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Long-Term Pavement Performance Indicators for Failed Materials

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16. Abstract

State Transportation Agencies (STAs) use quality control/quality assurance (QC/QA) specifications to guide the testing and inspection of road pavement construction. Although failed materials of pavement rarely occur in practice, it is critical to have a sound decision framework to assist in making data-driven, informed decisions regarding failed materials because such decisions have profound impacts on the long-term performance of the pavement and the operation and maintenance costs of the responsible highway agencies.

A performance-related specification (PRS) is a quality acceptance (QA) specification that specifies the acceptable levels of key acceptance quality characteristics (AQCs) that are directly related to fundamental engineering properties, which in turn, determine the long-term performance of the constructed end products. Two PRS tools, PaveSpec for Portland Cement Concrete Pavement (PCCP) and Quality Related Specification Software (QRSS) for QC/QA Hot Mixed Asphalt (HMA) pavement, were investigated in this study to develop decision frameworks for PCCP and HMA pavement to assist the decision-making regarding failed materials at INDOT. A large number of simulations of various scenarios in the context of INDOT pavement construction were conducted to fully develop and implement the decision framework.

For PCCP, the newly developed decision framework based on PaveSpec was validated using data from an INDOT construction project. The framework is readily implementable to assist INDOT in making informed decision regarding failed materials for PCCP. For QC/QA pavement, it was found that QRSS is not an appropriate PRS tool to estimate the long-term performance because of its limitations, the misalignment between QRSS process and INDOT practice, and erroneous simulation results.

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EXECUTIVE SUMMARY

LONG-TERM PAVEMENT PERFORMANCE INDICATORS FOR FAILED MATERIALS

INTRODUCTION

State Transportation Agencies (STAs) use quality control/quality assurance (QC/QA) specifications to guide the testing and inspection of road pavement construction. Any pavement section that does not pass the testing is viewed as failed materials. Although failed materials rarely occur in practice, it is critical to have a sound decision framework to assist in making data-driven, informed decisions because such decisions have profound impacts on the long-term performance of pavement and the operation and maintenance costs of the responsible highway agencies.

At the Indiana Department of Transportation (INDOT), the Failed Materials Committee makes decisions regarding whether failed materials should be considered for "removal and replacement" or be "accepted with a heavy penalty." The "removal and replacement" option, most of the time, is not popular because the pavement section has to be closed for a long period of time. However, choosing the "heavy penalty" option leaves INDOT with questions regarding the reliability of pavement performance. Uncertainty about long-term pavement performance creates a dilemma for INDOT, and therefore a procedure is needed for assessing performance based on the reliability of sub-standard pavement materials. This procedure should be based on the predicted performance difference, which in turn causes the life-cycle cost (LCC) difference between as-designed and as-constructed pavement, to assist the Committee to make data-driven decisions.

In this study a decision framework was created to assist INDOT in making decisions regarding pavement sections of failed materials. The framework is based on the long-term performance modules available from existing performance-related specification (PRS) tools. A PRS is a quality acceptance (QA) specification that speci-fies the acceptable levels of key acceptance quality characteristics (AQCs) that are directly related to fundamental engineering properties, which in turn determine the long-term performance of construction end products (e.g., pavement). Pavement PRS tools are capable of analyzing input AQCs to predict the lifetime per-formance and life-cycle cost of the pavement through computer simulations for both as-designed and as-constructed pavement. Using the decision framework, INDOT can compare the LCC of the as-designed pavement to the LCC of the as-constructed pavement to calculate the LCC difference at various confidence levels and compare the LCC difference to the contract price to decide which option (i.e., "removal and replacement" versus "acceptance with a heavy penalty") is more economic.

Two PRS tools, PaveSpec for Portland cement concrete pave-ment (PCCP) and Quality Related Specification Software (QRSS) for hot mixed asphalt (HMA) pavement, were explored in develop-ing the decision framework. A large number of simulations of various scenarios in the context of INDOT pavement construction were conducted to fully develop and implement the decision framework. The newly developed framework was tested and validated using design and construction data from an INDOT construction project.

FINDINGS

Valuable findings regarding the use of PRS tools to predict the long-term performance and to estimate the LCC of PCCP and HMA pavement as well as the interpretation of PRS analysis results to support decision-making regarding failed materials are summar-ized as follows.

Using PaveSpec to Develop the Decision Framework for Failed Materials of PCCP

- PaveSpec takes five AQCs for PCCP: concrete strength, slab thickness, air content, initial smoothness, and percent con-solidation around dowels (optional). The four mandatory AQCs are all being tested as stipulated in INDOT QA/QC specification for PCCP.
- PaveSpec provides two levels of specification, Level 1 and Level 2 Specification, to predict the long-term performance and to estimate the LCC for PCCP. The Level 2 Specifi-cation considers the correlation between AQCs. It is more reflective of the reality and therefore, Level 2 Specification is the level adopted in the newly developed decision frame-work. Simulation results show that LCCs estimated using the Level 2 Specification are lower than the LCCs estimated using the Level 1 Specification for the same PCCP pavement.
- In PaveSpec, two approaches are available to estimate the LCC of as-constructed PCCP—the interpolation and the re-simulation approach. The interpolation approach is the default one, which estimates the LCC of the as-constructed pavement by interpolating the pay factor table resulted from the simulations for the as-designed, based on individual AQCs. The re-simulation approach, a new approach created in this study, substitutes the target AQC values in the as-designed simulation with field-testing results of the AQCs and runs the simulation to estimate the LCC of the as-constructed pavement. The interpolation approach yields a single, deter-ministic estimate of the LCC for the as-constructed, but the re-simulation approach yields a set of predicted LCCs so that statistical analysis can be performed to calculate the confidence level for a given LCC and vice versa (e.g., 90th-percentile LCC and 95th-percentile LCC). Therefore, the re-simulation approach was adopted in the decision framework.
- For the flexural strength AQC, PaveSpec requires the 28-day strength, but could take the 7-day strength as an input if a curing curve is provided. INDOT tests 7-day strength only. Unfortunately, the curing curve depends on the mix formula, which varies from project to project. After an extensive literature review and consulting INDOT experts, a multi-plication constant (C) was set at 1.23 to calculate the 28-day strength from the 7-day strength (i.e., *28-day strength* = *7-day strength* × *1.23*).
- The examination of INDOT specifications on the criteria of failed materials revealed that a *lot* could contain both acceptable and failed *sublots*. Two different methods, the single lot method and the divide-estimate-sum method, were devised and their results were compared for various scenarios of the co-existence of both failed and acceptable *sublots* in a single *lot*. The single lot method treats the *lot* that contains both acceptable and failed sublots as a single *lot* in PaveSpec. The divide-estimate-sum method separates the original *lot* into two new *lots*, one contains acceptable

sublot(s) only and the other contains failed *sublot(s)* only. Simulations are then performed for the new lots and results are added to estimate the LCC for the original *lot*. Simulation results show that estimated LCCs are quite different between these two methods. For the flexural strength AQC, the single lot method always yielded higher LCCs than the divide-estimate-sum method did. For the air content AQC, the single lot method always yielded lower LCCs than the divide-estimate-sum method did. These observations can be explained by looking at the sensitivity of LCC to the mean and the standard deviation. For the flexural strength AQC, the LCC is more sensitive to the consistency (indicated by the standard deviation). For the air content, the LCC is more sensitive to the average (indicated by the mean). Separating acceptable and failed sublots into two new *lots* leads to two smaller standard deviations than the standard deviation of the original *lot* and two new means, one is larger and the other is smaller than the mean of the original *lot*. Based on the comparisons, it is concluded that (1) for the *lot* level failure, i.e., the lot average falls in the failed range, the single lot approach is more appropriate, and (2) for the *sublot* level failure, i.e., the lot average is acceptable, but the *lot* contains failed sublot(s), it reflects the reality better by separating the original *lot* into two new *lots*, one contains acceptable *sublot(s)* only and the other contains failed *sublot(s)* only. This conclusion was incorporated in developing the decision framework.

- A large number of simulation scenarios of failed materials were designed for a three-sublot lot. Simulations were performed to estimate the LCC of PCCP using the Level 2 Specification, the re-simulation approach, and the divide-estimate-sum method. Results show that for flexural strength and thickness AQCs, a trend exists: higher mean values (indicating better quality) and lower standard deviations (indicating higher consistency) always lead to lower LCCs. While the same trend exists for the air content AQC, it is not appropriate to use PaveSpec because a higher air content does not indicate a better quality.
- Concerned with the air content AQC, additional simulation scenarios were designed to investigate the aggregate effect of multiple AQCs (focusing on air content) on the LCC. Results show that higher means of the air content AQC always yielded lower LCC estimates regardless of the variations in other AQCs, such as concrete strength and thickness. It was concluded that PaveSpec is not an appropriate tool for estimating the as-constructed LCC if materials fail because of the air content AQC.
- The LCC difference at various level of confidence can be statistically calculated in such a way, in which (1) the simulated LCCs of the as-designed and the simulated LCCs of the as-constructed are two independent samples following the normal distribution, (2) the LCC differences are a derived sample that follows the normal distribution—its mean is the average of the means of the two samples in (1) and its standard deviation is the square root of the sum of the squares of the two standard deviations of the two samples in (1). Consequently, the LCC difference at any confidence level can be calculated following the calculation methods for normal distributions.
- Aforementioned findings were incorporated into a newly developed decision framework (see Figure 3.13) for failed materials of PCCP. It was validated using design and testing data from INDOT construction project (IR-30846).

Using QRSS to Develop the Decision Framework for Failed Materials of QC/QA HMA Pavement

- QRSS only estimates the service life by predicting the distresses of rutting, fatigue cracking, and thermal cracking; and comparing them to pre-set threshold values. It does not have a mechanism to incorporate maintenance strategies and costs to estimate the LCC.
- There is a misalignment between the AQCs specified in INDOT's QC/QA HMA specification and the AQCs required in QRSS. Table 4.1 illustrates that (1) only two AQCs—binder content and roadway core density—are common to both INDOT specification and QRSS, (2) two AQCs—lab-compacted air voids, and voids in mineral aggregate (VMA)—are included in INDOT specification, but cannot be used directly in QRSS, and (3) gradation AQCs are required by QRSS, but are not included in INDOT specification.
- Because of the misalignment, a pairing mechanism is needed in order to run QRSS simulations for INDOT QC/QA HMA pavement. Table 4.5 illustrates this pairing mechanism. A recommendation to INDOT would be to collect the AQCs that are required in QRSS in order to adopt QRSS in the decision framework.
- A challenge in applying QRSS to INDOT QC/QA HMA pavement is caused by the use of PWL as the criterion for failed materials in INDOT specification: many different scenarios could lead to the same PWL value.
- QRSS estimates the long-term pavement performance in terms of pavement distresses (i.e., rutting, fatigue cracking, and thermal cracking), predicts service life by comparing the distresses to their pre-set threshold values, and calculates the service life differences between as-designed and as-constructed pavements. However, QRSS simulations yielded abnormal results when predicting the service life difference between the as-designed and the as-constructed pavement based on fatigue cracking and thermal cracking. For the fatigue cracking, when the same set of values were used for both the as-designed and the as-constructed pavements, QRSS always predicted negative service life differences, i.e., the as-constructed pavement has a shorter service life than the as-built pavement. For the thermal cracking, QRSS always predicted there is no service life difference between the as-designed and the as-constructed even though their AQC values were different, but all in normal ranges. Furthermore, when either the as-constructed has extremely high AQC values or extremely low AQC values, QRSS predicted that the service life difference is over 50 years. Since QRSS yields abnormal results when considering thermal cracking and fatigue cracking, it is not appropriate to use both of them as the base for estimating the shortened service life attributable to failed materials.
- The current version of QRSS executes Monte Carlo simulations to predict service life differences based on pavement performance estimates. In the results, QRSS provides means of the service life differences; however, it does not provide standard deviations of the service life differences directly. Therefore, to predict the service life difference at a user-specified confidence/probability (e.g., 90th-percentile or 95th-percentile service life difference), a statistical approach was devised to calculate the standard deviation based on individual pairs of the service life of as-designed and as-constructed.

- A large number of simulation scenarios for the only two common AQCs in QRSS and INDOT specification—binder content and roadway core density—were crafted in lieu of a five-sublot *lot*. The simulation results showed that the service life is insensitive to the standard deviation, but it is closely correlated with the mean—a higher mean in either binder content or roadway core density leads to a longer service life. The trend, in turn, lead to erroneous results when applying the PWL concept. Because any value that is too high or too low is outside the limit, for a given PWL value, if the original set is leaning towards the higher end, the predicted service life is longer; if the original set is leaning towards the higher end, the predicted service life is shorter. As the result, QRSS estimated that for certain groups of failed materials, the service life of the as-constructed is longer than the service life of as-designed.
- Given the misalignment between INDOT AQCs and the AQCs required in QRSS, the limitations in QRSS, and the erroneous results from the QRSS simulations, QRSS is not being recommended as the PRS tool to be used for QC/QA HMA pavement at this moment.

IMPLEMENTATION

The findings from this study were used to develop the decision framework for failed materials of PCCP. This framework enables the calculation of the difference between the LCC of as-designed and the LCC of as-constructed pavement at a user-specified confidence level and the comparison of the LCC difference to the construction contract price to determine whether the "removal and replacement" or the "acceptance with a heavy penalty" option is more economically appropriate. The framework also helps to determine the appropriate monetary amount if the "acceptance with a heavy penalty" option is chosen. The framework was validated using the design and construction data of an INDOT highway construction project. This framework can be immediately implemented to assist INDOT in making informed decisions regarding failed PCCP materials while waiting for findings of the use of MEPDG on PCCP. Given the availability of the software tool and the matching AQCs, the implementation cost is minimal. However, training on the use of PaveSpec is critical to the success of implementation.

For QC/QA HMA pavement, while the concept on comparing the long-term performance between as-designed and as-constructed pavement is still valid, QRSS is not an appropriate PRS tool to estimate the long-term performance because of its limitations and the misalignment between QRSS process and INDOT practice. Further study is needed to find an appropriate PRS tool, which could be a modified version of QRSS or a different tool such as Mechanistic-Empirical Pavement Design Guide (MEPDG). An opportunity for immediate implementation is the set of AQCs: it is recommended that INDOT aligns its AQCs with the AQCs required in QRSS, which have been found to have significant effect on the long-term pavement performance.

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1. INTRODUCTION

1.1 Background

State Transportation Agencies (STAs) follow quality control/quality assurance (QC/QA) specifications to inspect and test road pavements in construction. Any pavement that does not pass the testing is viewed as failed materials of pavement. Although failed materials of pavement rarely occur in practice, it is critical to have a sound decision framework to assist in making informed decisions regarding failed materials because such decisions have profound impacts on the long-term performance of the pavement and the operation and maintenance costs of the responsible highway agencies.

At the Indiana Department of Transportation (INDOT), the Failed Materials Committee makes decisions regarding failed materials: should the failed materials be "removed and replaced" or be "accepted with a heavy penalty." The "remove and replace" option, most of the time, is not a popular option since the pavement section has to be closed for a long period of time. However, selecting a "heavy penalty" option leaves the INDOT Failed Material Committee with a question on the reliability in the performance of the failed material pavement section. Uncertainty in long-term pavement performance created a dilemma for the Committee. There is a need to have a procedure on how to assess long-term pavement performance based on reliability of the sub-standard pavement materials. Such a procedure should be based on the predicted performance difference, which in turn, causes the life-cycle cost (LCC) difference between as-designed and as-constructed pavement, to make real data driven decisions by the Committee.

Computing tools from Performance-Related Specification (PRS) are capable of predicting the long-term performance of the pavement and the LCCs of as-designed and of as-constructed pavement. PRS are quality acceptance (QA) specifications emerged in recent years. They specify the desired levels of key acceptance quality characteristics (AQCs) that have been bound to be correlated with fundamental engineering properties that can predict the long-term performance of the pavement. Based on this correlation, PRS tools are available to estimate the LCC for both as-designed and as-constructed pavement, using AQCs as inputs. A few state highway agencies (SHAs) have already adopted this PRS approach in their specifications to determine the pay factor (a percentage of the contract price) of as-constructed pavement based on the comparison between the LCC of the as-designed and the LCC of the as-constructed pavement (Evans, Darter, & Egan, 2005; Evans, Smith, Gharaibeh, & Darter, 2008; Rao, Smith, & Darter, 2007).

To address the challenge regarding failed materials INDOT is facing, INDOT initiated research (this research project) to develop a decision framework to assist in dealing with failed materials from the life-cycle performance perspective, based on the difference between the LCC of the as-designed and the LCC of the as-constructed pavement. The newly developed framework incorporates LCC estimation modules from existing PRS tools—PaveSpec for Portland cement concrete pavement (PCCP) and QRSS for Hot mixed asphalt (HMA) pavement. It also incorporates risk analysis to allow INDOT to make decisions according to its risk mitigation strategies. A large number of simulations were conducted to develop the framework. The resulting framework was tested and validated using data from an INDOT's highway construction project.

1.2 Problem Statement

Two options are considered by INDOT to deal with pavement segments that contain failed materials: "removal and replacement" and "acceptance with a heavy penalty." The "removal and replacement" option, most of the time, is not a popular one because the concerned pavement section has to be closed for a long period of time. However, choosing the "acceptance with a heavy penalty" option leaves INDOT with a question on the reliability in terms of the long-term performance of the pavement and the financial impact, e.g., excessive maintenance cost and elevated user cost due to its inferior performance and shortened service life. There is a need to establish a procedure to guide INDOT on decision-making regarding failed materials based on the reliability of the sub-standard pavement materials. Such a procedure should be based on the predicted performance difference and LCC difference between as-designed and as-constructed pavement.

1.3 Overall Objectives

The objective of this study is to (1) determine the monetary impact from the long-term pavement performance of sub-standard/failed materials; and (2) create a mechanism for INDOT to make data-driven, informed decision-making regarding failed pavement materials. The work scope includes both PCCP and QC/QA HMA pavement (dense grade mixes only).

Two main deliverables are: (1) an analysis procedure that leverages INDOT QA process and key acceptance quality characteristics (AQCs), and PRS tools (i.e., PaveSpec for PCCP pavement and Quality Related Specification Software (QRSS) for HMA pavement) to determine both short- and long-term performance, and monetary difference between "as-designed" and "as-constructed" pavement sections of failed materials; and (2) a guideline on using the aforementioned analysis procedure and interpreting results in a reliability-based manner – a tool for data-driven, informed decision-making regarding failed materials in both pavement types.

1.4 Work Plan

The research project consists of the following four tasks for monetarily assessing the long-term risks of inferior pavement performance because of failed materials.

- *Task 1:* Literature review: PRS, DOT QC/QA, and risk analysis

- *Task 2:* PRS based pavement performance analysis of failed materials
- *Task 3:* Risk analysis of long-term pavement performance of failed materials
- *Task 4:* Validation of proposed decision framework

2. LITERATURE REVIEW

2.1 INDOT Definition of Failed Materials

Failed materials lead to inferior performance that in turn, lead to excessive maintenance, repair, and rehabilitation costs, and shortened service life. INDOT defines failed materials of PCCP and QC/QA HMA pavement in its standard specification based on AQCs.

2.1.1 Failed Materials of Portland Cement Concrete Pavement (PCCP)

For PCCP, INDOT uses four AQCs—flexural strength, air content, thickness, and smoothness—to define the criteria for failed materials (INDOT, 2013). Table 2.1 summarizes these criteria. For the air content AQC, the failure criteria are defined on both the average and the range of the measures. The failure criteria for the flexural strength and the air content are defined at both levels of lot and sublot. The failure criteria for the air content range are at the lot level. The failure criteria for the thickness are defined only at the sublot level. While there is a failure criterion defined for the smoothness AQC, if the smoothness is greater than or equal to 3.8 inch/0.1 mile, it must be corrected; the pavement is not allowed to fail because of its smoothness.

2.1.2 Failed Materials of QC/QA Hot Mix Asphalt (HMA) Pavement

The criteria of failure for QC/QA HMA pavement are different for pavement that is greater than or equal to 1 lot and pavement that is less than 1 lot. In the INDOT specification on the quality assurance procedures for QC/QA HMA, a lot is defined as of 5,000 tons of the base or intermediate layer of HMA pavement and as of 3,000 tons of the surface layer of HMA pavement. A lot is then divided into 5 sublots that are of equal tons; a sublot for the base and intermediate layer of HMA pavement is 1,000 tons and a sublot for the surface layer of HMA pavement is 600 tons.

In the practice, most pavement sections are not the exact multiplications of either 5,000 or 3,000 tons; therefore, the remaining part, though it is smaller than 5.000 or 3,000 tons depending on which layer is considered, becomes a (“partial”) standalone lot. While it is straightforward to divide a “standard” lot into five equal-weight sublots, dividing a “partial” lot into sublots is different: a “partial” standalone lot is divided into as many sublots at the same size of the sublots in a “standard” lot; for any portion that remains, if it is no more than 100 tons, it is added to the proceeding sublot, otherwise, it is considered as a new sublot (INDOT, 2013). Figure 2.1 illustrates the definition of lot and sublot based on the surface layer of HMA pavement in INDOT with three examples. Lot 1 is a “standard” lot. It has a total of 3,000 tons of surface layer of an HMA pavement and is divided into five equivalent sublots, each at 600 tons. The failure criteria for a standard lot are described in INDOT specifications 401.19(a) and explained in section 2.1.2.1. Lot 2 is a “partial” lot. It is composed of two sublots, one at 600 tons (the standard size) and the other at 200 tons. Lot 3 is another “partial” lot. It is composed of two sublots, one at 600 tons and the other at 690 tons. The second sublot is larger than 600 tons and the extra 90 tons come from the remaining portion that is too small (<100 tons) to become a sublot. The failure criteria for partial lots are described in INDOT specifications 401.19(b), and explained in section 2.1.2.2.

2.1.2.1 Failure Criteria for QC/QA Pavement ≥1 Lot. For QC/QA HMA pavement that is greater than or equal to 1 lot, INDOT applies the concept of statistical quality control for the acceptance and pay adjustment of QC/QA HMA pavement at the lot level. Specifically, the Percent Within Limits (PWL) approach is used for QC/QA HMA pavement (INDOT, 2013; Scott, Konrath, & Ferragut, 2014). This PWL approach assumes that the

TABLE 2.1
Criteria of acceptance and failed materials for PCCP.

	Acceptable Range		Failure Criteria	
AQC Measures	**Full Pay**	**Discount Pay**	**Lot Average**	**Sublot**
Flexural Strength	≥570 psi	[515, 570] psi	≤514 psi	<500 psi
Air Content	[5.7, 8.9]%	[9.0, 9.8]% and [5.3, 5.6]%	<5.3% and >9.8%	<5.0% and >10.0%
Air Content Range	[0.0, 2.5]%	[2.6, 3.5]%	>3.5%	N/A*
Thickness: (Average core depth, or ACD) – (Design depth, or DD)	±0.2 inch	[-1.0, -0.2] inch	N/A	< -1.00 inch
Smoothness: 0.0-inch blanking band Profile Index (PI0.0)	>0.00 in./0.1 mi. and <3.60 in./0.1 mi.	[3.60, 3.80] in./0.1 mi.	≥3.8 in./0.1 mi. (must be corrected to less than 3.80 in./0.1 mi.)	N/A

*Not applicable.

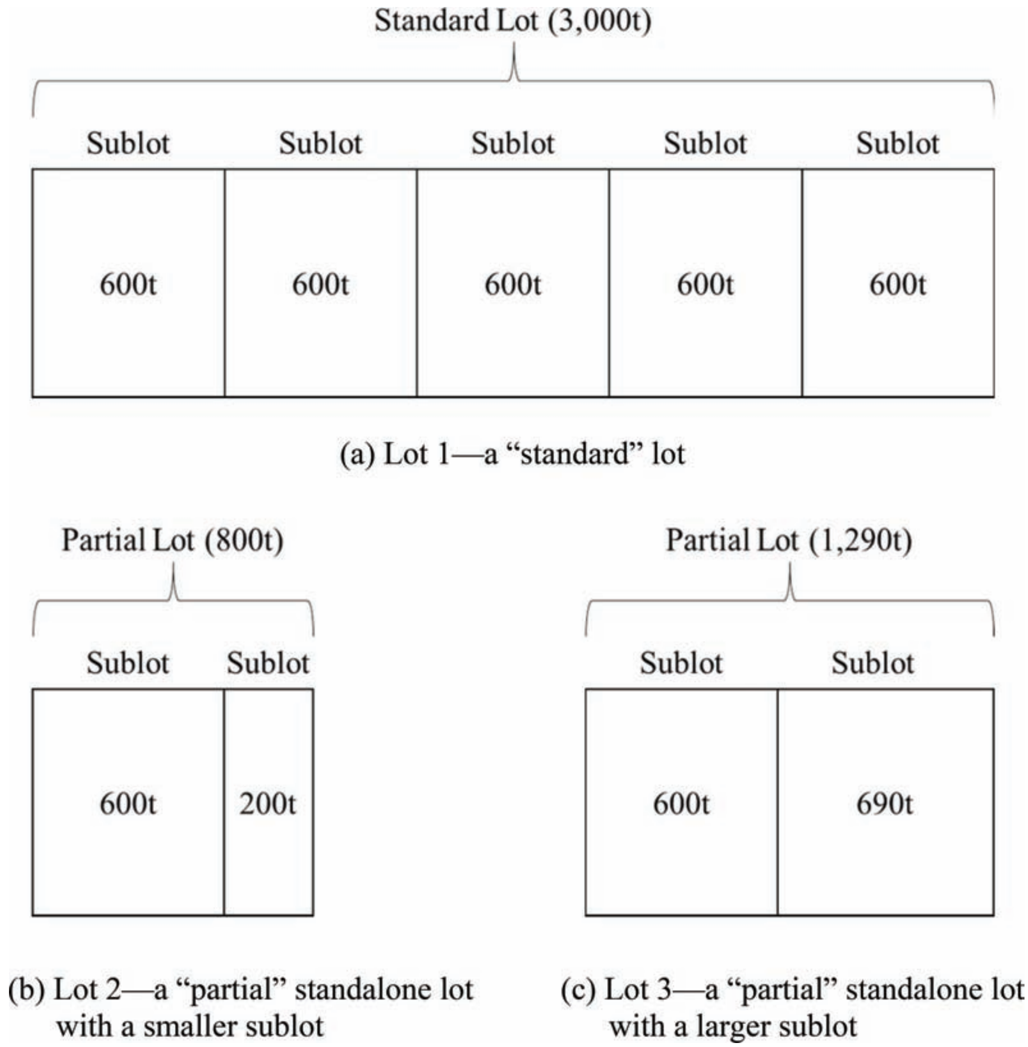


Figure 2.1 The lot and sublot concept of surface HMA pavement in INDOT.

TABLE 2.2
Lot based criteria of acceptance and failed materials for HMA pavement.

	AQC	Lower Specification Limit	Upper Specification Limit
Material	Binder Content, %	- 0.40% from Job Mix Formula (JMF)	+ 0.40% from JMF
	Air Voids at N_{des}, %	2.60%	5.40%
	Voids In Mineral Aggregate at N_{des}, %	Greater of -0.50% from Spec and -1.20% from JMF	Lesser of 2.00% from Spec and 1.20% from JMF
Construction	Roadway Core Density (% Gmm), %	91.00%	N/A

testing results follow a normal statistical distribution and can calculate the percentage of the testing results that fall within any given range (Sholar, Page, Musselman, Upshaw, & Moseley, 2003). Table 2.2 lists the acceptable ranges for the four AQCs: binder content, air voids at N_{des}, air voids in mineral aggregate at N_{des}, and roadway core density. Table 2.3 illustrates how the payment is adjusted according to the calculated PWL value. For any AQC, if the calculated PWL is less than 50(%), then the lot is considered to be failed. In addition to the PWL calculated at the lot level, INDOT defines that a lot is also considered failed materials if one of its sublots has an air void content that is less than 1.0% or greater than 7.0%.

2.1.2.2 Failure Criteria for QC/QA Pavement <1 Lot. For QC/QA HMA pavement that is less than 1 lot, while the same set of AQCs is used, the pay adjustment

TABLE 2.3
Pay adjustment and failure criterion based on PWL for QC/QA HMA pavement ≥1 *lot*.

PWL (%)	Pay Adjustment
>90	Pay factor = (105.00 – 0.50 × (100.00 – PWL))/100
≥50 and ≤90	Pay factor = (100.00 – 0.000020072 × (100.00 – PWL)3.5877)/100
<50	**Failed materials**, subject to the Failed Materials Committee

TABLE 2.4
Sublot based criteria of acceptance and failed materials for HMA pavement.

AQC		Acceptable Range		Failure Criteria
		Full Pay	Discount Pay	
Material	Binder Content, %	≤0.5% from JMF	[0.5, 1.0]% from JMF	>1.0% from JMF
	Air Voids at N_{des}, %	≤0.5% from JMF	[0.5, 2.0]% from JMF	>2.0% from JMF
	Voids In Mineral Aggregate at N_{des}, %	≤0.5% from JMF	[0.5, 2.5]% from JMF	>2.5% from JMF
Construction	Roadway Core Density (% Gmm), %	[92.0, 97.0]% from JMF	[88.9, 92.0]% from JMF	≤88.9% or ≥97.0% from JMF

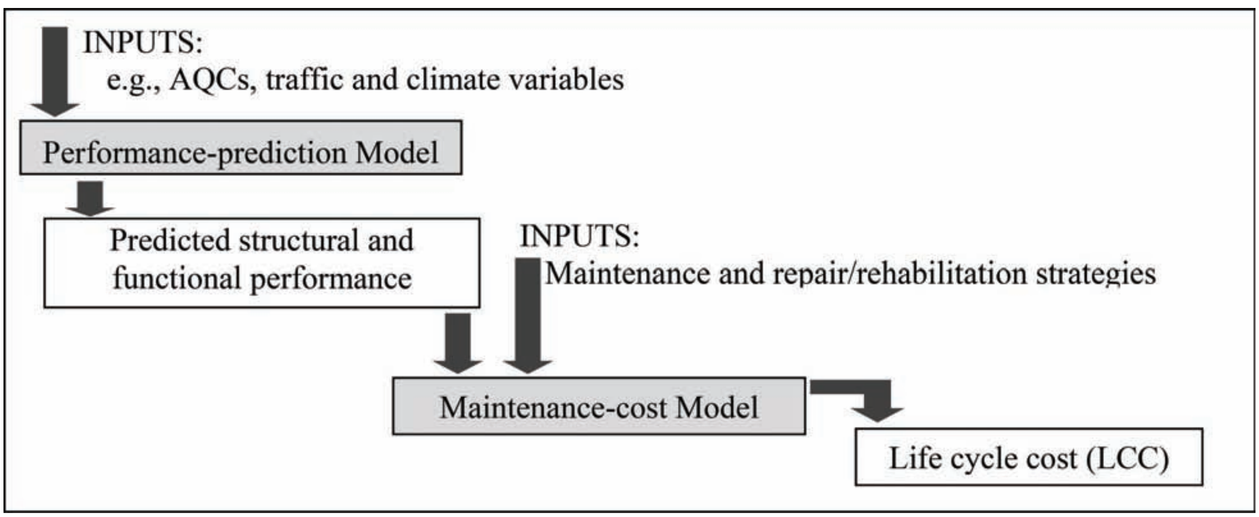


Figure 2.2 The typical PRS analysis procedure of PCCP.

and the failure criteria are both set at the sublot level. Table 2.4 summarizes the ranges for full pay, discount pay, and failure criteria at the sublot level for QC/QA HMA pavement (dense graded) that is less than 1 *lot*. All percentages refer to the deviation from JMF.

2.2 Long-Term Performance and LCC Estimation of PCCP

The long-term performance of PCCP pavement that involves failed materials is the key to making informed decision. PRS, a quality acceptance (QA) specification, describes the desired levels of key acceptance quality characteristics (AQCs) that are correlated with fundamental engineering properties that predict performance. It is capable of estimating the LCC of PCCP, as illustrated in Figure 2.2. In a PRS analysis. AQCs, traffic, and climate variables serve as inputs to the performance-prediction model to predict structural and functional performance of pavement. Resulting performance prediction, together with maintenance and repair/rehabilitation strategies, serves as input to the maintenance-cost model to predict the life-cycle cost. The predicted LCC excludes the initial construction cost.

