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Hot mix asphalt longitudinal joint evaluation

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by
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Table of Contents

Abstract:

Longitudinal joints are the portion of the road where two lanes meet and are formed because the lanes are paved at different times. Longitudinal joints tend to be the weakest portion of the roadway, and yet few regulations exist to control their quality. Currently, Arkansas specifications for asphalt pavement do not include any requirements for the measurement of joint quality. The purpose of this research project is to determine the most effective method for evaluating longitudinal joints in hot-mix asphalt (HMA) pavements.

Most of the literature concerning longitudinal joints focuses on density as the determining factor of quality because density is easy to measure, and denser pavement is less likely to allow air and water to penetrate. Numerous studies have determined that joints with higher densities perform better than those with lower densities. However, measurement of other asphalt properties could provide a good alternative to density testing as a means of quality control.

For this project, three field test sites were chosen, one site which was of good quality, one which was of marginal quality, and one which was of poor quality. Several cores were taken from these sites across the longitudinal joint and analyzed using the following methods: AASHTO T-166 (SSD), AASHTO T-331 (CoreLok), Kuss displacement, percent water absorbed, ASTM PS-129 (permeability), AASHTO T-30 (gradation), and oven derived percent binder content.

The data resulting from the various laboratory tests were visually and statistically analyzed to determine which method of testing yields data having the most direct correlation to the performance of the core and provides the greatest discrimination among

the different levels of joint quality. The purpose of this study was to identify which testing method shows the greatest relative differentiation of quality across the joint and from site to site so that this method may be studied further in order to recommend a minimum standard for the quality of longitudinal joints.

By testing longitudinal joints and maintaining a minimum quality, the life of the pavement will be extended and the necessary amount of both scheduled and unscheduled pavement maintenance will be reduced, thus decreasing the cost of maintenance.

Introduction:

Longitudinal joints in asphalt pavement occur where two lanes meet. When the first lane is paved, it is compacted and allowed to cool. Thus, this side of the road is referred to as the "cold" side. The second lane is paved afterwards; it is referred to as the "hot" side because asphalt is hot when it is freshly placed. Longitudinal joints are vulnerable to failures because the edges of the first lane lack confinement. When another lane is added, the joint area has a lower density than the other parts of the roadway, allowing more air and water to enter the pavement in that area.

The presence of air and water within a pavement is a primary instigator and accelerator of damages. Excess air causes the binder in the mix to oxidize more rapidly, resulting in dry and brittle pavement which is prone to fatigue cracking failures. Extra water in the pavement can lead to softening of the subgrade, which results in rutting, cracking, and potholes. Water can also cause the binder in the asphalt mix to separate from the aggregate particles, leaving the pavement more vulnerable to damage. Because joints are prone to having these types of problems, the quality of joints is critical in the overall durability of the pavement.

Background:

Joints are formed where two adjacent lanes meet because the two lanes must be paved separately. A variety of techniques exist for constructing joints. Some of the more common methods are described below.

Methods of compacting two adjacent lanes include "rolling from the hot side" and "rolling from the cold side." Rolling from the hot side is a method of joint construction where the hot side is compacted with an overlap onto the cold side. Rolling from the cold side is the opposite; the cold side is compacted and overlaps onto the hot side. A tack coat, made of a bituminous liquid asphalt material, may be applied to edges in order to promote bonding between the two lanes.

Other methods of joint construction involve the formation of the edges. "Cutting Wheel" is a technique where one to two inches of the unconfined edge of a lane are removed after initial compaction but before the mix cools. The adjacent lane is then paved. Edge restraining devices may also be used while paving in order to confine edges and increase density. "Wedge Joints" may be created by placing a sloped steel plate on the corner of the paver screed, forming a tapered edge.

Most of the literature concerning longitudinal joints focuses on density as the determining factor of quality because density is easy to measure, and denser pavement is less likely to allow air and water to penetrate. Numerous studies have determined that joints with higher densities perform better than those with lower densities. Denser pavements have fewer air voids, so the air voids are less likely to be connected to each other. Therefore, denser pavements are less likely to allow air and water to enter the pavement structure. For this reason, density can be a reasonable measure of quality for joints.

Although joint quality is typically determined by density, a number of other properties such as permeability, percent water absorbed, gradation, or percent binder may be tested to quantify quality.

Permeability could also be an effective descriptor of the quality of pavement because permeability describes how many of the air voids within the pavement are connected, allowing air and water to penetrate deep into the pavement structure.

Gradation could also be an important descriptor of quality; if the mix has segregated near the edge of the lane, the pavement around the joint will be poorly graded. When segregation occurs, a disproportionate amount of coarse aggregate separates from the mix forming a section of pavement which has different properties than the surrounding pavement. The section containing large quantities of coarse aggregate will likely contain many interconnected voids and thus allow air and water to penetrate readily.

While joint quality is essential to the performance and life of a pavement, many states do not have any regulation of joint quality during construction. The regulations of each state are shown in Table 1 below.

TABLE 1- STATE REGULATIONS

State:	AL
Density testing	Use nuclear gauge; compare each 1000 ft to theoretical max mix density.
Longitudinal joint density requirement	no
Other requirements	Joints must be rolled on first pass, layers offset by 6 inches
State:	AK
Density testing	full depth 6 in. core samples taken within 24 hours after final rolling
Longitudinal joint density requirement	**joint must be > 91% of max specific gravity**

Other requirements	layers of longitudinal joints offset by 6 inches
State:	AZ
Density testing	target density is 98% of lab density
Longitudinal joint density requirement	no
Other requirements	no
State:	CA
Density testing	no
Longitudinal joint density requirement	no
Other requirements	joints should be rolled from lower edge to highest portion
State:	CO
Density testing	target density is 96% of max theoretical density, tested using cores
Longitudinal joint density requirement	**92% of max theoretical density**
Other requirements	no
State:	CT
Density testing	no
Longitudinal joint density requirement	**>90% and <97% of the theoretical void free density**
Other requirements	no
State:	DE
Density testing	mean pavement compaction at least 98% of control strip target density, individual results at least 96%
Longitudinal joint density requirement	no
Other requirements	no
State:	Federal Lands Highways
Density testing	nuclear gauge readings calibrated based on core samples, use control strip, >90% of max specific gravity
Longitudinal joint density requirement	no
Other requirements	apply an asphalt tack coat to the edge of longitudinal joints
State:	FL
Density testing	G_{mm} based on corresponding sublot, average >93% of G_{mm} and individuals > 91%
Longitudinal joint density requirement	no
Other requirements	offset layers of joints by 6-12 inches
State:	GA
Density testing	not required for 90 lb/yd2 or less, 4.75 mm mix, or asphaltic concrete OGFC and PEM
Longitudinal joint density requirement	no
Other requirements	clean and tack vertical face of longitudinal joint, must not exceed 7.8 % Mean Air Voids
State:	HI
Density testing	No
Longitudinal joint density requirement	No
Other requirements	longitudinal joints should be rolled first, then follow regular rolling procedures
State:	ID
Density testing	No
Longitudinal joint	No

density requirement	
Other requirements	No
State:	IL
Density testing	No
Longitudinal joint density requirement	no
Other requirements	specifies method of compacting longitudinal joints in bituminous concrete binder and surface course
State:	IN
Density testing	AASHTO T-312, based on cores taken from lots and sublots whose density is expressed as MSG (mean specific gravity)
Longitudinal joint density requirement	no
Other requirements	compact using Superpave Gyratory Compactor, offset longitudinal joint layers by 6 in and within 12 in of lane line
State:	IA
Density testing	No
Longitudinal joint density requirement	No
Other requirements	has regulations on repairing longitudinal joints, but not constructing new joints
State:	KS
Density testing	No
Longitudinal joint density requirement	No
Other requirements	No
State:	KY
Density testing	No
Longitudinal joint density requirement	No
Other requirements	longitudinal joints should be coated with tack, offset joint 6 inches, avoid cold joints when possible
State:	LA
Density testing	conducted by Department, five random samples taken from each lot
Longitudinal joint density requirement	No
Other requirements	offset joint layers 3-6 inches, use tack, set screed to allow 25% fluff and overlap paver 2 inches on each pass
State:	ME
Density testing	Department will measure pavement density using core samples tested according to AASHTO T-166
Longitudinal joint density requirement	no
Other requirements	cores shall not be cut except for verification of nuclear density gauge, not to exceed 3/day or 2/1000 Mg placed
State:	MD
Density testing	If <500 tons, use thin layer nuclear density gauge. Otherwise, drill cores.
Longitudinal joint density requirement	no
Other requirements	use steel wheel rollers, roll longitudinal joints after transverse joints, offset joint layers 6 in, use tack coat
State:	MA
Density testing	Pavement no less than 95% of density obtained from laboratory compaction
Longitudinal joint density requirement	No
Other requirements	No

State:	MI
Density testing	No
Longitudinal joint density requirement	No
Other requirements	longitudinal joints shall be vertical or tapered and coincide with painted lane lines
State:	MN
Density testing	Use AASHTO T-166 Mn/DOT modified for bulk specific gravity. Two cores must not differ by more than 0.03.
Longitudinal joint density requirement	subject to density requirements of pavement
Other requirements	No
State:	MS
Density testing	avg lot density must be 92-95% of max density based on AASHTO T-209. Use nuclear gauge and cores.
Longitudinal joint density requirement	No
Other requirements	No
State:	MO
Density testing	94+or- 2% of theoretical max specific gravity for all mixes except SP125xSM
Longitudinal joint density requirement	**No less than 2% below specified density within 6 inches of a joint.**
Other requirements	VMA shall be within -0.5 or +2.0% and air voids shall be within +or-1.0% of requirement for mix type.
State:	MT
Density testing	No
Longitudinal joint density requirement	No
Other requirements	No
State:	NE
Density testing	use core samples for density testing
Longitudinal joint density requirement	No
Other requirements	all voids shall be filled when constructing longitudinal joints
State:	NV
Density testing	No
Longitudinal joint density requirement	No
Other requirements	offset joint layers by 6 in., within 12 in. of final traffic lanes, no more than one joint within same traffic lane
State:	NH
Density testing	No
Longitudinal joint density requirement	No
Other requirements	no joints over 3/4 in. high left open to traffic unless wedge joint is used, no joint open more than 30 hours.
State:	NM
Density testing	mean density >92% of theoretical max density determined by AASHTO T-209. Each test shall be 89-98%.
Longitudinal joint density requirement	No
Other requirements	No
State:	NY
Density testing	2 options: 1) if avg of cores is <88% of theoretical density, must be evaluated 2) cores should be 92-97% of mix avg daily max theoretical density

	test section: density is 96-103% of PTD in a test, 98% of PTD as moving avg of last 10 tests by nuclear gauge.
Longitudinal joint density requirement	No
Other requirements	No
State:	NC
Density testing	pavement at least 92% of G_{mm} by AASHTO T-209
Longitudinal joint density requirement	No
Other requirements	No
State:	ND
Density testing	avg density of field cores at least 91% of daily avg MTD, each sublot must avg 89% of daily avg MTD
Longitudinal joint density requirement	No
Other requirements	air voids 3-5%, joints tacked
State:	OH
Density testing	take 10 cores to determine MSG, pavement should be 92-97% of MSG.
Longitudinal joint density requirement	No
Other requirements	max slope of 3:1 for wedge joint,
State:	OK
Density testing	avg lot density should be 92-97% of MTD
Longitudinal joint density requirement	No
Other requirements	joints must be within 1 ft of lane lines, top layer at lane line, use tack coat
State:	OR
Density testing	No
Longitudinal joint density requirement	No
Other requirements	No
State:	PA
Density testing	use control strip and nuclear gauge
Longitudinal joint density requirement	No
Other requirements	offset joint layers by 6 in, paint edge of lane with thin coating of bituminous material before abutting lanes
State:	RI
Density testing	95% of lab Marshall specimens by AASHTO T-245, measure using nuclear gauge
Longitudinal joint density requirement	No
Other requirements	joints brush-painted or pressure sprayed with bituminous tack coat, stagger joints by 6 in.
State:	SC
Density testing	92% of MSG
Longitudinal joint density requirement	No
Other requirements	offset joint layers by 6 in., within 12 in. of lane line. For confined edges, first pass adjacent to edge shall be on hot mat 6 in. from joint. For unconfined edges, compaction shall extend 6 in. beyond the edge of the mat.
State:	TN
Density testing	bituminous plant mix base: grades A,B avg density >92%, individual >90% of TMD. Grades B-M, C avg 92%,

	individual 90%, Grade C-W, avg >88%, individual >85%. Asphaltic Concrete Surface Course: Grade D avg 92%,individual >90%, Grade F avg 92%, individual 89%, Grade A,B,B-M, C, D, E avg 90%, individual 87% for ADT of >1000, avg 91%, individual 89% for ADT between 1000 and 3000. Determine BSG by AASHTO T-166, Method A or C.
Longitudinal joint density requirement	No
Other requirements	No
State:	TX
Density testing	test by Tex-207-F and Tex-227-F, optimum density is 96% +or-1.5%
Longitudinal joint density requirement	No
Other requirements	compact 5-9% air voids calculated using max theoretical specific gravity by Tex-227-F
State:	UT
Density testing	No
Longitudinal joint density requirement	take at least one core per sublot from joint for density test, used for information only.
Other requirements	offset joints 6-12 in, top course within 12 in. of centerline, if previous pass cooled below 175F,tack edge
State:	VT
Density testing	density 92-96% of daily avg specific gravity. Values >98% or <90% will be evaluated by Engineer
Longitudinal joint density requirement	No
Other requirements	contains specific directions on construction of butt or tapered joints
State:	VA
Density testing	use control strip, mean density of section at least 98% of mean density of control strip, individual at least 95%. Use thin-lift nuclear gage on backscatter
Longitudinal joint density requirement	No
Other requirements	No
State:	WA
Density testing	No
Longitudinal joint density requirement	check for density below 90% of reference maximum density. If one is found, $200/lot price adjustment.
Other requirements	No
State:	WV
Density testing	pavement density 92-96% of target density
Longitudinal joint density requirement	No
Other requirements	No
State:	WI
Density testing	calculate max specific gravity by AASHTO T-209 and bulk specific gravity by AASHTO T-166. Traffic lanes must be 91.5% of target max density for mix types E-0.3, E-1, and E-3; 92% for E-10, E-30, and E-30X, 94% of SMA. Use nuclear gauge.
Longitudinal joint density requirement	No
Other requirements	No
State:	WY
Density testing	use test strip, avg density of 10 samples at least 95% of max density, individual

	no less than 92%
Longitudinal joint density requirement	No
Other requirements	No

Currently, Arkansas specifications for asphalt pavement do not include any requirements for the measurement of joint quality. The purpose of this research project is to determine the most effective method for evaluating longitudinal joints in hot-mix asphalt (HMA) pavements based on the method's ability to provide relative differentiation of quality across the joint of the pavement. By improving the quality of longitudinal joints, the life of the pavement extended, and the overall quality of the road will be improved.

Literature Review:

Longitudinal cracks and raveling often occur due to a density gradient across the joint. The cold side often has a lower density than the hot side because the cold side often lacks confinement. If the heights of the two sides are different, water may accumulate at the joint and accelerate the deterioration of the joint. Other factors such as percent air voids, permeability, and gradation play a role in the performance of the pavement also. These issues need to be addressed during the construction of longitudinal joints; however, the best method for preventing such problems is unclear.

Many studies have been performed on the construction methods of longitudinal joints in order to improve roadway quality. These studies have used a variety of testing procedures in order to quantify the quality of the joints; however, most studies use or include density tests in their procedures. Following is a brief list of such studies and an explanation of their findings.

Evaluation of Longitudinal Joint Construction Techniques for Asphalt Pavements(1)

In Kandhal's study, joints were constructed in the following ways: rolling from the hot side, rolling from the cold side, rolling from the hot side 6 inches away from the joint, tapered joint with 12.5 mm offset without tack coat, tapered joint with 12.5 mm offset with tack coat, edge restraining device, cutting wheel with tack coat, cutting wheel without tack coat, tapered joint with vertical 25 mm offset, rubberized asphalt tack coat, and New Jersey wedge. The joints were then tested for density and percent air voids. According to this study, joints perform best when rolled from the hot side and second best when rolled from the hot side six inches away from the joint.

A Study of Longitudinal Joint Construction Techniques in HMA Pavements (2)

In Kandhal's study, longitudinal joints were constructed by the following seven methods: taper rolled from hot side, taper rolled from cold side, taper rolled from hot side 152 mm away from joint, taper removed and tack coated, taper removed with no tack coat, 3:1 taper with 25 mm offset, and rubberized asphalt tack coat. The quality of the joints was determined based on bulk specific gravity by the ASTM D226 method, the calculation of air voids using max specific gravity, and the presence of cracks over time. The taper with 25 mm offset demonstrated the highest quality followed by the taper removed and tack coated. The taper rolled from the hot side had the lowest joint density.

Longitudinal Joint Construction Techniques for Asphalt Pavement (3)

During Kandhal's study, the following methods of constructing longitudinal joints were evaluated: conventional overlapping with the roller mostly on the hot side, conventional overlapping with the roller mostly on the cold side, conventional overlapping with the roller about 6 inches away from the joint on the hot side, wedge joint without tack coat, wedge joint with tack coat, restrained edge compaction, cutting wheel, and AW-2R joint maker. Cores of 6 inch diameter were taken at the joint (half on the cold side and half on the hot side) and 2 feet from the joint on the hot side. From these samples, bulk specific gravity was determined according to ASTM D2726, theoretical maximum specific gravity was determined according to ASTM D2041, mean and standard deviation were calculated, and the percent air voids was determined. Nuclear density readings were also taken on the joint and one foot away from the joint on both sides. The nuclear density readings were then correlated to core densities. Based on the data collected, the wedge joint, cutting wheel, and edge restraining device gave higher densities than the other methods tested and were recommended as the best construction methods.

Evaluation of Techniques for Asphaltic Pavement Longitudinal Joint Construction- Final Report (4**)**

In Toepel's study, eight construction techniques were evaluated for longitudinal joints in Wisconsin: rolling from the hot side 6 inches from the joint, wedge joint method rolling with hauling truck tires, wedge joint method without truck tire rolling, wedge joint method with steel side roller wheel installed on side of steel-wheeled roller, wedge joint method with rubber side roller wheel installed on side of rubber-tire roller, wedge joint method with tag-along roller installed on the HMA paver, cut joint method (similar to cutting wheel), and conventional joint with Bomag Edge Constraint Device (similar to restrained edge compaction). Both nuclear and non-nuclear density tests were conducted on samples of each type of joint construction.

Only two of the eight methods yielded joints meeting Wisconsin's minimum joint density requirement of 92 percent of the density of the middle of the lane. The two successful methods were wedge joints constructed with steel side roller wheel and wedge joints constructed with tag-along roller attached to the paver. While the wedge joint constructed with the tag-along roller experienced the least amount of damage over time, workers tend to be more comfortable with the steel side roller and thus the quality of the joints constructed with the steel side roller is more consistent.

Evaluation of Various Longitudinal Joint Construction Techniques for Asphalt Airfield Pavements (5)

Several techniques were tested for density and endurance over time in Kandhal's study. From highest to lowest density, the tested techniques ranked as follows: 3:1 tapered joint with 25 mm offset, cutting wheel with tack coat, cutting wheel without tack coat, 3:1 taper rolled from hot side 152 mm from joint, 3:1 taper rolled from the cold side, and 3:1 taper rolled from the hot side. From highest to lowest crack resistance, the techniques ranked as follows: 3:1 tapered joint with 25 mm vertical offset, cutting wheel with tack coat, rubberized asphalt tack coat, cutting wheel without tack coat, 3:1 taper rolled from hot side 152 mm away from joint, 3:1 taper rolled from hot side, and 3:1 taper rolled from cold side.

Although the rankings for density were not exactly the same as the rankings for crack resistance, a strong correlation is evident between density and crack resistance over time. This study also found that the optimum density was obtained when 1.25 inches of uncompacted hot mix asphalt was poured on the hot side for each 1 inch of compacted lift thickness on the cold side. In addition, raking and luting can be avoided when the correct amount of overlapping material is poured. Not only must the proper construction technique be selected, but the construction must be properly administered, compacted, and tested for proper quality.

Density Evaluation of the Longitudinal Construction Joint of Hot-Mix Asphalt Pavements (6)

Several case studies were performed by Estakhri on pavements which underwent significant damage within the first few years of service. A study was conducted on Interstate Highway 10 near Yoakum District in Texas. This highway was experiencing stripping and water penetration. Several tests were conducted on samples obtained from two locations along this highway, and the following data was obtained concerning in-place density for the top layer: at location 1 the longitudinal joint density was 90.5 percent, wheel path density was 94.2 percent, and density between the wheel paths was 93.2 percent of the target density. At location 2, the longitudinal joint density was 90.8 percent, wheel path density was 95.6 percent, and density between the wheel paths was 93.7 percent of the target density. The longitudinal joint density was consistently and significantly lower than the densities obtained in other locations of the pavement.

The second case study occurred on the US 277 loop in Eagle Pass, Laredo District. This roadway had potholes and cracking along the joint. Laboratory tests included: verify mix design, compare density of joint to mid-lane density, and identify moisture susceptibility and rutting susceptibility. The mix design met the specifications but the asphalt cement content and percent passing a number 200 sieve were both high. The pavement had marginal rutting susceptibility, failed the tensile strength ratio of 0.8 for three out of six locations tested, had low joint density, and had high moisture susceptibility. However, low joint density was believed to be the main culprit of the potholes and cracking within the pavement.

After this case study, thirty-five pavements of many different asphalt types were sampled using nuclear gauges, and nearly all of the pavements had lower densities at unconfined edges or longitudinal joints. These areas had a range of two to twelve pounds per cubic foot and an average of six to seven pounds per cubic foot below the density in the middle of the lane. Ideally, joint densities should fall within five pounds per cubic foot of the internal mat density. Clearly, low quality of longitudinal joints is a common problem which leads to premature deterioration of roads.

A third case study was conducted on IH20 near Pecos in Odessa District. This pavement contained alligator cracking and had a lip along the longitudinal joint which held water. The joint was poorly compacted and contained 16.6 percent air voids while other parts of the lane contained ten percent air voids. It is believed that the poor compaction and high air voids of this roadway are the primary causes of this early failure.

Other Studies

Many theories have been developed concerning the best construction technique for longitudinal joints; most of these theories are based on density testing, but a wide variety of methods have been used for justification of a construction method.

Based on the findings of national research supported by INDOT, the highest longitudinal joint density is achieved when the hot mat is laid 6 mm higher than the cold mat, the first and second passes overlap the cold mat by six inches, and the entire width of the mat receives the same number of passes (7).

A study by Brown sought to specifying density by three methods: percent of the control strip density, percent of laboratory density, and percent of theoretical maximum density. According to the results of this study, the hot side should be poured 20 percent thicker than the cold side, and the free edge should not be rolled with a rubber tire roller because it will round the edges causing difficulties in compaction. Furthermore, heating the cold side could improve the density at the joint if done correctly. Unfortunately, the evenness of the heating can be difficult to control, and overheating may damage the binder (8).

Rather than using various testing methods to identify best construction techniques, another approach is to focus on minimum or maximum values for the results of certain testing methods. Few regulations currently exist, and most of these regulations are related to density. For example, PANYNJ increased the lower limit for longitudinal joint density from 93.3 percent of the density specified by the FAA to 94.3 percent of the Marshall density with payment reductions for any longitudinal joints having over ten percent of the test densities below the requirement (9). Many density related regulations simply specify that the joint density be no more than two percent below the required mat density.

Many different methods for determining density exist, and opinions on which method is best also vary. Many people prefer the nuclear density test because it yields quick results and is non-destructive. However, the nuclear gauge is difficult to set properly over the joint due to the sloped nature of the pavement surface and often includes data from material well outside of the joint (10). In order for nuclear gauges to be properly calibrated, cores must be drilled and tested in the laboratory to determine their bulk specific gravity (11).

Since cores must be drilled regardless of testing method and the testing of cores tends to provide more accurate results, some argue that laboratory testing should be required for quality control of longitudinal joints. According to the Asphalt Technology

News, the AASHTO T-166 method is good for testing fine-graded mixes, but other methods may be more accurate for coarse graded mixes (12). If a core absorbs more than 1percent moisture during the AASHTO T-166 test, then the vacuum-seal test should be conducted because the weight measurements in air and water during the testing of a core may be inaccurate if the core is porous (10). According to AASHTO T-166, the allowable absorption level to use this method is two percent; but for greater accuracy, one percent is a better limit because density readings tend to be high when the absorption level exceeds one percent (11).

Both the vacuum-sealing and AASHTO T-166 methods are accurate at low air voids, but at air voids above five percent, the vacuum-seal method is more accurate than the AASHTO T-166 method (11). According to Asphalt Technology News, the vacuum-sealing method should be used for field samples with void ratios of six percent or more (12). Asphalt Technology News also states that the water displacement and vacuum-sealing methods are both acceptable for calculating bulk specific gravity at low water absorption rates (12).

While density is the most common descriptor of roadway quality, other properties which are closely related to density may provide good alternatives to density as a method for quality control testing.

Permeability describes the amount of interconnected voids within the pavement; therefore, a high percentage of air voids will likely result in a highly permeable pavement. When asphalt pavement contains over eight percent air voids, permeability increases quickly with only a small increase in the in-place air voids (11). Although eight percent in-place air voids is commonly accepted as the point at which pavement becomes excessively permeable, studies show that pavements may be excessively permeable at values below eight percent (12). Therefore, the air voids should not exceed seven percent to ensure that permeability is not a problem (11).

Factors such as lift thickness, NMAS (nominal maximum aggregate size), and gradation shape are also related to the permeability of a pavement. Because lift thickness is inversely related to permeability, the Florida Department of Transportation suggests a lift thickness to NMAS ratio of four for coarse-graded mixes and three for fine-graded mixes (12). As the NMAS increases, the in-place air void sizes increase causing the probability of interconnected voids within the pavement to increase. Coarse-graded mixes tend to be more permeable than fine-graded mixes at a given air void level (11). At eight percent air voids, coarse-graded mixes have a permeability of 60E-5 cm/s while fine-graded mixes have a permeability of 10E/5 cm/s (11). Therefore, maintaining some standard maximum gradation and/or minimum percent air voids may greatly improve the quality of longitudinal joints. Following is a study by Cooley which has recommended ranges for these properties.

Development of Critical Field Permeability and Pavement Density Values for Coarse-Graded Superpave Pavements (13)

Cooley's study combined density, gradation, and air voids to identify a point at which pavements become excessively permeable. The study yielded the following results: 9.5-12.5 mm NMAS mixes became permeable at 7.7 percent in place air voids and 92.3 percent density with a field permeability of 100E-5 cm/s, 19 mm NMAS became permeable at 5.5 percent air voids and 94.5 percent density with a field permeability of 120E-5 cm/s, and 25 mm NMAS became permeable at 4.4 percent air voids and 95.6 percent density with a field permeability of 150E-5 cm/s. Based on these results, an in-place air void content of three to eight percent for dense-graded mixes is recommended because low air voids lead to rutting or shoving while high air voids lead to air and water penetration, moisture damage, raveling, and cracking.

In spite of the number of studies which have been conducted in order to identify ways of improving the quality of longitudinal joints, no common solution has been agreed upon by professionals, and few regulations on longitudinal joint quality exist. At this time, only four states have a minimum density requirement for longitudinal joints. Of the states which test for density, typically either a control strip is used in order to conduct the AASHTO T-166 test or a nuclear gauge is used to determine the density of the roadway as a whole, regardless of the asphalt mix design.

By nature, longitudinal joints are more vulnerable to damage than other parts of the road. Therefore, minimum quality requirements are necessary. While many have tried to specify a standard construction method, this may not be the most effective way to meet a specified level of quality because so many factors influence the effectiveness of a construction method in individual situations. For example, construction workers may not have experience with a particular construction method, and their inexperience could result in improper practices and lower quality joints. Many regulations focus on density; however, it is unclear whether this is the best test method for quality control. Perhaps tests for percent air voids or permeability might be more appropriate in the determination of the joint quality.

Objective:

The purpose of this project is to identify the best laboratory testing procedure to use as a quality control standard for longitudinal joints in asphalt based on the method's ability to provide relative differentiation of quality across the joint and from site to site. Therefore, samples were taken from three roadways of varying quality and were tested for a variety of properties using several different commonly accepted laboratory procedures. Data was collected for each sample and analyzed in order to determine which testing procedure most clearly and reliably differentiates between levels of quality in a pavement and across the joint of a pavement.

Test Methods

For this project, cores were taken from three roadways of varying quality and from four locations on each roadway. Five samples were taken across the joint at each location, at twelve inches and six inches to either side of the joint and directly on the joint.

The tests conducted in the laboratory include bulk specific gravity tests, permeability tests, and gradation tests.

Bulk specific gravity tests were performed using the AASHTO T331 CoreLok method, the AASHTO T 166 SSD (saturated surface dry) method , and the Kuss methods, and density values were calculated based on the data collected.

The CoreLok method measures specific gravity by vacuum sealing a sample of pavement in a puncture resistant polymer bag and measuring the amount of water displaced by the sample. The SSD method involves weighing the pavement sample when dry, when saturated, and when saturated surface dry and using these values to calculate the specific gravity. The Kuss method involves submerging the sample into a device using a patented volume displacement technology, which compares the sample to a standard of known density and then calculates the sample's density. This method does not have an AASHTO standard specification.

Once the densities of the cores were determined, permeability tests were conducted according to ASTM PS-129. This specification was withdrawn years ago; however, it is still used because it has not been replaced by another specification for permeability testing. These tests involve the use of a Karol-Warner flexible wall laboratory permeameter to measure the degree to which water passes through the cores, thus identifying which areas of pavement are more likely to allow penetration of air and water in the field.

Upon completion of the permeability test, the cores were burned in an ignition oven in order to obtain the bare aggregate for gradation testing by means of a sieve analysis. The gradations were then observed to identify any changes across the joint or from location to location. This gradation testing was performed according to AASHTO T30.

Once all laboratory tests were completed, the results were analyzed visually and then statistically using the ANOVA two factor without replication and single factor methods. The ANOVA two factor without replication test analyzes the statistical significance of the site location as well as distance from the joint. The ANOVA single factor test analyzes the significance of the distance from joint only. At the completion of these analyses, the test methods best suited for a quality control standard of longitudinal joints were recommended.

Data Analysis:

Laboratory tests were conducted on core samples taken from varying distances on, to the east or south, and to the west or north of the joint of three different roadways. The samples that were taken from Gregg Street in Fayetteville begin with "G," the samples taken from Russellville begin with "R," and the samples taken from Yellville begin with "Y."

Four sample groups were taken in the transverse direction across the joint; the roadway identifier (G, R, or Y) is followed by a number 1 through 4 as a way of identifying to which sample group the core belongs. The identifier then contains a hyphen followed by either a "12" for twelve inches from the joint, a "6" for six inches from the joint, or a "J" for directly on the joint.

Samples taken to the side of the joint are identified with "E" for east of the joint, "S" for south, "W" for west, or "N" for north of the joint. So, the core taken from the first group of samples on Gregg Street and located six inches to the east of the joint would be identified as "G1-6E." The following laboratory tests were performed on the core samples collected: SSD G_{mb}, CoreLok G_{mb}, Kuss G_{mb}, permeability, and gradation. The data collected for these tests are shown in Appendix A.

During the testing procedures, three of the Russellville joint samples (R2-J, R3-J, and R4-J) and one of the Yellville joint samples (Y4-J) cracked. Due to the cracks, data was unobtainable for these samples. In order to conduct the statistical analyses, however, data for every sample was necessary. Therefore, specific gravity values were estimated using averages from the nuclear density readings taken before sampling. This allowed for a reasonable estimation of the values for all of the density methods tested. However, no method was determined for estimating the missing values of permeability or percent water absorbed. The nuclear data used to estimate the density is shown in Appendix B.

Once the missing density values were estimated, the results for each test at varying distances from the joint were compiled by roadway location and graphed for visual observation.

Gregg Street Visual Analysis

Gregg Street Samples, Compiled Raw Data

TABLE 2- G1 DATA

Sample	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
SSD G_{mb}	2.303	2.242	2.210	2.273	2.284
% Water Absorbed by Volume	1.2	1.6	2.0	1.2	1.6
CoreLok Gmb	2.255	2.214	2.198	2.270	2.272
Kuss Gmb	2.281	2.224	2.218	2.267	2.272
Permeability	2.67	2.57	6.99	0.00	0.00
Oven Derived AC%	6.64	6.65	5.60	6.86	6.48

TABLE 3- G2 DATA

Sample	G2-12W	G2-6W	G2-J	G2-6E	G2-12E
SSD G_{mb}	2.264	2.210	2.134	2.175	2.218
% Water Absorbed by Volume	0.9	2.0	5.0	3.5	2.5
CoreLok Gmb	2.260	2.193	2.085	2.125	2.207
Kuss Gmb	2.268	2.219	2.204	2.195	2.231
Permeability	0.00	0.52	103.30	53.73	0.44
Oven Derived AC%	6.43	6.76	6.45	6.37	6.36

TABLE 4- G3 DATA

Sample	G3-12W	G3-6W	G3-J	G3-6E	G3-12E
SSD G_{mb}	2.299	2.258	2.152	2.257	2.280
% Water Absorbed by Volume	1.5	1.3	3.2	1.7	1.8
CoreLok Gmb	2.289	2.235	2.135	2.240	2.282
Kuss Gmb	2.299	2.245	2.219	2.265	2.284
Permeability	0.00	6.56	1.62	0.00	0.38
Oven Derived AC%	6.52	6.86	6.50	6.74	6.71

TABLE 5- G4 DATA

Sample	G4-12W	G4-6W	G4-J	G4-6E	G4-12E
SSD G_{mb}	2.294	2.228	2.152	2.221	2.288
% Water Absorbed by Volume	1.3	3.0	3.5	2.7	1.6
CoreLok Gmb	2.285	2.187	2.115	2.206	2.271
Kuss Gmb	2.299	2.218	2.218	2.244	2.287
Permeability	0.00	91.94	14.54	0.49	0.77
Oven Derived AC%	6.66	6.43	7.33	6.49	6.86

TABLE 6- AVERAGE G DATA

Sample	G12W	G6W	GJ	G6E	G12E
SSD G_{mb}	2.290	2.234	2.162	2.231	2.267
% Water Absorbed by Volume	1.236	1.982	3.443	2.274	1.868
CoreLok Gmb	2.272	2.207	2.133	2.210	2.258
Kuss Gmb	2.287	2.227	2.215	2.243	2.269
Permeability	0.667	25.400	31.615	13.555	0.398
Oven Derived AC%	6.563	6.675	6.470	6.615	6.603

TABLE 7- G1 SIEVE DATA

Sieve Size	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	100.0	100.0	100.0
1/2 in.	93.4	92.0	92.8	92.4	92.2
3/8 in.	82.6	81.3	83.8	81.2	79.7
No. 4	49.5	49.1	51.2	48.4	45.9
No. 8	31.2	31.3	31.8	30.9	29.3
No. 16	21.9	21.6	21.6	21.2	20.0
No. 30	16.9	16.1	16.2	16.0	15.0
No. 50	14.4	13.1	13.0	12.9	12.1
No. 100	11.8	10.6	10.2	10.3	9.7
No. 200	9.0	7.9	7.3	7.5	7.0

TABLE 8- G2 SIEVE DATA

Sieve Size	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	98.0	100.0	100.0	100.0	98.3
3/4 in.	97.4	100.0	100.0	100.0	97.7
1/2 in.	89.7	90.9	92.2	91.5	90.8
3/8 in.	80.1	81.5	79.1	78.1	79.7
No. 4	50.1	48.6	45.8	44.8	49.1
No. 8	32.9	30.2	29.2	28.2	31.4
No. 16	22.9	21.0	20.2	19.5	21.5
No. 30	17.2	15.9	15.2	14.9	16.1
No. 50	13.8	12.8	12.2	12.1	12.8
No. 100	11.1	10.3	9.9	9.8	10.3
No. 200	8.3	7.5	7.3	7.2	7.6

TABLE 9- G3 SIEVE DATA

Sieve Size	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	100.0	100.0	100.0
1/2 in.	92.3	93.4	93.7	92.7	94.3
3/8 in.	80.6	82.0	81.8	79.9	80.0
No. 4	49.1	49.6	48.6	46.0	47.0
No. 8	31.1	31.6	31.0	29.6	31.1
No. 16	21.6	21.7	21.6	20.4	21.0
No. 30	16.3	16.3	16.4	15.6	15.9
No. 50	13.2	13.2	13.3	12.8	12.9
No. 100	10.6	10.5	10.7	10.6	10.3
No. 200	7.7	7.6	7.8	8.1	7.4

TABLE 10- G4 SIEVE DATA

Sieve Size	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	100.0	100.0	100.0
1/2 in.	90.9	89.4	92.2	92.3	93.5
3/8 in.	81.7	77.7	80.0	79.0	81.9
No. 4	49.7	46.6	45.9	46.5	48.3
No. 8	31.7	28.9	29.7	30.2	31.2
No. 16	21.9	19.9	20.7	20.7	21.2
No. 30	16.5	15.0	15.8	15.6	16.1
No. 50	13.3	12.1	12.8	12.6	13.1
No. 100	10.7	9.7	10.4	10.1	10.5
No. 200	7.7	7.0	7.7	7.3	7.6

TABLE 11- G AVERAGE SIEVE DATA

Sieve Size	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	99.5	100.0	100.0	100.0	99.6
3/4 in.	99.3	100.0	100.0	100.0	99.4
1/2 in.	91.6	91.4	92.7	92.2	92.7
3/8 in.	81.2	80.6	81.2	79.5	80.3
No. 4	49.6	48.5	47.9	46.4	47.6
No. 8	31.7	30.5	30.4	29.8	30.7
No. 16	22.1	21.1	21.0	20.5	20.9
No. 30	16.7	15.8	15.9	15.5	15.7
No. 50	13.7	12.8	12.8	12.6	12.7
No. 100	11.0	10.3	10.3	10.2	10.2
No. 200	8.2	7.5	7.5	7.5	7.4

Gregg Street samples, Water Absorbed

FIGURE 1- G1, WATER ABSORBED

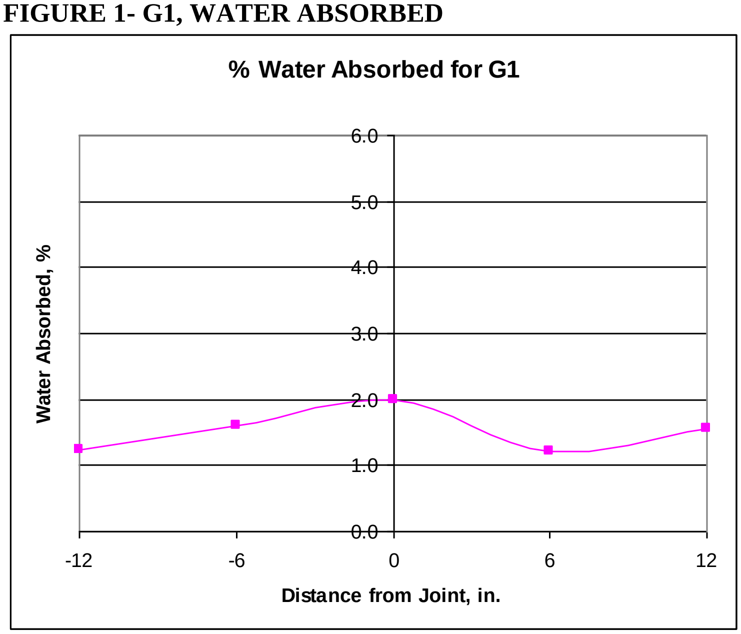


FIGURE 2- G2, WATER ABSORBED

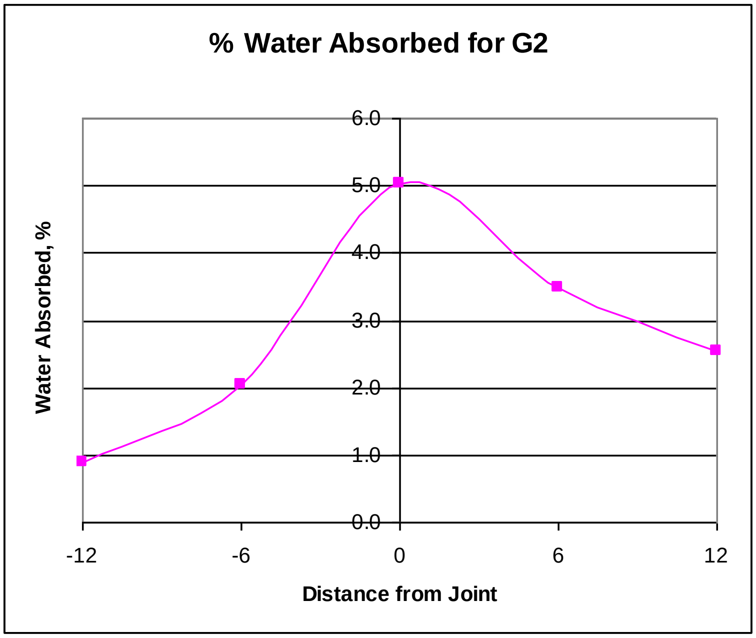


FIGURE 3- G3, WATER ABSORBED

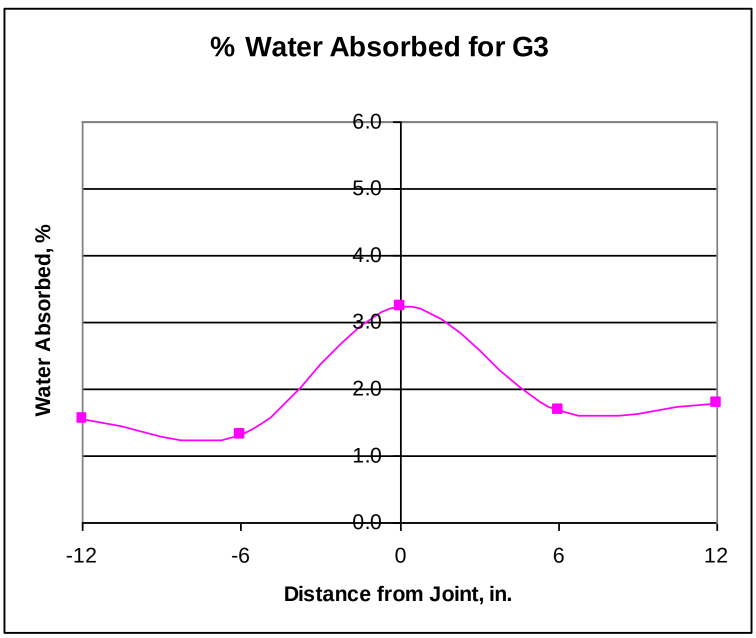


FIGURE 4- G4, WATER ABSORBED

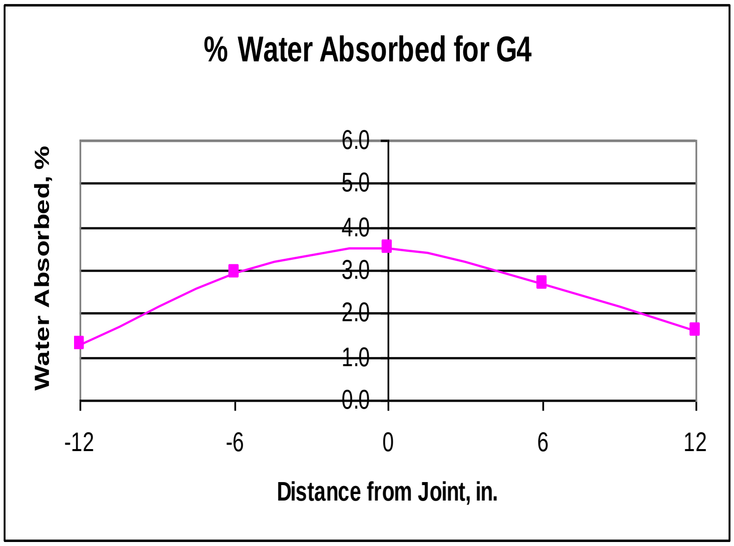
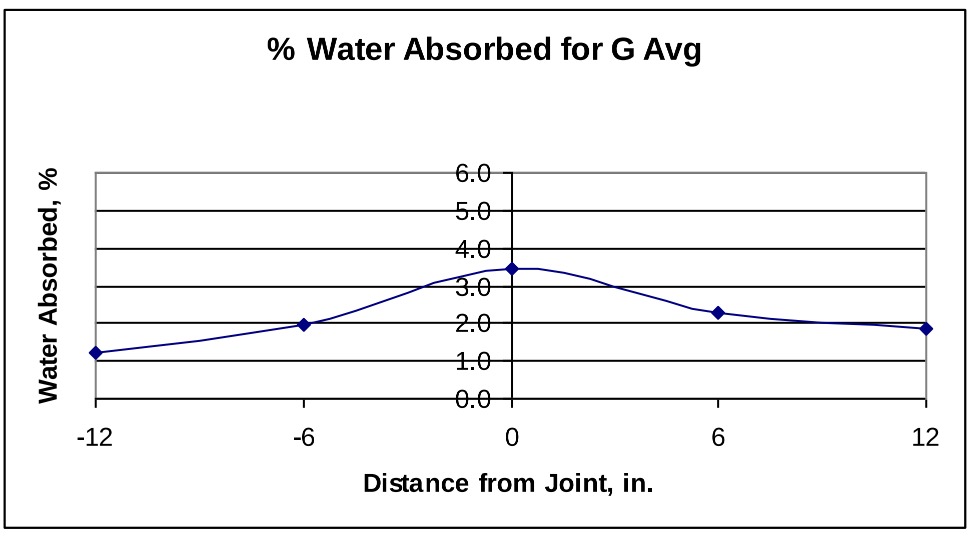


FIGURE 5- AVERAGE, WATER ABSORBED



The average difference in percent water absorbed across the joint was 2.207. Figures 1-5 all show an increase in the amount of water absorbed at the joint and a decrease with distance from the core. This indicates that the joint area holds more water than other parts of the road, which indicates poor quality and can lead to deterioration of the road. Figures 1, 2, 3, and 5 all show a slight increase in amount of water absorbed by samples located six to twelve inches from the joint.. This may indicate a different problem in that area such as a crack, poor confinement of the edges, or a poor sample representation. While the trend is consistent among these samples, the magnitude varies quite a bit, especially between Figures 1 and 2.

