PERMANENT DEFORMATION CHARACTERISTICS OF OREGON MIXES USING THE ASPHALT PAVEMENT ANALYZER

Final Report

SPR 340

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by

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16. Abstract

The Asphalt Pavement Analyzer (APA) device was used to characterize the impacts of various mix factors on the development of permanent deformation dense-graded mixes. Factors investigated included: aggregate size of 12.5 and 19 mm (0.5 and 0.75 in), VMA (high, design, low), fines content (design and high), binder content (low, design, high) and binder type (PG 64-22, PG 70-22, PG 76-22). A single aggregate source was used for all mixes. A compactive effort of 100 gyrations was used for all test specimens and specimens were tested at 64°C (147.2°F) following standard APA test protocol.

The measured rut depth did not exceed the NCAT recommendation of 8 mm (0.312 in) for any of the mixes tested. An increase in the binder content increased the permanent deformation of the mixes prepared with the PG 64-22 binder, irrespective of the other mix parameters. These effects were not noted in the mixes prepared with PG 70-22 and PG 76-22 binders, perhaps due to the standard test temperature of 64°C (147.2°F). All mixes prepared with the higher temperature binders showed very low permanent deformation when tested at the standard 64°C (147.2°F) regardless of the value of the older mix parameters.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	ml
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit	(F-32)/1.8	Celsius	°C
		PRESSURE		
psi	pounds per square inch	6.895	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
m^2	meters squared	1.196	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
		VOLUME		
ml	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		PRESSURE		
kPa	kilopascals	0.1450	pounds per square inch	psi

*SI is the symbol for the International System of Measurement

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PERMANENT DEFORMATION CHARACTERISTICS OF OREGON MIXES USING THE ASPHALT PAVEMENT ANALYZER

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 BACKGROUND

Permanent deformation has been one of the primary concerns of pavement designers, contractors, and federal and local highway agencies for decades and is frequently termed rutting. Rutting is defined as the load-induced permanent deformation along the wheel path of flexible pavements due to repeated movement of traffic (*Roberts, Kandhal and Brown 1996*). It is an accumulation of small deformations caused by repeated heavy loads. Rutting is one of the most dangerous forms of distress in the pavement because it permits water to pond in the wheel path, which leads to hydroplaning and an increase in vehicle accidents. Much of this rutting can be attributed to improper mix designs. Some of the most common mistakes when designing hot mix asphalt (HMA) mixtures are the following (*Roberts, Kandhal and Brown 1996*):

- selection of asphalt content that is too high
- use of excessive filler material (passing 0.075 mm (#200) sieve)
- use of too many rounded particles in both coarse and fine aggregates in the HMA

The Oregon Department of Transportation (ODOT) currently uses the Hveem Stabilometer to evaluate rut susceptibility of asphalt concrete mixtures designed in the laboratory. Preparation of Hveem stability samples requires mix compaction in a device very different from that used in the Superpave mix design process. The Hveem test results have not been correlated with the Superpave system, and it is widely accepted that the conventional mix design procedures, Marshall and Hveem, are inadequate to address the present in-service performance problems (*Choubane, Page and Musselman 2000*). Furthermore, Hveem stability testing has high variability and is insensitive to changes in asphalt grade.

The Superpave mix design and analysis system does not presently specify a proof test to assess the relative rutting susceptibility of HMA. Such a test is needed to assure that any mix will perform and stand without rutting for the design life of the road. One such device, the Asphalt Pavement Analyzer (APA), has been developed to test asphalt concrete mixes for rutting susceptibility.

1.2 OBJECTIVES

The objective of this study was to assess the suitability of the APA device as a tool for evaluating mixtures during the mix design phase, and judge the effects of varying mix properties on APA results. The project focuses on the following factors to assess the permanent deformation characteristics of different asphalt mixes using the APA device:

- maximum aggregate size
- gradation as reflected in Voids in Mineral Aggregate (VMA)
- binder type
- binder content
- fines content

This report also makes recommendations for implementing the results of this research.

1.3 SCOPE

Rutting is being influenced by a variety of factors beyond those identified above (i.e., failure to achieve adequate field density). These factors were not considered in this research. Also, as discussed in this report, only two-way interactions of factors were investigated, due to limited research funding. Finally, no efforts were made to vary testing procedures in the APA device (tube pressure, wheel load, etc), based on the difficulty separating them due to their interaction and their combined effect.

2.0 LITERATURE REVIEW

2.1 PERMANENT DEFORMATION CHARACTERIZATION

The primary purpose of asphalt mixtures is to produce a road surface that is smooth and will remain smooth for its entire design life without any deterioration. Permanent deformation is an accumulation of small deformations in the asphalt surface caused by repeated heavy loads at high temperatures. This can occur either through consolidation or through plastic flow. Consolidation is the result of further compaction of the asphalt pavement by traffic after construction. Plastic flow (permanent deformation) is the result of the excessive use of asphalt binder in the mix, which leads to a loss of internal friction between aggregate particles (*Roberts, Kandhal and Brown 1996*).

There are a variety of procedures and devices that have been used to evaluate the rutting potential of hot mix asphalt mixtures. In the study by, Zhang, Cooley and Kandhal (*2002*), these were classified into three groups, as listed below.

Fundamental tests:

- unconfined and confined cylindrical specimens in creep
- repeated dynamic loading
- cylindrical specimens in diametral creep or repeated loading
- Superpave Shear Test (SST)
- repeated shear at constant height test
- shear modulus test
- quasi-direct shear test and shear strength test

Empirical mix design related tests:

- Marshall Stability and Flow
- Hveem Stabilometer and Cohesionometer

Simulation Tests:

- Georgia Loaded Wheel Tester
- Hamburg Wheel Tracking Device
- LCPC Wheel Tracker
- Purdue University Laboratory Wheel Tracking Device

- Nottingham Pavement Tester
- Accelerated Pavement Tester (Accelerated Pavement Load Facility, APLF)
- Asphalt Pavement Analyzer

Each of the test devices and procedures used have advantages and disadvantages. A recent study by Brown, Kandhal and Zhang (*2001*), includes the advantages and disadvantages of the devices and procedures in the three categories.

Fundamental Diametral tests:

Advantages:

- Tests are easy to perform.
- The equipment is usually available in most labs and the specimens are easy to fabricate (4 in. diameter x 2.5 in. height or 101.6 x 63.5 mm).
- These tests are considered non-destructive.

Disadvantages:

- These tests may be inappropriate for estimating permanent deformation.
- These tests have been found to overestimate rutting.
- For the dynamic test, the equipment is complex.

Fundamental Triaxial tests:

Advantages:

- Common sample dimensions are: 4 in diameter x 8 in height (101.6 x 203.2 mm).
- These tests are considered non-destructive.
- Potentially inexpensive.

Disadvantages:

- Requires triaxial chamber.
- Equipment is relatively complex and expensive.
- Ability to predict permanent deformation is questionable.

Fundamental Shear tests:

Advantages:

- AASHTO standardized procedure available.
- Specimen available from the Superpave Gyratory Compactor (SGC) sample (6 in diameter x 2 in height or 152.4 x 50.8 mm).
- These tests are considered non-destructive.

Disadvantages:

- Equipment extremely expensive and rarely available.
- SGC samples need to be cut and glued before testing.
- Test is complex and difficult to run, usually need special training.

Empirical tests:

Advantages:

- Tests are wide spread and well known.
- Sample dimensions are 4 in diameter x 2.5 in height (101.6 x 63.5 mm).
- Equipment available in all labs.
- Developed with a good basic philosophy.

Disadvantages:

- Not able to correctly rank mixes for permanent deformation.
- Not much data available.

Simulative tests:

Advantages:

- Simulate field traffic and temperature conditions.
- Specimens can be from the field as well as lab prepared.
- Most of them use SGC samples.

Disadvantages:

- Relatively expensive.
- Not widely available in U.S.
- Very little data available.

Among the simulative tests currently available, Brown, Kandhal and Zhang (*2001*) ranked the APA as the number one choice.

2.2 ASPHALT PAVEMENT ANALYZER

The focus herein is on the Asphalt Pavement Analyzer given the prior decision by ODOT to focus on the use of this device.

The APA is a wheel tracking device that has gained credibility in the asphalt industry and with several state DOTs. The APA, as shown in Figure 2.1, is the latest version of the Georgia Loaded Wheel Tester. The APA is considered a multi-functional loaded wheel device as a result of its capability to measure rutting susceptibility, fatigue cracking and moisture susceptibility of HMA mixes.

Figure 2.1: Asphalt Pavement Analyzer

HMA specimens may be prepared using a gyratory compactor, a vibratory compactor, or a Marshall Hammer. The device is also capable of testing cores or beams extracted from the roadway. Permanent deformation tendencies can be determined on three beam specimens, six cylindrical specimens, or a combination of both. Permanent deformation tests are conducted in a controlled temperature environment, from 30°C to 70°C (86°F to 158°F), either dry or submerged in water. Each sample is loaded independently with up to 113 kg (250 lbs). Tire pressures of up to 827 kPa (120 psi) can be simulated, with optional pressures up to 1379 kPa (200 psi) available.

An automated rut-depth measuring system is available, and capable of plotting the deformation with respect to cycles or time. The system obtains rutting measurements and displays those measurements in a numeric and graphical format, as shown in Figure 2.2. Five measurements can be taken during a single pass over a beam specimen and two measurements can be taken during a single pass over a cylindrical specimen.

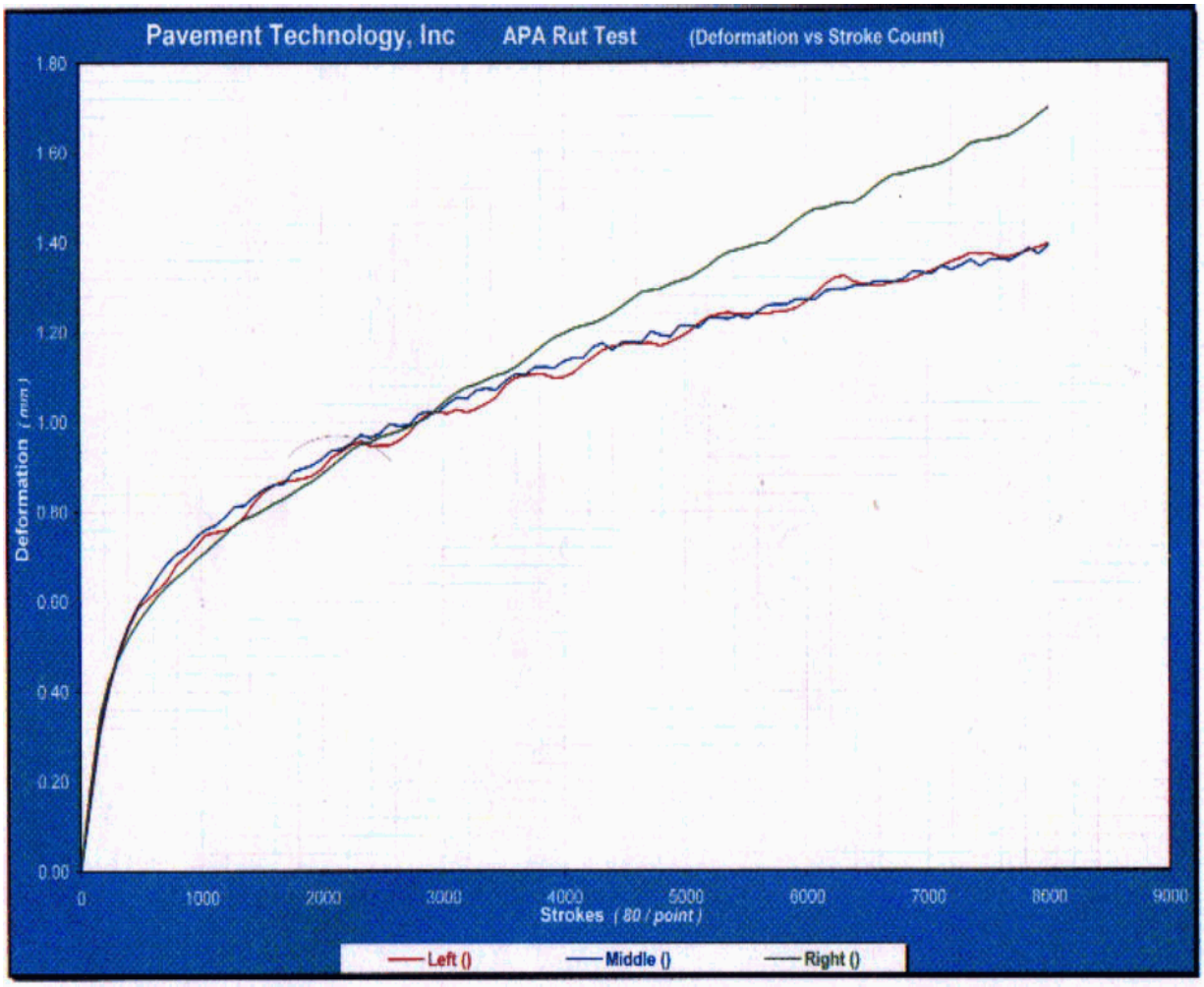

Figure 2.2: Typical Rut results (APA)

The APA can also determine fatigue resistance of a mixture by using a steel wheel, in place of the rubber hose and concave wheel used in the permanent deformation test. The test is conducted in a controlled environment of 5°C to 30°C (41°F to 86°F). Each sample can be loaded independently with up to 113 kg (250 lbs) and with a contact pressure in excess of 827 kPa (120 psi). Moisture susceptibility of a mix can also be determined using the APA. This is accomplished by conducting the test for rutting susceptibility on both dry and pre-conditioned specimens.

The pre-conditioned specimens are submerged in water for two hours and fifteen minutes prior to the testing. This method compares favorably with the AASHTO T-283 test, which is the widely accepted standard procedure for evaluating moisture susceptibility (*Lynn 2000*).

2.3 CURRENT RESEARCH

2.3.1 APA and Permanent Deformation

Some studies have shown that the APA can provide valuable data on permanent deformation (*Jackson and Baldwin 1999; Collins, Shami and Lai 1996*). In one study, by Kandhal and Mallick (*1999*), the APA was used to predict the rutting potential of HMA mixes when using different aggregates (granite, limestone, gravel) with the same gradation. Gradations passing above, through, and below the restricted zone (ARZ, TRZ, BRZ respectively) and different asphalt binders (PG 64-22 and PG 58-22) were compared. For this study, the wearing (nominal size 12.5 mm or 0.5 in) and binder courses (nominal size 19.5 mm or 0.75 in) were tested separately. All test samples were prepared at 4 percent air voids with the SGC. The samples were compacted at N_{design}= 76 (corresponding to 0.3-1 million ESALS).

Statistical analyses of the data showed a significant effect in deformation from changes in aggregate type, asphalt binder type, gradation, course type and an interaction of aggregate and gradation. Mixes with gravel and limestone showed higher rutting than granite mixes. Mixes with asphalt PG 58-22 showed higher rutting compared with PG 64-22 asphalt mixes. For the granite and limestone mixes, with gradations passing below the restricted zone (BRZ), they generally showed the highest amount of rutting. Whereas, gradations through the restricted zone (TRZ) showed the lowest rut depth and, ARZ gradations showed intermediate rutting. For gravel mixes, the BRZ gradations showed the least amount of rutting; whereas, mixes with ARZ gradations showed the highest amount of rutting. Mixes with gradations TRZ showed either higher or similar rutting, as mixes with gradations BRZ.

It was also noticed that while granite and limestone tended to have more rutting with an increase in film thickness (for wearing courses), for gravel, the rutting decreased with an increase in film thickness. VMA for the granite and limestone mixes, there was an increase in rut depth with an increase in VMA. The trend was reversed for gravel mixes, as there was a decrease in rut depth with an increase in VMA; but the research did not explain this behavior. Finally, an ANOVA test was also done to determine correlations between, mix rut depths and density at $N_{initial}$ and N_{max}. It was concluded, that mixes meeting $N_{initial}$ and N_{max} criteria did not necessarily show less rutting potential, than mixes that did not meet the criteria.

2.3.2 APA and Density Gradients

The APA has also been used to evaluate density gradients, as measured by variations in air voids, within samples and by comparisons of two types of compactive efforts used for APA samples: vibratory and gyratory (*Cooley and Kandhal 1999*). For this study, beam samples were compacted with the asphalt vibratory compactor (AVC), and the cylindrical specimens were compacted with both the AVC and with the SGC.

All specimens were compacted at 7± 1.0 percent air voids. Two aggregate types with different aggregate angularity and particle shape were used for this study: 1) granite and 2) crushed gravel. The test matrix included HMA mixtures having two nominal maximum sizes 12.5 (0.5 in) and 19 mm (0.75 in). Each fabricated specimen was cut into predetermined sizes and the bulk specific gravity of each individual piece was determined.

It was found that vibratory compaction resulted in more compaction at the top and less compaction at the bottom of the samples. This was consistent for both beams and cylinders. Gyratory compacted samples showed less compaction in the top and bottom of samples and significantly more compaction in the middle. The gradation differences seemed to affect density gradients in vibratory compacted samples. Gradations passing above the restricted zone had less density in the top 25 mm (0.975 in) of samples than gradations passing below the restricted zone. Density gradients within the AVC compacted specimens indicated that the bottom of the samples had significantly less density. Finally, the vibratory compacted beams showed a difference of 0.6 percent air voids between the top 25 mm (0.975 in) and the bottom 25 mm (0.975 in) of the samples. SGC compacted cylinders showed an approximate 2 percent difference in air voids from the top and bottom 25 mm (0.975 in) to the middle 25 mm (0.975 in).

2.3.3 Field Results Correlated to APA Results

In a separate study by, Choubane, Page and Musselman (*2000*), attempts were made to correlate field rut depth measurements to APA results. Three sections with different types of mix from the Florida interstate pavement system were considered in this study (Mix B, Mix C, and Mix D). The sections were selected because of their varied performance (good, severely rutted, and light to moderate rutting). Core samples were obtained from the three sections to determine the in-place aggregate gradations and asphalt contents. The specimens prepared for this study closely matched the gradations and the original asphalt contents. The original asphalt cement used for these sections was not available, so a standard grade AC–20 was used for all three mixes. The air void contents of the original and reproduced designs were around 2.8% and 4.3 %, and the VMA were between 13.7 and 15.9.

All samples were compacted to a target air void content of 7 % to simulate the typical initial density achieved in the field. A total of 90 samples were prepared, 72 beams by using the AVC and 18 specimens by using the SGC.

Results reported that the gyratory samples had greater rutting than beam samples when the ruts were less than 10 mm (0.39 in). Above the 10 mm (0.39 in) mark, the beam deformed more,

regardless of the mixture type. The APA testing variability may differ from test to test and, within each test, from location to location, for both gyratory and beam samples.

The beam and gyratory samples did not result in statistically similar results, regardless of the mix type. Thus, it may not be appropriate to use the same pass/fail test criteria for both. Average values within the ranges of 7 to 8 mm (0.273 to 0.312 in) and of 8 to 9 mm (0.312 to 0.351 in) may be used as a performance limiting criteria at 8000 cycles for beam and gyratory samples, respectively. Under similar testing conditions, independently of the mix type and loading cycle number, a good correlation between the APA and Georgia Loaded Wheel Tester (GLWT) test results was obtained. However, the magnitudes of the respective rut depths were not comparable. The APA deformations were approximately twice as large as those of the GLWT.