To facilitate the computation, PRS tools have been developed based on the correlation between AQCs and the long-term performance to estimate the LCC of pavement through computer simulations (Office of Asset Management, 2001). ERES Consultants, through a federal highway administration (FHWA)-funded project, created PaveSpec—a PRS tool for PCCP—in 1993 (Graveen et al., 2009). The working procedure of PaveSpec follows

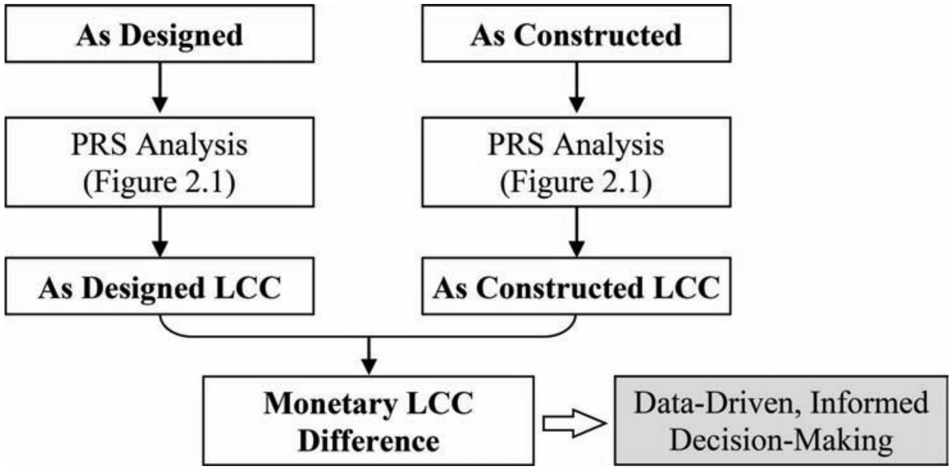


Figure 2.3 LCC comparison method between as-designed LCC and as-constructed LCC.

the general PRS analysis procedure and adopts the life-cycle cost simulation to quantitatively evaluate the performance of PCCP.

By relying on the capability of PRS in estimating the long-term performance and predicting the life-cycle cost of PCCP, the monetary impact from failed materials can be quantified as the life-cycle cost difference between the as-designed and as-constructed pavements. Figure 2.3 illustrates the process to determine the life-cycle cost difference. This information (i.e., the LCC difference) can assist SHAs in determining which option, i.e., "removal and replacement" or "acceptance with a heavy penalty," is more beneficial; and what is the appropriate/fair monetary amount of the "penalty" to be assigned to the "acceptance with a heavy penalty" option.

A number of studies have been conducted to specify the acceptance of pavement through the use of PRS. Evans et al. (2005) developed and implemented a trial PRS for concrete pavement construction in Tennessee. They concluded that PRS is a viable approach to set up incentives for contractors to work harder and perform better. Rao et al. (2007) developed a PRS for concrete pavement construction in Wisconsin. The PRS defined the requirements for four AQCs, thickness, concrete strength, air content, and smoothness; and designed pay factors correspondingly. Evans et al. (2008) developed, implemented, and evaluated a PRS for a construction project in Florida based on three AQCs, thickness, strength, and smoothness. Graveen et al. (2009) developed a PRS for INDOT and validated it using a previously completed construction project. These studies have demonstrated in common that the use of PRS leads to a win-win situation: contractors received higher pay for delivering higher quality pavement and SHAs saved in the long-term by receiving higher quality pavement with lower maintenance costs, better pavement performance, and increased service life.

2.3 Estimating Long-Term Performance for HMA Pavement

PRS for HMA pavement has been developed to describe acceptable levels of AQCs that correlate with the long-term performance in aspects of permanent deformation (e.g., rutting), fatigue cracking, and thermal cracking (Scott et al., 2014). Similar to the PRS for PCCP, the PRS for HMA pavement is capable of estimating its long-term performance. Different from the PRS for PCCP, the PRS for HMA pavement does not quantify the long-term performance into LCC. Rather, by setting the threshold values for the three distresses (i.e., rutting, fatigue cracking, and thermal cracking), the long-term performance is quantified into service life. Figure 2.4 illustrates the PRS analysis process for HMA pavement. The associated computational tool/software is QRSS.

The comparison approach (see Figure 2.3) developed for PCCP can still be used to support the decision-making regarding failed materials of HMA pavement. The difference is that the base for the decision is no longer the LCC difference, but the service life difference instead.

A number of studies have been conducted to develop PRS for HMA pavement and to estimate the long-term performance of HMA pavement using PRS tools. Mensching, McCarthy, Mehta, & Byrne (2013) developed a PRS-based framework to set post-construction targets for rutting performance in HMA pavement overlay projects in the state of Rhode Island. De Jarnette, McCarthy, Bennert, & Guercio (2013) analyzed current PRS programs and recommended to assign pay factor adjustments for HMA pavement based on performance measures. McCarthy, Guercio, Bennert, & De Jarnette (2014) compared performance prediction results of several PRS tools and found that the results are quite consistent.

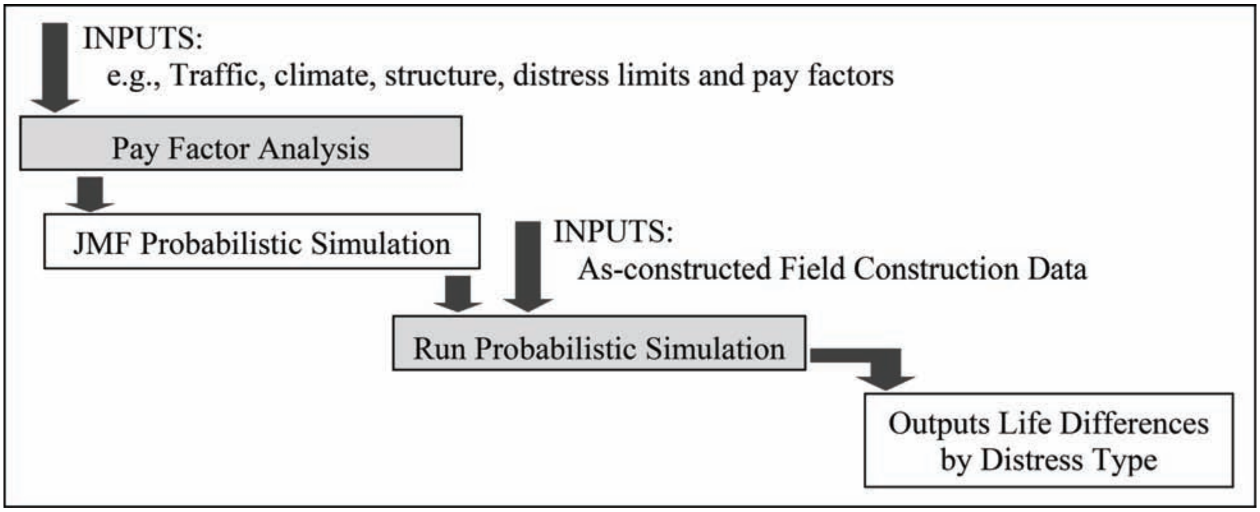


Figure 2.4 The PRS analysis procedure of QRSS for HMA pavement.

TABLE 3.1
AQCs and related distress indicators.

AQC	Related Distress Indicators	Type
Concrete Strength	Transverse Joint Spalling, Transverse Slab Cracking	Required
Slab Thickness	Transverse Joint Faulting	Required
Air Content	Transverse Joint Spalling	Required
Initial Smoothness	Decreasing Smoothness	Required
Percent Consolidation Around Dowels	Transverse Joint Faulting	Optional

3. AN LCC BASED DECISION FRAMEWORK FOR FAILED PCCP MATERIALS

In this study, PaveSpec was investigated as the PRS tool to predict the long-term performance of PCCP that involves failed materials, and a decision framework was developed based on the findings from a large number of simulations. The descriptions regarding PaveSpec in this Chapter are all for the current version of PaveSpec, version 3.0. At the time of this writing, a newer version, version 4.0, is under development (Scott et al., 2014).

3.1 Distresses and Required AQCS in PaveSpec

The current version of PaveSpec, version 3.0, relies on four types of distress indicators—transverse joint faulting, transverse joint spalling, transverse slab cracking, and decreasing smoothness—to estimate LCCs for PCCP. These distress are predicted based on five AQCs: concrete strength, slab thickness, air content, initial smoothness, and percent consolidation around dowels, as shown in Table 3.1. Among them, percent consolidation around dowels is optional while the other four AQCs are required.

TABLE 3.2
Input categories in PaveSpec.

Category	Numbers of Inputs
Basic Specification and Dimensions and Lane Data	10 inputs
Traffic Data	9 inputs
Pavement Design Data	14 inputs
Climatic Data	5 inputs
Maintenance and Rehabilitation Data	28 inputs
Unit Cost Data	17 inputs
Simulation Control	35 inputs
Definition of Pavement Performance	2 inputs
AQC Sampling and Testing	27 inputs
AQC As-Designed Target Value Definition	16 inputs

3.2 Input Variables

PaveSpec requires 163 inputs that can be divided into ten categories, as shown in Table 3.2. Appendix A lists

Figure 3.1 PaveSpec workflow: (a) basic specification information; (b) dimensions and lane configuration; (c) design-related modules; (d) definition of pavement performance; (e) AQC sampling and testing; (f) AQC as-designed target value definition; (g) life-cycle cost-related modules; (h) simulation control; (i) results—pay factor matrices and LCCs (as-designed); (j) as-constructed AQCs; (k) overall pay factor and LCC (as-constructed).

TABLE 3.3
Related inputs for each step in Figure 3.1.

Step	Related Inputs in Appendix A
(a) Basic Specification Information	#1 – #2
(b) Dimensions and Lane Configuration	#3 – #10
(c) Design-Related Modules	#11 – #38
(d) Definition of Pavement Performance	#39 – #40
(e) AQC Sampling and Testing	#41 – #64
(f) AQC As-Designed Target Value Definition	#65 – #80
(g) Life-Cycle Cost-Related Modules	#81 – #129
(h) Simulation Control	#130 – #134

all 163 input variables, their ranges, and sample values (from INDOT project R-25715, a section of I-65 in Clarksville, Indiana). Many of the sample values were used later in the simulations in this study.

3.3 Analytical Process of PaveSpec

Figure 3.1 illustrates how PaveSpec was executed to take inputs, conduct simulations, and report results. The whole process consists of eleven steps. Table 3.3 lists inputs (as listed in Appendix A) that are relevant in each step.

PaveSpec has two levels of specification, Level 1 and Level 2. The major difference is that a Level 2 Specification incorporates the interactions of/correlation between AQCs while a Level 1 Specification does not (Hoerner & Darter, 1999). The user chooses either Level 1 or Level 2 Specification in step (a).

Figure 3.2 illustrates the selection of distress indicators in step (d) in this study. The distress indicator of transverse joint faulting is not checked because it requires the optional AQC—% Consolidation, which is not considered in this study. Based on the selection of the distress indicators, four required AQCs (i.e., concrete strength, slab thickness, air content, initial smoothness, and percent consolidation around dowels) are included.

AQC sampling and testing information is input into PaveSpec at step (e). Table 3.4 illustrates the current sampling and testing methods used by INDOT in its QA/QC program for PCCP. Figure 3.3 graphically illustrates the sampling method, using a *lot* that contains three *sublots* as an example. Note that once the random sample is identified, the tests for air content and flexural strength are performed on the same sample. Air content tests have to be done from a sample obtained on the grade. Beam specimens can be cast from the on grade sample, but they can also be obtained from a truck sample obtained at the point prior to delivery to

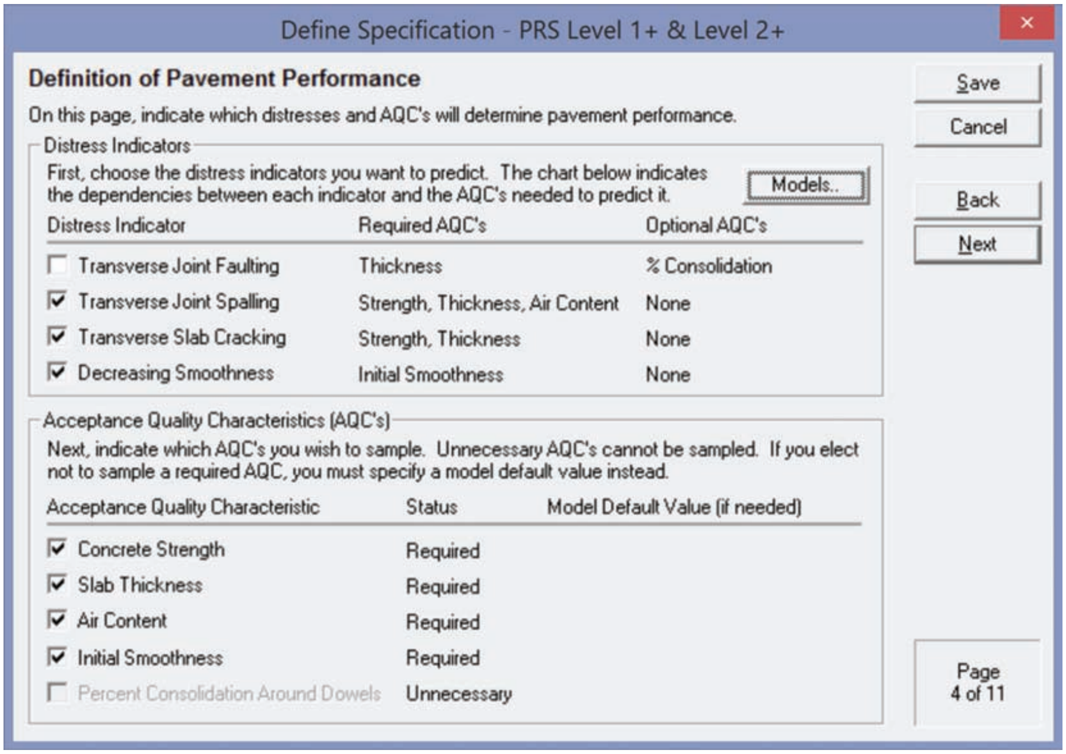


Figure 3.2 Definition of pavement performance.

TABLE 3.4
Current INDOT sampling and testing method.

AQC Value	Sampling Method	Sampling Frequency	Sampling Locations	Testing Method	Precision
Strength	Beams	Two beams per sublot*	1	AASHTO T 97	1 psi
Air Content	Air Pressure Meter	One per sublot	1	AASHTO T 152 or ASTM C 173	0.1%
Thickness	Cores	Two cores per sublot	2	ITM 404	0.1 in
Smoothness	Profile Index (0.0-in blanking band)	1 pass per lane	N/A**	ITM 912	in./0.1 mi.

*Two beams in one location.
**Not applicable.

the grade, where the sample will be obtained for air content.

Figure 3.4 illustrates the inputs of target values for AQCs in step (f). PaveSpec allows ways to estimate the LCC for as-designed: "through simulation" and "using AQC means only." The default method, "through simulation," generates random numbers, which follow a normal distribution, to predict AQCs and run Monte Carlo simulations. The "using AQC means only" method estimates LCC in a deterministic manner. Considering that a pavement section is never homogeneous and AQCs are only obtained at sample locations, the "through simulation" method incorporates the randomness of AQCs and therefore, reflects the reality more accurately (Graveen et al., 2009). In this study, the default "through simulation" method was used to incorporate the inhomogeneity in AQCs.

The user sets simulation control in step (h). The simulation control inputs are divided into two major sections: generic settings and AQC-specific settings. In particular, AQC settings directly affect the range and level of detail in the generated pay factor matrices.

In step (i), PaveSpec reports summary simulation results. If Level 1 Specification is used, the results include (1) predicted distresses for every sublot, (2) pay factor matrices for individual AQCs based on their mean and standard deviation values, and (3) LCCs (present worth) for every sublot and lot. If Level 2 Specification is used, the results do not include pay factor matrices, but the other two items are included. Figure 3.5 illustrates four example outputs, the first three are from Level 1 Specification and the fourth is from Level 2 Specification.

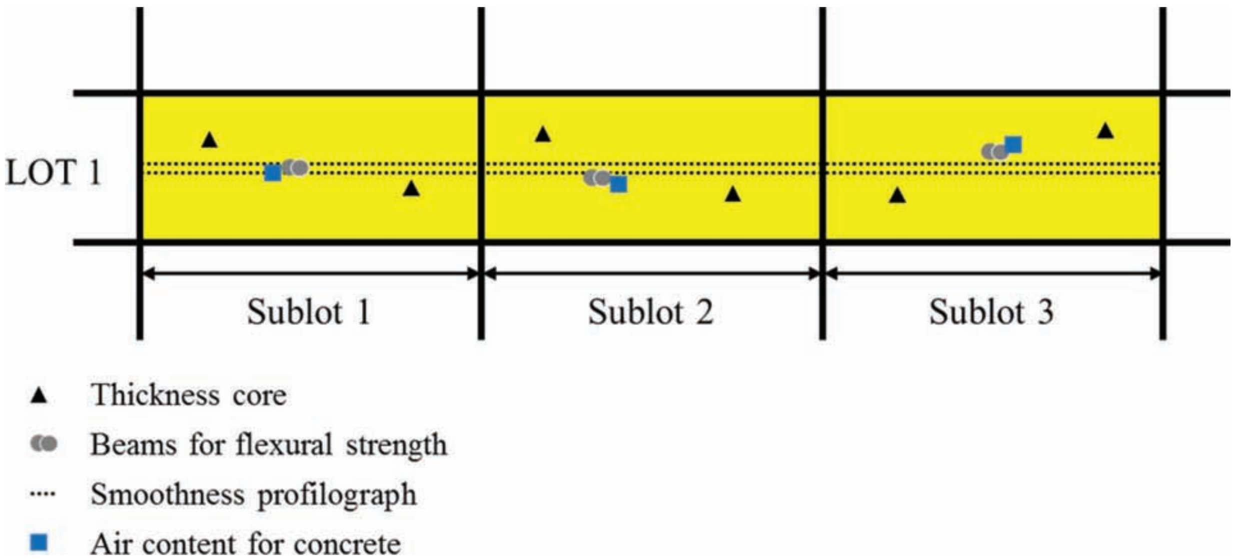


Figure 3.3 Current INDOT sampling method.

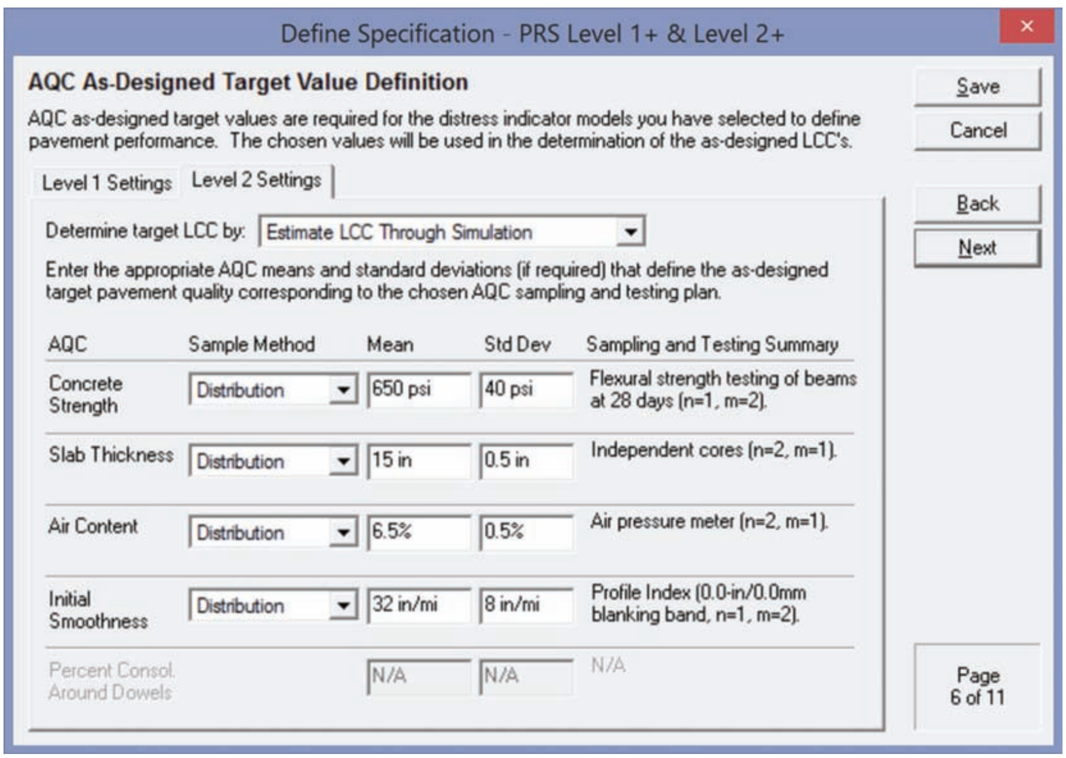
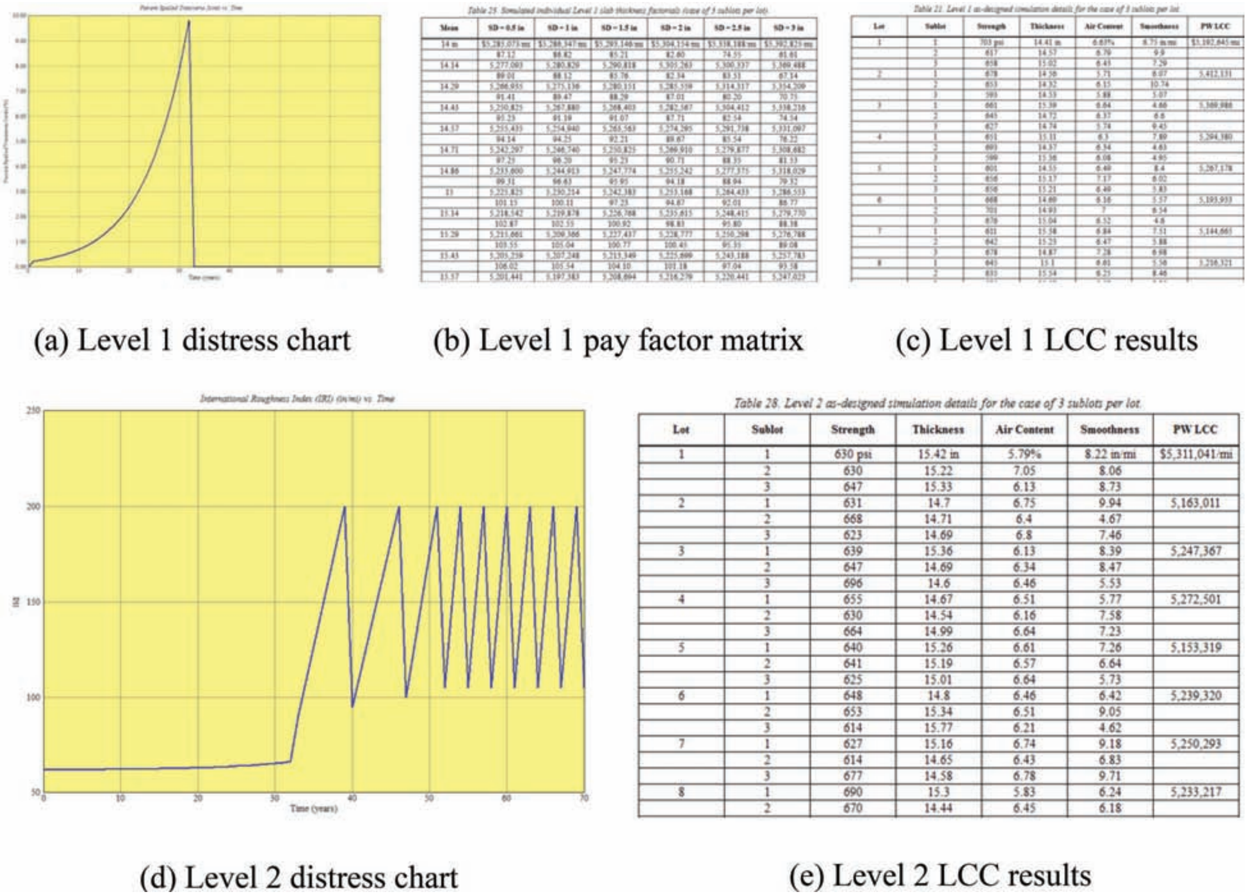


Figure 3.4 AQC as-designed target value definition.

In step (j), field-testing results of AQCs are input into PaveSpec as as-constructed AQCs. If Level 1 Specification is chosen, interpolations are performed by referencing to those individual pay factor matrices, resulting in pay factors and as-constructed LCCs based on individual AQCs. The individual pay factors are then averaged (a weighted average) to estimate the overall pay factor. The as-constructed LCC can then be calculated by using the as-designed LCC, the overall pay factor, and the construction contract price. If Level 2 Specification is used, PaveSpec incorporates all AQCs and their interactions to report the LCC for the as-constructed. Results are reported in step (k). Figure 3.6 illustrates two sample results from Level 1 Specification and Level 2 Specification.

3.3.1 Interpolation Method between 7-day and 28-day Concrete Strength

For the flexural strength AQC, PaveSpec requires 28-day strength, but accepts 7-day strength with a curing



Lot	Sublot	Strength	Thickness	Air Content	Smoothness	PW LCC
1	1	630 psi	15.42 in	5.79%	8.22 in/mi	$5,311,041/mi
	2	630	15.22	7.05	8.06	
	3	647	15.33	6.13	8.73	
2	1	631	14.7	6.75	9.94	5,163,011
	2	668	14.71	6.4	4.67	
	3	623	14.69	6.8	7.46	
3	1	639	15.36	6.13	8.39	5,247,367
	2	647	14.69	6.34	8.47	
	3	696	14.6	6.46	5.53	
4	1	655	14.67	6.51	5.77	5,272,501
	2	630	14.54	6.16	7.58	
	3	664	14.99	6.64	7.23	
5	1	640	15.26	6.61	7.26	5,153,319
	2	641	15.19	6.57	6.64	
	3	625	15.01	6.64	5.73	
6	1	648	14.8	6.46	6.42	5,239,320
	2	653	15.34	6.51	9.05	
	3	614	15.77	6.21	4.62	
7	1	627	15.16	6.74	9.18	5,250,293
	2	614	14.65	6.43	6.83	
	3	677	14.58	6.78	9.71	
8	1	690	15.3	5.83	6.24	5,233,217
	2	670	14.44	6.45	6.18	

Figure 3.5 Preconstruction outputs: (a) Level 1 distress chart; (b) Level 1 pay factor matrix; (c) Level 1 LCC results; (d) Level 2 distress chart; (e) Level 2 LCC results.

Project Pay Factor Summary.

Lot	Strength Pay Factor	Thickness Pay Factor	Air Content Pay Factor	Smoothness Pay Factor	Composite Pay Factor
Lot 1	78.71%	80.70%	103.24%	102.01%	91.17%
Average	78.71%	80.70%	103.24%	102.01%	91.17%

(a) Composite pay factor, Level 1 Specification

Level 2 Pay Factors by Lot.

Lot	PW LCC	AD LCC	Specification Bid Price	Pay Factor
1	$5,106,684/mi	$5,224,750/mi	$422,400/mi	127.95%

(b) Composite pay factor, Level 2 Specification

Figure 3.6 PaveSpec use specification execution results: (a) Level 1 Specification; (b) Level 2 Specification.

curve to allow the estimation of the 28-day strength from the 7-day strength (Evans et al., 2005; Evans et al., 2008; Rao, Smith, & Darter, 2007). In the current practice, INDOT tests 7-day strength and, based on this 7-day strength, determines the pay factor for pay adjustment.

To use PaveSpec for INDOT projects, a conversion mechanism is needed to convert the 7-day strength to the 28-day strength. A previous JTRP study (Graveen et al., 2009) suggested the use of a conversion coefficient, C, to convert between the 7-day and 28-day strength. Equation (3.1) illustrates how this coefficient C can be determined and used.

$$C = \frac{f_{28-Day}}{f_{7-Day}} \tag{3.1}$$

This coefficient method is straightforward and easy to use without sacrificing the accuracy; therefore, it was used in this study to convert 7-day strength into 28-day strength. INDOT considers 570 psi at 7-day concrete strength as the threshold value for a full pay, expecting it to reach 700 psi at 28-day. Thus, the strength multiplication constant C is calculated to be 1.23, which was used in all simulations for PCCP.

Note that the coefficient might be determined in a much more accurate way by slightly modifying the current practice in sampling and testing. For instance, both the 7-day and 28-day flexural strength at the time of the trial batch can be measured to determine coefficient C for the specific mix design. Or, ores from broken beam halves or actual pavement areas in questions could be obtained very close to the 28-day age and tested for split tensile strength (to be converted to a 28-day flexural strength).

3.4 Estimating the LCC of As-Constructed PCCP: The Interpolation Approach versus the Re-Simulation Approach

The default approach in PaveSpec to estimate the LCC of the as-constructed is an interpolation approach. The execution of PaveSpec simulations yields an LCC pay factor matrix for each AQC based on its mean and standard deviation. The LCC of as-constructed PCCP can be estimated by using the field-testing values (the means and standard deviations of AQCs) to interpolate the matrix. Resulting LCC estimates based on individual AQCs are then averaged (could be weighted) to obtain an overall LCC estimate. This interpolation approach does not count for the composite effect of multiple AQCs deviating from their as-designed targets. It generates a single, deterministic estimate of the LCC for the as-constructed PCCP. Consequently, it cannot be used to estimate the LCC difference between the as-designed and as-constructed at user specified confidence levels.

In this study, we devised a re-simulation approach to enable the statistical analysis and the estimate of LCC difference at user specified confidence levels. The mean and standard deviation values of AQCs obtained from field samples are input into PaveSpec in the place of design targets to run Monte Carlo simulations again to estimate the LCC of the as-constructed pavement. The re-simulation approach incorporates the aggregate effect of multiple AQCs deviating from their design targets; therefore, it is expected to be more accurate than the interpolation approach. Instead of yielding one deterministic LCC estimate for the as-constructed, a set of estimates are available to calculate the LCC at user specified confidence levels and to estimate the LCC difference between the as-designed and the as-constructed with varying probabilities.

A large number of simulations were performed to assess the effect from these two different approaches. Figure 3.7, Table 3.5, and Table 3.6 compare the LCCs of the as-designed and as-constructed pavements under scenarios of either only one AQC deviating from its design targets or all four AQCs deviating from their design targets. All simulations were executed using both levels of specification, Level 1 and Level 2 Specification. The re-simulation approach leads to more consistent results than the interpolation approach. Furthermore, for a PCCP whose slab thickness is thinner than the design target and whose initial smoothness is worse than the design target, the interpolation approach estimates the LCC of the as-constructed to be lower than the LCC of the as-designed. This is opposite to the reality: thinner slab and inferior smoothness lead to a higher LCC, not a lower one.

3.5 Level 1 Specification versus Level 2 Specification

The major difference between Level 1 and Level 2 Specifications is that the interactions of AQCs are only included in the Level 2 Specification (Hoerner & Darter, 1999). For example, increasing concrete strength may offset a deficiency in slab thickness. However, only a Level 2 Specification can account for this effect.

A large number of simulations were conducted to assess the difference between the Level 1 Specification and Level 2 Specification in estimating the LCC of both as-designed and as-constructed. Figure 3.8 and Table 3.7 compare the simulation results of Level 1 and Level 2 Specifications when as-constructed AQC values are different from their as-designed target values, but still in acceptable ranges. Level 2 Specification results in slightly smaller as-designed LCCs than those of Level 1 Specification. In all scenarios, LCC differences between as-designed and as-constructed values are smaller when using Level 2 Specification. LCC differences in the first three scenarios, in which only one AQC deviates from its design target, are slightly different between Level 1 and Level 2 Specifications. The 4 AQCs scenario (i.e., all four AQCs deviate from their design targets) illustrates the largest discrepancy between Level 1 and Level 2 results, highlighting the significance of the impact considering the interactions among the AQCs.

