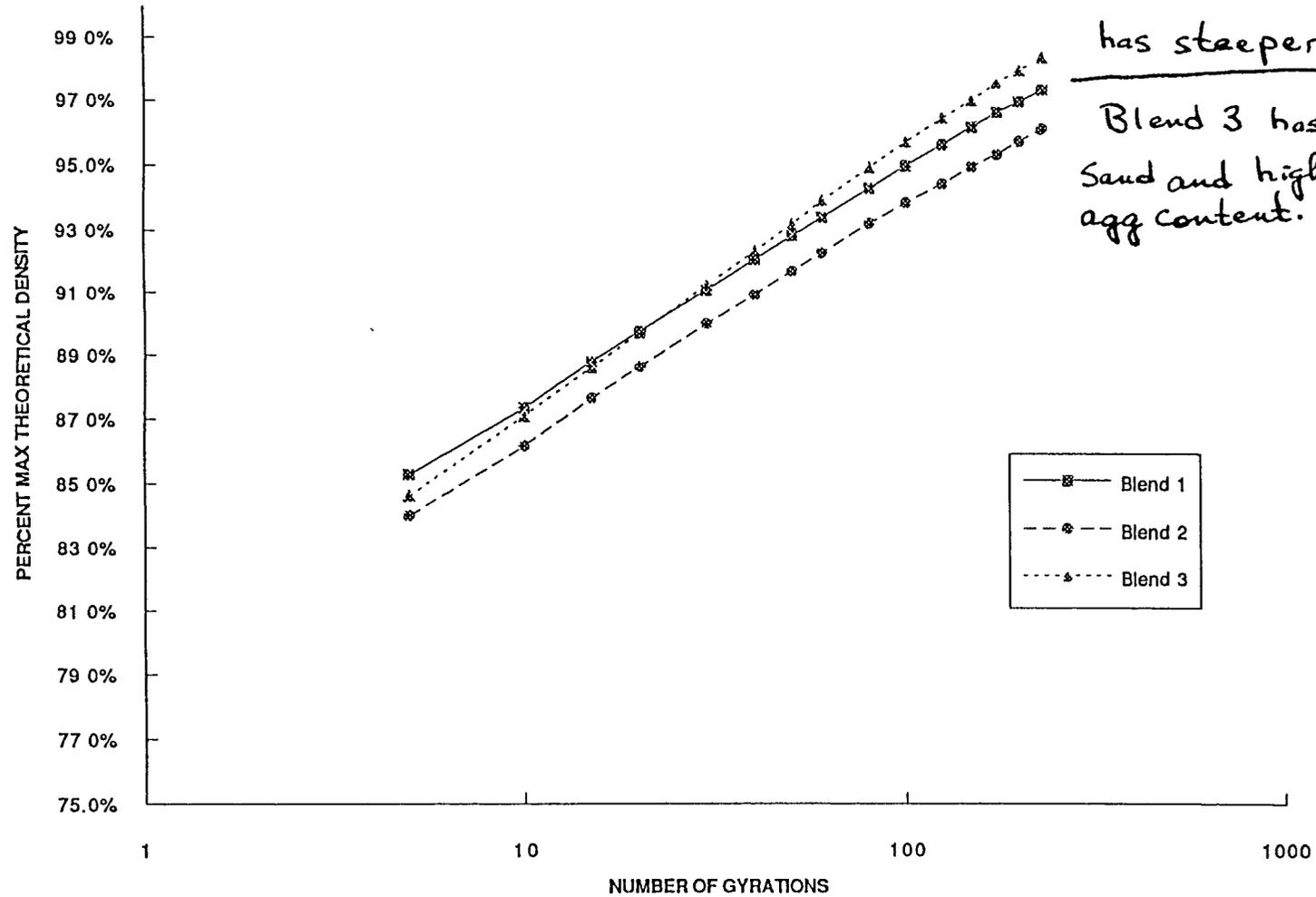
0.0%



I-43 Surface, Blend 2, 4.6% AC



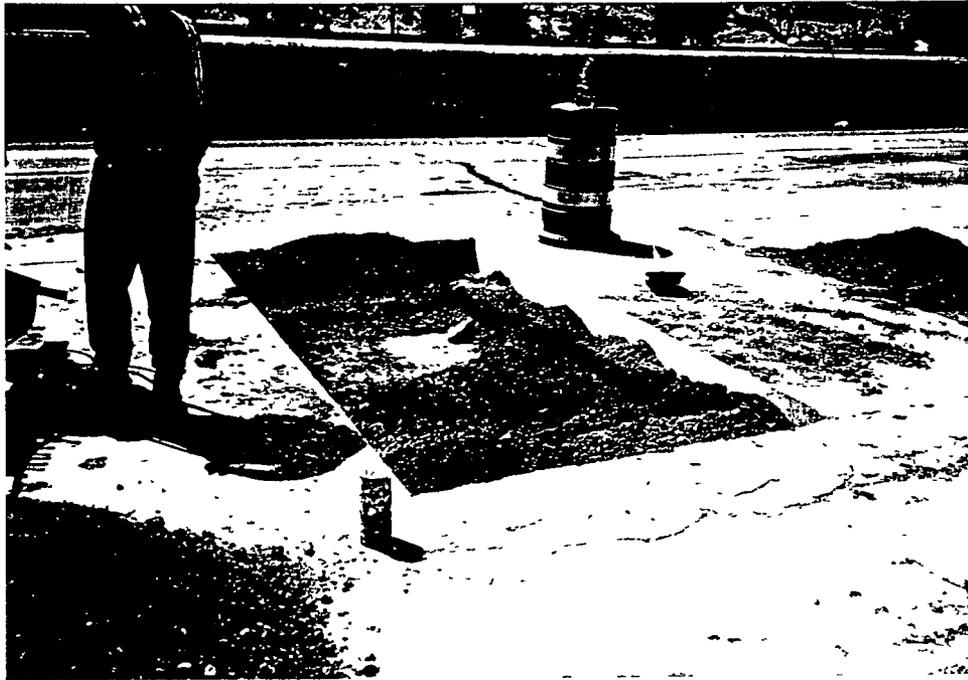
Trial Blends : I-43 Surface



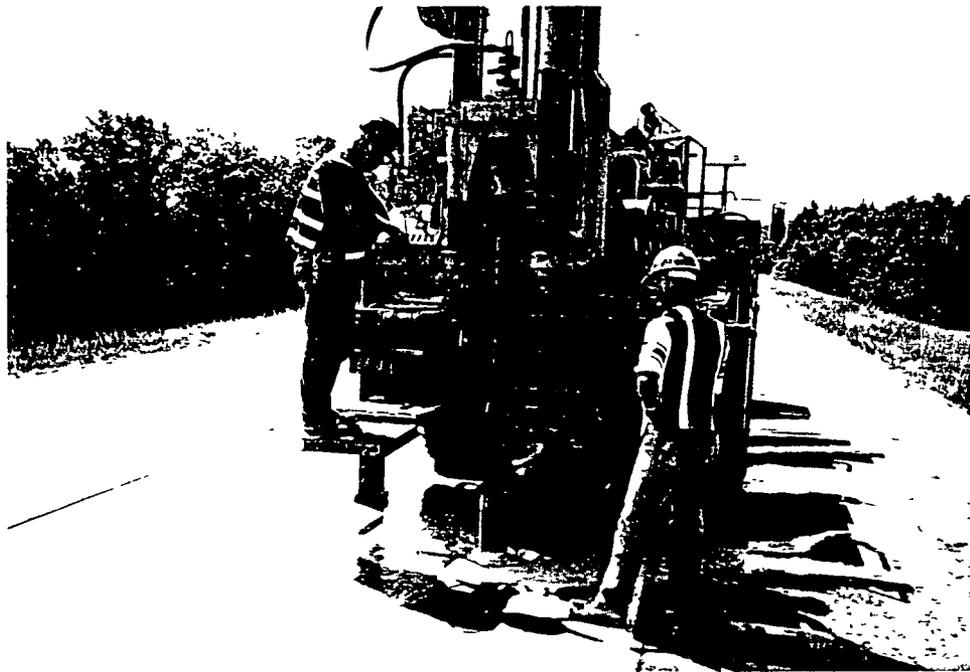