2.3.4 Differing Properties of HMA

In Tennessee, the APA was used to determine if it readily distinguishes between differing properties of HMA (*Jackson and Baldwin 1999*). Mixes designed by both Marshall and Superpave methods were evaluated. Both modified and unmodified binders were tested including AC-20, PG76-22, PMAG-20, PG64-22, and MG20-4.

Specimens were compacted in the SGC to achieve 7±1 percent air voids (typical value for Tennessee). The compacted samples were subjected to a total of 8000 cycles in the APA. Rut depth measurements were obtained at a seating load of 10 cycles, and intermediate loadings of 500, 1000, 4000, and 8000 cycles. The wheel loading conditions were held constant at 100 pounds downward force and hose pressure of 689.5 kPa (100 psi). The chamber temperature was set at 120°F (49°C). From the results, it was found that there was no apparent pattern in the APA rut depth data, with respect to air voids. Data suggested that there was a higher occurrence of excessive rutting (greater than 5 mm (0.195 in) in the conventional Marshall surface mixes, as opposed to the other type of mixes. Every mix tested that exhibited excessive rutting in the APA (> 5 mm or > 0.195 in), whether designed by the Marshall or Superpave mix design methods, contained a PG64-22 or AC-20 binder.

It was also found that there was a slight (weak) tendency for increased rutting, with an increase in binder content, especially above approximately 6.5 percent. The dust content was also analyzed, showing that within reasonable limits it does not correlate well with the performance of HMA in the APA. The dust-to-asphalt ratio analysis suggested that the APA was more sensitive to its effect, than either the, binder content or dust content. Finally, it was illustrated that the APA results at 500 cycles correlated well with the results at 8000 cycles (R^2=0.93). After 500 cycles, any mix with a rut depth greater than 1.5 mm (0.058 in) experienced excessive rutting (> 5 mm or > 0.195 in) at the end of the 8000 cycle test.

2.3.5 Variability of the APA

Some researchers have been interested in testing the variability of the APA (*Sholar and Page 1999*). The objective of this study was to analyze the variability of the APA in terms of rutting potential of four Superpave mixes: two 12.5 mm (0.5 in) mixes, one coarse graded and one fine graded, each of the same aggregate type; and two 9.5 mm (0.375 in) mixes, one coarse graded

and one fine graded, containing an unmodified binder, AC-30. A comparison between the automated data recording system and the manual method of recording was also included in the research.

The two coarse graded mixes had gradations that passed below the restricted zone. The two fine graded mixes had gradations that passed above the restricted zone. The N_{design} = 96 gyrations for the coarse graded mix and 86 gyrations for the fine graded mix. In this study, 36 beams were made with a target air void content of 7±0.5 percent. The test temperature was 64°C (142.7°F), the hose pressure was set to 689.5 kPa (100 psi) and the vertical load was set to 45.4 kg (100 lbs). A 25 cycle seating load was applied, and initial rut depths were manually recorded. Manual measurements were also recorded at 500, 2000, 4000, and 8000 cycles.

Sholar and Page tried to find a relationship between air voids and rut depth in this study. The results indicated that there was no significant relationship between the air void content and the rut depth (R^2=0.29) within the range of air voids tested (7±0.5).

The research concluded that the variability between the tests and the locations was high; but using the average rut depth for the three beams it was possible to get fairly consistent results from test to test. It was also found that the center position on this particular APA device consistently resulted in higher rut depths than the left or right positions. Results also indicated that the 12.5 mm (0.57 in) mixes rutted less than the 9.5 mm (0.375 in) mixes. The coarse graded mixes rutted less than the fine graded mixes for a given nominal maximum size aggregate.

The automated data acquisition system used by Sholar and Page (*1999*) for this study was very accurate when compared to the manual method of measuring rut depth, and was much less time consuming. Therefore, the automated data acquisition system was chosen to be used on all mixes in the future, with occasional manual measurements taken to verify the accuracy of the automated system.

As can be seen from the previous research, there are interactions among the factors that affect rutting. Most of the studies used 19 mm (0.75 in) and 12.5 mm (0.5 in) nominal aggregate sizes. Sometimes researchers found correlations between rutting and air voids, sometimes results were not correlated, and occasionally results were counter-intuitive. Nevertheless, most past research indicates that the APA is able to identify mixes that have a tendency to rut.

3.0 EXPERIMENT DESIGN

3.1 EXPERIMENTAL FACTORS

Information obtained from the literature review, and the input from the project Technical Advisory Committee (TAC) helped identify the experimental factors shown below.

- Binder Types – PG 64-22, PG 70-22, and PG 76-22
- Voids in Mineral Aggregate (VMA) – Low, Design and High
- Asphalt Content - Low, Optimum, and High
- Aggregate Source – Single Source
- Aggregate Maximum Size – 12.5 mm (0.5 in) and 19 mm (0.75 in)
- Fines Content – Design and Design+3%

There are a total of 108 ($2^2 3^3$) cells in the full factorial, but testing of all the combinations exceeded the available resources for this project. Therefore, a fractional factorial was proposed, and is displayed in Table 3.1. This ½ factorial requires only 54 of the cells be filled, yet allows the main factors (as listed above) and the two-way interactions to be investigated.

Table 3.1: Fractional factorial experimental design

Maximum Aggregate Size	VMA	Fines Content	*Binder Grade and Content*								
			PG 64-22			PG 70-22			PG 76-22		
			Low	Optimum	High	Low	Optimum	High	Low	Optimum	High
19 mm (0.75 in)	Low VMA	Design	X	X	X	X	X	X	X	X	X
		Design + 3%									
	Design VMA	Design	X	X*	X	X	X	X	X	X	X
		Design + 3%									
	High VMA	Design	X	X	X	X	X	X	X	X	X
		Design + 3%									
12.5 mm (0.5 in)	Low VMA	Design									
		Design + 3%	X	X	X	X	X	X	X	X	X
	Design VMA	Design		*							
		Design + 3%	X	X	X	X	X	X	X	X	X
	High VMA	Design									
		Design + 3%	X	X	X	X	X	X	X	X	X

Note: * indicates control mixes; all tests conducted at 64°C (147.2°F)

The optimum binder content was determined following standard ODOT procedure; a 100 gyration mix using PG 64-22 binder. The low binder content was determined by preparing a 125 gyration mix design and noting the binder content reduction required to maintain 4 percent air voids. The high binder content was established by preparing a 75 gyration mix and noting the required increase in binder content to maintain 4 percent air voids. The binder contents established above were used for the PG 70-22 and PG 76-22 mixes.

The voids in mineral aggregate (VMA) was adjusted by modifying the aggregate gradations as shown in Tables 3.2 and 3.3.

Table 3.2: Aggregate gradations for 19 mm (0.75 in) mixes

Sieve Size		Low VMA	Target VMA	High VMA
mm	English Equivalent			
25	1 in	100	100	100
19	0.75 in	92	94	98
12.5	0.5 in	79	81	85
9.5	0.375 in	69	71	73
6.3	0.25 in	66	66	54
4.75	#4	60	59	46
2.36	#8	44	42	30
0.6	#30	21	19	12
0.075	#200	6.5	6.3	3.5

Table 3.3: Aggregate gradations for 12.5 mm (0.5 in) mixes

Sieve Size		Target P200 Content			Target P200 Content + 3%		
mm	English Equivalent	Low VMA	Target VMA	High VMA	Low VMA	Target VMA	High VMA
19	0.75 in	100	100	100	100	100	100
12.5	0.5 in	90	96	98	90	96	98
9.5	0.375 in	80	83	84	80	83	84
6.3	0.25 in	75	70	60	75	70	60
4.75	#4	69	62	51	69	62	51
2.36	#8	50	43	32	50	43	32
0.6	#30	22	20	15	22	20	15
0.075	#200	7.4	6.4	4.4	10.4	9.4	7.4

In Table 3.4, a modification of the matrix shown in Table 3.1 was done to further establish the effect of the fines content. Nine combinations were tested to avoid the confounding effect of aggregate size with the fines content (shaded areas of Table 3.4).

Table 3.4: Modified experimental factorial

Maximum Aggregate Size	VMA	Fines Content	*Binder Grade and Content*								
			PG 64-22			PG 70-22			PG 76-22		
			Low	Optimum	High	Low	Optimum	High	Low	Optimum	High
19 mm (0.75 in)	Low VMA	Design	X	X	X	X	X	X	X	X	X
		Design + 3%	X	X	X						
	Design VMA	Design	X	X*	X	X	X	X	X	X	X
		Design + 3%	X	X	X						
	High VMA	Design	X	X	X	X	X	X	X	X	X
		Design + 3%	X	X	X						
12.5 mm (0.5 in)	Low VMA	Design									
		Design + 3%	X	X	X	X	X	X	X	X	X
	Design VMA	Design		*							
		Design + 3%	X	X	X	X	X	X	X	X	X
	High VMA	Design									
		Design + 3%	X	X	X	X	X	X	X	X	X

3.2 MATERIALS AND PROCEDURES

All test specimens were compacted using a SHRP gyratory compactor located at the Asphalt Pavement Association of Oregon (APAO) in Salem, Oregon. Following the approach taken by NCAT (*Asphalt 2001*), all specimens received a compactive effort of 100 gyrations to simulate field compacted material, that is fixed energy input.

The asphalt binders, PG 64-22, PG 70-22 and PG 76-22 were supplied by Albina Oil Company, McCall Oil Company and Chevron Oil Company, respectively. The basaltic aggregate was supplied by River Bend Sand & Gravel Company of Salem, Oregon.

3.2.1 Aggregate Tests

Gradation tests were performed for all mixes. Summary results of the different tests used for the 19 mm (0.75 in) and 12.5 mm (0.5 in) aggregates sizes are listed in Tables 3.5 and 3.6, respectively.

Table 3.5: Summary of aggregate test results for 19 mm (0.75 in) maximum aggregate size

Coarse Aggregate		Fine Aggregate		
Fraction Size, mm	19.0-4.75	Fraction Size, mm	4.75-2.36	2.36-0.00
Source	24-045-2	Source	24-045-2	24-054-2
Soundness Loss, %	1.0	Soundness Loss, %	6.0	7.0
Abrasion Loss, % (LAR)	12.7	Abrasion Loss, % (LAR)		
Degradation		Degradation		
Sediment Height, mm		Sediment Height, mm	17.0	17.0
% passing 0.85 mm (No. 20)		% passing 0.85 mm (No. 20)	9.7	9.7
Fractured Faces, %	See QL	Fractured Faces, %	See QL	
Lightweight Pieces, %	0.0	Fine Aggregate Angularity (method A)		
Wood Particles, %				
Dust or Clay Coating				
Elongated Pieces, %				
Bulk Specific Gravity, (G_{sb})	2.629	Bulk Specific Gravity (G_{sb})	2.587	2.591
Absorption, %	1.7	Absorption, %	2.3	2.3

Table 3.6: Summary of aggregate test results for 12.5 mm (0.5 mm) maximum aggregate size

Coarse Aggregate		Fine Aggregate		
Fraction Size, mm	12.5-4.75	Fraction Size, mm	4.75-2.36	2.36-0.00
Source	24-054-2	Source	24-054-2	24-054-2
Soundness Loss, %	1.0	Soundness Loss, %	6.0	7.0
Abrasion Loss, % (LAR)	12.0	Abrasion Loss, % (LAR)		
Degradation		Degradation		
Sediment Height, mm	9.0	Sediment Height, mm	17.0	17.0
% passing 0.85 mm (No. 20)	12.7	% passing 0.85 mm (No. 20)	9.7	9.7
Fractured Faces, %	See QL	Fractured Faces, %	See QL	
Lightweight Pieces, %	0.0	Fine Aggregate Angularity (method A)		
Wood Particles, %				
Dust or Clay Coating				
Elongated Pieces, %				
Bulk Specific Gravity, (G_{sb})	2.638	Bulk Specific Gravity (G_{sb})	2.587	2.591
Absorption, %	1.7	Absorption, %	2.3	2.3

ODOT requires the Soundness Loss Test (*AASHTO T104 1993*) for both coarse and fine aggregates, with a weighted loss not exceeding 12% when subjected to five cycles. This test estimates the resistance of aggregate to in-service weathering. The Abrasion Loss Test (*AASHTO T96 1993*) provides durability testing of coarse aggregate. ODOT's specification limit is 30 percent.

For the Fracture Faces test, ODOT specifications require a minimum of 75% for materials retained on the 2.36 mm (#8) sieve (one fractured face) and a minimum of 75% for materials retained on 37.5, 25.0, 19.0, 12.5 and 4.75 mm (1.5 in, 1 in, 0.75 in, 0.5 in and #4) sieves (two fractured faces). (*ODOT (a-5) 1998*)

The degradation test (*ODOT TM 208 1986*) is another indicator of aggregate soundness. The maximum limit for sediment height for coarse aggregate and fine aggregate is 75 mm (2.925 in) and 100 mm (3.9 in), respectively. The maximum value for percent passing the .850 mm (#20) sieve tests for coarse and fine aggregate is 30.0 percent. The lightweight pieces test was done according to the AASHTO T113 (*1993*) procedure. ODOT allows a maximum value of 1.0 percent for coarse aggregates.

3.3 MIX DESIGN

The job mix formula for this project was developed based on a Level 3 mix design from ODOT's specifications (*ODOT 1998*). A summary of the mix design values is shown in Tables 3.7 and 3.8. The binder content for the control mix was determined for a 100 gyration mix using a PG 64-22 binder (commonly used in Oregon). The same binder content was used for the PG 70-22 and PG 76-22 mixes containing the design fines content and VMA. The design asphalt content was 6.2 and 6.6 percent for the 19 and 12.5 mm (0.75 and 0.5 in) mixes, respectively.

As noted above, these values were increased or decreased to obtain the high and low binder contents. This was done by reducing or increasing the number of gyrations, and then repeating the mix design with the goal of maintaining the 4.0 percent target air voids. This approach yielded, low, design, and high binder contents of 5.7, 6.2 and 6.7 percent for the 19 mm (0.75 in) mixes and 6.1, 6.6 and 7.1 percent binder contents for the 12.5 mm (0.5 in) mixes.

Table 3.7: Summary of mix design results for 19 mm (0.75 in) mix (PG 64-22)

Mixture Design Asphalt Content		Job Mix Formula	
Maximum Specific Gravity (Gmm)	2.454	25.0 mm (1 in)	100
Gyro. Bulk Specific Gravity	2.357	19.0 mm (0.75 in)	94
Air Voids, % (Va)	4.0	12.5 mm (0.5 in)	81
VMA, %	15.5	9.5 mm (0.375 in)	71
VFA, %	74	6.3 mm 0.25 in)	66
Effective Asphalt Content (Pbe), %	4.9	4.75 mm (#4)	59
P0.075/Asphalt Content Ratio	1.0	2.36 mm (#8)	42
P0.075/Pbe Ratio	1.3	0.600 mm (#30)	19
Target Maximum Density, Kg/m^3	2454	0.075 mm (#200)	6.3
Combined Aggregate Gsb	2.606	Asphalt Content, %	6.2
Tensile Strength Ratio (TSR)		Asphalt Brand	ALBINA
TSR Compaction Gyrations		Asphalt Grade	64-22
Gmm Dryback Correction		Mix Temperature	156-161
		Compaction Temperature	142-147
Date		Asphalt Sp. Gr. (Gb) 25/25	-
Signature		Asphalt Sp. Gr. (Gb) 15.6/15.6	1.033

Table 3.8: Summary of mix design for 12.5 mm (0.5 in) mix (PG 64-22)

Mixture Design Asphalt Content		Job Mix Formula	
Maximum Specific Gravity (Gmm)	2.439	25.0 mm (1 in)	100
Gyro. Bulk Specific Gravity	2.338	19.0 mm (0.75 in)	100
Air Voids, % (Va)	4.0	12.5 mm (0.5 in)	96
VMA, %	16.2	9.5 mm (0.375 in)	83
VFA, %	74	6.3 mm 0.25 in)	70
Effective Asphalt Content (Pbe), %	5.3	4.75 mm (#4)	62
P0.075/Asphalt Content Ratio	1.0	2.36 mm (#8)	43
P0.075/Pbe Ratio	1.2	0.600 mm (#30)	20
Target Maximum Density, Kg/m^3	2439	0.075 mm (#200)	6.4
Combined Aggregate Gsb	2.605	Asphalt Content, %	6.6
Tensile Strength Ratio (TSR)		Asphalt Brand	ALBINA
TSR Compaction Gyrations		Asphalt Grade	64-22
Gmm Dryback Correction		Mix Temperature	156-161
		Compaction Temperature	142-147
Date		Asphalt Sp. Gr. (Gb) 25/25	-
Signature		Asphalt Sp. Gr. (Gb) 15.6/15.6	1.033

3.4 SUPERPAVE GYRATORY COMPACTOR (SGC)

The Superpave Gyratory Compactor (SGC) was used to prepare the asphalt cylinders. The SGC produces asphalt mix specimens to densities approximating those achieved under actual construction conditions. The SGC consists of a rigid reaction frame, a loading system, a specimen height measurement and a recording system. It compacts the asphalt mixture specimen at a constant pressure of 600 kPa (87 psi). The mixture is compacted by a gyratory kneading action using a compaction angle of 1.25 degrees and operating at 30 rpm. The SGC used for this study was equipped with a 1.44 MB (3.5") floppy disk drive which stored data from the previous twenty specimens in its memory.

3.5 APA TESTING

Testing was conducted following standard APA testing protocol (*Kandhal and Mallick 1999*) with a tube pressure of 690 kPa (100 psi) and an applied mass of 45 kg (99.225 lb). It is particularly important to note that all testing was conducted at 64°C (147.2°F) regardless of the binder grade used in the mix. Specimens were prepared with a standard compactive effort of 100 gyrations, rather than attempting to adjust the compactive effort to achieve constant air voids of 7 percent.

4.0 RESULTS AND ANALYSES

4.1 SUMMARY RESULTS

The test results are shown in Table 4.1 for the 12.5 mm (0.5 in) aggregate size and in Table 4.2 for the 19 mm (0.75 in) maximum aggregate size. Only the mean values of the measured rutting and air voids are shown. Complete results are included in Appendix A. It should be noted that none of the 63 combinations had rut depths above the NCAT recommended maximum permissible value of 8 mm (0.312 in). Each of the 19 mm (0.75 in) mixes had low binder contents and design fines contents with high VMA.