Gregg Street Samples, Density

FIGURE 6- G1, DENSITY

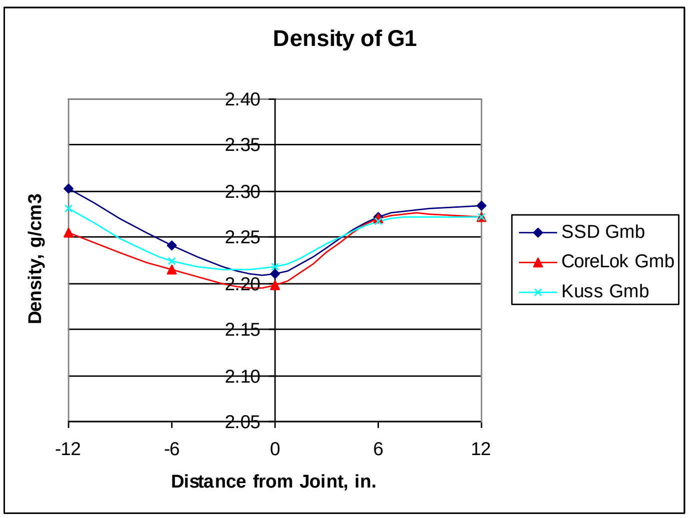


FIGURE 7- G2 DENSITY

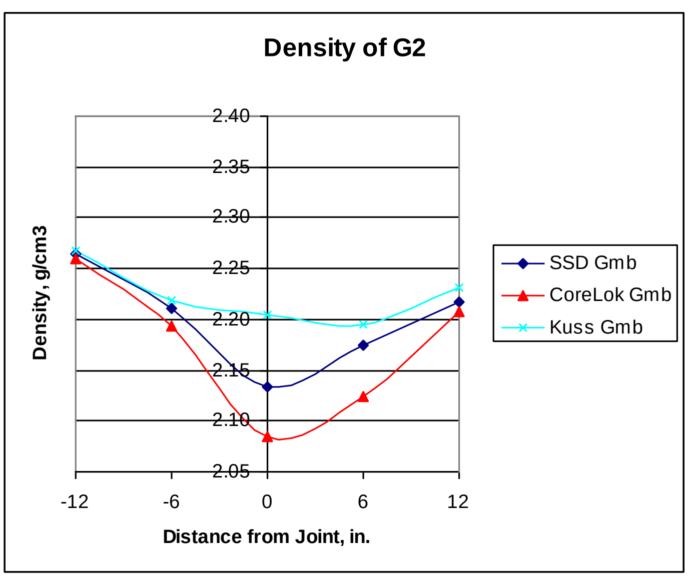


FIGURE 8- G3 DENSITY

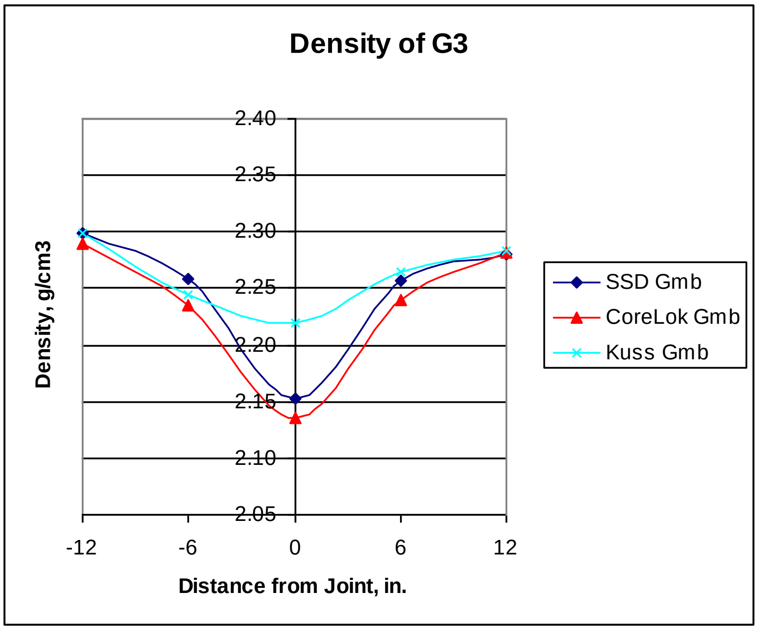


FIGURE 9- G4 DENSITY

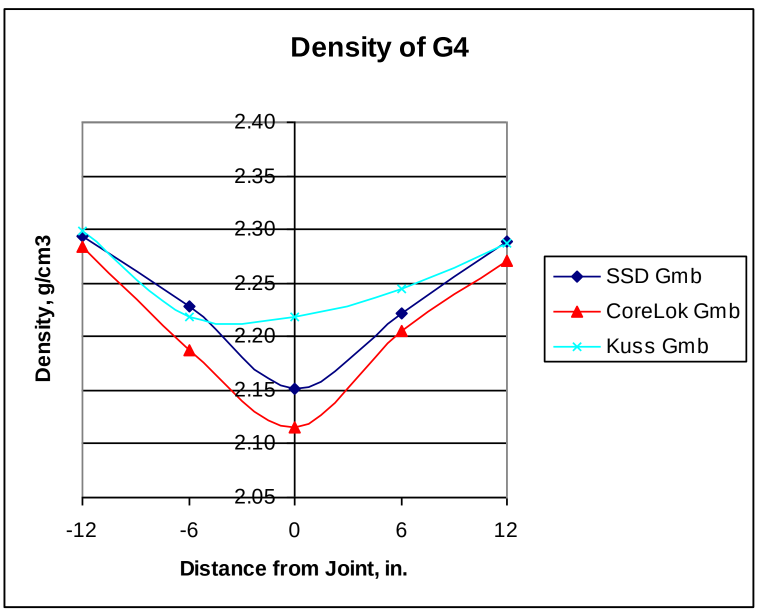
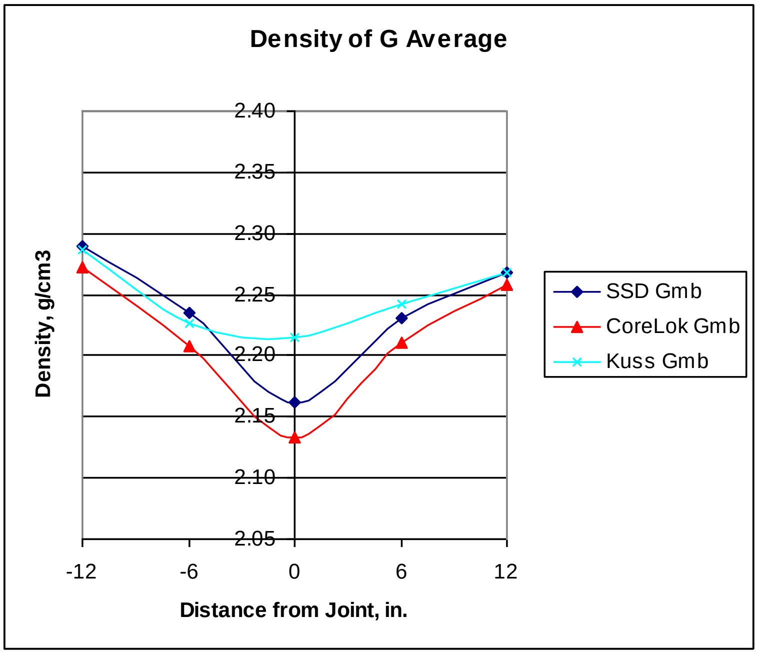


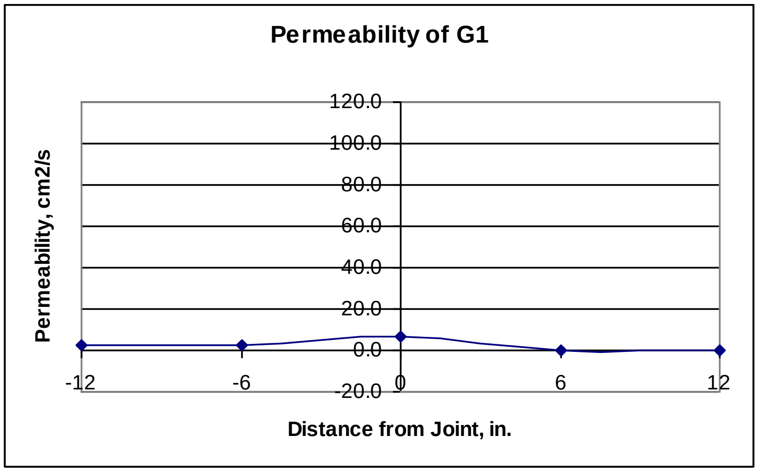
FIGURE 10- G AVERAGE DENSITY



Based on all three density tests performed, the density decreases as it nears the joint, indicating lower quality in that area. The SSD method produced an average change in density across the joint of 0.128 g/cm^3 (a difference of approximately 5.3 percent compaction), the CoreLok method had a change of 0.139 g/cm^3 (a difference of approximately 5.8 percent compaction), and the Kuss method had a change of 0.072 g/cm^3 (a difference of approximately 3.0 percent compaction). Upon inspection of Figures 6-10, the CoreLok density test consistently shows the greatest difference in density between the outside samples and the joint sample, except possibly in Figure 6 where it is comparable to the SSD method only with lower data values. Not only is the trend line consistent across the joint, but the range of values is also fairly consistent. The Kuss method provides results consistent with the CoreLok and SSD methods for samples away from the joint; however, for the lower density samples taken at the joint, the Kuss method yields much higher density values than the other testing methods.

Gregg Street Samples, Permeability

FIGURE 11- G1, PERMEABILITY



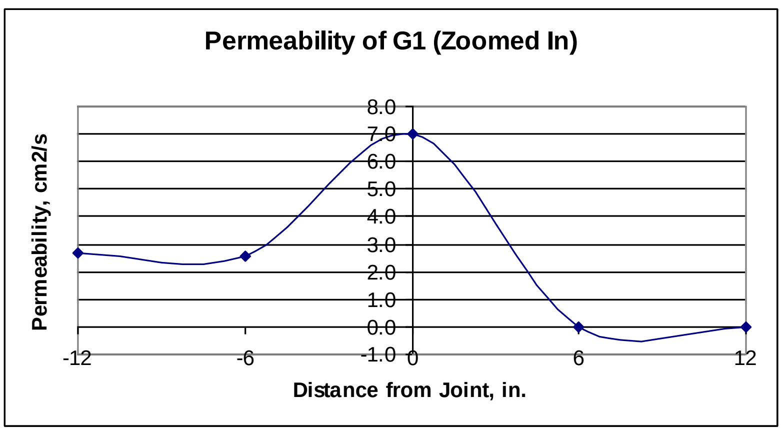


FIGURE 12- G2, PERMEABILITY

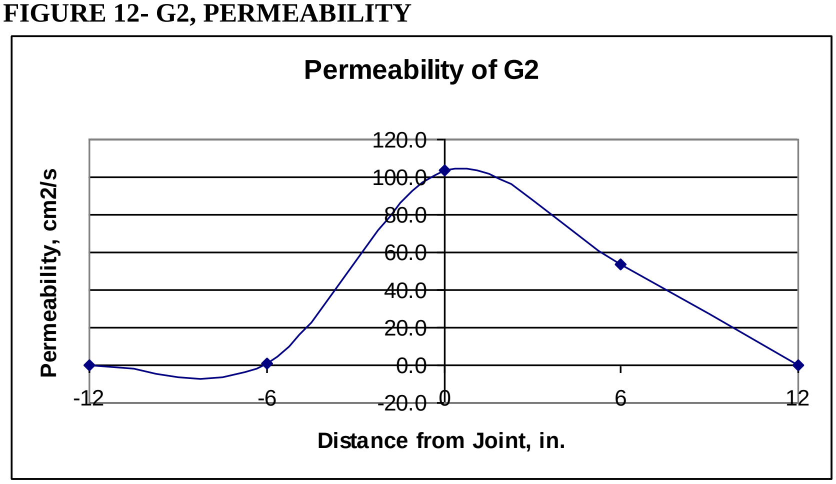
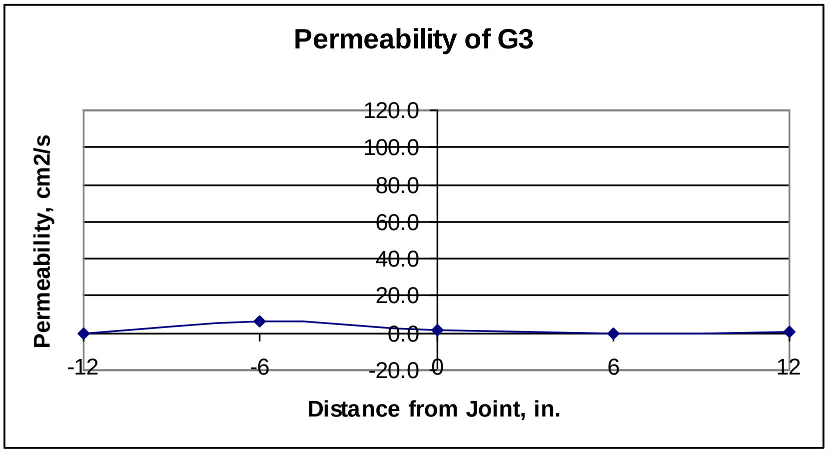


FIGURE 13- G3, PERMEABILITY



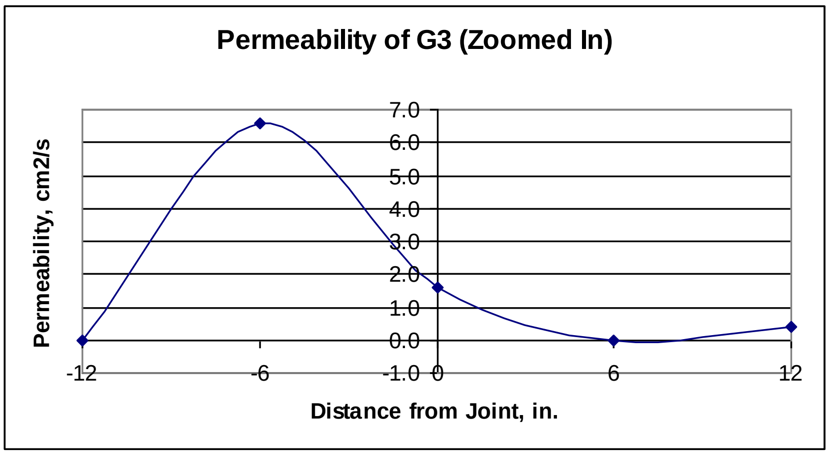


FIGURE 14- G4, PERMEABILITY

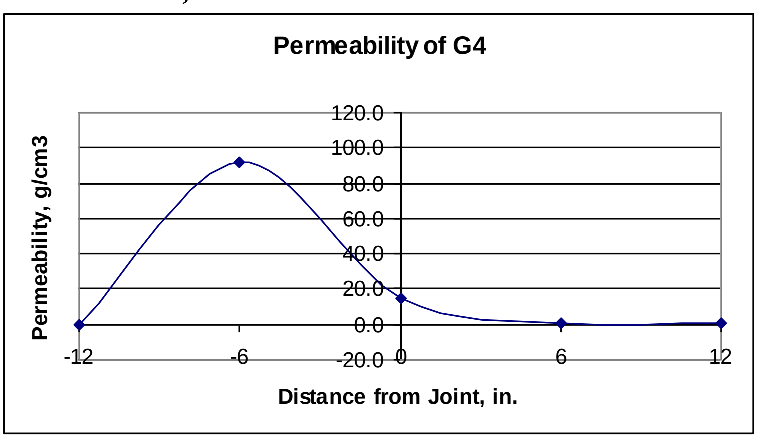
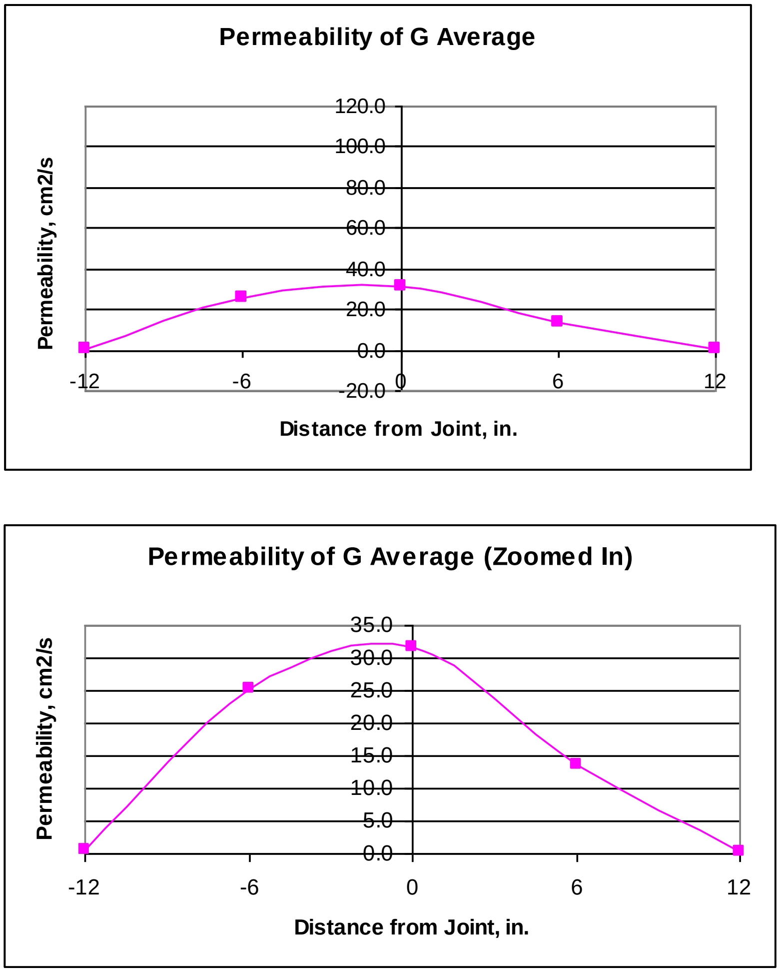


FIGURE 15- G AVERAGE, PERMEABILITY



Figures 11 and 12 show a significant increase in permeability at the joint area, and an overall decrease in permeability with distance from the joint. The average change in permeability across the joint was 31.217 cm^2/s. Figures 13 and 14 show the point of highest permeability at the sample taken 6 inches to the west of the joint; this result is unexpected and may be due to a defect in the sample or to some error in the test. The range of values is extremely high for these test results. For these reasons, this test method does not produce reliably accurate results and is not recommended for use as a quality measurement standard.

Gregg Street Samples, Oven Derived AC%

FIGURE 16- G1, ASPHALT CONTENT

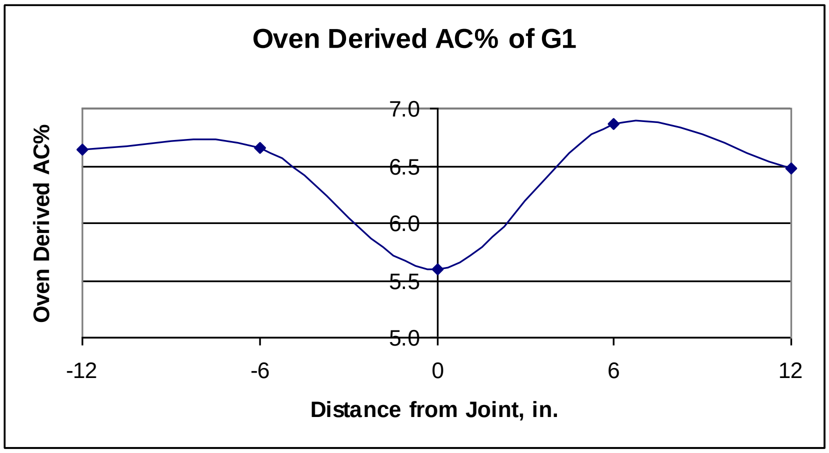


FIGURE 17- G2, ASPHALT CONTENT

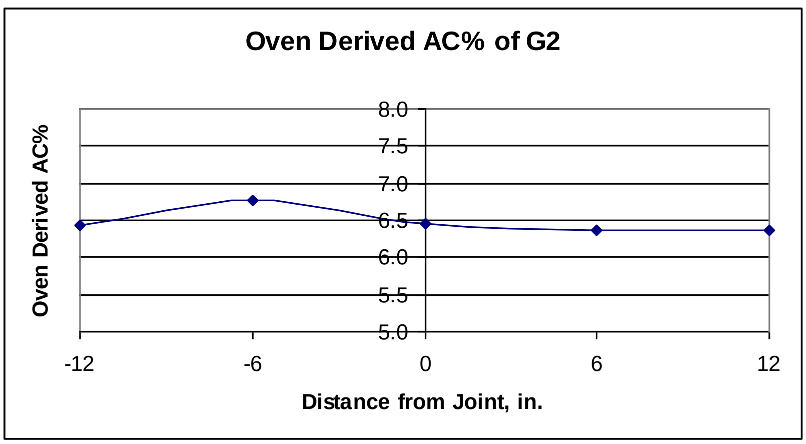


FIGURE 18- G3, ASPHALT CONTENT

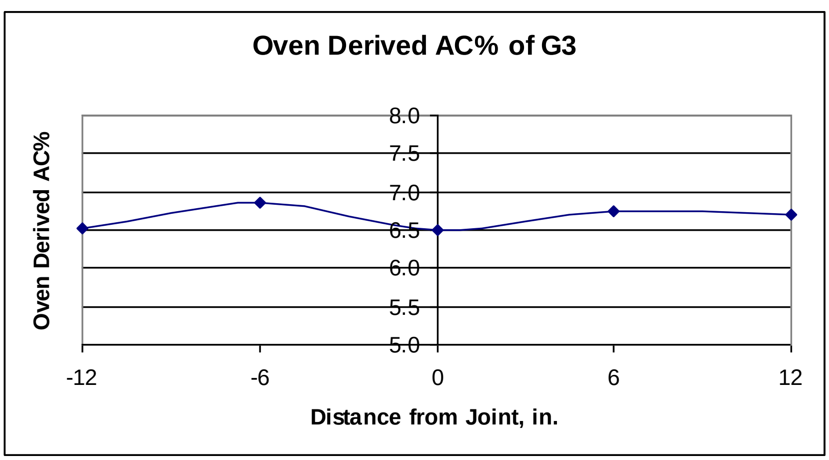


FIGURE 19- G4, ASPHALT CONTENT

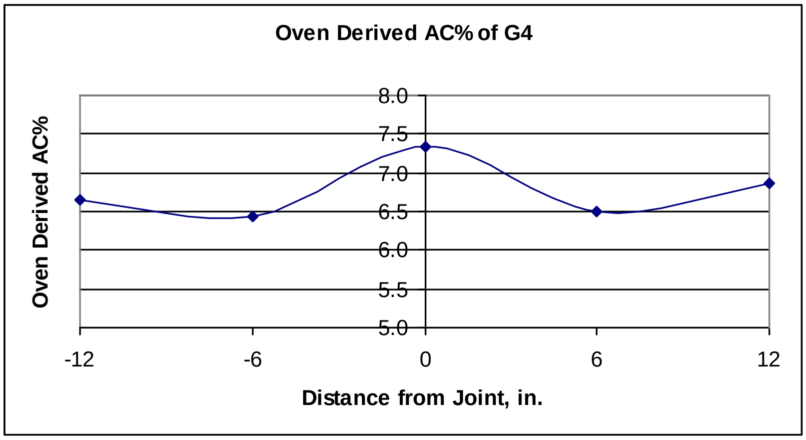
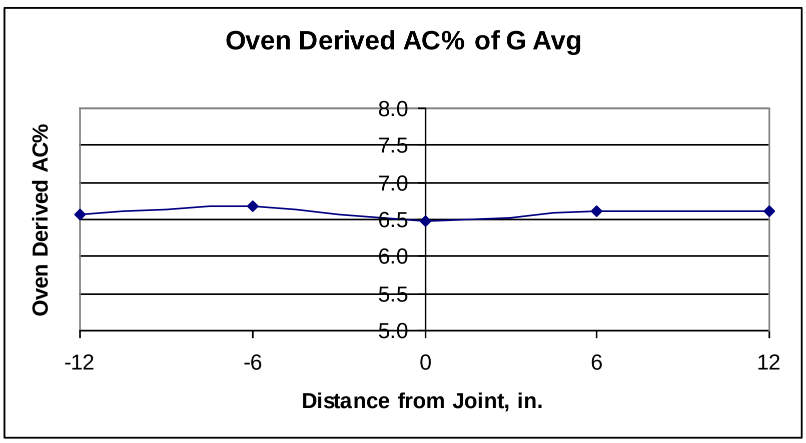


FIGURE 20- G AVERAGE, ASPHALT CONTENT



The average change in the oven derived asphalt content across the joint was 0.205 percent. Figures 16-20 show no significant pattern. The values across the joint are inconsistent from sample to sample. Therefore, this test method is not recommended for use as a quality measurement standard.

Gregg Street Samples, Gradation

FIGURE 21- GRADATION OF G1 SAMPLES

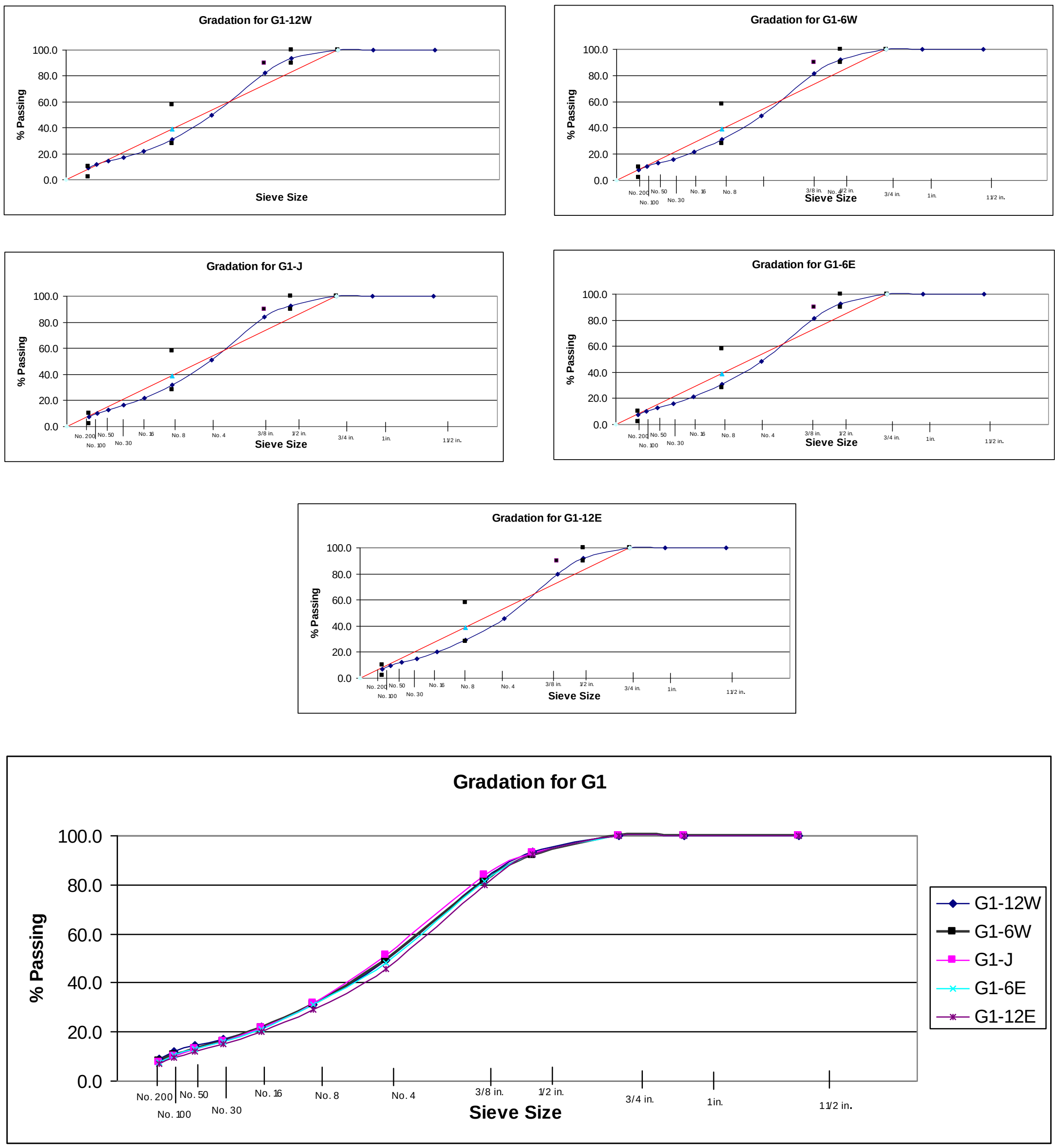


FIGURE 22: GRADATION OF G2 SAMPLES

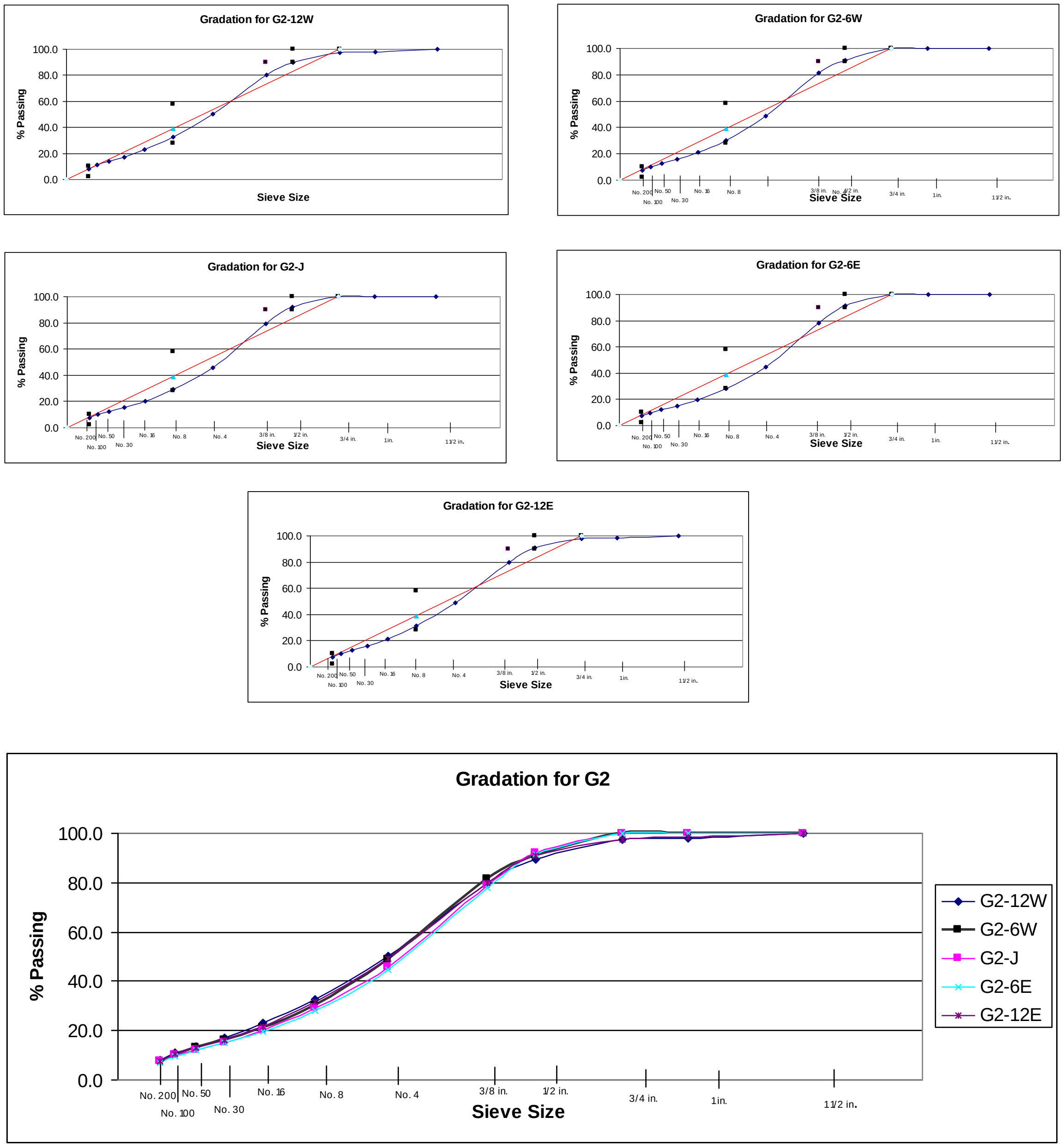


FIGURE 23: GRADATION OF G3 SAMPLES

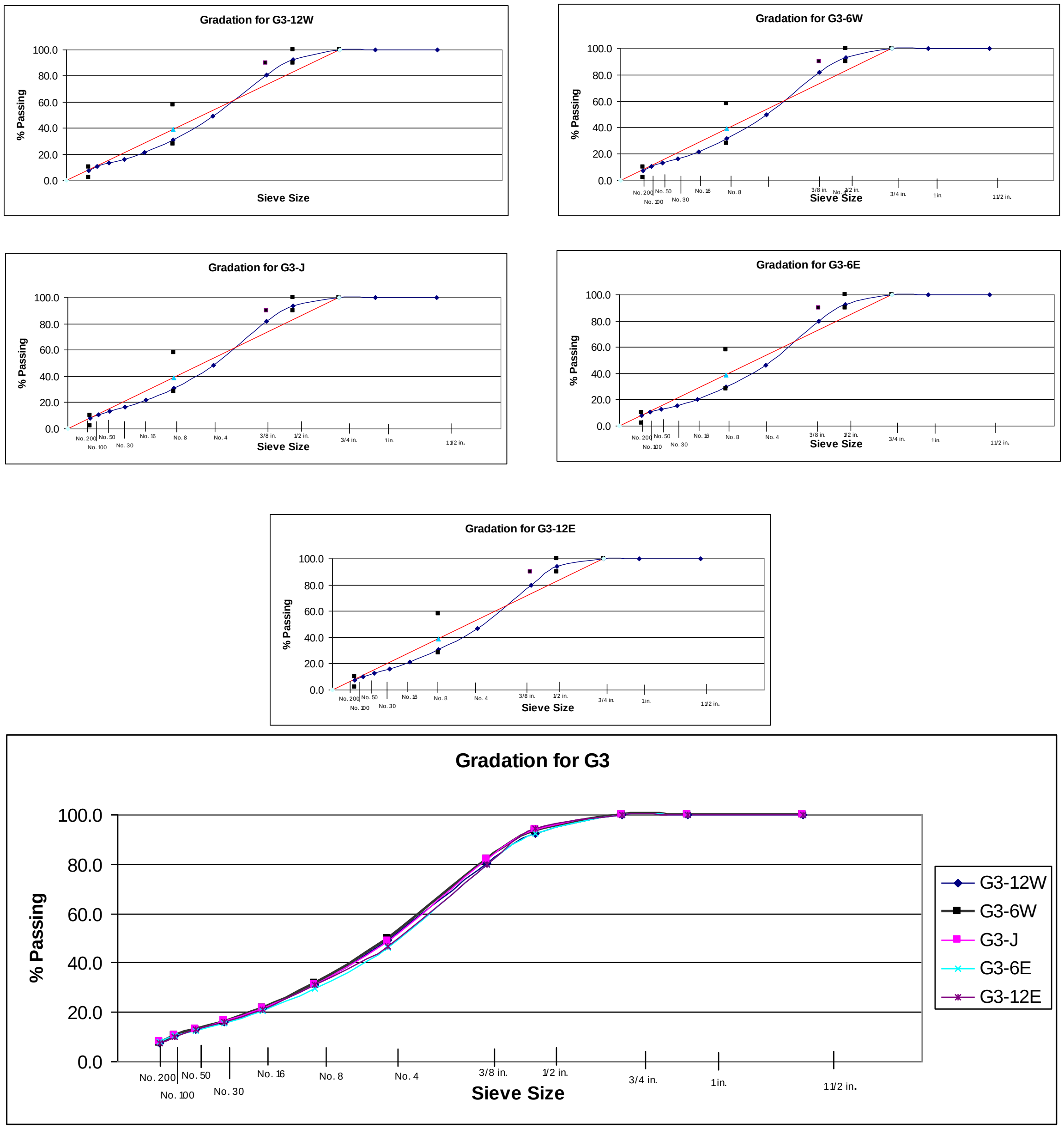


FIGURE 24: GRADATION OF G4 SAMPLES

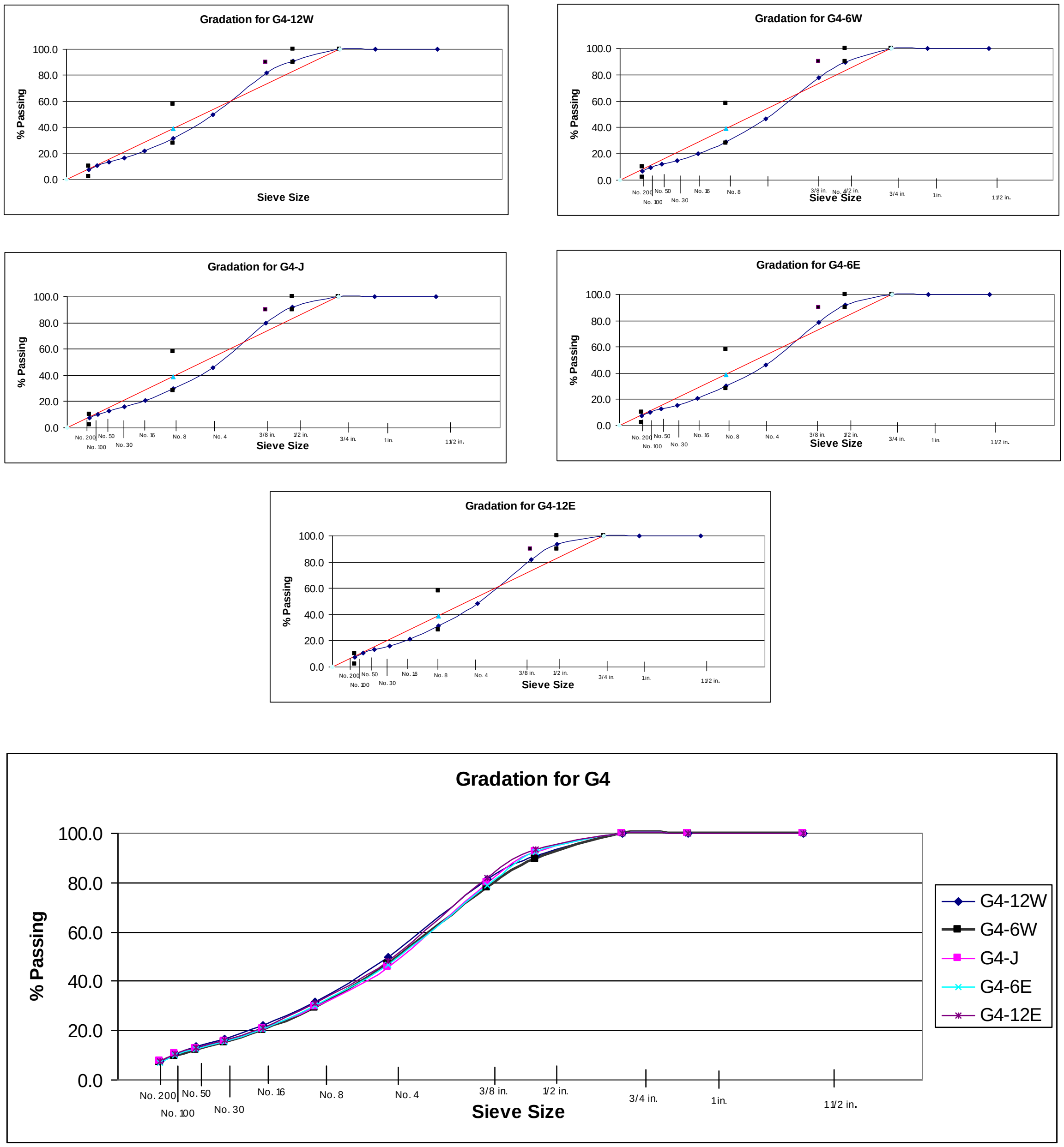
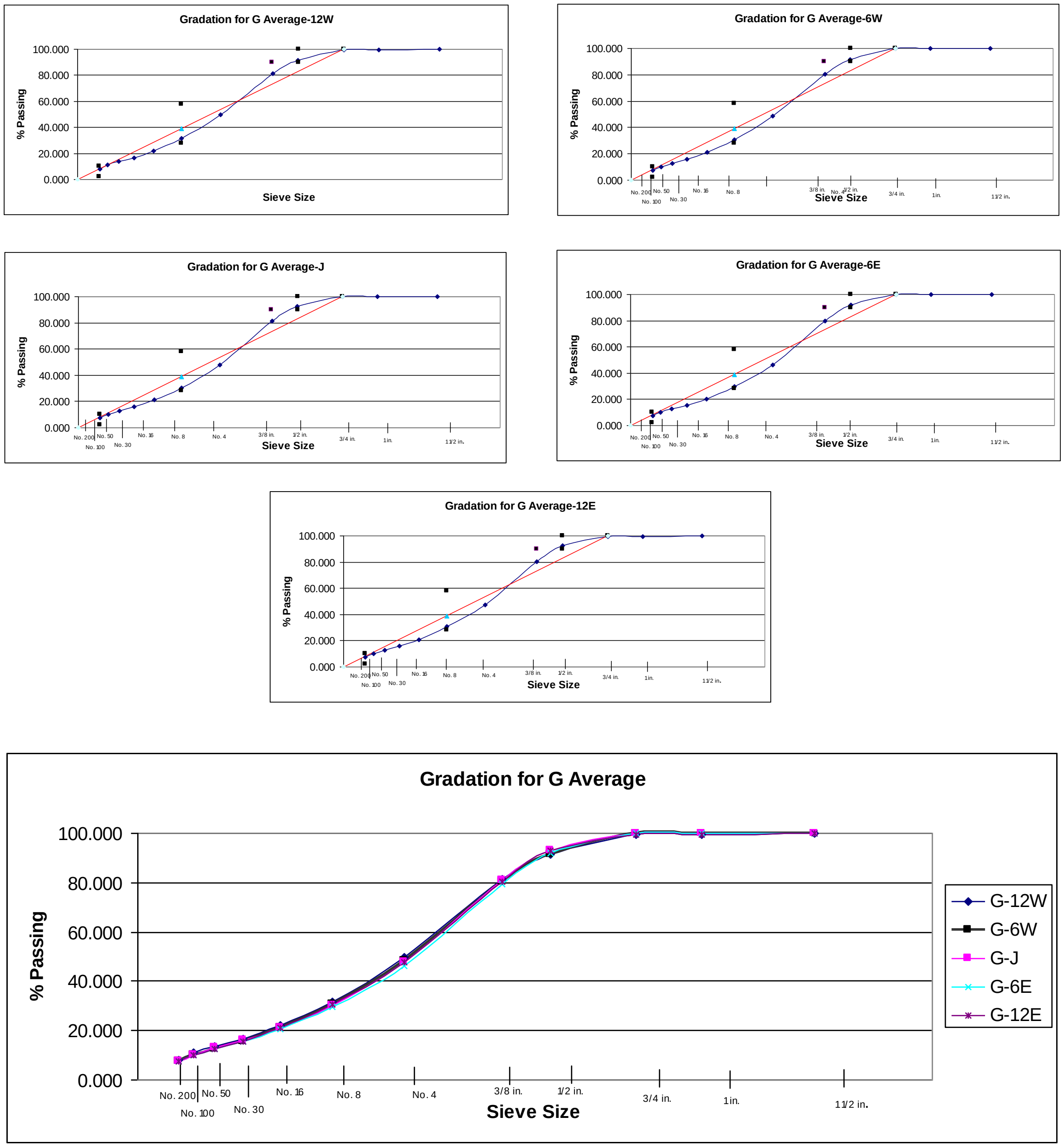


FIGURE 25: GRADATION OF G AVERAGE



Figures 21-25 do not show great change in gradation across the joint and are consistent from sample to sample. Because the gradation graphs do not clearly demonstrate a change in quality across the joint, this test method is not recommended for use as a quality control standard.