Notice that Blend 3
has steeper slope

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

Photos



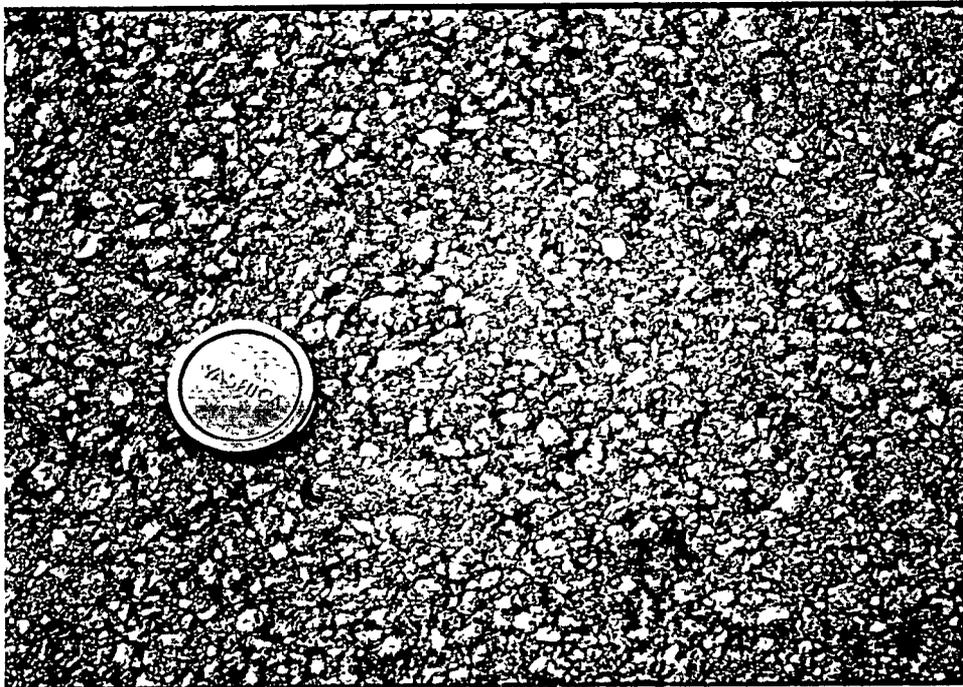
Test Pits in Joint Repair Area



Sampling and Testing Prior to Overlay