Table 4.1: Summary results for 12.5 mm (0.5 in) mixes

12.5 mm	Averages	Binder Grade								
		PG 64-22			PG 70-22			PG 76-22		
		6.1	6.6	7.1	6.1	6.6	7.1	6.1	6.6	7.1
Design VMA, P200	Rut Depth (mm)		3.63							
	Air Content (%)		3.50							
	VMA		15.4							
Low VMA, P200+3%	Rut Depth (mm)	2.16	2.65	2.34	1.57	2.07	2.29	0.85	0.84	1.00
	Air Content (%)	2.60	2.00	0.60	3.10	2.10	0.90	3.10	1.60	0.90
	VMA	13.5	14.1	13.8	14.4	14.5	14.6	14.0	13.8	14.3
Design VMA, P200+3%	Rut Depth (mm)	3.47	3.11	1.76	2.22	2.30	2.06	1.00	0.77	1.12
	Air Content (%)	3.80	2.50	1.40	3.70	2.00	1.10	4.10	2.80	1.30
	VMA	14.6	14.6	14.7	14.9	14.5	14.9	15.0	14.9	14.8
High VMA, P200+3%	Rut Depth (mm)	3.73	4.82	4.71	3.01	3.54	3.70	1.84	1.76	2.33
	Air Content (%)	5.80	5.60	4.00	5.80	4.10	3.40	5.30	5.10	3.40
	VMA	16.3	17.2	16.5	16.7	16.3	16.6	16.0	16.8	16.4

Table 4.2: Summary results for 19 mm (0.75 in) mixes

19 mm	Averages	Binder Grade								
		PG 64-22			PG 70-22			PG 76-22		
		5.7	6.2	6.7	5.7	6.2	6.7	5.7	6.2	6.7
Low VMA, P200	Rut Depth (mm)	2.39	3.05	3.56	2.03	1.83	1.78	1.11	1.05	1.39
	Air Content (%)	3.90	2.50	1.60	4.10	2.50	1.30	3.80	2.30	1.50
	VMA	14.2	14.0	14.2	14.2	13.8	13.8	14.1	13.8	14.3
Design VMA, P200	Rut Depth (mm)	3.13	4.18	5.05	2.11	2.78	1.98	1.31	1.45	1.33
	Air Content (%)	4.80	3.00	1.90	4.60	3.50	1.90	4.20	3.40	1.80
	VMA	14.9	14.4	14.5	14.7	14.7	14.4	14.5	14.9	14.5
High VMA, P200	Rut Depth (mm)	3.75	3.76	3.16	3.52	3.26	3.41	1.78	1.69	1.83
	Air Content (%)	8.70	7.20	5.30	9.00	7.30	5.30	8.00	7.10	5.00
	VMA	18.4	18.0	17.4	18.5	18.1	17.3	17.8	18.1	17.3

4.2 STATISTICAL APPROACH

The results of this study were analyzed by conducting an ANOVA test, using SAS software (*SAS 2001; Littell, Stroup and Freund 2002; Kuehl 2000*). Following the ANOVA test, the levels of significance and two-way interactions were assessed using multiple comparisons with a Tukey-Kramer adjustment. There are a total of 63 cells with rut values; each cell contains 6 rut values. For the analysis, the averages of the six values were used, as shown in Table 4.3.

Table 4.3: Summary results for 19 mm (0.75 in) mixes (P200+3%)

19 mm	Averages	Binder Grade		
		PG 64-22		
		5.7	6.2	6.7
Low VMA, P200+3%	Rut Depth (mm)	2.30	3.39	3.13
	Air Content (%)	1.10	0.40	0.10
	VMA	12.0	12.5	13.4
Design VMA, P200+3%	Rut Depth (mm)	2.35	2.26	2.94
	Air Content (%)	2.20	0.80	0.70
	VMA	13.2	13.0	14.0
High VMA, P200+3%	Rut Depth (mm)	4.29	4.65	5.42
	Air Content (%)	6.60	5.60	4.40
	VMA	17.2	17.4	17.5

The model considered for this study contained rut depth as the "dependent variable". The independent variables were: aggregate size (2 levels), binder type (3 levels), binder content (3 levels), VMA (3 levels), fines content-P200 (2 levels), and the covariate air content.

The questions to be addressed in the statistical analyses were:

- Is there an effect of the amount of VMA in the mix after taking into account all of the factors?
- Is there an effect of aggregate size in rutting after taking into account all of the factors?
- Is there an effect of binder content in rutting after taking into account all of the factors?
- Is there an effect of increasing the fines content by 3 percent in rutting after taking into account all of the factors?
- Is there an effect of binder type in rutting potential after taking into account all of the factors?

4.3 STATISTICAL ANALYSES

A Type III ANOVA was used because the experiment was unbalanced as a result of the extra nine cells used to investigate the effects of the fines content on rut depth (ANOVA tables are shown in Appendix B).

Initially the statistical analysis was conducted with air content included as a covariate. This analysis showed that the only factor of significance was binder type. The two-way interaction of the fines content and VMA was identified as significant. However, further analysis showed that this interaction was confounded with air content and therefore not statistically significant. The statistical consultant for this project recommended that subsequent analysis exclude the covariate air content. The ANOVA results described below do not include the covariate air content.

The effect of binder type on rut depth is shown in Figure 4.1. Statistical analysis showed that there is strong evidence that the rut depth mean values decrease as the high temperature grade of the binder increases (p-value = 0.0001). This reflects the increasing high temperature stiffness of the binder. Since all binders were tested at the same temperature of 64°C (147.2°F) following standard procedure, it is not surprising that the higher stiffness binders demonstrated less permanent deformation. The estimated rut mean value for binder type PG 64-22 was 3.38 mm (0.131 in) (95% confidence interval: 3.14 to 3.61). The estimated rut mean value for binder type PG 70-22 was 2.53 mm (0.098 in) (95% confidence interval: 2.29 to 2.76). The estimated rut mean value for binder type PG 76-22 was 1.36 mm (0.053 in) (95% confidence interval: 1.12 to 1.59).

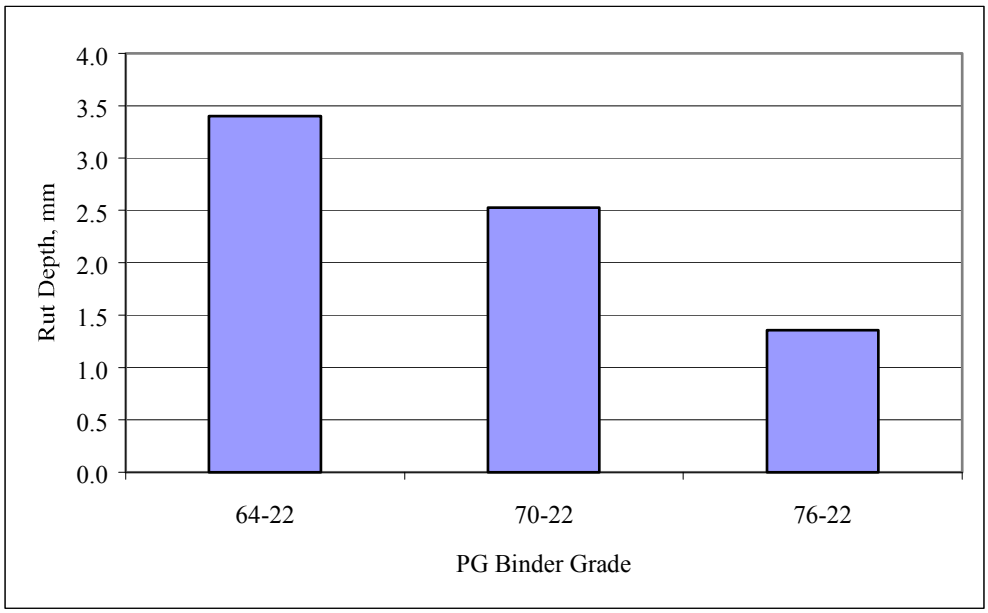

Figure 4.1: Effect of binder type on rutting

There is no statistical evidence that changes in binder content, within the range investigated here, affects rutting potential (p-value = 0.3245). Figures 4.2 and 4.3 show the effects of binder content for the 19 and 12.5 mm (0.75 and 0.5 in) mixes, respectively. As shown in these figures, as the binder content increases, the rutting also increases for the PG 64-22 mixes, but not for the other binder grades. Again, when the standardized test temperature of 64°C (147.2°F) is used for all mixes, regardless of binder grade, the effect of increasing the binder content is masked. Conversely, it can be argued that for a given field environment, small increases in the binder

content will not result in increased rutting if a higher stiffness binder is used. This assumes that the APA results are indicative of field performance.

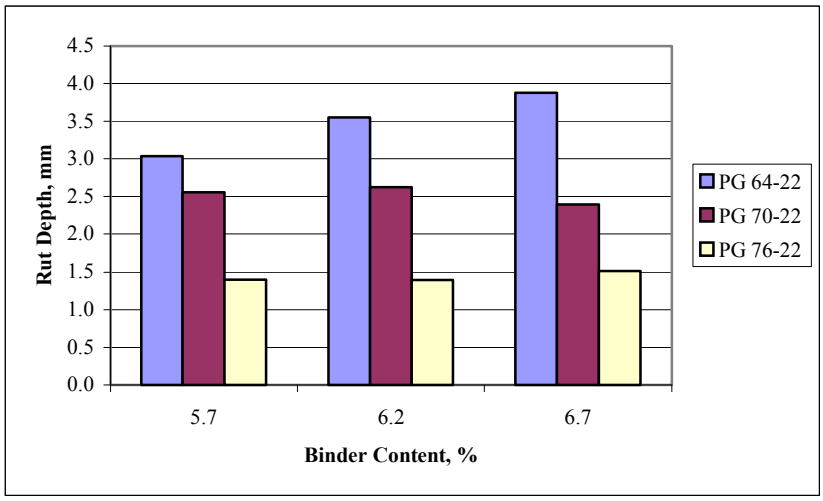

Figure 4.2: Effect of Binder type and binder content in rutting for 19 mm mixes

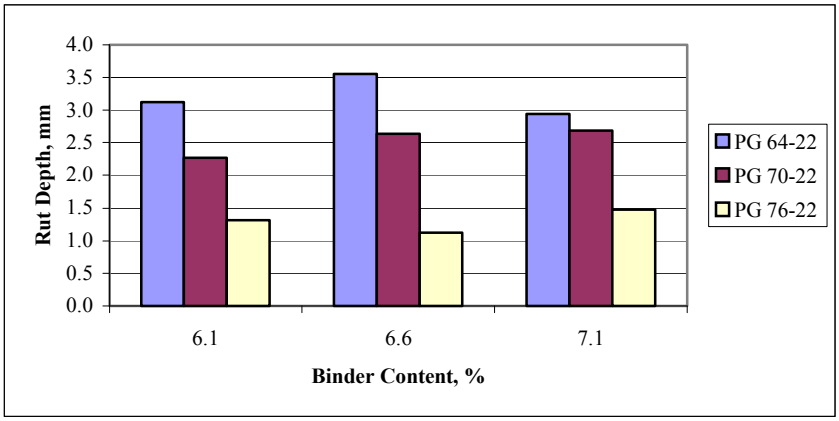

Figure 4.3: Effect of Binder type and Binder content in rutting for 12.5 mm

A contrast analysis was done to assess the effect of the extra three percent fines content in the 19 mm (0.75 in), PG 64-22 mixes. There was no statistical evidence that the mean rut depths change when the fines content is increased by three percent over the design value (p-value = 0.5349). Figure 4.4 shows the relationship between rut depths, VMA, and binder content for the two fines levels investigated.

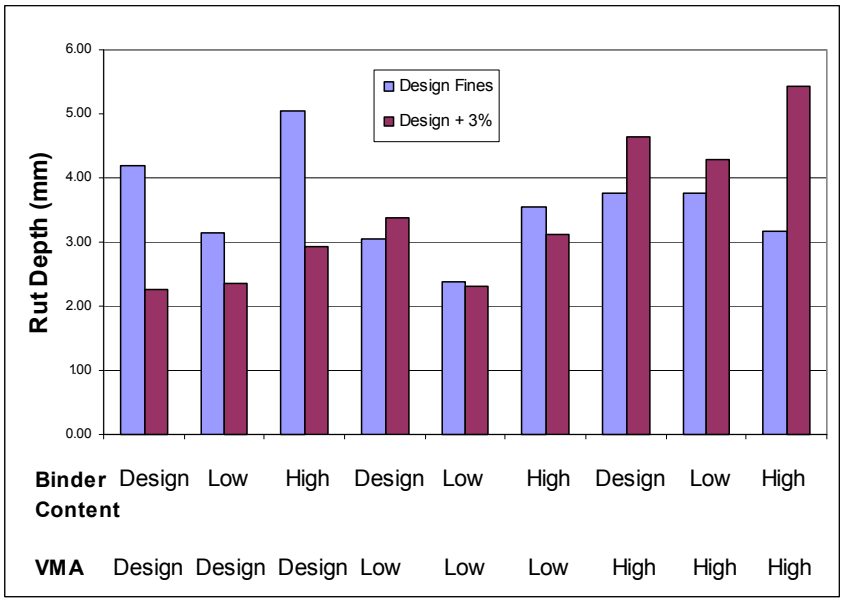

Figure 4.4: Effect of fines content on mean APA rut depths in 19 mm mixes

Figure 4.5 shows the effect of the extra three percent fines on the air voids in the 19 mm (0.75 in) mixes. As shown in the figure, the air voids followed the same trend in the design and high fines mixes. As expected, there was a reduction of air voids in the mix as the fines content increased. The air voids drop an average of 1.9 percent when the fines content is increased by three percent.

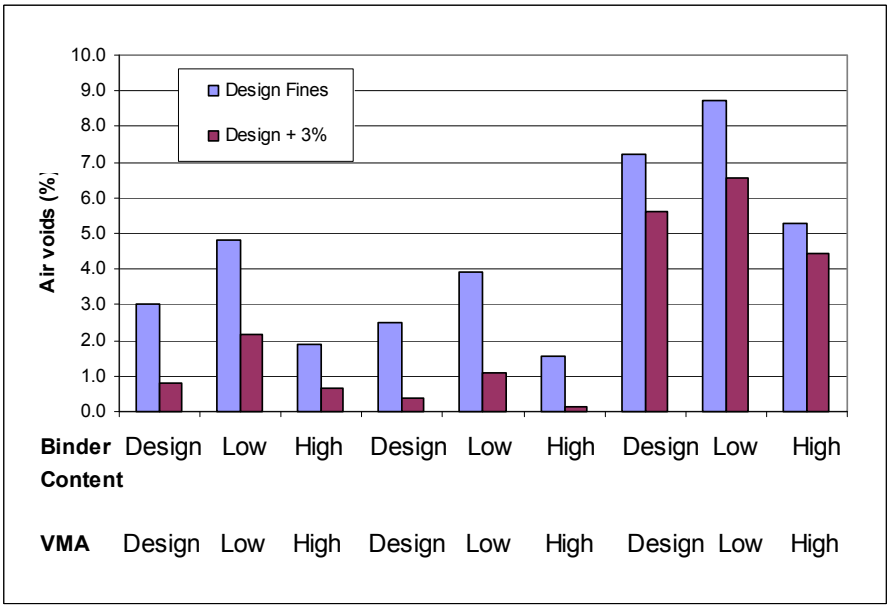

Figure 4.5: Effect of fines content on mean air voids in 19 mm mixes

Figure 4.6 shows the effect of the interaction of VMA and aggregate size on rutting across all mix combinations. Statistically, there is a modest relationship (p=0.05) between VMA and aggregate size on the measured APA rut depths. There are statistically significant differences between the mean values shown (i.e., 19 mm (0.75 in) high VMA versus 19 mm (0.75 in) design VMA), but there is no consistent trend across the range of VMA levels and aggregate size investigated. A summary of these least squares means analysis (Tukey-Kramer) is shown in Appendix B.

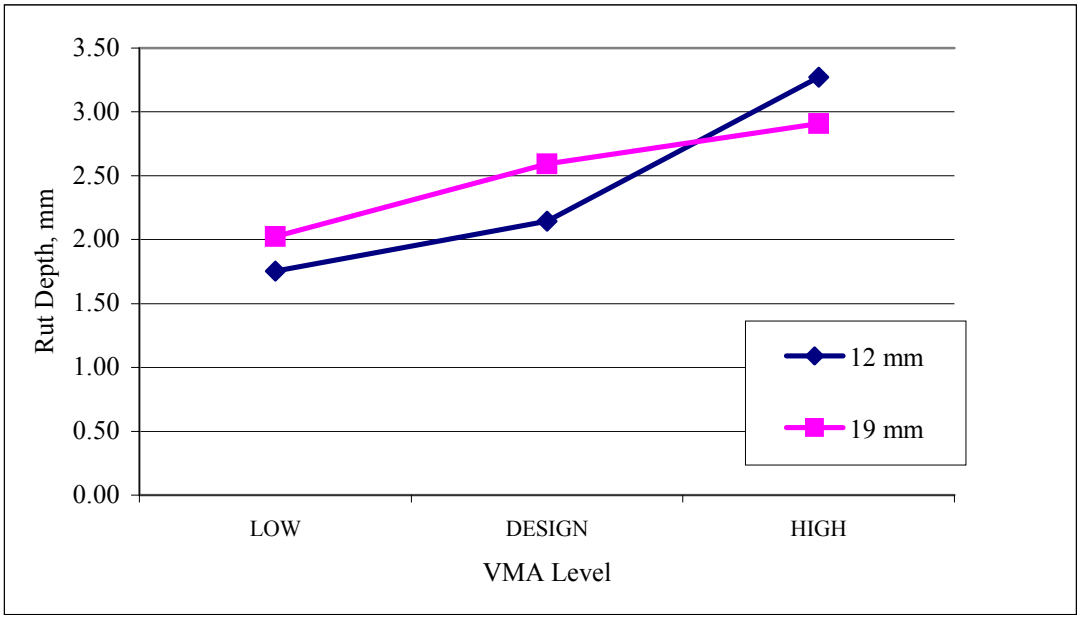

Figure 4.6: Effect of VMA and aggregate size on rutting

The effects of VMA on rutting for the three different binder types are shown in Figures 4.7 and 4.8.