Russellville Visual Analysis

Russellville Samples, Compiled Raw Data

TABLE 12- R1 RAW DATA

Sample	R1-12W	R1-6W	R1-J	R1-6E	R1-12E
SSD G_{mb}	2.264	2.235	2.091	2.120	2.128
% Water Absorbed by Volume	2.3	3.2	9.5	7.6	7.1
CoreLok Gmb	2.261	2.229	2.032	2.077	2.112
Kuss Gmb	2.617	2.289	2.270	2.287	2.263
Permeability	2.57	3.20	118.51	40.88	34.17
Oven Derived AC%	6.87	7.00	6.74	7.05	

TABLE 13- R2 RAW DATA

Sample	R2-12W	R2-6W	R2-J	R2-6E	R2-12E
SSD G_{mb}	2.267	2.245	2.160	2.131	2.165
% Water Absorbed by Volume	3.3	2.8		7.7	4.7
CoreLok Gmb	2.259	2.238	2.128	2.099	2.129
Kuss Gmb	2.298	2.289	2.322	2.289	2.273
Permeability	1.20	3.59		16.96	9.46
Oven Derived AC%	7.09	7.36		6.27	7.20

TABLE 14- R3 RAW DATA

Sample	R3-12W	R3-6W	R3-J	R3-6E	R3-12E
SSD G_{mb}	2.267	2.271	2.130	2.173	2.233
% Water Absorbed by Volume	3.0	2.3		5.6	3.3
CoreLok Gmb	2.255	2.267	2.075	2.151	2.220
Kuss Gmb	2.297	2.290	2.181	2.268	2.271
Permeability	2.22	26.64		22.13	36.53
Oven Derived AC%	6.87	6.33		7.80	

TABLE 15- R4 RAW DATA

Sample	R4-12W	R4-6W	R4-J	R4-6E	R4-12E
SSD G_{mb}	2.303	2.279	2.099	2.163	2.204
% Water Absorbed by Volume	1.5	2.7		7.0	5.4
CoreLok Gmb	2.287	2.261	2.085	2.115	2.261
Kuss Gmb	2.339	2.312	2.143	2.263	2.303
Permeability	22.13	16.91		0.87	47.53
Oven Derived AC%	6.46			7.33	6.92

TABLE 16- R AVERAGE RAW DATA

Sample	R12W	R6W	RJ	R6E	R12E
SSD G_{mb}	2.275	2.258	2.120	2.147	2.183
% Water Absorbed by Volume	2.540	2.729	9.484	6.987	5.134
CoreLok Gmb	2.266	2.249	2.080	2.110	2.181
Kuss Gmb	2.388	2.295	2.229	2.277	2.278
Permeability	7.031		118.511		20.426
Oven Derived AC%	6.823	5.173	6.740	7.113	3.530

TABLE 17- R1 SIEVE DATA

Sieve Size	R1-12W	R1-6W	R1-J	R1-6E	R1-12E
1 1/2 in.	100.0	100.0	100.000	100.000	100.0
1 in.	100.0	100.0	100.000	100.000	100.0
3/4 in.	99.5	99.2	99.986	99.993	100.0
1/2 in.	94.7	95.9	97.321	94.539	96.4
3/8 in.	85.1	85.0	85.914	83.750	86.4
No. 4	53.6	54.7	55.639	51.848	55.4
No. 8	36.3	38.1	36.437	33.931	35.9
No. 16	27.1	28.3	26.128	24.073	23.2
No. 30	21.9	22.9	20.962	19.446	17.1
No. 50	16.8	17.6	16.836	16.403	13.0
No. 100	10.9	11.4	11.144	11.227	9.2
No. 200	9.0	6.87	8.543	8.677	5.4

TABLE 18- R2 SIEVE DATA

Sieve Size	R2-12W	R2-6W	R2-J	R2-6E	R2-12E
1 1/2 in.	100.000	100.000	100.000	100.000	100.000
1 in.	100.000	100.000	100.000	100.000	100.000
3/4 in.	99.987	99.715	99.587	100.000	99.975
1/2 in.	92.160	97.927	98.700	93.667	94.513
3/8 in.	80.955	88.833	86.770	81.545	86.889
No. 4	52.537	57.260	55.882	52.418	54.602
No. 8	35.719	39.145	37.781	34.976	35.892
No. 16	26.816	28.609	27.405	24.271	24.354
No. 30	21.654	22.940	21.589	19.550	19.507
No. 50	16.611	17.314	17.456	16.400	16.341
No. 100	10.630	10.803	11.440	11.028	10.892
No. 200	8.127	6.232	8.798	6.467	6.446

TABLE 19- R3 SIEVE DATA

Sieve Size	R3-12W	R3-6W	R3-J	R3-6E	R3-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	100.0	100.0	100.0
1/2 in.	95.8	96.2	96.6	94.6	93.3
3/8 in.	85.0	87.6	87.4	84.2	86.0
No. 4	50.8	55.0	62.8	51.4	55.0
No. 8	35.3	37.8	46.2	33.7	32.2
No. 16	26.5	28.3	34.7	23.4	22.0
No. 30	21.4	22.7	29.1	18.6	17.1
No. 40	21.4	22.7	29.1	18.6	17.1
No. 100	10.7	11.3	15.4	10.1	8.8
No. 200	8.5	9.0	10.9	7.3	5.4

TABLE 20- R4 SIEVE DATA

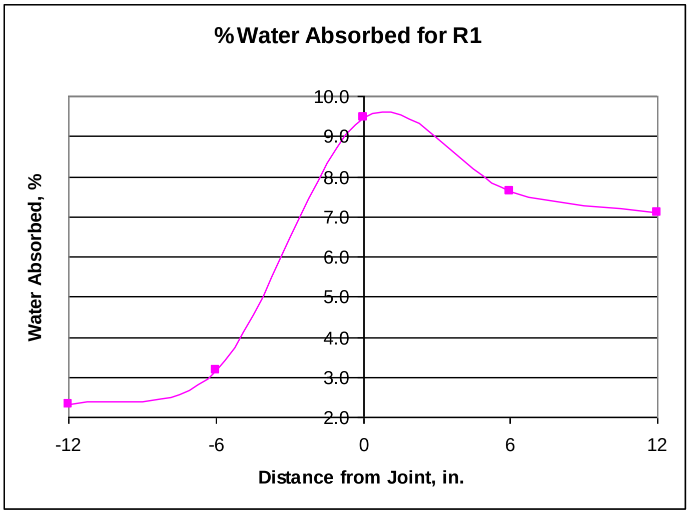
Sieve Size	R4-12W	R4-6W	R4-J	R4-6E	R4-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	99.5	100.0	100.0	100.0
1/2 in.	95.6	95.8	96.7	94.4	94.2
3/8 in.	85.8	81.1	85.1	84.7	84.1
No. 4	54.1	52.5	57.8	53.4	53.7
No. 8	36.8	38.1	45.2	34.9	35.4
No. 16	27.4	28.6	35.3	24.2	24.4
No. 30	21.9	23.5	30.0	19.6	19.5
No. 50	16.7	18.9	25.8	16.6	16.2
No. 100	10.8	10.9	17.5	11.3	10.7
No. 200	8.2	6.7	11.0	6.6	6.1

TABLE 21- R AVERAGE SIEVE DATA

Sieve Size	R-12W	R-6W	R-J	R-6E	R-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	99.9	99.6	99.9	100.0	100.0
1/2 in.	94.6	96.5	97.3	94.3	94.6
3/8 in.	84.2	85.6	86.3	83.5	85.8
No. 4	52.8	54.9	58.0	52.3	54.7
No. 8	36.0	38.3	41.4	34.4	34.9
No. 16	27.0	28.4	30.9	24.0	23.5
No. 30	21.7	23.0	25.4	19.3	18.3
No. 50	16.6	17.8	20.9	16.2	14.7
No. 100	10.8	11.1	13.9	10.9	9.9
No. 200	8.5	7.2	9.8	7.3	5.8

Russellville samples, Water Absorbed

FIGURE 26- R1, WATER ABSORBED



Sample R1 is the only Russellville sample group which could be analyzed for water absorption because the other sample groups contained broken cores. This sample shows an increase of 7.2 percent across the joint which is much larger than the Gregg Street samples, indicating poorer quality. No accurate way exists to estimate the percent water absorption of the broken cores. However, the inability to test the samples could be considered a failure of the roadway to meet the standard necessary for testing.

Russellville samples, Density

FIGURE 27- R1, DENSITY

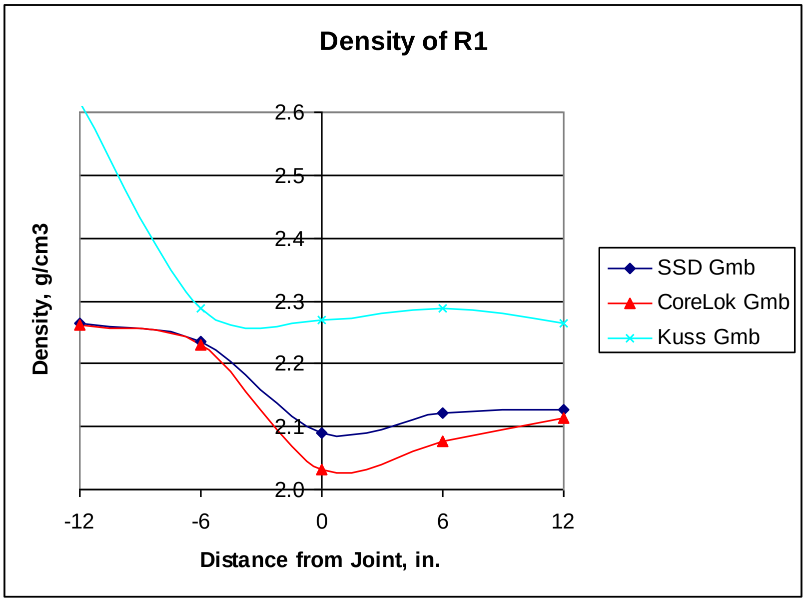


FIGURE 28- R2, DENSITY

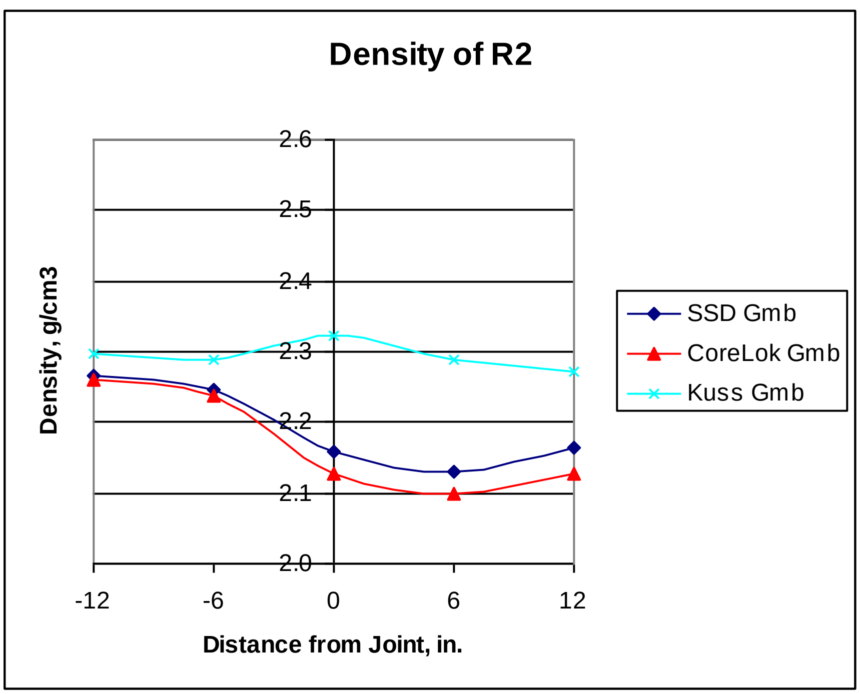


FIGURE 29- R3, DENSITY

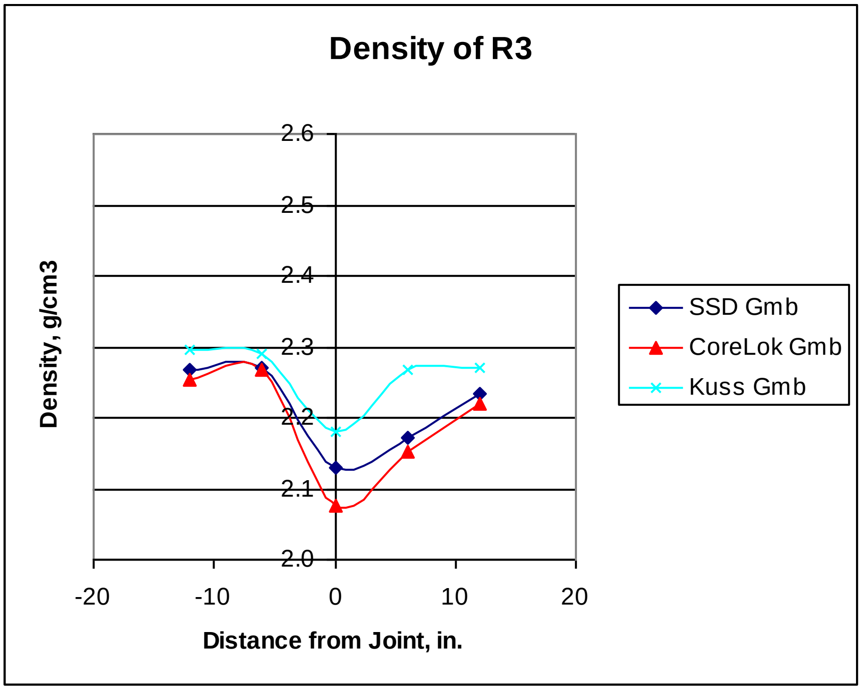


FIGURE 30- R4, DENSITY

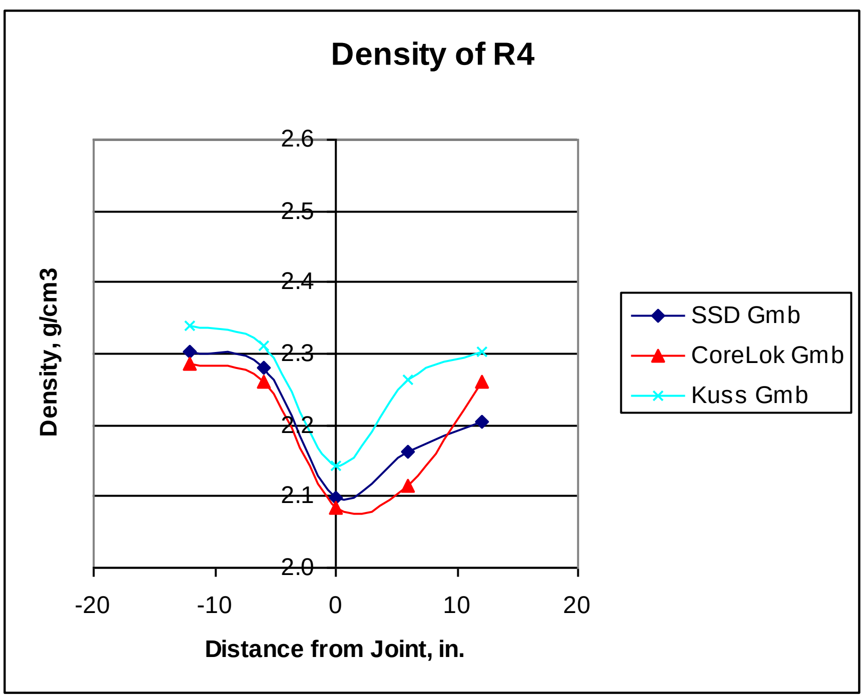
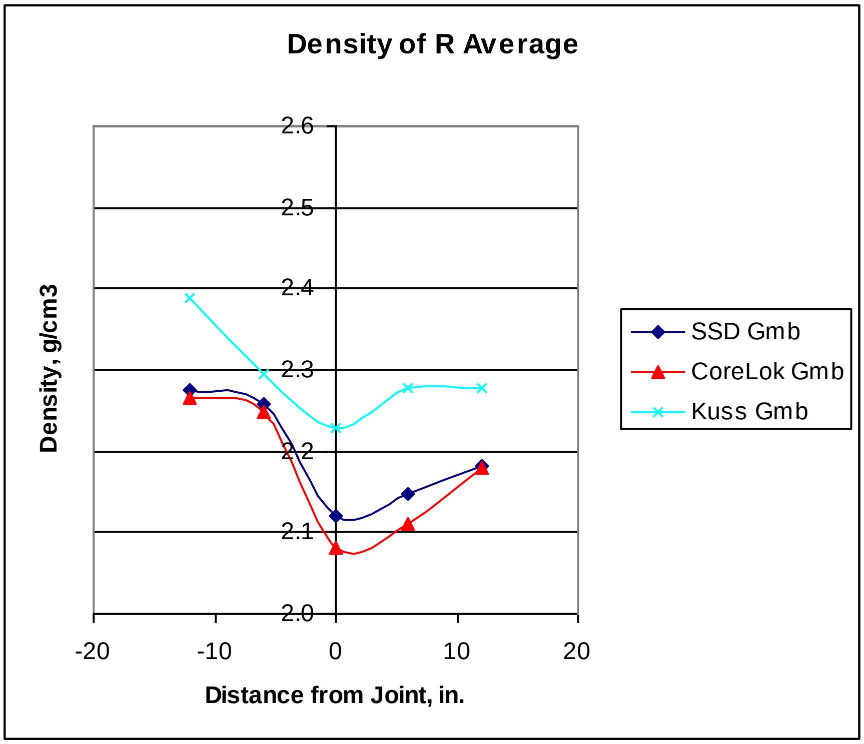


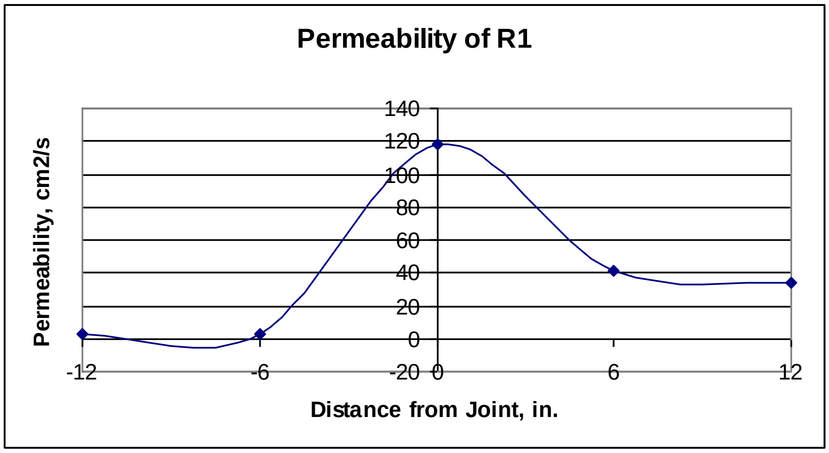
FIGURE 31- R AVERAGE, DENSITY



The density of each sample across the joint was able to be estimated in spite of some broken cores; the density of the broken cores was estimated based on the nuclear density determined in the field. As shown by Figures 27-31, the density drops at the joint area indicating lower quality in that area. The SSD method produced an average change in density across the joint of 0.204 g/cm^3 (a difference of approximately 8.4 percent compaction), the CoreLok method had a change of 0.202 g/cm^3 (a difference of approximately 8.3 percent compaction), and the Kuss method had a change of 0.196 g/cm^3 (a difference of approximately 8.0 percent compaction). Similar to the results of the Gregg Street analysis, the Russellville results show that the CoreLok method produces the most consistent and most well defined trend line. The Kuss method results do not closely match the results of the other methods, especially for low density samples.

Russellville samples, Permeability

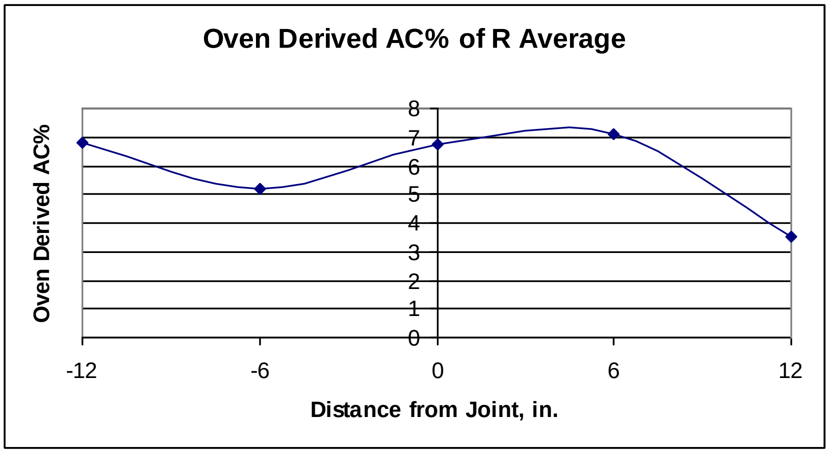
FIGURE 32- R1, PERMEABILITY



Similar to the percent water absorbed data, the permeability test results may only be analyzed when none of the samples are broken. Since R2, R3, and R4 all had broken cores, they can not be analyzed. For this reason, permeability is not recommended for use as a quality control standard testing procedure.

Russellville samples, Oven Derived AC %

FIGURE 33-R AVERAGE, ASPHALT CONTENT



Because some samples cracked and became un-useable during the testing procedures, data on these cores was not able to be collected. However, the data from similar locations on each set was averaged to produce Figure 33. The trend line formed by the averages does not provide a clear reflection on the joint quality. Therefore, this method is not recommended for as the standard quality control testing procedure.

Russellville Samples, Gradation

FIGURE 34- GRADATION OF R1 SAMPLES

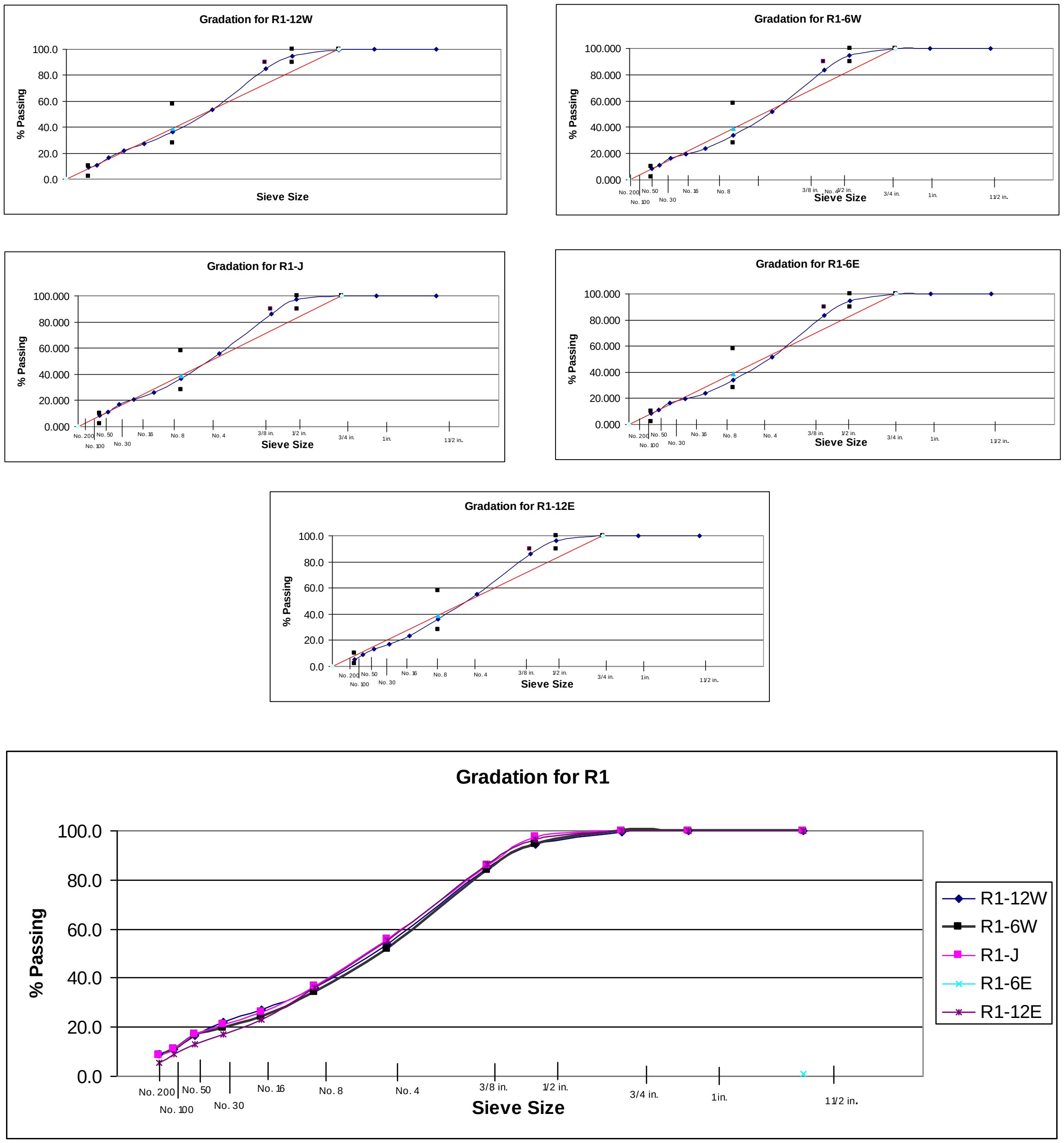


FIGURE 35- GRADATION OF R2 SAMPLES

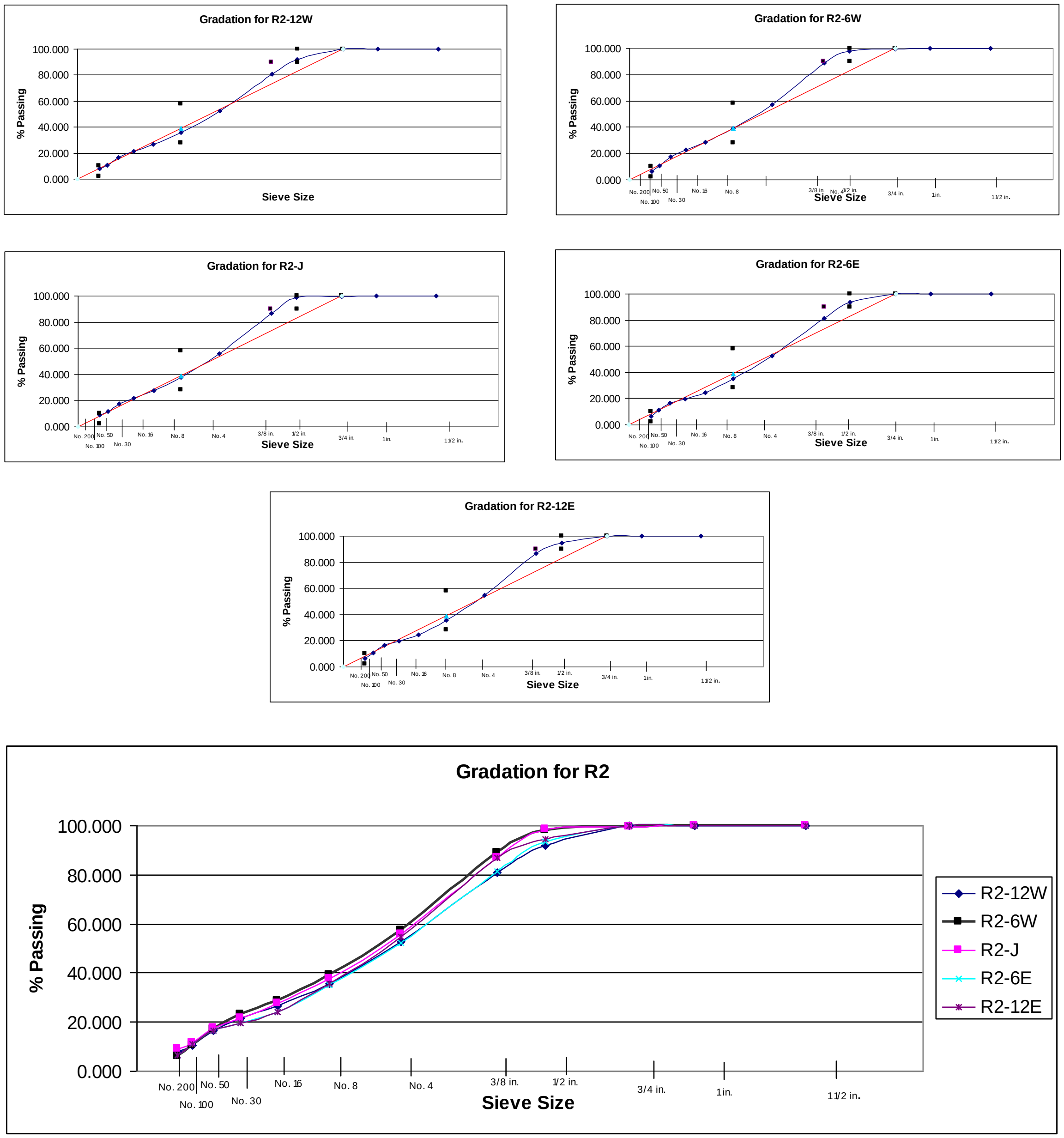
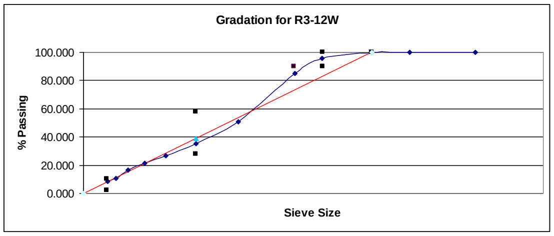
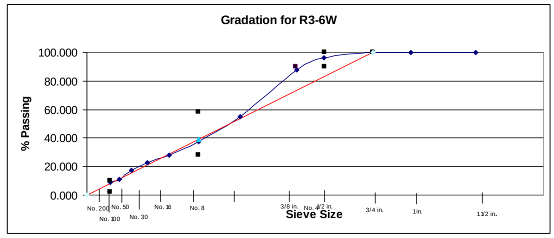
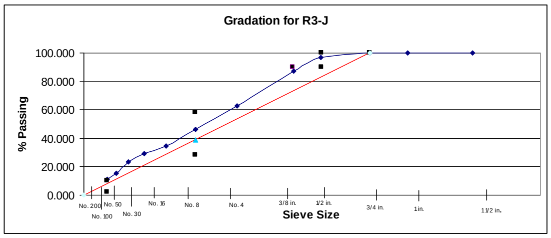
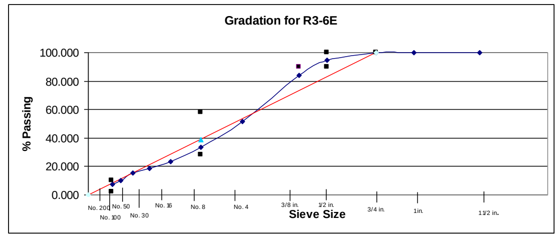


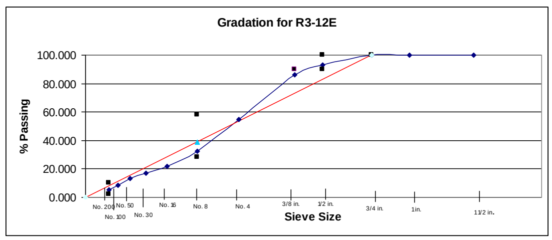
FIGURE 36- GRADATION OF R3 SAMPLES











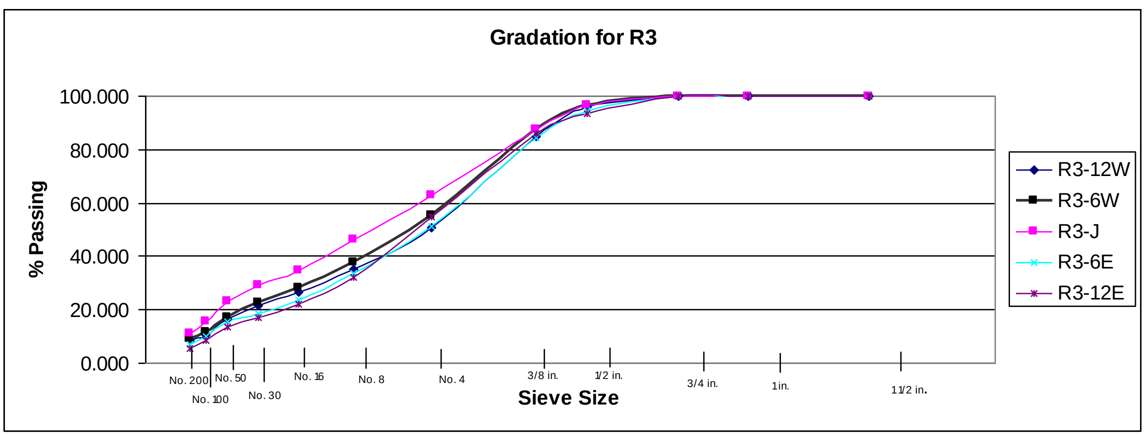


FIGURE 37- GRADATION OF R4 SAMPLES

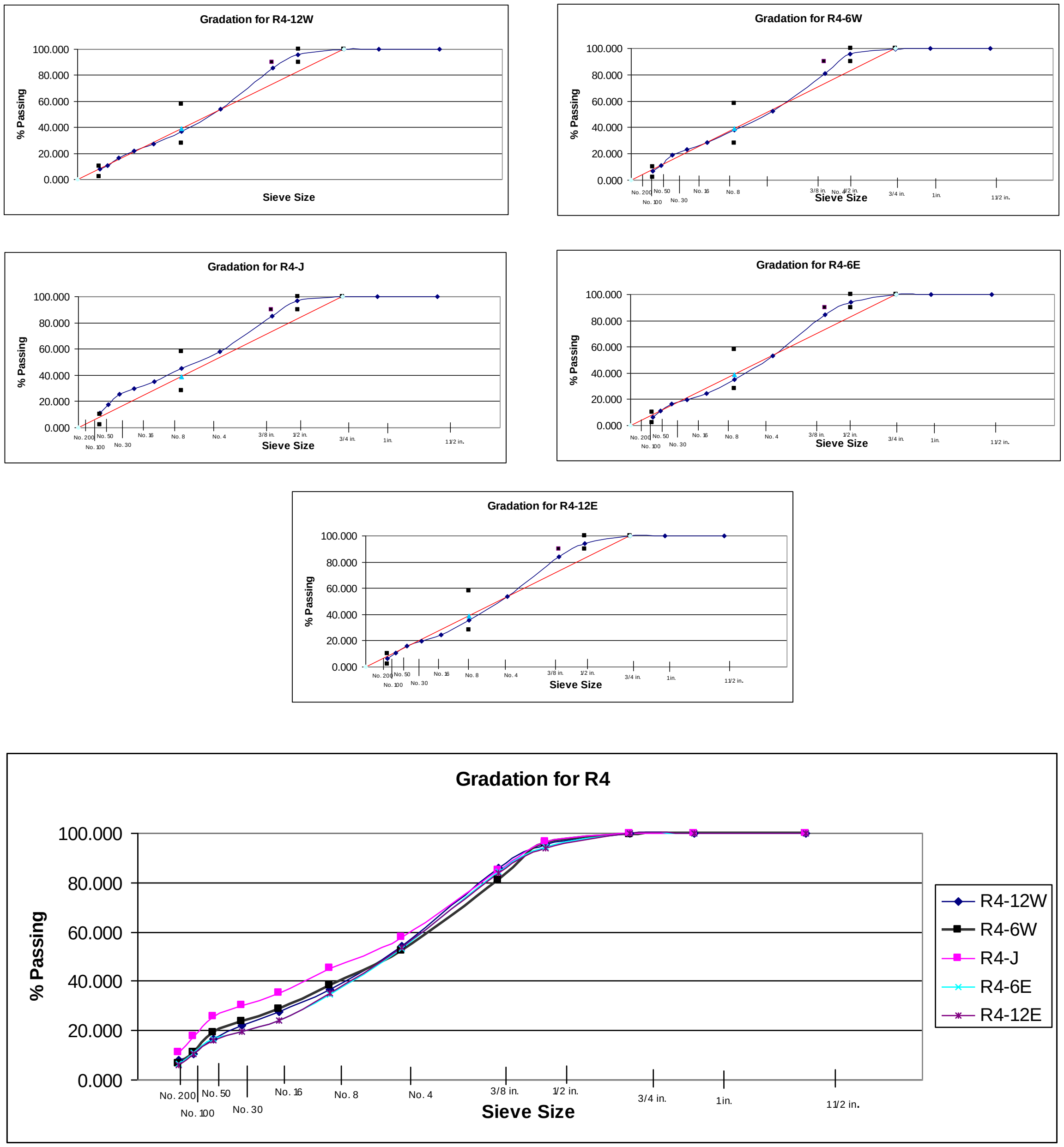
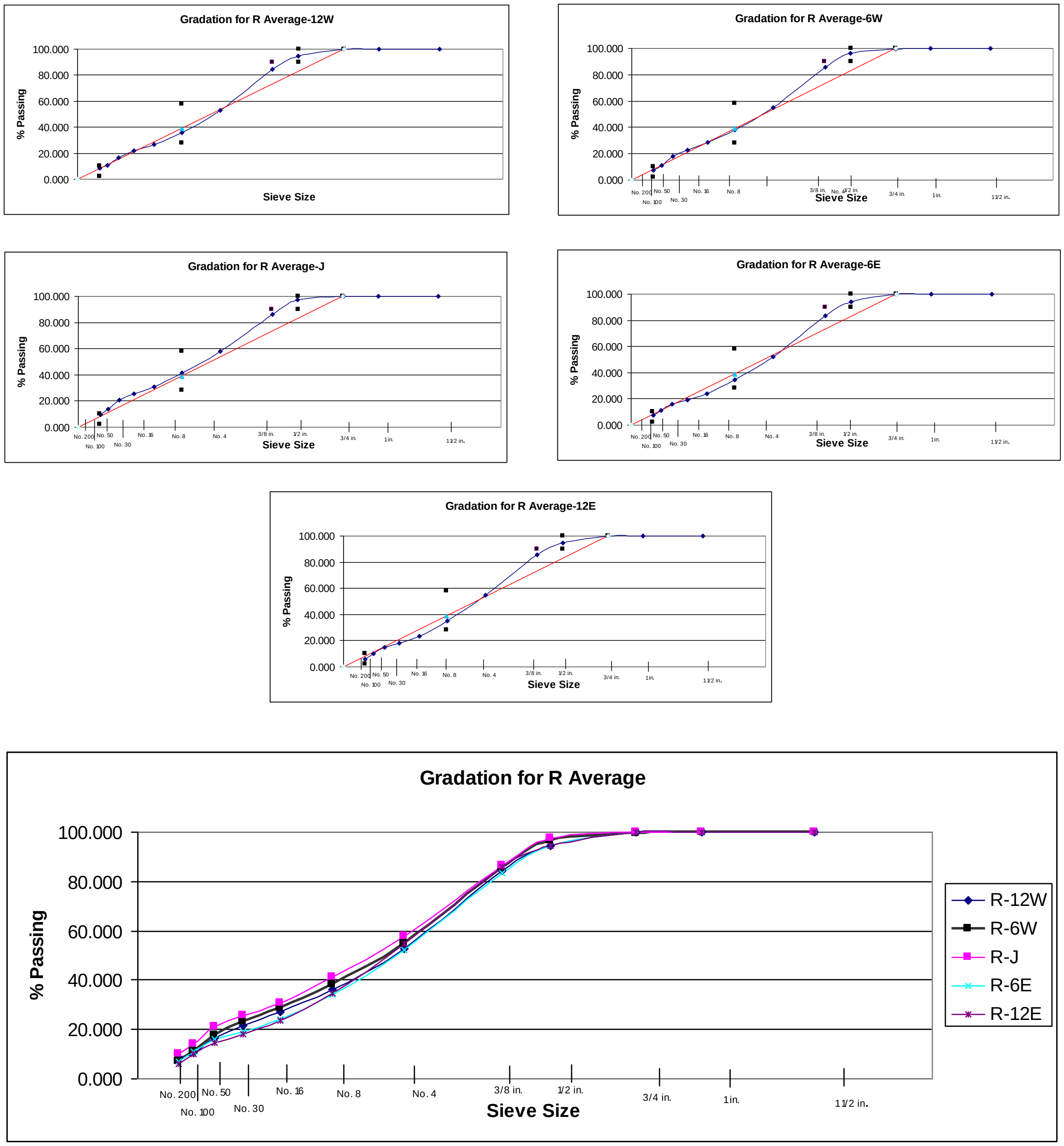


FIGURE 38- GRADATION OF R AVERAGE



The Russellville samples show a slight change across the joint, especially for sample groups R3 and R4. The gradations of samples near the joint demonstrate less deviation from the slope of the maximum density line, which indicates possible problems with adequate VMA of the mix. However, this change across the joint is subtle and is not clearly demonstrated for each sample group.

Yellville Visual Analysis

Yellville Samples, Compiled Raw Data

TABLE 22- Y1 RAW DATA

Sample	Y1-12S	Y1-6S	Y1-J	Y1-6N	Y1-12N
SSD G_{mb}	2.240	2.130	2.007	2.123	2.157
% Water Absorbed by Volume	3.1	6.4	12.2	7.6	5.7
CoreLok Gmb	2.229	2.133	1.909	2.114	2.147
Kuss Gmb	2.265	2.241	2.253	2.243	2.231
Permeability	568.85	1037.48	1757.08	1288.65	758.27
Oven Derived AC%	5.93				

TABLE 23- Y2 RAW DATA

Sample	Y2-12S	Y2-6S	Y2-J	Y2-6N	Y2-12N
SSD G_{mb}	2.262	2.217	2.035	2.222	2.219
% Water Absorbed by Volume	3.1	3.7	10.3	3.9	3.7
CoreLok Gmb	2.264	2.216	1.984	2.194	2.210
Kuss Gmb	2.292	2.289	2.232	2.256	2.250
Permeability	67.68	267.32	3027.41	391.22	180.45
Oven Derived AC%			3.35	5.49	

TABLE 24- Y3 RAW DATA

Sample	Y3-12S	Y3-6S	Y3-J	Y3-6N	Y3-12N
SSD G_{mb}	2.229	2.170	2.018	2.216	2.221
% Water Absorbed by Volume	3.6	5.5	11.2	3.5	2.7
CoreLok Gmb	2.230	2.166	1.989	2.209	2.226
Kuss Gmb	2.265	2.234	2.257	1.950	2.269
Permeability	257.83	534.04	1742.69	209.87	171.87
Oven Derived AC%			5.80	6.09	

TABLE 25- Y4 RAW DATA

Sample	Y4-12S	Y4-6S	Y4-J	Y4-6N	Y4-12N
SSD G_{mb}	2.246	2.160	2.100	2.221	2.238
% Water Absorbed by Volume	2.7	5.3		3.6	3.2
CoreLok Gmb	2.242	2.146	2.091	2.221	2.233
Kuss Gmb	2.279	2.246	2.063	2.279	2.266
Permeability	267.30	592.42		315.81	193.87
Oven Derived AC%	5.14	5.51		5.24	5.04

TABLE 26- Y AVERAGE RAW DATA

Sample	Y12S	Y6S	YJ	Y6N	Y12N
SSD G_{mb}	2.244	2.169	2.040	2.196	2.209
% Water Absorbed by Volume	3.140	5.233	11.242	4.639	3.841
CoreLok Gmb	2.241	2.165	1.993	2.184	2.204
Kuss Gmb	2.275	2.253	2.201	2.182	2.254
Permeability	290.41	607.81	744.75	551.38	994.89
Oven Derived AC%	2.768	1.378	3.050	4.205	1.260

TABLE 27- Y1 SIEVE DATA

Sieve Size	Y1-12W	Y1-6W	Y1-J	Y1-6E	Y1-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	100.0	99.9	100.0
1/2 in.	99.8	99.7	98.3	99.3	97.9
3/8 in.	92.9	91.6	88.9	88.7	85.5
No. 4	63.6	62.0	57.8	55.3	48.6
No. 8	43.8	42.8	41.6	38.3	30.8
No. 16	31.9	31.4	31.9	28.3	21.8
No. 30	26.0	25.3	25.4	23.6	17.1
No. 50	18.6	18.8	18.0	17.2	12.0
No. 100	8.1	9.4	10.3	8.4	6.0
No. 200	4.2	4.3	8.0	6.5	6.0

TABLE 28- Y2 SIEVE DATA

Sieve Size	Y2-12W	Y2-6W	Y2-J	Y2-6E	Y2-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	100.0	100.0	99.6
1/2 in.	99.2	99.4	99.8	99.1	96.7
3/8 in.	94.1	92.2	90.9	90.6	87.1
No. 4	64.0	64.2	60.2	57.2	60.4
No. 8	42.8	43.1	41.2	39.1	41.1
No. 16	32.2	31.1	32.6	28.9	28.8
No. 30	24.9	24.9	27.5	23.8	23.4
No. 50	17.7	18.0	21.0	17.7	17.7
No. 100	9.3	9.2	11.1	9.1	8.8
No. 200	6.6	8.4	8.9	6.2	7.1

TABLE 29- Y3 SIEVE DATA

Sieve Size	Y3-12W	Y3-6W	Y3-J	Y3-6E	Y3-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	100.0	100.0	99.6
1/2 in.	98.8	99.7	98.5	99.7	97.1
3/8 in.	93.3	92.6	89.5	92.9	88.9
No. 4	60.8	63.4	55.5	62.0	58.3
No. 8	40.2	42.1	37.1	42.6	39.3
No. 16	28.4	29.9	27.6	31.9	29.2
No. 30	22.4	23.9	22.5	27.3	23.6
No. 50	16.1	17.2	16.5	20.4	17.2
No. 100	7.8	8.1	8.1	10.4	8.5
No. 200	4.9	4.9	7.3	8.7	8.5

TABLE 30- Y4 SIEVE DATA

Sieve Size	Y4-12W	Y4-6W	Y4-J	Y4-6E	Y4-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	99.6	100.0	100.0
1/2 in.	98.1	99.6	97.2	99.5	99.2
3/8 in.	89.7	91.3	88.2	92.5	91.0
No. 4	55.9	60.2	54.9	60.9	57.6
No. 8	37.3	40.8	38.2	41.2	38.7
No. 16	27.1	30.3	27.8	30.4	28.7
No. 30	22.1	25.0	22.0	24.4	23.4
No. 50	16.5	18.7	15.8	17.3	17.2
No. 100	8.2	9.0	7.9	8.6	11.7
No. 200	5.5	5.9	6.5	7.3	10.7

TABLE 31- Y AVERAGE SIEVE DATA

Sieve Size	Y-12W	Y-6W	Y-J	Y-6E	Y-12E
1 1/2 in.	100.0	100.0	100.0	100.0	100.0
1 in.	100.0	100.0	100.0	100.0	100.0
3/4 in.	100.0	100.0	99.9	100.0	99.8
1/2 in.	99.0	99.6	98.4	99.4	97.7
3/8 in.	92.5	91.9	89.4	91.2	88.1
No. 4	61.1	62.5	57.1	58.9	56.2
No. 8	41.0	42.2	39.5	40.3	37.5
No. 16	29.9	30.7	30.0	29.9	27.1
No. 30	23.9	24.8	24.3	24.8	21.9
No. 50	17.2	18.2	17.8	18.1	16.0
No. 100	8.3	8.9	9.3	9.1	8.7
No. 200	5.3	5.9	7.7	7.2	8.1

Yellville Samples, % Water Absorbed

FIGURE 39- Y1, % WATER ABSORBED

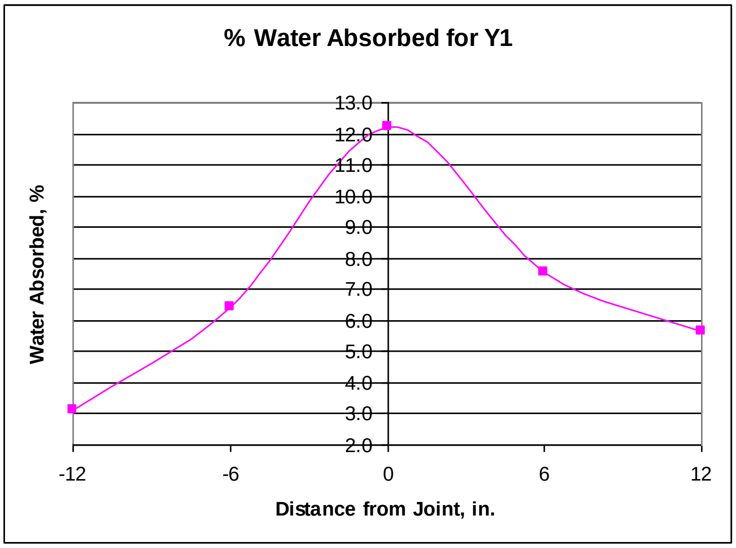


FIGURE 40- Y2, % WATER ABSORBED

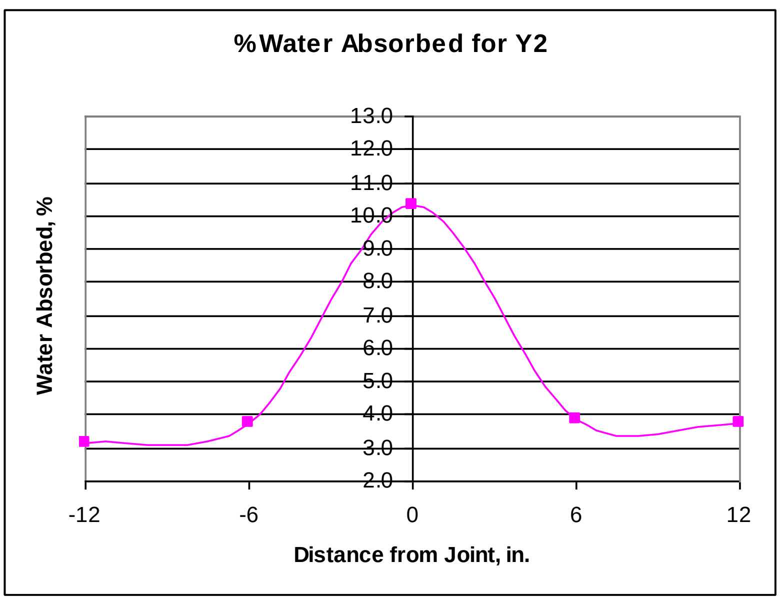


FIGURE 41- Y3, % WATER ABSORBED

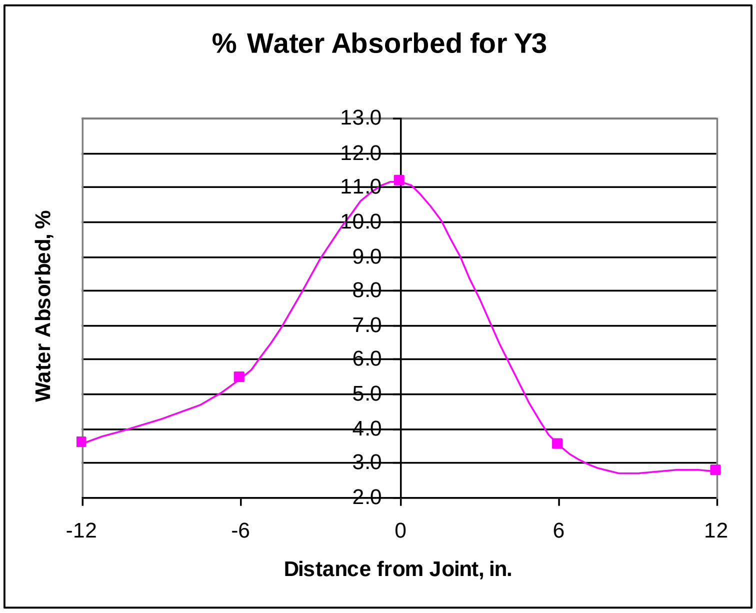
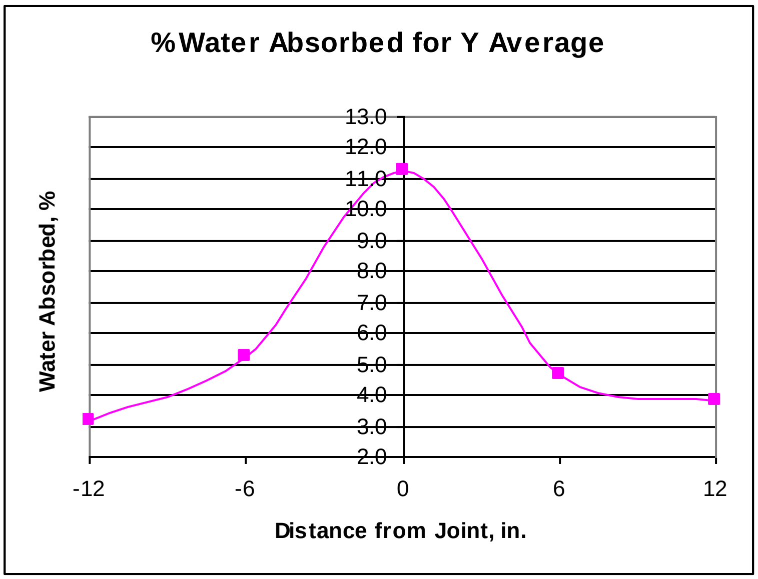


FIGURE 42- Y AVERAGE, % WATER ABSORBED



Figures 29-42 show an even greater increase in percent water absorbed than the Russellville and the Gregg Street samples, indicating that the Yellville samples are the poorest quality. The average change in percent water absorbed across the joint was 8.102. These results reflect the expected conditions of each roadway. Furthermore, and the data consistently falls within the same range across the joint. However, as discussed in the section concerning the Russellville samples, the samples across a joint cannot be analyzed if any of the cores are broken.