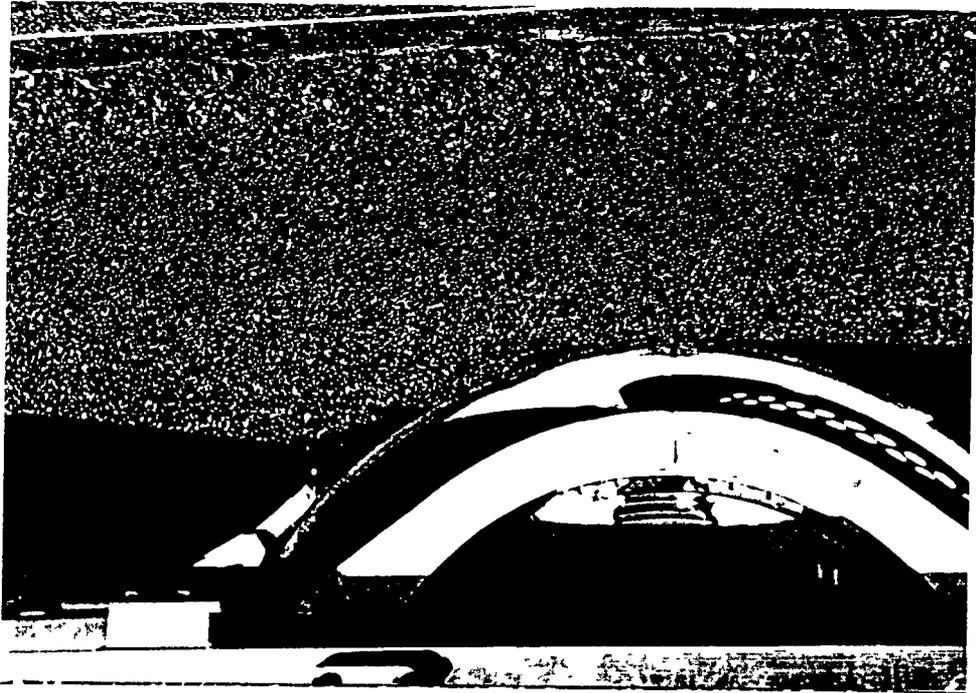
Placement of SHRP SUPERPAVE Mix



Close Up of SUPERPAVE Mix



**Fibers Used in SMA F-2 Mix
Section 55A907**



**SMA F1 Mix
Section 55A903**