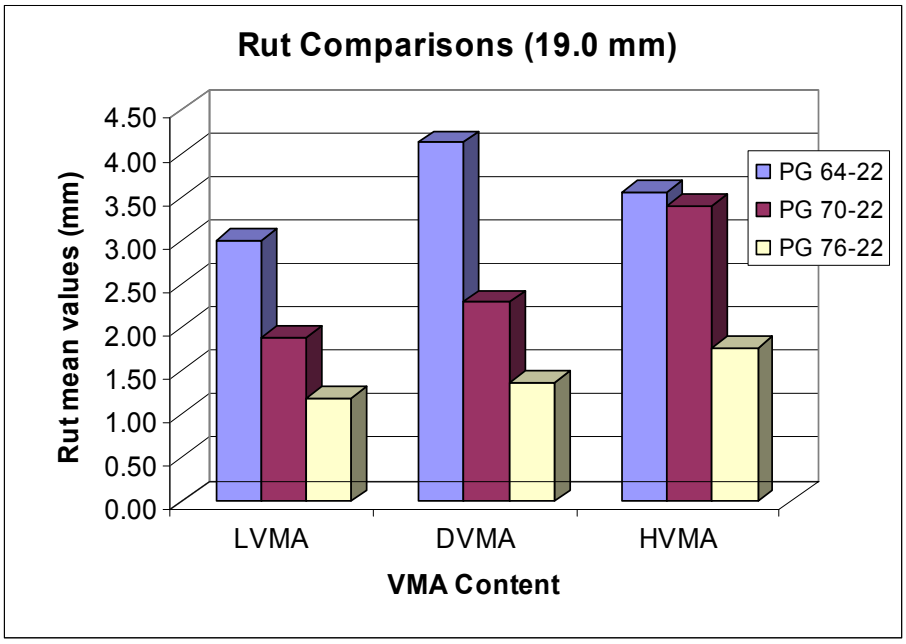

Figure 4.7: Effect of VMA in rutting for 19 mm (0.75 in)

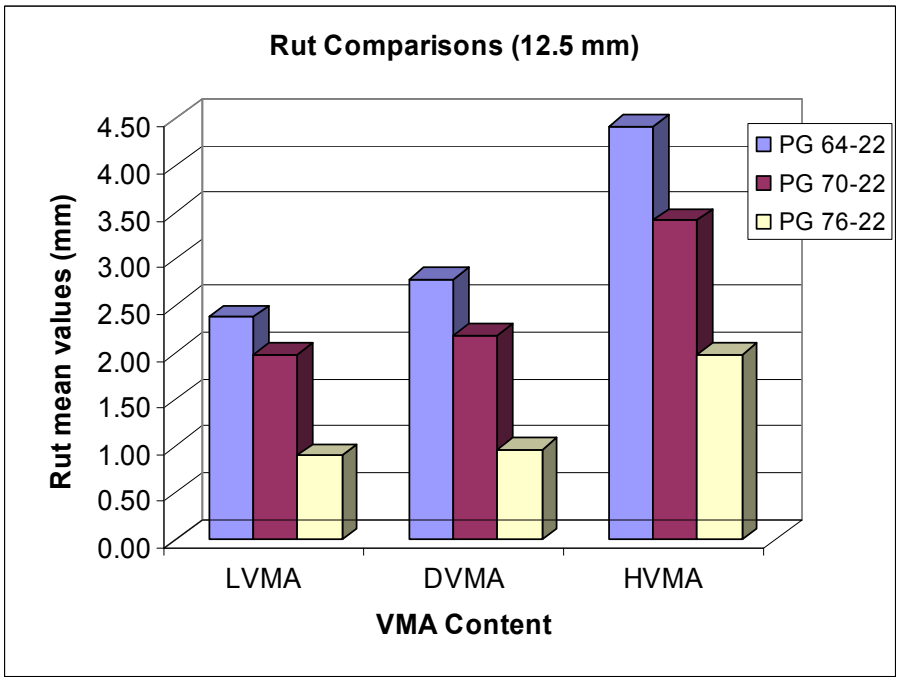

Figure 4.8: Effect of VMA in rutting for 12.5 mm (0.5 in)

5.0 SUMMARY AND RECOMMENDATIONS

The APA device was used to characterize the impacts of various mix factors on the measured permanent deformation in 19 and 12.5 mm (0.75 and 0.5 in) dense graded mixes. This device is used in the United States by agencies to judge the likelihood that a given mix will deform in the field. Current practice tests all mixes at 64°C (147.2°F) and limits the maximum acceptable permanent deformation to 8 mm (0.312 in) after 8000 cycles.

The research reported herein focused on the effects of voids in mineral aggregate (VMA), binder type, binder content, maximum aggregate size, and fines content. Each of the factors was considered at three levels, except that only two maximum aggregate sizes were included from a single crushed gravel source in Western Oregon. The analyses lead to the following conclusions:

- Final permanent deformation measurements of all of the mix combinations tested in the project were below the 8 mm (0.312 in) maximum permanent deformation recommended by NCAT. This suggests, for the combinations investigated, that unacceptable field rutting is not likely to occur if the APA test results are truly correlated to field performance.

- A standard compactive effort of 100 gyrations using the Superpave Gyratory Compactor was used for all mixes. This produces mixes with variable air contents. This effect was statistically confounded with measured rut depth. While controlling air voids is possible, it requires adjusting the compactive energy input to the specimen. This approach does not mimic field compaction.

- Stiffer binders (PG 70-22 and PG 76-22) had lower measured permanent deformation compared to the PG 64-22 binder grade. This is not surprising since all mixes were tested at 64°C (147.2°F).

- Permanent deformation increased with the increasing content of the PG 64-22 binder, but this trend was not evident in the stiffer binders. One would expect that the trend exhibited in the PG 64-22 binder would also be present in the stiffer binders if they were tested at higher temperatures.

- The effect of VMA depends on the aggregate size used and the fines content. It was not possible to separate this interaction effect.

- Increasing the binder content also increases the rutting potential for the PG 64-22 binders. But for stiffer binders, there is no increase in rutting associated with the increase of binder contents.

- The use of a stiffer binder than required by the environment (e.g., PG 70-22 rather than a PG 64-22) appears to limit permanent deformation, even when a variation in mix properties occurs during the field placement.

This research suggests that the APA device is relatively insensitive to changes in mix properties when the test temperature does not match the high temperature rating of the binder. It is possible, that when tested at the high temperature PG rating, similar trends will emerge. Further testing is recommended to confirm this hypothesis.

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APPENDICES

APPENDIX A

RAW APA DATA

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU Research	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU1	**Test Date:**	10/30/02	**Wheel Load :**	100 (lbs)
Mix Type :	Design Mix 6.6%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:20 (hh:mm:ss)

Left Sample ID	**FB**	**Bulk S Gravity**	**2.362**	**% Air Void**	**3.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.200	
1,000										1.659	38.3
1,500										1.841	11.0
2,000										2.107	14.4
3,000										2.469	17.2
4,000										2.675	8.4
5,000										2.954	10.4
6,000										3.277	10.9
7,000										3.289	0.4
8,000										3.337	1.4
8,000										3.337	0.0

Middle Sample ID	**EA**	**Bulk S Gravity**	**2.359**	**% Air Void**	**3.60%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.335	
1,000										1.717	28.6
1,500										2.081	21.2
2,000										2.348	12.8
3,000										2.788	18.8
4,000										3.071	10.1
5,000										3.325	8.3
6,000										3.544	6.6
7,000										3.680	3.9
8,000										3.865	5.0
8,000										3.865	0.0

Right Sample ID	**DC**	**Bulk S Gravity**	**2.364**	**% Air Void**	**3.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.128	
1,000										1.513	34.2
1,500										1.871	23.7
2,000										2.158	15.3
3,000										2.592	20.1
4,000										2.891	11.5
5,000										3.100	7.2
6,000										3.298	6.4
7,000										3.484	5.6
8,000										3.682	5.7
8,000										3.682	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU2	**Test No. :**	**R0606-1**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU2	**Test Date:**	**10/30/02**	**Wheel Load :**	100 (lbs)
Mix Type :	D-VMA,3%F,6.6%	**Data File :**	**R0606_1.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:29** (hh:mm:ss)

Left Sample ID	**AB**		**Bulk S Gravity**		**2.385**			**% Air Void**		**2.40%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.959	
1,000										1.189	23.9
1,500										1.328	11.7
2,000										1.473	10.9
3,000										1.669	13.3
4,000										1.838	10.1
5,000										1.966	7.0
6,000										2.105	7.1
7,000										2.344	11.4
8,000										2.483	5.9
8,000										2.483	0.0

Middle Sample ID	**FC**		**Bulk S Gravity**		**2.381**			**% Air Void**		**2.50%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.106	
1,000										1.448	30.9
1,500										1.704	17.7
2,000										1.912	12.2
3,000										2.219	16.1
4,000										2.517	13.4
5,000										2.780	10.5
6,000										3.015	8.4
7,000										3.216	6.7
8,000										3.399	5.7
8,000										3.399	0.0

Right Sample ID	**ED**		**Bulk S Gravity**		**2.383**			**% Air Void**		**2.50%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.012	
1,000										1.297	28.2
1,500										1.496	15.4
2,000										1.672	11.8
3,000										2.024	21.1
4,000										2.329	15.1
5,000										2.734	17.4
6,000										2.963	8.4
7,000										3.285	10.9
8,000										3.454	5.1
8,000										3.454	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU3	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU3	**Test Date:**	10/30/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA.3%,6.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:16:39 (hh:mm:ss)

Left Sample ID	**CD**	**Bulk S Gravity**	**2.37**	**% Air Void**	**3.70%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.915	
1,000										1.191	30.2
1,500										1.399	17.4
2,000										1.670	19.4
3,000										1.972	18.0
4,000										2.236	13.4
5,000										2.540	13.6
6,000										2.671	5.2
7,000										2.850	6.7
8,000										2.955	3.7
8,000										2.955	0.0

Middle Sample ID	**FA**	**Bulk S Gravity**	**2.369**	**% Air Void**	**3.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.053	
1,000										1.503	42.8
1,500										1.836	22.2
2,000										2.089	13.7
3,000										2.685	28.6
4,000										3.089	15.0
5,000										3.396	9.9
6,000										3.610	6.3
7,000										3.670	1.7
8,000										3.835	4.5
8,000										3.835	0.0

Right Sample ID	**BE**	**Bulk S Gravity**	**2.367**	**% Air Void**	**3.90%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.039	
1,000										1.441	38.7
1,500										1.719	19.3
2,000										1.938	12.7
3,000										2.282	17.7
4,000										2.613	14.5
5,000										2.956	13.1
6,000										3.173	7.4
7,000										3.425	7.9
8,000										3.617	5.6
8,000										3.617	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU4	**Test No. :**	**R0607-1**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU4	**Test Date:**	**10/30/02**	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,+3%,7.1%	**Data File :**	**R0607_1.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:16:05** (hh:mm:ss)

Left Sample ID	**DA**	**Bulk S Gravity**	**2.393**	**% Air Void**	**1.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.663	
1,000										0.903	36.1
1,500										0.996	10.3
2,000										1.072	7.6
3,000										1.147	7.0
4,000										1.345	17.2
5,000										1.426	6.1
6,000										1.641	15.1
7,000										1.746	6.4
8,000										1.844	5.6
8,000										1.844	0.0

Middle Sample ID	**FC**	**Bulk S Gravity**	**2.392**	**% Air Void**	**1.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.666	
1,000										0.853	28.2
1,500										0.923	8.1
2,000										1.022	10.8
3,000										1.151	12.6
4,000										1.266	10.0
5,000										1.390	9.7
6,000										1.457	4.8
7,000										1.565	7.4
8,000										1.700	8.6
8,000										1.700	0.0

Right Sample ID	**BE**	**Bulk S Gravity**	**2.392**	**% Air Void**	**1.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.605	
1,000										0.816	34.8
1,500										0.907	11.1
2,000										1.036	14.3
3,000										1.155	11.5
4,000										1.289	11.6
5,000										1.410	9.4
6,000										1.515	7.4
7,000										1.579	4.3
8,000										1.742	10.3
8,000										1.742	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU5	**Test No. :**	**R0615-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU5	**Test Date:**	**10/30/02**	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,+3%,6.6%	**Data File :**	**R0615_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:24:34** (hh:mm:ss)

Left Sample ID	**DC**		**Bulk S Gravity**		**2.386**			**% Air Void**		**2.00%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.731	
1,000										0.943	28.9
1,500										1.095	16.2
2,000										1.202	9.7
3,000										1.426	18.7
4,000										1.611	12.9
5,000										1.811	12.4
6,000										1.984	9.5
7,000										2.152	8.5
8,000										2.307	7.2
8,000										2.307	0.0

Middle Sample ID	**AB**		**Bulk S Gravity**		**2.385**			**% Air Void**		**2.00%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.729	
1,000										0.971	33.2
1,500										1.193	22.8
2,000										1.385	16.1
3,000										1.619	16.9
4,000										1.857	14.7
5,000										2.027	9.2
6,000										2.195	8.3
7,000										2.302	4.9
8,000										2.482	7.9
8,000										2.482	0.0

Right Sample ID	**EF**		**Bulk S Gravity**		**2.384**			**% Air Void**		**2.10%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.776	
1,000										0.974	25.5
1,500										1.117	14.6
2,000										1.224	9.6
3,000										1.431	17.0
4,000										1.589	11.0
5,000										1.738	9.3
6,000										1.868	7.5
7,000										1.963	5.1
8,000										2.097	6.8
8,000										2.097	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU6	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU6	**Test Date:**	11/01/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,+3%,6.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:51 (hh:mm:ss)

Left Sample ID	BF	Bulk S Gravity	2.36	% Air Void	3.80%

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.962	
1,000										1.231	28.0
1,500										1.364	10.8
2,000										1.533	12.4
3,000										1.799	17.3
4,000										2.011	11.8
5,000										2.250	11.9
6,000										2.431	8.0
7,000										2.556	5.2
8,000										2.690	5.2
8,000										2.690	0.0

Middle Sample ID	EA	Bulk S Gravity	2.364	% Air Void	3.60%

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.826	
1,000										1.031	24.9
1,500										1.182	14.6
2,000										1.298	9.8
3,000										1.482	14.2
4,000										1.630	10.0
5,000										1.744	7.0
6,000										1.842	5.6
7,000										1.929	4.7
8,000										2.039	5.7
8,000										2.039	0.0

Right Sample ID	DC	Bulk S Gravity	2.358	% Air Void	3.80%

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.746	
1,000										0.994	33.2
1,500										1.128	13.5
2,000										1.207	7.0
3,000										1.376	14.0
4,000										1.520	10.5
5,000										1.631	7.4
6,000										1.731	6.1
7,000										1.813	4.7
8,000										1.918	5.8
8,000										1.918	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU7	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU7	**Test Date:**	11/01/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,+3%,7.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:17 (hh:mm:ss)

Left Sample ID	**CA**	**Bulk S Gravity**	**2.387**	**% Air Void**	**1.20%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.485	
1,000										0.606	25.0
1,500										0.676	11.6
2,000										0.775	14.6
3,000										0.931	20.1
4,000										1.099	18.0
5,000										1.192	8.5
6,000										1.372	15.0
7,000										1.538	12.1
8,000										1.630	6.0
8,000										1.630	0.0

Middle Sample ID	**EF**	**Bulk S Gravity**	**2.385**	**% Air Void**	**1.10%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.657	
1,000										0.931	41.7
1,500										1.118	20.1
2,000										1.282	14.7
3,000										1.525	18.9
4,000										1.818	19.2
5,000										1.955	7.6
6,000										2.143	9.6
7,000										2.354	9.8
8,000										2.523	7.2
8,000										2.523	0.0

Right Sample ID	**BD**	**Bulk S Gravity**	**2.389**	**% Air Void**	**1.00%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.666	
1,000										0.912	36.9
1,500										1.064	16.7
2,000										1.204	13.1
3,000										1.398	16.1
4,000										1.557	11.4
5,000										1.689	8.5
6,000										1.807	7.0
7,000										1.920	6.3
8,000										2.015	5.0
8,000										2.015	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU8	**Test No. :**	**R0619-2**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU8	**Test Date:**	**11/01/02**	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,+3%,7.1%	**Data File :**	**R0619_2.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:20** (hh:mm:ss)

Left Sample ID	**CE**	**Bulk S Gravity**	**2.374**	**% Air Void**	**2.80%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.190	
1,000										0.333	75.5
1,500										0.372	11.9
2,000										0.477	28.2
3,000										0.510	6.9
4,000										0.555	8.9
5,000										0.624	12.4
6,000										0.602	-3.6
7,000										0.662	10.0
8,000										0.652	-1.4
8,001										0.653	0.2

Middle Sample ID	**DF**	**Bulk S Gravity**	**2.373**	**% Air Void**	**2.80%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.291	
1,000										0.384	32.1
1,500										0.440	14.6
2,000										0.494	12.3
3,000										0.546	10.4
4,000										0.585	7.2
5,000										0.622	6.4
6,000										0.659	5.9
7,000										0.707	7.2
8,000										0.727	2.9
8,001										0.728	0.1

Right Sample ID	**AB**	**Bulk S Gravity**	**2.377**	**% Air Void**	**2.70%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.350	
1,000										0.456	30.5
1,500										0.521	14.2
2,000										0.618	18.6
3,000										0.716	15.7
4,000										0.772	7.8
5,000										0.817	5.8
6,000										0.885	8.4
7,000										0.928	4.9
8,000										0.941	1.3
8,001										0.938	-0.3

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU9	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU9	**Test Date:**	11/01/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,+3%,6.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:33 (hh:mm:ss)

Left Sample ID	**DB**	**Bulk S Gravity**	**2.358**	**% Air Void**	**4.10%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.552	
1,000										0.690	25.1
1,500										0.741	7.3
2,000										0.895	20.8
3,000										0.977	9.2
4,000										1.107	13.3
5,000										1.125	1.6
6,000										1.170	4.0
7,000										1.238	5.8
8,000										1.261	1.9
8,001										1.264	0.2

Middle Sample ID	**CE**	**Bulk S Gravity**	**2.357**	**% Air Void**	**4.10%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.402	
1,000										0.512	27.1
1,500										0.560	9.4
2,000										0.613	9.4
3,000										0.662	8.1
4,000										0.716	8.1
5,000										0.759	6.0
6,000										0.780	2.9
7,000										0.826	5.9
8,000										0.840	1.7
8,001										0.839	0.0

Right Sample ID	**AF**	**Bulk S Gravity**	**2.358**	**% Air Void**	**4.10%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.423	
1,000										0.526	24.5
1,500										0.588	11.8
2,000										0.626	6.4
3,000										0.698	11.5
4,000										0.754	8.0
5,000										0.787	4.3
6,000										0.797	1.3
7,000										0.839	5.3
8,000										0.884	5.3
8,001										0.883	-0.1

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU10	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU10	**Test Date:**	11/01/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,+3%,7.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:30:31 (hh:mm:ss)

Left Sample ID	**BA**	**Bulk S Gravity**	**2.389**	**% Air Void**	**1.40%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.452	
1,000										0.596	31.6
1,500										0.660	10.8
2,000										0.682	3.4
3,000										0.775	13.7
4,000										0.859	10.8
5,000										0.911	6.1
6,000										0.947	3.9
7,000										0.985	4.1
8,000										1.035	5.1
8,000										1.035	0.0

Middle Sample ID	**ED**	**Bulk S Gravity**	**2.391**	**% Air Void**	**1.30%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.453	
1,000										0.560	23.6
1,500										0.645	15.1
2,000										0.703	8.9
3,000										0.713	1.4
4,000										0.824	15.6
5,000										0.834	1.2
6,000										0.917	9.9
7,000										0.960	4.8
8,000										0.969	0.9
8,000										0.969	0.0

Right Sample ID	**CF**	**Bulk S Gravity**	**2.391**	**% Air Void**	**1.30%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.687	
1,000										0.820	19.4
1,500										0.916	11.6
2,000										0.983	7.4
3,000										1.090	10.9
4,000										1.176	7.8
5,000										1.187	1.0
6,000										1.250	5.3
7,000										1.316	5.3
8,000										1.355	3.0
8,000										1.355	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU11	**Test No. :**	**R0622-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU11	**Test Date:**	**11/01/02**	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,+3%,6.6%	**Data File :**	**R0622_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:17:46** (hh:mm:ss)