Yellville Samples, Density

FIGURE 43- Y1, DENSITY

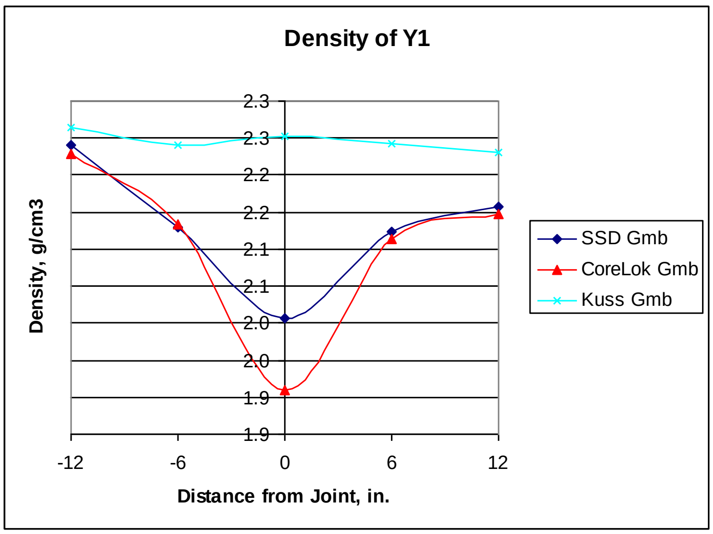


FIGURE 44- Y2, DENSITY

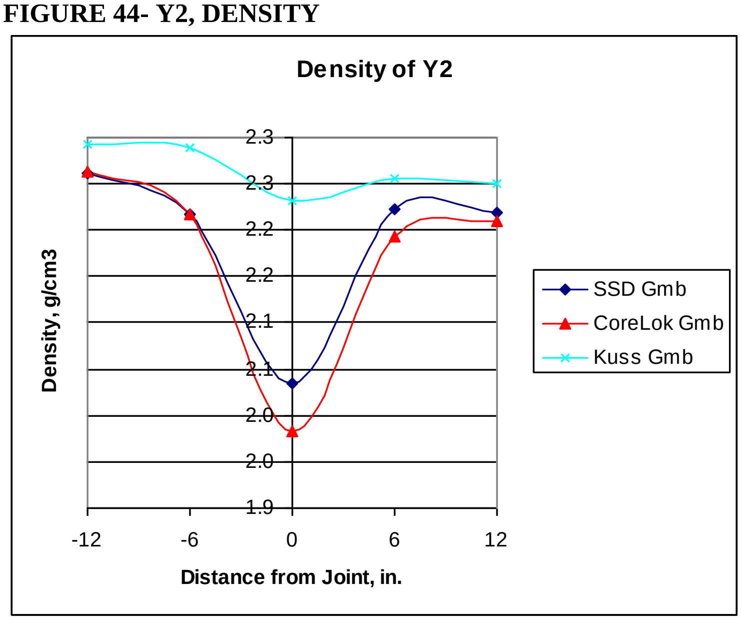


FIGURE 45- Y3, DENSITY

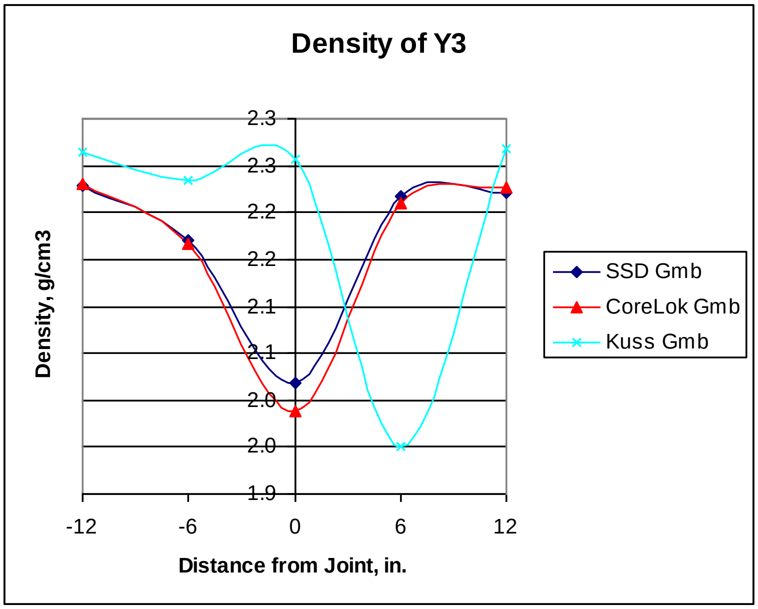


FIGURE 46- Y4, DENSITY

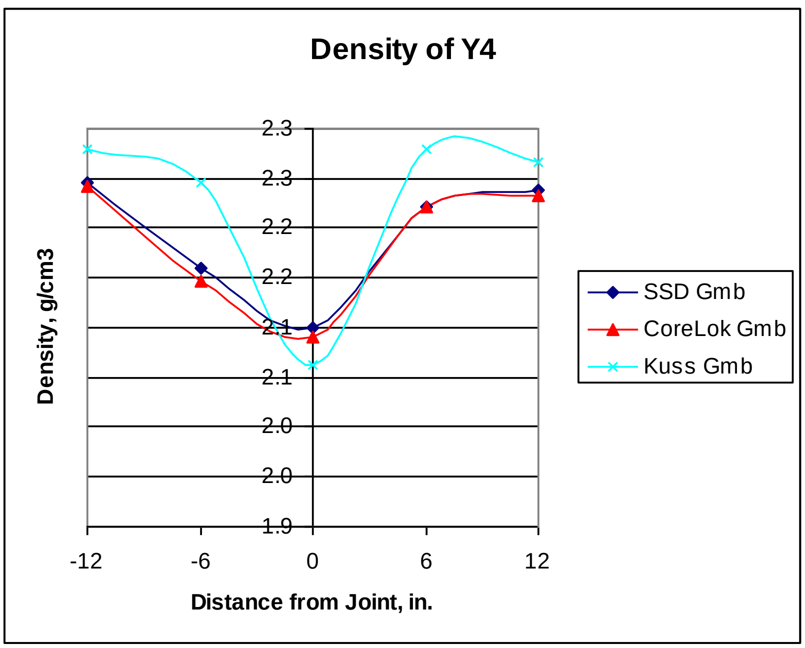
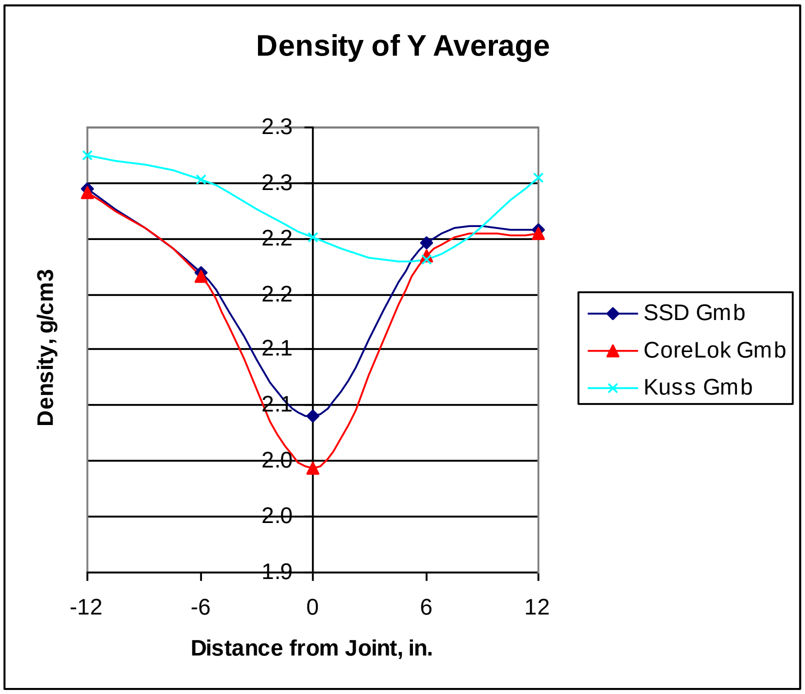


FIGURE 47- Y AVERAGE, DENSITY



The SSD method produced an average change in density across the joint of 0.204 g/cm^3 (a difference of approximately 8.4 percent compaction), the CoreLok method had a change of 0.248 g/cm^3 (a difference of approximately 10.2 percent compaction), and the Kuss method had a change of 0.093 g/cm^3 (a difference of approximately 3.8 percent compaction). All of the density graphs show a decrease in density at the joint area, and all graphs except for Figure 46 show the CoreLok method having the most clear difference in density across the joint. This agrees with the results of the Gregg Street and Russellville tests; the CoreLok method is the best of the three density test methods for determining quality of a joint based on visual analysis because it consistently yields the clearest description of quality.

Yellville Samples, Permeability

FIGURE 48- Y1, PERMEABILITY

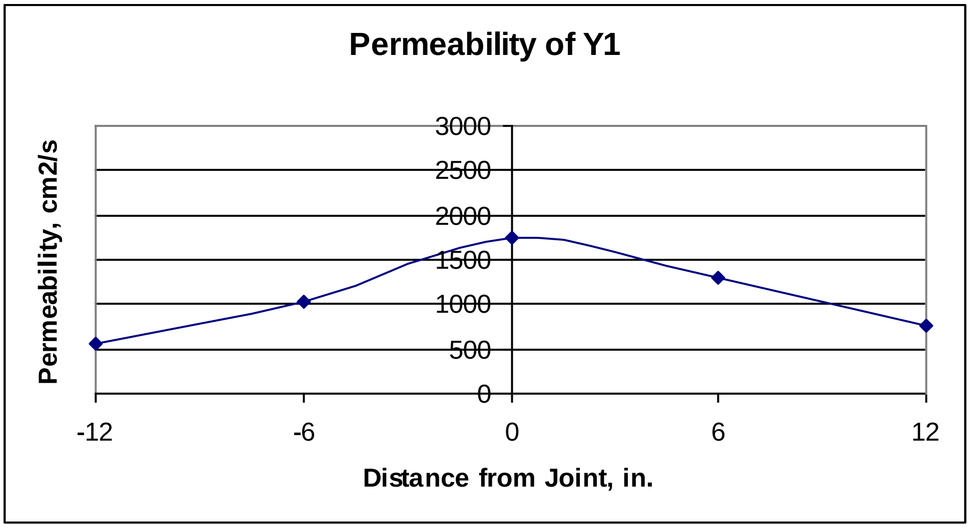


FIGURE 49- Y2, PERMEABILITY

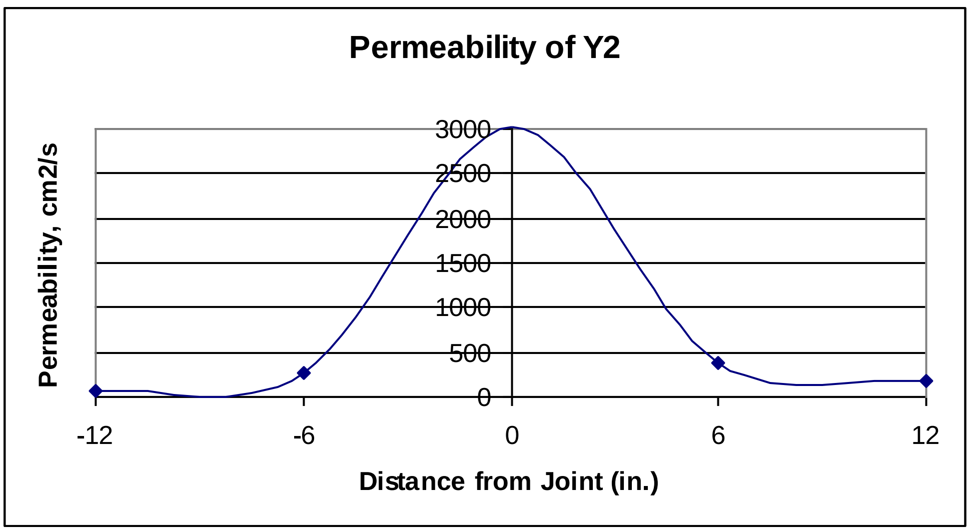


FIGURE 50- Y3, PERMEABILITY

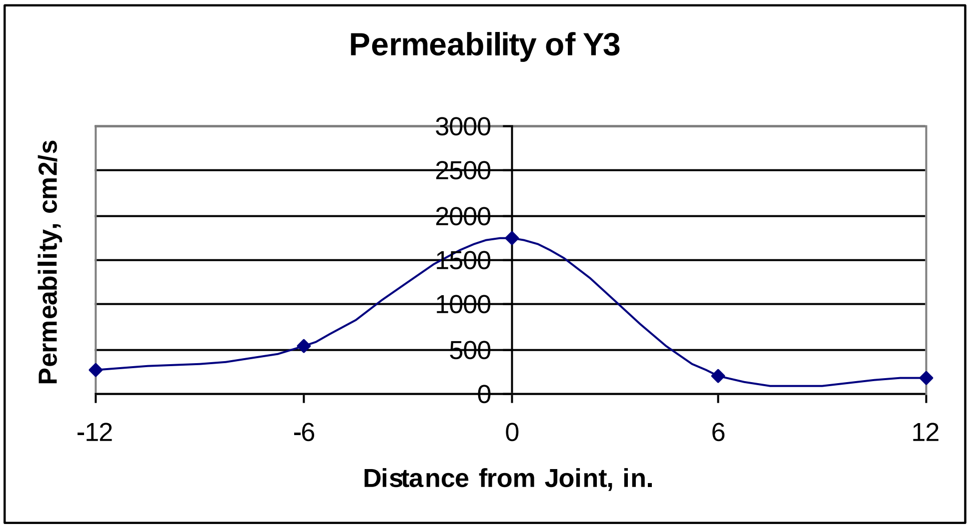
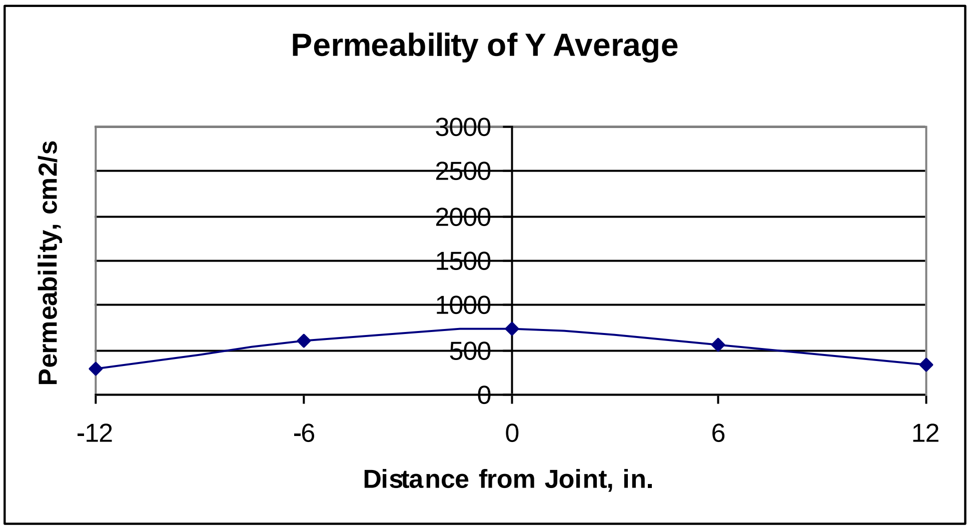


FIGURE 51- Y AVERAGE, PERMEABILITY



Figures 48-51 consistently show an increase in permeability at the joint; however, the results fall within a very large range. In addition, samples cannot be analyzed when cores are broken. Therefore, the permeability test is not recommended as a standard testing procedure for joint quality.

Yellville Samples, Oven Derived AC %

None of the samples were able to be analyzed due to broken cores. For this reason and the lack of any pattern or consistency of results in the Gregg Street and Russellville results, this testing method is not recommended as a quality control standard testing procedure.

Yellville Samples, Gradation

FIGURE 52- Y1, GRADATION

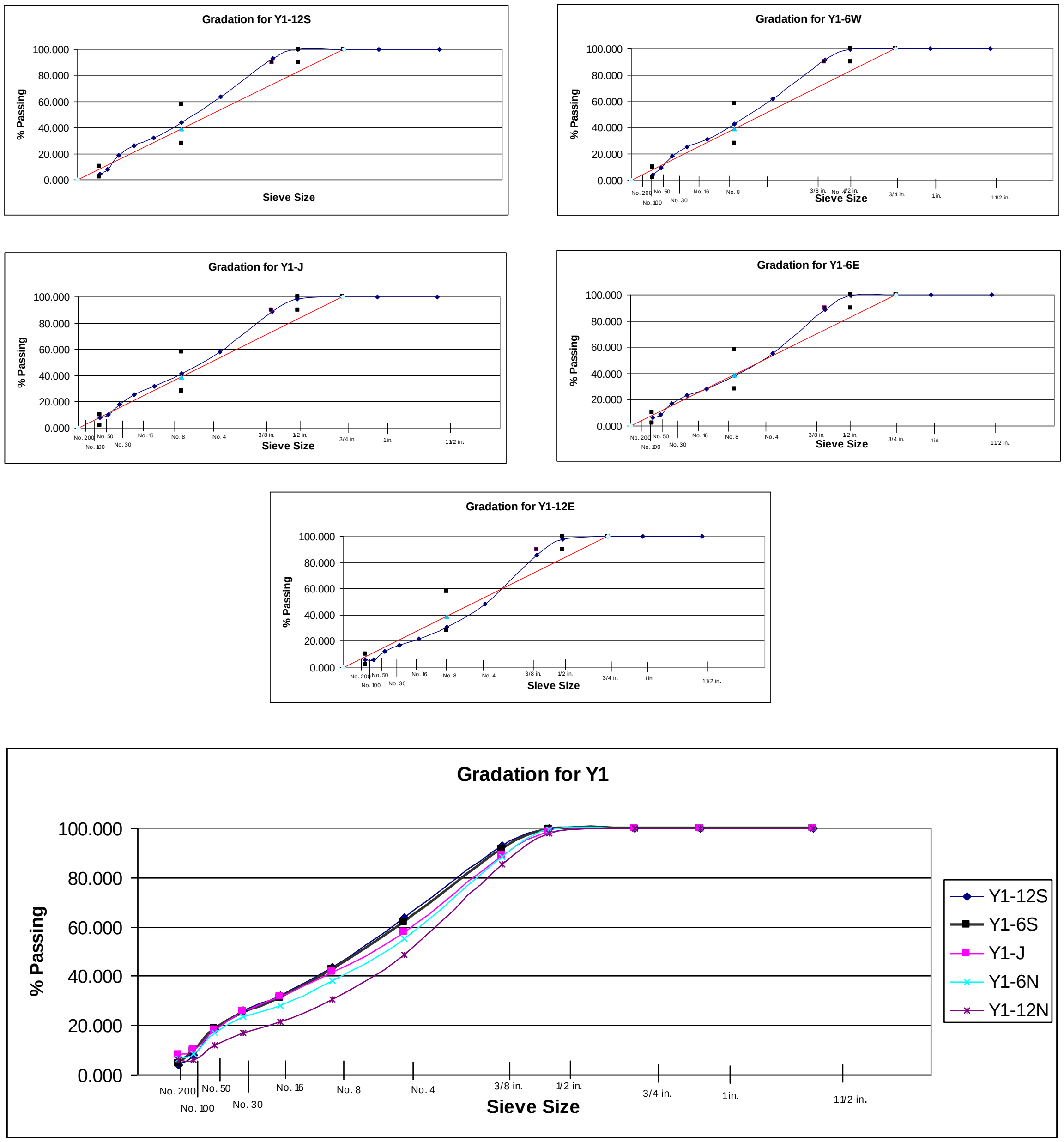


FIGURE 53- Y2, GRADATION

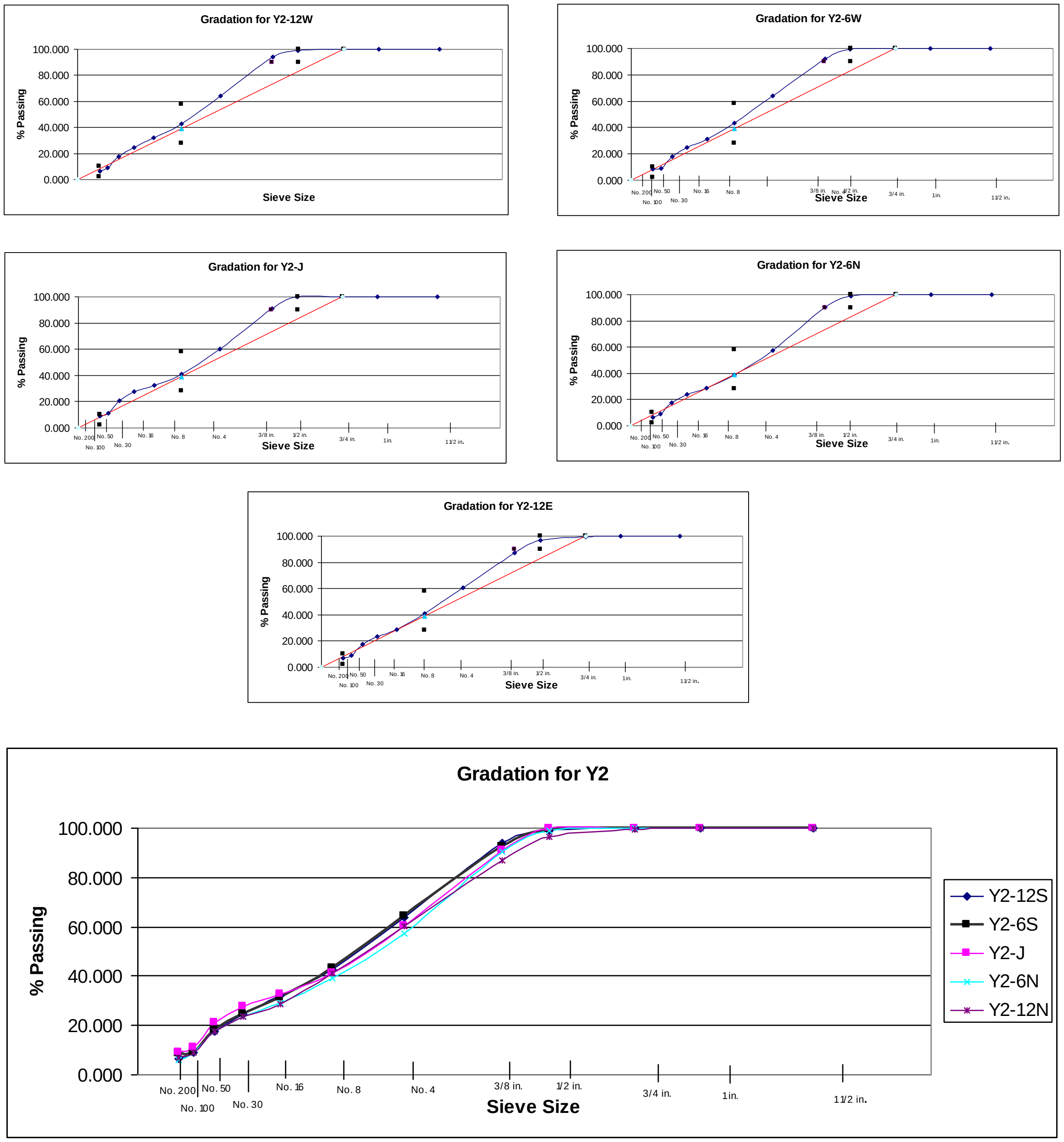


FIGURE 54- Y3, GRADATION

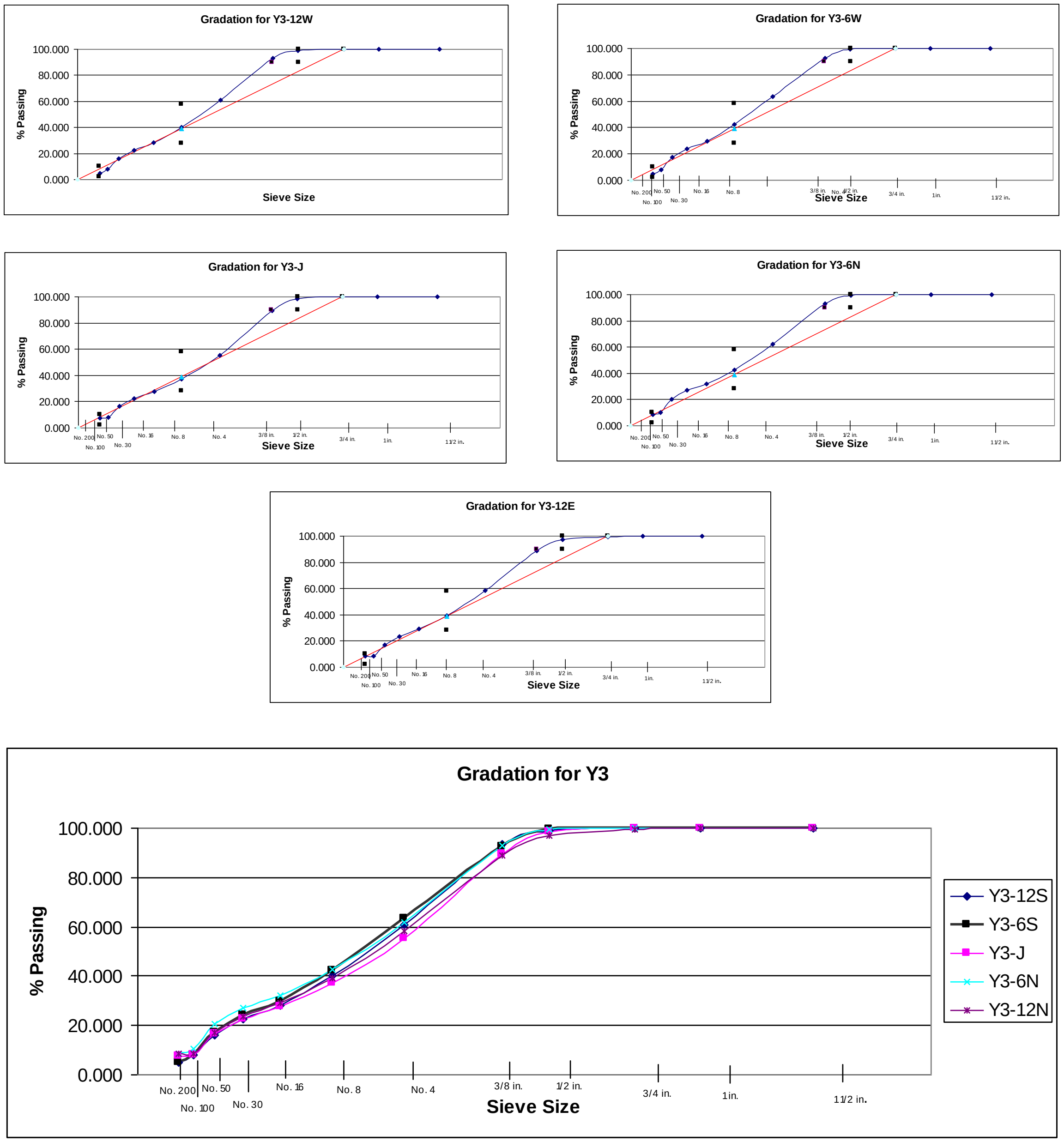


FIGURE 55- Y4, GRADATION

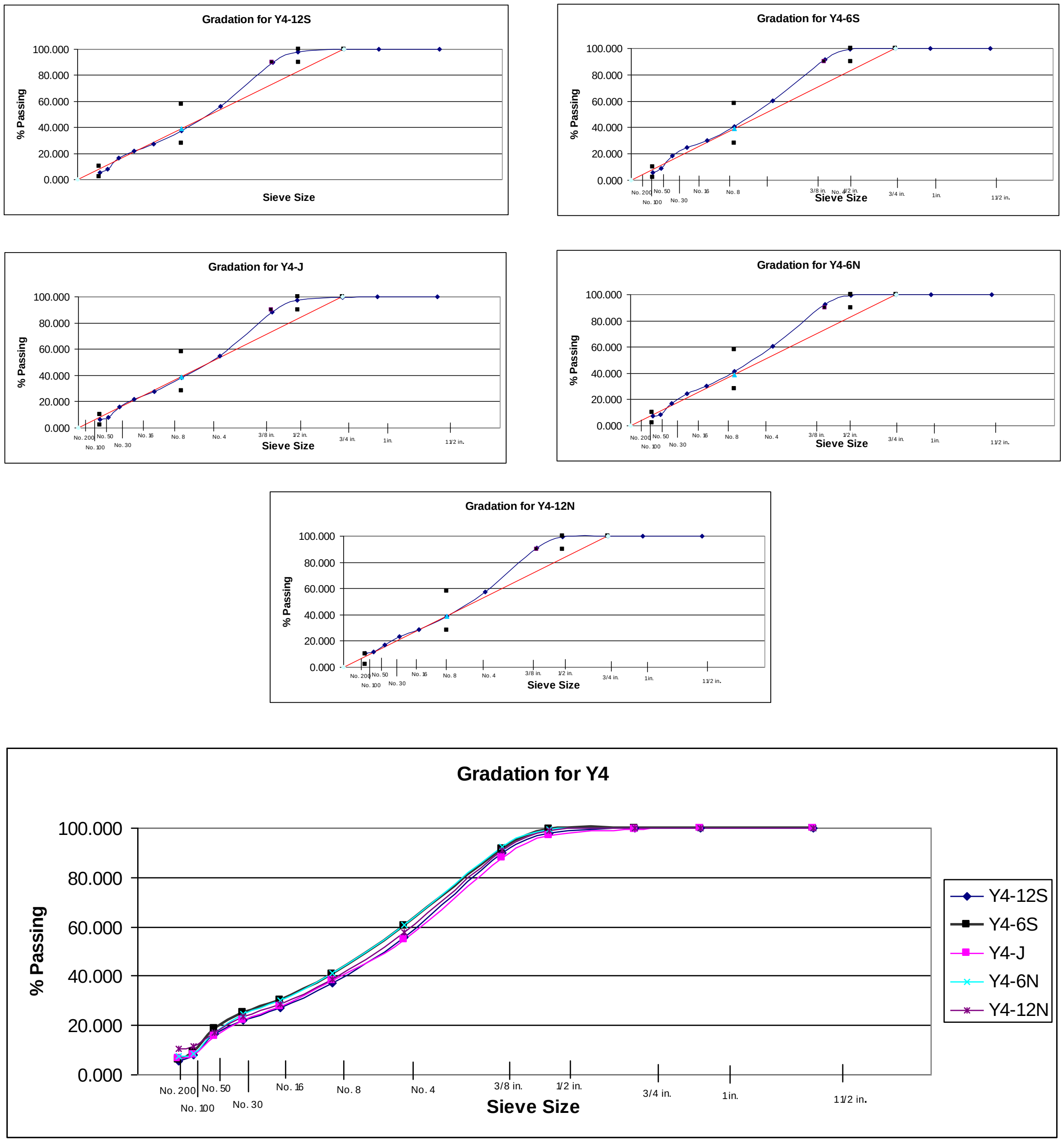
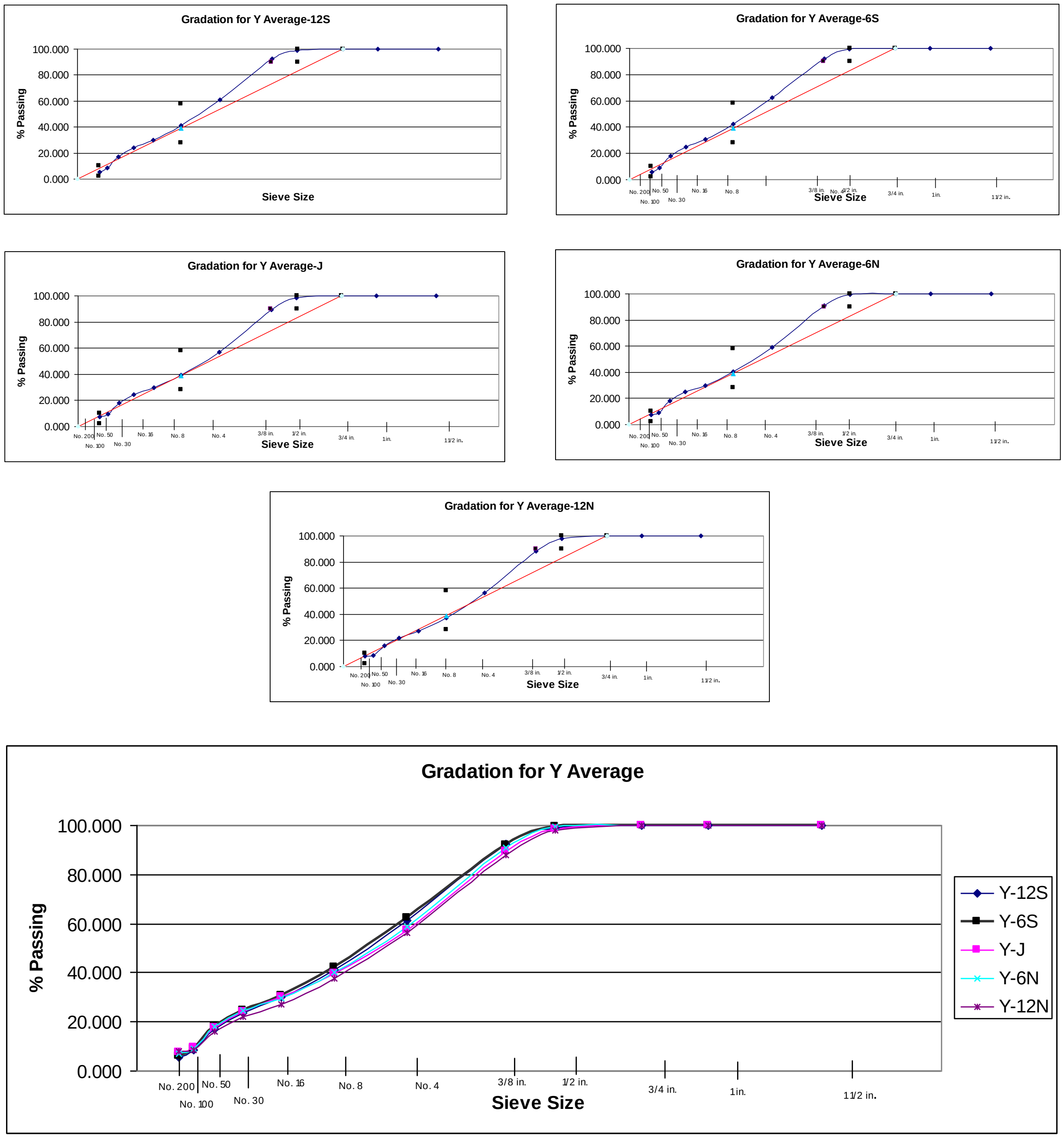


FIGURE 56- Y AVERAGE, GRADATION

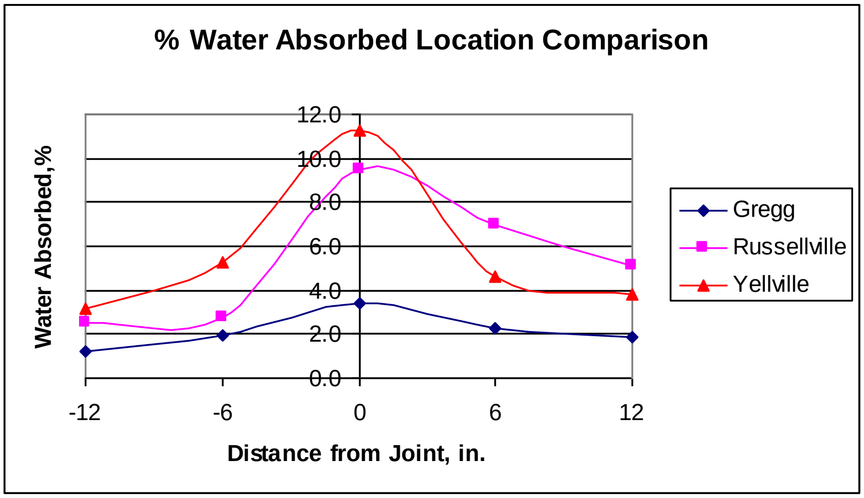


The gradation curves of the Yellville samples lack adequate variation from the slope of the maximum density line. In addition, these gradation curves contain an undesirable bump in the fines which indicates a problem with the gradation of the mix. While the gradation curves for the Yellville samples clearly show a poor quality mix design, they do not show a significant difference in quality of material across the joint.

The gradation test would be useful as a general quality control test for the roadway as a whole; however, this test is not recommended as a quality control measure for the joint due to the lack of discrimination among samples at and away from the joint.

Location Comparison, % Water Absorbed

FIGURE 57- % WATER ABSORBED



The percent water absorbed for each site was plotted using the average values of the unbroken samples. This method accurately reflects the quality of the roadways, showing Yellville as the worst and Gregg Street as the best. The main disadvantage of this method is that results cannot be analyzed if any of the samples across the joint are broken.

Location Comparison, Density

FIGURE 58- SSD DENSITY

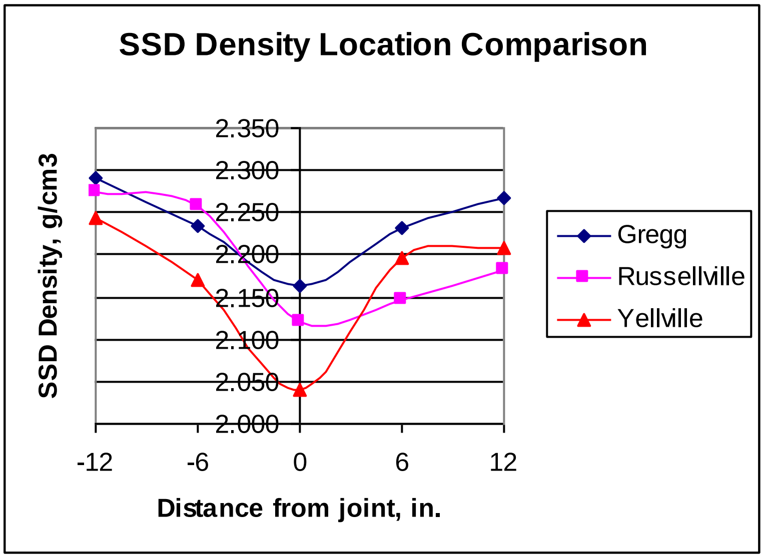


FIGURE 59- CORELOK DENSITY

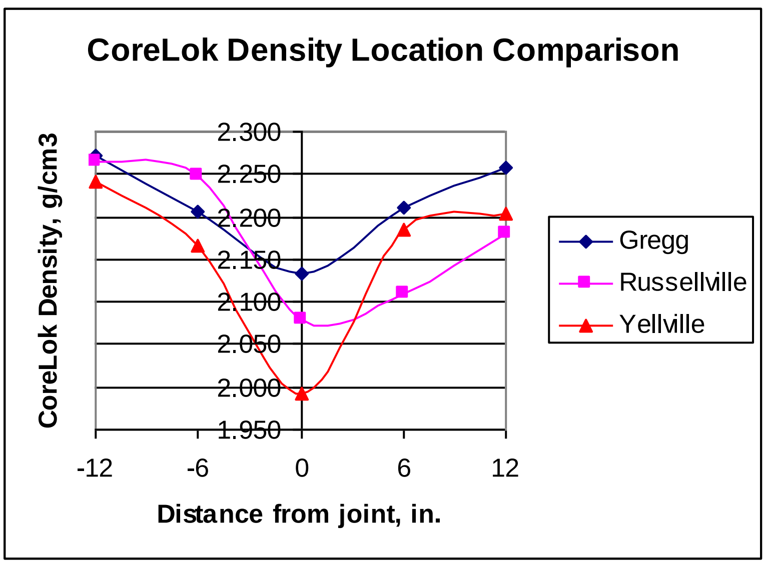
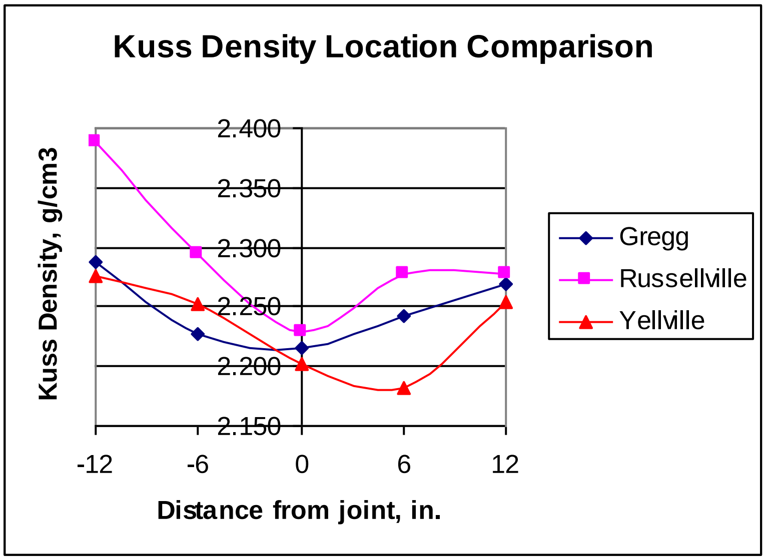


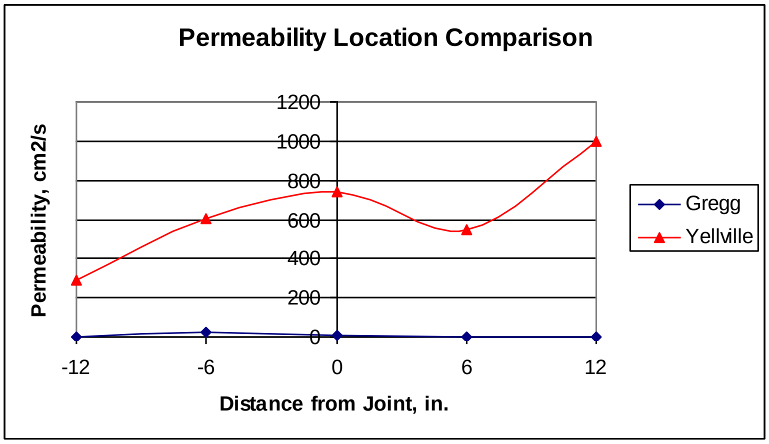
FIGURE 60- KUSS DENSITY



The SSD and CoreLok method both show Gregg Street as having the highest joint density and Yellville as having the lowest joint density, which accurately reflects the true quality of these roadways. The Kuss density method does not clearly show this order of quality.