3.6 Selecting the Approach and the Level of Specification

In Section 3.4 and 3.5, it was illustrated that the re-simulation approach leads to more consistent results than the interpolation approach and Level 2 Specification results more closely reflect the reality. To select the approach (i.e., the interpolation approach versus the re-simulation approach) and the level of specification (i.e., the Level 1 Specification and the Level 2 Specification) to be used by INDOT, a number of simulation scenarios were crafted to evaluate the composite effect on the LCC estimates from the two approaches and two levels of specification. Table 3.8 lists all 20 scenarios used in this analysis. Only one AQC deviates from its design target in the first sixteen scenarios. In the last four scenarios, all four AQCs deviate from their design targets.

Table 3.9 shows the cross-comparison results to assess the effect of level of specification. The magnitude of the LCC difference between the interpolation approach and the re-simulation approach is always significantly larger in Level 2 than in Level 1. In particular, LCC difference of four AQC deviations in Level 2 Specification constitutes around fourteen percent of construction price.

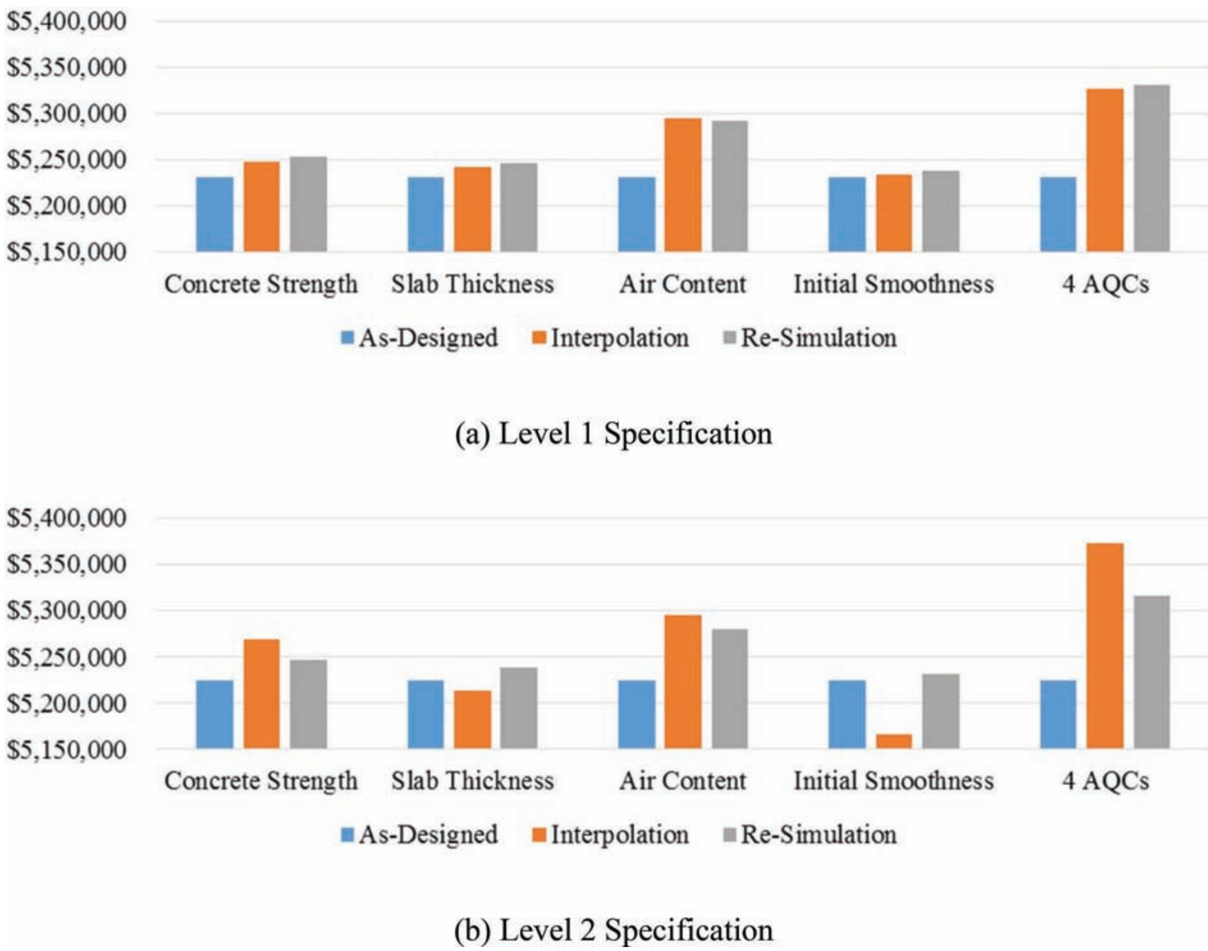


Figure 3.7 LCC results comparisons of the interpolation and the re-simulation methods: (a) Level 1 Specification; (b) Level 2 Specification.

TABLE 3.5
Comparison of LCC results of the interpolation and the re-simulation approaches (Level 1 Specification).

Simulation Type	As-Designed (LCC, $)	As-Constructed (Interpolation Approach) (LCC, $)	Interpolation Difference ($)	As-Constructed (Re-simulation Approach) (LCC, $)	Re-simulation Difference ($)
Concrete Strength	$5,230,669	$5,248,283	$17,614	$5,253,622	$22,953
Slab Thickness	$5,230,669	$5,242,243	$11,574	$5,246,083	$15,414
Air Content	$5,230,669	$5,294,113	$63,444	$5,291,841	$61,172
Initial Smoothness	$5,230,669	$5,233,457	$2,788	$5,237,300	$6,631
4 AQCs	$5,230,669	$5,326,089	$95,420	$5,331,140	$100,471

Table 3.10 shows the cross-comparison results to assess the effect of the approach. The magnitude of the LCC difference between the Level 1 and Level 2 Specifications is always significantly larger under the interpolation approach than under the re-simulation approach. Moreover, LCC difference of four AQC deviations in the interpolation approach constitutes around eleven percent of the construction price.

The comparison results highlight the significant difference between the use of different approaches and different levels of specifications. Following the discussions with the SAC, it was concluded that the Level 2 Specification and the re-simulation approach reflect the reality more closely and fits the application needs better. Therefore, the re-simulation approach and the Level 2 Specification were selected to develop the

TABLE 3.6
Comparison of LCC results of the interpolation and the re-simulation approaches (Level 2 Specification).

Simulation Type	As-Designed (LCC, $)	As-Constructed (Interpolation Approach) (LCC, $)	Interpolation Difference ($)	As-Constructed (Re-simulation Approach) (LCC, $)	Re-simulation Difference ($)
Concrete Strength	$5,224,750	$5,269,319	$44,569	$5,247,058	$22,308
Slab Thickness	$5,224,750	$5,213,477	-$11,273	$5,238,555	$13,805
Air Content	$5,224,750	$5,294,539	$69,789	$5,279,506	$54,756
Initial Smoothness	$5,224,750	$5,165,945	-$58,805	$5,231,247	$6,497
4 AQCs	$5,224,750	$5,372,469	$147,719	$5,316,124	$91,374

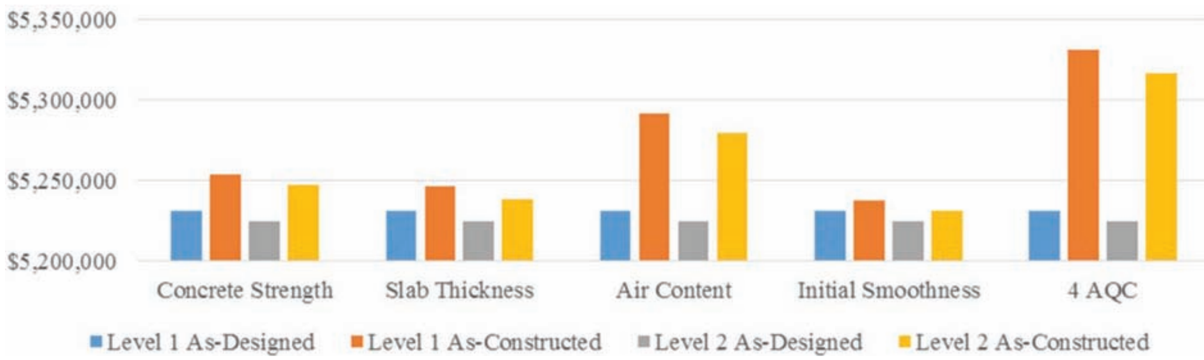


Figure 3.8 LCC results comparisons of Level 1 Specification and Level 2 Specification.

TABLE 3.7
LCC results comparisons of Level 1 Specification and Level 2 Specification.

Simulation Type	Level 1 As-Designed (LCC, $)	Level 1 As-Constructed (LCC, $)	Level 1 Difference ($)	Level 2 As-Designed (LCC, $)	Level 2 As-Constructed (LCC, $)	Level 2 Difference ($)
Concrete Strength	$5,230,669	$5,253,622	$22,953	$5,224,750	$5,247,058	$22,308
Slab Thickness	$5,230,669	$5,246,083	$15,414	$5,224,750	$5,238,555	$13,805
Air Content	$5,230,669	$5,291,841	$61,172	$5,224,750	$5,279,506	$54,756
Initial Smoothness	$5,230,669	$5,237,300	$6,631	$5,224,750	$5,231,247	$6,497
4 AQCs	$5,230,669	$5,331,140	$100,471	$5,224,750	$5,316,124	$91,374

decision framework for failed PCCP materials for INDOT.

3.7 LCC Trend and Sensitivity Analysis Via Simulations

Upon the selection of the re-simulation approach and the Level 2 Specification for estimating the LCCs of failed PCCP materials, a series of simulation scenarios were designed to examine the sensitivity and trend of LCCs in correspondence to changes in the means and standard deviations of the AQCs, covering both acceptable and failed ranges. All simulations were conducted for a three-*sublot lot* of PCCP with the sampling methods specified in INDOT specifications (INDOT, 2011). Figure 3.9 illustrates the trends of the LCCs of the as-constructed PCCP to the variations in the standard deviation and mean of individual AQCs. The simulation results of flexural strength and thickness show an obvious trend: lower means (lower quality) and higher standard deviations (lower consistency) correspond to higher LCC estimates. The simulation results of smoothness show that higher means (lower quality) and larger standard deviations (lower consistency) associate with higher LCC estimates. This is because a higher smoothness value indicates a lower quality pavement. The simulation results of the air content present a dilemma. The trend is such that higher mean and lower standard deviation associate with lower LCC estimates. However, INDOT specifies the failure criteria for air content as a range rather than a threshold value. Figure 3.10 illustrates the dilemma. For the failures because of high air content, the LCC of the as-constructed is even lower than the LCC of the as-designed. One possible explanation for the odds is that a pavement of high air content, but with an acceptable flexural strength is actually a high quality product and thus, the LCC is lower. A comprehensive list of scenarios were crafted to further investigate the trend of LCC to various AQCs in Section 3.8.

TABLE 3.8
Scenarios for selecting approach and level of specification.

No.	As-Constructed Deviations	Approach	Specification
1	Concrete Strength	Interpolation	Level 1
2	Concrete Strength	Re-Simulation	Level 1
3	Concrete Strength	Interpolation	Level 2
4	Concrete Strength	Re-Simulation	Level 2
5	Slab Thickness	Interpolation	Level 1
6	Slab Thickness	Re-Simulation	Level 1
7	Slab Thickness	Interpolation	Level 2
8	Slab Thickness	Re-Simulation	Level 2
9	Air Content	Interpolation	Level 1
10	Air Content	Re-Simulation	Level 1
11	Air Content	Interpolation	Level 2
12	Air Content	Re-Simulation	Level 2
13	Initial Smoothness	Interpolation	Level 1
14	Initial Smoothness	Re-Simulation	Level 1
15	Initial Smoothness	Interpolation	Level 2
16	Initial Smoothness	Re-Simulation	Level 2
17	4 AQCs	Interpolation	Level 1
18	4 AQCs	Re-Simulation	Level 1
19	4 AQCs	Interpolation	Level 2
20	4 AQCs	Re-Simulation	Level 2

3.8 Simulation Results of Various AQC Failure Scenarios

The preceding simulation results of air content AQC show that higher means and lower standard deviations associate with lower LCC estimates. On the other hand, constructed concrete materials that have more than 9.8% air content are considered failed materials according to INDOT specifications. Thus, it is possible to infer that PaveSpec might have some limitations in accurately estimating LCC when the air content mean is outside the acceptable range. A large number of simulation scenarios were designed to investigate the composite effects of multiple AQCs. Appendix B contains all the simulation scenarios (a total of 2,520) and the estimated LCCs. Data in Appendix B allow much more analyses than the ones used in this section.

Figure 3.11 illustrates a few LCC trends against the mean and standard deviation of air content with other AQCs in different ranges. It is quite obvious that that no matter what value ranges the other AQCs are in, higher air content mean values are always associated with lower LCCs. Furthermore, the estimated LCCs of the as-constructed pavement were compared to the corresponding LCCs of the as-designed pavement (i.e., LCC with 15 inch thickness AQC, and LCC with 12 inch thickness AQC) for all the simulation scenarios. Considering that a failed PCCP with lower as-constructed LCC as abnormal, a total of 1,355 (643 cases with 15 inch design target of thickness, and 712 cases with 12 inch design target of thickness) abnormal cases were

TABLE 3.9
Comparisons between the interpolation and re-simulation approaches.

No.	As-Constructed Deviations	Level	LCC (Interpolation Approach)	LCC (Re-simulation Approach)	LCC Difference	Difference % with As-Designed LCC (%)	Difference % with Construction Price ($422,400, %)
1	Concrete Strength	1	$5,248,283	$5,253,622	-$5,339	0.10%	1.26%
		2	$5,269,319	$5,247,058	$22,261	0.43%	5.27%
2	Slab Thickness	1	$5,242,243	$5,246,083	-$3,840	0.07%	0.91%
		2	$5,213,477	$5,238,555	-$25,078	0.48%	5.94%
3	Air Content	1	$5,294,113	$5,291,841	$2,272	0.04%	0.54%
		2	$5,294,539	$5,279,506	$15,033	0.29%	3.56%
4	Initial Smoothness	1	$5,233,457	$5,237,300	-$3,843	0.07%	0.91%
		2	$5,165,945	$5,231,247	-$65,302	1.25%	15.46%
5	4 AQC	1	$5,326,089	$5,331,140	-$5,051	0.10%	1.20%
		2	$5,372,469	$5,316,124	$56,345	1.08%	13.34%

TABLE 3.10
Comparisons between the Level 1 Specification and Level 2 Specification.

No.	As-Constructed Deviations	Approach	LCC (Level 1)	LCC (Level 2)	LCC Difference	Difference % with As-Designed LCC (%)	Difference % with Construction Price ($422,400, %)
1	Concrete Strength	Interpolation	$5,248,283	$5,269,319	-$21,036	0.40%	4.98%
		Re-Simulation	$5,253,622	$5,247,058	$6,564	0.13%	1.55%
2	Slab Thickness	Interpolation	$5,242,243	$5,213,477	$28,766	0.55%	6.81%
		Re-Simulation	$5,246,083	$5,238,555	$7,528	0.14%	1.78%
3	Air Content	Interpolation	$5,294,113	$5,294,539	-$426	0.00%	0.10%
		Re-Simulation	$5,291,841	$5,279,506	$12,335	0.24%	2.92%
4	Initial Smoothness	Interpolation	$5,233,457	$5,165,945	$67,512	1.29%	15.98%
		Re-Simulation	$5,237,300	$5,231,247	$6,053	0.12%	1.43%
5	4 AQC	Interpolation	$5,326,089	$5,372,469	-$46,380	0.89%	10.98%
		Re-Simulation	$5,331,140	$5,316,124	$15,016	0.29%	3.55%

identified. 84%, or 1,135 cases (470 cases with 15 inch thickness, and 665 cases with 12 inch thickness) have an air content that is higher than 9.8%. These abnormal results were discussed with SAC and the conclusion is that if PCCP fails because of air content, PaveSpec is not suitable to accurately estimate the LCC of the as-constructed pavement.

3.9 LCC Estimation for *Lots* with Both Failed and Acceptable *Sublots*

INDOT defined the failure criteria for flexural strength and air content at both sublot and lot levels. This leads to a diversity of failure scenarios (e.g., a three-sublot lot could fail because of the lot average, but one or two sublots might be acceptable; or, the lot average of a three-sublot lot is acceptable, but one or two sublots fail). The challenge is how to estimate the as-constructed LCC of a lot that contains both acceptable and failed sublots. Two methods were investigated in this study. In the divide-estimate-sum method, such a lot is divided into two new lots: one contains only acceptable sublot(s), and the other contains only failed sublot(s). The LCC of the original lot is the total of the LCCs of the two newly created lots. In the single lot method, the lot is treated as a single lot with a mix of failed and acceptable sublots to estimate the LCC.

A large number of simulation scenarios were devised to evaluate the difference in the resulting lot LCC between the two methods. Figure 3.12 illustrates the difference between the results from the divide-estimate-sum method and the results from the single lot method, under various combinations of lot failure/acceptance and sublot failure/acceptance, focusing on flexural strength only.

Figure 3.12 illustrates that (1) under most scenarios, the differences are quite significant, and (2) under all scenarios, the LCC estimated in the single lot method is always higher than the LCC estimated in the divide-estimate-sum method. This can be explained by examining the standard deviation. A lower standard deviation indicates a higher consistency in pavement quality and a lower LCC. Separating acceptable sublot(s) and failed sublot(s) leads to smaller standard deviations and lower LCCs in the two new lots than the original lot.

It is recommended that for the failure scenarios of "acceptable lot average, mix of acceptable and failed sublots," all failed sublots compose a new lot and the as-designed LCC and the as-constructed LCC for this new lot are estimated and compared to make the decision for these failed sublots. For the failure scenarios of "lot average failure," the single lot method should be used; that is, the as-designed LCC and the as-constructed LCC form the base for the decision regarding failed materials for the lot.

3.10 The Calculation of LCC Difference at User-Specified Confidence Levels

The AQC values are for sample locations only. When PaveSpec estimates the LCC of the as-designed and as-constructed PCCP sections, the inherent uncertainty in the AQCs is incorporated by assuming that the AQCs follow normal distributions. Random numbers are generated in each round of simulation to pick probable AQC values, based on which the pavement performance is predicted and the LCC is estimated. PaveSpec, by default, reports the mean LCC of all these 500 LCCs. From a statistical perspective, the mean value indicates that there is a 50% probability of a higher LCC and a 50% probability of a lower LCC. This interpretation presents a dilemma for SHAs in making their decisions directly based on the mean LCC. Noting that these 500 LCCs follow a normal distribution and each distribution is independent, 90th-percentile and 95th-percentile LCC differences between as-designed and as-constructed LCC distributions can be calculated using Equations (3.2), (3.3), (3.4), and (3.5). From a

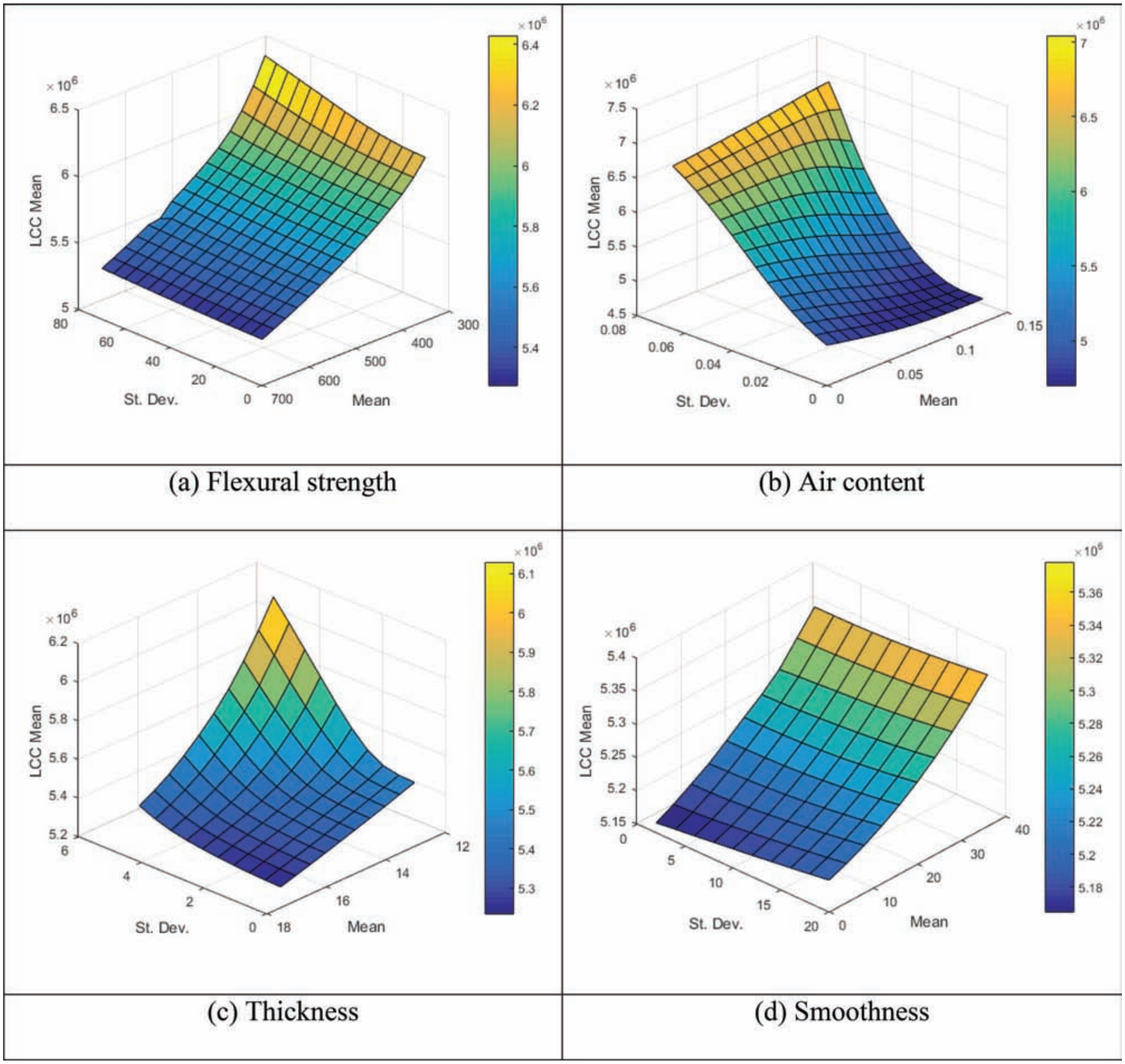


Figure 3.9 Trend analysis results: (a) flexural strength; (b) air content; (c) thickness; (d) smoothness.

statistical perspective, the 90th-percentile LCC difference indicates a 90% probability/confidence of the actual LCC difference being lower. This means that SHAs can specify an appropriate confidence level and compare these two LCCs to determine the financial impact of the failed materials at a confidence level that reflects the agency's risk-taking strategy.

$$LCC_{Difference\_Mean} = LCC_{Mean\_As-Constructed} - LCC_{Mean\_As-Designed} \quad (3.2)$$

$$LCC_{Difference\_St.Dev.} = \sqrt{LCC^2{}_{St.Dev.\_As-Constructed} + LCC^2{}_{St.Dev.-As-Designed}} \quad (3.3)$$

$$LCC_{Difference\_90\%} = LCC_{Difference\_Mean} + 1.28 \times LCC_{Difference\_St.Dev.} \quad (3.4)$$

$$LCC_{Difference\_95\%} = LCC_{Difference\_Mean} + 1.65 \times LCC_{Difference\_St.Dev.} \quad (3.5)$$

where, $LCC_{Difference\_90\%}$ is a 90th-percentile LCC difference, $LCC_{Difference\_95\%}$ is a 95th-percentile LCC difference, $LCC_{Difference\_\ Mean}$ is the mean of LCC difference between as-designed and as-constructed LCC distributions, and $LCC_{Difference\_\ St.Dev.}$ is a standard deviation of LCC difference between as-designed and as-constructed LCC distributions.

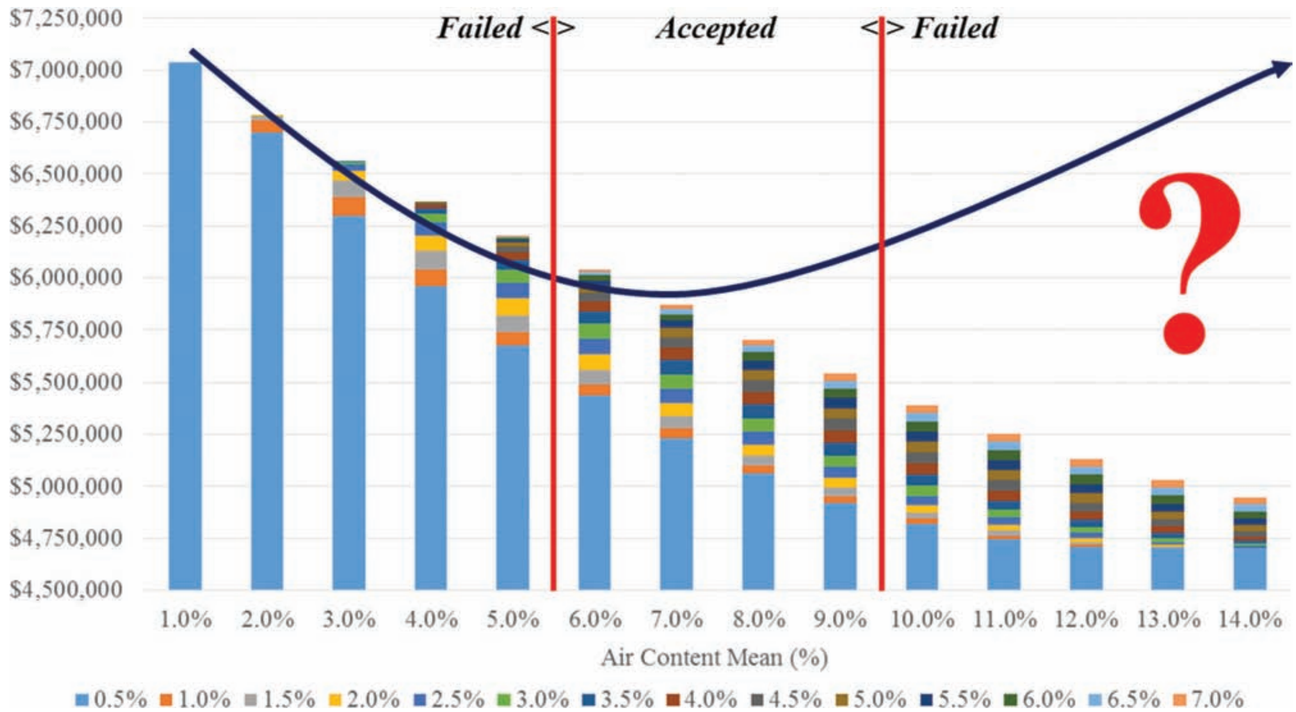


Figure 3.10 The dilemma caused by air content.

3.11 The Decision Frameweork for Failed PCCP Materials

Based on the aforementioned simulation results and observations, a decision framework was created to assist the decision-making for INDOT for failed materials of PCCP, illustrated in Figure 3.13.

The decision framework consists of five steps. In Step 1, Level 2 Specification is used to simulate the as-designed PCCP performance and estimate LCC. In Step 2, following the re-simulation approach, the field AQC values of as-constructed PCCP are input into PaveSpec to simulate the as-constructed PCCP performance and estimate the as-constructed LCC. In this step, if the air content AQC fails, Decision 1: Removal and Replacement is reached and the process stops. If the air content is acceptable, the process continues to Step 3, in which the PaveSpec executes simulations for the as-constructed pavement to predict its long-term performance and estimate its LCC. In Step 4, the 90th-percentile and 95th-percentile LCC differences between the as-designed and as-constructed PCCP are calculated. Other percentile LCCs could be calculated depending on a SHA's risk perception and management strategy. In Step 5, the 90th-percentile, 95th-percentile, or any other percentile LCC difference between the as-designed and as-constructed PCCP is compared to the initial construction cost to determine the financial impact of failed materials. If the LCC difference is larger, Decision 1: Removal and Replacement is reached. Otherwise, the pavement will be accepted with a heavy penalty that equals the LCC difference.

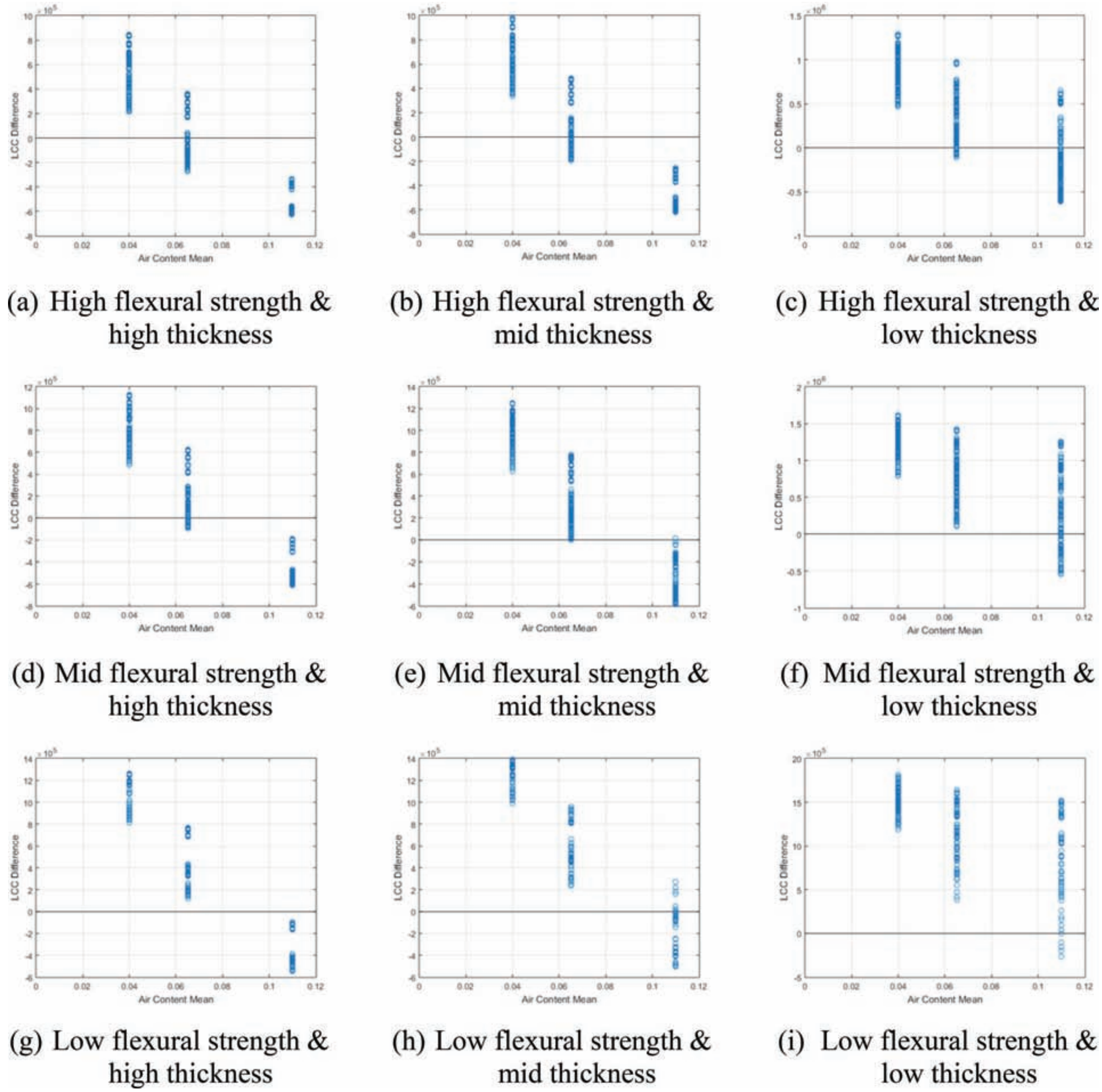
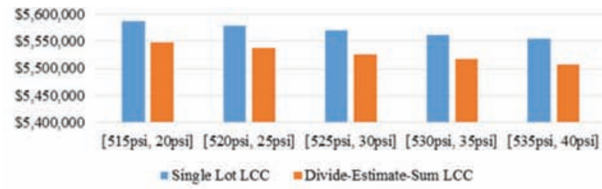
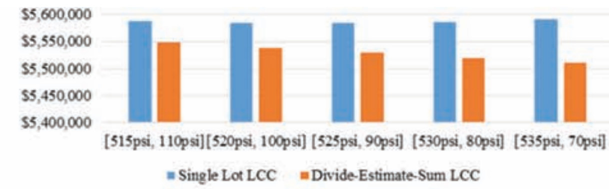


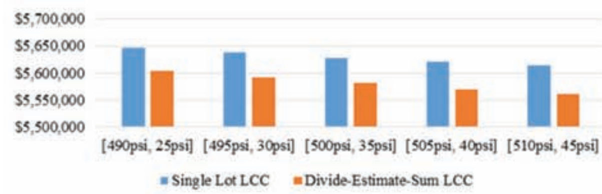
Figure 3.11 Composite effects of multiple AQCs analysis results.