Left Sample ID	**DA**		**Bulk S Gravity**		**2.381**			**% Air Void**		**2.00%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.851	
1,000										1.070	25.7
1,500										1.198	11.9
2,000										1.409	17.6
3,000										1.621	15.1
4,000										1.861	14.8
5,000										2.089	12.3
6,000										2.255	7.9
7,000										2.430	7.8
8,000										2.608	7.3
8,000										2.608	0.0

Middle Sample ID	**BF**		**Bulk S Gravity**		**2.383**			**% Air Void**		**2.00%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.790	
1,000										1.085	37.4
1,500										1.232	13.6
2,000										1.368	11.0
3,000										1.591	16.3
4,000										1.840	15.6
5,000										2.041	10.9
6,000										2.184	7.0
7,000										2.357	7.9
8,000										2.469	4.8
8,000										2.469	0.0

Right Sample ID	**CE**		**Bulk S Gravity**		**2.384**			**% Air Void**		**1.90%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.728	
1,000										0.965	32.6
1,500										1.183	22.6
2,000										1.376	16.3
3,000										1.677	21.8
4,000										1.937	15.5
5,000										2.253	16.3
6,000										2.461	9.2
7,000										2.687	9.2
8,000										2.877	7.1
8,000										2.877	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU12	**Test No. :**	**R0625-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU12	**Test Date:**	**11/01/02**	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,+3%,6.1%	**Data File :**	**R0625_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:37** (hh:mm:ss)

Left Sample ID	**CD**		**Bulk S Gravity**		**2.388**			**% Air Void**		**2.50%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.708	
1,000										0.882	24.6
1,500										0.991	12.4
2,000										1.088	9.8
3,000										1.263	16.1
4,000										1.378	9.1
5,000										1.455	5.6
6,000										1.526	4.9
7,000										1.608	5.4
8,000										1.735	7.9
8,001										1.731	-0.3

Middle Sample ID	**AB**		**Bulk S Gravity**		**2.38**			**% Air Void**		**2.80%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.678	
1,000										0.863	27.2
1,500										0.993	15.1
2,000										1.132	14.0
3,000										1.345	18.8
4,000										1.582	17.6
5,000										1.711	8.2
6,000										1.936	13.1
7,000										1.994	3.0
8,000										2.142	7.4
8,001										2.136	-0.3

Right Sample ID	**EF**		**Bulk S Gravity**		**2.391**			**% Air Void**		**2.40%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.807	
1,000										1.039	28.8
1,500										1.182	13.7
2,000										1.315	11.2
3,000										1.578	20.1
4,000										1.857	17.6
5,000										2.074	11.7
6,000										2.264	9.1
7,000										2.441	7.8
8,000										2.619	7.3
8,001										2.613	-0.2

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU13	**Test No. :**	**R0625-1**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU13	**Test Date:**	**11/01/02**	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,+3%,7.1%	**Data File :**	**R0625_1.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:17:08** (hh:mm:ss)

Left Sample ID	**AB**		**Bulk S Gravity**		**2.401**			**% Air Void**		**0.60%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.722	
1,000										0.844	17.0
1,500										0.957	13.4
2,000										1.094	14.3
3,000										1.183	8.1
4,000										1.340	13.3
5,000										1.449	8.1
6,000										1.526	5.3
7,000										1.622	6.2
8,000										1.699	4.8
8,000										1.699	0.0

Middle Sample ID	**DC**		**Bulk S Gravity**		**2.401**			**% Air Void**		**0.60%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.936	
1,000										1.185	26.7
1,500										1.370	15.5
2,000										1.538	12.3
3,000										1.831	19.1
4,000										2.085	13.9
5,000										2.316	11.0
6,000										2.538	9.6
7,000										2.755	8.5
8,000										2.917	5.9
8,000										2.917	0.0

Right Sample ID	**FE**		**Bulk S Gravity**		**2.4**			**% Air Void**		**0.60%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.966	
1,000										1.204	24.7
1,500										1.353	12.4
2,000										1.505	11.2
3,000										1.704	13.2
4,000										1.864	9.3
5,000										2.023	8.5
6,000										2.166	7.1
7,000										2.304	6.4
8,000										2.416	4.9
8,000										2.416	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU14	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU14	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,+3%,6.6%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:16:18 (hh:mm:ss)

Left Sample ID	**CE**	**Bulk S Gravity**	**2.381**	**% Air Void**	**2.00%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.739	
1,000										0.986	33.4
1,500										1.086	10.1
2,000										1.243	14.5
3,000										1.422	14.4
4,000										1.569	10.3
5,000										1.684	7.4
6,000										1.807	7.3
7,000										1.919	6.2
8,000										2.037	6.2
8,000										2.037	0.0

Middle Sample ID	**FA**	**Bulk S Gravity**	**2.373**	**% Air Void**	**2.30%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.683	
1,000										0.876	28.1
1,500										1.051	20.1
2,000										1.149	9.3
3,000										1.321	15.0
4,000										1.435	8.6
5,000										1.662	15.8
6,000										1.788	7.6
7,000										1.896	6.1
8,000										1.891	-0.3
8,000										1.891	0.0

Right Sample ID	**BD**	**Bulk S Gravity**	**2.379**	**% Air Void**	**2.10%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.777	
1,000										0.986	26.9
1,500										1.137	15.3
2,000										1.275	12.2
3,000										1.470	15.3
4,000										1.637	11.3
5,000										1.825	11.5
6,000										2.004	9.8
7,000										2.154	7.5
8,000										2.270	5.4
8,000										2.270	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU15	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU15	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,+3%,6.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:19:10 (hh:mm:ss)

Left Sample ID	**BC**		**Bulk S Gravity**		**2.37**			**% Air Void**		**3.10%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.685	
1,000										0.859	25.4
1,500										0.917	6.8
2,000										0.998	8.8
3,000										1.139	14.1
4,000										1.323	16.2
5,000										1.364	3.1
6,000										1.468	7.6
7,000										1.623	10.6
8,000										1.680	3.5
8,000										1.680	0.0

Middle Sample ID	**AC**		**Bulk S Gravity**		**2.37**			**% Air Void**		**3.10%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.635	
1,000										0.822	29.6
1,500										0.953	15.9
2,000										1.037	8.8
3,000										1.145	10.4
4,000										1.292	12.9
5,000										1.360	5.2
6,000										1.481	8.9
7,000										1.565	5.7
8,000										1.622	3.6
8,000										1.622	0.0

Right Sample ID	**FE**		**Bulk S Gravity**		**2.37**			**% Air Void**		**3.10%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.562	
1,000										0.704	25.3
1,500										0.818	16.1
2,000										0.892	9.1
3,000										1.009	13.0
4,000										1.126	11.6
5,000										1.210	7.5
6,000										1.273	5.2
7,000										1.350	6.0
8,000										1.421	5.3
8,000										1.421	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU16	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU16	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	L-VMA,+3%,7.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:24 (hh:mm:ss)

Left Sample ID	**DF**	**Bulk S Gravity**	**2.39**	**% Air Void**	**0.90%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.005	
1,000										1.280	27.4
1,500										1.465	14.4
2,000										1.616	10.3
3,000										1.869	15.7
4,000										2.046	9.5
5,000										2.191	7.1
6,000										2.340	6.8
7,000										2.510	7.3
8,000										2.659	5.9
8,000										2.659	0.0

Middle Sample ID	**AB**	**Bulk S Gravity**	**2.391**	**% Air Void**	**0.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.061	
1,000										1.328	25.2
1,500										1.458	9.8
2,000										1.585	8.7
3,000										1.815	14.5
4,000										1.995	9.9
5,000										2.094	5.0
6,000										2.207	5.4
7,000										2.259	2.3
8,000										2.411	6.8
8,000										2.411	0.0

Right Sample ID	**EC**	**Bulk S Gravity**	**2.389**	**% Air Void**	**0.90%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.821	
1,000										0.997	21.5
1,500										1.120	12.3
2,000										1.220	9.0
3,000										1.372	12.4
4,000										1.504	9.6
5,000										1.589	5.6
6,000										1.671	5.2
7,000										1.743	4.3
8,000										1.794	2.9
8,000										1.794	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU17	**Test No. :**	**R0711-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU17	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,+3%,6.65	**Data File :**	**R0711_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:16:03** (hh:mm:ss)

Left Sample ID	**AC**		**Bulk S Gravity**		**2.388**			**% Air Void**		**1.50%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.415	
1,000										0.498	20.0
1,500										0.618	24.1
2,000										0.583	-5.6
3,000										0.661	13.3
4,000										0.713	7.8
5,000										0.748	5.0
6,000										0.773	3.3
7,000										0.820	6.0
8,000										0.864	5.4
8,001										0.869	0.5

Middle Sample ID	**BE**		**Bulk S Gravity**		**2.387**			**% Air Void**		**1.60%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.433	
1,000										0.509	17.4
1,500										0.580	14.0
2,000										0.653	12.7
3,000										0.709	8.6
4,000										0.763	7.6
5,000										0.794	4.0
6,000										0.845	6.5
7,000										0.860	1.8
8,000										0.894	3.9
8,001										0.898	0.5

Right Sample ID	**DF**		**Bulk S Gravity**		**2.387**			**% Air Void**		**1.60%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.408	
1,000										0.503	23.1
1,500										0.572	13.9
2,000										0.595	4.0
3,000										0.660	10.9
4,000										0.674	2.2
5,000										0.684	1.4
6,000										0.711	4.0
7,000										0.728	2.5
8,000										0.743	2.0
8,001										0.747	0.5

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU18	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU18	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,+3%,6.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:21 (hh:mm:ss)

Left Sample ID	**EA**	**Bulk S Gravity**	**2.367**	**% Air Void**	**3.10%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.554	
1,000										0.668	20.6
1,500										0.721	8.0
2,000										0.745	3.3
3,000										0.818	9.8
4,000										0.902	10.3
5,000										0.946	4.9
6,000										0.967	2.1
7,000										1.038	7.4
8,000										1.078	3.8
8,000										1.078	0.0

Middle Sample ID	**BD**	**Bulk S Gravity**	**2.369**	**% Air Void**	**3.00%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.385	
1,000										0.442	14.7
1,500										0.479	8.4
2,000										0.520	8.6
3,000										0.564	8.5
4,000										0.631	11.9
5,000										0.718	13.7
6,000										0.686	-4.4
7,000										0.732	6.7
8,000										0.764	4.3
8,000										0.764	0.0

Right Sample ID	**CF**	**Bulk S Gravity**	**2.368**	**% Air Void**	**3.10%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.327	
1,000										0.441	34.9
1,500										0.505	14.5
2,000										0.562	11.3
3,000										0.611	8.7
4,000										0.634	3.8
5,000										0.656	3.5
6,000										0.662	0.8
7,000										0.689	4.1
8,000										0.717	4.1
8,000										0.717	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU19	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU19	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,+3%,7.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:22 (hh:mm:ss)

Left Sample ID	**FC**	**Bulk S Gravity**	**2.386**	**% Air Void**	**0.90%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.444	
1,000										0.472	6.3
1,500										0.592	25.4
2,000										0.627	6.1
3,000										0.692	10.3
4,000										0.776	12.1
5,000										0.820	5.7
6,000										0.849	3.5
7,000										0.886	4.4
8,000										0.927	4.7
8,001										0.928	0.1

Middle Sample ID	**AE**	**Bulk S Gravity**	**2.386**	**% Air Void**	**0.90%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.408	
1,000										0.534	30.7
1,500										0.594	11.3
2,000										0.615	3.5
3,000										0.665	8.1
4,000										0.760	14.3
5,000										0.774	1.9
6,000										0.795	2.7
7,000										0.848	6.6
8,000										0.900	6.1
8,001										0.901	0.1

Right Sample ID	**DB**	**Bulk S Gravity**	**2.383**	**% Air Void**	**1.00%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.480	
1,000										0.671	40.0
1,500										0.753	12.1
2,000										0.809	7.6
3,000										0.913	12.8
4,000										0.995	8.9
5,000										1.040	4.5
6,000										1.066	2.5
7,000										1.119	5.0
8,000										1.157	3.4
8,001										1.157	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU20	**Test No. :**	**R0716-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU20	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,+3%,6.6%	**Data File :**	**R0716_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:58:18** (hh:mm:ss)

Left Sample ID	**ED**		**Bulk S Gravity**		**2.29**			**% Air Void**		**5.50%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.863	
1,000										2.448	31.4
1,500										2.900	18.5
2,000										3.133	8.0
3,000										3.560	13.6
4,000										3.948	10.9
5,000										4.309	9.1
6,000										4.523	5.0
7,000										4.761	5.3
8,000										4.981	4.6
8,000										4.981	0.0

Middle Sample ID	**AB**		**Bulk S Gravity**		**2.288**			**% Air Void**		**5.60%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.820	
1,000										2.497	37.2
1,500										3.006	20.4
2,000										3.436	14.3
3,000										4.036	17.5
4,000										4.368	8.2
5,000										4.700	7.6
6,000										4.930	4.9
7,000										5.154	4.5
8,000										5.280	2.5
8,000										5.280	0.0

Right Sample ID	**FC**		**Bulk S Gravity**		**2.288**			**% Air Void**		**5.60%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.554	
1,000										2.123	36.6
1,500										2.452	15.5
2,000										2.704	10.3
3,000										3.138	16.1
4,000										3.447	9.8
5,000										3.677	6.7
6,000										3.845	4.6
7,000										4.035	4.9
8,000										4.189	3.8
8,000										4.189	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU21	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU21	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,+3%,6.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:42 (hh:mm:ss)

Left Sample ID	**AD**	**Bulk S Gravity**	**2.301**	**% Air Void**	**5.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.466	
1,000										1.976	34.8
1,500										2.241	13.4
2,000										2.471	10.2
3,000										2.760	11.7
4,000										2.972	7.7
5,000										3.128	5.2
6,000										3.286	5.0
7,000										3.393	3.3
8,000										3.499	3.1
8,000										3.499	0.0

Middle Sample ID	**EF**	**Bulk S Gravity**	**2.302**	**% Air Void**	**5.70%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.486	
1,000										1.917	29.0
1,500										2.246	17.2
2,000										2.507	11.6
3,000										2.828	12.8
4,000										3.124	10.4
5,000										3.344	7.1
6,000										3.548	6.1
7,000										3.731	5.2
8,000										3.863	3.5
8,000										3.863	0.0

Right Sample ID	**CB**	**Bulk S Gravity**	**2.3**	**% Air Void**	**5.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.437	
1,000										1.946	35.4
1,500										2.289	17.6
2,000										2.528	10.5
3,000										2.900	14.7
4,000										3.109	7.2
5,000										3.347	7.6
6,000										3.508	4.8
7,000										3.681	4.9
8,000										3.838	4.2
8,000										3.838	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU22	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU22	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,+3%,7.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:58 (hh:mm:ss)

Left Sample ID	DE	Bulk S Gravity	2.322	% Air Void	3.80%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.903	
1,000										2.472	29.9
1,500										2.821	14.1
2,000										3.081	9.2
3,000										3.379	9.7
4,000										3.614	7.0
5,000										3.870	7.1
6,000										4.059	4.9
7,000										4.178	2.9
8,000										4.288	2.6
8,000										4.288	0.0

Middle Sample ID	BF	Bulk S Gravity	2.321	% Air Void	3.90%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.778	
1,000										2.599	46.2
1,500										3.080	18.5
2,000										3.531	14.6
3,000										4.297	21.7
4,000										4.814	12.0
5,000										5.140	6.8
6,000										5.463	6.3
7,000										5.719	4.7
8,000										5.915	3.4
8,000										5.915	0.0

Right Sample ID	CA	Bulk S Gravity	2.313	% Air Void	4.20%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.704	
1,000										2.324	36.4
1,500										2.683	15.5
2,000										2.891	7.7
3,000										3.196	10.5
4,000										3.440	7.7
5,000										3.583	4.1
6,000										3.736	4.3
7,000										3.873	3.7
8,000										3.930	1.5
8,000										3.930	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU23	**Test No. :**	**R0722-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU23	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA, +3%, 6.6%	**Data File :**	**R0722_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:57** (hh:mm:ss)

Left Sample ID	**EB**	**Bulk S Gravity**	**2.322**	**% Air Void**	**4.10%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.197	
1,000										1.620	35.3
1,500										1.965	21.3
2,000										2.202	12.1
3,000										2.596	17.9
4,000										2.976	14.6
5,000										3.233	8.6
6,000										3.423	5.9
7,000										3.535	3.3
8,000										3.632	2.8
8,001										3.633	0.0

Middle Sample ID	**DF**	**Bulk S Gravity**	**2.321**	**% Air Void**	**4.20%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.386	
1,000										1.903	37.3
1,500										2.278	19.7
2,000										2.558	12.3
3,000										2.904	13.5
4,000										3.176	9.4
5,000										3.400	7.0
6,000										3.629	6.7
7,000										3.762	3.7
8,000										3.896	3.6
8,001										3.895	0.0

Right Sample ID	**CA**	**Bulk S Gravity**	**2.322**	**% Air Void**	**4.10%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.209	
1,000										1.600	32.3
1,500										1.817	13.6
2,000										2.030	11.7
3,000										2.355	16.0
4,000										2.565	8.9
5,000										2.763	7.7
6,000										2.895	4.8
7,000										2.995	3.4
8,000										3.085	3.0
8,001										3.082	-0.1

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU24	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU24	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,+3%,6.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:18:48 (hh:mm:ss)

Left Sample ID	**CE**	**Bulk S Gravity**	**2.297**	**% Air Void**	**5.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.149	
1,000										1.552	35.1
1,500										1.766	13.8
2,000										1.960	11.0
3,000										2.200	12.3
4,000										2.422	10.1
5,000										2.545	5.1
6,000										2.715	6.7
7,000										2.835	4.4
8,000										2.887	1.9
8,000										2.887	0.0

Middle Sample ID	**BA**	**Bulk S Gravity**	**2.298**	**% Air Void**	**5.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.220	
1,000										1.552	27.2
1,500										1.771	14.1
2,000										1.975	11.5
3,000										2.163	9.5
4,000										2.312	6.9
5,000										2.438	5.4
6,000										2.585	6.0
7,000										2.687	4.0
8,000										2.768	3.0
8,000										2.768	0.0

Right Sample ID	**DF**	**Bulk S Gravity**	**2.296**	**% Air Void**	**5.90%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.143	
1,000										1.485	29.9
1,500										1.779	19.8
2,000										2.034	14.4
3,000										2.325	14.3
4,000										2.594	11.6
5,000										2.823	8.8
6,000										3.033	7.4
7,000										3.203	5.6
8,000										3.377	5.5
8,000										3.377	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU25	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU25	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA, +3%, 7.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:39 (hh:mm:ss)

Left Sample ID	**EC**	**Bulk S Gravity**	**2.326**	**% Air Void**	**3.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.371	
1,000										1.743	27.2
1,500										2.044	17.2
2,000										2.265	10.8
3,000										2.491	10.0
4,000										2.683	7.7
5,000										2.779	3.6
6,000										2.904	4.5
7,000										3.008	3.6
8,000										3.074	2.2
8,000										3.074	0.0

Middle Sample ID	**BA**	**Bulk S Gravity**	**2.324**	**% Air Void**	**3.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.455	
1,000										1.887	29.7
1,500										2.295	21.7
2,000										2.570	12.0
3,000										3.051	18.7
4,000										3.409	11.7
5,000										3.689	8.2
6,000										3.865	4.8
7,000										4.071	5.3
8,000										4.199	3.1
8,000										4.199	0.0