Location Comparison, Permeability

FIGURE 61- PERMEABILITY



The permeability for each site was plotted using the average values of the unbroken samples. This method accurately shows Yellville as the worst and Gregg Street as the best in quality; however, the accuracy of the data is questionable, and data cannot be estimated for broken cores.

Location Comparison, Gradation

FIGURE 62- GRADATION OF 12 W/S

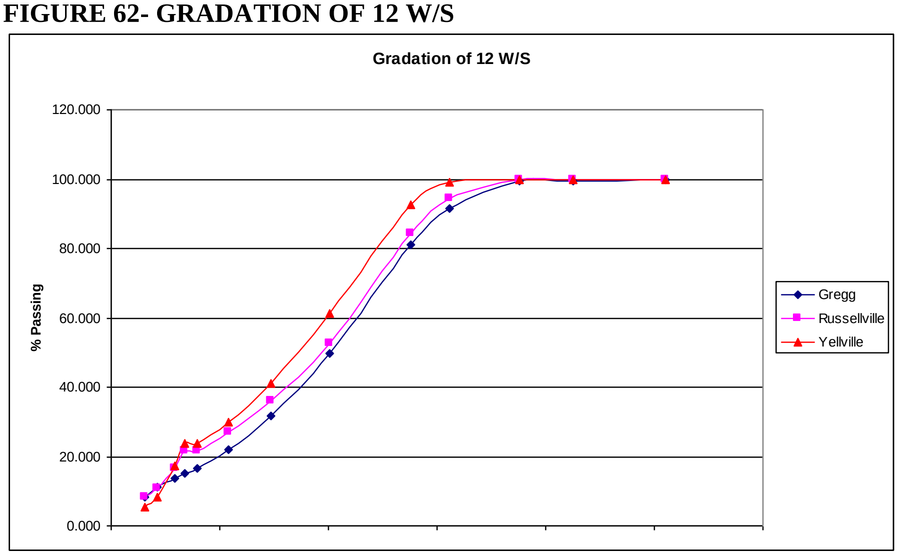


FIGURE 63- GRADATION OF 6 W/S

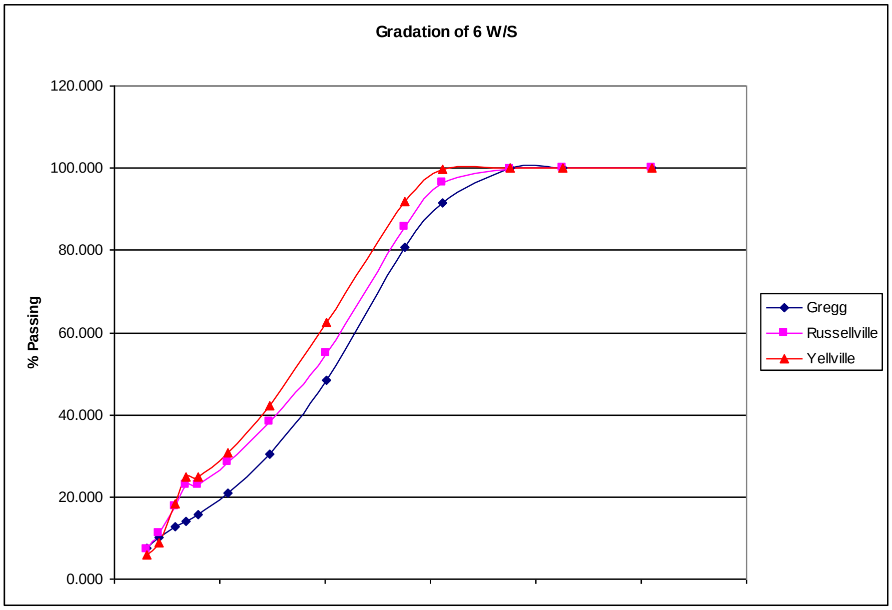


FIGURE 64- GRADATION OF J

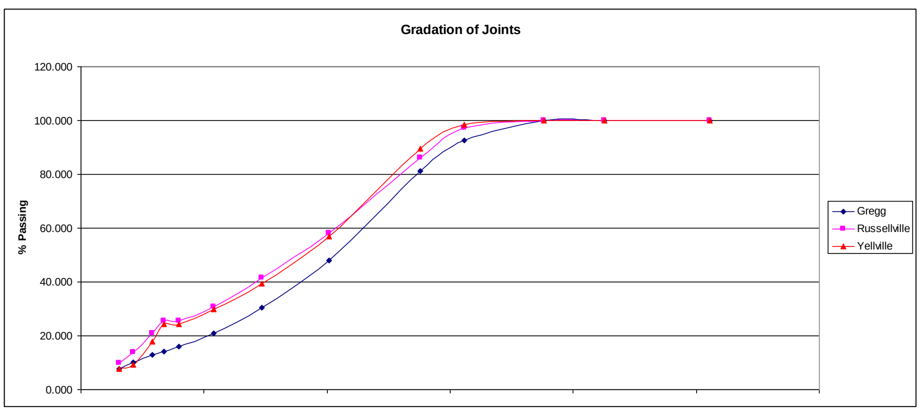


FIGURE 65- GRADATION OF 6 E/N

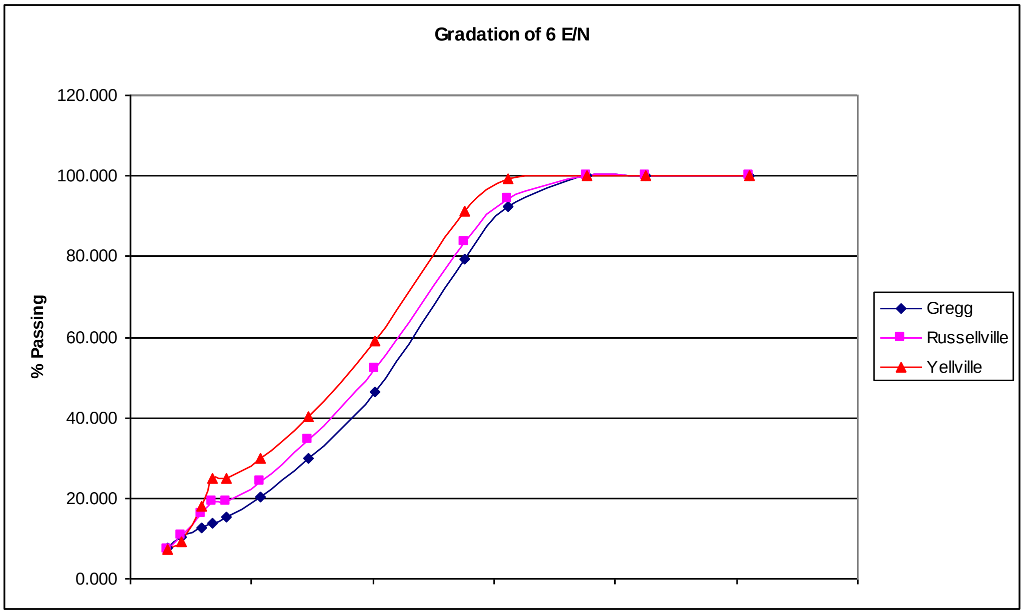
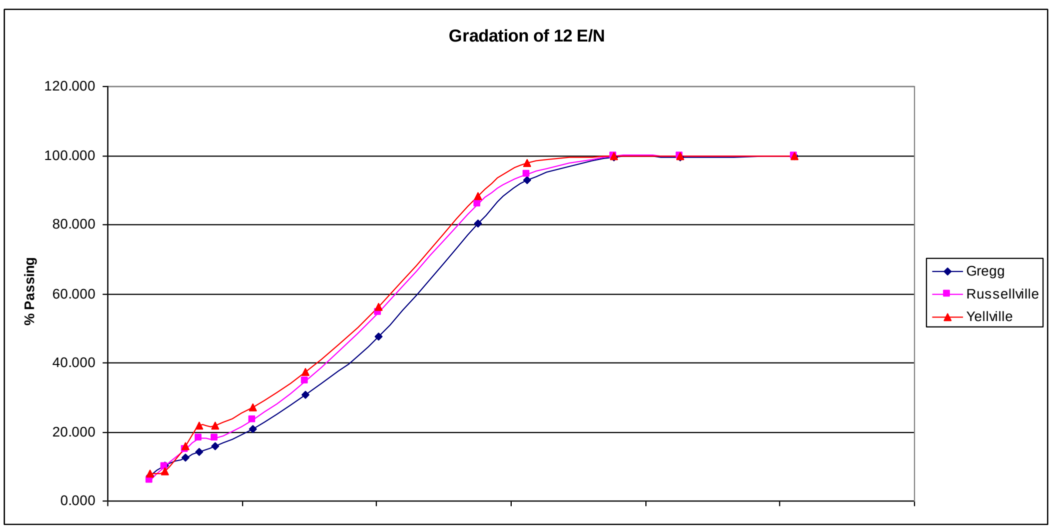


FIGURE 66- GRADATION OF 12 E/N



The gradation curve does not show noticeable change across the joint of any of the locations; however, each of Figures 62-66 show Yellville highest and Gregg lowest across the sieve sizes in terms of percent passing. However, this reflects more on the quality of the roadway as a whole than it does on the difference in quality across the roadway.

ANOVA Statistical Analysis

Based on the visual analyses, density is clearly the most reliable method of determining the quality of longitudinal joints. Upon inspection of the graphs created using the data from the density tests, it appears that the CoreLok method will be best; however, the density test method yielding the most statistically significant results across the joint should be the choice method. Therefore, an ANOVA statistical analysis was performed, and the results are listed below.

Kuss Method

Single Factor Analysis of Gregg Street

TABLE 32- KUSS DENSITY DATA FOR GREGG STREET

	12W	6W	J	6E	12E
G1	2.281	2.224	2.218	2.267	2.272
G2	2.268	2.219	2.204	2.195	2.231
G3	2.299	2.245	2.219	2.265	2.284
G4	2.299	2.218	2.218	2.244	2.287

TABLE 33- SUMMARY OF KUSS CALCULATIONS FOR GREGG STREET

Groups	*Count*	*Sum*	*Average*	*Variance*
12W Column	4	9.147	2.28675	0.000228
6W Column	4	8.906	2.2265	0.000159
J Column	4	8.859	2.21475	5.16E-05
6E Column	4	8.971	2.24275	0.001122
12E Column	4	9.074	2.2685	0.000667

TABLE 34- RESULTS OF KUSS SINGLE FACTOR ANALYSIS OF GREGG STREET

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.0140683	4	0.003517	7.894964	0.00124	3.055568
Within Location From Joint	0.00668225	15	0.000445			
Total	0.02075055	19				
Gregg distance is significant because P-value<.05 and F>Fcrit						

Single Factor Analysis of Russellville

TABLE 35- KUSS DENSITY DATA FOR RUSSELLVILLE

	12W	6W	J	6E	12E
R1	2.617	2.289	2.270	2.287	2.263
R2	2.298	2.289	**2.322**	2.289	2.273
R3	2.297	2.290	**2.181**	2.268	2.271
R4	2.339	2.312	**2.143**	2.263	2.303

*****bold values indicate estimated value for broken sample

TABLE 36- SUMMARY OF KUSS CALCULATIONS FOR RUSSELLVILLE

Groups	*Count*	*Sum*	*Average*	*Variance*
12W Column	4	9.551	2.38775	0.023741
6W Column	4	9.18	2.295	0.000129
J Column	4	8.915	2.228993	0.006646
6E Column	4	9.107	2.27675	0.000174
12E Column	4	9.11	2.2775	0.000308

TABLE 37- RESULTS OF KUSS SINGLE FACTOR ANALYSIS OF RUSSELLVILLE

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.054330404	4	0.013583	2.190987	0.119445	3.055568
Within Location From Joint	0.092989621	15	0.006199			
Total	0.147320025	19				
Russellville distance is NOT significant because P-value>.05 and F<Fcrit						

Single Factor Analysis of Yellville

TABLE 38- KUSS DENSITY DATA FOR YELLVILLE

	12S	6S	J	6N	12N
Y1	2.265	2.241	2.253	2.243	2.231
Y2	2.292	2.289	2.232	2.256	2.250
Y3	2.265	2.234	2.257	1.950	2.269
Y4	2.279	2.246	**2.063**	2.279	2.266

*****bold values indicate estimated value for broken sample

TABLE 39-SUMMARY OF KUSS CALCULATIONS FOR YELLVILLE

Groups	*Count*	*Sum*	*Average*	*Variance*
12S Column	4	9.101	2.2752	0.000168
6S Column	4	9.01	2.2525	0.000616
J Column	4	8.804	2.2012	0.00863
6E Column	4	8.728	2.182	0.024143
12E Column	4	9.016	2.254	0.000305

TABLE 40- RESULTS OF KUSS SINGLE FACTOR ANALYSIS OF YELLVILLE

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.024872089	4	0.006218	0.918118	0.478918	3.055568
Within Location From Joint	0.101588604	15	0.006773			
Total	0.126460693	19				
Yellville distance is NOT significant because P-value>.05						

Two Factor Without Replacement Analysis

TABLE 41- KUSS DENSITY DATA FOR ALL LOCATIONS

	Site	Kuss Gmb				
		12W/S	6W/S	J	6W/S	12W/S
G1	1	2.281	2.224	2.218	2.267	2.272
G2	1	2.268	2.219	2.204	2.195	2.231
G3	1	2.299	2.245	2.219	2.265	2.284
G4	1	2.299	2.218	2.218	2.244	2.287
R1	2	2.617	2.289	2.270	2.287	2.263
R2	2	2.298	2.289	**2.322**	2.289	2.273
R3	2	2.297	2.290	**2.181**	2.268	2.271
R4	2	2.339	2.312	**2.143**	2.263	2.303
Y1	3	2.265	2.241	2.253	2.243	2.231
Y2	3	2.292	2.289	2.232	2.256	2.250
Y3	3	2.265	2.234	2.257	1.950	2.269
Y4	3	2.279	2.246	**2.063**	2.279	2.266

*****bold values indicate estimated value for broken sample

TABLE 42- SUMMARY OF KUSS CALCULATIONS FOR ALL LOCATIONS

SUMMARY	*Count*	*Sum*	*Average*	*Variance*
G1	5	11.262	2.2524	0.000851
G2	5	11.117	2.2234	0.000812
G3	5	11.312	2.2624	0.001
G4	5	11.266	2.2532	0.001451
R1	5	11.726	2.3452	0.023208
R2	5	11.47069	2.294138	0.000318
R3	5	11.30716	2.261432	0.002165
R4	5	11.36012	2.272024	0.005935
Y1	5	11.233	2.2466	0.000167
Y2	5	11.319	2.2638	0.000673
Y3	5	10.975	2.195	0.018942
Y4	5	11.13283	2.226567	0.00856
12W/S	12	27.799	2.316583	0.00937
6W/S	12	27.096	2.258	0.001116
J	12	26.5798	2.214984	0.004321
6E/N	12	26.806	2.233833	0.008613
12E/N	12	27.2	2.266667	0.000451

TABLE 43- RESULTS OF KUSS TWO FACTOR WITHOUT REPLACEMENT ANALYSIS

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Roadway	0.077549222	11	0.00705	1.676459	0.111006	2.014046
Distance From Joint	0.071298557	4	0.017825	4.238663	0.005473	2.583667
Error	0.185031034	44	0.004205			
Total	0.333878812	59				
site- NOT significant because P-value-value>.05 and F< Fcrit						
distance- significant because P-value<.05 and F> Fcrit						

CoreLok Method

Single Factor Analysis of Gregg Street

TABLE 44- CORELOK DENSITY DATA FOR GREGG STREET

	12W	6W	J	6E	12E
G1	2.255	2.214	2.198	2.270	2.272
G2	2.260	2.193	2.085	2.125	2.207
G3	2.289	2.235	2.135	2.240	2.282
G4	2.285	2.187	2.115	2.206	2.271

TABLE 45- SUMMARY OF CORELOK CALCULATIONS FOR GREGG STREET

Groups	*Count*	*Sum*	*Average*	*Variance*
12W Column	4	9.088932637	2.272233	0.000292
6W Column	4	8.828332862	2.207083	0.000478
J Column	4	8.533440911	2.13336	0.00229
6E Column	4	8.840673245	2.210168	0.003951
12E Column	4	9.031534361	2.257884	0.001179

TABLE 46- RESULTS OF CORELOK SINGLE FACTOR ANALYSIS OF GREGG STREET

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.04743658 7	4	0.01185 9	7.23982 6	0.00186 9	3.05556 8
Within Location From Joint	0.02457064 5	15	0.00163 8			
Total	0.07200723 2	19				
Gregg distance is significant because P-value<.05 and F>Fcrit						

Single Factor Analysis of Russellville

TABLE 47- CORELOK DENSITY DATA FOR RUSSELLVILLE

	12W	6W	J	6E	12E
R1	2.261	2.229	**2.032**	2.077	2.112
R2	2.259	2.238	**2.128**	2.099	2.129
R3	2.255	2.267	**2.075**	2.151	2.220
R4	2.287	2.261	**2.085**	2.115	2.261

***bold values indicate estimated value for broken sample**

TABLE 48- SUMMARY OF CORELOK CALCULATIONS FOR RUSSELLVILLE

Groups	*Count*	*Sum*	*Average*	*Variance*
12W Column	4	9.062435776	2.265609	0.000214
6W Column	4	8.995554716	2.248889	0.000323
J Column	4	8.320145363	2.080036	0.001526
6E Column	4	8.44176417	2.110441	0.000974
12E Column	4	8.722691803	2.180673	0.005158

TABLE 49- RESULTS OF CORELOK SINGLE FACTOR ANALYSIS OF RUSSELLVILLE

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.107459919	4	0.0268	16.39221	2.38E-05	3.055568
Within Location From Joint	0.024583298	15	0.0016			
Total	0.132043218	19				
Russelleville distance is significant because P-value<.05 and F>Fcrit						

Single Factor Analysis of Yellville

TABLE 50- CORELOK DENSITY DATA FOR YELLVILLE

	12S	6S	J	6N	12N
Y1	2.229	2.133	1.909	2.114	2.147
Y2	2.264	2.216	1.984	2.194	2.210
Y3	2.230	2.166	1.989	2.209	2.226
Y4	2.242	2.146	**2.091**	2.221	2.233

TABLE 51- SUMMARY OF CORELOK CALCULATIONS FOR YELLVILLE

Groups	*Count*	*Sum*	*Average*	*Variance*
12S Column	4	8.964613523	2.241153	0.000266
6S Column	4	8.661138398	2.165285	0.001337
J Column	4	7.971763699	1.992941	0.005612
6N Column	4	8.737385175	2.184346	0.002329
12N Column	4	8.815279706	2.20382	0.001524

TABLE 52- RESULTS OF CORELOK SINGLE FACTOR ANALYSIS OF YELLVILLE

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.148017744	4	0.037004	16.71732	2.11E-05	3.055568
Within Location From Joint	0.033203086	15	0.002214			
Total	0.18122083	19				
Yellville distance is significant because P-value<.05 and F>Fcrit						

Two Factor Without Replacement Analysis

TABLE 53- CORELOK DENSITY DATA FOR ALL LOCATIONS

	Site	CoreLok Gmb				
		12W/S	6W/S	J	6E/N	12E/N
G1	1	2.255	2.214	2.198	2.270	2.272
G2	1	2.260	2.193	2.085	2.125	2.207
G3	1	2.289	2.235	2.135	2.240	2.282
G4	1	2.285	2.187	2.115	2.206	2.271
R1	2	2.261	2.229	**2.032**	2.077	2.112
R2	2	2.259	2.238	**2.128**	2.099	2.129
R3	2	2.255	2.267	**2.075**	2.151	2.220
R4	2	2.287	2.261	**2.085**	2.115	2.261
Y1	3	2.229	2.133	1.909	2.114	2.147
Y2	3	2.264	2.216	1.984	2.194	2.210
Y3	3	2.230	2.166	1.989	2.209	2.226
Y4	3	2.242	2.146	**2.091**	2.221	2.233

*****bold values indicate estimated value for broken sample

TABLE 54- SUMMARY OF CORELOK CALCULATIONS FOR ALL LOCATIONS

SUMMARY	*Count*	*Sum*	*Average*	*Variance*
G1	5	11.21018	2.242036	0.00114
G2	5	10.86958	2.173917	0.004812
G3	5	11.18001	2.236001	0.003787
G4	5	11.06314	2.212628	0.004687
R1	5	10.71234	2.142469	0.009747
R2	5	10.8531	2.170621	0.005294
R3	5	10.9678	2.19356	0.006392
R4	5	11.00935	2.20187	0.008921
Y1	5	10.53131	2.106263	0.014131
Y2	5	10.86712	2.173424	0.011937
Y3	5	10.8192	2.163841	0.01024
Y4	5	10.93254	2.186509	0.004297
12W/S	12	27.11598	2.259665	0.000405
6W/S	12	26.48503	2.207085	0.001854
J	12	24.82535	2.068779	0.006225
6E/N	12	26.01982	2.168319	0.003927
12E/N	12	26.56951	2.214125	0.003286

TABLE 55- RESULTS OF CORELOK TWO FACTOR WITHOUT REPLACEMENT ANALYSIS

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Roadway	0.079369018	11	0.007215	3.402772	0.001797	2.014046
Distance From Joint	0.248239557	4	0.06206	29.26749	6.79E-12	2.583667
Error	0.093299258	44	0.00212			
Total	0.420907834	59				

site- significant because P-value<.05 and F> Fcrit
distance- very significant because P-value<.05 and F> Fcrit

SSD Method

Single Factor Analysis of Gregg Street

TABLE 56- SSD DENSITY DATA FOR GREGG STREET

	12W	6W	J	6E	12E
G1	2.303	2.242	2.210	2.273	2.284
G2	2.264	2.210	2.134	2.175	2.218
G3	2.299	2.258	2.152	2.257	2.280
G4	2.294	2.228	2.152	2.221	2.288

TABLE 57- SUMMARY OF SSD CALCULATIONS FOR GREGG STREET

Groups	*Count*	*Sum*	*Average*	*Variance*
12W Column	4	9.159844026	2.289961	0.000307
6W Column	4	8.937912591	2.234478	0.000418
J Column	4	8.648018967	2.162005	0.001098
6E Column	4	8.925249442	2.231312	0.001889
12E Column	4	9.069827027	2.267457	0.001112

TABLE 58- RESULTS OF SSD SINGLE FACTOR ANALYSIS OF GREGG STREET

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.037581884	4	0.009395	9.738869	0.000434	3.055568
Within Location From Joint	0.014471092	15	0.000965			
Total	0.052052976	19				

Gregg distance is significant because P-value<.05 and F>Fcrit

Single Factor Analysis of Russellville

TABLE 59- SSD DENSITY DATA FOR RUSSELLVILLE

	12W	6W	J	6E	12E
R1	2.264	2.235	2.091	2.120	2.128
R2	2.267	2.245	**2.160**	2.131	2.165
R3	2.267	2.271	**2.130**	2.173	2.233
R4	2.303	2.279	**2.099**	2.163	2.204

*****bold values indicate estimated value for broken sample

TABLE 60-SUMMARY OF SSD CALCULATIONS FOR RUSSELLVILLE

Groups	*Count*	*Sum*	*Average*	*Variance*
12W Column	4	9.101026205	2.275257	0.00034
6W Column	4	9.03017795	2.257544	0.000447
J Column	4	8.479820989	2.119955	0.000997
6E Column	4	8.587701008	2.146925	0.000631
12E Column	4	8.73050144	2.182625	0.002097

TABLE 61- RESULTS OF SSD SINGLE FACTOR ANALYSIS OF RUSSELLVILLE

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.073753107	4	0.0184	20.42725	6.24E-06	3.055568
Within Location From Joint	0.013539469	15	0.000903			
Total	0.087292576	19				
Russellville distance is significant because P-value<.05 and F>Fcrit						

Single Factor Analysis of Yellville

TABLE 62- SSD DENSITY DATA FOR YELLVILLE

	12S	6S	J	6N	12N
Y1	2.240	2.130	2.007	2.123	2.157
Y2	2.262	2.217	2.035	2.222	2.219
Y3	2.229	2.170	2.018	2.216	2.221
Y4	2.246	2.160	**2.100**	2.221	2.238

*****bold values indicate estimated value for broken sample

TABLE 63- SUMMARY OF SSD CALCULATIONS FOR YELLVILLE

Groups	*Count*	*Sum*	*Average*	*Variance*
12S Column	4	8.97680585	2.244201	0.000186
6S Column	4	8.676914611	2.169229	0.001279
J Column	4	8.160352107	2.040088	0.001729
6N Column	4	8.782672037	2.195668	0.002369
12N Column	4	8.834483129	2.208621	0.001282

TABLE 64- RESULTS OF SSD SINGLE FACTOR ANALYSIS OF YELLVILLE

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Locations Across Joint	0.098087179	4	0.024522	17.90824	1.4E-05	3.055568
Within Location From Joint	0.020539536	15	0.001369			
Total	0.118626715	19				
Yellville distance is significant because P-value<.05 and F>Fcrit						

Two Factor Without Replacement Analysis

TABLE 44- SSD DENSITY DATA FOR ALL LOCATIONS

	Site	SSD Gmb				
		12W/S	6W/S	J	6E/N	12E/N
G1	1	2.303	2.242	2.210	2.273	2.284
G2	1	2.264	2.210	2.134	2.175	2.218
G3	1	2.299	2.258	2.152	2.257	2.280
G4	1	2.294	2.228	2.152	2.221	2.288
R1	2	2.264	2.235	2.091	2.120	2.128
R2	2	2.267	2.245	**2.160**	2.131	2.165
R3	2	2.267	2.271	**2.130**	2.173	2.233
R4	2	2.303	2.279	**2.099**	2.163	2.204
Y1	3	2.240	2.130	2.007	2.123	2.157
Y2	3	2.262	2.217	2.035	2.222	2.219
Y3	3	2.229	2.170	2.018	2.216	2.221
Y4	3	2.246	2.160	**2.100**	2.221	2.238

TABLE 45- SUMMARY OF SSD CALCULATIONS FOR ALL LOCATIONS

SUMMARY	*Count*	*Sum*	*Average*	*Variance*
G1	5	11.31082	2.262163	0.001341
G2	5	11.00037	2.200073	0.002389
G3	5	11.24626	2.249251	0.003236
G4	5	11.18341	2.236682	0.003363
R1	5	10.838	2.1676	0.005865
R2	5	10.96845	2.19369	0.003478
R3	5	11.07415	2.214831	0.0038
R4	5	11.04862	2.209724	0.006988
Y1	5	10.65717	2.131434	0.006973
Y2	5	10.95504	2.191009	0.007901
Y3	5	10.85322	2.170644	0.007856
Y4	5	10.96579	2.193159	0.003856
12W/S	12	27.23768	2.269806	0.000624
6W/S	12	26.64501	2.220417	0.002111
J	12	25.28819	2.107349	0.003832
6E/N	12	26.29562	2.191302	0.002639
12E/N	12	26.63481	2.219568	0.002599

TABLE 46- RESULTS OF SSD TWO FACTOR WITHOUT REPLACEMENT ANALYSIS

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Roadway	0.073480855	11	0.00668	5.214154	3.4E-05	2.014046
Distance From Joint	0.171818679	4	0.042955	33.52839	7.68E-13	2.583667
Error	0.056370299	44	0.001281			
Total	0.301669833	59				

site- significant because P-value<.05 and F> Fcrit
distance- very significant because P-value<.05 and F> Fcrit

Based on the ANOVA analyses of each test method, the SSD method yields the most statistically significant results; however, this data may be skewed due to the estimated values for broken cores. The ANOVA analysis of the CoreLok method shows that this method also yields statistically significant results.

Conclusion:

Based on the results of this study, the percent water absorbed, CoreLok, and SSD methods are recommended as possible laboratory quality control testing procedures for judging the quality of longitudinal joints. The percent asphalt method shows no clear indication of roadway quality, and the permeability method often yields results which are inaccurate and unrepeatable. The gradation method does not provide results which clearly show changes in quality across the joint. Therefore, these methods are not recommended.

The percent water absorbed may serve as a good replacement to the permeability test because it is closely related to permeability and yields more precise and consistent results. The main disadvantage of this method is the inability to predict values for samples which are cracked. However, a solution to this problem could be to simply reject roadways which cannot produce in-tact samples. Further testing is recommended to investigate the possibility of using this method as a quality control standard.

Out of the three density tests examined, the CoreLok method showed the greatest visual differentiation between various levels of quality of the roadways. Also, as mentioned in the literature review, the CoreLok method may be more accurate for highly absorptive samples. However, the SSD method is more economical to conduct. Furthermore, the SSD method showed the most statistically significant results based on the ANOVA calculations. Since some density values were estimated, the results of the ANOVA analysis may be skewed. Further testing is recommended for the CoreLok and SSD methods to determine which of these two density testing methods is more appropriate to use as a quality control standard.

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Appendix A

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BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name: TRC 0801 Date: 4/1/2008
Material: Gregg Street Tested By: Annette
Source: Station 1

Sample Number	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
Dry Weight in Air, gm (A)	1840.4	1756.5	2048.0	2319.7	2171.7
Submerged Weight, gm (C)	1051.0	985.4	1139.7	1311.5	1235.8
SSD Weight, gm (B)	1850.3	1769.0	2066.4	2332.2	2186.6
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.303	2.242	2.210	2.273	2.284
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	1.2	1.6	2.0	1.2	1.6

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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ASPHALT LABORATORY

BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008

Source: Gregg Street - Station 1 Tested By: Annette

Sample Number	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
Wt. of Dry Core in Air before testing, g (A)	1840.4	1756.5	2048.0	2319.7	2171.7
Wt. of Sealed Core in Air, g (B)	1891.8	1807.7	2099.2	2370.8	2222.7
Wt of Sealed Core in Water, g (C)	1011.4	950.5	1102.4	1283.7	1202.0
Wt. of Dry Core in Air after testing, g (D)	1840.4	1756.3	2047.4	2319.5	2171.4
Bag Weight E = (B - A)	51.4	51.2	51.2	51.1	51.0
Bag Ratio F = A / E	35.805	34.307	40.000	45.395	42.582
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.800	0.803	0.793	0.784	0.789
Total Volume H = (E + D) - C	880.4	857.0	996.2	1086.9	1020.4
Bag Volume I = E / G	64.2	63.8	64.5	65.2	64.6
Sample Volume J = H - I	816.2	793.2	931.7	1021.7	955.8
Bulk Specific Gravity (G_{mb}) K = A / J	2.255	2.214	2.198	2.270	2.272
Check: % wt. change *(must be -0.08% to +0.04%)*	0.00%	0.01%	0.03%	0.01%	0.01%

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KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Gregg Street Tested By: Annette
Source: Station 1

Sample Number	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
Dry Weight in Air, gm	1840.4	1756.3	2047.4	2319.5	2171.4
Sample Volume, cc	806	789	923	1023	955
Bulk Specific Gravity, Gmb	2.281	2.224	2.218	2.267	2.272

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LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 4/1/2008
Source: Gregg Street - Station 1 Tested By: Annette

Sample Number	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	46.38	49.01	53.03	58.25	55.88
Specimen height, mm	50.06	44.51	53.08	59.39	55.12
Specimen height, mm	46.67	44.17	54.22	59.70	55.13
Specimen height, mm	52.06	49.30	55.66	59.07	55.27
Average specimen height, cm	4.879	4.675	5.400	5.910	5.535
Specimen diameter, mm	151.15	151.47	152.26	151.64	151.65
Specimen diameter, mm	151.02	152.07	151.41	151.75	152.13
Specimen diameter, mm	150.80	151.22	152.34	151.02	151.80
Specimen diameter, mm	150.72	151.78	151.92	151.28	151.46
Average specimen diameter, cm	15.092	15.164	15.198	15.142	15.176
Specimen Area, cm^2	178.895	180.588	181.417	180.082	180.886
			REP #1		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	59.6	62.5	63.5	62.1	61.4
Time, final (min.)	15.0	18.0	15.0	15.0	16.0
Ht @ Time, final	51.7	52.9	45.7	62.1	61.4
Permeability 1 (k x 10^{-5})	2.66	2.49	6.70	0.00	0.00
			REP #2		
Time, initial (min.)	15.0	18.0	15.0	15.0	16.0
Ht. @ Time, initial	51.7	52.9	45.7	62.1	61.4
Time, final (min.)	30.0	30.0	30.0	30.0	30.0
Ht @ Time, final	44.6	47.1	30.4	62.1	61.4
Permeability 2 (k x 10^{-5})	2.67	2.52	7.50	0.00	0.00
Average Permeability (k x 10^{-5})	2.67	2.50	7.10	0.00	0.00
Water Temp, F	68.0	66.0	69.0	66.0	66.0
Water Temp, C	20.0	18.9	20.6	18.9	18.9
R_T Factor	1.0000	1.0276	0.9856	1.0276	1.0276
PERMEABILITY (k x 10-5)	2.67	2.57	6.99	0.00	0.00

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ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 1		

ASPHALT CONTENT BY THE IGNITION METHOD					
Test Samples					
Sample ID	G1-12W	G1-6W	G1-J	G1-6E	G1-12E
Weight of Basket (g)	3267.00	3259.00	3268.00	3266.00	3260.00
Specimen + Basket (g)	5082.00	4996.00	5277.00	5553.00	5401.00
Net Wt. of Specimen (g)	1815.00	1737.00	2009.00	2287.00	2141.00
Calibration Factor	0.00	0.00	0.00	0.00	0.00
Temperature Correction Factor	0.11	0.10	0.10	0.08	0.07
Oven Derived AC%	6.64	6.65	5.60	6.86	6.48
Corrected Value (if CF not used)	6.64	6.65	5.60	6.86	6.48

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 1 - 12W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	637.50	526.50	111.00	111.00	6.56	93.44	93.4
3/8	9.5	711.20	528.00	183.20	294.20	17.38	82.62	82.6
#4	4.750	1055.10	494.10	561.00	855.20	50.53	49.47	49.5
#8	2.360	782.30	473.30	309.00	1164.20	68.79	31.21	31.2
#16	1.180	573.20	415.10	158.10	1322.30	78.13	21.87	21.9
#30	0.600	462.90	378.00	84.90	1407.20	83.15	16.85	16.9
#40	0.425	382.00	359.80	22.20	1429.40	84.46	15.54	15.5
#50	0.300	370.20	351.00	19.20	1448.60	85.59	14.41	14.4
#100	0.150	379.50	335.90	43.60	1492.20	88.17	11.83	11.8
#200	0.075	373.90	326.10	47.80	1540.00	91.00	9.00	9.00
Pan	Pan	381.00	365.90	15.10	1555.10			

A) Weight of Original Sample, g	1692.40	AHTD Dust Proportion	0.58
B) Weight after Wash, g	1555.10		
C) Wash Loss, g (A-B)	137.30	Fineness Modulus	4.718
D) Minus #200 From Sieve, g	15.10		
Total Minus #200, g (C+D)	152.40	Acceptance Check	1.0000

Wash Loss 8.11 %

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 1 - 6W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	656.10	526.50	129.60	129.60	8.00	92.00	92.0
3/8	9.5	702.00	528.10	173.90	303.50	18.74	81.26	81.3
#4	4.750	1015.20	493.90	521.30	824.80	50.92	49.08	49.1
#8	2.360	760.40	472.60	287.80	1112.60	68.69	31.31	31.3
#16	1.180	572.80	414.80	158.00	1270.60	78.45	21.55	21.6
#30	0.600	466.00	377.70	88.30	1358.90	83.90	16.10	16.1
#40	0.425	386.10	359.40	26.70	1385.60	85.55	14.45	14.5
#50	0.300	372.90	350.80	22.10	1407.70	86.91	13.09	13.1
#100	0.150	375.70	335.80	39.90	1447.60	89.37	10.63	10.6
#200	0.075	370.50	325.90	44.60	1492.20	92.13	7.87	7.87
Pan	Pan	378.00	365.80	12.20	1504.40			

A) Weight of Original Sample, g	1619.70	AHTD Dust Proportion	0.54
B) Weight after Wash, g	1504.40		
C) Wash Loss, g (A-B)	115.30	Fineness Modulus	4.770
D) Minus #200 From Sieve, g	12.20		
Total Minus #200, g (C+D)	127.50	Acceptance Check	1.0000

Wash Loss 7.12 %

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 1 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	663.10	526.50	136.60	136.60	7.21	92.79	92.8
3/8	9.5	697.50	528.00	169.50	306.10	16.16	83.84	83.8
#4	4.750	1112.50	493.90	618.60	924.70	48.81	51.19	51.2
#8	2.360	841.70	473.50	368.20	1292.90	68.25	31.75	31.8
#16	1.180	607.50	415.80	191.70	1484.60	78.37	21.63	21.6
#30	0.600	480.10	378.00	102.10	1586.70	83.76	16.24	16.2
#40	0.425	393.30	359.80	33.50	1620.20	85.53	14.47	14.5
#50	0.300	379.00	351.00	28.00	1648.20	87.00	13.00	13.0
#100	0.150	389.00	336.10	52.90	1701.10	89.80	10.20	10.2
#200	0.075	381.00	326.10	54.90	1756.00	92.69	7.31	7.31
Pan	Pan	385.30	365.90	19.40	1775.40			

A) Weight of Original Sample, g	1894.40	AHTD Dust Proportion	0.50
B) Weight after Wash, g	1775.40		
C) Wash Loss, g (A-B)	119.00	Fineness Modulus	4.721
D) Minus #200 From Sieve, g	19.40		
Total Minus #200, g (C+D)	138.40	Acceptance Check	1.0000

Wash Loss 6.28 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 1 - 6E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	687.90	526.40	161.50	161.50	7.58	92.42	92.4
3/8	9.5	766.90	527.80	239.10	400.60	18.81	81.19	81.2
#4	4.750	1192.20	494.00	698.20	1098.80	51.59	48.41	48.4
#8	2.360	845.60	473.30	372.30	1471.10	69.07	30.93	30.9
#16	1.180	622.60	415.60	207.00	1678.10	78.78	21.22	21.2
#30	0.600	489.70	378.00	111.70	1789.80	84.03	15.97	16.0
#40	0.425	395.60	359.70	35.90	1825.70	85.71	14.29	14.3
#50	0.300	380.20	351.00	29.20	1854.90	87.08	12.92	12.9
#100	0.150	391.00	336.10	54.90	1909.80	89.66	10.34	10.3
#200	0.075	387.40	326.00	61.40	1971.20	92.54	7.46	7.46
Pan	Pan	389.20	366.00	23.20	1994.40			

A) Weight of Original Sample, g	2130.00	AHTD Dust Proportion	0.52
B) Weight after Wash, g	1994.40		
C) Wash Loss, g (A-B)	135.60	Fineness Modulus	4.790
D) Minus #200 From Sieve, g	23.20		
Total Minus #200, g (C+D)	158.80	Acceptance Check	1.0000

Wash Loss 6.37 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 1 - 12E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	682.20	526.50	155.70	155.70	7.78	92.22	92.2
3/8	9.5	777.90	528.00	249.90	405.60	20.27	79.73	79.7
#4	4.750	1170.10	494.00	676.10	1081.70	54.07	45.93	45.9
#8	2.360	806.50	473.20	333.30	1415.00	70.73	29.27	29.3
#16	1.180	601.00	415.40	185.60	1600.60	80.00	20.00	20.0
#30	0.600	478.50	378.00	100.50	1701.10	85.03	14.97	15.0
#40	0.425	391.60	359.80	31.80	1732.90	86.61	13.39	13.4
#50	0.300	376.70	351.00	25.70	1758.60	87.90	12.10	12.1
#100	0.150	384.00	336.10	47.90	1806.50	90.29	9.71	9.7
#200	0.075	380.10	326.10	54.00	1860.50	92.99	7.01	7.01
Pan	Pan	385.80	366.00	19.80	1880.30			

A) Weight of Original Sample, g	2000.70	AHTD Dust Proportion	0.52
B) Weight after Wash, g	1880.30		
C) Wash Loss, g (A-B)	120.40	Fineness Modulus	4.883
D) Minus #200 From Sieve, g	19.80		
Total Minus #200, g (C+D)	140.20	Acceptance Check	1.0000

Wash Loss 6.02 %

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BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name: TRC 0801 Date: 4/1/2008
Material: Gregg Street Tested By: Annette
Source: Station 2

Sample Number	G2-12W	G2-6W	G2-J	G2-6E	G2-12E
Dry Weight in Air, gm (A)	2651.6	1597.0	2316.5	1995.4	2861.9
Submerged Weight, gm (C)	1490.9	889.1	1285.4	1109.7	1604.1
SSD Weight, gm (B)	2662.0	1611.7	2371.0	2027.3	2894.6
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.264	2.210	2.134	2.175	2.218
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	0.9	2.0	5.0	3.5	2.5

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008

Source: Gregg Street - Station 1 Tested By: Annette

Sample Number	G2-12W	G2-6W	G2-J	G2-6E	G2-12E
Wt. of Dry Core in Air before testing, g (A)	2651.6	1597.0	2316.5	1995.4	2861.9
Wt. of Sealed Core in Air, g (B)	2703.0	1648.2	2368.0	2047.0	2913.4
Wt of Sealed Core in Water, g (C)	1463.5	856.5	1191.2	1042.7	1549.1
Wt. of Dry Core in Air after testing, g (D)	2651.6	1597.0	2316.3	1995.2	2861.5
Bag Weight E = (B - A)	51.4	51.2	51.5	51.6	51.5
Bag Ratio F = A / E	51.588	31.191	44.981	38.671	55.571
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.774	0.808	0.785	0.795	0.767
Total Volume H = (E + D) - C	1239.5	791.7	1176.6	1004.1	1363.9
Bag Volume I = E / G	66.4	63.4	65.6	64.9	67.1
Sample Volume J = H - I	1173.1	728.3	1111.0	939.2	1296.8
Bulk Specific Gravity (G_{mb}) K = A / J	2.260	2.193	2.085	2.125	2.207
Check: % wt. change *(must be -0.08% to +0.04%)*	0.00%	0.00%	0.01%	0.01%	0.01%

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KUSS Gmb

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 1		

Sample Number	G2-12W	G2-6W	G2-J	G2-6E	G2-12E
Dry Weight in Air, gm	2651.6	1597.0	2316.3	1995.2	2861.5
Sample Volume, cc	1169	719	1050	908	1282
Bulk Specific Gravity, Gmb	2.268	2.219	2.204	2.195	2.231

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ASPHALT LABORATORY

LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 4/1/2008
Source: Gregg Street - Station 1 Tested By: Annette

Sample Number	G2-12W	G2-6W	G2-J	G2-6E	G2-12E
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	68.81	44.45	63.72	54.84	75.46
Specimen height, mm	69.80	42.77	64.51	56.94	74.51
Specimen height, mm	69.63	40.18	64.46	52.49	74.18
Specimen height, mm	67.26	40.70	62.62	52.23	75.67
Average specimen height, cm	6.888	4.203	6.383	5.413	7.496
Specimen diameter, mm	151.05	152.05	151.08	152.01	151.79
Specimen diameter, mm	150.97	152.37	151.42	151.95	152.42
Specimen diameter, mm	150.67	151.21	151.46	151.65	152.35
Specimen diameter, mm	151.08	152.61	151.59	152.99	151.59
Average specimen diameter, cm	15.094	15.206	15.139	15.215	15.204
Specimen Area, cm^2	178.942	181.602	179.999	181.817	181.548
			REP #1		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	65.2	59.0	61.0	58.0	61.0
Time, final (min.)	15.0	15.0	6.8	10.9	15.0
Ht @ Time, final	65.2	56.7	0.0	0.0	60.2
Permeability 1 ($k \times 10^{-5}$)	0.00	0.64	110.05	55.75	0.41
			REP #2		
Time, initial (min.)	15.0	15.0	0.0	0.0	15.0
Ht. @ Time, initial	65.2	56.7	57.0	59.0	60.2
Time, final (min.)	30.0	30.0	7.2	11.5	30.0
Ht @ Time, final	65.2	55.1	0.0	0.0	59.2
Permeability 2 ($k \times 10^{-5}$)	0.00	0.46	99.57	53.28	0.46
Average Permeability ($k \times 10^{-5}$)	0.00	0.55	104.81	54.51	0.43
Water Temp, F	68.0	71.0	69.0	69.0	66.5
Water Temp, C	20.0	21.7	20.6	20.6	19.2
R_T Factor	1.0000	0.9602	0.9856	0.9856	1.0202
PERMEABILITY (k x 10-5)	0.00	0.52	103.30	53.73	0.44