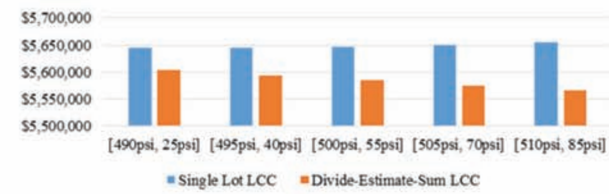
(a) Lot average acceptable, 1 sublot failed: failed sublot average remains constant



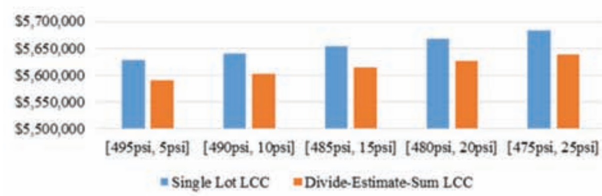
(b) Lot average acceptable, 1 sublot failed: failed sublot average decreased



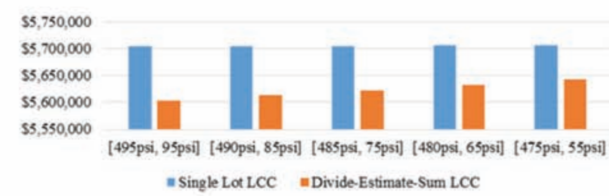
(c) Lot average failed, 1 sublot failed: failed sublot average remains constant



(d) Lot average failed, 1 sublot failed: failed sublot average decreased



(e) Lot average failed, 2 sublot failed: acceptable sublot average remains constant



(f) Lot average failed, 2 sublot failed: acceptable sublot average increased

Figure 3.12 Comparison of two different methods in estimating the LCC of a lot that contains both acceptable and failed sublots (flexural strength).

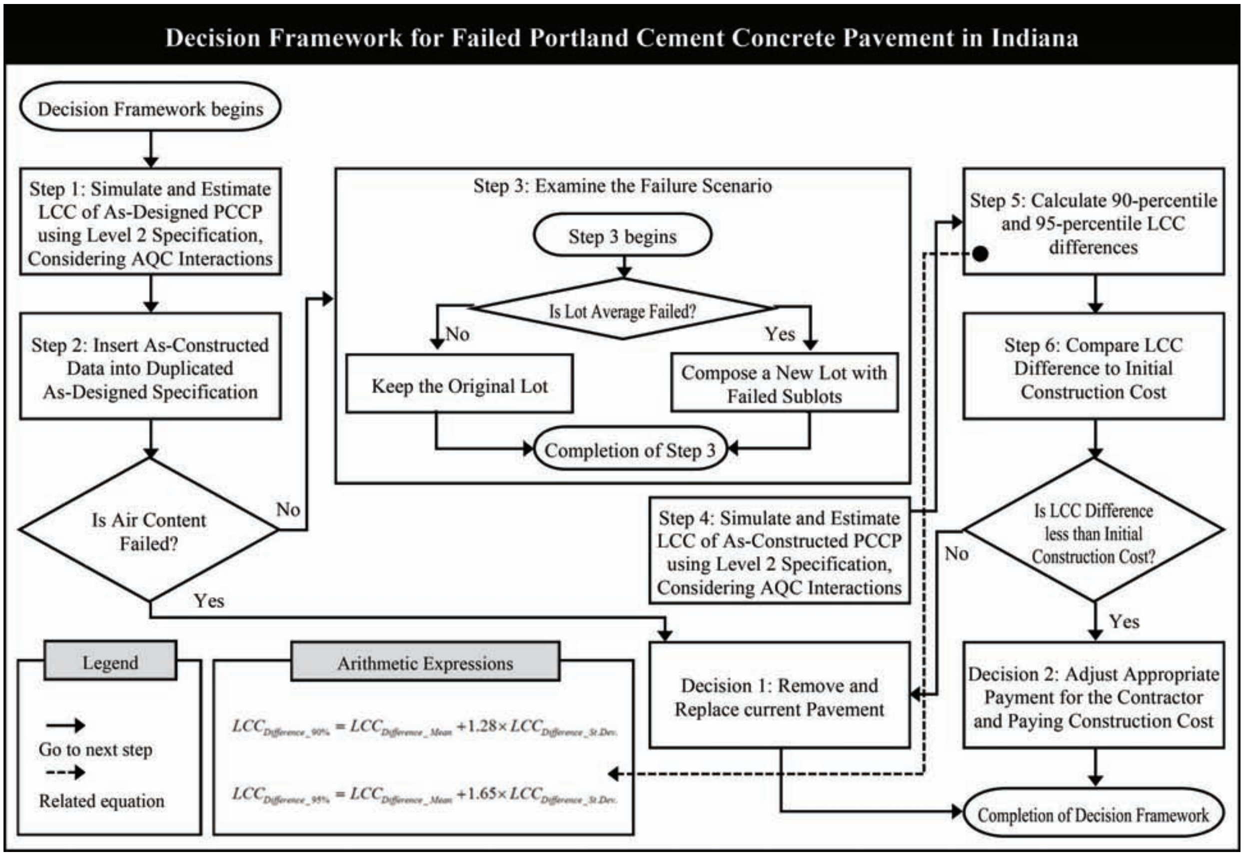


Figure 3.13 Illustration of the decision framework for PCCP of failed materials.

4. USE OF QRSS FOR QC/QA HMA PAVEMENT OF FAILED MATERAILS

In this study, QRSS was investigated as the PRS tool to predict the long-term performance of HMA pavement that involves failed materials. The descriptions regarding QRSS in this Chapter are all for the stand-alone program of QRSS implemented under Microsoft Windows (version XP and 7 only).

4.1 Distresses and Service Life Prediction

QRSS uses three types of distresses—rutting, fatigue cracking, and thermal cracking—for predicting the long-term pavement performance. QRSS estimates the service life based on the predicted long-term performance, for each type of distress; there is an estimated service life based on each type of distress. Equation 4.1 illustrates the determination of service life based on rutting (Moulthrop & Witczak, 2011). Factors that are used in QRSS to determine the service life include the deterministic distress predictions (RUT_c), design life (Y_c) and dynamic modulus (E^* and E^*_c). Moreover, the same method (i.e., Equation 4.1) is used in the calculation of the service lives for both the as-designed and as-constructed pavements.

$$Y = \frac{\log\left(\left(\frac{RUT}{RUT_c} \times \frac{E^*}{E^*_c}\right)^{1/0.479244}\left((1+r)^{Y_c} - 1\right) + 1\right)}{\log(1+r)} \qquad (4.1)$$

where Y is the predicted service life, Y_c is the design life, RUT is the rut depth, RUT_c is the deterministically predicted rut depth criterion value, E^* is the dynamic modulus, E^*_c is the dynamic modulus criterion value, and r is the growth rate (rate of traffic increase per year).

4.2 Input Variables

Input variables to QRSS include mixture volumetrics, design features, traffic characteristics, and sampling data for predicting performances. The QRSS inputs are broadly divided into two groups: inputs for the as-designed pavement and inputs for the as-constructed pavement. Table 4.1 presents the inputs required to run the QRSS program.

Appendix C lists a total of 135 input variables with values obtained from an INDOT highway construction project—a toll road project for the Indiana State Road 13 located in Goshen, Indiana. These data were used in this study to investigate QRSS in details.

4.3 Analytical Process of QRSS

As-designed data and as-constructed data are both input into QRSS to run the simulations to predict the long-term performance and estimate the service life. Figure 4.1 illustrates the steps involved in the use of

QRSS. Table 4.2 lists inputs (as listed in Appendix C) that are relevant in each step.

Taking the data inputs, in step (h), QRSS runs Monte Carlo simulations to evaluate the target JMF to determine whether the as-designed mix satisfies the pre-set distress limits and projected effective dynamic modulus ($|E^*|$) criteria for the design life of the pavement. It is important that predicting dynamic modulus ($|E^*|$) for the QRSS procedure. Figure 4.2 illustrates a sample result after completing step (h).

TABLE 4.1
QRSS inputs required for analysis.

As-Designed Pavement Input	As-Constructed Pavement Input
• Design Speed	• Lot Definition
• Design Life	• Tonnage by Lot
• Design Year 1 Daily Equivalent Single-Axle Loads (ESALs)	• Gradation
• Design Volumetrics	• Volumetrics
• Binder Characteristics	• Layer Thickness
• Target Gradation	• Binder Characteristics
• Target In-Situ Volumetrics	
• Layer Thickness	
• Location	
• Distress Limits	

QRSS requires *lot* information (e.g., amount of *lot* and *lot* tonnage), in-situ gradation and volumetric data of each HMA pavement layer for estimating as-constructed service life. QRSS runs Monte Carlo simulations again for each *lot* to evaluate the in-situ JMF after taking the data inputs in step (i). In step (j), QRSS reports the estimated service life difference between the as-designed and as-constructed pavements. Figure 4.3 illustrates a sample output summary and Table 4.3 lists analysis results in a tabular form.

4.4 Service Life Difference with Probabilities

The current version of QRSS reports the mean of the service life differences between the as-designed and as-constructed pavements through Monte Carlo simulations. However, it does not provide standard deviations of the service life differences directly. From a statistical perspective, the mean value indicates that there is a 50% probability of a higher service life difference and a 50% probability of a lower service life difference. To enable the calculation the service life difference at any user-specified confidence/probability (e.g., 90th-percentile or 95th-percentile service life difference), Equations (4.2), (4.3), (4.4), and (4.5) must be followed.

$$SLD_{Mean} = SL_{Mean\_As-Constructed} - SL_{Mean\_As-Designed} \tag{4.2}$$

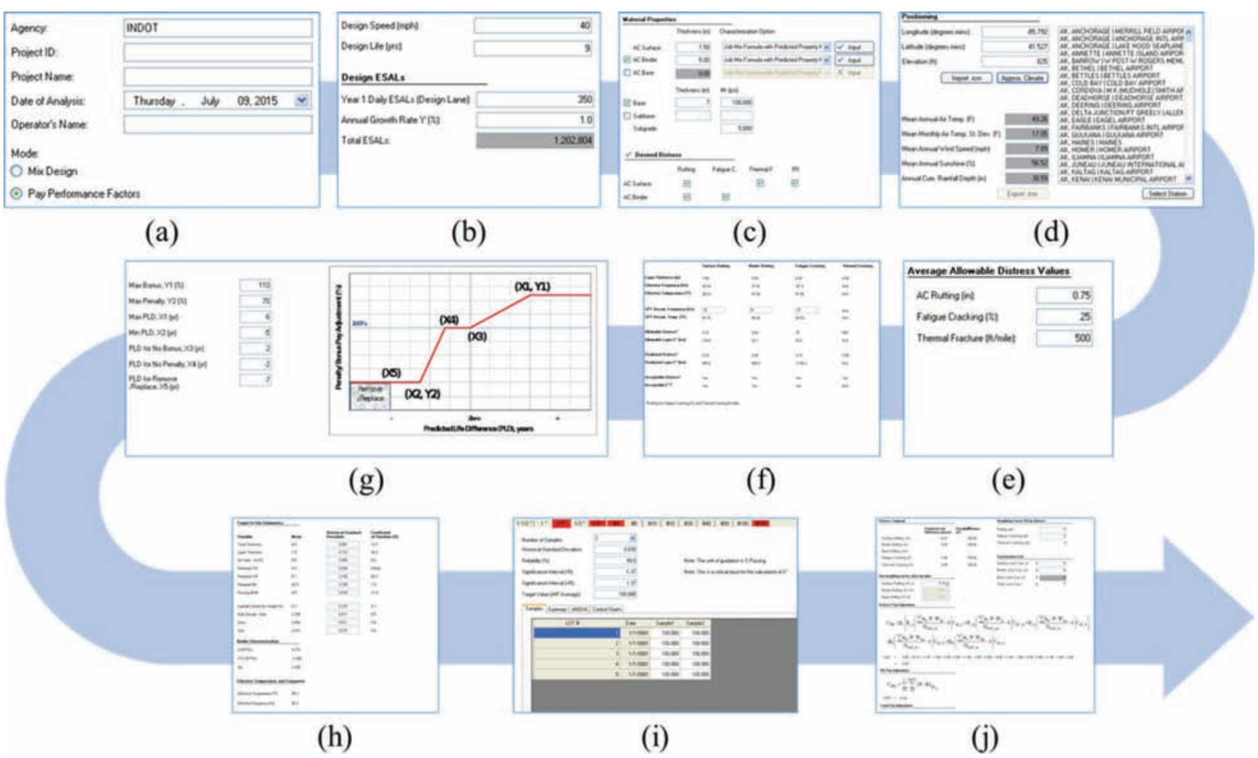


Figure 4.1 QRSS workflow: (a) mode selection and general information; (b) traffic; (c) structure and distress selection and material and volumetric property; (d) climate; (e) distress limits; (f) mix design; (g) pay factors; (h) As-designed (JMF) solutions; (i) QC/QA AQCs; (j) simulation outputs.

TABLE 4.2
Related inputs for each step.

Step			Related Inputs in Appendix C
(a) Mode Selection and General Information			#1 – #6
As-Designed Mix	(b) Traffic		#7 – #11
	(c) Structure and Distress Selection and Material and Volumetric Property		#12 – #83
	(d) Climate		#84 – #91
	(e) Distress Limits		#92 – #94
	(f) Mix Design		#95
	(g) Pay Factors		#96 – #109
	(h) As-Designed (JMF) Solutions		#110 – #131
(i) As-Constructed Mix (QC/QA AQCs)	Surface Layer	General Information	#132 – #133
		Gradation	#134 – #147
		Volumetrics	#148 – #153
	Binder Layer	General Information	#154 – #155
		Gradation	#156 – #169
		Volumetrics	#170 – #175

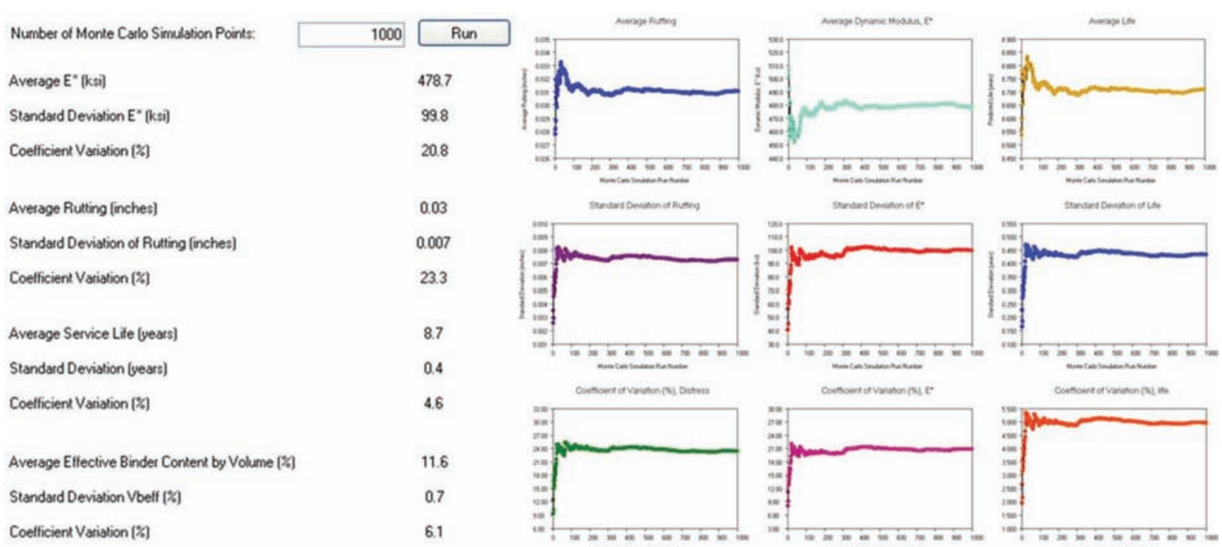


Figure 4.2 Monte Carlo simulation of the as-designed mix.

$$SLD_{St.Dev.} = \sqrt{SL^2{}_{St.Dev.\_As-Constructed} + SL^2{}_{St.Dev.-As-Designed}} \quad (4.3)$$

$$SLD_{90\%} = SLD_{Mean} + 1.28 \times SLD_{St.Dev.} \quad (4.4)$$

$$SLD_{95\%} = SLD_{Mean} + 1.65 \times SLD_{St.Dev.} \quad (4.5)$$

where, $SLD_{90\%}$ is a 90th-percentile service life difference, $SLD_{95\%}$ is a 95th-percentile service life difference, SLD_{Mean} is the mean of service life difference between as-designed and as-constructed pavements, and $SLD_{St.Dev.}$

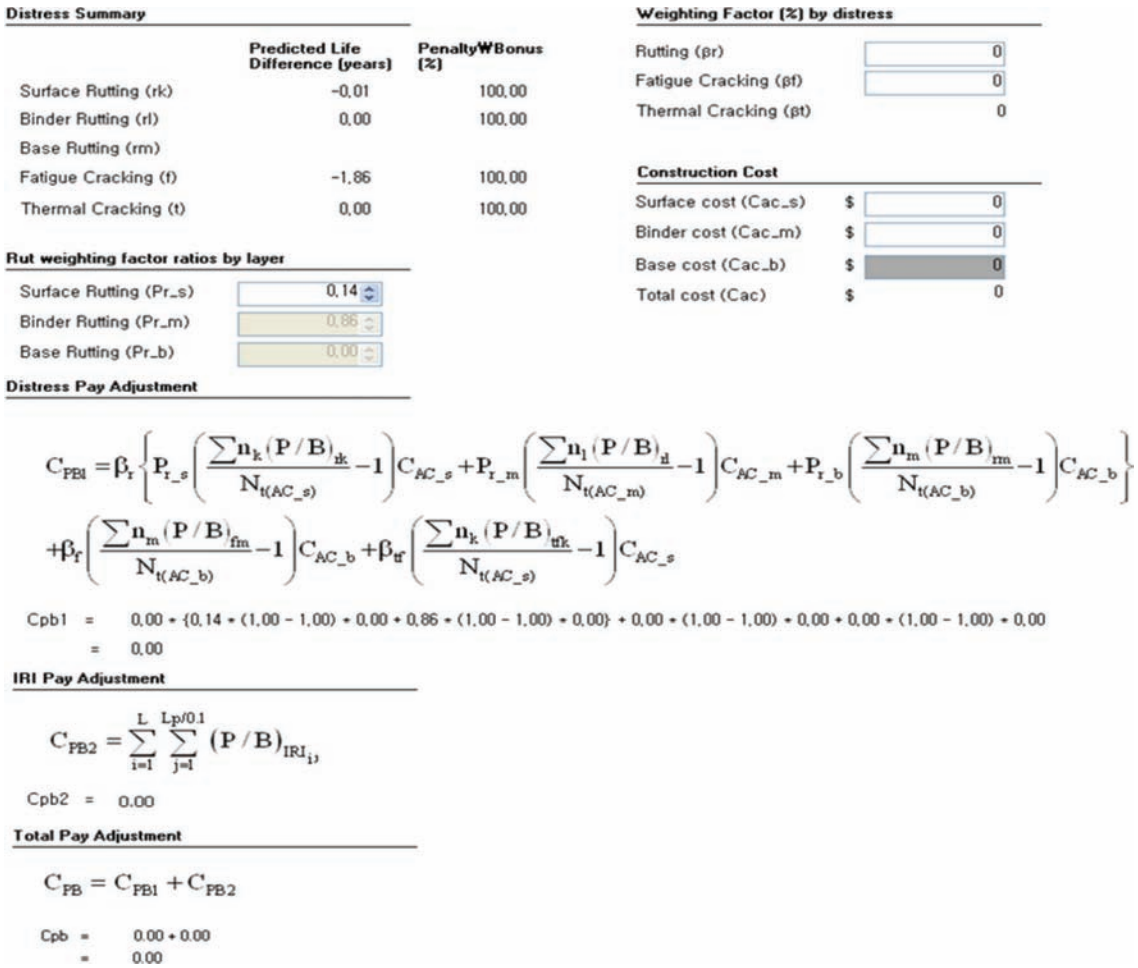


Figure 4.3 QRSS analysis outputs.

is the standard deviation of service life difference between as-designed and as-constructed pavements.

4.5 Challenge 1: Aligning INDOT AQCs to QRSS AQCs

As aforementioned in Chapter 2.1.2, INDOT evaluates as-constructed HMA pavements based on the PWL concept and four AQCs—binder content, lab compacted air voids and VMA, and density. In particular, lab compacted air voids and VMA are measured through a gyratory test and then the measured results are compared with the design values to evaluate qualities. INDOT practice is not based on MEPDG at this stage. QRSS are based on MEPDG and it requires many more variables to define as-designed/targeted JMF and compute predicted service life differences between the targeted JMF and actual as-constructed volumetric properties. QC/QA in QRSS focuses on JMF and JMF related variables. Table 4.4 lists the AQCs used by INDOT and QRSS QC/QA. For the ten AQCs required in QRSS, only two are being collected by INDOT.

The misalignment between INDOT AQCs and QRSS AQCs is a big challenge to applying QRSS at INDOT. Table 4.5 illustrates the efforts to pair/align them—only one direct pair (i.e., asphalt content and binder content) and one indirect pair (roadway core density is converted into in-situ air voids by using Equation 4.6).

$$\text{In}-\text{Situ Air Voids}_{\text{QRSS}} = 100\text{–Road Way Core Density}_{\text{INDOT AQC}} \qquad (4.6)$$

4.6 Challenge 2: Abnormal Results for Failed Materials

QRSS predicts service life differences between the as-designed and as-constructed pavements based on the estimation of long-term performance in three aspects: rutting, fatigue cracking, and thermal cracking. According to a related research report (Moulthrop & Witczak, 2011), service life differences caused by fatigue cracking distress are predicted by comparing as-designed and as-constructed variables that are relevant to the HMA mix. It is expected that if an as-constructed mix is the same as the as-designed mix based on those relevant variables, the as-constructed mix would achieve the same service life as the as-designed mix. However, the simulation results show aberrant trends when using

TABLE 4.3
Simulation outputs.

No.	Output	Value
1	Lot	1
2	Date	7/5/2015
3	Tonnage	600
4	Air Voids (%)	8.000
5	Binder Content (Vbeff %)	11.608
6	Effective Temperature (°F)	95.198
7	Effective Frequency (Hz)	40.668
8	Target E* (ksi)	478.713
9	Predicted E* (ksi)	477.960
10	E* Variance	94.377
11	E* Coefficient of Variation (%)	19.746
12	Target Distress (in)	0.031
13	Predicted Distresse (in)	0.031
14	Distress Standard Deviation	0.007
15	Distress Coefficient of Variation (%)	21.775
16	Target Service Life (yrs)	8.709
17	Predicted Service Life (yrs)	8.705
18	Service Life Standard Deviation	0.405
19	Service Life Coefficient of Varation (%)	4.647
20	Predicted Life Difference (yrs)	-0.004
21	Reliability	0.497
22	Penalty / Bonus	100.00
23	Weighted Pay Adjustment	20.000

the fatigue cracking distress to determine the service life. For the same mix, QRSS estimates the service life of the as-constructed is always smaller than the service life of the as-designed. This abnormality leads to the observation that QRSS is not reliable in estimating service life difference between as-designed and as-constructed caused by fatigue cracking.

Furthermore, the prediction results of service life differences caused by thermal cracking are also abnormal. The maximum and minimum probable service life differences caused by thermal cracking are set to ± 50 years in the current version of QRSS (Moulthrop & Witczak, 2011). When the quality of an as-constructed mix is very high or very low, QRSS always reports the service life to be ± 50. Therefore, QRSS is very limited in estimating the service life difference for failed materials based on thermal cracking because failed materials indicate a very low quality of the as-constructed mix.

Because of the abnormal results encountered in using the fatigue cracking and thermal cracking, rutting is the only distress considered in this study when applying QRSS to HMA pavement of failed materials.

4.7 Challenge 3: Uncertainties Introduced by PWL

In this section, the service life differences were predicted based on the rutting distress. A large number of simulation scenarios were designed and after being executed, results were examined to determine how service life differences change in correspondence to the mean and standard deviation values of the only two AQCs common in INDOT practice and QRSS, binder content and roadway core density. The simulation scenarios covered both acceptable and failed materials.

Figure 4.4 illustrates the procedure followed in generating simulation scenarios. Starting with a target mean and standard deviation of a normal distribution, Monte Carlo simulation was used to generate a sample. For binder content, the sample size was 5; and for roadway core density, the sample size was 10, considering a standard 5-sublot lot and INDOT requires one sample per *sublot* for binder content and two samples per *sublot* for roadway core density. This sample was then input into QRSS to estimate the service life difference. The PWL value was calculated using the mean and standard deviation values of the generated sample. Table 4.6 provides a few examples of the samples generated per binder content and estimated service life differences at both *sublot* and *lot* levels. Table 4.7 provides examples per roadway core density. Appendices D and E provide complete lists of all the simulation scenarios used in this section.

Figure 4.5 illustrates the trend of service life differences for various combinations of the means and standard deviations of individual AQCs—binder content and roadway core density. The service life difference was calculated as the estimated service life of the as-constructed – the service life of the as-designed. A positive service life difference means that QRSS estimates the as-constructed service life is longer than the as-designed service life and vice versa. It was observed that simulation results of binder content have an obvious trend: higher means are always associated with longer service lives. Simulation results of roadway core density show that lower means are associated with longer service lives. In both cases, the impact from the standard deviation is minimal.

For each simulation scenario, its PWL value was calculated according to Indiana Test Methods (ITM) 588, assuming the samples from the five sublots follow normal distributions (INDOT, 2008). INDOT specification defines both lower and upper limits for the binder content, but only the lower limit for the roadway core density. This indicates that for the binder content, the same PWL value could result from two very different samples, one leaning towards the higher end while the other leaning towards the lower end, as illustrated in Figure 4.6. Both sample 1 and sample 2 have the same PWL of 70, but their mean values and standard deviation values are very different.

TABLE 4.4
AQCs for INDOT QC/QA HMA and QRSS.

AQCs		QRSS	INDOT QC/QA HMA
Gradation	3/4″	X	
	3/8″	X	
	#4	X	
	#200	X	
Volumetric	Asphalt Content	X	X
	Maximum Theoretical Specific Gravity (Gmm)	X	
	In-Situ Bulk Density	X	
	In-Situ Air Voids	X	X (100 – Roadway Core Density)
	Thickness	X	
	Aggregate Bulk Specific Gravity (Gsb)	X	
Gyratory Test	Air Voids at N_{des}		X
	VMA at N_{des}		X

TABLE 4.5
Pairing results of the AQCs for INDOT QC/QA HMA and QRSS.

QRSS AQCs		AQCs for INDOT QC/QA HMA
Gradation	3/4″	N/A*
	3/8″	N/A
	#4	N/A
	#200	N/A
Volumetric	Asphalt Content	Binder Content
	Maximum Theoretical Specific Gravity (Gmm)	N/A
	In-Situ Bulk Density	N/A
	In-Situ Air Voids	100 – Roadway Core Density
	Thickness	N/A
	Bulk Specific Gravity (Gsb)	N/A
Gyratory Test	N/A	Air Voids at N_{des}
	N/A	VMA at N_{des}

*Not applicable.

Figure 4.7 uses 2-D scatter plots to show the relationship between the service life difference and PWL of the binder content AQC. All samples were divided into two groups: Figure 4.7 (a)—those samples with sample mean values greater than the mean value of the design target, and Figure 4.7 (b)—those samples with sample mean values less than the mean value of the design target. A few observations are obtained as follows. (1) Figure 4.7 (a) and Figure 4.7 (b) are mirror copies to each other; Service life differences are all positive in Figure 4.7 (a) and are all negative in Figure 4.7 (b). (2) The cutoff appears to be at the PWL of 30 and service life difference of 0.033 and -0.04. (3) The predicted service life difference is very small; the range is from -0.06 to 0.05 years, or -3.1 to 2.6 weeks. (4) Even for very poor PWL (e.g., 10 or 10%), the service life difference is very small. (5) For a large PWL (e.g., 98 or 98%), the service life difference can be positive or negative; that is, the service life of the as-constructed could be estimated to be longer or shorter than the service life of the as-designed.

Figure 4.8 illustrates the relationship between the estimated service life difference and the PWL for the roadway core density AQC, grouped into the mean values (e.g., 94.5%, 94.0%, etc.). Results show that for the low mean values (i.e., 90.0% and 90.5%), although PWL values are less than 50%—failed, the estimated service life differences are all positive (*longer service life of the failed as-constructed*). For high mean values (i.e., from 92.5% to 94.5%), although PWL values are greater than 50% and many approach 100%—acceptable with full pay, the estimated service life differences are all negative (*shorter service life of the full pay as-constructed*). Only two groups—mean values at 91.5% and 92.0%—show positive service life differences with acceptable PWL values. However, the magnitude is small (less than 0.1 year) and the effect from PWL is minimal (points forming a horizontal line in both groups).

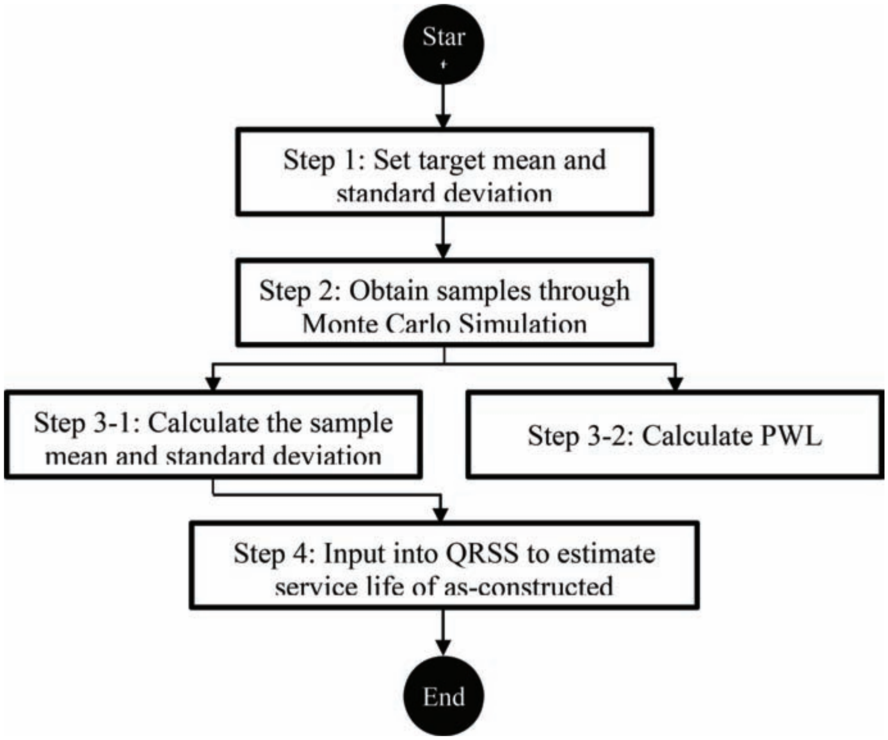


Figure 4.4 Simulation procedure for each scenario.