Right Sample ID	**FD**	**Bulk S Gravity**	**2.322**	**% Air Void**	**3.50%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.503	
1,000										2.014	34.0
1,500										2.324	15.4
2,000										2.608	12.2
3,000										3.048	16.8
4,000										3.289	7.9
5,000										3.452	4.9
6,000										3.622	4.9
7,000										3.762	3.9
8,000										3.840	2.1
8,000										3.840	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU26	**Test No. :**	**R0730-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU26	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA, +3%, 6.6%	**Data File :**	**R0730_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:21** (hh:mm:ss)

Left Sample ID	**EC**	**Bulk S Gravity**	**2.302**	**% Air Void**	**5.00%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.726	
1,000										0.888	22.3
1,500										0.943	6.2
2,000										1.080	14.5
3,000										1.210	12.1
4,000										1.319	9.0
5,000										1.444	9.5
6,000										1.541	6.7
7,000										1.605	4.2
8,000										1.669	4.0
8,000										1.669	0.0

Middle Sample ID	**BF**	**Bulk S Gravity**	**2.3**	**% Air Void**	**5.10%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.806	
1,000										1.038	28.7
1,500										1.212	16.8
2,000										1.293	6.7
3,000										1.506	16.5
4,000										1.702	13.1
5,000										1.687	-0.9
6,000										1.787	5.9
7,000										1.871	4.7
8,000										1.923	2.8
8,000										1.923	0.0

Right Sample ID	**DA**	**Bulk S Gravity**	**2.299**	**% Air Void**	**5.10%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.672	
1,000										0.822	22.3
1,500										0.927	12.8
2,000										1.016	9.6
3,000										1.154	13.6
4,000										1.255	8.8
5,000										1.496	19.1
6,000										1.552	3.8
7,000										1.609	3.7
8,000										1.686	4.8
8,000										1.686	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU27	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU27	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,+3%,6.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:50 (hh:mm:ss)

Left Sample ID	**CE**	**Bulk S Gravity**	**2.312**	**% Air Void**	**5.30%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.683	
1,000										0.854	25.0
1,500										0.988	15.7
2,000										1.038	5.1
3,000										1.208	16.4
4,000										1.323	9.4
5,000										1.457	10.2
6,000										1.396	-4.2
7,000										1.567	12.2
8,000										1.753	11.9
8,000										1.753	0.0

Middle Sample ID	**AB**	**Bulk S Gravity**	**2.312**	**% Air Void**	**5.30%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.974	
1,000										1.174	20.6
1,500										1.306	11.2
2,000										1.459	11.7
3,000										1.634	12.0
4,000										1.738	6.4
5,000										1.884	8.4
6,000										2.091	11.0
7,000										2.149	2.8
8,000										2.123	-1.2
8,000										2.123	0.0

Right Sample ID	**DF**	**Bulk S Gravity**	**2.311**	**% Air Void**	**5.30%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.745	
1,000										0.919	23.3
1,500										1.035	12.6
2,000										1.139	10.1
3,000										1.276	12.1
4,000										1.361	6.6
5,000										1.459	7.2
6,000										1.519	4.1
7,000										1.594	5.0
8,000										1.632	2.4
8,000										1.632	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU28	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU28	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,+3%,7.1%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:13:58 (hh:mm:ss)

Left Sample ID	CE	Bulk S Gravity	2.325	% Air Void	3.40%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.886	
1,000										1.150	29.9
1,500										1.278	11.1
2,000										1.431	12.0
3,000										1.668	16.5
4,000										1.911	14.5
5,000										2.095	9.6
6,000										2.289	9.3
7,000										2.446	6.9
8,000										2.578	5.4
8,000										2.578	0.0

Middle Sample ID	DA	Bulk S Gravity	2.324	% Air Void	3.40%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.031	
1,000										1.243	20.5
1,500										1.407	13.1
2,000										1.560	10.9
3,000										1.645	5.5
4,000										1.900	15.5
5,000										2.113	11.2
6,000										2.199	4.1
7,000										2.188	-0.5
8,000										2.358	7.8
8,000										2.358	0.0

Right Sample ID	FB	Bulk S Gravity	2.323	% Air Void	3.40%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.821	
1,000										1.039	26.6
1,500										1.217	17.1
2,000										1.329	9.2
3,000										1.452	9.2
4,000										1.663	14.5
5,000										1.777	6.8
6,000										1.889	6.3
7,000										1.924	1.8
8,000										2.043	6.2
8,000										2.043	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU29	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU29	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA, 6.2%,64	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:10:45 (hh:mm:ss)

Left Sample ID	**FE**	**Bulk S Gravity**	**2.381**	**% Air Void**	**2.90%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.621	
1,000										2.180	34.6
1,500										2.647	21.4
2,000										2.985	12.8
3,000										3.423	14.7
4,000										3.776	10.3
5,000										4.104	8.7
6,000										4.327	5.4
7,000										4.419	2.1
8,000										4.707	6.5
8,000										4.707	0.0

Middle Sample ID	**BA**	**Bulk S Gravity**	**2.378**	**% Air Void**	**3.00%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.293	
1,000										1.638	26.7
1,500										2.107	28.7
2,000										2.302	9.2
3,000										2.581	12.1
4,000										2.713	5.1
5,000										2.908	7.2
6,000										3.157	8.5
7,000										3.179	0.7
8,000										3.365	5.9
8,000										3.365	0.0

Right Sample ID	**DC**	**Bulk S Gravity**	**2.376**	**% Air Void**	**3.10%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.770	
1,000										2.242	26.6
1,500										2.791	24.5
2,000										3.106	11.3
3,000										3.590	15.6
4,000										3.848	7.2
5,000										4.086	6.2
6,000										4.231	3.5
7,000										4.263	0.7
8,000										4.481	5.1
8,000										4.481	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU29A	**Test No. :**	**R0513-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	DVMA 6.2% +3%	**Test Date:**	**06/26/03**	**Wheel Load :**	100 (lbs)
Mix Type :		**Data File :**	**R0513_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:16** (hh:mm:ss)

Left Sample ID	**EA**	**Bulk S Gravity**	**2.413**	**% Air Void**	**0.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.851	
1,000										1.023	20.2
1,500										1.219	19.2
2,000										1.307	7.3
3,000										1.475	12.8
4,000										1.619	9.8
5,000										1.749	8.0
6,000										1.856	6.1
7,000										1.962	5.7
8,000										2.068	5.4
8,000										2.068	0.0

Middle Sample ID	**DF**	**Bulk S Gravity**	**2.415**	**% Air Void**	**0.70%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.755	
1,000										0.899	19.2
1,500										0.991	10.2
2,000										1.095	10.5
3,000										1.359	24.1
4,000										1.532	12.8
5,000										1.700	11.0
6,000										1.813	6.7
7,000										2.066	13.9
8,000										1.951	-5.6
8,000										1.951	0.0

Right Sample ID	**CB**	**Bulk S Gravity**	**2.414**	**% Air Void**	**0.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.078	
1,000										1.352	25.4
1,500										1.545	14.2
2,000										1.657	7.3
3,000										1.914	15.5
4,000										2.113	10.4
5,000										2.321	9.8
6,000										2.493	7.4
7,000										2.630	5.5
8,000										2.762	5.0
8,000										2.762	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU30	**Test No. :**	**R0803-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU30	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA, 5.7%, 64	**Data File :**	**R0803_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:03:11** (hh:mm:ss)

Left Sample ID	**FC**	**Bulk S Gravity**	**2.351**	**% Air Void**	**4.80%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.466	
1,000										1.941	32.4
1,500										2.109	8.7
2,000										2.353	11.6
3,000										2.782	18.2
4,000										3.010	8.2
5,000										3.229	7.3
6,000										3.424	6.0
7,000										3.481	1.7
8,000										3.577	2.7
8,001										3.591	0.4

Middle Sample ID	**AE**	**Bulk S Gravity**	**2.35**	**% Air Void**	**4.80%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.057	
1,000										1.326	25.5
1,500										1.464	10.4
2,000										1.642	12.1
3,000										1.894	15.4
4,000										2.034	7.4
5,000										2.143	5.4
6,000										2.325	8.5
7,000										2.373	2.1
8,000										2.451	3.3
8,001										2.460	0.4

Right Sample ID	**DB**	**Bulk S Gravity**	**2.351**	**% Air Void**	**4.80%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.210	
1,000										1.710	41.3
1,500										1.943	13.7
2,000										2.183	12.3
3,000										2.554	17.0
4,000										2.674	4.7
5,000										2.940	9.9
6,000										3.055	3.9
7,000										3.139	2.8
8,000										3.329	6.1
8,001										3.343	0.4

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU30A	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU30A	**Test Date:**	06/26/03	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA 5.7% +3%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:11 (hh:mm:ss)

Left Sample ID	CA	Bulk S Gravity	2.4	% Air Void	2.10%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.896	
1,000										1.109	23.8
1,500										1.240	11.9
2,000										1.392	12.3
3,000										1.576	13.2
4,000										1.755	11.4
5,000										1.857	5.8
6,000										1.987	7.0
7,000										2.154	8.4
8,000										2.232	3.6
8,000										2.232	0.0

Middle Sample ID	EF	Bulk S Gravity	2.397	% Air Void	2.20%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.776	
1,000										0.772	-0.5
1,500										0.949	22.9
2,000										0.988	4.0
3,000										1.179	19.4
4,000										1.373	16.5
5,000										1.668	21.4
6,000										1.900	13.9
7,000										1.723	-9.3
8,000										1.844	7.0
8,000										1.844	0.0

Right Sample ID	BD	Bulk S Gravity	2.395	% Air Void	2.30%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.303	
1,000										1.606	23.3
1,500										1.801	12.1
2,000										1.977	9.7
3,000										2.258	14.3
4,000										2.467	9.2
5,000										2.623	6.3
6,000										2.735	4.3
7,000										2.873	5.1
8,000										2.985	3.9
8,000										2.985	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU31	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU31	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA, 6.7%, 64	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:02:26 (hh:mm:ss)

Left Sample ID	BC	Bulk S Gravity	2.389	% Air Void	1.80%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.247	
1,000										1.692	35.6
1,500										2.050	21.2
2,000										2.374	15.8
3,000										2.948	24.2
4,000										3.407	15.6
5,000										3.729	9.5
6,000										3.919	5.1
7,000										4.214	7.5
8,000										4.465	6.0
8,000										4.465	0.0

Middle Sample ID	FD	Bulk S Gravity	2.388	% Air Void	1.80%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.302	
1,000										1.957	50.4
1,500										2.354	20.2
2,000										2.798	18.9
3,000										3.322	18.7
4,000										3.835	15.4
5,000										4.216	9.9
6,000										4.465	5.9
7,000										4.695	5.2
8,000										5.002	6.5
8,000										5.002	0.0

Right Sample ID	EA	Bulk S Gravity	2.384	% Air Void	2.00%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.860	
1,000										2.728	46.7
1,500										3.273	20.0
2,000										3.749	14.5
3,000										4.193	11.9
4,000										4.679	11.6
5,000										5.061	8.2
6,000										5.211	3.0
7,000										5.450	4.6
8,000										5.696	4.5
8,000										5.696	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU31A	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU31A	**Test Date:**	06/26/03	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA 6.7% +3%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:01 (hh:mm:ss)

Left Sample ID	**AE**		**Bulk S Gravity**		**2.399**			**% Air Void**		**0.70%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.097	
1,000										1.373	25.1
1,500										1.608	17.2
2,000										1.785	11.0
3,000										2.003	12.2
4,000										2.228	11.3
5,000										2.394	7.5
6,000										2.524	5.4
7,000										2.579	2.2
8,000										2.771	7.4
8,000										2.771	0.0

Middle Sample ID	**BC**		**Bulk S Gravity**		**2.398**			**% Air Void**		**0.70%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.807	
1,000										1.485	84.1
1,500										1.406	-5.3
2,000										1.639	16.6
3,000										1.764	7.6
4,000										2.126	20.6
5,000										2.039	-4.1
6,000										2.270	11.3
7,000										2.613	15.1
8,000										3.299	26.3
8,000										3.299	0.0

Right Sample ID	**DF**		**Bulk S Gravity**		**2.398**			**% Air Void**		**0.70%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.962	
1,000										1.174	22.1
1,500										1.328	13.1
2,000										1.449	9.1
3,000										1.725	19.1
4,000										1.973	14.4
5,000										2.176	10.2
6,000										2.339	7.5
7,000										2.548	8.9
8,000										2.748	7.8
8,000										2.748	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU32	**Test No. :**	**R0806-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU32	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA, 6.2%, 70	**Data File :**	**R0806_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:00:12** (hh:mm:ss)

Left Sample ID	**CD**		**Bulk S Gravity**		**2.373**			**% Air Void**		**3.30%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.912	
1,000										1.412	54.9
1,500										1.596	13.0
2,000										1.769	10.9
3,000										2.043	15.5
4,000										2.290	12.1
5,000										2.459	7.4
6,000										2.730	11.0
7,000										2.788	2.1
8,000										2.992	7.3
8,000										2.992	0.0

Middle Sample ID	**FB**		**Bulk S Gravity**		**2.369**			**% Air Void**		**3.50%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.948	
1,000										1.071	13.0
1,500										1.423	32.9
2,000										1.514	6.4
3,000										1.890	24.8
4,000										2.055	8.7
5,000										2.334	13.6
6,000										2.482	6.4
7,000										2.678	7.9
8,000										2.799	4.5
8,000										2.799	0.0

Right Sample ID	**EA**		**Bulk S Gravity**		**2.366**			**% Air Void**		**3.60%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.927	
1,000										1.138	22.7
1,500										1.406	23.5
2,000										1.525	8.5
3,000										1.762	15.6
4,000										1.935	9.8
5,000										2.117	9.4
6,000										2.307	9.0
7,000										2.437	5.6
8,000										2.537	4.1
8,000										2.537	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU33	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU33	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,5.7%,70	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:04:57 (hh:mm:ss)

Left Sample ID	EF		Bulk S Gravity		2.356			% Air Void		4.60%	
Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.820	
1,000										1.146	39.8
1,500										1.426	24.5
2,000										1.581	10.8
3,000										1.907	20.7
4,000										2.226	16.7
5,000										2.361	6.1
6,000										2.561	8.5
7,000										2.683	4.8
8,000										2.768	3.2
8,000										2.768	0.0

Middle Sample ID	BC		Bulk S Gravity		2.36			% Air Void		4.50%	
Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.669	
1,000										0.817	22.1
1,500										1.007	23.3
2,000										1.104	9.6
3,000										1.279	15.9
4,000										1.383	8.1
5,000										1.507	9.0
6,000										1.600	6.2
7,000										1.605	0.3
8,000										1.742	8.5
8,000										1.742	0.0

Right Sample ID	AD		Bulk S Gravity		2.357			% Air Void		4.60%	
Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.674	
1,000										0.870	29.0
1,500										1.069	22.9
2,000										1.164	8.9
3,000										1.338	15.0
4,000										1.492	11.5
5,000										1.591	6.6
6,000										1.716	7.9
7,000										1.745	1.7
8,000										1.820	4.3
8,000										1.820	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU34	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU34	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA, 6.7%,70	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:04:03 (hh:mm:ss)

Left Sample ID	**BA**	**Bulk S Gravity**	**2.394**	**% Air Void**	**1.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.724	
1,000										0.930	28.5
1,500										1.116	20.0
2,000										1.228	10.0
3,000										1.432	16.6
4,000										1.548	8.1
5,000										1.671	7.9
6,000										1.806	8.1
7,000											
8,000										1.829	
8,000										1.829	0.0

Middle Sample ID	**DE**	**Bulk S Gravity**	**2.391**	**% Air Void**	**1.90%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.742	
1,000										1.000	34.8
1,500										1.182	18.2
2,000										1.307	10.6
3,000										1.515	15.9
4,000										1.663	9.7
5,000										1.772	6.6
6,000										1.945	9.8
7,000											
8,000										2.098	
8,000										2.098	0.0

Right Sample ID	**FC**	**Bulk S Gravity**	**2.391**	**% Air Void**	**1.90%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.677	
1,000										0.871	28.7
1,500										1.028	18.0
2,000										1.156	12.5
3,000										1.392	20.5
4,000										1.570	12.8
5,000										1.685	7.3
6,000										1.865	10.7
7,000											
8,000										2.010	
8,000										2.010	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU35	**Test No. :**	**R0809-3**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU35	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA, 6.2%, 76	**Data File :**	**R0809_3.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:06:01** (hh:mm:ss)

Left Sample ID	**FE**		**Bulk S Gravity**		**2.365**			**% Air Void**		**3.40%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.300	
1,000										0.471	57.0
1,500										0.605	28.5
2,000										0.671	10.9
3,000										0.856	27.5
4,000										1.021	19.2
5,000										1.137	11.4
6,000										1.189	4.6
7,000										1.368	15.0
8,000											
8,001										1.385	

Middle Sample ID	**BA**		**Bulk S Gravity**		**2.362**			**% Air Void**		**3.50%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.656	
1,000										0.803	22.5
1,500										0.924	15.0
2,000										1.004	8.7
3,000										1.127	12.3
4,000										1.199	6.4
5,000										1.302	8.6
6,000										1.384	6.3
7,000										1.450	4.8
8,000											
8,001										1.518	

Right Sample ID	**CD**		**Bulk S Gravity**		**2.364**			**% Air Void**		**3.40%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.550	
1,000										0.701	27.5
1,500										0.809	15.4
2,000										0.881	8.9
3,000										1.025	16.3
4,000										1.141	11.4
5,000										1.214	6.3
6,000										1.291	6.3
7,000										1.370	6.1
8,000											
8,001										1.436	

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU36	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU36	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	DVMA,5.7%,76	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:08 (hh:mm:ss)

Left Sample ID	**EF**	**Bulk S Gravity**	**2.362**	**% Air Void**	**4.20%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.650	
1,000										0.726	11.8
1,500										0.854	17.5
2,000										0.977	14.5
3,000										1.000	2.3
4,000										1.112	11.2
5,000										1.166	4.8
6,000										1.216	4.3
7,000										1.279	5.2
8,000										1.317	3.0
8,000										1.317	0.0

Middle Sample ID	**BD**	**Bulk S Gravity**	**2.361**	**% Air Void**	**4.30%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.572	
1,000										0.732	27.9
1,500										0.842	15.0
2,000										0.910	8.1
3,000										1.011	11.2
4,000										1.072	6.0
5,000										1.078	0.5
6,000										1.117	3.6
7,000										1.185	6.1
8,000										1.266	6.9
8,000										1.266	0.0

Right Sample ID	**CA**	**Bulk S Gravity**	**2.363**	**% Air Void**	**4.20%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.639	
1,000										0.802	25.5
1,500										0.911	13.5
2,000										0.976	7.2
3,000										1.057	8.2
4,000										1.097	3.8
5,000										1.168	6.5
6,000										1.241	6.3
7,000										1.325	6.7
8,000										1.360	2.7
8,000										1.360	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU37	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU37	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	DMVA,6.7%,76	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:00 (hh:mm:ss)