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ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name: TRC 0801
Material: Gregg Street
Source: Station 1

Date: 4/1/2008
Tested By: Annette

Test Samples Sample ID	G2-12W	G2-6W	G2-J	G2-6E	G2-12E
Weight of Basket (g)	3264.00	3271.00	3262.00	3264.00	3257.00
Specimen + Basket (g)	5869.00	4864.00	5557.00	5243.00	6081.00
Net Wt. of Specimen (g)	2605.00	1593.00	2295.00	1979.00	2824.00
Calibration Factor	0.00	0.00	0.00	0.00	0.00
Temperature Correction Factor	0.11	0.18	0.08	0.10	0.05
Oven Derived AC%	6.43	6.76	6.45	6.37	6.36
Corrected Value (if CF not used)	6.43	6.76	6.45	6.37	6.36

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name: TRC 0801 Date: 4/1/2008
Material: Gregg Street Tested By: Annette
Source: Station 2 - 12W

WET and DRY SIEVE ANALYSIS								
Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0	579.60	530.00	49.60	49.60	2.04	97.96	98.0
3/4	19.0	550.80	535.90	14.90	64.50	2.65	97.35	97.4
1/2	12.5	713.40	526.60	186.80	251.30	10.32	89.68	89.7
3/8	9.5	762.10	528.00	234.10	485.40	19.94	80.06	80.1
#4	4.750	1224.60	494.10	730.50	1215.90	49.95	50.05	50.1
#8	2.360	891.80	473.20	418.60	1634.50	67.14	32.86	32.9
#16	1.180	657.30	415.40	241.90	1876.40	77.08	22.92	22.9
#30	0.600	516.90	378.00	138.90	2015.30	82.78	17.22	17.2
#40	0.425	405.40	359.80	45.60	2060.90	84.66	15.34	15.3
#50	0.300	388.30	351.00	37.30	2098.20	86.19	13.81	13.8
#100	0.150	401.60	336.10	65.50	2163.70	88.88	11.12	11.1
#200	0.075	395.60	326.10	69.50	2233.20	91.74	8.26	8.26
Pan	Pan	382.50	366.00	16.50	2249.70			

A) Weight of Original Sample, g	2434.40	AHTD Dust Proportion	0.54
B) Weight after Wash, g	2249.70		
C) Wash Loss, g (A-B)	184.70	Fineness Modulus	4.746
D) Minus #200 From Sieve, g	16.50		
Total Minus #200, g (C+D)	201.20	Acceptance Check	1.0000

Wash Loss 7.59 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 2 - 6W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	661.90	526.50	135.40	135.40	9.13	90.87	90.9
3/8	9.5	668.60	529.50	139.10	274.50	18.52	81.48	81.5
#4	4.750	981.40	494.40	487.00	761.50	51.37	48.63	48.6
#8	2.360	746.60	473.50	273.10	1034.60	69.80	30.20	30.2
#16	1.180	551.40	415.70	135.70	1170.30	78.95	21.05	21.0
#30	0.600	454.50	378.00	76.50	1246.80	84.11	15.89	15.9
#40	0.425	384.60	359.80	24.80	1271.60	85.79	14.21	14.2
#50	0.300	371.30	351.00	20.30	1291.90	87.16	12.84	12.8
#100	0.150	374.30	336.10	38.20	1330.10	89.73	10.27	10.3
#200	0.075	367.00	326.10	40.90	1371.00	92.49	7.51	7.51
Pan	Pan	378.00	366.00	12.00	1383.00			

A) Weight of Original Sample, g	1482.30	AHTD Dust Proportion	0.53
B) Weight after Wash, g	1383.00		
C) Wash Loss, g (A-B)	99.30	Fineness Modulus	4.796
D) Minus #200 From Sieve, g	12.00		
Total Minus #200, g (C+D)	111.30	Acceptance Check	1.0000

Wash Loss 6.70 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 2 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	693.40	526.50	166.90	166.90	7.79	92.21	92.2
3/8	9.5	809.40	527.90	281.50	448.40	20.93	79.07	79.1
#4	4.750	1206.10	493.90	712.20	1160.60	54.18	45.82	45.8
#8	2.360	830.10	473.20	356.90	1517.50	70.84	29.16	29.2
#16	1.180	606.50	415.50	191.00	1708.50	79.75	20.25	20.2
#30	0.600	485.50	378.00	107.50	1816.00	84.77	15.23	15.2
#40	0.425	395.00	359.70	35.30	1851.30	86.42	13.58	13.6
#50	0.300	379.60	351.00	28.60	1879.90	87.76	12.24	12.2
#100	0.150	387.30	336.10	51.20	1931.10	90.15	9.85	9.9
#200	0.075	380.80	326.10	54.70	1985.80	92.70	7.30	7.30
Pan	Pan	381.20	366.00	15.20	2001.00			

A) Weight of Original Sample, g	2142.20	AHTD Dust Proportion	0.54
B) Weight after Wash, g	2001.00		
C) Wash Loss, g (A-B)	141.20	Fineness Modulus	4.884
D) Minus #200 From Sieve, g	15.20		
Total Minus #200, g (C+D)	156.40	Acceptance Check	1.0000

Wash Loss 6.59 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 2 - 6E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	684.30	526.50	157.80	157.80	8.53	91.47	91.5
3/8	9.5	776.10	528.00	248.10	405.90	21.93	78.07	78.1
#4	4.750	1109.80	494.00	615.80	1021.70	55.20	44.80	44.8
#8	2.360	780.00	473.50	306.50	1328.20	71.76	28.24	28.2
#16	1.180	577.20	416.10	161.10	1489.30	80.46	19.54	19.5
#30	0.600	464.40	378.00	86.40	1575.70	85.13	14.87	14.9
#40	0.425	388.00	359.70	28.30	1604.00	86.66	13.34	13.3
#50	0.300	374.10	351.00	23.10	1627.10	87.91	12.09	12.1
#100	0.150	379.10	336.20	42.90	1670.00	90.23	9.77	9.8
#200	0.075	373.00	326.10	46.90	1716.90	92.76	7.24	7.24
Pan	Pan	378.80	366.00	12.80	1729.70			

A) Weight of Original Sample, g	1850.90	AHTD Dust Proportion	0.54
B) Weight after Wash, g	1529.70		
C) Wash Loss, g (A-B)	321.20	Fineness Modulus	4.926
D) Minus #200 From Sieve, g	12.80		
Total Minus #200, g (C+D)	334.00	Acceptance Check	1.1307

Wash Loss 17.35 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 2 - 12E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0	574.80	530.00	44.80	44.80	1.69	98.31	98.3
3/4	19.0	550.90	535.80	15.10	59.90	2.27	97.73	97.7
1/2	12.5	708.70	526.50	182.20	242.10	9.16	90.84	90.8
3/8	9.5	822.90	528.00	294.90	537.00	20.31	79.69	79.7
#4	4.750	1301.60	494.00	807.60	1344.60	50.85	49.15	49.1
#8	2.360	941.20	473.20	468.00	1812.60	68.55	31.45	31.4
#16	1.180	678.70	415.10	263.60	2076.20	78.52	21.48	21.5
#30	0.600	520.90	377.90	143.00	2219.20	83.93	16.07	16.1
#40	0.425	406.70	359.70	47.00	2266.20	85.70	14.30	14.3
#50	0.300	389.50	351.00	38.50	2304.70	87.16	12.84	12.8
#100	0.150	403.00	336.00	67.00	2371.70	89.69	10.31	10.3
#200	0.075	396.70	326.10	70.60	2442.30	92.36	7.64	7.64
Pan	Pan	387.10	366.00	21.10	2463.40			

A) Weight of Original Sample, g	2644.20	AHTD Dust Proportion	0.53
B) Weight after Wash, g	2463.40		
C) Wash Loss, g (A-B)	180.80	Fineness Modulus	4.813
D) Minus #200 From Sieve, g	21.10		
Total Minus #200, g (C+D)	201.90	Acceptance Check	1.0000

Wash Loss 6.84 %

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MATERIALS LABORATORY

BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 3		

Sample Number	G3-12W	G3-6W	G3-J	G3-6E	G3-12E
Dry Weight in Air, gm (A)	1692.5	1838.9	1849.3	2039.1	2117.7
Submerged Weight, gm (C)	967.7	1035.4	1018.0	1150.7	1205.4
SSD Weight, gm (B)	1703.9	1849.7	1877.2	2054.3	2134.2
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.299	2.258	2.152	2.257	2.280
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	1.5	1.3	3.2	1.7	1.8

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
ASPHALT LABORATORY

BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008

Source: Gregg Street - Station 3 Tested By: Annette

Sample Number	G3-12W	G3-6W	G3-J	G3-6E	G3-12E
Wt. of Dry Core in Air before testing, g (A)	1692.5	1838.9	1849.3	2039.1	2117.7
Wt. of Sealed Core in Air, g (B)	1744.1	1889.9	1900.7	2090.2	2169.4
Wt of Sealed Core in Water, g (C)	940.5	1003.1	970.0	1115.2	1175.8
Wt. of Dry Core in Air after testing, g (D)	1692.4	1838.8	1849.1	2038.9	2117.5
Bag Weight E = (B - A)	51.6	51.0	51.4	51.1	51.7
Bag Ratio F = A / E	32.800	36.057	35.979	39.904	40.961
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.805	0.800	0.800	0.793	0.792
Total Volume H = (E + D) - C	803.5	886.7	930.5	974.8	993.4
Bag Volume I = E / G	64.1	63.8	64.3	64.4	65.3
Sample Volume J = H - I	739.4	822.9	866.2	910.4	928.1
Bulk Specific Gravity (G_{mb}) K = A / J	2.289	2.235	2.135	2.240	2.282
Check: % wt. change *(must be -0.08% to +0.04%)*	0.01%	0.01%	0.01%	0.01%	0.01%

KUSS Gmb

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 3		

Sample Number	G3-12W	G3-6W	G3-J	G3-6E	G3-12E
Dry Weight in Air, gm	1692.4	1838.8	1849.1	2038.9	2117.5
Sample Volume, cc	735	818	833	900	927
Bulk Specific Gravity, Gmb	2.299	2.245	2.219	2.265	2.284

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ASPHALT LABORATORY

LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 4/1/2008
Source: Gregg Street - Station 3 Tested By: Annette

Sample Number	G3-12W	G3-6W	G3-J	G3-6E	G3-12E
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	39.85	46.69	47.66	50.88	52.52
Specimen height, mm	42.07	48.11	51.75	52.53	51.43
Specimen height, mm	45.57	48.78	54.47	54.69	54.42
Specimen height, mm	42.93	46.33	48.76	52.12	54.75
Average specimen height, cm	4.261	4.748	5.066	5.256	5.328
Specimen diameter, mm	152.61	152.90	153.13	151.72	151.92
Specimen diameter, mm	151.89	152.72	151.37	152.57	151.77
Specimen diameter, mm	152.84	152.47	152.48	151.15	151.52
Specimen diameter, mm	151.74	152.89	151.35	151.14	151.93
Average specimen diameter, cm	15.227	15.275	15.208	15.165	15.179
Specimen Area, cm^2	182.104	183.242	181.655	180.612	180.945
			REP #1		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	60.8	58.0	59.8	60.0	60.0
Time, final (min.)	15.0	15.0	15.0	15.0	15.0
Ht @ Time, final	60.8	38.5	54.4	60.0	58.8
Permeability 1 (k x 10^{-5})	0.00	7.04	1.82	0.00	0.41
			REP #2		
Time, initial (min.)	15.0	0.0	15.0	15.0	15.0
Ht. @ Time, initial	60.8	61.5	54.4	60.0	58.8
Time, final (min.)	30.0	15.0	30.0	30.0	30.0
Ht @ Time, final	60.8	42.1	50.1	60.0	57.7
Permeability 2 (k x 10^{-5})	0.00	6.63	1.56	0.00	0.39
Average Permeability (k x 10^{-5})	0.00	6.83	1.69	0.00	0.40
Water Temp, F	71.0	71.0	71.0	71.0	71.0
Water Temp, C	21.7	21.7	21.7	21.7	21.7
R_T Factor	0.9602	0.9602	0.9602	0.9602	0.9602
PERMEABILITY (k x 10-5)	0.00	6.56	1.62	0.00	0.38

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ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 3		

ASPHALT CONTENT BY THE IGNITION METHOD

Test Samples					
Sample ID	G3-12W	G3-6W	G3-J	G3-6E	G3-12E
Weight of Basket (g)	3267.00	3267.00	3273.00	3271.00	3275.00
Specimen + Basket (g)	4941.00	5098.00	5106.00	5293.00	5359.00
Net Wt. of Specimen (g)	1674.00	1831.00	1833.00	2022.00	2084.00
Calibration Factor	0.00	0.00	0.00	0.00	0.00
Temperature Correction Factor	0.12	0.16	0.13	0.14	0.10
Oven Derived AC%	6.52	6.86	6.50	6.74	6.71
Corrected Value (if CF not used)	6.52	6.86	6.50	6.74	6.71

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 3 - 12W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	647.50	526.40	121.10	121.10	7.75	92.25	92.3
3/8	9.5	709.90	527.80	182.10	303.20	19.40	80.60	80.6
#4	4.750	986.00	494.40	491.60	794.80	50.86	49.14	49.1
#8	2.360	756.50	474.90	281.60	1076.40	68.88	31.12	31.1
#16	1.180	565.30	416.50	148.80	1225.20	78.40	21.60	21.6
#30	0.600	461.20	378.20	83.00	1308.20	83.71	16.29	16.3
#40	0.425	386.70	359.90	26.80	1335.00	85.43	14.57	14.6
#50	0.300	372.90	351.10	21.80	1356.80	86.82	13.18	13.2
#100	0.150	377.10	336.10	41.00	1397.80	89.45	10.55	10.6
#200	0.075	371.00	326.10	44.90	1442.70	92.32	7.68	7.68
Pan	Pan	377.00	366.00	11.00	1453.70			

A) Weight of Original Sample, g	1562.70	AHTD Dust Proportion	0.53
B) Weight after Wash, g	1453.70		
C) Wash Loss, g (A-B)	109.00	Fineness Modulus	4.775
D) Minus #200 From Sieve, g	11.00		
Total Minus #200, g (C+D)	120.00	Acceptance Check	1.0000

Wash Loss 6.98 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 3 - 6W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	639.20	526.40	112.80	112.80	6.63	93.37	93.4
3/8	9.5	721.20	528.00	193.20	306.00	17.97	82.03	82.0
#4	4.750	1046.40	494.10	552.30	858.30	50.42	49.58	49.6
#8	2.360	780.40	473.70	306.70	1165.00	68.43	31.57	31.6
#16	1.180	584.20	415.90	168.30	1333.30	78.32	21.68	21.7
#30	0.600	469.30	378.00	91.30	1424.60	83.68	16.32	16.3
#40	0.425	389.20	359.80	29.40	1454.00	85.41	14.59	14.6
#50	0.300	374.70	351.00	23.70	1477.70	86.80	13.20	13.2
#100	0.150	381.30	336.10	45.20	1522.90	89.46	10.54	10.5
#200	0.075	376.00	326.10	49.90	1572.80	92.39	7.61	7.61
Pan	Pan	384.50	366.00	18.50	1591.30			

A) Weight of Original Sample, g	1702.40	AHTD Dust Proportion	0.52
B) Weight after Wash, g	1591.30		
C) Wash Loss, g (A-B)	111.10	Fineness Modulus	4.751
D) Minus #200 From Sieve, g	18.50		
Total Minus #200, g (C+D)	129.60	Acceptance Check	1.0000

Wash Loss 6.53 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 3 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	633.50	526.30	107.20	107.20	6.26	93.74	93.7
3/8	9.5	732.90	527.90	205.00	312.20	18.24	81.76	81.8
#4	4.750	1062.50	494.20	568.30	880.50	51.45	48.55	48.6
#8	2.360	773.50	473.40	300.10	1180.60	68.98	31.02	31.0
#16	1.180	577.60	416.00	161.60	1342.20	78.43	21.57	21.6
#30	0.600	466.80	377.90	88.90	1431.10	83.62	16.38	16.4
#40	0.425	388.80	359.70	29.10	1460.20	85.32	14.68	14.7
#50	0.300	374.60	350.90	23.70	1483.90	86.71	13.29	13.3
#100	0.150	380.10	336.00	44.10	1528.00	89.28	10.72	10.7
#200	0.075	375.10	326.00	49.10	1577.10	92.15	7.85	7.85
Pan	Pan	378.00	365.90	12.10	1589.20			

A) Weight of Original Sample, g	1711.40	AHTD Dust Proportion	0.53
B) Weight after Wash, g	1589.20		
C) Wash Loss, g (A-B)	122.20	Fineness Modulus	4.767
D) Minus #200 From Sieve, g	12.10		
Total Minus #200, g (C+D)	134.30	Acceptance Check	1.0000

Wash Loss 7.14 %

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 3 - 6E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	664.70	526.50	138.20	138.20	7.34	92.66	92.7
3/8	9.5	767.60	527.90	239.70	377.90	20.07	79.93	79.9
#4	4.750	1132.30	494.10	638.20	1016.10	53.97	46.03	46.0
#8	2.360	782.80	473.90	308.90	1325.00	70.38	29.62	29.6
#16	1.180	589.80	416.10	173.70	1498.70	79.60	20.40	20.4
#30	0.600	468.70	378.10	90.60	1589.30	84.42	15.58	15.6
#40	0.425	388.90	359.80	29.10	1618.40	85.96	14.04	14.0
#50	0.300	374.70	351.00	23.70	1642.10	87.22	12.78	12.8
#100	0.150	377.40	336.10	41.30	1683.40	89.41	10.59	10.6
#200	0.075	373.30	326.10	47.20	1730.60	91.92	8.08	8.08
Pan	Pan	376.40	365.90	10.50	1741.10			

A) Weight of Original Sample, g	1882.70	AHTD Dust Proportion	0.58
B) Weight after Wash, g	1741.10		
C) Wash Loss, g (A-B)	141.60	Fineness Modulus	4.851
D) Minus #200 From Sieve, g	10.50		
Total Minus #200, g (C+D)	152.10	Acceptance Check	1.0000

Wash Loss 7.52 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 3 - 12E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	636.20	526.40	109.80	109.80	5.65	94.35	94.3
3/8	9.5	807.30	527.90	279.40	389.20	20.04	79.96	80.0
#4	4.750	1134.60	494.10	640.50	1029.70	53.03	46.97	47.0
#8	2.360	782.60	474.40	308.20	1337.90	68.90	31.10	31.1
#16	1.180	611.90	416.40	195.50	1533.40	78.96	21.04	21.0
#30	0.600	478.10	378.20	99.90	1633.30	84.11	15.89	15.9
#40	0.425	391.70	359.70	32.00	1665.30	85.76	14.24	14.2
#50	0.300	377.00	351.10	25.90	1691.20	87.09	12.91	12.9
#100	0.150	387.00	336.20	50.80	1742.00	89.71	10.29	10.3
#200	0.075	382.70	326.10	56.60	1798.60	92.62	7.38	7.38
Pan	Pan	383.20	365.90	17.30	1815.90			

A) Weight of Original Sample, g	1941.90	AHTD Dust Proportion	0.52
B) Weight after Wash, g	1815.90		
C) Wash Loss, g (A-B)	126.00	Fineness Modulus	4.818
D) Minus #200 From Sieve, g	17.30		
Total Minus #200, g (C+D)	143.30	Acceptance Check	1.0000

Wash Loss 6.49 %

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MATERIALS LABORATORY

BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 4		

Sample Number	G4-12W	G4-6W	G4-J	G4-6E	G4-12E
Dry Weight in Air, gm (A)	1970.0	2347.2	2055.0	2310.0	1908.0
Submerged Weight, gm (C)	1122.2	1325.0	1133.6	1298.3	1087.4
SSD Weight, gm (B)	1980.9	2378.5	2088.6	2338.2	1921.3
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.294	2.228	2.152	2.221	2.288
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	1.3	3.0	3.5	2.7	1.6

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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ASPHALT LABORATORY

BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008

Source: Gregg Street - Station 4 Tested By: Annette

Sample Number	G4-12W	G4-6W	G4-J	G4-6E	G4-12E
Wt. of Dry Core in Air before testing, g (A)	1970.1	2347.2	2055.9	2310.1	1908.2
Wt. of Sealed Core in Air, g (B)	2020.9	2398.5	2106.4	2361.1	1958.9
Wt of Sealed Core in Water, g (C)	1094.6	1259.6	1069.8	1248.8	1054.7
Wt. of Dry Core in Air after testing, g (D)	1970.0	2347.2	2055.0	2310.0	1908.0
Bag Weight E = (B - A)	50.8	51.3	50.5	51.0	50.7
Bag Ratio F = A / E	38.781	45.754	40.711	45.296	37.637
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.795	0.784	0.792	0.784	0.797
Total Volume H = (E + D) - C	926.2	1138.9	1035.7	1112.2	904.0
Bag Volume I = E / G	63.9	65.5	63.8	65.0	63.6
Sample Volume J = H - I	862.3	1073.4	971.9	1047.2	840.4
Bulk Specific Gravity (G_{mb}) K = A / J	2.285	2.187	2.115	2.206	2.271
Check: % wt. change *(must be -0.08% to +0.04%)*	0.01%	0.00%	0.04%	0.00%	0.01%

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ASPHALT LABORATORY

KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Gregg Street Tested By: Annette
Source: Station 4

Sample Number	G4-12W	G4-6W	G4-J	G4-6E	G4-12E
Dry Weight in Air, gm	1970.0	2347.2	2055.0	2310.0	1908.0
Sample Volume, cc	856	1058	926	1029	834
Bulk Specific Gravity, Gmb	2.299	2.218	2.218	2.244	2.287

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
ASPHALT LABORATORY
LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 | Date: 4/1/2008
Source: Gregg Street - Station 4 | Tested By: Annette

Sample Number	G4-12W	G4-6W	G4-J	G4-6E	G4-12E
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	51.23	62.18	56.26	60.24	47.30
Specimen height, mm	49.61	61.69	61.36	60.59	48.03
Specimen height, mm	50.78	60.22	56.38	59.60	48.81
Specimen height, mm	50.34	62.14	53.79	60.37	76.76
Average specimen height, cm	5.049	6.156	5.695	6.020	5.523
Specimen diameter, mm	151.47	152.50	151.93	152.32	152.11
Specimen diameter, mm	151.22	153.53	151.76	152.22	153.52
Specimen diameter, mm	151.26	152.83	151.32	151.67	152.02
Specimen diameter, mm	151.20	152.91	151.91	151.92	151.89
Average specimen diameter, cm	15.129	15.294	15.173	15.203	15.239
Specimen Area, cm^2	179.761	183.716	180.814	181.536	182.379
			REP #1		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	60.5	60.0	58.5	62.5	61.6
Time, final (min.)	15.0	7.4	15.0	15.0	15.0
Ht @ Time, final	60.5	0.0	26.8	61.1	59.1
Permeability 1 ($k \times 10^{-5}$)	0.00	93.74	15.47	0.53	0.88
			REP #2		
Time, initial (min.)	15.0	0.0	0.0	15.0	15.0
Ht. @ Time, initial	60.5	56.0	58.5	61.1	59.1
Time, final (min.)	30.0	7.5	15.0	30.0	30.0
Ht @ Time, final	60.5	0.0	27.8	59.8	57.1
Permeability 2 ($k \times 10^{-5}$)	0.00	90.15	14.82	0.50	0.72
Average Permeability ($k \times 10^{-5}$)	0.00	91.94	15.14	0.51	0.80
Water Temp, F	71.0	68.0	71.0	71.0	71.0
Water Temp, C	21.7	20.0	21.7	21.7	21.7
R_T Factor	0.9602	1.0000	0.9602	0.9602	0.9602
PERMEABILITY (k x 10-5)	0.00	91.94	14.54	0.49	0.77

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

ASPHALT CONTENT BY THE IGNITION METHOD (AASHTO T 308)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 4		

ASPHALT CONTENT BY THE IGNITION METHOD

Test Samples					
Sample ID	G4-12W	G4-6W	G4-J	G4-6E	G4-12E
Weight of Basket (g)	3271.00	3256.00	3264.00	3272.00	3272.00
Specimen + Basket (g)	5213.00	5562.00	5322.00	5557.00	5159.00
Net Wt. of Specimen (g)	1942.00	2306.00	2058.00	2285.00	1887.00
Calibration Factor	0.00	0.00	0.00	0.00	0.00
Temperature Correction Factor	0.13	0.13	0.14	0.08	0.15
Oven Derived AC%	6.66	6.43	7.33	6.49	6.86
Corrected Value (if CF not used)	6.66	6.43	7.33	6.49	6.86

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 4 - 12W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	691.60	526.40	165.20	165.20	9.13	90.87	90.9
3/8	9.5	694.90	528.00	166.90	332.10	18.35	81.65	81.7
#4	4.750	1073.10	494.00	579.10	911.20	50.34	49.66	49.7
#8	2.360	797.80	473.50	324.30	1235.50	68.26	31.74	31.7
#16	1.180	593.90	415.60	178.30	1413.80	78.11	21.89	21.9
#30	0.600	476.10	377.90	98.20	1512.00	83.54	16.46	16.5
#40	0.425	391.20	359.70	31.50	1543.50	85.28	14.72	14.7
#50	0.300	376.30	351.00	25.30	1568.80	86.67	13.33	13.3
#100	0.150	384.50	336.10	48.40	1617.20	89.35	10.65	10.7
#200	0.075	379.80	326.10	53.70	1670.90	92.31	7.69	7.69
Pan	Pan	381.20	366.00	15.20	1686.10			

A) Weight of Original Sample, g	1810.00	AHTD Dust Proportion	0.52
B) Weight after Wash, g	1686.10		
C) Wash Loss, g (A-B)	123.90	Fineness Modulus	4.746
D) Minus #200 From Sieve, g	15.20		
Total Minus #200, g (C+D)	139.10	Acceptance Check	1.0000

Wash Loss 6.85 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 4 - 6W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	755.80	526.50	229.30	229.30	10.64	89.36	89.4
3/8	9.5	778.50	528.10	250.40	479.70	22.27	77.73	77.7
#4	4.750	1165.30	494.00	671.30	1151.00	53.42	46.58	46.6
#8	2.360	846.10	465.50	380.60	1531.60	71.09	28.91	28.9
#16	1.180	607.80	414.50	193.30	1724.90	80.06	19.94	19.9
#30	0.600	485.10	377.80	107.30	1832.20	85.04	14.96	15.0
#40	0.425	393.40	358.50	34.90	1867.10	86.66	13.34	13.3
#50	0.300	378.40	351.00	27.40	1894.50	87.93	12.07	12.1
#100	0.150	386.80	336.00	50.80	1945.30	90.29	9.71	9.7
#200	0.075	383.70	325.80	57.90	2003.20	92.98	7.02	7.02
Pan	Pan	379.50	366.00	13.50	2016.70			

A) Weight of Original Sample, g	2154.50	AHTD Dust Proportion	0.53
B) Weight after Wash, g	2016.70		
C) Wash Loss, g (A-B)	137.80	Fineness Modulus	4.901
D) Minus #200 From Sieve, g	13.50		
Total Minus #200, g (C+D)	151.30	Acceptance Check	1.0000

Wash Loss 6.40 %

UNIVERSITY OF ARKANSAS
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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 4 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	674.10	526.40	147.70	147.70	7.76	92.24	92.2
3/8	9.5	762.00	528.00	234.00	381.70	20.05	79.95	80.0
#4	4.750	1142.80	494.40	648.40	1030.10	54.10	45.90	45.9
#8	2.360	782.60	473.70	308.90	1339.00	70.32	29.68	29.7
#16	1.180	586.30	415.80	170.50	1509.50	79.28	20.72	20.7
#30	0.600	472.40	377.90	94.50	1604.00	84.24	15.76	15.8
#40	0.425	390.80	359.70	31.10	1635.10	85.87	14.13	14.1
#50	0.300	376.20	351.00	25.20	1660.30	87.20	12.80	12.8
#100	0.150	382.70	336.10	46.60	1706.90	89.64	10.36	10.4
#200	0.075	376.60	326.10	50.50	1757.40	92.30	7.70	7.70
Pan	Pan	379.20	366.00	13.20	1770.60			

A) Weight of Original Sample, g	1904.10	AHTD Dust Proportion	0.55
B) Weight after Wash, g	1770.60		
C) Wash Loss, g (A-B)	133.50	Fineness Modulus	4.848
D) Minus #200 From Sieve, g	13.20		
Total Minus #200, g (C+D)	146.70	Acceptance Check	1.0000

Wash Loss 7.01 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 4 - 6E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	691.50	526.40	165.10	165.10	7.73	92.27	92.3
3/8	9.5	811.60	527.90	283.70	448.80	21.02	78.98	79.0
#4	4.750	1187.20	494.20	693.00	1141.80	53.49	46.51	46.5
#8	2.360	821.10	473.50	347.60	1489.40	69.77	30.23	30.2
#16	1.180	620.10	415.70	204.40	1693.80	79.34	20.66	20.7
#30	0.600	486.30	378.00	108.30	1802.10	84.42	15.58	15.6
#40	0.425	394.70	359.80	34.90	1837.00	86.05	13.95	13.9
#50	0.300	379.60	351.00	28.60	1865.60	87.39	12.61	12.6
#100	0.150	390.00	336.10	53.90	1919.50	89.91	10.09	10.1
#200	0.075	386.00	326.10	59.90	1979.40	92.72	7.28	7.28
Pan	Pan	385.30	366.00	19.30	1998.70			

A) Weight of Original Sample, g	2134.80	AHTD Dust Proportion	0.52
B) Weight after Wash, g	1998.70		
C) Wash Loss, g (A-B)	136.10	Fineness Modulus	4.853
D) Minus #200 From Sieve, g	19.30		
Total Minus #200, g (C+D)	155.40	Acceptance Check	1.0000

Wash Loss 6.38 %

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Gregg Street	Tested By:	Annette
Source:	Station 4 - 12E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0			0.00	0.00	0.00	100.00	100.0
1/2	12.5	639.60	526.40	113.20	113.20	6.45	93.55	93.5
3/8	9.5	733.20	528.00	205.20	318.40	18.15	81.85	81.9
#4	4.750	1083.20	494.10	589.10	907.50	51.72	48.28	48.3
#8	2.360	773.80	473.60	300.20	1207.70	68.83	31.17	31.2
#16	1.180	590.80	416.20	174.60	1382.30	78.78	21.22	21.2
#30	0.600	468.70	378.10	90.60	1472.90	83.95	16.05	16.1
#40	0.425	389.10	359.80	29.30	1502.20	85.61	14.39	14.4
#50	0.300	374.80	351.40	23.40	1525.60	86.95	13.05	13.1
#100	0.150	381.20	336.10	45.10	1570.70	89.52	10.48	10.5
#200	0.075	377.00	326.10	50.90	1621.60	92.42	7.58	7.58
Pan	Pan	382.70	365.90	16.80	1638.40			

A) Weight of Original Sample, g	1754.60	AHTD Dust Proportion	0.53
B) Weight after Wash, g	1638.40		
C) Wash Loss, g (A-B)	116.20	Fineness Modulus	4.779
D) Minus #200 From Sieve, g	16.80		
Total Minus #200, g (C+D)	133.00	Acceptance Check	1.0000

Wash Loss 6.62 %

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BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Annette
Source:	Station 1		

Sample Number	R1-12W	R1-6W	R1-J	R1-6E	R1-12E
Dry Weight in Air, gm (A)	1577.8	1622.3	1510.2	1548.6	1751.2
Submerged Weight, gm (C)	897.0	919.2	856.4	874.0	986.8
SSD Weight, gm (B)	1593.9	1645.2	1578.7	1604.3	1809.7
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.264	2.235	2.091	2.120	2.128
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	2.3	3.2	9.5	7.6	7.1

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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ASPHALT LABORATORY

BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008

Source: Russellville - Hwy. 7 - Station 1 Tested By: Annette

Sample Number	R1-12W	R1-6W	R1-J	R1-6E	R1-12E
Wt. of Dry Core in Air before testing, g (A)	1578.5	1623.6	1510.2	1549.8	1753.5
Wt. of Sealed Core in Air, g (B)	1629.4	1673.7	1561.4	1599.8	1802.3
Wt of Sealed Core in Water, g (C)	867.7	881.9	755.2	790.5	908.9
Wt. of Dry Core in Air after testing, g (D)	1577.8	1622.3	1510.2	1548.6	1751.2
Bag Weight E = (B - A)	50.9	50.1	51.2	50.0	48.8
Bag Ratio F = A / E	31.012	32.407	29.496	30.996	35.932
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.808	0.806	0.811	0.808	0.800
Total Volume H = (E + D) - C	761.0	790.5	806.2	808.1	891.1
Bag Volume I = E / G	63.0	62.2	63.2	61.9	61.0
Sample Volume J = H - I	698.0	728.3	743.0	746.2	830.1
Bulk Specific Gravity (G_{mb}) K = A / J	2.261	2.229	2.032	2.077	2.112
Check: % wt. change *(must be -0.08% to +0.04%)*	0.04%	0.08%	0.00%	0.08%	0.13%

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KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Russellville - Hwy. 7 Tested By: Annette
Source: Station 1

Sample Number	R1-12W	R1-6W	R1-J	R1-6E	R1-12E
Dry Weight in Air, gm	1802.3	1622.3	1510.2	1548.6	1751.2
Sample Volume, cc	688	708	665	677	773
Bulk Specific Gravity, Gmb	2.617	2.289	2.270	2.287	2.263

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ASPHALT LABORATORY

LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: Started 5/27/2008
Source: Russelville - Hwy. 7 - Station 1 Tested By: Leela

Sample Number	R1-12W		R1-6W		R1-J	R1-6E	R1-12E
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	40.65	40.65	41.05	41.05	44.07	40.29	45.43
Specimen height, mm	39.02	39.02	41.01	41.01	42.92	40.43	45.56
Specimen height, mm	37.37	37.37	41.11	41.11	42.56	41.62	48.94
Specimen height, mm	39.28	39.28	41.58	41.58	43.21	40.59	49.78
Average specimen height, cm	3.908	3.908	4.119	4.119	4.319	4.073	4.743
Specimen diameter, mm	150.86	150.86	150.80	150.80	151.32	150.59	150.97
Specimen diameter, mm	150.31	150.31	150.91	150.91	152.13	150.49	150.52
Specimen diameter, mm	150.48	150.48	148.86	148.86	151.54	150.99	150.78
Specimen diameter, mm	150.11	150.11	150.48	150.48	150.40	149.43	150.76
Average specimen diameter, cm	15.044	15.044	15.026	15.026	15.135	15.038	15.076
Specimen Area, cm^2	177.753	177.753	177.334	177.334	179.904	177.599	178.504
	REP #1						
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	59.0	59.0	59.0	59.0	59.0	59.0	59.0
Time, final (min.)	15.4	29.3	15.1	26.5	4.1	11.4	16.7
Ht @ Time, final	48.0	42.0	47.0	41.0	0.0	0.0	0.0
Permeability 1 (k x 10^{-5})	3.00	2.56	3.56	3.19	120.16	41.42	32.88
	REP #2						
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	59.0	59.0	59.0	59.0	59.0	59.0	59.0
Time, final (min.)	18.2	34.4	17.3	28.9	4.2	11.7	15.5
Ht @ Time, final	48.0	42.0	47.0	41.0	0.0	0.0	0.0
Permeability 2 (k x 10^{-5})	2.54	2.18	3.10	2.93	116.87	40.34	35.47
Average Permeability (k x 10^{-5})	2.77	2.37	3.33	3.06	118.51	40.88	34.17
Water Temp, F	68.0	68.0	68.0	68.0	68.0	68.0	68.0
Water Temp, C	20.0	20.0	20.0	20.0	20.0	20.0	20.0
R_T Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
PERMEABILITY (k x 10-5)	2.77	2.37	3.33	3.06	118.51	40.88	34.17
PERMEABILITY (k x 10-5)	2.57		3.20		118.51	40.88	34.17

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ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 1		

ASPHALT CONTENT BY THE IGNITION METHOD

Test Samples					
Sample ID	R1-12W	R1-6W	R1-J	R1-6E	R1-12E
Weight of Basket (g)	3264.30	3266.90	3273.30	3267.70	
Specimen + Basket (g)	4842.60	4888.40	4783.00	4823.10	
Net Wt. of Specimen (g)	1578.30	1621.50	1509.70	1555.40	
Calibration Factor	0.00	0.00	0.00	0.00	
Temperature Correction Factor	0.19	0.17	0.37	0.19	
Oven Derived AC%	6.87	7.00	6.74	7.05	
Corrected Value (if CF not used)	6.87	7.00	6.74	7.05	

UNIVERSITY OF ARKANSAS
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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 1 - 12W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	559.00	551.70	7.30	7.30	0.50	99.50	99.5
1/2	12.5	598.20	527.50	70.70	78.00	5.32	94.68	94.7
3/8	9.5	661.10	521.10	140.00	218.00	14.87	85.13	85.1
#4	4.750	969.50	507.30	462.20	680.20	46.40	53.60	53.6
#8	2.360	723.00	469.10	253.90	934.10	63.72	36.28	36.3
#16	1.180	587.60	453.50	134.10	1068.20	72.87	27.13	27.1
#30	0.600	466.20	389.50	76.70	1144.90	78.10	21.90	21.9
#40	0.425			0.00	1144.90	78.10	21.90	21.9
#50	0.300	434.70	360.40	74.30	1219.20	83.17	16.83	16.8
#100	0.150	430.00	343.60	86.40	1305.60	89.06	10.94	10.9
#200	0.075	350.70	322.50	28.20	1333.80	90.99	9.01	9.01
Pan	Pan	426.60	370.10	56.50	1390.30			

A) Weight of Original Sample, g	1465.90	AHTD Dust Proportion	0.41
B) Weight after Wash, g	1392.70		
C) Wash Loss, g (A-B)	73.20	Fineness Modulus	4.487
D) Minus #200 From Sieve, g	56.50		
Total Minus #200, g (C+D)	129.70	Acceptance Check	0.9983

Wash Loss 4.99 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 1 - 6W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	572.80	560.10	12.70	12.70	0.84	99.16	99.2
1/2	12.5	571.50	523.10	48.40	61.10	4.06	95.94	95.9
3/8	9.5	713.20	549.10	164.10	225.20	14.98	85.02	85.0
#4	4.750	960.90	505.90	455.00	680.20	45.25	54.75	54.7
#8	2.360	691.30	441.00	250.30	930.50	61.90	38.10	38.1
#16	1.180	590.60	442.60	148.00	1078.50	71.75	28.25	28.3
#30	0.600	457.70	377.40	80.30	1158.80	77.09	22.91	22.9
#40	0.425			0.00	1158.80	77.09	22.91	22.9
#50	0.300	446.80	367.20	79.60	1238.40	82.38	17.62	17.6
#100	0.150	433.20	339.20	94.00	1332.40	88.64	11.36	11.4
#200	0.075	393.30	325.80	67.50	1399.90	93.13	6.87	6.87
Pan	Pan	384.70	368.50	16.20	1416.10			

A) Weight of Original Sample, g	1503.20	AHTD Dust Proportion	0.30
B) Weight after Wash, g	1424.10		
C) Wash Loss, g (A-B)	79.10	Fineness Modulus	4.428
D) Minus #200 From Sieve, g	16.20		
Total Minus #200, g (C+D)	95.30	Acceptance Check	0.9944

Wash Loss 5.26 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 1 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.70	551.50	0.20	0.20	0.01	99.99	100.0
1/2	12.5	565.00	527.60	37.40	37.60	2.68	97.32	97.3
3/8	9.5	681.50	521.40	160.10	197.70	14.09	85.91	85.9
#4	4.750	932.20	507.30	424.90	622.60	44.36	55.64	55.6
#8	2.360	738.00	468.50	269.50	892.10	63.56	36.44	36.4
#16	1.180	597.70	453.00	144.70	1036.80	73.87	26.13	26.1
#30	0.600	461.70	389.20	72.50	1109.30	79.04	20.96	21.0
#40	0.425			0.00	1109.30	79.04	20.96	21.0
#50	0.300	418.10	360.20	57.90	1167.20	83.16	16.84	16.8
#100	0.150	423.40	343.50	79.90	1247.10	88.86	11.14	11.1
#200	0.075	359.00	322.50	36.50	1283.60	91.46	8.54	8.54
Pan	Pan	422.10	370.10	52.00	1335.60			

A) Weight of Original Sample, g	1403.50	AHTD Dust Proportion	0.41
B) Weight after Wash, g	1343.30		
C) Wash Loss, g (A-B)	60.20	Fineness Modulus	4.470
D) Minus #200 From Sieve, g	52.00		
Total Minus #200, g (C+D)	112.20	Acceptance Check	0.9943

Wash Loss 4.29 %

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 1 - 6E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.40	551.30	0.10	0.10	0.01	99.99	100.0
1/2	12.5	606.00	527.50	78.50	78.60	5.46	94.54	94.5
3/8	9.5	675.40	520.10	155.30	233.90	16.25	83.75	83.8
#4	4.750	965.00	505.80	459.20	693.10	48.15	51.85	51.8
#8	2.360	726.30	468.40	257.90	951.00	66.07	33.93	33.9
#16	1.180	595.30	453.40	141.90	1092.90	75.93	24.07	24.1
#30	0.600	456.10	389.50	66.60	1159.50	80.55	19.45	19.4
#40	0.425			0.00	1159.50	80.55	19.45	19.4
#50	0.300	404.30	360.50	43.80	1203.30	83.60	16.40	16.4
#100	0.150	418.10	343.60	74.50	1277.80	88.77	11.23	11.2
#200	0.075	359.00	322.30	36.70	1314.50	91.32	8.68	8.68
Pan	Pan	419.70	369.80	49.90	1364.40			

A) Weight of Original Sample, g	1439.40	AHTD Dust Proportion	0.45
B) Weight after Wash, g	1364.40		
C) Wash Loss, g (A-B)	75.00	Fineness Modulus	4.593
D) Minus #200 From Sieve, g	49.90		
Total Minus #200, g (C+D)	124.90	Acceptance Check	1.0000

Wash Loss 5.21 %

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 1 - 12E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.40	551.40	0.00	0.00	0.00	100.00	100.0
1/2	12.5	589.30	527.50	61.80	61.80	3.63	96.37	96.4
3/8	9.5	689.30	520.00	169.30	231.10	13.58	86.42	86.4
#4	4.750	1033.80	505.80	528.00	759.10	44.61	55.39	55.4
#8	2.360	799.60	468.50	331.10	1090.20	64.07	35.93	35.9
#16	1.180	670.40	453.50	216.90	1307.10	76.81	23.19	23.2
#30	0.600	492.80	389.50	103.30	1410.40	82.88	17.12	17.1
#40	0.425			0.00	1410.40	82.88	17.12	17.1
#50	0.300	429.90	360.50	69.40	1479.80	86.96	13.04	13.0
#100	0.150	409.10	343.40	65.70	1545.50	90.82	9.18	9.2
#200	0.075	387.40	322.30	65.10	1610.60	94.65	5.35	5.35
Pan	Pan	387.30	369.60	17.70	1628.30			

A) Weight of Original Sample, g	1701.70	AHTD Dust Proportion	0.31
B) Weight after Wash, g	1637.20		
C) Wash Loss, g (A-B)	64.50	Fineness Modulus	4.597
D) Minus #200 From Sieve, g	17.70		
Total Minus #200, g (C+D)	82.20	Acceptance Check	0.9946

Wash Loss 3.79 %

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BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name: TRC 0801 Date: 4/1/2008
Material: Russellville - Hwy. 7 Tested By: Annette
Source: Station 2

Sample Number	R2-12W	R2-6W	R2-J	R2-6E	R2-12E
Dry Weight in Air, gm (A)	1723.2	1794.1		1602.7	1721.6
Submerged Weight, gm (C)	988.1	1017.1		908.7	964.2
SSD Weight, gm (B)	1748.2	1816.2		1660.8	1759.3
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.267	2.245		2.131	2.165
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	3.3	2.8		7.7	4.7

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 | Date: 4/1/2008

Source: Russellville - Hwy. 7 - Station 2 | Tested By: Annette

Sample Number	R2-12W	R2-6W	R2-J	R2-6E	R2-12E
Wt. of Dry Core in Air before testing, g (A)	1723.4	1793.9		1604.0	1722.7
Wt. of Sealed Core in Air, g (B)	1774.7	1844.9		1654.0	1773.0
Wt of Sealed Core in Water, g (C)	947.9	980.0		826.6	899.9
Wt. of Dry Core in Air after testing, g (D)	1723.2	1794.1		1602.7	1721.6
Bag Weight E = (B - A)	51.3	51.0		50.0	50.3
Bag Ratio F = A / E	33.595	35.175		32.080	34.249
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.804	0.801		0.806	0.803
Total Volume H = (E + D) - C	826.6	865.1		826.1	872.0
Bag Volume I = E / G	63.8	63.7		62.0	62.7
Sample Volume J = H - I	762.8	801.4		764.1	809.3
Bulk Specific Gravity (G_{mb}) K = A / J	2.259	2.238		2.099	2.129
Check: % wt. change *(must be -0.08% to +0.04%)*	0.01%	-0.01%		0.08%	0.06%

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KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Russellville - Hwy. 7 Tested By: Annette
Source: Station 2