The root cause of the limitations (and associated abnormality as has been observed) in QRSS to deal with PWL is whether the standard deviation, or the consistency, in the samples is counted. PWL calculation incorporates standard deviation while QRSS does not concern standard deviation. As Figure 4.9 illustrates, QRSS estimates the service life difference to be the same for the mean value regardless of how big or small the standard deviation is.

4.8 Recommendations Regarding the Use of QRSS for QC/QA HMA

For QC/QA HMA pavement, the concept on comparing the long-term performances between as-designed and as-constructed pavements and then based on the comparison to make decision regarding failed materials is still valid. However, given all the limitations, the misalignment between INDOT practice and QRSS methods, QRSS is not being recommended to be used as the PRS tool to predict the long-term performance and assess the impact of failed materials.

At the stage of this writing, QRSS itself is still in the validation phases and it could be modified in the near future. A future study is necessary to evaluate existing tools such as the modified QRSS and MEPDG, and align those tools with INDOT practice. Changes to the current INDOT practice might be necessary to adopt PRS tools and develop PRS-based decision framework to assist decision-making regarding QC/QA HMA pavement of failed materials.

TABLE 4.6
Generated samples and estimated service life differences per binder content.

Target		Sample	Samples								Service Life Differences					
Mean	St. Dev.	Number	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean	St. Dev.	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
4.00	0.10	4	3.89	3.96	3.97	4.14	4.05	4.00	0.10	0	-0.060	-0.055	-0.054	-0.042	-0.048	-0.052
4.00	0.20	1	4.20	3.73	4.18	3.92	3.95	4.00	0.20	7	-0.038	-0.071	-0.039	-0.058	-0.056	-0.052
4.00	0.30	14	3.84	4.26	3.72	3.82	4.38	4.00	0.30	16	-0.063	-0.034	-0.072	-0.065	-0.026	-0.052
4.00	0.40	2	3.88	4.40	4.07	3.38	4.27	4.00	0.40	22	-0.061	-0.024	-0.047	-0.097	-0.033	-0.052

TABLE 4.7
Generated samples and estimated service life differences per roadway core density.

Target		Sample	Sublot Samples											St.		Service Life Differences					
Mean	St. Dev.	Size	Sub 1-1	Sub 1-2	Sub 2-1	Sub 2-2	Sub 3-1	Sub 3-2	Sub 4-1	Sub 4-2	Sub 5-1	Sub 5-2	M	Dev.	PWL	Sub 1	Sub2	Sub3	Subl4	Sub5	Mean
5.50	0.10	1	5.34	5.37	5.47	5.48	5.49	5.51	5.53	5.53	5.60	5.67	5.5	0.1	100	-0.349	-0.335	-0.333	-0.329	-0.318	-0.333
5.50	0.20	7	5.15	5.32	5.34	5.39	5.45	5.56	5.67	5.68	5.68	5.73	5.5	0.2	100	-0.362	-0.348	-0.332	-0.313	-0.310	-0.333
5.50	0.30	1	5.06	5.21	5.25	5.26	5.51	5.51	5.71	5.74	5.77	5.97	5.5	0.3	100	-0.372	-0.359	-0.332	-0.307	-0.291	-0.332
5.50	0.40	11	5.05	5.12	5.22	5.33	5.34	5.37	5.42	5.89	5.99	6.23	5.5	0.4	100	-0.377	-0.357	-0.349	-0.315	-0.262	-0.332
5.50	0.50	9	4.61	4.98	5.13	5.27	5.50	5.56	5.74	5.92	6.09	6.15	5.5	0.5	100	-0.406	-0.365	-0.329	-0.295	-0.261	-0.331

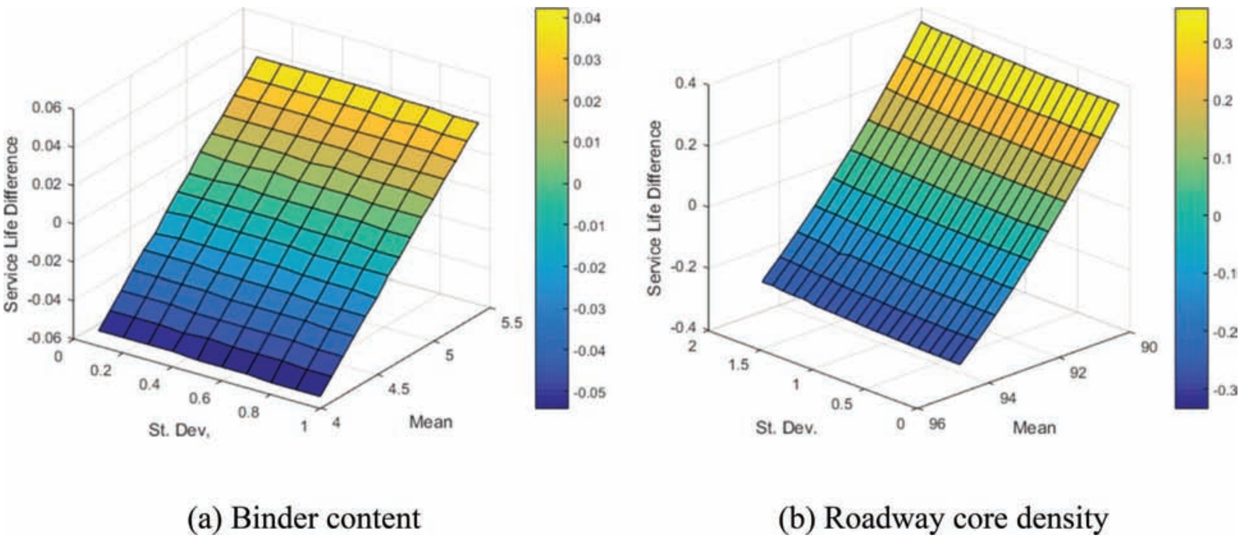


Figure 4.5 Trend analysis results: (a) binder content; (b) roadway core density.

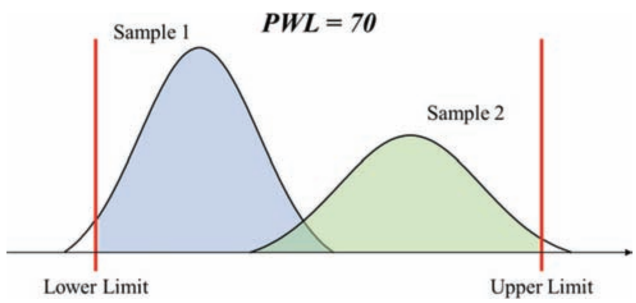
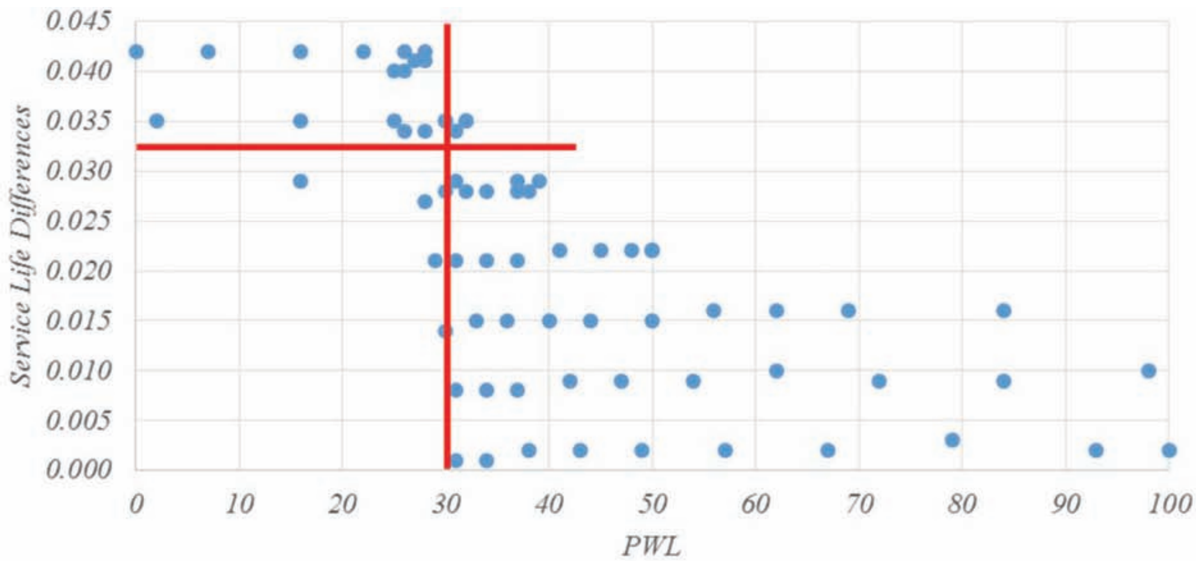
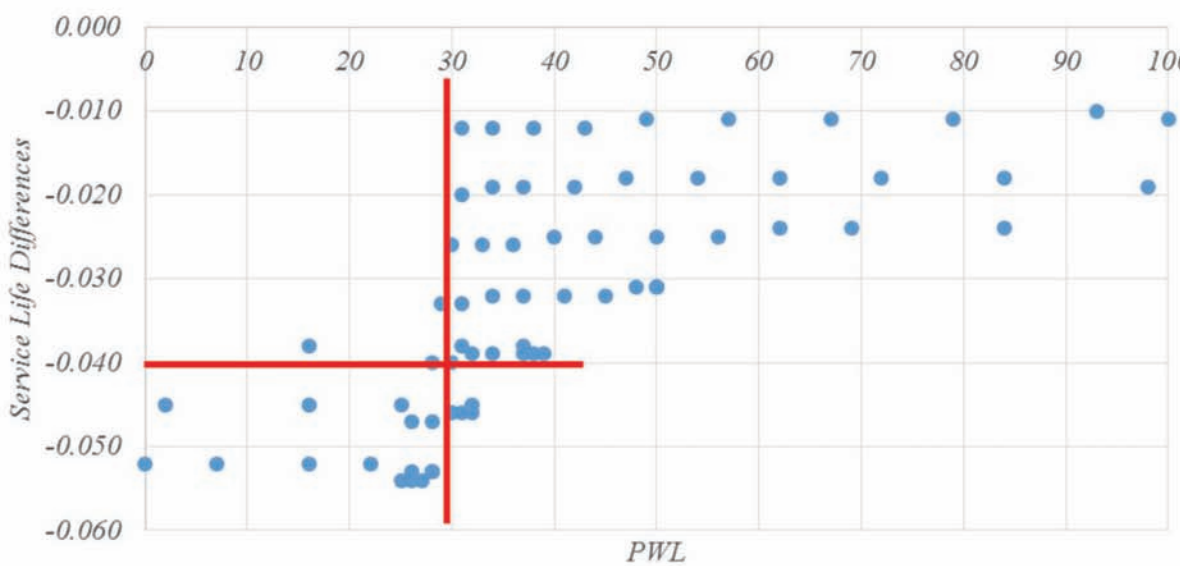


Figure 4.6 An illustration of two different samples with the same PWL value.



(a) Higher mean values as compared to As-designed value



(b) Lower mean values as compared to As-designed value

Figure 4.7 Relationship between the service life difference and the PWL of binder content: (a) higher mean values as compared to as-designed value; (b) lower mean values as compared to as-designed value.

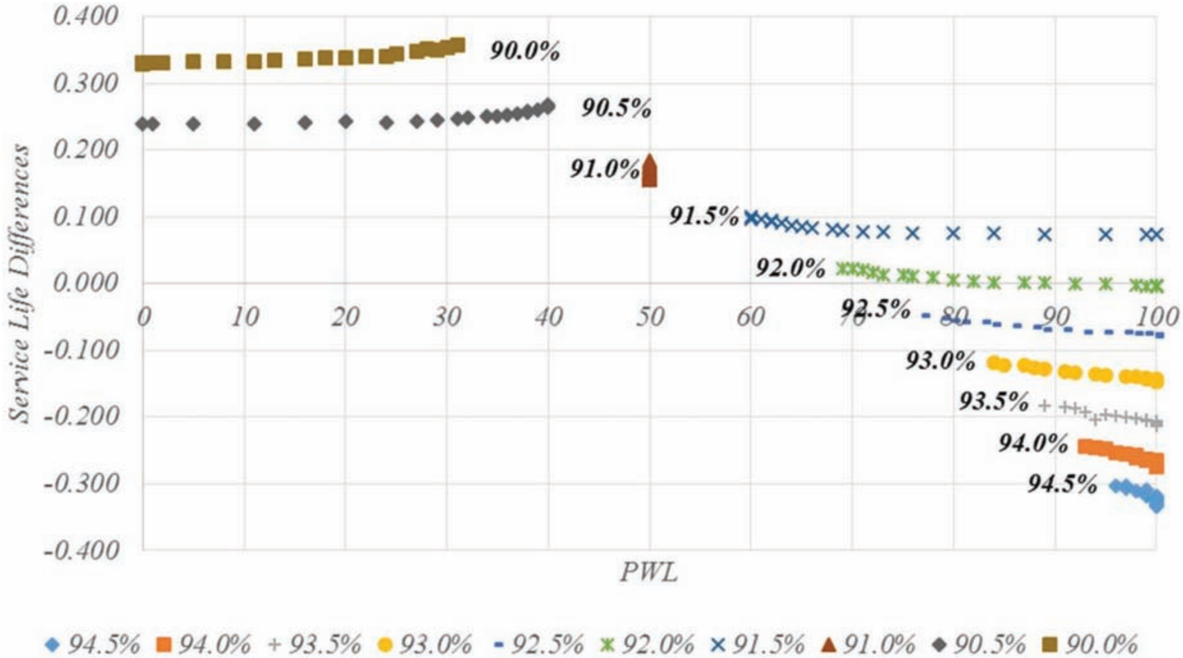
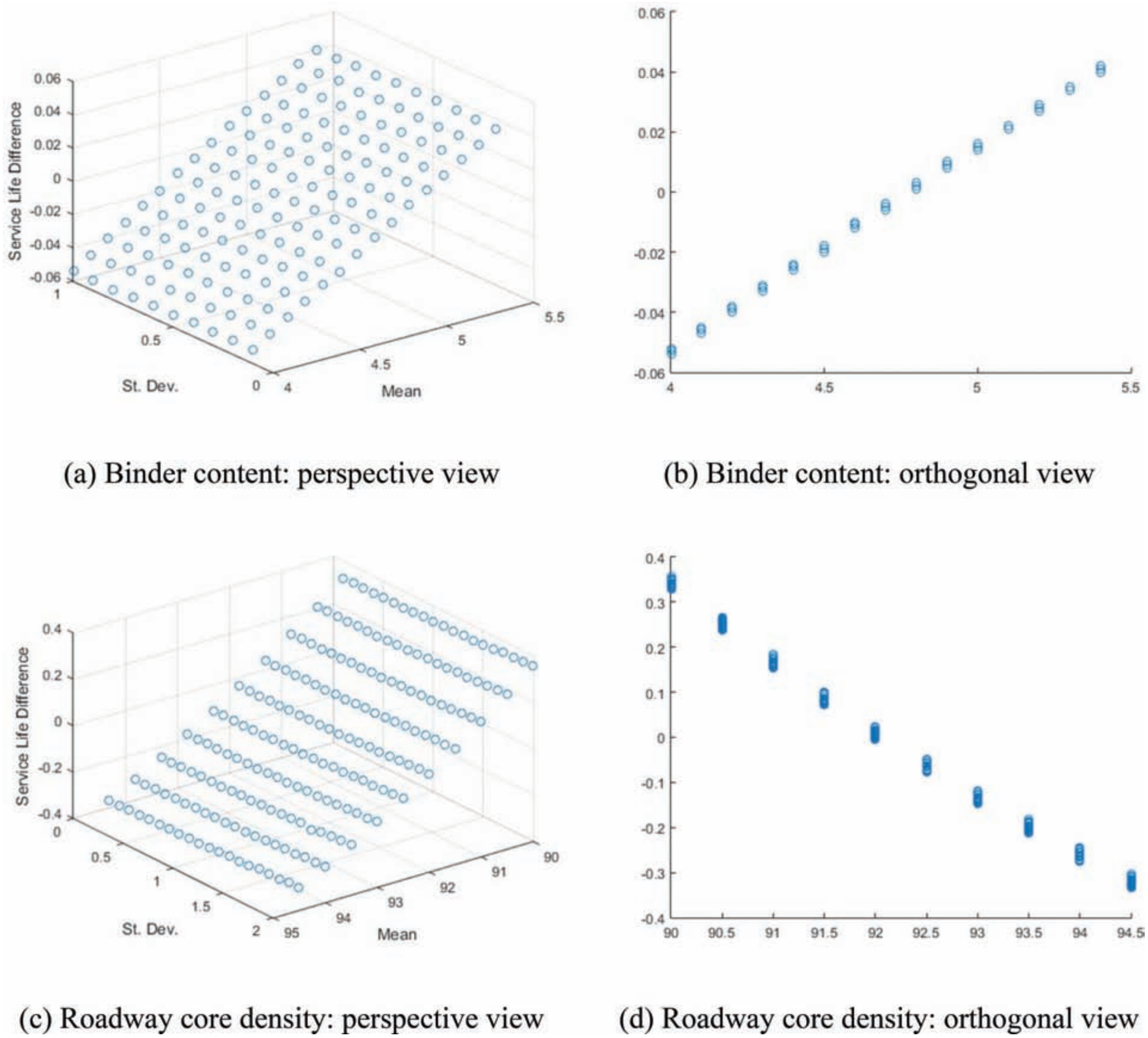


Figure 4.8 Relationship between service life differences and PWL per roadway core density.



(a) Binder content: perspective view

(b) Binder content: orthogonal view

(c) Roadway core density: perspective view

(d) Roadway core density: orthogonal view

Figure 4.9 The relationships between service life differences and the means and standard deviations: (a) binder content: perspective view; (b) binder content: orthogonal view; (c) roadway core density: perspective view; (d) roadway core density: orthogonal view.

5. CASE ILLUSTRATION OF THE DECISION FRAMEWORK FOR PCCP

5.1 Case Overview

The validation case is a concrete pavement project (INDOT Project IR-30846), a section of SR-25 in Delphi, Indiana, completed in 2011. Figure 5.1 provides an aerial view of the project area.

5.2 The Application of the Decision Framework

The decision framework (see Figure 3.13 in Section 3.11) was applied to this case to illustrate how the financial impact caused by the inferior performance of PCCP of failed materials can be statistically quantified to support decision-making regarding failed materials.

5.2.1 Input Variables and As-Designed AQC Targets

Appendix F lists all the values for the input variables required in PaceSpec. Table 5.1 lists the design targets for the four AQCs in both aspects of mean and standard deviation. As-designed mean values are determined based on INDOT specifications and project documents. As-designed standard deviations are adopted from a previous JTRP project (Graveen et al., 2009). The current version of INDOT specifications does not specify standard deviations for AQCs. Both mean and standard deviation values can be customized to suit individual construction projects. Users can use their own project mean and standard deviation values of AQCs to implement the proposed decision framework. Note that from the statistical perspective, given any mean and standard deviation values, certain amount of the work under investigation might be significantly substandard and it could be missed by random sampling. For instance, regarding thickness with a mean value of 9.5 inch and a standard deviation value of 0.5 inch, about 17% of the sublot could have a thickness less than 9", which is significantly substandard

TABLE 5.1
Design AQC values (from INDOT project IR-30846).

AQC Value	As-Designed Mean	As-Designed Standard Deviation
28-day Flexural Strength (psi)	700 psi	50 psi
Thickness (in)	9.5 in	0.5 in
Air Content (%)	6.5%	0.5%
Smoothness (in/mile)	3.2 in / 0.1 mile	0.8 in / 0.1 mile

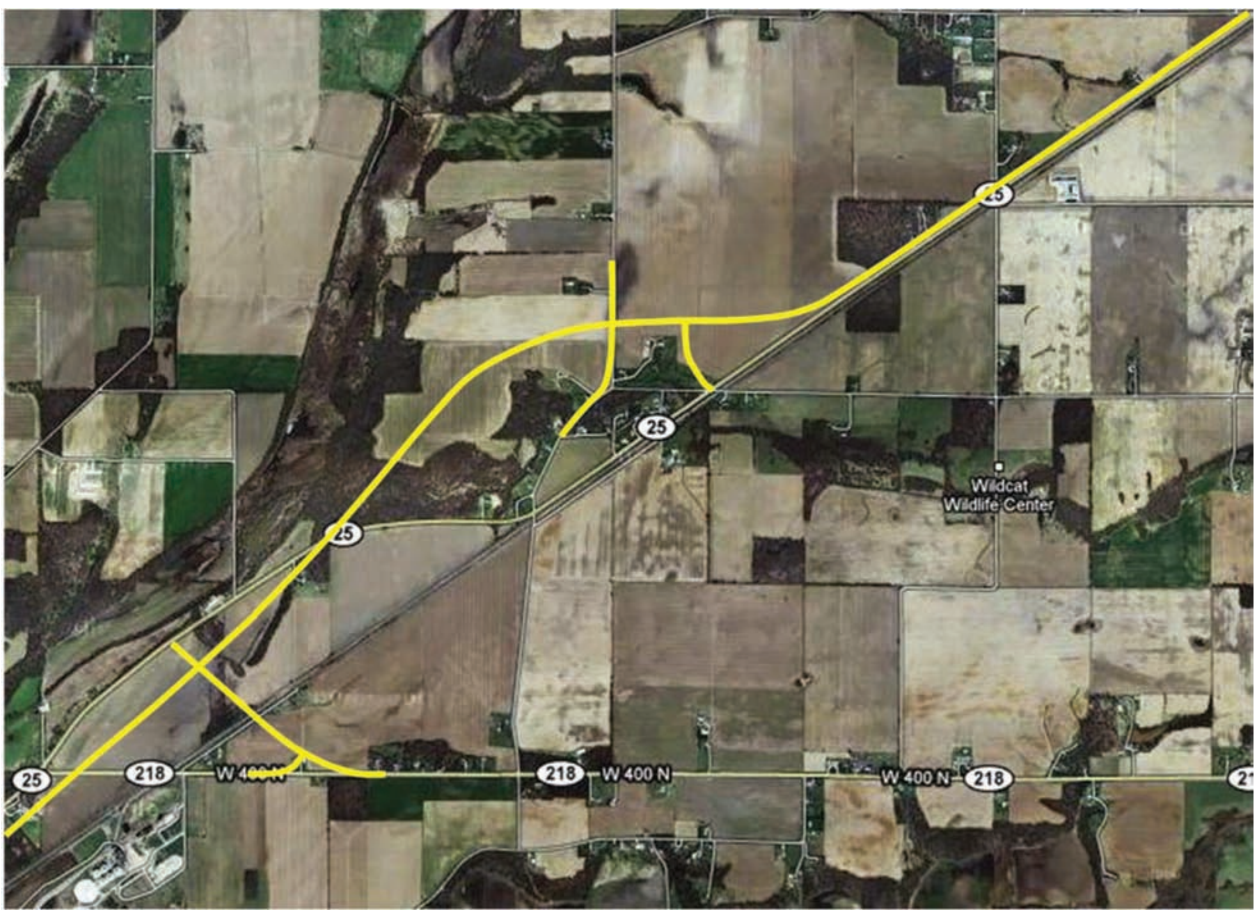


Figure 5.1 INDOT project IR-30846.

TABLE 5.2
Acceptance testing results (*lot* 7, INDOT project IR-30846).

Lot/Sublot		Air Content (%)	7-day Flexural Strength (psi)	Thickness (inches)
Lot 7	Sublot 1	6.4	495	9.9
	Sublot 2	7.0	535	10.1
	Sublot 3	7.4	493	9.8
	Average	6.9	508	9.9

TABLE 5.3
LCCs estimated in PaveSpec.

Simulation Type	LCC Mean ($/mile)	LCC Standard Deviation ($/mile)
As-Designed LCC	85,341	24,913
As-Constructed LCC	109,533	33,488

and could possibly be missed by the random coring. The analysis life for this case illustration is 30 years.

5.2.2 As-Constructed AQCs (Failed Materials due to Flexural Strength)

Lot 7 is the *lot* of failed materials and it is used as the case to illustrate how the framework works. *Lot* 7 contains three *sublots*. Table 5.2 lists the acceptance testing results for all *sublots* and the calculated average for the *lot*. *Lot* 7 fails due to the flexural strength. The lot average of the 7-day flexural strength is 508 psi, which is lower than the threshold value of 514 psi as specified in INDOT specification. *Sublot* 1 and 3 both have 7-day flexural strength lower than 500 psi, the threshold value set at the *sublot* level.

5.2.3 Estimating LCCs

Following the decision framework (Figure 3.13), Level 2 Specification and the re-simulation approach were used to run simulations and estimate the LCCs of the as-designed and the as-constructed pavement. Since the failure scenario is a lot-average-failure, although it contains acceptable and failed sublots, the single lot method was used to estimate the LCC of the as-constructed pavement. For all these simulations, the 7-day flexural strengths were converted into 28-day flexural strengths using the multiplication constant *C* (set to be 1.23), described in detail in Section 3.3.1. Table 5.3 provides the simulation results regarding LCCs in both aspects of mean and standard deviation. The mean LCC of the as-constructed is about $24,000 (per mile) higher than the mean LCC of the as-designed pavement. The standard deviation of the as-constructed LCC is larger than that of the as-designed LCC; the as-constructed pavement is lower in consistency.

TABLE 5.4
Estimated 90th-percentile and 95th-percentile LCC differences.

LCC Difference Mean ($/mile)	LCC Difference Standard Deviation ($/mile)	90th-Percentile LCC Difference ($/mile)	95th-Percentile LCC Difference ($/mile)
24,192	41,739	77,618	93,061

Following Equations (3.2) to (3.5), the 90th-percentile and 95th-percentile LCC differences between as-designed and as-constructed pavement were calculated as $77,618/mile and $93,061/mile, respectively. Table 5.4 shows the results.

5.2.4 Decision-Making

The 90th-percentile LCC difference ($77,618/mile) and the 95th-percentile LCC difference ($93,061/mile) were compared to the initial construction cost—the contract cost set at $281,600/mile. Both LCC differences are much lower than the initial construction cost; therefore, the decision would be to "accept with a penalty" and the penalty could be set at either $77,618/mile (the 90th-percentile) or $93,061/mile (the 95th-percentile).

6. SUMMARY AND RECOMMENDATIONS

6.1 Summary and Recommendations

This study investigated the use of PRS tools, namely PaveSpec for PCCP and QRSS for QC/QA HMA pavement, to assist the decision-making regarding failed materials based on the predicted long-term performance from the life-cycle perspective. A decision framework that incorporates PaveSpec performance-prediction model and maintenance-cost model was developed for PCCP of failed materials. A large number of simulations were performed to develop and test the framework. The framework was validated using the design and construction data from an INDOT construction project. It is recommended that INDOT adopt this framework to assist its decision-making regarding PCCP of failed materials.

In evaluating QRSS for QC/QA HMA pavement of failed materials, a number of challenges and issues were identified, leading to the recommendation that QRSS, at its current version, is not an adequate tool to reliably predict the long-term performance of QC/QA HMA pavement that involves failed materials.

6.2 Key Findings

Key findings have been summarized in the Executive Summary section and are repeated as follows.

6.2.1 Using PaveSpec to Develop the Decision Framework for Failed Materials of PCCP

- PaveSpec takes five AQCs for PCCP: concrete strength, slab thickness, air content, initial smoothness, and percent consolidation around dowels (optional). The four mandatory AQCs are all being tested as stipulated in INDOT QA/QC specification for PCCP.
- PaveSpec provides two levels of specification, Level 1 and Level 2 Specification, to predict the long-term performance and to estimate the LCC for PCCP. The Level 2 Specification considers the correlation between AQCs. It is more reflective of the reality and therefore, Level 2 Specification is the level adopted in the newly developed decision framework. Simulation results show that LCCs estimated using the Level 2 Specification are lower than the LCCs estimated using the Level 1 Specification for the same PCCP pavement.
- In PaveSpec, two approaches are available to estimate the LCC of as-constructed PCCP—the interpolation and the re-simulation approach. The interpolation approach is the default one, which estimates the LCC of the as-constructed pavement by interpolating the pay factor table resulted from the simulations for the as-designed, based on individual AQCs. The re-simulation approach, a new approach created in this study, substitutes the target AQC values in the as-designed simulation with field-testing results of the AQCs and runs the simulation to estimate the LCC of the as-constructed pavement. The interpolation approach yields a single, deterministic estimate of the LCC for the as-constructed, but the re-simulation approach yields a set of predicted LCCs so that statistical analysis can be performed to calculate the confidence level for a given LCC and vice versa (e.g., 90th-percentile LCC and 95th-percentile LCC). Therefore, the re-simulation approach was adopted in the decision framework.
- For the flexural strength AQC, PaveSpec requires the 28-day strength, but could take the 7-day strength as an input if a curing curve is provided. INDOT tests 7-day strength only. Unfortunately, the curing curve depends on the mix formula, which varies from project to project. After an extensive literature review and consulting INDOT experts, a multiplication constant (*C*) was set at 1.23 to calculate the 28-day strength from the 7-day strength (i.e., *28-day strength* = *7-day strength* × *1.23*). It is recommended to determine C in a much more accurate way by slightly modifying the current practice in sampling and testing. For instance, both the 7-day and 28-day flexural strength at the time of the trial batch can be measured to determine coefficient C for the specific mix design. Or, ores from broken beam halves or actual pavement areas in questions could be obtained very close to the 28-day age and tested for split tensile strength (to be converted to a 28-day flexural strength).
- The examination of INDOT specifications on the criteria of failed materials revealed that a *lot* could contain both acceptable and failed *sublots*. Two different methods, the single lot method and the divide-estimate-sum method, were devised and their results were compared for various scenarios of the co-existence of both failed and acceptable *sublots* in a single *lot*. The single lot method treats the *lot* that contains both acceptable and failed sublots as a single *lot* in PaveSpec. The divide-estimate-sum method separates the original *lot* into two new *lots*, one contains acceptable *sublot(s)* only and the other contains failed *sublot(s)* only. Simulations are then performed for the new *lots* and results are added to estimate the LCC for the original *lot*. Simulation results show that estimated LCCs are quite different between these two methods. For the flexural strength AQC, the single lot method always yielded higher LCCs than the divide-estimate-sum method did. For the air content AQC, the single lot method always yielded lower LCCs than the divide-estimate-sum method did. These observations can be explained by looking at the sensitivity of LCC to the mean and the standard deviation. For the flexural strength AQC, the LCC is more sensitive to the consistency (indicated by the standard deviation). For the air content, the LCC is more sensitive to the average (indicated by the mean). Separating acceptable and failed sublots into two new lots leads to two smaller standard deviations than the standard deviation of the original *lot* and two new means, one is larger and the other is smaller than the mean of the original *lot*. Based on the comparisons, it is concluded that (1) for the *lot* level failure, i.e., the lot average falls in the failed range, the single lot approach is more appropriate, and (2) for the *sublot* level failure, i.e., the lot average is acceptable, but the *lot* contains failed *sublot(s)*, it reflects the reality better by separating the original *lot* into two new *lots*, one contains acceptable *sublot(s)* only and the other contains failed *sublot(s)* only. This conclusion was incorporated in developing the decision framework.
- A large number of simulation scenarios of failed materials were designed for a three-sublot lot. Simulations were performed to estimate the LCC of PCCP using the Level 2 Specification, the re-simulation approach, and the divide-estimate-sum method. Results show that for flexural strength and thickness AQCs, a trend exists: higher mean values (indicating better quality) and lower standard deviations (indicating higher consistency) always lead to lower LCCs. While the same trend exists for the air content AQC, it is not appropriate to use PaveSpec because a higher air content does not indicate a better quality.
- Concerned with the air content AQC, additional simulation scenarios were designed to investigate the aggregate effect of multiple AQCs (focusing on air content) on the LCC. Results show that higher means of the air content AQC always yielded lower LCC estimates regardless of the variations in other AQCs, such as concrete strength and thickness. It was concluded that PaveSpec is not an appropriate tool for estimating the as-constructed LCC if materials fail because of the air content AQC.
- The LCC difference at various level of confidence can be statistically calculated in such a way, in which (1) the simulated LCCs of the as-designed and the simulated LCCs of the as-constructed are two independent samples following the normal distribution, (2) the LCC differences are a derived sample that follows the normal distribution—its mean is the average of the means of the two samples in (1) and its standard deviation is the square root of the sum of the squares of the two standard deviations of the two samples in (1). Consequently, the LCC difference at any confidence level can be calculated following the calculation methods for normal distributions.
- Aforementioned findings were incorporated into a newly developed decision framework (see Figure 3.13) for failed materials of PCCP. It was validated using design and testing data from INDOT construction project (IR-30846).