Left Sample ID	**DA**	**Bulk S Gravity**	**2.388**	**% Air Void**	**1.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.745	
1,000										0.884	18.7
1,500										1.014	14.7
2,000										1.039	2.5
3,000										1.195	15.1
4,000										1.295	8.4
5,000										1.347	4.0
6,000										1.370	1.7
7,000										1.431	4.4
8,000										1.465	2.4
8,000										1.465	0.0

Middle Sample ID	**FC**	**Bulk S Gravity**	**2.388**	**% Air Void**	**1.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.550	
1,000										0.696	26.6
1,500										0.788	13.2
2,000										0.871	10.5
3,000										1.010	16.0
4,000										1.100	8.9
5,000										1.241	12.9
6,000										1.252	0.9
7,000										1.365	9.0
8,000										1.451	6.3
8,000										1.451	0.0

Right Sample ID	**BE**	**Bulk S Gravity**	**2.388**	**% Air Void**	**1.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.573	
1,000										0.662	15.6
1,500										0.747	12.7
2,000										0.783	4.9
3,000										0.848	8.3
4,000										0.916	8.0
5,000										0.970	5.9
6,000										0.998	2.9
7,000										1.042	4.4
8,000										1.073	2.9
8,000										1.073	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU38	**Test No. :**	**R0910-1**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU38	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,6.2%,64	**Data File :**	**R0910_1.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:12** (hh:mm:ss)

Left Sample ID	**FB**	**Bulk S Gravity**	**2.379**	**% Air Void**	**2.50%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.810	
1,000										1.053	30.0
1,500										1.206	14.5
2,000										1.465	21.5
3,000										1.701	16.1
4,000										1.868	9.8
5,000										2.078	11.3
6,000										2.257	8.6
7,000										2.365	4.8
8,000										2.462	4.1
8,001										2.460	-0.1

Middle Sample ID	**CD**	**Bulk S Gravity**	**2.38**	**% Air Void**	**2.50%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.972	
1,000										1.281	31.7
1,500										1.578	23.2
2,000										1.788	13.3
3,000										2.268	26.9
4,000										2.586	14.0
5,000										2.951	14.1
6,000										3.299	11.8
7,000										3.566	8.1
8,000										3.795	6.4
8,001										3.796	0.0

Right Sample ID	**AE**	**Bulk S Gravity**	**2.379**	**% Air Void**	**2.50%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.966	
1,000										1.291	33.6
1,500										1.512	17.1
2,000										1.698	12.3
3,000										2.002	17.9
4,000										2.234	11.6
5,000										2.442	9.3
6,000										2.616	7.1
7,000										2.776	6.1
8,000										2.911	4.9
8,001										2.909	-0.1

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU38A	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU38A	**Test Date:**	06/26/03	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA 6.2% +3%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:40 (hh:mm:ss)

Left Sample ID	**AC**		**Bulk S Gravity**		**2.426**			**% Air Void**		**0.40%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.388	
1,000										1.765	27.2
1,500										1.974	11.8
2,000										2.162	9.5
3,000										2.474	14.4
4,000										2.699	9.1
5,000										2.857	5.9
6,000										3.025	5.9
7,000										3.153	4.3
8,000										3.260	3.4
8,000										3.260	0.0

Middle Sample ID	**FB**		**Bulk S Gravity**		**2.426**			**% Air Void**		**0.40%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.392	
1,000										1.257	-9.7
1,500										1.878	49.4
2,000										1.942	3.4
3,000										2.310	18.9
4,000										2.051	-11.2
5,000										2.173	5.9
6,000										2.409	10.9
7,000										2.591	7.5
8,000										2.844	9.8
8,000										2.844	0.0

Right Sample ID	**DE**		**Bulk S Gravity**		**2.425**			**% Air Void**		**0.40%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.956	
1,000										2.426	24.0
1,500										2.770	14.2
2,000										3.036	9.6
3,000										3.303	8.8
4,000										3.583	8.5
5,000										3.733	4.2
6,000										3.859	3.4
7,000										3.974	3.0
8,000										4.075	2.5
8,000										4.075	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU39	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU39	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,5.7%,64	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:01 (hh:mm:ss)

Left Sample ID	**CA**		**Bulk S Gravity**		**2.363**			**% Air Void**		**3.90%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.839	
1,000										1.091	30.1
1,500										1.265	15.9
2,000										1.427	12.8
3,000										1.627	14.0
4,000										1.781	9.5
5,000										1.910	7.2
6,000										2.025	6.0
7,000										2.123	4.8
8,000										2.204	3.8
8,000										2.204	0.0

Middle Sample ID	**BF**		**Bulk S Gravity**		**2.362**			**% Air Void**		**3.90%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.926	
1,000										1.161	25.3
1,500										1.272	9.6
2,000										1.397	9.8
3,000										1.599	14.4
4,000										1.756	9.9
5,000										1.909	8.7
6,000										2.022	5.9
7,000										2.101	3.9
8,000										2.204	4.9
8,000										2.204	0.0

Right Sample ID	**DE**		**Bulk S Gravity**		**2.36**			**% Air Void**		**4.00%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.902	
1,000										1.223	35.5
1,500										1.466	19.9
2,000										1.709	16.6
3,000										2.023	18.4
4,000										2.238	10.6
5,000										2.412	7.8
6,000										2.579	6.9
7,000										2.676	3.8
8,000										2.759	3.1
8,000										2.759	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU39A	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU39A	**Test Date:**	06/26/03	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA 5.7% +3%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:32 (hh:mm:ss)

Left Sample ID	**EC**		**Bulk S Gravity**		**2.426**			**% Air Void**		**1.10%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.906	
1,000										1.185	30.8
1,500										1.284	8.4
2,000										1.424	10.9
3,000										1.647	15.6
4,000										1.783	8.3
5,000										1.899	6.5
6,000										2.004	5.5
7,000										2.106	5.0
8,000										2.151	2.2
8,000										2.151	0.0

Middle Sample ID	**DA**		**Bulk S Gravity**		**2.427**			**% Air Void**		**1.10%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.761	
1,000										1.071	40.7
1,500										0.866	-19.1
2,000										1.811	109.1
3,000										1.054	-41.8
4,000										1.926	82.7
5,000										2.303	19.6
6,000										1.886	-18.1
7,000										2.311	22.6
8,000										1.919	-17.0
8,000										1.919	0.0

Right Sample ID	**BF**		**Bulk S Gravity**		**2.428**			**% Air Void**		**1.00%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										1.037	
1,000										1.388	33.8
1,500										1.584	14.1
2,000										1.752	10.6
3,000										1.993	13.7
4,000										2.236	12.2
5,000										2.412	7.9
6,000										2.568	6.4
7,000										2.709	5.5
8,000										2.820	4.1
8,000										2.820	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU40	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU40	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,6.7%,64	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:01 (hh:mm:ss)

Left Sample ID	**AC**	**Bulk S Gravity**	**2.386**	**% Air Void**	**1.60%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.194	
1,000										1.621	35.8
1,500										1.961	21.0
2,000										2.206	12.5
3,000										2.651	20.2
4,000										2.860	7.9
5,000										3.127	9.3
6,000										3.432	9.8
7,000										3.617	5.4
8,000										3.793	4.9
8,001										3.790	-0.1

Middle Sample ID	**FB**	**Bulk S Gravity**	**2.388**	**% Air Void**	**1.50%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.954	
1,000										1.234	29.4
1,500										1.447	17.2
2,000										1.683	16.3
3,000										1.989	18.2
4,000										2.329	17.1
5,000										2.582	10.9
6,000										2.937	13.8
7,000										3.208	9.2
8,000										3.378	5.3
8,001										3.374	-0.1

Right Sample ID	**ED**	**Bulk S Gravity**	**2.385**	**% Air Void**	**1.60%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.054	
1,000										1.456	38.2
1,500										1.769	21.5
2,000										2.012	13.7
3,000										2.378	18.2
4,000										2.671	12.3
5,000										2.949	10.4
6,000										3.156	7.0
7,000										3.347	6.1
8,000										3.510	4.9
8,001										3.506	-0.1

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU40A	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU40A	**Test Date:**	06/26/03	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA 6.7% +3%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:12 (hh:mm:ss)

Left Sample ID	AF	Bulk S Gravity	2.414	% Air Void	0.20%

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.330	
1,000										1.760	32.3
1,500										1.981	12.6
2,000										2.239	13.0
3,000										2.558	14.2
4,000										2.853	11.5
5,000										3.098	8.6
6,000										3.294	6.3
7,000										3.456	4.9
8,000										3.603	4.3
8,000										3.603	0.0

Middle Sample ID	BD	Bulk S Gravity	2.415	% Air Void	0.10%

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.436	
1,000										2.255	57.0
1,500										2.714	20.3
2,000										2.647	-2.5
3,000										2.482	-6.2
4,000										3.163	27.4
5,000										3.100	-2.0
6,000										3.456	11.5
7,000										3.082	-10.8
8,000										3.301	7.1
8,000										3.301	0.0

Right Sample ID	EC	Bulk S Gravity	2.416	% Air Void	0.10%

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.161	
1,000										1.350	16.3
1,500										1.545	14.5
2,000										1.670	8.0
3,000										1.882	12.7
4,000										2.026	7.7
5,000										2.190	8.1
6,000										2.321	6.0
7,000										2.429	4.6
8,000										2.497	2.8
8,000										2.497	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU41	**Test No. :**	**R0916-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU41	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,6.2%,70	**Data File :**	**R0916_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:14:59** (hh:mm:ss)

Left Sample ID	**DC**		**Bulk S Gravity**		**2.383**			**% Air Void**		**2.50%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.707	
1,000										0.886	25.4
1,500										0.999	12.7
2,000										1.057	5.9
3,000										1.250	18.2
4,000										1.367	9.4
5,000										1.459	6.8
6,000										1.569	7.5
7,000										1.635	4.2
8,000										1.664	1.8
8,000										1.664	0.0

Middle Sample ID	**BF**		**Bulk S Gravity**		**2.382**			**% Air Void**		**2.50%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.840	
1,000										1.004	19.5
1,500										1.122	11.7
2,000										1.235	10.1
3,000										1.445	17.0
4,000										1.534	6.1
5,000										1.679	9.5
6,000										1.816	8.1
7,000										1.864	2.7
8,000										1.999	7.2
8,000										1.999	0.0

Right Sample ID	**AE**		**Bulk S Gravity**		**2.383**			**% Air Void**		**2.50%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.679	
1,000										0.863	27.2
1,500										0.993	15.1
2,000										1.069	7.7
3,000										1.207	12.9
4,000										1.378	14.1
5,000										1.502	9.0
6,000										1.584	5.5
7,000										1.698	7.2
8,000										1.836	8.1
8,000										1.836	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU42	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU42	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,5.7%,70	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:00 (hh:mm:ss)

Left Sample ID	**DF**		**Bulk S Gravity**	**2.36**				**% Air Void**	**4.10%**		
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.878	
1,000										1.110	26.4
1,500										1.278	15.2
2,000										1.400	9.6
3,000										1.562	11.6
4,000										1.685	7.9
5,000										1.794	6.4
6,000										1.827	1.8
7,000										1.900	4.0
8,000										2.027	6.7
8,000										2.027	0.0

Middle Sample ID	**CA**		**Bulk S Gravity**	**2.36**				**% Air Void**	**4.10%**		
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.668	
1,000										0.879	31.5
1,500										0.987	12.3
2,000										1.108	12.2
3,000										1.292	16.7
4,000										1.441	11.5
5,000										1.549	7.5
6,000										1.688	9.0
7,000										1.775	5.1
8,000										1.900	7.0
8,000										1.900	0.0

Right Sample ID	**BE**		**Bulk S Gravity**	**2.361**				**% Air Void**	**4.10%**		
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.849	
1,000										1.109	30.6
1,500										1.278	15.2
2,000										1.411	10.4
3,000										1.562	10.7
4,000										1.731	10.8
5,000										1.868	7.9
6,000										1.987	6.4
7,000										2.085	4.9
8,000										2.173	4.2
8,000										2.173	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU43	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU43	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,6.7%,70	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:10 (hh:mm:ss)

Left Sample ID	AD	Bulk S Gravity	2.396	% Air Void	1.30%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.820	
1,000										1.031	25.7
1,500										1.137	10.2
2,000										1.223	7.5
3,000										1.373	12.3
4,000										1.477	7.6
5,000										1.554	5.2
6,000										1.668	7.3
7,000										1.751	5.0
8,000										1.826	4.3
8,000										1.826	0.0

Middle Sample ID	EF	Bulk S Gravity	2.396	% Air Void	1.30%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.775	
1,000										0.891	15.0
1,500										1.033	15.9
2,000										1.083	4.8
3,000										1.191	10.0
4,000										1.365	14.6
5,000										1.389	1.7
6,000										1.540	10.9
7,000										1.567	1.7
8,000										1.685	7.6
8,000										1.685	0.0

Right Sample ID	CB	Bulk S Gravity	2.394	% Air Void	1.40%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.731	
1,000										0.926	26.6
1,500										1.061	14.6
2,000										1.161	9.4
3,000										1.310	12.8
4,000										1.497	14.3
5,000										1.595	6.5
6,000										1.689	5.9
7,000										1.779	5.3
8,000										1.843	3.6
8,000										1.843	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU44	**Test No. :**	**R0918-2**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU44	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,6.2%,76	**Data File :**	**R0918_2.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:06** (hh:mm:ss)

Left Sample ID	**DA**		**Bulk S Gravity**		**2.388**			**% Air Void**		**2.30%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.465	
1,000										0.541	16.5
1,500										0.606	12.0
2,000										0.664	9.5
3,000										0.744	12.0
4,000										0.849	14.2
5,000										0.984	15.9
6,000										1.024	4.1
7,000										1.008	-1.6
8,000										0.999	-0.9
8,000										0.999	0.0

Middle Sample ID	**FB**		**Bulk S Gravity**		**2.388**			**% Air Void**		**2.30%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.484	
1,000										0.606	25.4
1,500										0.661	9.1
2,000										0.706	6.8
3,000										0.772	9.3
4,000										0.861	11.6
5,000										0.913	6.1
6,000										0.950	4.0
7,000										0.983	3.4
8,000										1.027	4.5
8,000										1.027	0.0

Right Sample ID	**EC**		**Bulk S Gravity**		**2.39**			**% Air Void**		**2.20%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.601	
1,000										0.748	24.3
1,500										0.785	4.9
2,000										0.826	5.2
3,000										0.889	7.7
4,000										0.957	7.6
5,000										1.020	6.5
6,000										1.051	3.1
7,000										1.094	4.1
8,000										1.116	2.0
8,000										1.116	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU45	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU45	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,5.7%,76	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:02 (hh:mm:ss)

Left Sample ID	**DB**	**Bulk S Gravity**	**2.366**	**% Air Void**	**3.90%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.595	
1,000										0.693	16.5
1,500										0.741	6.9
2,000										0.801	8.1
3,000										0.942	17.7
4,000										1.002	6.3
5,000										0.995	-0.7
6,000										1.072	7.7
7,000										1.102	2.9
8,000										1.100	-0.2
8,000										1.100	0.0

Middle Sample ID	**FE**	**Bulk S Gravity**	**2.367**	**% Air Void**	**3.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.652	
1,000										0.772	18.5
1,500										0.828	7.2
2,000										0.894	8.0
3,000										0.965	7.9
4,000										1.000	3.6
5,000										1.059	5.9
6,000										1.097	3.5
7,000										1.123	2.5
8,000										1.144	1.8
8,000										1.144	0.0

Right Sample ID	**CA**	**Bulk S Gravity**	**2.367**	**% Air Void**	**3.80%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.642	
1,000										0.738	14.9
1,500										0.789	6.9
2,000										0.865	9.6
3,000										0.909	5.1
4,000										0.948	4.3
5,000										0.984	3.9
6,000										1.033	4.9
7,000										1.061	2.7
8,000										1.073	1.1
8,000										1.073	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU46	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU46	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	LVMA,6.7%,76	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:08 (hh:mm:ss)

Left Sample ID	**FD**	**Bulk S Gravity**	**2.388**	**% Air Void**	**1.50%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.657	
1,000										0.739	12.5
1,500										0.818	10.7
2,000										0.887	8.4
3,000										0.945	6.6
4,000										0.973	3.0
5,000										1.028	5.7
6,000										1.157	12.5
7,000										1.215	5.0
8,000										1.216	0.1
8,000										1.216	0.0

Middle Sample ID	**EC**	**Bulk S Gravity**	**2.389**	**% Air Void**	**1.50%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.719	
1,000										0.933	29.7
1,500										1.049	12.4
2,000										1.136	8.3
3,000										1.240	9.2
4,000										1.305	5.3
5,000										1.396	6.9
6,000										1.459	4.5
7,000										1.516	3.9
8,000										1.565	3.3
8,000										1.565	0.0

Right Sample ID	**BA**	**Bulk S Gravity**	**2.388**	**% Air Void**	**1.50%**

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										0.605	
1,000										0.810	34.0
1,500										0.930	14.8
2,000										0.996	7.1
3,000										1.107	11.2
4,000										1.166	5.3
5,000										1.249	7.1
6,000										1.295	3.7
7,000										1.333	2.9
8,000										1.386	4.0
8,000										1.386	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU47	**Test No. :**	**R0923-0**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU47	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,6.2%,64	**Data File :**	**R0923_0.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:14:57** (hh:mm:ss)

Left Sample ID	**CB**		**Bulk S Gravity**		**2.266**			**% Air Void**		**7.20%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.665	
1,000										2.106	26.5
1,500										2.487	18.1
2,000										2.759	10.9
3,000										3.102	12.4
4,000										3.332	7.4
5,000										3.483	4.5
6,000										3.622	4.0
7,000										3.691	1.9
8,000										3.801	3.0
8,000										3.801	0.0

Middle Sample ID	**DE**		**Bulk S Gravity**		**2.266**			**% Air Void**		**7.20%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.589	
1,000										1.983	24.8
1,500										2.195	10.7
2,000										2.346	6.9
3,000										2.634	12.3
4,000										2.844	8.0
5,000										2.973	4.6
6,000										3.115	4.7
7,000										3.269	5.0
8,000										3.346	2.3
8,000										3.346	0.0

Right Sample ID	**FA**		**Bulk S Gravity**		**2.266**			**% Air Void**		**7.20%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.603	
1,000										2.130	32.9
1,500										2.525	18.5
2,000										2.808	11.2
3,000										3.274	16.6
4,000										3.558	8.7
5,000										3.771	6.0
6,000										3.935	4.4
7,000										4.046	2.8
8,000										4.138	2.3
8,000										4.138	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU47A	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU47A	**Test Date:**	06/26/03	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA 6.2% +3%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:14 (hh:mm:ss)

Left Sample ID	EF	Bulk S Gravity	2.292	% Air Void	5.60%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.681	
1,000										2.223	32.2
1,500										2.508	12.8
2,000										2.753	9.8
3,000										3.211	16.6
4,000										3.581	11.5
5,000										3.927	9.7
6,000										4.157	5.8
7,000										4.315	3.8
8,000										4.477	3.8
8,000										4.477	0.0