Sample Number	R2-12W	R2-6W	R2-J	R2-6E	R2-12E
Dry Weight in Air, gm	1723.2	1794.1		1602.7	1721.6
Sample Volume, cc	749	783		700	757
Bulk Specific Gravity, Gmb	2.298	2.289		2.289	2.273

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ASPHALT LABORATORY
LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 6/1/2008

Source: Russellville - Hwy. 7 - Station 2 Tested By: Leela

Sample Number	R2-12W		R2-6W		R2-J	R2-6E		R2-12E	
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	44.80	44.80	44.27	44.27		45.69	45.69	46.49	46.49
Specimen height, mm	47.49	47.49	44.33	44.33		41.83	41.83	44.93	44.93
Specimen height, mm	40.18	40.18	44.66	44.66		41.69	41.69	45.96	45.96
Specimen height, mm	40.39	40.39	44.16	44.16		45.04	45.04	45.08	45.08
Average specimen height, cm	4.322	4.322	4.436	4.436		4.356	4.356	4.562	4.562
Specimen diameter, mm	151.48	151.48	151.22	151.22		151.33	151.33	150.94	150.94
Specimen diameter, mm	151.42	151.42	151.34	151.34		150.32	150.32	150.90	150.90
Specimen diameter, mm	151.32	151.32	151.55	151.55		150.01	150.01	151.11	151.11
Specimen diameter, mm	151.25	151.25	150.14	150.14		151.58	151.58	150.57	150.57
Average specimen diameter, cm	15.137	15.137	15.106	15.106		15.081	15.081	15.088	15.088
Specimen Area, cm^2	179.951	179.951	179.227	179.227		178.628	178.628	178.794	178.794
					REP #1				
Time, initial (min.)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ht. @ Time, initial	59.0	59.0	59.0	59.0		59.0	59.0	59.0	59.0
Time, final (min.)	14.0	26.3	14.2	24.3		15.2	27.0	13.7	28.4
Ht @ Time, final	55.0	52.0	48.0	40.0		15.0	0.0	35.0	17.0
Permeability 1 (k x 10^{-5})	1.25	1.19	3.67	3.95		18.81	18.66	9.57	9.80
					REP #2				
Time, initial (min.)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ht. @ Time, initial	59.0	59.0	59.0	59.0		59.0	59.0	59.0	59.0
Time, final (min.)	14.4	30.9	16.5	26.8		18.2	34.4	14.4	29.7
Ht @ Time, final	55.0	51.0	48.0	40.0		15.0	0.0	35.0	17.0
Permeability 2 (k x 10^{-5})	1.21	1.16	3.15	3.58		15.75	14.62	9.10	9.39
Average Permeability (k x 10^{-5})	1.23	1.18	3.41	3.77		17.28	16.64	9.33	9.59
Water Temp, F	68.0	68.0	68.0	68.0		68.0	68.0	68.0	68.0
Water Temp, C	20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0
R_T Factor	1.0000	1.0000	1.0000	1.0000		1.0000	1.0000	1.0000	1.0000
PERMEABILITY (k x 10-5)	1.23	1.18	3.41	3.77		17.28	16.64	9.33	9.59
PERMEABILITY (k x 10-5)	1.20		3.59			16.96		9.46	

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MATERIALS LABORATORY

ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 2		

ASPHALT CONTENT BY THE IGNITION METHOD

Test Samples					
Sample ID	R2-12W	R2-6W	R2-J	R2-6E	R2-12E
Weight of Basket (g)	3264.40	3268.90		3267.70	3276.30
Specimen + Basket (g)	4996.40	5064.20		4866.10	5001.30
Net Wt. of Specimen (g)	1732.00	1795.30		1598.40	1725.00
Calibration Factor	0.00	0.00		0.00	0.00
Temperature Correction Factor	0.17	0.16		0.28	0.17
Oven Derived AC%	7.09	7.36		6.27	7.20
Corrected Value (if CF not used)	7.09	7.36		6.27	7.20

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 2 - 12W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.60	551.40	0.20	0.20	0.01	99.99	100.0
1/2	12.5	652.60	527.50	125.10	125.30	7.84	92.16	92.2
3/8	9.5	700.30	521.20	179.10	304.40	19.05	80.95	81.0
#4	4.750	961.50	507.30	454.20	758.60	47.46	52.54	52.5
#8	2.360	737.90	469.10	268.80	1027.40	64.28	35.72	35.7
#16	1.180	596.10	453.80	142.30	1169.70	73.18	26.82	26.8
#30	0.600	472.20	389.70	82.50	1252.20	78.35	21.65	21.7
#40	0.425			0.00	1252.20	78.35	21.65	21.7
#50	0.300	441.20	360.60	80.60	1332.80	83.39	16.61	16.6
#100	0.150	439.30	343.70	95.60	1428.40	89.37	10.63	10.6
#200	0.075	362.60	322.60	40.00	1468.40	91.87	8.13	8.13
Pan	Pan	429.30	370.20	59.10	1527.50			

A) Weight of Original Sample, g	1598.30	AHTD Dust Proportion	0.38
B) Weight after Wash, g	1528.90		
C) Wash Loss, g (A-B)	69.40	Fineness Modulus	4.551
D) Minus #200 From Sieve, g	59.10		
Total Minus #200, g (C+D)	128.50	Acceptance Check	0.9991

Wash Loss 4.34 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 2 - 6W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	564.80	560.10	4.70	4.70	0.28	99.72	99.7
1/2	12.5	552.60	523.10	29.50	34.20	2.07	97.93	97.9
3/8	9.5	699.20	549.20	150.00	184.20	11.17	88.83	88.8
#4	4.750	1026.80	506.00	520.80	705.00	42.74	57.26	57.3
#8	2.360	738.70	439.90	298.80	1003.80	60.85	39.15	39.1
#16	1.180	616.30	442.50	173.80	1177.60	71.39	28.61	28.6
#30	0.600	470.90	377.40	93.50	1271.10	77.06	22.94	22.9
#40	0.425			0.00	1271.10	77.06	22.94	22.9
#50	0.300	460.00	367.20	92.80	1363.90	82.69	17.31	17.3
#100	0.150	446.60	339.20	107.40	1471.30	89.20	10.80	10.8
#200	0.075	401.10	325.70	75.40	1546.70	93.77	6.23	6.23
Pan	Pan	397.70	368.50	29.20	1575.90			

A) Weight of Original Sample, g	1649.50	AHTD Dust Proportion	0.27
B) Weight after Wash, g	1577.30		
C) Wash Loss, g (A-B)	72.20	Fineness Modulus	4.354
D) Minus #200 From Sieve, g	29.20		
Total Minus #200, g (C+D)	101.40	Acceptance Check	0.9991

Wash Loss 4.38 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 2 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	568.10	560.10	8.00	8.00	0.41	99.59	99.6
1/2	12.5	540.30	523.10	17.20	25.20	1.30	98.70	98.7
3/8	9.5	780.40	549.20	231.20	256.40	13.23	86.77	86.8
#4	4.750	1104.60	506.00	598.60	855.00	44.12	55.88	55.9
#8	2.360	790.70	439.90	350.80	1205.80	62.22	37.78	37.8
#16	1.180	643.60	442.50	201.10	1406.90	72.60	27.40	27.4
#30	0.600	490.10	377.40	112.70	1519.60	78.41	21.59	21.6
#40	0.425			0.00	1519.60	78.41	21.59	21.6
#50	0.300	447.30	367.20	80.10	1599.70	82.54	17.46	17.5
#100	0.150	455.80	339.20	116.60	1716.30	88.56	11.44	11.4
#200	0.075	376.90	325.70	51.20	1767.50	91.20	8.80	8.80
Pan	Pan	452.50	368.50	84.00	1851.50			

A) Weight of Original Sample, g	1938.00	AHTD Dust Proportion	0.41
B) Weight after Wash, g	1859.90		
C) Wash Loss, g (A-B)	78.10	Fineness Modulus	4.421
D) Minus #200 From Sieve, g	84.00		
Total Minus #200, g (C+D)	162.10	Acceptance Check	0.9955

Wash Loss 4.03 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 2 - 6E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	560.40	560.40	0.00	0.00	0.00	100.00	100.0
1/2	12.5	616.80	522.50	94.30	94.30	6.33	93.67	93.7
3/8	9.5	730.20	549.70	180.50	274.80	18.46	81.54	81.5
#4	4.750	939.70	506.00	433.70	708.50	47.58	52.42	52.4
#8	2.360	700.40	440.70	259.70	968.20	65.02	34.98	35.0
#16	1.180	601.90	442.50	159.40	1127.60	75.73	24.27	24.3
#30	0.600	447.70	377.40	70.30	1197.90	80.45	19.55	19.6
#40	0.425			0.00	1197.90	80.45	19.55	19.6
#50	0.300	414.10	367.20	46.90	1244.80	83.60	16.40	16.4
#100	0.150	418.70	338.70	80.00	1324.80	88.97	11.03	11.0
#200	0.075	393.80	325.90	67.90	1392.70	93.53	6.47	6.47
Pan	Pan	389.80	368.50	21.30	1414.00			

A) Weight of Original Sample, g	1489.00	AHTD Dust Proportion	0.33
B) Weight after Wash, g	1414.10		
C) Wash Loss, g (A-B)	74.90	Fineness Modulus	4.598
D) Minus #200 From Sieve, g	21.30		
Total Minus #200, g (C+D)	96.20	Acceptance Check	0.9999

Wash Loss 5.03 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 2 - 12E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	560.40	560.00	0.40	0.40	0.03	99.97	100.0
1/2	12.5	610.30	523.20	87.10	87.50	5.49	94.51	94.5
3/8	9.5	670.70	549.10	121.60	209.10	13.11	86.89	86.9
#4	4.750	1021.00	506.10	514.90	724.00	45.40	54.60	54.6
#8	2.360	738.90	440.50	298.40	1022.40	64.11	35.89	35.9
#16	1.180	626.30	442.30	184.00	1206.40	75.65	24.35	24.4
#30	0.600	454.40	377.10	77.30	1283.70	80.49	19.51	19.5
#40	0.425			0.00	1283.70	80.49	19.51	19.5
#50	0.300	417.60	367.10	50.50	1334.20	83.66	16.34	16.3
#100	0.150	424.30	337.40	86.90	1421.10	89.11	10.89	10.9
#200	0.075	396.40	325.50	70.90	1492.00	93.55	6.45	6.45
Pan	Pan	392.50	368.50	24.00	1516.00			

A) Weight of Original Sample, g	1594.80	AHTD Dust Proportion	0.33
B) Weight after Wash, g	1542.70		
C) Wash Loss, g (A-B)	52.10	Fineness Modulus	4.515
D) Minus #200 From Sieve, g	24.00		
Total Minus #200, g (C+D)	76.10	Acceptance Check	0.9827

Wash Loss 3.27 %

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MATERIALS LABORATORY

BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name: TRC 0801 Date: 4/1/2008
Material: Russellville - Hwy. 7 Tested By: Annette
Source: Station 3

Sample Number	R3-12W	R3-6W	R3-J	R3-6E	R3-12E
Dry Weight in Air, gm (A)	1788.5	1962.0		1643.9	1801.1
Submerged Weight, gm (C)	1023.5	1118.0		929.5	1021.2
SSD Weight, gm (B)	1812.4	1981.9		1686.1	1827.7
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.267	2.271		2.173	2.233
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	3.0	2.3		5.6	3.3

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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ASPHALT LABORATORY

BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008
Source: Russellville - Hwy. 7 - Station 3 Tested By: Annette

Sample Number	R3-12W	R3-6W	R3-J	R3-6E	R3-12E
Wt. of Dry Core in Air before testing, g (A)	1788.8	1962.4		1645.0	1800.7
Wt. of Sealed Core in Air, g (B)	1840.0	2013.5		1695.3	1851.9
Wt of Sealed Core in Water, g (C)	982.4	1083.1		867.0	977.4
Wt. of Dry Core in Air after testing, g (D)	1788.5	1962.0		1643.9	1801.1
Bag Weight E = (B - A)	51.2	51.1		50.3	51.2
Bag Ratio F = A / E	34.938	38.403		32.704	35.170
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.802	0.796		0.805	0.801
Total Volume H = (E + D) - C	857.3	930.0		827.2	874.9
Bag Volume I = E / G	63.9	64.2		62.5	63.9
Sample Volume J = H - I	793.4	865.8		764.7	811.0
Bulk Specific Gravity (G_{mb}) K = A / J	2.255	2.267		2.151	2.220
Check: % wt. change *(must be -0.08% to +0.04%)*	0.02%	0.02%		0.07%	-0.02%

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ASPHALT LABORATORY

KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Russellville - Hwy. 7 Tested By: Annette
Source: Station 3

Sample Number	R3-12W	R3-6W	R3-J	R3-6E	R3-12E
Dry Weight in Air, gm	1788.5	1962.0		1643.9	1801.1
Sample Volume, cc	778	856		724	793
Bulk Specific Gravity, Gmb	2.297	2.290		2.268	2.271

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ASPHALT LABORATORY

LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 6/1/2008

Source: Russellville - Hwy. 7 - Station 3 Tested By: Leela

Sample Number	R3-12W		R3-6W	R3-J	R3-6E		R3-12E
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	45.53	45.53	46.28		43.41	43.41	44.44
Specimen height, mm	45.52	45.52	45.43		44.33	44.33	46.49
Specimen height, mm	45.13	45.13	45.26		44.21	44.21	48.76
Specimen height, mm	44.44	44.44	45.19		43.19	43.19	48.17
Average specimen height, cm	4.516	4.516	4.554		4.379	4.379	4.697
Specimen diameter, mm	150.94	150.94	151.66		150.98	150.98	151.53
Specimen diameter, mm	151.58	151.58	151.32		150.92	150.92	150.34
Specimen diameter, mm	150.99	150.99	151.80		151.03	151.03	150.46
Specimen diameter, mm	151.06	151.06	151.29		151.00	151.00	150.26
Average specimen diameter, cm	15.114	15.114	15.152		15.098	15.098	15.065
Specimen Area, cm^2	179.417	179.417	180.308		179.037	179.037	178.244
	REP #1						
Time, initial (min.)	0.0	0.0	0.0		0.0	0.0	0.0
Ht. @ Time, initial	59.0	59.0	59.0		59.0	59.0	59.0
Time, final (min.)	18.4	32.5	18.1		15.1	22.7	13.4
Ht @ Time, final	50.0	45.0	0.0		12.0	0.0	0.0
Permeability 1 (k x 10^{-5})	2.32	2.12	28.88		21.28	22.24	40.59
	REP #2						
Time, initial (min.)	0.0	0.0	0.0		0.0	0.0	0.0
Ht. @ Time, initial	59.0	59.0	59.0		59.0	59.0	59.0
Time, final (min.)	17.1	35.6	21.4		15.9	21.7	16.8
Ht @ Time, final	50.0	45.0	0.0		10.0	0.0	0.0
Permeability 2 (k x 10^{-5})	2.49	1.94	24.40		21.77	23.23	32.47
Average Permeability (k x 10^{-5})	2.41	2.03	26.64		21.53	22.74	36.53
Water Temp, F	68.0	68.0	68.0		68.0	68.0	68.0
Water Temp, C	20.0	20.0	20.0		20.0	20.0	20.0
R_T Factor	1.0000	1.0000	1.0000		1.0000	1.0000	1.0000
PERMEABILITY (k x 10-5)	2.41	2.03	26.64		21.53	22.74	36.53
PERMEABILITY (k x 10-5)	2.22		26.64		22.13		36.53

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MATERIALS LABORATORY

ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 3		

ASPHALT CONTENT BY THE IGNITION METHOD

Test Samples					
Sample ID	R3-12W	R3-6W	R3-J	R3-6E	R3-12E
Weight of Basket (g)	3263.50	3281.00		3273.10	
Specimen + Basket (g)	5051.80	5239.60		4921.30	
Net Wt. of Specimen (g)	1788.30	1958.60		1648.20	
Calibration Factor	0.00	0.00		0.00	
Temperature Correction Factor	0.16	0.15		0.18	
Oven Derived AC%	6.87	6.33		7.80	
Corrected Value (if CF not used)	6.87	6.33		7.80	

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 3 - 12W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.40	551.10	0.30	0.30	0.02	99.98	100.0
1/2	12.5	597.30	527.50	69.80	70.10	4.24	95.76	95.8
3/8	9.5	698.70	521.20	177.50	247.60	14.98	85.02	85.0
#4	4.750	1072.40	507.30	565.10	812.70	49.17	50.83	50.8
#8	2.360	726.50	469.10	257.40	1070.10	64.74	35.26	35.3
#16	1.180	598.10	453.70	144.40	1214.50	73.48	26.52	26.5
#30	0.600	474.10	389.50	84.60	1299.10	78.60	21.40	21.4
#40	0.425			0.00	1299.10	78.60	21.40	21.4
#50	0.300	443.30	360.80	82.50	1381.60	83.59	16.41	16.4
#100	0.150	438.30	343.70	94.60	1476.20	89.31	10.69	10.7
#200	0.075	358.80	322.40	36.40	1512.60	91.51	8.49	8.49
Pan	Pan	426.00	370.00	56.00	1568.60			

A) Weight of Original Sample, g	1652.90	AHTD Dust Proportion	0.40
B) Weight after Wash, g	1569.30		
C) Wash Loss, g (A-B)	83.60	Fineness Modulus	4.539
D) Minus #200 From Sieve, g	56.00		
Total Minus #200, g (C+D)	139.60	Acceptance Check	0.9996

Wash Loss 5.06 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 3 - 6W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.40	551.40	0.00	0.00	0.00	100.00	100.0
1/2	12.5	595.50	527.40	68.10	68.10	3.76	96.24	96.2
3/8	9.5	678.30	521.20	157.10	225.20	12.42	87.58	87.6
#4	4.750	1097.10	507.20	589.90	815.10	44.97	55.03	55.0
#8	2.360	781.50	468.90	312.60	1127.70	62.21	37.79	37.8
#16	1.180	626.40	453.50	172.90	1300.60	71.75	28.25	28.3
#30	0.600	490.00	389.40	100.60	1401.20	77.30	22.70	22.7
#40	0.425			0.00	1401.20	77.30	22.70	22.7
#50	0.300	457.80	360.40	97.40	1498.60	82.67	17.33	17.3
#100	0.150	452.30	343.60	108.70	1607.30	88.67	11.33	11.3
#200	0.075	365.10	322.40	42.70	1650.00	91.02	8.98	8.98
Pan	Pan	432.10	370.00	62.10	1712.10			

A) Weight of Original Sample, g	1812.70	AHTD Dust Proportion	0.40
B) Weight after Wash, g	1713.70		
C) Wash Loss, g (A-B)	99.00	Fineness Modulus	4.400
D) Minus #200 From Sieve, g	62.10		
Total Minus #200, g (C+D)	161.10	Acceptance Check	0.9991

Wash Loss 5.46 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 3 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.60	551.60	0.00	0.00	0.00	100.00	100.0
1/2	12.5	595.10	527.70	67.40	67.40	3.43	96.57	96.6
3/8	9.5	701.20	521.00	180.20	247.60	12.60	87.40	87.4
#4	4.750	990.80	507.30	483.50	731.10	37.21	62.79	62.8
#8	2.360	795.30	469.60	325.70	1056.80	53.78	46.22	46.2
#16	1.180	679.40	453.60	225.80	1282.60	65.27	34.73	34.7
#30	0.600	500.30	389.40	110.90	1393.50	70.92	29.08	29.1
#40	0.425			0.00	1393.50	70.92	29.08	29.1
#50	0.300	473.50	360.40	113.10	1506.60	76.67	23.33	23.3
#100	0.150	499.30	343.60	155.70	1662.30	84.60	15.40	15.4
#200	0.075	410.20	322.50	87.70	1750.00	89.06	10.94	10.94
Pan	Pan	447.30	370.00	77.30	1827.30			

A) Weight of Original Sample, g	1965.00	AHTD Dust Proportion	0.38
B) Weight after Wash, g	1871.50		
C) Wash Loss, g (A-B)	93.50	Fineness Modulus	4.010
D) Minus #200 From Sieve, g	77.30		
Total Minus #200, g (C+D)	170.80	Acceptance Check	0.9764

Wash Loss 4.76 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 3 - 6E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.70	551.70	0.00	0.00	0.00	100.00	100.0
1/2	12.5	609.10	527.70	81.40	81.40	5.40	94.60	94.6
3/8	9.5	677.60	521.10	156.50	237.90	15.79	84.21	84.2
#4	4.750	1002.20	507.30	494.90	732.80	48.65	51.35	51.4
#8	2.360	735.40	469.10	266.30	999.10	66.32	33.68	33.7
#16	1.180	608.60	453.50	155.10	1154.20	76.62	23.38	23.4
#30	0.600	462.10	389.40	72.70	1226.90	81.45	18.55	18.6
#40	0.425			0.00	1226.90	81.45	18.55	18.6
#50	0.300	407.50	360.40	47.10	1274.00	84.57	15.43	15.4
#100	0.150	423.40	343.60	79.80	1353.80	89.87	10.13	10.1
#200	0.075	365.60	322.40	43.20	1397.00	92.74	7.26	7.26
Pan	Pan	418.00	370.00	48.00	1445.00			

A) Weight of Original Sample, g	1506.40	AHTD Dust Proportion	0.39
B) Weight after Wash, g	1446.70		
C) Wash Loss, g (A-B)	59.70	Fineness Modulus	4.633
D) Minus #200 From Sieve, g	48.00		
Total Minus #200, g (C+D)	107.70	Acceptance Check	0.9988

Wash Loss 3.96 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 3 - 12E		

WET and DRY SIEVE ANALYSIS								
Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	560.10	560.10	0.00	0.00	0.00	100.00	100.0
1/2	12.5	650.50	523.20	127.30	127.30	6.66	93.34	93.3
3/8	9.5	690.40	549.00	141.40	268.70	14.05	85.95	86.0
#4	4.750	1099.20	506.30	592.90	861.60	45.05	54.95	55.0
#8	2.360	875.30	440.50	434.80	1296.40	67.78	32.22	32.2
#16	1.180	638.00	442.30	195.70	1492.10	78.01	21.99	22.0
#30	0.600	470.40	377.00	93.40	1585.50	82.90	17.10	17.1
#40	0.425			0.00	1585.50	82.90	17.10	17.1
#50	0.300	438.10	367.20	70.90	1656.40	86.60	13.40	13.4
#100	0.150	425.90	337.50	88.40	1744.80	91.23	8.77	8.8
#200	0.075	390.70	325.30	65.40	1810.20	94.65	5.35	5.35
Pan	Pan	401.20	368.50	32.70	1842.90			

A) Weight of Original Sample, g	1912.60	AHTD Dust Proportion	0.31
B) Weight after Wash, g	1849.10		
C) Wash Loss, g (A-B)	63.50	Fineness Modulus	4.656
D) Minus #200 From Sieve, g	32.70		
Total Minus #200, g (C+D)	96.20	Acceptance Check	0.9966

Wash Loss 3.32 %

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MATERIALS LABORATORY

BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Annette
Source:	Station 4		

Sample Number	R4-12W	R4-6W	R4-J	R4-6E	R4-12E
Dry Weight in Air, gm (A)	1923.8	1931.3		1713.7	1931.3
Submerged Weight, gm (C)	1101.2	1106.8		977.2	1102.2
SSD Weight, gm (B)	1936.6	1954.1		1769.3	1978.5
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.303	2.279		2.163	2.204
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	1.5	2.7		7.0	5.4

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008

Source: Russellville - Hwy. 7 - Station 4 Tested By: Annette

Sample Number	R4-12W	R4-6W	R4-J	R4-6E	R4-12E
Wt. of Dry Core in Air before testing, g (A)	1925.1	1931.1		1715.3	1931.1
Wt. of Sealed Core in Air, g (B)	1974.8	1981.8		1765.0	1981.8
Wt of Sealed Core in Water, g (C)	1069.3	1064.4		890.3	1064.4
Wt. of Dry Core in Air after testing, g (D)	1923.8	1931.3		1713.7	1931.3
Bag Weight E = (B - A)	49.7	50.7		49.7	50.7
Bag Ratio F = A / E	38.734	38.089		34.513	38.089
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.795	0.796		0.802	0.796
Total Volume H = (E + D) - C	904.2	917.6		873.1	917.6
Bag Volume I = E / G	62.5	63.7		61.9	63.7
Sample Volume J = H - I	841.7	853.9		811.2	853.9
Bulk Specific Gravity (G_{mb}) K = A / J	2.287	2.261		2.115	2.261
Check: % wt. change *(must be -0.08% to +0.04%)*	0.07%	-0.01%		0.09%	-0.01%

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DEPARTMENT OF CIVIL ENGINEERING
ASPHALT LABORATORY

KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Russellville - Hwy. 7 Tested By: Annette
Source: Station 4

Sample Number	R4-12W	R4-6W	R4-J	R4-6E	R4-12E
Dry Weight in Air, gm	1923.8	1931.3		1713.7	1940.0
Sample Volume, cc	822	835		757	842
Bulk Specific Gravity, Gmb	2.339	2.312		2.263	2.303

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ASPHALT LABORATORY

LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 6/1/2008
Source: Russellville - Hwy. 7 - Station 4 Tested By: Leela

Sample Number	R4-12W		R4-6W		R4-J	R4-6E		R4-12E
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	43.41	43.41	45.69	45.69		49.82	49.82	49.66
Specimen height, mm	44.33	44.33	41.83	41.83		49.74	49.74	50.17
Specimen height, mm	44.21	44.21	41.69	41.69		49.83	49.83	50.82
Specimen height, mm	43.19	43.19	45.04	45.04		49.61	49.61	51.58
Average specimen height, cm	4.379	4.379	4.356	4.356		4.975	4.975	5.056
Specimen diameter, mm	150.98	150.98	151.33	151.33		150.67	150.67	152.02
Specimen diameter, mm	150.92	150.92	150.32	150.32		150.23	150.23	151.51
Specimen diameter, mm	151.03	151.03	151.01	151.01		150.59	150.59	152.08
Specimen diameter, mm	151.00	151.00	151.58	151.58		150.77	150.77	151.10
Average specimen diameter, cm	15.098	15.098	15.106	15.106		15.057	15.057	15.168
Specimen Area, cm^2	179.037	179.037	179.221	179.221		178.048	178.048	180.689
REP #1								
Time, initial (min.)	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Ht. @ Time, initial	59.0	59.0	59.0	59.0		59.0	59.0	58.0
Time, final (min.)	15.1	22.7	15.2	27.0		18.2	25.4	11.1
Ht @ Time, final	12.0	0.0	15.0	0.0		56.0	54.0	0.0
Permeability 1 (k x 10^{-5})	21.28	22.24	18.75	18.60	#DIV/0!	0.83	1.01	51.57
REP #2								
Time, initial (min.)	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Ht. @ Time, initial	59.0	59.0	59.0	59.0		59.0	59.0	58.0
Time, final (min.)	15.9	21.7	18.2	34.4		13.4	28.3	13.2
Ht @ Time, final	10.0	0.0	15.0	0.0		57.0	54.0	0.0
Permeability 2 (k x 10^{-5})	21.77	23.23	15.70	14.57		0.75	0.90	43.49
Average Permeability (k x 10^{-5})	21.53	22.74	17.23	16.59		0.79	0.96	47.53
Water Temp, F	68.0	68.0	68.0	68.0		68.0	68.0	68.0
Water Temp, C	20.0	20.0	20.0	20.0		20.0	20.0	20.0
R_T Factor	1.0000	1.0000	1.0000	1.0000		1.0000	1.0000	1.0000
PERMEABILITY (k x 10-5)	21.53	22.74	17.23	16.59		0.79	0.96	47.53
PERMEABILITY (k x 10-5)	22.13		16.91			0.87		47.53

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ASPHALT CONTENT BY THE IGNITION METHOD (AASHTO T 308)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 4		

ASPHALT CONTENT BY THE IGNITION METHOD

Test Samples					
Sample ID	R4-12W	R4-6W	R4-J	R4-6E	R4-12E
Weight of Basket (g)	3265.60			3274.70	3276.10
Specimen + Basket (g)	5151.90			4999.20	5195.20
Net Wt. of Specimen (g)	1886.30			1724.50	1919.10
Calibration Factor	0.00			0.00	0.00
Temperature Correction Factor	0.31			0.17	0.42
Oven Derived AC%	6.46			7.33	6.92
Corrected Value (if CF not used)	6.46			7.33	6.92

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 4 - 12W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.50	551.50	0.00	0.00	0.00	100.00	100.0
1/2	12.5	604.30	527.20	77.10	77.10	4.38	95.62	95.6
3/8	9.5	694.00	520.90	173.10	250.20	14.20	85.80	85.8
#4	4.750	1064.60	506.70	557.90	808.10	45.87	54.13	54.1
#8	2.360	775.00	469.00	306.00	1114.10	63.23	36.77	36.8
#16	1.180	618.20	453.60	164.60	1278.70	72.58	27.42	27.4
#30	0.600	486.20	389.60	96.60	1375.30	78.06	21.94	21.9
#40	0.425			0.00	1375.30	78.06	21.94	21.9
#50	0.300	452.50	360.60	91.90	1467.20	83.27	16.73	16.7
#100	0.150	448.20	343.30	104.90	1572.10	89.23	10.77	10.8
#200	0.075	368.40	322.60	45.80	1617.90	91.83	8.17	8.17
Pan	Pan	433.30	370.30	63.00	1680.90			

A) Weight of Original Sample, g	1761.90	AHTD Dust Proportion	0.37
B) Weight after Wash, g	1682.40		
C) Wash Loss, g (A-B)	79.50	Fineness Modulus	4.464
D) Minus #200 From Sieve, g	63.00		
Total Minus #200, g (C+D)	142.50	Acceptance Check	0.9991

Wash Loss 4.51 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 4 - 6W		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	569.60	560.00	9.60	9.60	0.53	99.47	99.5
1/2	12.5	589.40	523.20	66.20	75.80	4.21	95.79	95.8
3/8	9.5	814.30	549.10	265.20	341.00	18.93	81.07	81.1
#4	4.750	1020.40	505.90	514.50	855.50	47.50	52.50	52.5
#8	2.360	701.20	441.10	260.10	1115.60	61.94	38.06	38.1
#16	1.180	612.60	442.50	170.10	1285.70	71.38	28.62	28.6
#30	0.600	470.40	377.50	92.90	1378.60	76.54	23.46	23.5
#40	0.425			0.00	1378.60	76.54	23.46	23.5
#50	0.300	449.40	367.20	82.20	1460.80	81.10	18.90	18.9
#100	0.150	482.70	339.20	143.50	1604.30	89.07	10.93	10.9
#200	0.075	401.50	325.80	75.70	1680.00	93.27	6.73	6.73
Pan	Pan	394.20	368.50	25.70	1705.70			

A) Weight of Original Sample, g	1801.20	AHTD Dust Proportion	0.29
B) Weight after Wash, g	1712.10		
C) Wash Loss, g (A-B)	89.10	Fineness Modulus	4.470
D) Minus #200 From Sieve, g	25.70		
Total Minus #200, g (C+D)	114.80	Acceptance Check	0.9963

Wash Loss 4.95 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 4 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.50	551.50	0.00	0.00	0.00	100.00	100.0
1/2	12.5	591.30	527.50	63.80	63.80	3.34	96.66	96.7
3/8	9.5	742.10	521.40	220.70	284.50	14.91	85.09	85.1
#4	4.750	1028.10	507.40	520.70	805.20	42.20	57.80	57.8
#8	2.360	709.40	468.50	240.90	1046.10	54.83	45.17	45.2
#16	1.180	641.60	453.10	188.50	1234.60	64.71	35.29	35.3
#30	0.600	490.50	389.20	101.30	1335.90	70.02	29.98	30.0
#40	0.425			0.00	1335.90	70.02	29.98	30.0
#50	0.300	440.10	360.20	79.90	1415.80	74.20	25.80	25.8
#100	0.150	501.70	343.60	158.10	1573.90	82.49	17.51	17.5
#200	0.075	445.80	322.40	123.40	1697.30	88.96	11.04	11.04
Pan	Pan	434.60	370.00	64.60	1761.90			

A) Weight of Original Sample, g	1908.00	AHTD Dust Proportion	0.37
B) Weight after Wash, g	1815.60		
C) Wash Loss, g (A-B)	92.40	Fineness Modulus	4.034
D) Minus #200 From Sieve, g	64.60		
Total Minus #200, g (C+D)	157.00	Acceptance Check	0.9704

Wash Loss 4.84 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 4 - 6E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	561.00	561.00	0.00	0.00	0.00	100.00	100.0
1/2	12.5	613.10	523.30	89.80	89.80	5.65	94.35	94.4
3/8	9.5	703.20	549.10	154.10	243.90	15.34	84.66	84.7
#4	4.750	1003.30	506.00	497.30	741.20	46.61	53.39	53.4
#8	2.360	735.10	440.60	294.50	1035.70	65.13	34.87	34.9
#16	1.180	611.50	442.30	169.20	1204.90	75.77	24.23	24.2
#30	0.600	451.00	377.30	73.70	1278.60	80.40	19.60	19.6
#40	0.425			0.00	1278.60	80.40	19.60	19.6
#50	0.300	415.10	367.20	47.90	1326.50	83.42	16.58	16.6
#100	0.150	423.60	338.80	84.80	1411.30	88.75	11.25	11.3
#200	0.075	398.60	325.40	73.20	1484.50	93.35	6.65	6.65
Pan	Pan	391.70	368.50	23.20	1507.70			

A) Weight of Original Sample, g	1590.20	AHTD Dust Proportion	0.34
B) Weight after Wash, g	1509.10		
C) Wash Loss, g (A-B)	81.10	Fineness Modulus	4.554
D) Minus #200 From Sieve, g	23.20		
Total Minus #200, g (C+D)	104.30	Acceptance Check	0.9991

Wash Loss 5.10 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	6/1/2008
Material:	Russellville - Hwy. 7	Tested By:	Ashly
Source:	Station 4 - 12E		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	560.10	560.10	0.00	0.00	0.00	100.00	100.0
1/2	12.5	627.10	523.20	103.90	103.90	5.81	94.19	94.2
3/8	9.5	729.60	548.90	180.70	284.60	15.91	84.09	84.1
#4	4.750	1048.90	506.00	542.90	827.50	46.26	53.74	53.7
#8	2.360	768.60	440.80	327.80	1155.30	64.59	35.41	35.4
#16	1.180	640.00	442.50	197.50	1352.80	75.63	24.37	24.4
#30	0.600	465.00	377.40	87.60	1440.40	80.53	19.47	19.5
#40	0.425			0.00	1440.40	80.53	19.47	19.5
#50	0.300	426.60	367.20	59.40	1499.80	83.85	16.15	16.2
#100	0.150	437.10	339.00	98.10	1597.90	89.33	10.67	10.7
#200	0.075	407.00	325.80	81.20	1679.10	93.87	6.13	6.13
Pan	Pan	393.20	368.30	24.90	1704.00			

A) Weight of Original Sample, g	1788.70	AHTD Dust Proportion	0.31
B) Weight after Wash, g	1704.20		
C) Wash Loss, g (A-B)	84.50	Fineness Modulus	4.561
D) Minus #200 From Sieve, g	24.90		
Total Minus #200, g (C+D)	109.40	Acceptance Check	0.9999

Wash Loss 4.72 %

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MATERIALS LABORATORY

BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Annette
Source:	Station 1		

Sample Number	Y1-12S	Y1-6S	Y1-J	Y1-6N	Y1-12N
Dry Weight in Air, gm (A)	1952.7	1843.2	1541.7	2069.9	1974.5
Submerged Weight, gm (C)	1108.0	1033.5	867.7	1168.6	1110.8
SSD Weight, gm (B)	1979.7	1898.7	1635.7	2143.7	2026.4
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.240	2.130	2.007	2.123	2.157
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	3.1	6.4	12.2	7.6	5.7

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
ASPHALT LABORATORY
BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008

Source: Yellville - Hwy. 62 - Station 1 Tested By: Annette

Sample Number	Y1-12S	Y1-6S	Y1-J	Y1-6N	Y1-12N
Wt. of Dry Core in Air before testing, g (A)	1953.5	1844.2	1541.7	2066.8	1975.9
Wt. of Sealed Core in Air, g (B)	2002.8	1894.1	1592.2	2117.1	2025.6
Wt of Sealed Core in Water, g (C)	1063.4	966.0	722.0	1078.9	1041.3
Wt. of Dry Core in Air after testing, g (D)	1952.7	1843.2	1541.7	2069.9	1974.5
Bag Weight E = (B - A)	49.3	49.9	50.5	50.3	49.7
Bag Ratio F = A / E	39.625	36.958	30.529	41.089	39.757
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.794	0.798	0.809	0.791	0.794
Total Volume H = (E + D) - C	938.6	927.1	870.2	1041.3	982.9
Bag Volume I = E / G	62.1	62.5	62.4	63.6	62.6
Sample Volume J = H - I	876.5	864.6	807.8	977.7	920.3
Bulk Specific Gravity (G_{mb}) K = A / J	2.229	2.133	1.909	2.114	2.147
Check: % wt. change *(must be -0.08% to +0.04%)*	0.04%	0.05%	0.00%	-0.15%	0.07%

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
ASPHALT LABORATORY

KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Yellville - Hwy. 62 Tested By: Annette
Source: Station 1

Sample Number	Y1-12S	Y1-6S	Y1-J	Y1-6N	Y1-12N
Dry Weight in Air, gm	1952.7	1843.2	1541.7	2069.9	1974.5
Sample Volume, cc	861	822	684	922	884
Bulk Specific Gravity, Gmb	2.265	2.241	2.253	2.243	2.231

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UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
ASPHALT LABORATORY
LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 7/1/2008
Source: Yellville - Hwy. 62 - Station 1 Tested By: Leela

Sample Number	Y1-12S	Y1-6S	Y1-J	Y1-6N	Y1-12N
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	48.01	50.09	48.74	58.27	52.03
Specimen height, mm	51.83	48.13	45.81	56.41	48.96
Specimen height, mm	50.52	48.23	47.92	54.52	51.52
Specimen height, mm	49.24	48.09	46.83	57.83	52.93
Average specimen height, cm	4.990	4.864	4.733	5.676	5.136
Specimen diameter, mm	153.53	151.45	152.26	150.81	152.19
Specimen diameter, mm	152.09	151.71	151.85	150.99	151.84
Specimen diameter, mm	152.10	151.63	151.63	151.46	151.92
Specimen diameter, mm	152.26	151.27	151.92	150.62	151.56
Average specimen diameter, cm	15.250	15.152	15.192	15.097	15.188
Specimen Area, cm^2	182.642	180.302	181.256	179.007	181.166
			REP #1		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	58.0	58.0	58.0	58.0	58.0
Time, final (min.)	0.9	0.5	0.3	0.5	0.7
Ht @ Time, final	0.0	0.0	0.0	0.0	0.0
Permeability 1 ($k \times 10^{-5}$)	597.90	1055.28	1765.17	1295.04	822.38
			REP #2		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	58.0	58.0	58.0	58.0	58.0
Time, final (min.)	1.0	0.5	0.3	0.5	0.8
Ht @ Time, final	0.0	0.0	0.0	0.0	0.0
Permeability 2 ($k \times 10^{-5}$)	539.79	1019.68	1749.00	1282.25	694.17
Average Permeability ($k \times 10^{-5}$)	568.85	1037.48	1757.08	1288.65	758.27
Water Temp, F	68.0	68.0	68.0	68.0	68.0
Water Temp, C	20.0	20.0	20.0	20.0	20.0
R_T Factor	1.0000	1.0000	1.0000	1.0000	1.0000
PERMEABILITY (k x 10-5)	568.85	1037.48	1757.08	1288.65	758.27

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 1		

ASPHALT CONTENT BY THE IGNITION METHOD

Sample ID	Y1-12S	Y1-6S	Y1-J	Y1-6N	Y1-12N
Weight of Basket (g)	3268.00				
Specimen + Basket (g)	5210.00				
Net Wt. of Specimen (g)	1942.00				
Calibration Factor	0.00				
Temperature Correction Factor	0.15				
Oven Derived AC%	5.93				
Corrected Value (if CF not used)	5.93				

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 1 - 12S		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	556.80	556.80	0.00	0.00	0.00	100.00	100.0
1/2	12.5	539.30	536.20	3.10	3.10	0.17	99.83	99.8
3/8	9.5	663.60	536.50	127.10	130.20	7.15	92.85	92.9
#4	4.750	1040.50	507.80	532.70	662.90	36.38	63.62	63.6
#8	2.360	848.70	486.90	361.80	1024.70	56.24	43.76	43.8
#16	1.180	653.20	438.00	215.20	1239.90	68.05	31.95	31.9
#30	0.600	497.20	389.30	107.90	1347.80	73.97	26.03	26.0
#40	0.425			0.00	1347.80	73.97	26.03	26.0
#50	0.300	488.90	353.80	135.10	1482.90	81.39	18.61	18.6
#100	0.150	540.80	348.90	191.90	1674.80	91.92	8.08	8.1
#200	0.075	402.00	331.90	70.10	1744.90	95.77	4.23	4.23
Pan	Pan	375.00	364.00	11.00	1755.90			

A) Weight of Original Sample, g	1822.00	AHTD Dust Proportion	0.16
B) Weight after Wash, g	1761.91		
C) Wash Loss, g (A-B)	60.09	Fineness Modulus	4.151
D) Minus #200 From Sieve, g	11.00		
Total Minus #200, g (C+D)	71.09	Acceptance Check	0.9966

Wash Loss 3.30 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 1 - 6S		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	556.80	556.80	0.00	0.00	0.00	100.00	100.0
1/2	12.5	542.50	536.20	6.30	6.30	0.34	99.66	99.7
3/8	9.5	684.80	536.60	148.20	154.50	8.44	91.56	91.6
#4	4.750	1047.80	507.80	540.00	694.50	37.96	62.04	62.0
#8	2.360	839.20	487.00	352.20	1046.70	57.21	42.79	42.8
#16	1.180	646.80	438.00	208.80	1255.50	68.63	31.37	31.4
#30	0.600	500.30	389.30	111.00	1366.50	74.69	25.31	25.3
#40	0.425			0.00	1366.50	74.69	25.31	25.3
#50	0.300	473.50	353.80	119.70	1486.20	81.24	18.76	18.8
#100	0.150	520.30	348.70	171.60	1657.80	90.61	9.39	9.4
#200	0.075	425.50	332.00	93.50	1751.30	95.73	4.27	4.27
Pan	Pan	367.20	364.00	3.20	1754.50			

A) Weight of Original Sample, g	1829.50	AHTD Dust Proportion	0.17
B) Weight after Wash, g	1767.90		
C) Wash Loss, g (A-B)	61.60	Fineness Modulus	4.188
D) Minus #200 From Sieve, g	3.20		
Total Minus #200, g (C+D)	64.80	Acceptance Check	0.9924

Wash Loss 3.37 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 1 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.60	551.50	0.10	0.10	0.01	99.99	100.0
1/2	12.5	557.50	527.60	29.90	30.00	1.73	98.27	98.3
3/8	9.5	683.10	521.50	161.60	191.60	11.06	88.94	88.9
#4	4.750	1046.80	507.30	539.50	731.10	42.22	57.78	57.8
#8	2.360	749.70	469.70	280.00	1011.10	58.38	41.62	41.6
#16	1.180	622.30	453.80	168.50	1179.60	68.11	31.89	31.9
#30	0.600	501.30	389.70	111.60	1291.20	74.56	25.44	25.4
#40	0.425			0.00	1291.20	74.56	25.44	25.4
#50	0.300	489.00	360.80	128.20	1419.40	81.96	18.04	18.0
#100	0.150	478.60	344.00	134.60	1554.00	89.73	10.27	10.3
#200	0.075	363.10	323.00	40.10	1594.10	92.05	7.95	7.95
Pan	Pan	440.30	370.50	69.80	1663.90			

A) Weight of Original Sample, g	1731.80	AHTD Dust Proportion	0.31
B) Weight after Wash, g	1680.70		
C) Wash Loss, g (A-B)	51.10	Fineness Modulus	4.260
D) Minus #200 From Sieve, g	69.80		
Total Minus #200, g (C+D)	120.90	Acceptance Check	0.9900

Wash Loss 2.95 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 1 - 6N		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	552.30	551.30	1.00	1.00	0.06	99.94	99.9
1/2	12.5	538.40	527.60	10.80	11.80	0.66	99.34	99.3
3/8	9.5	711.50	521.50	190.00	201.80	11.35	88.65	88.7
#4	4.750	1099.70	507.10	592.60	794.40	44.67	55.33	55.3
#8	2.360	772.10	469.70	302.40	1096.80	61.68	38.32	38.3
#16	1.180	632.40	454.00	178.40	1275.20	71.71	28.29	28.3
#30	0.600	473.80	389.70	84.10	1359.30	76.44	23.56	23.6
#40	0.425			0.00	1359.30	76.44	23.56	23.6
#50	0.300	473.90	360.80	113.10	1472.40	82.80	17.20	17.2
#100	0.150	500.70	344.10	156.60	1629.00	91.60	8.40	8.4
#200	0.075	356.30	323.10	33.20	1662.20	93.47	6.53	6.53
Pan	Pan	425.40	370.50	54.90	1717.10			

A) Weight of Original Sample, g	1778.30	AHTD Dust Proportion	0.28
B) Weight after Wash, g	1729.50		
C) Wash Loss, g (A-B)	48.80	Fineness Modulus	4.403
D) Minus #200 From Sieve, g	54.90		
Total Minus #200, g (C+D)	103.70	Acceptance Check	0.9928

Wash Loss 2.74 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 1 - 12N		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.40	551.40	0.00	0.00	0.00	100.00	100.0
1/2	12.5	567.00	527.60	39.40	39.40	2.13	97.87	97.9
3/8	9.5	750.30	521.50	228.80	268.20	14.47	85.53	85.5
#4	4.750	1192.40	507.20	685.20	953.40	51.45	48.55	48.6
#8	2.360	798.80	469.70	329.10	1282.50	69.21	30.79	30.8
#16	1.180	619.70	453.90	165.80	1448.30	78.16	21.84	21.8
#30	0.600	477.70	389.70	88.00	1536.30	82.90	17.10	17.1
#40	0.425			0.00	1536.30	82.90	17.10	17.1
#50	0.300	454.70	360.80	93.90	1630.20	87.97	12.03	12.0
#100	0.150	456.70	344.10	112.60	1742.80	94.05	5.95	6.0
#200	0.075	322.30	323.00	-0.70	1742.10	94.01	5.99	5.99
Pan	Pan	430.40	370.50	59.90	1802.00			