6.2.2 Using QRSS to Develop the Decision Framework for Failed Materials of QC/QA HMA Pavement

- QRSS only estimates the service life by predicting the distresses of rutting, fatigue cracking, and thermal cracking; and comparing them to pre-set threshold values. It does not have a mechanism to incorporate maintenance strategies and costs to estimate the LCC.
- There is a misalignment between the AQCs specified in INDOT's QC/QA HMA specification and the AQCs required in QRSS. Table 4.1 illustrates that (1) only two AQCs—binder content and roadway core density—are common to both INDOT specification and QRSS, (2) two AQCs—lab-compacted air voids, and voids in mineral aggregate (VMA)—are included in INDOT specification, but cannot be used directly in QRSS, and (3) gradations are required by QRSS, but are not included in INDOT specification.
- Because of the misalignment, a pairing mechanism is needed in order to run QRSS simulations for INDOT QC/QA HMA pavement. Table 4.5 illustrates this pairing mechanism. A recommendation to INDOT would be to collect the AQCs that are required in QRSS in order to adopt QRSS in the decision framework.
- A challenge in applying QRSS to INDOT QC/QA HMA pavement is caused by the use of PWL as the criterion for failed materials in INDOT specification: many different scenarios could lead to the same PWL value.
- QRSS estimates the long-term pavement performance in terms of pavement distresses (i.e., rutting, fatigue cracking, and thermal cracking), predicts service life by comparing the distresses to their pre-set threshold values, and calculates the service life differences between as-designed and as-constructed pavements. However, QRSS simulations yielded abnormal results when predicting the service life difference between the as-designed and the as-constructed pavement based on fatigue cracking and thermal cracking. For the fatigue cracking, when the same set of values were used for both the as-designed and the as-constructed pavements, QRSS always predicted negative service life differences, i.e., the as-constructed pavement has a shorter service life than the as-built pavement. For the thermal cracking, QRSS always predicted there is no service life difference between the as-designed and the as-constructed even though their AQC values were different, but all in normal ranges. Furthermore, when either the as-constructed has extremely high AQC values or extremely low AQC values, QRSS predicted that the service life difference is over 50 years. Since QRSS yields abnormal results when considering thermal cracking and fatigue cracking, it is not appropriate to use both of them as the base for estimating the shortened service life attributable to failed materials.
- The current version of QRSS executes Monte Carlo simulations to predict service life differences based on pavement performance estimates. In the results, QRSS provides means of the service life differences; however, it does not provide standard deviations of the service life differences directly. Therefore, to predict the service life difference at a user-specified confidence/probability (e.g., 90th-percentile or 95th-percentile service life difference), a statistical approach was devised to calculate the standard deviation based on individual pairs of the service life of as-designed and as-constructed.
- A large number of simulation scenarios for the only two common AQCs in QRSS and INDOT specification—binder content and roadway core density—were crafted in lieu of a five-sublot *lot*. The simulation results showed that the service life is insensitive to the standard deviation, but it is closely correlated with the mean—a higher mean in either binder content or roadway core density leads to a longer service life. The trend, in turn, lead to erroneous results when applying the PWL concept. Because any value that is too high or too low is outside the limit, for a given PWL value, if the original set is leaning towards the higher end, the predicted service life is longer; if the original set is leaning towards the higher end, the predicted service life is shorter. As the result, QRSS estimated that for certain groups of failed materials, the service life of the as-constructed is longer than the service life of as-designed.
- Given the misalignment between INDOT AQCs and the AQCs required in QRSS, the limitations in QRSS, and the erroneous results from the QRSS simulations, QRSS is not being recommended as the PRS tool to be used for QC/QA HMA pavement at this moment.

6.3 Recommendations for Implementation

This study developed the decision framework for failed materials of PCCP. The developed decision framework enables the calculation of the LCC differences between the as-designed and as-constructed pavements at a user-specified confidence level. In addition, more economically appropriate option between the "removal and replacement" or the "acceptance with a heavy penalty" option can be determined through the comparison of the LCC differences to the construction contract price. This framework can be immediately implemented to assist INDOT for data-driven, informed decision-making regarding failed PCCP materials. However, additional case validations of the decision framework for PCCP may be needed for the INDOT to support implementation and adoption of the PRS based methodologies. Moreover, training on the use of PaveSpec is critical to the success implementation.

For QC/QA HMA pavement, further study is needed to find an appropriate PRS tool. The current version of QRSS is not an appropriate PRS tool to estimate the long-term performances because of its limitations and the misalignment between QRSS process and current INDOT practices although the concept on comparing the long-term performance between as-designed and as-constructed pavements is still valid. A suggestion for immediate implementation would be to align an MEPDG based AQCs for HMA pavement. Although QRSS is still in validation phase and this study concluded that QRSS is not an appropriate tool, dissimilar analysis results might be expected if AQCs of INDOT align to QRSS AQCs. Particularly, currently INDOT collects two types of HMA samples, loose mixtures and core mixtures, to evaluate pavement qualities. Loose mixtures are used to measure binder content, and lab compacted air voids and VMA, while core mixtures are used to measure density. On the other hand, if the AQCs aligned with the QRSS AQCs, INDOT would have to collect core mixture samples that can assist to determine pavement qualities and performances.

6.4 Deliverables

The main deliverable is the decision framework to assist INDOT in making informed decisions regarding PCCP of failed materials. The decision framework is based on PaveSpec. It was developed following thousands of simulations and validated using an INDOT construction project, in which a lot failed due to flexural strength. The framework enables the quantitative determination of financial impact caused by failed materials due to inferior performance and shortened service life. Furthermore, the framework enables the calculation of the financial impact at any user-specified confidence level to allow SHAs to make risk-aware decisions that reflect the agencies' risk perception and management strategies.

Accompanying the development of the decision framework for PCCP, a large number of simulation scenarios were devised. All simulation results are included in Appendices. Many more statistical analyses could be conducted to further analyze the impacts of various combinations of AQCs.

In this study, QRSS, a PRS tool for HMA pavement, were investigated in detail. The conclusion is that given the limitations in the current version of QRSS and the misalignment between AQCs required in QRSS and AQCs specified in INDOT's acceptance testing, QRSS is inadequate to accurately estimate the long-term performance and predict service life difference. Modifications to the current practice at INDOT is required in order to develop a decision framework based on QRSS to assist decision-making regarding QC/QA HMA pavement of failed materials.

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APPENDICES

APPENDIX A. PAVESPEC INPUT DATA FOR STUDYING

No.	Input		Value
1	Specification Level		Develop a Level 1 and Level 2 Specification at the same time.
2	Traffic Direction		NB and SB
3	Lane configuration		Six. Divided
4	Lane width		12ft
5	Lane Accept		Check
6	Shoulder type		Tied PCC
7	Widened by (Widened Lane Selected Only)		–
	Stress load transfer efficiency (Tied PCC Selected Only)		20%
8	Inner lane cracking as % of outer lane		10%
9	Road Location		Urban
10	Project length		9893ft
11	Pavement Design Modules (Design Inputs)	Design Life	30years
12		Pavement Type	Jointed Plain (JPCP), Doweled
13		Dowel Bar Diameter	1.5in
14		Transverse Joint Spacing	18.33ft
15		PCC modulus of elasticity	3,400,000psi
16		Transverse Joint Sealant type	Silicone
17		Modulus of Subgrade Reaction (static k-value)	100psi/in
18		Water-Cement Ratio	0.42
19		Percent Subgrade Material Passing the #200 Sieve	88%
20	Pavement Design Modules (Base Variables)	Base Permeability	Permiable
21		Base Thickness	9in
22		Base Modulus of Elasticity	30,000psi
23		PCC-Base Interface	Unbonded
24		Base Erodibility Factor	5

TABLE
(Continued)

No.	Input		Value
25	Design Traffic Modules	Defined traffic based on	Average Daily Traffic (ADT)
26		Specific traffic for year	1
27		ADT at that year	61,200
–		Cumulative ESALs at that year (millions)	Calculated by PaveSpec
28		Growth Rate	2.535%
29		Growth Type	Compound
30		ESAL-to ADT Directional factor	50%
31		Percent of trucks	15%
32		Percent trucks in outer lane	99%
33		Average truck load equivalency factor	1.15ESALs/truck
34	Climate Variable Modules	Average Annual Freezing Index	0F-days
35		Average Annual Precipitation	44.5in
36		Average Annual Air Freeze-Thaw Cycles	65cycles
37		Average Annual Number of Days over 90F	33.2days
38		Climatic Zone	Wet-Nonfreeze
39	Distress Indicators		Transverse Joint Spalling
			Transverse Slab Cracking
			Decreasing Smoothness
40	Acceptance Quality Characteristics (AQC's)		Concrete Strength
			Slab Thickness
			Air Content
			Initial Smoothness
41	Strength	Sampling Method	Beams
42		Timing of Cores	–
43		Number of Samples per Sublot	1
44		Number of Replicates per Sample	2
45		Target Timing of Testing	28days
46		Test Maturity	–
47		Core-to-cylinder strength relationship	–
48		Lab-created maturity equation	–
49		Compressive-to-flexural relationship	–
50	Thickness	Sampling Method	Independent Cores
51		Timing of Samples	4days
52		Number of Samples per Sublot	2
53		Number of Replicates per Sample	1

TABLE
(Continued)

No.	Input		Value
54	Air Content	Sampling Method	Air pressure Meter
55		Timing of Samples	–
56		Number of Samples per Sublot	2
57		Number of Replicates per Sample	1
58	Initial Smoothness	Initial Smoothness Indicator	Profile Index (0.0-in blanking band)
59		Initial Smoothness Relationship	–
60		Number of Pass Locations per Sublot	1
61		Pass Locations (describe)	
62		Number of Replications per Pass Location	2
63		Timing of Samples (describe)	
64		Profilograph Reduction Method	v
65	Determine target LCC by		Estimate LCC through Simulation
66	Concrete Strength	Sample Method	Distribution
67		Mean	650psi
68		Std Dev	40psi
69	Slab Thickness	Sample Method	Distribution
70		Mean	15in
71		Std Dev	0.5in
72	Air Content	Sample Method	Distribution
73		Mean	6.50%
74		Std Dev	0.50%
75	Initial Smoothness	Sample Method	Distribution
76		Mean	32in/mi
77		Std Dev	8in/mi
78	Percent Consol. Around Dowels	Sample Method	–
79		Mean	–
80		Std Dev	–
81	Maintenance and Rehabilitation Plan Modules (Maintenance)	Maintenance Transverse Joints	Check
82		Seal	40%
83		Regular Maintenance Year	5years
84		Maintenance Longitudinal Joints	Check
85		Seal	25%
86		Regular Maintenance Year	5years
87		Maintenance Transverse Cracks	Check
88		Seal	100%
89		Regular Maintenance Year	3years

TABLE
(Continued)

No.		Input	Value
90	Maintenance and Rehabilitation Plan Modules (Local Rehab)	Step 1 (defined)	Always do full-depth repairs to 100% of spalled joints.
		Step 2 (defined)	If cumulative percent cracked slabs exceed 10.00%, then consider the sublot failed.
		Step 3 (defined)	If cumulative percent spalled joints exceeds 10.00%, then consider the sublot failed.
		Step 4 (defined)	If average transverse joint faulting exceeds 0.2500 in, then consider the sublot failed.
		Step 5 (defined)	If percent failed sublots exceed 25%, then begin global rehab scenario 1.
91	Maintenance and Rehabilitation Plan Modules (Global Rehab)	Repair Spalled Joints	Check
92		% of spalled joints to be repaired	100%
93		Repair Type	Partial-depth repairs
94		Repair Cracked Slabs	Check
95		% of cracked slabs to be repaired	100%
96		Repair Type	Partial slab replacements
97		1st Global Rehabilitation to Apply	AC Overlay
98		Assumed life of 1st global rehabilitation	7years
99		Start IRI of 1st global rehabilitation	90in/mi
100		End IRI of 1st global rehabilitation	200in/mi
101		2nd Global Rehabilitation to Apply	AC Overlay
102		Assumed life of 2nd global rehabilitation	7years
103		Start IRI of 2nd global rehabilitation	95in/mi
104		End IRI of 2nd global rehabilitation	200in/mi
105		3rd Global Rehabilitation to Apply	AC Overlay
106		Assumed life of 3rd global rehabilitation	5years
107		Start IRI of 3rd global rehabilitation	100in/mi
108		End IRI of 3rd global rehabilitation	200in/mi
109		4th Global Rehabilitation to Apply	AC Overlay
110		Assumed life of 4th global rehabilitation	3years
111		Start IRI of 4th global rehabilitation	105in/mi
112		End IRI of 4th global rehabilitation	200in/mi
113	Unit Costs Modules (Maintenance)	Transverse Joint Sealing	$1.20 per ft
114		Longitudinal Joint Sealing	$1.00 per ft
115		Transverse Crack Sealing	$1.00 per ft

TABLE
(Continued)

No.		Input	Value
116	Unit Costs Modules (Rehabilitation)	Full-depth repairs of transverse joints	$159 per sq. yd
117		Partial-depth repairs of transverse joints	$364 per sq. yd
118		Full slab replacements	–
119		Partial slab replacements	$135 per sq. yd
120		AC overlay	$11 per sq. yd
121		PCC overlay	–
122		Diamond grinding	–
123	Unit Costs Modules (Other)	Annual inflation rate	3%
124		Annual interest rate	6%
125		Assumed width of a full-depth repair of a transverse joint	6ft
126		Assumed width of a partial-depth repair of a transverse joint	6ft
127		Assumed width of a partial slab replacement	6ft
128		User cost percentage to include	2%
129		Year of construction	2002
130	Generic Settings	Number of lots to simulate at each factorial point	500
131		Minimum number of sublots per lot to simulate	3
132		Maximum number of sublots per lot to simulate	3
133		Average bid price	$20/sq.yd
134		Analysis life	70years

APPENDIX B. COMPOSITE EFFECTS OF MULTIPLE AQCS ANALYSIS RESULTS

Two as-design cases serve as the base for the comparisons. In Case 1, the design target for the slab thickness is 15 inches and the as-designed LCC is $5,330,980. Comparison 1 refers to the difference between the LCC of an as-constructed and Case 1 as-designed LCC. In Case 2, the design target for the slab thickness is 12 inches and the as-designed LCC is $5,492,366. Comparison 2 refers to comparisons of as-constructed LCCs against Case 2 as-designed LCC.

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	0.50%	16 in	0.5 in	450	20	$4,788,875	-$542,105	-$703,491
11.00%	0.50%	16 in	0.5 in	450	40	$4,793,160	-$537,820	-$699,206
11.00%	0.50%	16 in	0.5 in	450	60	$4,800,174	-$530,806	-$692,192
11.00%	0.50%	16 in	0.5 in	450	80	$4,808,548	-$522,432	-$683,818
11.00%	0.50%	16 in	0.5 in	500	20	$4,748,218	-$582,762	-$744,148
11.00%	0.50%	16 in	0.5 in	500	40	$4,753,021	-$577,959	-$739,345
11.00%	0.50%	16 in	0.5 in	500	60	$4,760,191	-$570,789	-$732,175
11.00%	0.50%	16 in	0.5 in	500	80	$4,767,423	-$563,557	-$724,943
11.00%	0.50%	16 in	0.5 in	550	20	$4,721,449	-$609,531	-$770,917
11.00%	0.50%	16 in	0.5 in	550	40	$4,724,362	-$606,618	-$768,004
11.00%	0.50%	16 in	0.5 in	550	60	$4,729,133	-$601,847	-$763,233
11.00%	0.50%	16 in	0.5 in	550	80	$4,735,216	-$595,764	-$757,150
11.00%	0.50%	16 in	0.5 in	600	20	$4,711,558	-$619,422	-$780,808
11.00%	0.50%	16 in	0.5 in	600	40	$4,712,218	-$618,762	-$780,148
11.00%	0.50%	16 in	0.5 in	600	60	$4,713,802	-$617,178	-$778,564
11.00%	0.50%	16 in	0.5 in	600	80	$4,715,718	-$615,262	-$776,648
11.00%	0.50%	16 in	0.5 in	650	20	$4,707,556	-$623,424	-$784,810
11.00%	0.50%	16 in	0.5 in	650	40	$4,707,725	-$623,255	-$784,641
11.00%	0.50%	16 in	0.5 in	650	60	$4,708,111	-$622,869	-$784,255
11.00%	0.50%	16 in	0.5 in	650	80	$4,709,033	-$621,947	-$783,333
11.00%	0.50%	16 in	2 in	450	20	$4,795,284	-$535,696	-$697,082
11.00%	0.50%	16 in	2 in	450	40	$4,799,113	-$531,867	-$693,253
11.00%	0.50%	16 in	2 in	450	60	$4,807,677	-$523,303	-$684,689
11.00%	0.50%	16 in	2 in	450	80	$4,820,284	-$510,696	-$672,082
11.00%	0.50%	16 in	2 in	500	20	$4,754,561	-$576,419	-$737,805
11.00%	0.50%	16 in	2 in	500	40	$4,758,254	-$572,726	-$734,112
11.00%	0.50%	16 in	2 in	500	60	$4,764,257	-$566,723	-$728,109
11.00%	0.50%	16 in	2 in	500	80	$4,772,418	-$558,562	-$719,948
11.00%	0.50%	16 in	2 in	550	20	$4,725,597	-$605,383	-$766,769
11.00%	0.50%	16 in	2 in	550	40	$4,728,043	-$602,937	-$764,323
11.00%	0.50%	16 in	2 in	550	60	$4,732,600	-$598,380	-$759,766
11.00%	0.50%	16 in	2 in	550	80	$4,738,633	-$592,347	-$753,733
11.00%	0.50%	16 in	2 in	600	20	$4,712,764	-$618,216	-$779,602

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	0.50%	16 in	2 in	600	40	$4,713,699	-$617,281	-$778,667
11.00%	0.50%	16 in	2 in	600	60	$4,715,603	-$615,377	-$776,763
11.00%	0.50%	16 in	2 in	600	80	$4,718,563	-$612,417	-$773,803
11.00%	0.50%	16 in	2 in	650	20	$4,707,864	-$623,116	-$784,502
11.00%	0.50%	16 in	2 in	650	40	$4,708,128	-$622,852	-$784,238
11.00%	0.50%	16 in	2 in	650	60	$4,708,764	-$622,216	-$783,602
11.00%	0.50%	16 in	2 in	650	80	$4,709,835	-$621,145	-$782,531
11.00%	0.50%	15 in	0.5 in	450	20	$4,806,825	-$524,155	-$685,541
11.00%	0.50%	15 in	0.5 in	450	40	$4,811,864	-$519,116	-$680,502
11.00%	0.50%	15 in	0.5 in	450	60	$4,819,843	-$511,137	-$672,523
11.00%	0.50%	15 in	0.5 in	450	80	$4,831,172	-$499,808	-$661,194
11.00%	0.50%	15 in	0.5 in	500	20	$4,766,779	-$564,201	-$725,587
11.00%	0.50%	15 in	0.5 in	500	40	$4,771,157	-$559,823	-$721,209
11.00%	0.50%	15 in	0.5 in	500	60	$4,777,313	-$553,667	-$715,053
11.00%	0.50%	15 in	0.5 in	500	80	$4,784,995	-$545,985	-$707,371
11.00%	0.50%	15 in	0.5 in	550	20	$4,731,328	-$599,652	-$761,038
11.00%	0.50%	15 in	0.5 in	550	40	$4,735,301	-$595,679	-$757,065
11.00%	0.50%	15 in	0.5 in	550	60	$4,741,532	-$589,448	-$750,834
11.00%	0.50%	15 in	0.5 in	550	80	$4,748,670	-$582,310	-$743,696
11.00%	0.50%	15 in	0.5 in	600	20	$4,714,836	-$616,144	-$777,530
11.00%	0.50%	15 in	0.5 in	600	40	$4,716,263	-$614,717	-$776,103
11.00%	0.50%	15 in	0.5 in	600	60	$4,719,150	-$611,830	-$773,216
11.00%	0.50%	15 in	0.5 in	600	80	$4,723,552	-$607,428	-$768,814
11.00%	0.50%	15 in	0.5 in	650	20	$4,709,215	-$621,765	-$783,151
11.00%	0.50%	15 in	0.5 in	650	40	$4,709,484	-$621,496	-$782,882
11.00%	0.50%	15 in	0.5 in	650	60	$4,710,275	-$620,705	-$782,091
11.00%	0.50%	15 in	0.5 in	650	80	$4,711,831	-$619,149	-$780,535
11.00%	0.50%	15 in	2 in	450	20	$4,826,780	-$504,200	-$665,586
11.00%	0.50%	15 in	2 in	450	40	$4,834,099	-$496,881	-$658,267
11.00%	0.50%	15 in	2 in	450	60	$4,849,512	-$481,468	-$642,854
11.00%	0.50%	15 in	2 in	450	80	$4,871,318	-$459,662	-$621,048
11.00%	0.50%	15 in	2 in	500	20	$4,775,026	-$555,954	-$717,340
11.00%	0.50%	15 in	2 in	500	40	$4,779,516	-$551,464	-$712,850
11.00%	0.50%	15 in	2 in	500	60	$4,787,471	-$543,509	-$704,895
11.00%	0.50%	15 in	2 in	500	80	$4,798,397	-$532,583	-$693,969
11.00%	0.50%	15 in	2 in	550	20	$4,737,404	-$593,576	-$754,962

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	0.50%	15 in	2 in	550	40	$4,740,454	-$590,526	-$751,912
11.00%	0.50%	15 in	2 in	550	60	$4,746,353	-$584,627	-$746,013
11.00%	0.50%	15 in	2 in	550	80	$4,754,694	-$576,286	-$737,672
11.00%	0.50%	15 in	2 in	600	20	$4,717,286	-$613,694	-$775,080
11.00%	0.50%	15 in	2 in	600	40	$4,718,835	-$612,145	-$773,531
11.00%	0.50%	15 in	2 in	600	60	$4,721,783	-$609,197	-$770,583
11.00%	0.50%	15 in	2 in	600	80	$4,726,068	-$604,912	-$766,298
11.00%	0.50%	15 in	2 in	650	20	$4,709,782	-$621,198	-$782,584
11.00%	0.50%	15 in	2 in	650	40	$4,710,269	-$620,711	-$782,097
11.00%	0.50%	15 in	2 in	650	60	$4,711,387	-$619,593	-$780,979
11.00%	0.50%	15 in	2 in	650	80	$4,713,177	-$617,803	-$779,189
11.00%	0.50%	14 in	0.5 in	450	20	$4,827,068	-$503,912	-$665,298
11.00%	0.50%	14 in	0.5 in	450	40	$4,833,616	-$497,364	-$658,750
11.00%	0.50%	14 in	0.5 in	450	60	$4,845,166	-$485,814	-$647,200
11.00%	0.50%	14 in	0.5 in	450	80	$4,867,141	-$463,839	-$625,225
11.00%	0.50%	14 in	0.5 in	500	20	$4,785,413	-$545,567	-$706,953
11.00%	0.50%	14 in	0.5 in	500	40	$4,789,586	-$541,394	-$702,780
11.00%	0.50%	14 in	0.5 in	500	60	$4,796,671	-$534,309	-$695,695
11.00%	0.50%	14 in	0.5 in	500	80	$4,805,863	-$525,117	-$686,503
11.00%	0.50%	14 in	0.5 in	550	20	$4,745,817	-$585,163	-$746,549
11.00%	0.50%	14 in	0.5 in	550	40	$4,750,279	-$580,701	-$742,087
11.00%	0.50%	14 in	0.5 in	550	60	$4,757,058	-$573,922	-$735,308
11.00%	0.50%	14 in	0.5 in	550	80	$4,764,366	-$566,614	-$728,000
11.00%	0.50%	14 in	0.5 in	600	20	$4,720,374	-$610,606	-$771,992
11.00%	0.50%	14 in	0.5 in	600	40	$4,722,877	-$608,103	-$769,489
11.00%	0.50%	14 in	0.5 in	600	60	$4,727,408	-$603,572	-$764,958
11.00%	0.50%	14 in	0.5 in	600	80	$4,733,055	-$597,925	-$759,311
11.00%	0.50%	14 in	0.5 in	650	20	$4,711,370	-$619,610	-$780,996
11.00%	0.50%	14 in	0.5 in	650	40	$4,711,980	-$619,000	-$780,386
11.00%	0.50%	14 in	0.5 in	650	60	$4,713,437	-$617,543	-$778,929
11.00%	0.50%	14 in	0.5 in	650	80	$4,716,090	-$614,890	-$776,276
11.00%	0.50%	14 in	2 in	450	20	$4,918,282	-$412,698	-$574,084
11.00%	0.50%	14 in	2 in	450	40	$4,933,643	-$397,337	-$558,723
11.00%	0.50%	14 in	2 in	450	60	$4,964,171	-$366,809	-$528,195
11.00%	0.50%	14 in	2 in	450	80	$5,009,677	-$321,303	-$482,689
11.00%	0.50%	14 in	2 in	500	20	$4,817,921	-$513,059	-$674,445

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	0.50%	14 in	2 in	500	40	$4,826,400	-$504,580	-$665,966
11.00%	0.50%	14 in	2 in	500	60	$4,840,518	-$490,462	-$651,848
11.00%	0.50%	14 in	2 in	500	80	$4,860,774	-$470,206	-$631,592
11.00%	0.50%	14 in	2 in	550	20	$4,759,294	-$571,686	-$733,072
11.00%	0.50%	14 in	2 in	550	40	$4,764,672	-$566,308	-$727,694
11.00%	0.50%	14 in	2 in	550	60	$4,773,190	-$557,790	-$719,176
11.00%	0.50%	14 in	2 in	550	80	$4,784,904	-$546,076	-$707,462
11.00%	0.50%	14 in	2 in	600	20	$4,726,501	-$604,479	-$765,865
11.00%	0.50%	14 in	2 in	600	40	$4,728,912	-$602,068	-$763,454
11.00%	0.50%	14 in	2 in	600	60	$4,733,997	-$596,983	-$758,369
11.00%	0.50%	14 in	2 in	600	80	$4,741,523	-$589,457	-$750,843
11.00%	0.50%	14 in	2 in	650	20	$4,713,007	-$617,973	-$779,359
11.00%	0.50%	14 in	2 in	650	40	$4,713,881	-$617,099	-$778,485
11.00%	0.50%	14 in	2 in	650	60	$4,715,741	-$615,239	-$776,625
11.00%	0.50%	14 in	2 in	650	80	$4,719,115	-$611,865	-$773,251
11.00%	0.50%	13 in	0.5 in	450	20	$4,857,703	-$473,277	-$634,663
11.00%	0.50%	13 in	0.5 in	450	40	$4,870,700	-$460,280	-$621,666
11.00%	0.50%	13 in	0.5 in	450	60	$4,917,789	-$413,191	-$574,577
11.00%	0.50%	13 in	0.5 in	450	80	$5,010,492	-$320,488	-$481,874
11.00%	0.50%	13 in	0.5 in	500	20	$4,805,102	-$525,878	-$687,264
11.00%	0.50%	13 in	0.5 in	500	40	$4,810,412	-$520,568	-$681,954
11.00%	0.50%	13 in	0.5 in	500	60	$4,820,772	-$510,208	-$671,594
11.00%	0.50%	13 in	0.5 in	500	80	$4,841,251	-$489,729	-$651,115
11.00%	0.50%	13 in	0.5 in	550	20	$4,746,214	-$584,766	-$746,152
11.00%	0.50%	13 in	0.5 in	550	40	$4,768,707	-$562,273	-$723,659
11.00%	0.50%	13 in	0.5 in	550	60	$4,775,215	-$555,765	-$717,151
11.00%	0.50%	13 in	0.5 in	550	80	$4,784,147	-$546,833	-$708,219
11.00%	0.50%	13 in	0.5 in	600	20	$4,729,721	-$601,259	-$762,645
11.00%	0.50%	13 in	0.5 in	600	40	$4,733,299	-$597,681	-$759,067
11.00%	0.50%	13 in	0.5 in	600	60	$4,739,095	-$591,885	-$753,271
11.00%	0.50%	13 in	0.5 in	600	80	$4,746,360	-$584,620	-$746,006
11.00%	0.50%	13 in	0.5 in	650	20	$4,714,555	-$616,425	-$777,811
11.00%	0.50%	13 in	0.5 in	650	40	$4,715,783	-$615,197	-$776,583
11.00%	0.50%	13 in	0.5 in	650	60	$4,718,489	-$612,491	-$773,877
11.00%	0.50%	13 in	0.5 in	650	80	$4,722,694	-$608,286	-$769,672
11.00%	0.50%	13 in	2 in	450	20	$5,187,510	-$143,470	-$304,856

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	0.50%	13 in	2 in	450	40	$5,214,225	-$116,755	-$278,141
11.00%	0.50%	13 in	2 in	450	60	$5,265,029	-$65,951	-$227,337
11.00%	0.50%	13 in	2 in	450	80	$5,336,185	$5,205	-$156,181
11.00%	0.50%	13 in	2 in	500	20	$4,951,476	-$379,504	-$540,890
11.00%	0.50%	13 in	2 in	500	40	$4,965,036	-$365,944	-$527,330
11.00%	0.50%	13 in	2 in	500	60	$4,993,187	-$337,793	-$499,179
11.00%	0.50%	13 in	2 in	500	80	$5,034,533	-$296,447	-$457,833
11.00%	0.50%	13 in	2 in	550	20	$4,826,620	-$504,360	-$665,746
11.00%	0.50%	13 in	2 in	550	40	$4,836,343	-$494,637	-$656,023
11.00%	0.50%	13 in	2 in	550	60	$4,852,147	-$478,833	-$640,219
11.00%	0.50%	13 in	2 in	550	80	$4,874,268	-$456,712	-$618,098
11.00%	0.50%	13 in	2 in	600	20	$4,756,384	-$574,596	-$735,982
11.00%	0.50%	13 in	2 in	600	40	$4,762,237	-$568,743	-$730,129
11.00%	0.50%	13 in	2 in	600	60	$4,772,036	-$558,944	-$720,330
11.00%	0.50%	13 in	2 in	600	80	$4,785,413	-$545,567	-$706,953
11.00%	0.50%	13 in	2 in	650	20	$4,724,458	-$606,522	-$767,908
11.00%	0.50%	13 in	2 in	650	40	$4,726,642	-$604,338	-$765,724
11.00%	0.50%	13 in	2 in	650	60	$4,731,237	-$599,743	-$761,129
11.00%	0.50%	13 in	2 in	650	80	$4,738,071	-$592,909	-$754,295
11.00%	0.50%	12 in	0.5 in	450	20	$5,068,741	-$262,239	-$423,625
11.00%	0.50%	12 in	0.5 in	450	40	$5,177,841	-$153,139	-$314,525
11.00%	0.50%	12 in	0.5 in	450	60	$5,333,809	$2,829	-$158,557
11.00%	0.50%	12 in	0.5 in	450	80	$5,491,408	$160,428	-$958
11.00%	0.50%	12 in	0.5 in	500	20	$4,842,513	-$488,467	-$649,853
11.00%	0.50%	12 in	0.5 in	500	40	$4,864,928	-$466,052	-$627,438
11.00%	0.50%	12 in	0.5 in	500	60	$4,927,432	-$403,548	-$564,934
11.00%	0.50%	12 in	0.5 in	500	80	$5,029,189	-$301,791	-$463,177
11.00%	0.50%	12 in	0.5 in	550	20	$4,787,154	-$543,826	-$705,212
11.00%	0.50%	12 in	0.5 in	550	40	$4,792,565	-$538,415	-$699,801
11.00%	0.50%	12 in	0.5 in	550	60	$4,804,248	-$526,732	-$688,118
11.00%	0.50%	12 in	0.5 in	550	80	$4,833,068	-$497,912	-$659,298
11.00%	0.50%	12 in	0.5 in	600	20	$4,744,443	-$586,537	-$747,923
11.00%	0.50%	12 in	0.5 in	600	40	$4,749,190	-$581,790	-$743,176
11.00%	0.50%	12 in	0.5 in	600	60	$4,756,489	-$574,491	-$735,877
11.00%	0.50%	12 in	0.5 in	600	80	$4,766,110	-$564,870	-$726,256
11.00%	0.50%	12 in	0.5 in	650	20	$4,720,105	-$610,875	-$772,261