Middle Sample ID	DB	Bulk S Gravity	2.294	% Air Void	5.60%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.334	
1,000										1.920	43.9
1,500										2.381	24.0
2,000										2.699	13.4
3,000										2.926	8.4
4,000										3.671	25.5
5,000										3.835	4.5
6,000										3.919	2.2
7,000										4.332	10.5
8,000										4.436	2.4
8,000										4.436	0.0

Right Sample ID	FC	Bulk S Gravity	2.294	% Air Void	5.60%

Stroke Count	Temperature F	Temperature C	Depth Gauge Reading (mm) 1	2	3	4	5	Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
0									0.000	0.000	
500										1.767	
1,000										2.336	32.2
1,500										2.701	15.6
2,000										2.991	10.7
3,000										3.476	16.2
4,000										3.867	11.3
5,000										4.244	9.8
6,000										4.580	7.9
7,000										4.839	5.7
8,000										5.042	4.2
8,000										5.042	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU48	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU48	**Test Date:**	11/06/02	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,5.7%,64	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:28 (hh:mm:ss)

Left Sample ID	**FE**		**Bulk S Gravity**		**2.247**			**% Air Void**		**8.50%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.642	
1,000										2.138	30.2
1,500										2.429	13.6
2,000										2.637	8.6
3,000										2.946	11.7
4,000										3.171	7.6
5,000										3.432	8.2
6,000										3.699	7.8
7,000										3.903	5.5
8,000										4.075	4.4
8,001										4.079	0.1

Middle Sample ID	**BC**		**Bulk S Gravity**		**2.242**			**% Air Void**		**8.80%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.566	
1,000										2.028	29.5
1,500										2.390	17.9
2,000										2.629	10.0
3,000										3.000	14.1
4,000										3.302	10.1
5,000										3.512	6.4
6,000										3.669	4.5
7,000										3.778	3.0
8,000										3.869	2.4
8,001										3.873	0.1

Right Sample ID	**DA**		**Bulk S Gravity**		**2.238**			**% Air Void**		**8.90%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										1.613	
1,000										1.947	20.7
1,500										2.181	12.0
2,000										2.354	7.9
3,000										2.630	11.7
4,000										2.795	6.3
5,000										2.944	5.3
6,000										3.077	4.5
7,000										3.192	3.7
8,000										3.306	3.6
8,001										3.301	-0.1

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU 48A	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU 48A	**Test Date:**	06/26/03	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA 5.7% +3%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:09 (hh:mm:ss)

Left Sample ID	**DE**	**Bulk S Gravity**	**2.287**	**% Air Void**	**6.50%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.817	
1,000										2.366	30.2
1,500										2.739	15.8
2,000										2.956	7.9
3,000										3.231	9.3
4,000										3.517	8.8
5,000										3.616	2.8
6,000										3.764	4.1
7,000										3.900	3.6
8,000										3.993	2.4
8,000										3.993	0.0

Middle Sample ID	**CA**	**Bulk S Gravity**	**2.284**	**% Air Void**	**6.70%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.850	
1,000										2.484	34.2
1,500										2.740	10.3
2,000										2.930	7.0
3,000										2.974	1.5
4,000										3.562	19.8
5,000										3.414	-4.2
6,000										3.837	12.4
7,000										3.595	-6.3
8,000										3.981	10.7
8,000										3.981	0.0

Right Sample ID	**BA**	**Bulk S Gravity**	**2.287**	**% Air Void**	**6.50%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										2.151	
1,000										2.788	29.6
1,500										3.168	13.6
2,000										3.450	8.9
3,000										3.799	10.1
4,000										4.072	7.2
5,000										4.294	5.5
6,000										4.488	4.5
7,000										4.704	4.8
8,000										4.887	3.9
8,000										4.887	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU49	**Test No. :**	**R0925-2**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU49	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,6.7%,64	**Data File :**	**R0925_2.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:36** (hh:mm:ss)

Left Sample ID	**FC**	**Bulk S Gravity**	**2.296**	**% Air Void**	**5.20%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.808	
1,000										1.090	34.9
1,500										1.252	14.8
2,000										1.411	12.7
3,000										1.742	23.5
4,000										2.043	17.3
5,000										2.316	13.4
6,000										2.520	8.8
7,000										2.750	9.1
8,000										2.949	7.2
8,001										2.947	-0.1

Middle Sample ID	**DE**	**Bulk S Gravity**	**2.296**	**% Air Void**	**5.20%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										0.951	
1,000										1.208	26.9
1,500										1.451	20.2
2,000										1.632	12.4
3,000										2.079	27.4
4,000										2.352	13.1
5,000										2.577	9.5
6,000										2.793	8.4
7,000										2.972	6.4
8,000										3.195	7.5
8,001										3.196	0.0

Right Sample ID	**BA**	**Bulk S Gravity**	**2.292**	**% Air Void**	**5.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.044	
1,000										1.391	33.2
1,500										1.664	19.6
2,000										1.872	12.5
3,000										2.141	14.4
4,000										2.368	10.6
5,000										2.575	8.7
6,000										2.804	8.9
7,000										3.102	10.7
8,000										3.339	7.6
8,001										3.340	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU49A	**Test No. :**	~	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU49A	**Test Date:**	06/26/03	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA 6.7% +3%	**Data File :**	~	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	Ready	**Run Time**	2:15:02 (hh:mm:ss)

Left Sample ID	AE		Bulk S Gravity			2.304		% Air Void		4.40%	
Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										2.026	
1,000										2.531	24.9
1,500										2.854	12.8
2,000										3.131	9.7
3,000										3.513	12.2
4,000										3.855	9.7
5,000										4.185	8.6
6,000										4.479	7.0
7,000										4.748	6.0
8,000										4.910	3.4
8,000										4.910	0.0

Middle Sample ID	CF		Bulk S Gravity			2.304		% Air Void		4.40%	
Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.519	
1,000										1.883	24.0
1,500										2.469	31.1
2,000										2.407	-2.5
3,000										3.092	28.5
4,000										3.974	28.5
5,000										3.802	-4.3
6,000										3.990	5.0
7,000										4.563	14.4
8,000										4.623	1.3
8,000										4.623	0.0

Right Sample ID	DB		Bulk S Gravity			2.305		% Air Void		4.40%	
Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										2.418	
1,000										3.257	34.7
1,500										3.942	21.0
2,000										4.327	9.7
3,000										4.932	14.0
4,000										5.355	8.6
5,000										5.686	6.2
6,000										6.138	7.9
7,000										6.456	5.2
8,000										6.719	4.1
8,000										6.719	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU50	**Test No. :**	**R0926-2**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU50	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA, 6.2%,70	**Data File :**	**R0926_2.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:17** (hh:mm:ss)

Left Sample ID	**FD**	**Bulk S Gravity**	**2.262**	**% Air Void**	**7.40%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.338	
1,000										1.710	27.7
1,500										1.948	14.0
2,000										2.080	6.8
3,000										2.329	12.0
4,000										2.505	7.6
5,000										2.719	8.5
6,000										2.813	3.5
7,000										2.980	5.9
8,000										3.030	1.7
8,000										3.030	0.0

Middle Sample ID	**AC**	**Bulk S Gravity**	**2.265**	**% Air Void**	**7.30%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.627	
1,000										2.078	27.8
1,500										2.324	11.8
2,000										2.508	7.9
3,000										2.782	10.9
4,000										2.919	4.9
5,000										3.082	5.6
6,000										3.188	3.5
7,000										3.300	3.5
8,000										3.381	2.5
8,000										3.381	0.0

Right Sample ID	**BE**	**Bulk S Gravity**	**2.265**	**% Air Void**	**7.30%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.408	
1,000										1.800	27.9
1,500										2.068	14.9
2,000										2.283	10.4
3,000										2.605	14.1
4,000										2.809	7.8
5,000										2.974	5.8
6,000										3.125	5.1
7,000										3.266	4.5
8,000										3.373	3.3
8,000										3.373	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU51	**Test No. :**	**R0927-2**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU51	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,5.7%,70	**Data File :**	**R0927_2.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:20** (hh:mm:ss)

Left Sample ID	**CF**		**Bulk S Gravity**		**2.241**			**% Air Void**		**9.00%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										1.733	
1,000										2.187	26.2
1,500										2.502	14.4
2,000										2.735	9.3
3,000										3.102	13.4
4,000										3.369	8.6
5,000										3.519	4.5
6,000										3.615	2.7
7,000										3.750	3.8
8,000										3.836	2.3
8,000										3.836	0.0

Middle Sample ID	**DB**		**Bulk S Gravity**		**2.242**			**% Air Void**		**9.00%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										1.495	
1,000										2.007	34.3
1,500										2.356	17.4
2,000										2.575	9.3
3,000										2.916	13.3
4,000										3.158	8.3
5,000										3.289	4.2
6,000										3.423	4.1
7,000										3.579	4.6
8,000										3.702	3.4
8,000										3.702	0.0

Right Sample ID	**AE**		**Bulk S Gravity**		**2.241**			**% Air Void**		**9.00%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										1.335	
1,000										1.738	30.2
1,500										1.972	13.5
2,000										2.111	7.0
3,000										2.368	12.1
4,000										2.588	9.3
5,000										2.723	5.2
6,000										2.827	3.8
7,000										2.920	3.3
8,000										3.008	3.0
8,000										3.008	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU52	**Test No. :**	**R1001-1**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU52	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,6.7%,70	**Data File :**	**R1001_1.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:07** (hh:mm:ss)

Left Sample ID	**AE**	**Bulk S Gravity**	**2.302**	**% Air Void**	**5.20%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.140	
1,000										1.675	46.9
1,500										1.940	15.8
2,000										2.142	10.4
3,000										2.487	16.1
4,000										2.723	9.5
5,000										2.913	7.0
6,000										3.060	5.1
7,000										3.170	3.6
8,000										3.273	3.3
8,000										3.273	0.0

Middle Sample ID	**DB**	**Bulk S Gravity**	**2.293**	**% Air Void**	**5.50%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.466	
1,000										1.944	32.7
1,500										2.223	14.3
2,000										2.419	8.8
3,000										2.707	11.9
4,000										2.905	7.3
5,000										3.081	6.0
6,000										3.235	5.0
7,000										3.338	3.2
8,000										3.447	3.3
8,000										3.447	0.0

Right Sample ID	**CF**	**Bulk S Gravity**	**2.301**	**% Air Void**	**5.20%**

Stroke Count	Temperature		Depth Gauge Reading (mm)					Manual Average	Net Man Deflection	APA-DAS Average	Percent Change
	F	C	1	2	3	4	5				
0									0.000	0.000	
500										1.554	
1,000										2.028	30.5
1,500										2.276	12.2
2,000										2.463	8.2
3,000										2.730	10.9
4,000										2.980	9.1
5,000										3.187	6.9
6,000										3.332	4.6
7,000										3.435	3.1
8,000										3.519	2.4
8,000										3.519	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU53	**Test No. :**	**R1002-2**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU53	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA, 6.2%,76	**Data File :**	**R1002_2.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:01** (hh:mm:ss)

Left Sample ID	**DB**		**Bulk S Gravity**		**2.262**			**% Air Void**		**7.10%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.618	
1,000										0.840	35.9
1,500										0.899	7.1
2,000										0.998	11.0
3,000										1.159	16.1
4,000										1.265	9.2
5,000										1.394	10.2
6,000										1.424	2.2
7,000										1.527	7.3
8,000										1.636	7.1
8,000										1.636	0.0

Middle Sample ID	**AC**		**Bulk S Gravity**		**2.262**			**% Air Void**		**7.10%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.542	
1,000										0.697	28.7
1,500										0.759	8.9
2,000										0.887	16.8
3,000										0.968	9.2
4,000										1.047	8.1
5,000										1.148	9.7
6,000										1.225	6.6
7,000										1.254	2.4
8,000										1.332	6.2
8,000										1.332	0.0

Right Sample ID	**EF**		**Bulk S Gravity**		**2.265**			**% Air Void**		**7.00%**	
Stroke Count	**Temperature**		**Depth Gauge Reading (mm)**					**Manual Average**	**Net Man Deflection**	**APA-DAS Average**	**Percent Change**
	F	**C**	**1**	**2**	**3**	**4**	**5**				
0									0.000	0.000	
500										0.856	
1,000										1.087	26.9
1,500										1.230	13.1
2,000										1.388	12.8
3,000										1.569	13.1
4,000										1.721	9.7
5,000										1.847	7.3
6,000										1.974	6.9
7,000										2.044	3.5
8,000										2.102	2.9
8,000										2.102	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU54	**Test No. :**	**R1003-2**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU54	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,5.7%,76	**Data File :**	**R1003_2.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:01** (hh:mm:ss)

Left Sample ID	**CB**		**Bulk S Gravity**		**2.257**			**% Air Void**		**8.00%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.804	
1,000										0.919	14.3
1,500										1.066	16.0
2,000										1.171	9.9
3,000										1.266	8.1
4,000										1.337	5.7
5,000										1.438	7.5
6,000										1.429	-0.6
7,000										1.509	5.6
8,000										1.570	4.1
8,000										1.570	0.0

Middle Sample ID	**DE**		**Bulk S Gravity**		**2.261**			**% Air Void**		**7.90%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.709	
1,000										0.924	30.2
1,500										1.022	10.7
2,000										1.113	8.9
3,000										1.249	12.2
4,000										1.361	8.9
5,000										1.440	5.8
6,000										1.525	5.9
7,000										1.580	3.6
8,000										1.663	5.2
8,000										1.663	0.0

Right Sample ID	**AF**		**Bulk S Gravity**		**2.257**			**% Air Void**		**8.00%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.930	
1,000										1.152	23.9
1,500										1.299	12.7
2,000										1.403	8.1
3,000										1.584	12.9
4,000										1.737	9.6
5,000										1.858	7.0
6,000										1.944	4.6
7,000										2.040	4.9
8,000										2.118	3.8
8,000										2.118	0.0

ASPHALT PAVEMENT ANALYZER

Rutting Test Data Sheet

Project No. :	OSU55	**Test No. :**	**R1004-1**	**Temperature :**	64 (deg. C)
Mix ID No. :	OSU55	**Test Date:**	**11/06/02**	**Wheel Load :**	100 (lbs)
Mix Type :	HVMA,6.7%,76	**Data File :**	**R1004_1.ptd**	**Hose Pressure :**	100 (psi)
Operator :	Jim Doll	**Run Status :**	**Complete**	**Run Time**	**2:15:08** (hh:mm:ss)

Left Sample ID	**FB**		**Bulk S Gravity**		**2.312**			**% Air Void**		**4.40%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.705	
1,000										0.840	19.2
1,500										0.916	9.0
2,000										0.999	9.0
3,000										1.089	9.0
4,000										1.203	10.5
5,000										1.291	7.3
6,000										1.350	4.6
7,000										1.403	3.9
8,000										1.461	4.2
8,001										1.471	0.7

Middle Sample ID	**AC**		**Bulk S Gravity**		**2.287**			**% Air Void**		**5.40%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.881	
1,000										1.134	28.7
1,500										1.312	15.7
2,000										1.438	9.6
3,000										1.655	15.1
4,000										1.846	11.6
5,000										1.956	6.0
6,000										2.133	9.0
7,000										2.160	1.3
8,000										2.341	8.4
8,001										2.342	0.1

Right Sample ID	**ED**		**Bulk S Gravity**		**2.291**			**% Air Void**		**5.30%**	
Stroke	**Temperature**		**Depth Gauge Reading (mm)**					**Manual**	**Net Man**	**APA-DAS**	**Percent**
Count	**F**	**C**	**1**	**2**	**3**	**4**	**5**	**Average**	**Deflection**	**Average**	**Change**
0									0.000	0.000	
500										0.835	
1,000										0.999	19.6
1,500										1.102	10.3
2,000										1.176	6.8
3,000										1.286	9.4
4,000										1.422	10.5
5,000										1.511	6.3
6,000										1.579	4.5
7,000										1.620	2.6
8,000										1.669	3.0
8,001										1.666	-0.2

APPENDIX B

STATISTICAL TABLES

Table 1 ANOVA type I.

Source	DF	Type I SS	Mean Square	F Value	Pr > F
BType	2	36.96280370	18.48140185	72.63	<.0001
BContent	2	0.55647037	0.27823519	1.09	0.3489
P200	1	0.40041667	0.40041667	1.57	0.2200
VMA	2	13.50147037	6.75073519	26.53	<.0001
BType*BContent	4	0.52544074	0.13136019	0.52	0.7244
BType*VMA	4	1.28994074	0.32248519	1.27	0.3062
BType*P200	2	0.31107778	0.15553889	0.61	0.5497
BContent*P200	2	0.03330000	0.01665000	0.07	0.9368
BContent*VMA	4	0.27854074	0.06963519	0.27	0.8925
P200*VMA	2	2.20930000	1.10465000	4.34	0.0228

Table 2 ANOVA type III.

Source	DF	Type III SS	Mean Square	F Value	Pr > F
BType	2	36.96280370	18.48140185	77.46	<.0001
BContent	2	0.55647037	0.27823519	1.17	0.3245
P200	1	0.09388889	0.09388889	0.39	0.5349
VMA	2	13.50147037	6.75073519	28.29	<.0001
AggS	1	0.00347222	0.00347222	0.01	0.9047
BType*BContent	4	0.52544074	0.13136019	0.55	0.7000
BType*VMA	4	1.28994074	0.32248519	1.35	0.2726
BType*AggS	2	0.31107778	0.15553889	0.65	0.5279
BContent*P200	2	0.29000333	0.14500167	0.61	0.5508
BContent*VMA	4	0.26993968	0.06748492	0.28	0.8869
BContent*AggS	2	0.42758333	0.21379167	0.90	0.4182
P200*VMA	2	4.50661333	2.25330667	9.44	0.0006
VMA*AggS	2	1.57225333	0.78612667	3.29	0.0500

Table 3 Least Squares Means for effect VMA and Aggregate Size.
Dependent Variable: Rut, Where i = VMA and j= Aggregate size.

i/j	1	2	3	4	5	6	VMA	AggS	LSMEANS
1		0.4070	0.9946	0.2644	0.1227	0.4008	D	12	1
2	0.4070		0.0763	<.0001	0.9926	0.9983	D	19	2
3	0.9946	0.0763		0.7366	0.0384	0.1525	H	12	3
4	0.2644	<.0001	0.7366		0.0002	0.0002	H	19	4
5	0.1227	0.9926	0.0384	0.0002		0.9719	L	12	5
6	0.4008	0.9983	0.1525	0.0002	0.9719		L	19	6

Table 4 Least Squares Means for effect Fines Content (P200) and VMA.
Dependent Variable: Rut, Where i= P200 and j= VMA.

i/j	1	2	3	4	5	6	P200	VMA	LSMEANS
1		0.9471	0.0412	0.0140	0.4714	0.0253	D	D	1
2	0.9471		0.2542	0.0312	0.2037	0.2022	D	H	2
3	0.0412	0.2542		0.9622	0.0002	1.0000	D	L	3
4	0.0140	0.0312	0.9622		<.0001	0.8852	H	D	4
5	0.4714	0.2037	0.0002	<.0001		<.0001	H	H	5
6	0.0253	0.2022	1.0000	0.8852	<.0001		H	L	6