A) Weight of Original Sample, g	1853.10	AHTD Dust Proportion	0.35
B) Weight after Wash, g	1806.30		
C) Wash Loss, g (A-B)	46.80	Fineness Modulus	4.782
D) Minus #200 From Sieve, g	59.90		
Total Minus #200, g (C+D)	106.70	Acceptance Check	0.9976

Wash Loss 2.53 %

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BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Annette
Source:	Station 2		

Sample Number	Y2-12S	Y2-6S	Y2-J	Y2-6N	Y2-12N
Dry Weight in Air, gm (A)	2061.6	1920.9	1533.9	1975.4	2059.2
Submerged Weight, gm (C)	1178.6	1086.7	858.1	1121.0	1166.0
SSD Weight, gm (B)	2090.2	1953.3	1611.7	2009.9	2093.9
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.262	2.217	2.035	2.222	2.219
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	3.1	3.7	10.3	3.9	3.7

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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ASPHALT LABORATORY

BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008
Source: Yellville - Hwy. 62 - Station 2 Tested By: Annette

Sample Number	Y2-12S	Y2-6S	Y2-J	Y2-6N	Y2-12N
Wt. of Dry Core in Air before testing, g (A)	2063.5	1917.5	1534.6	1975.4	2060.5
Wt. of Sealed Core in Air, g (B)	2112.6	1967.3	1584.8	2024.8	2109.9
Wt of Sealed Core in Water, g (C)	1137.0	1042.9	748.4	1062.1	1113.6
Wt. of Dry Core in Air after testing, g (D)	2061.6	1920.9	1533.9	1975.4	2059.2
Bag Weight E = (B - A)	49.1	49.8	50.2	49.4	49.4
Bag Ratio F = A / E	42.026	38.504	30.570	39.988	41.711
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.790	0.796	0.809	0.793	0.790
Total Volume H = (E + D) - C	973.7	927.8	835.7	962.7	995.0
Bag Volume I = E / G	62.2	62.6	62.1	62.3	62.5
Sample Volume J = H - I	911.5	865.2	773.6	900.4	932.5
Bulk Specific Gravity (G_{mb}) K = A / J	2.264	2.216	1.984	2.194	2.210
Check: % wt. change *(must be -0.08% to +0.04%)*	0.09%	-0.18%	0.05%	0.00%	0.06%

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KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Yellville - Hwy. 62 Tested By: Annette
Source: Station 2

Sample Number	Y2-12S	Y2-6S	Y2-J	Y2-6N	Y2-12N
Dry Weight in Air, gm	2061.6	1920.9	1533.9	1975.4	2059.2
Sample Volume, cc	899	839	687	875	915
Bulk Specific Gravity, Gmb	2.292	2.289	2.232	2.256	2.250

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ASPHALT LABORATORY

LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 7/1/2008
Source: Yellville - Hwy. 62 - Station 2 Tested By: Leela

Sample Number	Y2-12S	Y2-6S	Y2-J	Y2-6N	Y2-12N
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	48.58	50.50	45.60	52.15	52.21
Specimen height, mm	52.54	49.83	44.41	50.27	55.80
Specimen height, mm	54.58	48.33	44.25	51.21	53.53
Specimen height, mm	51.33	47.84	45.15	50.31	51.47
Average specimen height, cm	5.176	4.913	4.485	5.099	5.325
Specimen diameter, mm	151.85	152.49	151.48	153.60	152.61
Specimen diameter, mm	151.22	151.91	151.39	152.18	152.33
Specimen diameter, mm	151.12	151.92	151.70	152.87	152.39
Specimen diameter, mm	152.28	150.94	151.98	152.83	152.25
Average specimen diameter, cm	15.162	15.182	15.164	15.287	15.240
Specimen Area, cm^2	180.546	181.017	180.594	183.542	182.403
			REP #1		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	58.0	58.0	58.0	58.0	58.0
Time, final (min.)	8.6	2.1	0.2	1.4	3.3
Ht @ Time, final	0.0	0.0	0.0	0.0	0.0
Permeability 1 ($k \times 10^{-5}$)	68.19	270.75	2744.78	395.80	181.78
			REP #2		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	58.0	58.0	58.0	58.0	58.0
Time, final (min.)	8.7	2.1	0.2	1.5	3.3
Ht @ Time, final	0.0	0.0	0.0	0.0	0.0
Permeability 2 ($k \times 10^{-5}$)	67.17	263.88	3310.05	386.64	179.11
Average Permeability ($k \times 10^{-5}$)	67.68	267.32	3027.41	391.22	180.45
Water Temp, F	68.0	68.0	68.0	68.0	68.0
Water Temp, C	20.0	20.0	20.0	20.0	20.0
R_T Factor	1.0000	1.0000	1.0000	1.0000	1.0000
PERMEABILITY (k x 10-5)	67.68	267.32	3027.41	391.22	180.45

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 2		

ASPHALT CONTENT BY THE IGNITION METHOD					
Test Samples					
Sample ID	Y2-12S	Y2-6S	Y2-J	Y2-6N	Y2-12N
Weight of Basket (g)			3274.10	3265.50	
Specimen + Basket (g)			4799.50	5186.80	
Net Wt. of Specimen (g)			1525.40	1921.30	
Calibration Factor			0.00	0.00	
Temperature Correction Factor			0.39	0.29	
Oven Derived AC%			3.35	5.49	
Corrected Value (if CF not used)			3.35	5.49	

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 2 - 12S		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	560.60	560.00	0.60	0.60	0.04	99.96	100.0
1/2	12.5	535.70	523.20	12.50	13.10	0.82	99.18	99.2
3/8	9.5	630.60	549.00	81.60	94.70	5.95	94.05	94.1
#4	4.750	984.50	506.20	478.30	573.00	35.98	64.02	64.0
#8	2.360	779.30	441.00	338.30	911.30	57.23	42.77	42.8
#16	1.180	610.30	442.50	167.80	1079.10	67.77	32.23	32.2
#30	0.600	494.90	377.40	117.50	1196.60	75.14	24.86	24.9
#40	0.425			0.00	1196.60	75.14	24.86	24.9
#50	0.300	480.80	367.30	113.50	1310.10	82.27	17.73	17.7
#100	0.150	473.80	339.10	134.70	1444.80	90.73	9.27	9.3
#200	0.075	368.60	325.60	43.00	1487.80	93.43	6.57	6.57
Pan	Pan	403.70	368.50	35.20	1523.00			

A) Weight of Original Sample, g	1592.40	AHTD Dust Proportion	0.26
B) Weight after Wash, g	1545.90		
C) Wash Loss, g (A-B)	46.50	Fineness Modulus	4.151
D) Minus #200 From Sieve, g	35.20		
Total Minus #200, g (C+D)	81.70	Acceptance Check	0.9852

Wash Loss 2.92 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 2 - 6S		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.60	551.60	0.00	0.00	0.00	100.00	100.0
1/2	12.5	538.20	527.70	10.50	10.50	0.59	99.41	99.4
3/8	9.5	649.80	521.40	128.40	138.90	7.76	92.24	92.2
#4	4.750	1008.70	507.20	501.50	640.40	35.78	64.22	64.2
#8	2.360	846.70	469.20	377.50	1017.90	56.87	43.13	43.1
#16	1.180	668.50	453.60	214.90	1232.80	68.88	31.12	31.1
#30	0.600	501.70	389.50	112.20	1345.00	75.15	24.85	24.9
#40	0.425			0.00	1345.00	75.15	24.85	24.9
#50	0.300	483.40	360.40	123.00	1468.00	82.02	17.98	18.0
#100	0.150	501.20	343.30	157.90	1625.90	90.84	9.16	9.2
#200	0.075	335.60	322.50	13.10	1639.00	91.57	8.43	8.43
Pan	Pan	462.90	370.10	92.80	1731.80			

A) Weight of Original Sample, g	1789.80	AHTD Dust Proportion	0.34
B) Weight after Wash, g	1740.50		
C) Wash Loss, g (A-B)	49.30	Fineness Modulus	4.173
D) Minus #200 From Sieve, g	92.80		
Total Minus #200, g (C+D)	142.10	Acceptance Check	0.9950

Wash Loss 2.75 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 2 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.50	551.50	0.00	0.00	0.00	100.00	100.0
1/2	12.5	530.60	527.90	2.70	2.70	0.19	99.81	99.8
3/8	9.5	648.50	521.50	127.00	129.70	9.10	90.90	90.9
#4	4.750	945.50	507.60	437.90	567.60	39.85	60.15	60.2
#8	2.360	739.50	469.40	270.10	837.70	58.81	41.19	41.2
#16	1.180	576.90	454.10	122.80	960.50	67.43	32.57	32.6
#30	0.600	462.30	389.50	72.80	1033.30	72.54	27.46	27.5
#40	0.425			0.00	1033.30	72.54	27.46	27.5
#50	0.300	452.90	360.20	92.70	1126.00	79.05	20.95	21.0
#100	0.150	484.10	343.60	140.50	1266.50	88.91	11.09	11.1
#200	0.075	353.20	322.50	30.70	1297.20	91.06	8.94	8.94
Pan	Pan	407.20	370.20	37.00	1334.20			

A) Weight of Original Sample, g	1424.50	AHTD Dust Proportion	0.33
B) Weight after Wash, g	1347.80		
C) Wash Loss, g (A-B)	76.70	Fineness Modulus	4.157
D) Minus #200 From Sieve, g	37.00		
Total Minus #200, g (C+D)	113.70	Acceptance Check	0.9899

Wash Loss 5.38 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 2 - 6N		

WET and DRY SIEVE ANALYSIS								
Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	561.00	561.00	0.00	0.00	0.00	100.00	100.0
1/2	12.5	540.00	524.00	16.00	16.00	0.89	99.11	99.1
3/8	9.5	704.00	550.00	154.00	170.00	9.43	90.57	90.6
#4	4.750	1107.90	507.00	600.90	770.90	42.78	57.22	57.2
#8	2.360	768.40	441.40	327.00	1097.90	60.93	39.07	39.1
#16	1.180	626.00	443.50	182.50	1280.40	71.05	28.95	28.9
#30	0.600	470.60	378.20	92.40	1372.80	76.18	23.82	23.8
#40	0.425			0.00	1372.80	76.18	23.82	23.8
#50	0.300	477.70	368.10	109.60	1482.40	82.26	17.74	17.7
#100	0.150	496.10	340.00	156.10	1638.50	90.93	9.07	9.1
#200	0.075	378.80	326.50	52.30	1690.80	93.83	6.17	6.17
Pan	Pan	399.60	369.40	30.20	1721.00			

A) Weight of Original Sample, g	1802.00	AHTD Dust Proportion	0.26
B) Weight after Wash, g	1732.10		
C) Wash Loss, g (A-B)	69.90	Fineness Modulus	4.336
D) Minus #200 From Sieve, g	30.20		
Total Minus #200, g (C+D)	100.10	Acceptance Check	0.9936

Wash Loss 3.88 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 2 - 12N		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	558.30	551.40	6.90	6.90	0.37	99.63	99.6
1/2	12.5	582.40	527.50	54.90	61.80	3.28	96.72	96.7
3/8	9.5	701.40	520.10	181.30	243.10	12.92	87.08	87.1
#4	4.750	1007.80	505.60	502.20	745.30	39.60	60.40	60.4
#8	2.360	832.60	468.90	363.70	1109.00	58.93	41.07	41.1
#16	1.180	684.80	453.60	231.20	1340.20	71.21	28.79	28.8
#30	0.600	490.30	389.40	100.90	1441.10	76.57	23.43	23.4
#40	0.425			0.00	1441.10	76.57	23.43	23.4
#50	0.300	468.40	360.40	108.00	1549.10	82.31	17.69	17.7
#100	0.150	510.60	343.30	167.30	1716.40	91.20	8.80	8.8
#200	0.075	353.70	322.40	31.30	1747.70	92.86	7.14	7.14
Pan	Pan	427.30	370.00	57.30	1805.00			

A) Weight of Original Sample, g	1882.00	AHTD Dust Proportion	0.30
B) Weight after Wash, g	1813.30		
C) Wash Loss, g (A-B)	68.70	Fineness Modulus	4.331
D) Minus #200 From Sieve, g	57.30		
Total Minus #200, g (C+D)	126.00	Acceptance Check	0.9954

Wash Loss 3.65 %

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BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Annette
Source:	Station 3		

Sample Number	Y3-12S	Y3-6S	Y3-J	Y3-6N	Y3-12N
Dry Weight in Air, gm (A)	1945.3	1679.3	1706.2	1916.6	1985.8
Submerged Weight, gm (C)	1103.8	947.7	954.9	1082.4	1116.0
SSD Weight, gm (B)	1976.6	1721.6	1800.6	1947.1	2010.3
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.229	2.170	2.018	2.216	2.221
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	3.6	5.5	11.2	3.5	2.7

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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ASPHALT LABORATORY

BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008
Source: Yellville - Hwy. 62 - Station 3 Tested By: Annette

Sample Number	Y3-12S	Y3-6S	Y3-J	Y3-6N	Y3-12N
Wt. of Dry Core in Air before testing, g (A)	1945.6	1679.9	1706.2	1918.5	1985.9
Wt. of Sealed Core in Air, g (B)	1995.7	1730.0	1757.0	1967.8	2034.9
Wt of Sealed Core in Water, g (C)	1059.8	891.5	835.8	1035.4	1080.8
Wt. of Dry Core in Air after testing, g (D)	1945.3	1679.3	1706.2	1916.6	1985.8
Bag Weight E = (B - A)	50.1	50.1	50.8	49.3	49.0
Bag Ratio F = A / E	38.834	33.531	33.587	38.915	40.529
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.795	0.804	0.804	0.795	0.792
Total Volume H = (E + D) - C	935.6	837.9	921.2	930.5	954.0
Bag Volume I = E / G	63.0	62.3	63.2	62.0	61.8
Sample Volume J = H - I	872.6	775.6	858.0	868.5	892.2
Bulk Specific Gravity (G_{mb}) K = A / J	2.230	2.166	1.989	2.209	2.226
Check: % wt. change *(must be -0.08% to +0.04%)*	0.02%	0.04%	0.00%	0.10%	0.01%

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ASPHALT LABORATORY

KUSS Gmb

Job Name: TRC 0801 Date: 4/1/2008
Material: Yellville - Hwy. 62 Tested By: Annette
Source: Station 3

Sample Number	Y3-12S	Y3-6S	Y3-J	Y3-6N	Y3-12N
Dry Weight in Air, gm	1945.3	1679.3	1706.2	1916.6	1985.8
Sample Volume, cc	858	751	756	982	875
Bulk Specific Gravity, Gmb	2.265	2.234	2.257	1.950	2.269

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ASPHALT LABORATORY

LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 7/1/2008
Source: Yellville - Hwy. 62 - Station 3 Tested By: Leela

Sample Number	Y3-12S	Y3-6S	Y3-J	Y3-6N	Y3-12N
Standpipe inside dia., cm	3.175	3.175	3.175	3.175	3.175
Standpipe area, cm^2	7.917304	7.917304	7.917304	7.917304	7.917304
Specimen height, mm	47.82	45.24	49.27	47.52	52.40
Specimen height, mm	50.41	44.17	50.10	49.60	52.78
Specimen height, mm	51.38	43.85	50.55	47.12	50.99
Specimen height, mm	49.87	44.99	48.22	49.54	49.40
Average specimen height, cm	4.987	4.456	4.954	4.845	5.139
Specimen diameter, mm	152.00	151.68	151.18	151.07	151.24
Specimen diameter, mm	152.33	151.31	152.44	150.59	151.44
Specimen diameter, mm	152.34	151.43	151.96	151.41	151.16
Specimen diameter, mm	152.15	150.74	152.45	151.29	152.32
Average specimen diameter, cm	15.221	15.129	15.201	15.109	15.154
Specimen Area, cm^2	181.948	179.767	181.476	179.292	180.362
			REP #1		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	58.0	58.0	58.0	58.0	58.0
Time, final (min.)	2.3	0.9	0.3	2.5	3.7
Ht @ Time, final	0.0	0.0	0.0	0.0	0.0
Permeability 1 ($k \times 10^{-5}$)	240.11	539.14	1656.93	222.33	159.73
			REP #2		
Time, initial (min.)	0.0	0.0	0.0	0.0	0.0
Ht. @ Time, initial	58.0	58.0	58.0	58.0	58.0
Time, final (min.)	2.0	1.0	0.3	2.8	3.2
Ht @ Time, final	0.0	0.0	0.0	0.0	0.0
Permeability 2 ($k \times 10^{-5}$)	275.55	528.93	1828.44	197.41	184.02
Average Permeability ($k \times 10^{-5}$)	257.83	534.04	1742.69	209.87	171.87
Water Temp, F	68.0	68.0	68.0	68.0	68.0
Water Temp, C	20.0	20.0	20.0	20.0	20.0
R_T Factor	1.0000	1.0000	1.0000	1.0000	1.0000
PERMEABILITY (k x 10-5)	257.83	534.04	1742.69	209.87	171.87

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MATERIALS LABORATORY

ASPHALT CONTENT BY THE IGNITION METHOD
(AASHTO T 308)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 3		

ASPHALT CONTENT BY THE IGNITION METHOD					
Test Samples					
Sample ID	Y3-12S	Y3-6S	Y3-J	Y3-6N	Y3-12N
Weight of Basket (g)			3265.70	3279.50	
Specimen + Basket (g)			4969.70	5184.50	
Net Wt. of Specimen (g)			1704.00	1905.00	
Calibration Factor			0.00	0.00	
Temperature Correction Factor			0.35	0.34	
Oven Derived AC%			5.80	6.09	
Corrected Value (if CF not used)			5.80	6.09	

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 3 - 12S		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	560.20	560.00	0.20	0.20	0.01	99.99	100.0
1/2	12.5	544.20	523.20	21.00	21.20	1.16	98.84	98.8
3/8	9.5	650.40	549.10	101.30	122.50	6.73	93.27	93.3
#4	4.750	1096.70	506.20	590.50	713.00	39.17	60.83	60.8
#8	2.360	817.20	440.90	376.30	1089.30	59.84	40.16	40.2
#16	1.180	657.30	442.50	214.80	1304.10	71.63	28.37	28.4
#30	0.600	485.10	377.40	107.70	1411.80	77.55	22.45	22.4
#40	0.425			0.00	1411.80	77.55	22.45	22.4
#50	0.300	483.30	367.30	116.00	1527.80	83.92	16.08	16.1
#100	0.150	489.10	339.00	150.10	1677.90	92.17	7.83	7.8
#200	0.075	379.10	325.60	53.50	1731.40	95.11	4.89	4.89
Pan	Pan	406.30	368.40	37.90	1769.30			

A) Weight of Original Sample, g	1820.50	AHTD Dust Proportion	0.22
B) Weight after Wash, g	1771.80		
C) Wash Loss, g (A-B)	48.70	Fineness Modulus	4.310
D) Minus #200 From Sieve, g	37.90		
Total Minus #200, g (C+D)	86.60	Acceptance Check	0.9986

Wash Loss 2.68 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 3 - 6S		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	560.20	560.20	0.00	0.00	0.00	100.00	100.0
1/2	12.5	528.00	522.80	5.20	5.20	0.33	99.67	99.7
3/8	9.5	659.40	548.70	110.70	115.90	7.39	92.61	92.6
#4	4.750	964.50	506.00	458.50	574.40	36.60	63.40	63.4
#8	2.360	774.60	441.10	333.50	907.90	57.86	42.14	42.1
#16	1.180	634.70	442.40	192.30	1100.20	70.11	29.89	29.9
#30	0.600	470.90	377.50	93.40	1193.60	76.06	23.94	23.9
#40	0.425			0.00	1193.60	76.06	23.94	23.9
#50	0.300	472.70	367.40	105.30	1298.90	82.77	17.23	17.2
#100	0.150	482.60	339.10	143.50	1442.40	91.92	8.08	8.1
#200	0.075	375.30	325.80	49.50	1491.90	95.07	4.93	4.93
Pan	Pan	403.00	368.70	34.30	1526.20			

A) Weight of Original Sample, g	1569.20	AHTD Dust Proportion	0.21
B) Weight after Wash, g	1526.50		
C) Wash Loss, g (A-B)	42.70	Fineness Modulus	4.227
D) Minus #200 From Sieve, g	34.30		
Total Minus #200, g (C+D)	77.00	Acceptance Check	0.9998

Wash Loss 2.72 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 3 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.70	551.70	0.00	0.00	0.00	100.00	100.0
1/2	12.5	551.70	527.80	23.90	23.90	1.50	98.50	98.5
3/8	9.5	664.20	521.20	143.00	166.90	10.46	89.54	89.5
#4	4.750	1050.70	507.20	543.50	710.40	44.50	55.50	55.5
#8	2.360	762.60	469.00	293.60	1004.00	62.90	37.10	37.1
#16	1.180	605.30	453.50	151.80	1155.80	72.40	27.60	27.6
#30	0.600	471.20	389.60	81.60	1237.40	77.52	22.48	22.5
#40	0.425			0.00	1237.40	77.52	22.48	22.5
#50	0.300	456.20	360.60	95.60	1333.00	83.51	16.49	16.5
#100	0.150	477.70	343.60	134.10	1467.10	91.91	8.09	8.1
#200	0.075	335.30	322.50	12.80	1479.90	92.71	7.29	7.29
Pan	Pan	431.70	370.00	61.70	1541.60			

A) Weight of Original Sample, g	1596.30	AHTD Dust Proportion	0.32
B) Weight after Wash, g	1543.00		
C) Wash Loss, g (A-B)	53.30	Fineness Modulus	4.432
D) Minus #200 From Sieve, g	61.70		
Total Minus #200, g (C+D)	115.00	Acceptance Check	0.9991

Wash Loss 3.34 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 3 - 6N		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.70	551.70	0.00	0.00	0.00	100.00	100.0
1/2	12.5	533.50	527.40	6.10	6.10	0.35	99.65	99.7
3/8	9.5	639.10	520.10	119.00	125.10	7.10	92.90	92.9
#4	4.750	1049.70	505.70	544.00	669.10	37.97	62.03	62.0
#8	2.360	811.00	468.90	342.10	1011.20	57.38	42.62	42.6
#16	1.180	642.10	453.60	188.50	1199.70	68.08	31.92	31.9
#30	0.600	470.60	389.40	81.20	1280.90	72.69	27.31	27.3
#40	0.425			0.00	1280.90	72.69	27.31	27.3
#50	0.300	482.80	360.30	122.50	1403.40	79.64	20.36	20.4
#100	0.150	519.50	343.30	176.20	1579.60	89.64	10.36	10.4
#200	0.075	351.20	322.40	28.80	1608.40	91.27	8.73	8.73
Pan	Pan	438.00	370.00	68.00	1676.40			

A) Weight of Original Sample, g	1762.20	AHTD Dust Proportion	0.32
B) Weight after Wash, g	1693.20		
C) Wash Loss, g (A-B)	69.00	Fineness Modulus	4.125
D) Minus #200 From Sieve, g	68.00		
Total Minus #200, g (C+D)	137.00	Acceptance Check	0.9901

Wash Loss 3.92 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 3 - 12N		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	558.20	551.60	6.60	6.60	0.36	99.64	99.6
1/2	12.5	574.00	527.80	46.20	52.80	2.85	97.15	97.1
3/8	9.5	673.90	521.60	152.30	205.10	11.08	88.92	88.9
#4	4.750	1074.40	507.60	566.80	771.90	41.71	58.29	58.3
#8	2.360	821.50	469.10	352.40	1124.30	60.75	39.25	39.3
#16	1.180	640.30	453.90	186.40	1310.70	70.82	29.18	29.2
#30	0.600	492.60	390.00	102.60	1413.30	76.37	23.63	23.6
#40	0.425			0.00	1413.30	76.37	23.63	23.6
#50	0.300	479.20	360.80	118.40	1531.70	82.76	17.24	17.2
#100	0.150	505.70	344.00	161.70	1693.40	91.50	8.50	8.5
#200	0.075	323.10	322.20	0.90	1694.30	91.55	8.45	8.45
Pan	Pan	458.50	370.20	88.30	1782.60			

A) Weight of Original Sample, g	1850.70	AHTD Dust Proportion	0.36
B) Weight after Wash, g	1789.80		
C) Wash Loss, g (A-B)	60.90	Fineness Modulus	4.353
D) Minus #200 From Sieve, g	88.30		
Total Minus #200, g (C+D)	149.20	Acceptance Check	0.9960

Wash Loss 3.29 %

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BULK SPECIFIC GRAVITY AND % AIR VOIDS OF COMPACTED BITUMINOUS MIXTURES USING SSD SPECIMENS (AASHTO T-166, T-269)

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Annette
Source:	Station 4		

Sample Number	Y4-12S	Y4-6S	Y4-J	Y4-6N	Y4-12N
Dry Weight in Air, gm (A)	2263.9	1854.6		2140.5	2116.5
Submerged Weight, gm (C)	1283.7	1041.6	1104.5	1211.3	1201.3
SSD Weight, gm (B)	2291.5	1900.2	2058.1	2175.0	2146.9
Bulk Specific Gravity, G_{mb} (D)=A/(B-C)	2.246	2.160	0.000	2.221	2.238
Percent Water Absorbed by Volume (E)=(B-A)/(B-C) * 100	2.7	5.3	215.8	3.6	3.2

Note: if Percent Water Absorbed > 2%, Determine Gmb using AASHTO T-275

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BULK SPECIFIC GRAVITY BY THE CORELOK METHOD

Project: TRC 0801 Date: 4/1/2008
Source: Yellville - Hwy. 62 - Station 4 Tested By: Annette

Sample Number	Y4-12S	Y4-6S	Y4-J	Y4-6N	Y4-12N
Wt. of Dry Core in Air before testing, g (A)	2259.5	1856.7		2142.7	2118.7
Wt. of Sealed Core in Air, g (B)	2307.2	1906.1		2192.0	2167.8
Wt of Sealed Core in Water, g (C)	1242.9	976.8		1162.3	1154.3
Wt. of Dry Core in Air after testing, g (D)	2263.9	1854.6		2140.5	2116.5
Bag Weight E = (B - A)	47.7	49.4		49.3	49.1
Bag Ratio F = A / E	47.369	37.585		43.462	43.151
Large Bag Volume Correction (-0.00166*F+0.8596) (G)	0.781	0.797		0.787	0.788
Total Volume H = (E + D) - C	1068.7	927.2		1027.5	1011.3
Bag Volume I = E / G	61.1	62.0		62.6	62.3
Sample Volume J = H - I	1007.6	865.2		964.9	949.0
Bulk Specific Gravity (G_{mb}) K = A / J	2.242	2.146		2.221	2.233
Check: % wt. change *(must be -0.08% to +0.04%)*	-0.19%	0.11%		0.10%	0.10%

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ASPHALT LABORATORY

KUSS Gmb

Job Name:	TRC 0801	Date:	4/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Annette
Source:	Station 4		

Sample Number	Y4-12S	Y4-6S	Y4-J	Y4-6N	Y4-12N
Dry Weight in Air, gm	2263.9	1854.6		2140.5	2116.5
Sample Volume, cc	993	825		939	934
Bulk Specific Gravity, Gmb	2.279	2.246		2.279	2.266

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ASPHALT LABORATORY

LABORATORY PERMEABILITY BY THE KAROL-WARNER METHOD

Project: TRC 0801 Date: 7/1/2008
Source: Yellville - Hwy. 62 - Station 4 Tested By: Leela

Sample Number	Y4-12S	Y4-6S	Y4-J	Y4-6N	Y4-12N
Standpipe inside dia., cm	3.175	3.175		3.175	3.175
Standpipe area, cm^2	7.917304	7.917304		7.917304	7.917304
Specimen height, mm	55.90	48.06		55.85	55.09
Specimen height, mm	55.61	46.56		52.78	52.91
Specimen height, mm	59.74	49.90		56.03	54.88
Specimen height, mm	57.53	50.03		57.09	55.92
Average specimen height, cm	5.720	4.864		5.544	5.470
Specimen diameter, mm	151.14	151.76		152.22	151.91
Specimen diameter, mm	151.33	151.18		151.95	151.87
Specimen diameter, mm	151.29	150.93		151.52	151.83
Specimen diameter, mm	151.35	151.50		153.09	151.54
Average specimen diameter, cm	15.128	15.134		15.220	15.179
Specimen Area, cm^2	179.737	179.892		181.924	180.951
			REP #1		
Time, initial (min.)	0.0	0.0		0.0	0.0
Ht. @ Time, initial	58.0	57.0		58.0	58.0
Time, final (min.)	2.3	0.9		2.0	3.1
Ht @ Time, final	0.0	0.0		0.0	0.0
Permeability 1 ($k \times 10^{-5}$)	283.08	587.41		309.27	198.45
			REP #2		
Time, initial (min.)	0.0	0.0		0.0	0.0
Ht. @ Time, initial	58.0	57.0		58.0	58.0
Time, final (min.)	2.6	0.9		1.9	3.3
Ht @ Time, final	0.0	0.0		0.0	0.0
Permeability 2 ($k \times 10^{-5}$)	251.53	597.43		322.35	189.29
Average Permeability ($k \times 10^{-5}$)	267.30	592.42		315.81	193.87
Water Temp, F	68.0	68.0		68.0	68.0
Water Temp, C	20.0	20.0		20.0	20.0
R_T Factor	1.0000	1.0000		1.0000	1.0000
PERMEABILITY (k x 10-5)	267.30	592.42		315.81	193.87

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ASPHALT CONTENT BY THE IGNITION METHOD (AASHTO T 308)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 4		

ASPHALT CONTENT BY THE IGNITION METHOD					
Test Samples					
Sample ID	Y4-12S	Y4-6S	Y4-J	Y4-6N	Y4-12N
Weight of Basket (g)	3277.10	3270.00		3276.00	3266.90
Specimen + Basket (g)	5509.50	5115.00		5401.00	5368.20
Net Wt. of Specimen (g)	2232.40	1845.00		2125.00	2101.30
Calibration Factor	0.00	0.00		0.00	0.00
Temperature Correction Factor	0.13	0.11		0.09	0.14
Oven Derived AC%	5.14	5.51		5.24	5.04
Corrected Value (if CF not used)	5.14	5.51		5.24	5.04

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SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 4 - 12S		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	560.10	559.90	0.20	0.20	0.01	99.99	100.0
1/2	12.5	563.10	523.10	40.00	40.20	1.90	98.10	98.1
3/8	9.5	725.80	549.10	176.70	216.90	10.26	89.74	89.7
#4	4.750	1221.90	507.20	714.70	931.60	44.06	55.94	55.9
#8	2.360	834.10	440.30	393.80	1325.40	62.69	37.31	37.3
#16	1.180	658.90	442.30	216.60	1542.00	72.93	27.07	27.1
#30	0.600	481.70	377.20	104.50	1646.50	77.87	22.13	22.1
#40	0.425			0.00	1646.50	77.87	22.13	22.1
#50	0.300	485.70	367.20	118.50	1765.00	83.48	16.52	16.5
#100	0.150	514.80	339.10	175.70	1940.70	91.79	8.21	8.2
#200	0.075	381.70	325.00	56.70	1997.40	94.47	5.53	5.53
Pan	Pan	398.50	368.50	30.00	2027.40			

A) Weight of Original Sample, g	2114.30	AHTD Dust Proportion	0.25
B) Weight after Wash, g	2040.90		
C) Wash Loss, g (A-B)	73.40	Fineness Modulus	4.431
D) Minus #200 From Sieve, g	30.00		
Total Minus #200, g (C+D)	103.40	Acceptance Check	0.9934

Wash Loss 3.47 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE (AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 4 - 6S		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	557.00	557.00	0.00	0.00	0.00	100.00	100.0
1/2	12.5	543.40	535.90	7.50	7.50	0.43	99.57	99.6
3/8	9.5	679.60	536.80	142.80	150.30	8.65	91.35	91.3
#4	4.750	1047.40	507.10	540.30	690.60	39.76	60.24	60.2
#8	2.360	825.50	487.10	338.40	1029.00	59.24	40.76	40.8
#16	1.180	620.90	439.00	181.90	1210.90	69.71	30.29	30.3
#30	0.600	480.00	388.60	91.40	1302.30	74.97	25.03	25.0
#40	0.425			0.00	1302.30	74.97	25.03	25.0
#50	0.300	463.60	354.30	109.30	1411.60	81.27	18.73	18.7
#100	0.150	517.30	348.60	168.70	1580.30	90.98	9.02	9.0
#200	0.075	384.10	330.40	53.70	1634.00	94.07	5.93	5.93
Pan	Pan	390.50	364.40	26.10	1660.10			

A) Weight of Original Sample, g	1737.00	AHTD Dust Proportion	0.24
B) Weight after Wash, g	1660.60		
C) Wash Loss, g (A-B)	76.40	Fineness Modulus	4.246
D) Minus #200 From Sieve, g	26.10		
Total Minus #200, g (C+D)	102.50	Acceptance Check	0.9997

Wash Loss 4.40 %

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DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 4 - J		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	559.30	551.70	7.60	7.60	0.40	99.60	99.6
1/2	12.5	573.60	527.70	45.90	53.50	2.82	97.18	97.2
3/8	9.5	691.70	521.20	170.50	224.00	11.82	88.18	88.2
#4	4.750	1138.90	507.20	631.70	855.70	45.15	54.85	54.9
#8	2.360	784.60	469.10	315.50	1171.20	61.79	38.21	38.2
#16	1.180	651.00	453.50	197.50	1368.70	72.22	27.78	27.8
#30	0.600	499.30	389.50	109.80	1478.50	78.01	21.99	22.0
#40	0.425			0.00	1478.50	78.01	21.99	22.0
#50	0.300	477.80	360.60	117.20	1595.70	84.19	15.81	15.8
#100	0.150	492.70	343.50	149.20	1744.90	92.06	7.94	7.9
#200	0.075	349.50	322.50	27.00	1771.90	93.49	6.51	6.51
Pan	Pan	418.10	370.00	48.10	1820.00			

A) Weight of Original Sample, g	1895.30	AHTD Dust Proportion	0.30
B) Weight after Wash, g	1827.80		
C) Wash Loss, g (A-B)	67.50	Fineness Modulus	4.456
D) Minus #200 From Sieve, g	48.10		
Total Minus #200, g (C+D)	115.60	Acceptance Check	0.9957

Wash Loss 3.56 %

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MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 4 - 6N		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	552.10	552.10	0.00	0.00	0.00	100.00	100.0
1/2	12.5	539.20	528.30	10.90	10.90	0.54	99.46	99.5
3/8	9.5	662.10	522.10	140.00	150.90	7.51	92.49	92.5
#4	4.750	1146.10	511.40	634.70	785.60	39.11	60.89	60.9
#8	2.360	864.90	469.90	395.00	1180.60	58.77	41.23	41.2
#16	1.180	672.40	454.20	218.20	1398.80	69.63	30.37	30.4
#30	0.600	509.70	390.10	119.60	1518.40	75.59	24.41	24.4
#40	0.425			0.00	1518.40	75.59	24.41	24.4
#50	0.300	504.50	361.00	143.50	1661.90	82.73	17.27	17.3
#100	0.150	518.10	344.10	174.00	1835.90	91.39	8.61	8.6
#200	0.075	349.20	323.00	26.20	1862.10	92.70	7.30	7.30
Pan	Pan	432.80	370.70	62.10	1924.20			

A) Weight of Original Sample, g	2008.80	AHTD Dust Proportion	0.30
B) Weight after Wash, g	1930.20		
C) Wash Loss, g (A-B)	78.60	Fineness Modulus	4.247
D) Minus #200 From Sieve, g	62.10		
Total Minus #200, g (C+D)	140.70	Acceptance Check	0.9969

Wash Loss 3.91 %

UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING
MATERIALS LABORATORY

SIEVE ANALYSIS OF COARSE AND FINE AGGREGATE
(AASHTO T-11 and AASHTO T-27)

Job Name:	TRC 0801	Date:	7/1/2008
Material:	Yellville - Hwy. 62	Tested By:	Ashly
Source:	Station 4 - 12N		

WET and DRY SIEVE ANALYSIS

Sieve Size (U.S. Std.)	Sieve Size (mm)	Sieve + Agg Weight	Sieve Weight	Individual Weight Ret.	Cum. Wt. Retained	Cum. % Ret.	% Passing	Reported % Passing
2	50.0							
1-1/2	37.5			0.00	0.00	0.00	100.00	100.0
1	25.0			0.00	0.00	0.00	100.00	100.0
3/4	19.0	551.60	551.20	0.40	0.40	0.02	99.98	100.0
1/2	12.5	542.10	527.40	14.70	15.10	0.76	99.24	99.2
3/8	9.5	683.80	521.10	162.70	177.80	8.96	91.04	91.0
#4	4.750	1170.40	507.40	663.00	840.80	42.37	57.63	57.6
#8	2.360	844.70	468.90	375.80	1216.60	61.31	38.69	38.7
#16	1.180	651.80	453.30	198.50	1415.10	71.31	28.69	28.7
#30	0.600	494.20	389.20	105.00	1520.10	76.60	23.40	23.4
#40	0.425			0.00	1520.10	76.60	23.40	23.4
#50	0.300	484.00	360.00	124.00	1644.10	82.85	17.15	17.2
#100	0.150	451.50	343.40	108.10	1752.20	88.29	11.71	11.7
#200	0.075	341.30	322.10	19.20	1771.40	89.26	10.74	10.74
Pan	Pan	442.50	369.90	72.60	1844.00			

A) Weight of Original Sample, g	1984.50	AHTD Dust Proportion	0.46
B) Weight after Wash, g	1904.50		
C) Wash Loss, g (A-B)	80.00	Fineness Modulus	4.317
D) Minus #200 From Sieve, g	72.60		
Total Minus #200, g (C+D)	152.60	Acceptance Check	0.9682

Wash Loss 4.03 %

Appendix B

Density Estimates
for Broken Cores

SSD

											SSD Gmb	
			N	E	S	W	C	Avg	Avg/62.4	Offset	Avg Offsett	Est. Gmb
Russ	2	12W	139.8	140.5	140.3	139.1	140.3	140	2.244	-0.023		
Russ	2	6W	139.8	129.7	141	139.9	139.5	137.98	2.211	-0.034		
Russ	2	J	131.5	132.5	128.7	141.3	131.1	133.02	2.132		-0.028	2.160
Russ	2	6E	131.3	135.4	131	124.5	132.6	130.96	2.099	-0.032		
Russ	2	12E	132.4	135.8	133	133	134.3	133.7	2.143	-0.023		
Russ	3	12W	139.8	141.7	142	141.6	142.6	141.54	2.268	0.001		
Russ	3	6W	135.5	131.4	141.3	141.4	142.3	138.38	2.218	-0.053		
Russ	3	J	125.3	136.9	128.6	143	127.7	132.3	2.120		-0.010	2.130
Russ	3	6E	138.1	140.1	137.3	127.4	135.8	135.74	2.175	0.003		
Russ	3	12E	140.9	142.1	140.7	136	140.4	140.02	2.244	0.011		
Russ	4	12W	141.7	146.4	144.9	142.8	143.2	143.8	2.304	0.002		
Russ	4	6W	142.8	123	141.9	144.4	143.1	139.04	2.228	-0.051		
Russ	4	J	124.8	135.9	127	140.1	124.9	130.54	2.092		-0.007	2.099
Russ	4	6E	138.4	140.6	135.8	122.7	134.6	134.42	2.154	-0.009		
Russ	4	12E	138.1	143.3	140.1	136.8	138.9	139.44	2.235	0.031		
Yell	4	12W	134.2	141.3	141	139.4	141.9	139.56	2.237	-0.010		
Yell	4	6W	125.6	137.6	139.9	138.3	137	135.68	2.174	0.014		
Yell	4	J	141.1	126	137.9	126.9	124.9	131.36	2.105		0.005	2.100
Yell	4	6E	140.9	139.8	127.5	139.4	141	137.72	2.207	-0.014		
Yell	4	12E	142.4	140	145.1	140.9	139.6	141.6	2.269	0.031		

	SSD Gmb				
	12W	6W	J	6E	12E
R1	2.264	2.235	2.091	2.120	2.128
R2	2.267	2.245	**2.160**	2.131	2.165
R3	2.267	2.271	**2.130**	2.173	2.233
R4	2.303	2.279	**2.099**	2.163	2.204
Y1	2.240	2.130	2.007	2.123	2.157
Y2	2.262	2.217	2.035	2.222	2.219
Y3	2.229	2.170	2.018	2.216	2.221
Y4	2.246	2.160	**2.100**	2.221	2.238

CoreLok

			N	E	S	W	C	Avg	Avg/62.4	Offset	CoreLok Gmb Avg Offsett	Est. Gmb
Russ	2	12W	139.8	140.5	140.3	139.1	140.3	140	2.244	-0.018		
Russ	2	6W	139.8	129.7	141	139.9	139.5	137.98	2.211	-0.018		
Russ	2	J	131.5	132.5	128.7	141.3	131.1	133.02	2.132		0.004	2.128
Russ	2	6E	131.3	135.4	131	124.5	132.6	130.96	2.099	0.022		
Russ	2	12E	132.4	135.8	133	133	134.3	133.7	2.143	0.030		
Russ	3	12W	139.8	141.7	142	141.6	142.6	141.54	2.268	0.009		
Russ	3	6W	135.5	131.4	141.3	141.4	142.3	138.38	2.218	-0.021		
Russ	3	J	125.3	136.9	128.6	143	127.7	132.3	2.120		0.045	2.075
Russ	3	6E	138.1	140.1	137.3	127.4	135.8	135.74	2.175	0.076		
Russ	3	12E	140.9	142.1	140.7	136	140.4	140.02	2.244	0.115		
Russ	4	12W	141.7	146.4	144.9	142.8	143.2	143.8	2.304	0.050		
Russ	4	6W	142.8	123	141.9	144.4	143.1	139.04	2.228	-0.038		
Russ	4	J	124.8	135.9	127	140.1	124.9	130.54	2.092		0.007	2.085
Russ	4	6E	138.4	140.6	135.8	122.7	134.6	134.42	2.154	0.003		
Russ	4	12E	138.1	143.3	140.1	136.8	138.9	139.44	2.235	0.014		
Yell	4	12W	134.2	141.3	141	139.4	141.9	139.56	2.237	0.007	0.014	
Yell	4	6W	125.6	137.6	139.9	138.3	137	135.68	2.174	0.008		
Yell	4	J	141.1	126	137.9	126.9	124.9	131.36	2.105			2.091
Yell	6E	140.9	139.8	127.5	139.4	141	137.72	2.207	-0.002			
Yell	12E	142.4	140	145.1	140.9	139.6	141.6	2.269	0.043			

CoreLok

		12W	6W	J	6E	12E
R1	2	2.261	2.229	2.032	2.077	2.112
R2	2	2.259	2.238	**2.128**	2.099	2.129
R3	2	2.255	2.267	**2.075**	2.151	2.220
R4	2	2.287	2.261	**2.085**	2.115	2.261
Y1	3	2.229	2.133	1.909	2.114	2.147
Y2	3	2.264	2.216	1.984	2.194	2.210
Y3	3	2.230	2.166	1.989	2.209	2.226
Y4	3	2.242	2.146	**2.091**	2.221	2.233

Kuss

			N	E	S	W	C	Avg	Avg/62.4	Offset	Kuss Gmb Avg Offsett	Est. Gmb
Russ	2	12W	139.8	140.5	140.3	139.1	140.3	140	2.244	-0.373		
Russ	2	6W	139.8	129.7	141	139.9	139.5	137.98	2.211	-0.078		
Russ	2	J	131.5	132.5	128.7	141.3	131.1	133.02	2.132		-0.190	2.322
Russ	2	6E	131.3	135.4	131	124.5	132.6	130.96	2.099	-0.188		
Russ	2	12E	132.4	135.8	133	133	134.3	133.7	2.143	-0.120		
Russ	3	12W	139.8	141.7	142	141.6	142.6	141.54	2.268	-0.030		
Russ	3	6W	135.5	131.4	141.3	141.4	142.3	138.38	2.218	-0.071		
Russ	3	J	125.3	136.9	128.6	143	127.7	132.3	2.120		-0.061	2.181
Russ	3	6E	138.1	140.1	137.3	127.4	135.8	135.74	2.175	-0.114		
Russ	3	12E	140.9	142.1	140.7	136	140.4	140.02	2.244	-0.029		
Russ	4	12W	141.7	146.4	144.9	142.8	143.2	143.8	2.304	0.007		
Russ	4	6W	142.8	123	141.9	144.4	143.1	139.04	2.228	-0.062		
Russ	4	J	124.8	135.9	127	140.1	124.9	130.54	2.092		-0.051	2.143
Russ	4	6E	138.4	140.6	135.8	122.7	134.6	134.42	2.154	-0.114		
Russ	4	12E	138.1	143.3	140.1	136.8	138.9	139.44	2.235	-0.036		
Yell	4	12W	134.2	141.3	141	139.4	141.9	139.56	2.237	-0.028		
Yell	4	6W	125.6	137.6	139.9	138.3	137	135.68	2.174	-0.060		
Yell	4	J	141.1	126	137.9	126.9	124.9	131.36	2.105		0.042	2.063
Yell	4	6E	140.9	139.8	127.5	139.4	141	137.72	2.207	0.257		
Yell	4	12E	142.4	140	145.1	140.9	139.6	141.6	2.269	0.000		

Kuss

		12W	6W	J	6E	12E
R1	2	2.617	2.289	2.270	2.287	2.263
R2	2	2.298	2.289	**2.322**	2.289	2.273
R3	2	2.297	2.290	**2.181**	2.268	2.271
R4	2	2.339	2.312	**2.143**	2.263	2.303
Y1	3	2.265	2.241	2.253	2.243	2.231
Y2	3	2.292	2.289	2.232	2.256	2.250
Y3	3	2.265	2.234	2.257	1.950	2.269
Y4	3	2.279	2.246	**2.063**	2.279	2.266