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	0.50%	12 in	0.5 in	650	40	$4,722,360	-$608,620	-$770,006
11.00%	0.50%	12 in	0.5 in	650	60	$4,726,857	-$604,123	-$765,509
11.00%	0.50%	12 in	0.5 in	650	80	$4,732,550	-$598,430	-$759,816
11.00%	0.50%	12 in	2 in	450	20	$5,744,026	$413,046	$251,660
11.00%	0.50%	12 in	2 in	450	40	$5,765,153	$434,173	$272,787
11.00%	0.50%	12 in	2 in	450	60	$5,808,023	$477,043	$315,657
11.00%	0.50%	12 in	2 in	450	80	$5,865,520	$534,540	$373,154
11.00%	0.50%	12 in	2 in	500	20	$5,319,727	-$11,253	-$172,639
11.00%	0.50%	12 in	2 in	500	40	$5,343,105	$12,125	-$149,261
11.00%	0.50%	12 in	2 in	500	60	$5,384,619	$53,639	-$107,747
11.00%	0.50%	12 in	2 in	500	80	$5,442,075	$111,095	-$50,291
11.00%	0.50%	12 in	2 in	550	20	$5,038,276	-$292,704	-$454,090
11.00%	0.50%	12 in	2 in	550	40	$5,052,143	-$278,837	-$440,223
11.00%	0.50%	12 in	2 in	550	60	$5,079,148	-$251,832	-$413,218
11.00%	0.50%	12 in	2 in	550	80	$5,120,552	-$210,428	-$371,814
11.00%	0.50%	12 in	2 in	600	20	$4,871,537	-$459,443	-$620,829
11.00%	0.50%	12 in	2 in	600	40	$4,880,114	-$450,866	-$612,252
11.00%	0.50%	12 in	2 in	600	60	$4,896,486	-$434,494	-$595,880
11.00%	0.50%	12 in	2 in	600	80	$4,921,710	-$409,270	-$570,656
11.00%	0.50%	12 in	2 in	650	20	$4,781,100	-$549,880	-$711,266
11.00%	0.50%	12 in	2 in	650	40	$4,787,466	-$543,514	-$704,900
11.00%	0.50%	12 in	2 in	650	60	$4,798,108	-$532,872	-$694,258
11.00%	0.50%	12 in	2 in	650	80	$4,813,193	-$517,787	-$679,173
11.00%	0.50%	11 in	0.5 in	450	20	$5,959,052	$628,072	$466,686
11.00%	0.50%	11 in	0.5 in	450	40	$6,038,016	$707,036	$545,650
11.00%	0.50%	11 in	0.5 in	450	60	$6,131,841	$800,861	$639,475
11.00%	0.50%	11 in	0.5 in	450	80	$6,215,065	$884,085	$722,699
11.00%	0.50%	11 in	0.5 in	500	20	$5,293,150	-$37,830	-$199,216
11.00%	0.50%	11 in	0.5 in	500	40	$5,386,771	$55,791	-$105,595
11.00%	0.50%	11 in	0.5 in	500	60	$5,515,370	$184,390	$23,004
11.00%	0.50%	11 in	0.5 in	500	80	$5,645,212	$314,232	$152,846
11.00%	0.50%	11 in	0.5 in	550	20	$4,881,430	-$449,550	-$610,936
11.00%	0.50%	11 in	0.5 in	550	40	$4,932,672	-$398,308	-$559,694
11.00%	0.50%	11 in	0.5 in	550	60	$5,026,020	-$304,960	-$466,346
11.00%	0.50%	11 in	0.5 in	550	80	$5,142,200	-$188,780	-$350,166
11.00%	0.50%	11 in	0.5 in	600	20	$4,774,622	-$556,358	-$717,744

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	0.50%	11 in	0.5 in	600	40	$4,784,334	-$546,646	-$708,032
11.00%	0.50%	11 in	0.5 in	600	60	$4,809,920	-$521,060	-$682,446
11.00%	0.50%	11 in	0.5 in	600	80	$4,858,994	-$471,986	-$633,372
11.00%	0.50%	11 in	0.5 in	650	20	$4,732,277	-$598,703	-$760,089
11.00%	0.50%	11 in	0.5 in	650	40	$4,736,528	-$594,452	-$755,838
11.00%	0.50%	11 in	0.5 in	650	60	$4,744,853	-$586,127	-$747,513
11.00%	0.50%	11 in	0.5 in	650	80	$4,758,687	-$572,293	-$733,679
11.00%	0.50%	11 in	2 in	450	20	$6,354,682	$1,023,702	$862,316
11.00%	0.50%	11 in	2 in	450	40	$6,365,001	$1,034,021	$872,635
11.00%	0.50%	11 in	2 in	450	60	$6,386,593	$1,055,613	$894,227
11.00%	0.50%	11 in	2 in	450	80	$6,415,906	$1,084,926	$923,540
11.00%	0.50%	11 in	2 in	500	20	$5,941,679	$610,699	$449,313
11.00%	0.50%	11 in	2 in	500	40	$5,954,864	$623,884	$462,498
11.00%	0.50%	11 in	2 in	500	60	$5,983,563	$652,583	$491,197
11.00%	0.50%	11 in	2 in	500	80	$6,020,494	$689,514	$528,128
11.00%	0.50%	11 in	2 in	550	20	$5,541,569	$210,589	$49,203
11.00%	0.50%	11 in	2 in	550	40	$5,556,540	$225,560	$64,174
11.00%	0.50%	11 in	2 in	550	60	$5,589,006	$258,026	$96,640
11.00%	0.50%	11 in	2 in	550	80	$5,629,400	$298,420	$137,034
11.00%	0.50%	11 in	2 in	600	20	$5,208,558	-$122,422	-$283,808
11.00%	0.50%	11 in	2 in	600	40	$5,222,783	-$108,197	-$269,583
11.00%	0.50%	11 in	2 in	600	60	$5,250,358	-$80,622	-$242,008
11.00%	0.50%	11 in	2 in	600	80	$5,287,829	-$43,151	-$204,537
11.00%	0.50%	11 in	2 in	650	20	$4,987,243	-$343,737	-$505,123
11.00%	0.50%	11 in	2 in	650	40	$4,996,303	-$334,677	-$496,063
11.00%	0.50%	11 in	2 in	650	60	$5,014,854	-$316,126	-$477,512
11.00%	0.50%	11 in	2 in	650	80	$5,040,900	-$290,080	-$451,466
11.00%	0.50%	10 in	0.5 in	450	20	$6,648,962	$1,317,982	$1,156,596
11.00%	0.50%	10 in	0.5 in	450	40	$6,671,091	$1,340,111	$1,178,725
11.00%	0.50%	10 in	0.5 in	450	60	$6,699,949	$1,368,969	$1,207,583
11.00%	0.50%	10 in	0.5 in	450	80	$6,726,784	$1,395,804	$1,234,418
11.00%	0.50%	10 in	0.5 in	500	20	$6,220,593	$889,613	$728,227
11.00%	0.50%	10 in	0.5 in	500	40	$6,269,324	$938,344	$776,958
11.00%	0.50%	10 in	0.5 in	500	60	$6,330,562	$999,582	$838,196
11.00%	0.50%	10 in	0.5 in	500	80	$6,385,903	$1,054,923	$893,537
11.00%	0.50%	10 in	0.5 in	550	20	$5,662,583	$331,603	$170,217

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	0.50%	10 in	0.5 in	550	40	$5,729,164	$398,184	$236,798
11.00%	0.50%	10 in	0.5 in	550	60	$5,822,820	$491,840	$330,454
11.00%	0.50%	10 in	0.5 in	550	80	$5,913,690	$582,710	$421,324
11.00%	0.50%	10 in	0.5 in	600	20	$5,122,073	-$208,907	-$370,293
11.00%	0.50%	10 in	0.5 in	600	40	$5,186,058	-$144,922	-$306,308
11.00%	0.50%	10 in	0.5 in	600	60	$5,284,700	-$46,280	-$207,666
11.00%	0.50%	10 in	0.5 in	600	80	$5,395,184	$64,204	-$97,182
11.00%	0.50%	10 in	0.5 in	650	20	$4,821,989	-$508,991	-$670,377
11.00%	0.50%	10 in	0.5 in	650	40	$4,855,006	-$475,974	-$637,360
11.00%	0.50%	10 in	0.5 in	650	60	$4,917,425	-$413,555	-$574,941
11.00%	0.50%	10 in	0.5 in	650	80	$5,000,963	-$330,017	-$491,403
11.00%	0.50%	10 in	2 in	450	20	$6,797,350	$1,466,370	$1,304,984
11.00%	0.50%	10 in	2 in	450	40	$6,802,166	$1,471,186	$1,309,800
11.00%	0.50%	10 in	2 in	450	60	$6,815,801	$1,484,821	$1,323,435
11.00%	0.50%	10 in	2 in	450	80	$6,836,495	$1,505,515	$1,344,129
11.00%	0.50%	10 in	2 in	500	20	$6,522,770	$1,191,790	$1,030,404
11.00%	0.50%	10 in	2 in	500	40	$6,528,314	$1,197,334	$1,035,948
11.00%	0.50%	10 in	2 in	500	60	$6,540,700	$1,209,720	$1,048,334
11.00%	0.50%	10 in	2 in	500	80	$6,559,173	$1,228,193	$1,066,807
11.00%	0.50%	10 in	2 in	550	20	$6,191,804	$860,824	$699,438
11.00%	0.50%	10 in	2 in	550	40	$6,198,528	$867,548	$706,162
11.00%	0.50%	10 in	2 in	550	60	$6,214,505	$883,525	$722,139
11.00%	0.50%	10 in	2 in	550	80	$6,237,666	$906,686	$745,300
11.00%	0.50%	10 in	2 in	600	20	$5,830,736	$499,756	$338,370
11.00%	0.50%	10 in	2 in	600	40	$5,839,000	$508,020	$346,634
11.00%	0.50%	10 in	2 in	600	60	$5,857,045	$526,065	$364,679
11.00%	0.50%	10 in	2 in	600	80	$5,884,357	$553,377	$391,991
11.00%	0.50%	10 in	2 in	650	20	$5,492,326	$161,346	-$40
11.00%	0.50%	10 in	2 in	650	40	$5,502,938	$171,958	$10,572
11.00%	0.50%	10 in	2 in	650	60	$5,523,980	$193,000	$31,614
11.00%	0.50%	10 in	2 in	650	80	$5,553,927	$222,947	$61,561
11.00%	2.00%	16 in	0.5 in	450	20	$4,867,847	-$463,133	-$624,519
11.00%	2.00%	16 in	0.5 in	450	40	$4,870,548	-$460,432	-$621,818
11.00%	2.00%	16 in	0.5 in	450	60	$4,876,002	-$454,978	-$616,364
11.00%	2.00%	16 in	0.5 in	450	80	$4,882,637	-$448,343	-$609,729
11.00%	2.00%	16 in	0.5 in	500	20	$4,819,677	-$511,303	-$672,689

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	2.00%	16 in	0.5 in	500	40	$4,821,927	-$509,053	-$670,439
11.00%	2.00%	16 in	0.5 in	500	60	$4,825,905	-$505,075	-$666,461
11.00%	2.00%	16 in	0.5 in	500	80	$4,831,351	-$499,629	-$661,015
11.00%	2.00%	16 in	0.5 in	550	20	$4,781,009	-$549,971	-$711,357
11.00%	2.00%	16 in	0.5 in	550	40	$4,783,393	-$547,587	-$708,973
11.00%	2.00%	16 in	0.5 in	550	60	$4,786,875	-$544,105	-$705,491
11.00%	2.00%	16 in	0.5 in	550	80	$4,791,217	-$539,763	-$701,149
11.00%	2.00%	16 in	0.5 in	600	20	$4,751,987	-$578,993	-$740,379
11.00%	2.00%	16 in	0.5 in	600	40	$4,753,676	-$577,304	-$738,690
11.00%	2.00%	16 in	0.5 in	600	60	$4,756,344	-$574,636	-$736,022
11.00%	2.00%	16 in	0.5 in	600	80	$4,759,646	-$571,334	-$732,720
11.00%	2.00%	16 in	0.5 in	650	20	$4,731,352	-$599,628	-$761,014
11.00%	2.00%	16 in	0.5 in	650	40	$4,732,514	-$598,466	-$759,852
11.00%	2.00%	16 in	0.5 in	650	60	$4,734,518	-$596,462	-$757,848
11.00%	2.00%	16 in	0.5 in	650	80	$4,737,286	-$593,694	-$755,080
11.00%	2.00%	16 in	2 in	450	20	$4,870,428	-$460,552	-$621,938
11.00%	2.00%	16 in	2 in	450	40	$4,874,029	-$456,951	-$618,337
11.00%	2.00%	16 in	2 in	450	60	$4,881,493	-$449,487	-$610,873
11.00%	2.00%	16 in	2 in	450	80	$4,891,480	-$439,500	-$600,886
11.00%	2.00%	16 in	2 in	500	20	$4,821,640	-$509,340	-$670,726
11.00%	2.00%	16 in	2 in	500	40	$4,824,103	-$506,877	-$668,263
11.00%	2.00%	16 in	2 in	500	60	$4,828,628	-$502,352	-$663,738
11.00%	2.00%	16 in	2 in	500	80	$4,834,832	-$496,148	-$657,534
11.00%	2.00%	16 in	2 in	550	20	$4,783,620	-$547,360	-$708,746
11.00%	2.00%	16 in	2 in	550	40	$4,785,881	-$545,099	-$706,485
11.00%	2.00%	16 in	2 in	550	60	$4,788,752	-$542,228	-$703,614
11.00%	2.00%	16 in	2 in	550	80	$4,793,465	-$537,515	-$698,901
11.00%	2.00%	16 in	2 in	600	20	$4,753,745	-$577,235	-$738,621
11.00%	2.00%	16 in	2 in	600	40	$4,755,062	-$575,918	-$737,304
11.00%	2.00%	16 in	2 in	600	60	$4,757,634	-$573,346	-$734,732
11.00%	2.00%	16 in	2 in	600	80	$4,761,247	-$569,733	-$731,119
11.00%	2.00%	16 in	2 in	650	20	$4,732,723	-$598,257	-$759,643
11.00%	2.00%	16 in	2 in	650	40	$4,733,861	-$597,119	-$758,505
11.00%	2.00%	16 in	2 in	650	60	$4,735,806	-$595,174	-$756,560
11.00%	2.00%	16 in	2 in	650	80	$4,738,329	-$592,651	-$754,037
11.00%	2.00%	15 in	0.5 in	450	20	$4,892,822	-$438,158	-$599,544

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
11.00%	2.00%	15 in	0.5 in	450	40	$4,896,486	-$434,494	-$595,880
11.00%	2.00%	15 in	0.5 in	450	60	$4,901,930	-$429,050	-$590,436
11.00%	2.00%	15 in	0.5 in	450	80	$4,910,370	-$420,610	-$581,996
11.00%	2.00%	15 in	0.5 in	500	20	$4,840,405	-$490,575	-$651,961
11.00%	2.00%	15 in	0.5 in	500	40	$4,842,893	-$488,087	-$649,473
11.00%	2.00%	15 in	0.5 in	500	60	$4,847,847	-$483,133	-$644,519
11.00%	2.00%	15 in	0.5 in	500	80	$4,853,374	-$477,606	-$638,992
11.00%	2.00%	15 in	0.5 in	550	20	$4,797,876	-$533,104	-$694,490
11.00%	2.00%	15 in	0.5 in	550	40	$4,800,014	-$530,966	-$692,352
11.00%	2.00%	15 in	0.5 in	550	60	$4,803,689	-$527,291	-$688,677
11.00%	2.00%	15 in	0.5 in	550	80	$4,808,499	-$522,481	-$683,867
11.00%	2.00%	15 in	0.5 in	600	20	$4,764,684	-$566,296	-$727,682
11.00%	2.00%	15 in	0.5 in	600	40	$4,766,531	-$564,449	-$725,835
11.00%	2.00%	15 in	0.5 in	600	60	$4,769,637	-$561,343	-$722,729
11.00%	2.00%	15 in	0.5 in	600	80	$4,773,433	-$557,547	-$718,933
11.00%	2.00%	15 in	0.5 in	650	20	$4,740,296	-$590,684	-$752,070
11.00%	2.00%	15 in	0.5 in	650	40	$4,741,751	-$589,229	-$750,615
11.00%	2.00%	15 in	0.5 in	650	60	$4,743,970	-$587,010	-$748,396
11.00%	2.00%	15 in	0.5 in	650	80	$4,747,098	-$583,882	-$745,268
11.00%	2.00%	15 in	2 in	450	20	$4,906,499	-$424,481	-$585,867
11.00%	2.00%	15 in	2 in	450	40	$4,911,951	-$419,029	-$580,415
11.00%	2.00%	15 in	2 in	450	60	$4,924,310	-$406,670	-$568,056
11.00%	2.00%	15 in	2 in	450	80	$4,943,291	-$387,689	-$549,075
11.00%	2.00%	15 in	2 in	500	20	$4,844,107	-$486,873	-$648,259
11.00%	2.00%	15 in	2 in	500	40	$4,847,484	-$483,496	-$644,882
11.00%	2.00%	15 in	2 in	500	60	$4,854,094	-$476,886	-$638,272
11.00%	2.00%	15 in	2 in	500	80	$4,863,699	-$467,281	-$628,667
11.00%	2.00%	15 in	2 in	550	20	$4,800,452	-$530,528	-$691,914
11.00%	2.00%	15 in	2 in	550	40	$4,802,855	-$528,125	-$689,511
11.00%	2.00%	15 in	2 in	550	60	$4,807,114	-$523,866	-$685,252
11.00%	2.00%	15 in	2 in	550	80	$4,813,101	-$517,879	-$679,265
11.00%	2.00%	15 in	2 in	600	20	$4,766,742	-$564,238	-$725,624
11.00%	2.00%	15 in	2 in	600	40	$4,768,526	-$562,454	-$723,840
11.00%	2.00%	15 in	2 in	600	60	$4,771,038	-$559,942	-$721,328
11.00%	2.00%	15 in	2 in	600	80	$4,774,881	-$556,099	-$717,485
11.00%	2.00%	15 in	2 in	650	20	$4,741,722	-$589,258	-$750,644

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	2.00%	15 in	2 in	650	40	$4,743,084	-$587,896	-$749,282
11.00%	2.00%	15 in	2 in	650	60	$4,745,371	-$585,609	-$746,995
11.00%	2.00%	15 in	2 in	650	80	$4,748,356	-$582,624	-$744,010
11.00%	2.00%	14 in	0.5 in	450	20	$4,920,586	-$410,394	-$571,780
11.00%	2.00%	14 in	0.5 in	450	40	$4,924,835	-$406,145	-$567,531
11.00%	2.00%	14 in	0.5 in	450	60	$4,932,674	-$398,306	-$559,692
11.00%	2.00%	14 in	0.5 in	450	80	$4,950,586	-$380,394	-$541,780
11.00%	2.00%	14 in	0.5 in	500	20	$4,863,032	-$467,948	-$629,334
11.00%	2.00%	14 in	0.5 in	500	40	$4,866,326	-$464,654	-$626,040
11.00%	2.00%	14 in	0.5 in	500	60	$4,871,059	-$459,921	-$621,307
11.00%	2.00%	14 in	0.5 in	500	80	$4,878,897	-$452,083	-$613,469
11.00%	2.00%	14 in	0.5 in	550	20	$4,816,745	-$514,235	-$675,621
11.00%	2.00%	14 in	0.5 in	550	40	$4,819,066	-$511,914	-$673,300
11.00%	2.00%	14 in	0.5 in	550	60	$4,823,090	-$507,890	-$669,276
11.00%	2.00%	14 in	0.5 in	550	80	$4,828,219	-$502,761	-$664,147
11.00%	2.00%	14 in	0.5 in	600	20	$4,779,230	-$551,750	-$713,136
11.00%	2.00%	14 in	0.5 in	600	40	$4,781,161	-$549,819	-$711,205
11.00%	2.00%	14 in	0.5 in	600	60	$4,784,254	-$546,726	-$708,112
11.00%	2.00%	14 in	0.5 in	600	80	$4,788,601	-$542,379	-$703,765
11.00%	2.00%	14 in	0.5 in	650	20	$4,750,914	-$580,066	-$741,452
11.00%	2.00%	14 in	0.5 in	650	40	$4,752,681	-$578,299	-$739,685
11.00%	2.00%	14 in	0.5 in	650	60	$4,755,442	-$575,538	-$736,924
11.00%	2.00%	14 in	0.5 in	650	80	$4,758,488	-$572,492	-$733,878
11.00%	2.00%	14 in	2 in	450	20	$4,994,591	-$336,389	-$497,775
11.00%	2.00%	14 in	2 in	450	40	$5,007,864	-$323,116	-$484,502
11.00%	2.00%	14 in	2 in	450	60	$5,034,727	-$296,253	-$457,639
11.00%	2.00%	14 in	2 in	450	80	$5,076,331	-$254,649	-$416,035
11.00%	2.00%	14 in	2 in	500	20	$4,888,333	-$442,647	-$604,033
11.00%	2.00%	14 in	2 in	500	40	$4,894,902	-$436,078	-$597,464
11.00%	2.00%	14 in	2 in	500	60	$4,907,404	-$423,576	-$584,962
11.00%	2.00%	14 in	2 in	500	80	$4,924,987	-$405,993	-$567,379
11.00%	2.00%	14 in	2 in	550	20	$4,824,485	-$506,495	-$667,881
11.00%	2.00%	14 in	2 in	550	40	$4,828,634	-$502,346	-$663,732
11.00%	2.00%	14 in	2 in	550	60	$4,835,243	-$495,737	-$657,123
11.00%	2.00%	14 in	2 in	550	80	$4,844,707	-$486,273	-$647,659
11.00%	2.00%	14 in	2 in	600	20	$4,783,094	-$547,886	-$709,272

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	2.00%	14 in	2 in	600	40	$4,785,394	-$545,586	-$706,972
11.00%	2.00%	14 in	2 in	600	60	$4,789,028	-$541,952	-$703,338
11.00%	2.00%	14 in	2 in	600	80	$4,794,740	-$536,240	-$697,626
11.00%	2.00%	14 in	2 in	650	20	$4,753,266	-$577,714	-$739,100
11.00%	2.00%	14 in	2 in	650	40	$4,754,421	-$576,559	-$737,945
11.00%	2.00%	14 in	2 in	650	60	$4,757,028	-$573,952	-$735,338
11.00%	2.00%	14 in	2 in	650	80	$4,761,068	-$569,912	-$731,298
11.00%	2.00%	13 in	0.5 in	450	20	$4,957,350	-$373,630	-$535,016
11.00%	2.00%	13 in	0.5 in	450	40	$4,966,901	-$364,079	-$525,465
11.00%	2.00%	13 in	0.5 in	450	60	$5,003,937	-$327,043	-$488,429
11.00%	2.00%	13 in	0.5 in	450	80	$5,085,684	-$245,296	-$406,682
11.00%	2.00%	13 in	0.5 in	500	20	$4,889,454	-$441,526	-$602,912
11.00%	2.00%	13 in	0.5 in	500	40	$4,892,862	-$438,118	-$599,504
11.00%	2.00%	13 in	0.5 in	500	60	$4,900,715	-$430,265	-$591,651
11.00%	2.00%	13 in	0.5 in	500	80	$4,917,615	-$413,365	-$574,751
11.00%	2.00%	13 in	0.5 in	550	20	$4,837,147	-$493,833	-$655,219
11.00%	2.00%	13 in	0.5 in	550	40	$4,840,269	-$490,711	-$652,097
11.00%	2.00%	13 in	0.5 in	550	60	$4,844,824	-$486,156	-$647,542
11.00%	2.00%	13 in	0.5 in	550	80	$4,851,409	-$479,571	-$640,957
11.00%	2.00%	13 in	0.5 in	600	20	$4,795,404	-$535,576	-$696,962
11.00%	2.00%	13 in	0.5 in	600	40	$4,797,584	-$533,396	-$694,782
11.00%	2.00%	13 in	0.5 in	600	60	$4,801,313	-$529,667	-$691,053
11.00%	2.00%	13 in	0.5 in	600	80	$4,805,844	-$525,136	-$686,522
11.00%	2.00%	13 in	0.5 in	650	20	$4,763,894	-$567,086	-$728,472
11.00%	2.00%	13 in	0.5 in	650	40	$4,765,741	-$565,239	-$726,625
11.00%	2.00%	13 in	0.5 in	650	60	$4,768,273	-$562,707	-$724,093
11.00%	2.00%	13 in	0.5 in	650	80	$4,772,105	-$558,875	-$720,261
11.00%	2.00%	13 in	2 in	450	20	$5,248,884	-$82,096	-$243,482
11.00%	2.00%	13 in	2 in	450	40	$5,271,913	-$59,067	-$220,453
11.00%	2.00%	13 in	2 in	450	60	$5,317,511	-$13,469	-$174,855
11.00%	2.00%	13 in	2 in	450	80	$5,382,919	$51,939	-$109,447
11.00%	2.00%	13 in	2 in	500	20	$5,015,270	-$315,710	-$477,096
11.00%	2.00%	13 in	2 in	500	40	$5,027,296	-$303,684	-$465,070
11.00%	2.00%	13 in	2 in	500	60	$5,053,591	-$277,389	-$438,775
11.00%	2.00%	13 in	2 in	500	80	$5,092,565	-$238,415	-$399,801
11.00%	2.00%	13 in	2 in	550	20	$4,888,427	-$442,553	-$603,939

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	2.00%	13 in	2 in	550	40	$4,896,784	-$434,196	-$595,582
11.00%	2.00%	13 in	2 in	550	60	$4,909,954	-$421,026	-$582,412
11.00%	2.00%	13 in	2 in	550	80	$4,930,934	-$400,046	-$561,432
11.00%	2.00%	13 in	2 in	600	20	$4,816,011	-$514,969	-$676,355
11.00%	2.00%	13 in	2 in	600	40	$4,820,254	-$510,726	-$672,112
11.00%	2.00%	13 in	2 in	600	60	$4,828,266	-$502,714	-$664,100
11.00%	2.00%	13 in	2 in	600	80	$4,839,035	-$491,945	-$653,331
11.00%	2.00%	13 in	2 in	650	20	$4,772,147	-$558,833	-$720,219
11.00%	2.00%	13 in	2 in	650	40	$4,774,546	-$556,434	-$717,820
11.00%	2.00%	13 in	2 in	650	60	$4,779,023	-$551,957	-$713,343
11.00%	2.00%	13 in	2 in	650	80	$4,784,916	-$546,064	-$707,450
11.00%	2.00%	12 in	0.5 in	450	20	$5,131,030	-$199,950	-$361,336
11.00%	2.00%	12 in	0.5 in	450	40	$5,226,444	-$104,536	-$265,922
11.00%	2.00%	12 in	0.5 in	450	60	$5,371,571	$40,591	-$120,795
11.00%	2.00%	12 in	0.5 in	450	80	$5,521,950	$190,970	$29,584
11.00%	2.00%	12 in	0.5 in	500	20	$4,931,717	-$399,263	-$560,649
11.00%	2.00%	12 in	0.5 in	500	40	$4,948,696	-$382,284	-$543,670
11.00%	2.00%	12 in	0.5 in	500	60	$4,998,766	-$332,214	-$493,600
11.00%	2.00%	12 in	0.5 in	500	80	$5,088,704	-$242,276	-$403,662
11.00%	2.00%	12 in	0.5 in	550	20	$4,863,490	-$467,490	-$628,876
11.00%	2.00%	12 in	0.5 in	550	40	$4,867,238	-$463,742	-$625,128
11.00%	2.00%	12 in	0.5 in	550	60	$4,876,740	-$454,240	-$615,626
11.00%	2.00%	12 in	0.5 in	550	80	$4,900,818	-$430,162	-$591,548
11.00%	2.00%	12 in	0.5 in	600	20	$4,814,446	-$516,534	-$677,920
11.00%	2.00%	12 in	0.5 in	600	40	$4,817,161	-$513,819	-$675,205
11.00%	2.00%	12 in	0.5 in	600	60	$4,821,556	-$509,424	-$670,810
11.00%	2.00%	12 in	0.5 in	600	80	$4,828,671	-$502,309	-$663,695
11.00%	2.00%	12 in	0.5 in	650	20	$4,778,521	-$552,459	-$713,845
11.00%	2.00%	12 in	0.5 in	650	40	$4,780,127	-$550,853	-$712,239
11.00%	2.00%	12 in	0.5 in	650	60	$4,783,314	-$547,666	-$709,052
11.00%	2.00%	12 in	0.5 in	650	80	$4,787,659	-$543,321	-$704,707
11.00%	2.00%	12 in	2 in	450	20	$5,767,039	$436,059	$274,673
11.00%	2.00%	12 in	2 in	450	40	$5,788,205	$457,225	$295,839
11.00%	2.00%	12 in	2 in	450	60	$5,831,563	$500,583	$339,197
11.00%	2.00%	12 in	2 in	450	80	$5,888,200	$557,220	$395,834
11.00%	2.00%	12 in	2 in	500	20	$5,361,744	$30,764	-$130,622

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	2.00%	12 in	2 in	500	40	$5,382,067	$51,087	-$110,299
11.00%	2.00%	12 in	2 in	500	60	$5,421,104	$90,124	-$71,262
11.00%	2.00%	12 in	2 in	500	80	$5,475,387	$144,407	-$16,979
11.00%	2.00%	12 in	2 in	550	20	$5,088,559	-$242,421	-$403,807
11.00%	2.00%	12 in	2 in	550	40	$5,102,710	-$228,270	-$389,656
11.00%	2.00%	12 in	2 in	550	60	$5,128,427	-$202,553	-$363,939
11.00%	2.00%	12 in	2 in	550	80	$5,165,314	-$165,666	-$327,052
11.00%	2.00%	12 in	2 in	600	20	$4,925,501	-$405,479	-$566,865
11.00%	2.00%	12 in	2 in	600	40	$4,931,953	-$399,027	-$560,413
11.00%	2.00%	12 in	2 in	600	60	$4,946,754	-$384,226	-$545,612
11.00%	2.00%	12 in	2 in	600	80	$4,970,896	-$360,084	-$521,470
11.00%	2.00%	12 in	2 in	650	20	$4,830,738	-$500,242	-$661,628
11.00%	2.00%	12 in	2 in	650	40	$4,836,856	-$494,124	-$655,510
11.00%	2.00%	12 in	2 in	650	60	$4,846,242	-$484,738	-$646,124
11.00%	2.00%	12 in	2 in	650	80	$4,858,775	-$472,205	-$633,591
11.00%	2.00%	11 in	0.5 in	450	20	$5,960,402	$629,422	$468,036
11.00%	2.00%	11 in	0.5 in	450	40	$6,039,425	$708,445	$547,059
11.00%	2.00%	11 in	0.5 in	450	60	$6,133,746	$802,766	$641,380
11.00%	2.00%	11 in	0.5 in	450	80	$6,217,622	$886,642	$725,256
11.00%	2.00%	11 in	0.5 in	500	20	$5,315,347	-$15,633	-$177,019
11.00%	2.00%	11 in	0.5 in	500	40	$5,406,479	$75,499	-$85,887
11.00%	2.00%	11 in	0.5 in	500	60	$5,531,852	$200,872	$39,486
11.00%	2.00%	11 in	0.5 in	500	80	$5,659,642	$328,662	$167,276
11.00%	2.00%	11 in	0.5 in	550	20	$4,948,055	-$382,925	-$544,311
11.00%	2.00%	11 in	0.5 in	550	40	$4,988,343	-$342,637	-$504,023
11.00%	2.00%	11 in	0.5 in	550	60	$5,071,153	-$259,827	-$421,213
11.00%	2.00%	11 in	0.5 in	550	80	$5,179,259	-$151,721	-$313,107
11.00%	2.00%	11 in	0.5 in	600	20	$4,845,122	-$485,858	-$647,244
11.00%	2.00%	11 in	0.5 in	600	40	$4,852,010	-$478,970	-$640,356
11.00%	2.00%	11 in	0.5 in	600	60	$4,872,528	-$458,452	-$619,838
11.00%	2.00%	11 in	0.5 in	600	80	$4,914,590	-$416,390	-$577,776
11.00%	2.00%	11 in	0.5 in	650	20	$4,797,187	-$533,793	-$695,179
11.00%	2.00%	11 in	0.5 in	650	40	$4,800,015	-$530,965	-$692,351
11.00%	2.00%	11 in	0.5 in	650	60	$4,805,627	-$525,353	-$686,739
11.00%	2.00%	11 in	0.5 in	650	80	$4,816,188	-$514,792	-$676,178
11.00%	2.00%	11 in	2 in	450	20	$6,359,000	$1,028,020	$866,634

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	2.00%	11 in	2 in	450	40	$6,369,398	$1,038,418	$877,032
11.00%	2.00%	11 in	2 in	450	60	$6,390,427	$1,059,447	$898,061
11.00%	2.00%	11 in	2 in	450	80	$6,419,383	$1,088,403	$927,017
11.00%	2.00%	11 in	2 in	500	20	$5,954,393	$623,413	$462,027
11.00%	2.00%	11 in	2 in	500	40	$5,967,801	$636,821	$475,435
11.00%	2.00%	11 in	2 in	500	60	$5,996,801	$665,821	$504,435
11.00%	2.00%	11 in	2 in	500	80	$6,034,386	$703,406	$542,020
11.00%	2.00%	11 in	2 in	550	20	$5,564,499	$233,519	$72,133
11.00%	2.00%	11 in	2 in	550	40	$5,579,916	$248,936	$87,550
11.00%	2.00%	11 in	2 in	550	60	$5,611,370	$280,390	$119,004
11.00%	2.00%	11 in	2 in	550	80	$5,650,973	$319,993	$158,607
11.00%	2.00%	11 in	2 in	600	20	$5,244,981	-$85,999	-$247,385
11.00%	2.00%	11 in	2 in	600	40	$5,257,278	-$73,702	-$235,088
11.00%	2.00%	11 in	2 in	600	60	$5,282,077	-$48,903	-$210,289
11.00%	2.00%	11 in	2 in	600	80	$5,317,089	-$13,891	-$175,277
11.00%	2.00%	11 in	2 in	650	20	$5,028,525	-$302,455	-$463,841
11.00%	2.00%	11 in	2 in	650	40	$5,037,271	-$293,709	-$455,095
11.00%	2.00%	11 in	2 in	650	60	$5,054,930	-$276,050	-$437,436
11.00%	2.00%	11 in	2 in	650	80	$5,079,124	-$251,856	-$413,242
11.00%	2.00%	10 in	0.5 in	450	20	$6,649,130	$1,318,150	$1,156,764
11.00%	2.00%	10 in	0.5 in	450	40	$6,671,239	$1,340,259	$1,178,873
11.00%	2.00%	10 in	0.5 in	450	60	$6,700,103	$1,369,123	$1,207,737
11.00%	2.00%	10 in	0.5 in	450	80	$6,726,942	$1,395,962	$1,234,576
11.00%	2.00%	10 in	0.5 in	500	20	$6,220,967	$889,987	$728,601
11.00%	2.00%	10 in	0.5 in	500	40	$6,269,683	$938,703	$777,317
11.00%	2.00%	10 in	0.5 in	500	60	$6,330,888	$999,908	$838,522
11.00%	2.00%	10 in	0.5 in	500	80	$6,386,214	$1,055,234	$893,848
11.00%	2.00%	10 in	0.5 in	550	20	$5,665,023	$334,043	$172,657
11.00%	2.00%	10 in	0.5 in	550	40	$5,731,820	$400,840	$239,454
11.00%	2.00%	10 in	0.5 in	550	60	$5,825,929	$494,949	$333,563
11.00%	2.00%	10 in	0.5 in	550	80	$5,917,319	$586,339	$424,953
11.00%	2.00%	10 in	0.5 in	600	20	$5,143,758	-$187,222	-$348,608
11.00%	2.00%	10 in	0.5 in	600	40	$5,206,790	-$124,190	-$285,576
11.00%	2.00%	10 in	0.5 in	600	60	$5,301,640	-$29,340	-$190,726
11.00%	2.00%	10 in	0.5 in	600	80	$5,409,565	$78,585	-$82,801
11.00%	2.00%	10 in	0.5 in	650	20	$4,873,925	-$457,055	-$618,441

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	2.00%	10 in	0.5 in	650	40	$4,901,347	-$429,633	-$591,019
11.00%	2.00%	10 in	0.5 in	650	60	$4,955,508	-$375,472	-$536,858
11.00%	2.00%	10 in	0.5 in	650	80	$5,033,727	-$297,253	-$458,639
11.00%	2.00%	10 in	2 in	450	20	$6,797,516	$1,466,536	$1,305,150
11.00%	2.00%	10 in	2 in	450	40	$6,802,347	$1,471,367	$1,309,981
11.00%	2.00%	10 in	2 in	450	60	$6,816,113	$1,485,133	$1,323,747
11.00%	2.00%	10 in	2 in	450	80	$6,836,998	$1,506,018	$1,344,632
11.00%	2.00%	10 in	2 in	500	20	$6,524,138	$1,193,158	$1,031,772
11.00%	2.00%	10 in	2 in	500	40	$6,529,858	$1,198,878	$1,037,492
11.00%	2.00%	10 in	2 in	500	60	$6,542,181	$1,211,201	$1,049,815
11.00%	2.00%	10 in	2 in	500	80	$6,560,495	$1,229,515	$1,068,129
11.00%	2.00%	10 in	2 in	550	20	$6,196,307	$865,327	$703,941
11.00%	2.00%	10 in	2 in	550	40	$6,203,306	$872,326	$710,940
11.00%	2.00%	10 in	2 in	550	60	$6,219,506	$888,526	$727,140
11.00%	2.00%	10 in	2 in	550	80	$6,243,565	$912,585	$751,199
11.00%	2.00%	10 in	2 in	600	20	$5,841,788	$510,808	$349,422
11.00%	2.00%	10 in	2 in	600	40	$5,849,513	$518,533	$357,147
11.00%	2.00%	10 in	2 in	600	60	$5,868,039	$537,059	$375,673
11.00%	2.00%	10 in	2 in	600	80	$5,895,429	$564,449	$403,063
11.00%	2.00%	10 in	2 in	650	20	$5,509,799	$178,819	$17,433
11.00%	2.00%	10 in	2 in	650	40	$5,520,244	$189,264	$27,878
11.00%	2.00%	10 in	2 in	650	60	$5,541,252	$210,272	$48,886
11.00%	2.00%	10 in	2 in	650	80	$5,570,785	$239,805	$78,419
11.00%	5.00%	16 in	0.5 in	450	20	$5,165,597	-$165,383	-$326,769
11.00%	5.00%	16 in	0.5 in	450	40	$5,168,558	-$162,422	-$323,808
11.00%	5.00%	16 in	0.5 in	450	60	$5,173,245	-$157,735	-$319,121
11.00%	5.00%	16 in	0.5 in	450	80	$5,179,436	-$151,544	-$312,930
11.00%	5.00%	16 in	0.5 in	500	20	$5,088,287	-$242,693	-$404,079
11.00%	5.00%	16 in	0.5 in	500	40	$5,089,909	-$241,071	-$402,457
11.00%	5.00%	16 in	0.5 in	500	60	$5,093,943	-$237,037	-$398,423
11.00%	5.00%	16 in	0.5 in	500	80	$5,097,820	-$233,160	-$394,546
11.00%	5.00%	16 in	0.5 in	550	20	$5,019,574	-$311,406	-$472,792
11.00%	5.00%	16 in	0.5 in	550	40	$5,021,677	-$309,303	-$470,689
11.00%	5.00%	16 in	0.5 in	550	60	$5,024,856	-$306,124	-$467,510
11.00%	5.00%	16 in	0.5 in	550	80	$5,029,524	-$301,456	-$462,842
11.00%	5.00%	16 in	0.5 in	600	20	$4,960,801	-$370,179	-$531,565

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
11.00%	5.00%	16 in	0.5 in	600	40	$4,962,641	-$368,339	-$529,725
11.00%	5.00%	16 in	0.5 in	600	60	$4,965,156	-$365,824	-$527,210
11.00%	5.00%	16 in	0.5 in	600	80	$4,968,558	-$362,422	-$523,808
11.00%	5.00%	16 in	0.5 in	650	20	$4,911,049	-$419,931	-$581,317
11.00%	5.00%	16 in	0.5 in	650	40	$4,912,184	-$418,796	-$580,182
11.00%	5.00%	16 in	0.5 in	650	60	$4,914,511	-$416,469	-$577,855
11.00%	5.00%	16 in	0.5 in	650	80	$4,917,390	-$413,590	-$574,976
11.00%	5.00%	16 in	2 in	450	20	$5,165,884	-$165,096	-$326,482
11.00%	5.00%	16 in	2 in	450	40	$5,169,791	-$161,189	-$322,575
11.00%	5.00%	16 in	2 in	450	60	$5,175,566	-$155,414	-$316,800
11.00%	5.00%	16 in	2 in	450	80	$5,184,047	-$146,933	-$308,319
11.00%	5.00%	16 in	2 in	500	20	$5,087,823	-$243,157	-$404,543
11.00%	5.00%	16 in	2 in	500	40	$5,090,115	-$240,865	-$402,251
11.00%	5.00%	16 in	2 in	500	60	$5,094,788	-$236,192	-$397,578
11.00%	5.00%	16 in	2 in	500	80	$5,099,740	-$231,240	-$392,626
11.00%	5.00%	16 in	2 in	550	20	$5,021,034	-$309,946	-$471,332
11.00%	5.00%	16 in	2 in	550	40	$5,023,180	-$307,800	-$469,186
11.00%	5.00%	16 in	2 in	550	60	$5,025,805	-$305,175	-$466,561
11.00%	5.00%	16 in	2 in	550	80	$5,029,985	-$300,995	-$462,381
11.00%	5.00%	16 in	2 in	600	20	$4,962,081	-$368,899	-$530,285
11.00%	5.00%	16 in	2 in	600	40	$4,963,287	-$367,693	-$529,079
11.00%	5.00%	16 in	2 in	600	60	$4,965,727	-$365,253	-$526,639
11.00%	5.00%	16 in	2 in	600	80	$4,969,871	-$361,109	-$522,495
11.00%	5.00%	16 in	2 in	650	20	$4,911,732	-$419,248	-$580,634
11.00%	5.00%	16 in	2 in	650	40	$4,913,053	-$417,927	-$579,313
11.00%	5.00%	16 in	2 in	650	60	$4,915,547	-$415,433	-$576,819
11.00%	5.00%	16 in	2 in	650	80	$4,918,130	-$412,850	-$574,236
11.00%	5.00%	15 in	0.5 in	450	20	$5,203,819	-$127,161	-$288,547
11.00%	5.00%	15 in	0.5 in	450	40	$5,206,513	-$124,467	-$285,853
11.00%	5.00%	15 in	0.5 in	450	60	$5,211,660	-$119,320	-$280,706
11.00%	5.00%	15 in	0.5 in	450	80	$5,217,943	-$113,037	-$274,423
11.00%	5.00%	15 in	0.5 in	500	20	$5,122,061	-$208,919	-$370,305
11.00%	5.00%	15 in	0.5 in	500	40	$5,124,906	-$206,074	-$367,460
11.00%	5.00%	15 in	0.5 in	500	60	$5,128,662	-$202,318	-$363,704
11.00%	5.00%	15 in	0.5 in	500	80	$5,133,951	-$197,029	-$358,415
11.00%	5.00%	15 in	0.5 in	550	20	$5,050,789	-$280,191	-$441,577

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	5.00%	15 in	0.5 in	550	40	$5,052,077	-$278,903	-$440,289
11.00%	5.00%	15 in	0.5 in	550	60	$5,056,204	-$274,776	-$436,162
11.00%	5.00%	15 in	0.5 in	550	80	$5,059,908	-$271,072	-$432,458
11.00%	5.00%	15 in	0.5 in	600	20	$4,987,076	-$343,904	-$505,290
11.00%	5.00%	15 in	0.5 in	600	40	$4,989,253	-$341,727	-$503,113
11.00%	5.00%	15 in	0.5 in	600	60	$4,991,904	-$339,076	-$500,462
11.00%	5.00%	15 in	0.5 in	600	80	$4,995,711	-$335,269	-$496,655
11.00%	5.00%	15 in	0.5 in	650	20	$4,934,215	-$396,765	-$558,151
11.00%	5.00%	15 in	0.5 in	650	40	$4,935,751	-$395,229	-$556,615
11.00%	5.00%	15 in	0.5 in	650	60	$4,937,945	-$393,035	-$554,421
11.00%	5.00%	15 in	0.5 in	650	80	$4,941,244	-$389,736	-$551,122
11.00%	5.00%	15 in	2 in	450	20	$5,210,485	-$120,495	-$281,881
11.00%	5.00%	15 in	2 in	450	40	$5,215,765	-$115,215	-$276,601
11.00%	5.00%	15 in	2 in	450	60	$5,224,100	-$106,880	-$268,266
11.00%	5.00%	15 in	2 in	450	80	$5,237,938	-$93,042	-$254,428
11.00%	5.00%	15 in	2 in	500	20	$5,124,424	-$206,556	-$367,942
11.00%	5.00%	15 in	2 in	500	40	$5,126,833	-$204,147	-$365,533
11.00%	5.00%	15 in	2 in	500	60	$5,132,361	-$198,619	-$360,005
11.00%	5.00%	15 in	2 in	500	80	$5,140,112	-$190,868	-$352,254
11.00%	5.00%	15 in	2 in	550	20	$5,051,459	-$279,521	-$440,907
11.00%	5.00%	15 in	2 in	550	40	$5,053,406	-$277,574	-$438,960
11.00%	5.00%	15 in	2 in	550	60	$5,057,286	-$273,694	-$435,080
11.00%	5.00%	15 in	2 in	550	80	$5,062,166	-$268,814	-$430,200
11.00%	5.00%	15 in	2 in	600	20	$4,988,266	-$342,714	-$504,100
11.00%	5.00%	15 in	2 in	600	40	$4,990,311	-$340,669	-$502,055
11.00%	5.00%	15 in	2 in	600	60	$4,992,198	-$338,782	-$500,168
11.00%	5.00%	15 in	2 in	600	80	$4,996,064	-$334,916	-$496,302
11.00%	5.00%	15 in	2 in	650	20	$4,934,947	-$396,033	-$557,419
11.00%	5.00%	15 in	2 in	650	40	$4,936,080	-$394,900	-$556,286
11.00%	5.00%	15 in	2 in	650	60	$4,938,781	-$392,199	-$553,585
11.00%	5.00%	15 in	2 in	650	80	$4,942,111	-$388,869	-$550,255
11.00%	5.00%	14 in	0.5 in	450	20	$5,243,546	-$87,434	-$248,820
11.00%	5.00%	14 in	0.5 in	450	40	$5,247,276	-$83,704	-$245,090
11.00%	5.00%	14 in	0.5 in	450	60	$5,253,570	-$77,410	-$238,796
11.00%	5.00%	14 in	0.5 in	450	80	$5,267,016	-$63,964	-$225,350
11.00%	5.00%	14 in	0.5 in	500	20	$5,158,260	-$172,720	-$334,106

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	5.00%	14 in	0.5 in	500	40	$5,161,803	-$169,177	-$330,563
11.00%	5.00%	14 in	0.5 in	500	60	$5,166,118	-$164,862	-$326,248
11.00%	5.00%	14 in	0.5 in	500	80	$5,171,648	-$159,332	-$320,718
11.00%	5.00%	14 in	0.5 in	550	20	$5,082,707	-$248,273	-$409,659
11.00%	5.00%	14 in	0.5 in	550	40	$5,085,233	-$245,747	-$407,133
11.00%	5.00%	14 in	0.5 in	550	60	$5,087,955	-$243,025	-$404,411
11.00%	5.00%	14 in	0.5 in	550	80	$5,092,647	-$238,333	-$399,719
11.00%	5.00%	14 in	0.5 in	600	20	$5,016,097	-$314,883	-$476,269
11.00%	5.00%	14 in	0.5 in	600	40	$5,017,445	-$313,535	-$474,921
11.00%	5.00%	14 in	0.5 in	600	60	$5,020,577	-$310,403	-$471,789
11.00%	5.00%	14 in	0.5 in	600	80	$5,024,313	-$306,667	-$468,053
11.00%	5.00%	14 in	0.5 in	650	20	$4,959,071	-$371,909	-$533,295
11.00%	5.00%	14 in	0.5 in	650	40	$4,961,049	-$369,931	-$531,317
11.00%	5.00%	14 in	0.5 in	650	60	$4,963,536	-$367,444	-$528,830
11.00%	5.00%	14 in	0.5 in	650	80	$4,966,917	-$364,063	-$525,449
11.00%	5.00%	14 in	2 in	450	20	$5,288,825	-$42,155	-$203,541
11.00%	5.00%	14 in	2 in	450	40	$5,300,453	-$30,527	-$191,913
11.00%	5.00%	14 in	2 in	450	60	$5,319,496	-$11,484	-$172,870
11.00%	5.00%	14 in	2 in	450	80	$5,353,813	$22,833	-$138,553
11.00%	5.00%	14 in	2 in	500	20	$5,173,267	-$157,713	-$319,099
11.00%	5.00%	14 in	2 in	500	40	$5,178,805	-$152,175	-$313,561
11.00%	5.00%	14 in	2 in	500	60	$5,187,133	-$143,847	-$305,233
11.00%	5.00%	14 in	2 in	500	80	$5,201,508	-$129,472	-$290,858
11.00%	5.00%	14 in	2 in	550	20	$5,086,982	-$243,998	-$405,384
11.00%	5.00%	14 in	2 in	550	40	$5,089,845	-$241,135	-$402,521
11.00%	5.00%	14 in	2 in	550	60	$5,095,992	-$234,988	-$396,374
11.00%	5.00%	14 in	2 in	550	80	$5,103,656	-$227,324	-$388,710
11.00%	5.00%	14 in	2 in	600	20	$5,017,650	-$313,330	-$474,716
11.00%	5.00%	14 in	2 in	600	40	$5,019,725	-$311,255	-$472,641
11.00%	5.00%	14 in	2 in	600	60	$5,023,243	-$307,737	-$469,123
11.00%	5.00%	14 in	2 in	600	80	$5,028,075	-$302,905	-$464,291
11.00%	5.00%	14 in	2 in	650	20	$4,959,841	-$371,139	-$532,525
11.00%	5.00%	14 in	2 in	650	40	$4,961,802	-$369,178	-$530,564
11.00%	5.00%	14 in	2 in	650	60	$4,964,212	-$366,768	-$528,154
11.00%	5.00%	14 in	2 in	650	80	$4,968,288	-$362,692	-$524,078
11.00%	5.00%	13 in	0.5 in	450	20	$5,290,878	-$40,102	-$201,488

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	5.00%	13 in	0.5 in	450	40	$5,298,625	-$32,355	-$193,741
11.00%	5.00%	13 in	0.5 in	450	60	$5,323,909	-$7,071	-$168,457
11.00%	5.00%	13 in	0.5 in	450	80	$5,380,653	$49,673	-$111,713
11.00%	5.00%	13 in	0.5 in	500	20	$5,196,807	-$134,173	-$295,559
11.00%	5.00%	13 in	0.5 in	500	40	$5,200,336	-$130,644	-$292,030
11.00%	5.00%	13 in	0.5 in	500	60	$5,206,848	-$124,132	-$285,518
11.00%	5.00%	13 in	0.5 in	500	80	$5,219,632	-$111,348	-$272,734
11.00%	5.00%	13 in	0.5 in	550	20	$5,117,472	-$213,508	-$374,894
11.00%	5.00%	13 in	0.5 in	550	40	$5,120,108	-$210,872	-$372,258
11.00%	5.00%	13 in	0.5 in	550	60	$5,124,232	-$206,748	-$368,134
11.00%	5.00%	13 in	0.5 in	550	80	$5,129,287	-$201,693	-$363,079
11.00%	5.00%	13 in	0.5 in	600	20	$5,046,134	-$284,846	-$446,232
11.00%	5.00%	13 in	0.5 in	600	40	$5,048,140	-$282,840	-$444,226
11.00%	5.00%	13 in	0.5 in	600	60	$5,050,831	-$280,149	-$441,535
11.00%	5.00%	13 in	0.5 in	600	80	$5,055,229	-$275,751	-$437,137
11.00%	5.00%	13 in	0.5 in	650	20	$4,985,444	-$345,536	-$506,922
11.00%	5.00%	13 in	0.5 in	650	40	$4,987,188	-$343,792	-$505,178
11.00%	5.00%	13 in	0.5 in	650	60	$4,989,866	-$341,114	-$502,500
11.00%	5.00%	13 in	0.5 in	650	80	$4,993,420	-$337,560	-$498,946
11.00%	5.00%	13 in	2 in	450	20	$5,493,722	$162,742	$1,356
11.00%	5.00%	13 in	2 in	450	40	$5,515,274	$184,294	$22,908
11.00%	5.00%	13 in	2 in	450	60	$5,552,259	$221,279	$59,893
11.00%	5.00%	13 in	2 in	450	80	$5,599,860	$268,880	$107,494
11.00%	5.00%	13 in	2 in	500	20	$5,280,942	-$50,038	-$211,424
11.00%	5.00%	13 in	2 in	500	40	$5,290,249	-$40,731	-$202,117
11.00%	5.00%	13 in	2 in	500	60	$5,311,671	-$19,309	-$180,695
11.00%	5.00%	13 in	2 in	500	80	$5,344,178	$13,198	-$148,188
11.00%	5.00%	13 in	2 in	550	20	$5,149,191	-$181,789	-$343,175
11.00%	5.00%	13 in	2 in	550	40	$5,155,520	-$175,460	-$336,846
11.00%	5.00%	13 in	2 in	550	60	$5,165,882	-$165,098	-$326,484
11.00%	5.00%	13 in	2 in	550	80	$5,181,083	-$149,897	-$311,283
11.00%	5.00%	13 in	2 in	600	20	$5,058,938	-$272,042	-$433,428
11.00%	5.00%	13 in	2 in	600	40	$5,062,346	-$268,634	-$430,020
11.00%	5.00%	13 in	2 in	600	60	$5,067,930	-$263,050	-$424,436
11.00%	5.00%	13 in	2 in	600	80	$5,076,895	-$254,085	-$415,471
11.00%	5.00%	13 in	2 in	650	20	$4,989,607	-$341,373	-$502,759

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	5.00%	13 in	2 in	650	40	$4,992,363	-$338,617	-$500,003
11.00%	5.00%	13 in	2 in	650	60	$4,995,997	-$334,983	-$496,369
11.00%	5.00%	13 in	2 in	650	80	$5,000,923	-$330,057	-$491,443
11.00%	5.00%	12 in	0.5 in	450	20	$5,427,157	$96,177	-$65,209
11.00%	5.00%	12 in	0.5 in	450	40	$5,487,639	$156,659	-$4,727
11.00%	5.00%	12 in	0.5 in	450	60	$5,592,066	$261,086	$99,700
11.00%	5.00%	12 in	0.5 in	450	80	$5,709,578	$378,598	$217,212
11.00%	5.00%	12 in	0.5 in	500	20	$5,247,699	-$83,281	-$244,667
11.00%	5.00%	12 in	0.5 in	500	40	$5,260,086	-$70,894	-$232,280
11.00%	5.00%	12 in	0.5 in	500	60	$5,294,803	-$36,177	-$197,563
11.00%	5.00%	12 in	0.5 in	500	80	$5,358,088	$27,108	-$134,278
11.00%	5.00%	12 in	0.5 in	550	20	$5,155,479	-$175,501	-$336,887
11.00%	5.00%	12 in	0.5 in	550	40	$5,159,473	-$171,507	-$332,893
11.00%	5.00%	12 in	0.5 in	550	60	$5,166,674	-$164,306	-$325,692
11.00%	5.00%	12 in	0.5 in	550	80	$5,184,363	-$146,617	-$308,003
11.00%	5.00%	12 in	0.5 in	600	20	$5,078,976	-$252,004	-$413,390
11.00%	5.00%	12 in	0.5 in	600	40	$5,081,348	-$249,632	-$411,018
11.00%	5.00%	12 in	0.5 in	600	60	$5,085,010	-$245,970	-$407,356
11.00%	5.00%	12 in	0.5 in	600	80	$5,090,626	-$240,354	-$401,740
11.00%	5.00%	12 in	0.5 in	650	20	$5,014,308	-$316,672	-$478,058
11.00%	5.00%	12 in	0.5 in	650	40	$5,015,544	-$315,436	-$476,822
11.00%	5.00%	12 in	0.5 in	650	60	$5,018,669	-$312,311	-$473,697
11.00%	5.00%	12 in	0.5 in	650	80	$5,022,401	-$308,579	-$469,965
11.00%	5.00%	12 in	2 in	450	20	$5,911,103	$580,123	$418,737
11.00%	5.00%	12 in	2 in	450	40	$5,930,112	$599,132	$437,746
11.00%	5.00%	12 in	2 in	450	60	$5,966,137	$635,157	$473,771
11.00%	5.00%	12 in	2 in	450	80	$6,013,693	$682,713	$521,327
11.00%	5.00%	12 in	2 in	500	20	$5,564,533	$233,553	$72,167
11.00%	5.00%	12 in	2 in	500	40	$5,581,595	$250,615	$89,229
11.00%	5.00%	12 in	2 in	500	60	$5,610,935	$279,955	$118,569
11.00%	5.00%	12 in	2 in	500	80	$5,653,908	$322,928	$161,542
11.00%	5.00%	12 in	2 in	550	20	$5,314,846	-$16,134	-$177,520
11.00%	5.00%	12 in	2 in	550	40	$5,326,365	-$4,615	-$166,001
11.00%	5.00%	12 in	2 in	550	60	$5,350,580	$19,600	-$141,786
11.00%	5.00%	12 in	2 in	550	80	$5,382,364	$51,384	-$110,002
11.00%	5.00%	12 in	2 in	600	20	$5,154,555	-$176,425	-$337,811

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	5.00%	12 in	2 in	600	40	$5,160,910	-$170,070	-$331,456
11.00%	5.00%	12 in	2 in	600	60	$5,172,280	-$158,700	-$320,086
11.00%	5.00%	12 in	2 in	600	80	$5,192,429	-$138,551	-$299,937
11.00%	5.00%	12 in	2 in	650	20	$5,048,053	-$282,927	-$444,313
11.00%	5.00%	12 in	2 in	650	40	$5,052,619	-$278,361	-$439,747
11.00%	5.00%	12 in	2 in	650	60	$5,061,359	-$269,621	-$431,007
11.00%	5.00%	12 in	2 in	650	80	$5,071,243	-$259,737	-$421,123
11.00%	5.00%	11 in	0.5 in	450	20	$6,045,805	$714,825	$553,439
11.00%	5.00%	11 in	0.5 in	450	40	$6,117,035	$786,055	$624,669
11.00%	5.00%	11 in	0.5 in	450	60	$6,202,325	$871,345	$709,959
11.00%	5.00%	11 in	0.5 in	450	80	$6,278,342	$947,362	$785,976
11.00%	5.00%	11 in	0.5 in	500	20	$5,519,268	$188,288	$26,902
11.00%	5.00%	11 in	0.5 in	500	40	$5,586,433	$255,453	$94,067
11.00%	5.00%	11 in	0.5 in	500	60	$5,687,808	$356,828	$195,442
11.00%	5.00%	11 in	0.5 in	500	80	$5,792,883	$461,903	$300,517
11.00%	5.00%	11 in	0.5 in	550	20	$5,234,389	-$96,591	-$257,977
11.00%	5.00%	11 in	0.5 in	550	40	$5,260,845	-$70,135	-$231,521
11.00%	5.00%	11 in	0.5 in	550	60	$5,315,711	-$15,269	-$176,655
11.00%	5.00%	11 in	0.5 in	550	80	$5,395,520	$64,540	-$96,846
11.00%	5.00%	11 in	0.5 in	600	20	$5,119,907	-$211,073	-$372,459
11.00%	5.00%	11 in	0.5 in	600	40	$5,125,208	-$205,772	-$367,158
11.00%	5.00%	11 in	0.5 in	600	60	$5,139,738	-$191,242	-$352,628
11.00%	5.00%	11 in	0.5 in	600	80	$5,169,205	-$161,775	-$323,161
11.00%	5.00%	11 in	0.5 in	650	20	$5,046,382	-$284,598	-$445,984
11.00%	5.00%	11 in	0.5 in	650	40	$5,048,662	-$282,318	-$443,704
11.00%	5.00%	11 in	0.5 in	650	60	$5,052,846	-$278,134	-$439,520
11.00%	5.00%	11 in	0.5 in	650	80	$5,060,321	-$270,659	-$432,045
11.00%	5.00%	11 in	2 in	450	20	$6,411,437	$1,080,457	$919,071
11.00%	5.00%	11 in	2 in	450	40	$6,424,277	$1,093,297	$931,911
11.00%	5.00%	11 in	2 in	450	60	$6,448,160	$1,117,180	$955,794
11.00%	5.00%	11 in	2 in	450	80	$6,476,959	$1,145,979	$984,593
11.00%	5.00%	11 in	2 in	500	20	$6,052,034	$721,054	$559,668
11.00%	5.00%	11 in	2 in	500	40	$6,065,051	$734,071	$572,685
11.00%	5.00%	11 in	2 in	500	60	$6,091,587	$760,607	$599,221
11.00%	5.00%	11 in	2 in	500	80	$6,126,755	$795,775	$634,389
11.00%	5.00%	11 in	2 in	550	20	$5,707,728	$376,748	$215,362

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
11.00%	5.00%	11 in	2 in	550	40	$5,720,881	$389,901	$228,515
11.00%	5.00%	11 in	2 in	550	60	$5,747,198	$416,218	$254,832
11.00%	5.00%	11 in	2 in	550	80	$5,781,182	$450,202	$288,816
11.00%	5.00%	11 in	2 in	600	20	$5,423,086	$92,106	-$69,280
11.00%	5.00%	11 in	2 in	600	40	$5,435,658	$104,678	-$56,708
11.00%	5.00%	11 in	2 in	600	60	$5,456,089	$125,109	-$36,277
11.00%	5.00%	11 in	2 in	600	80	$5,482,087	$151,107	-$10,279
11.00%	5.00%	11 in	2 in	650	20	$5,217,153	-$113,827	-$275,213
11.00%	5.00%	11 in	2 in	650	40	$5,224,768	-$106,212	-$267,598
11.00%	5.00%	11 in	2 in	650	60	$5,240,572	-$90,408	-$251,794
11.00%	5.00%	11 in	2 in	650	80	$5,263,247	-$67,733	-$229,119
11.00%	5.00%	10 in	0.5 in	450	20	$6,667,210	$1,336,230	$1,174,844
11.00%	5.00%	10 in	0.5 in	450	40	$6,688,031	$1,357,051	$1,195,665
11.00%	5.00%	10 in	0.5 in	450	60	$6,715,164	$1,384,184	$1,222,798
11.00%	5.00%	10 in	0.5 in	450	80	$6,740,729	$1,409,749	$1,248,363
11.00%	5.00%	10 in	0.5 in	500	20	$6,263,784	$932,804	$771,418
11.00%	5.00%	10 in	0.5 in	500	40	$6,310,193	$979,213	$817,827
11.00%	5.00%	10 in	0.5 in	500	60	$6,367,506	$1,036,526	$875,140
11.00%	5.00%	10 in	0.5 in	500	80	$6,419,513	$1,088,533	$927,147
11.00%	5.00%	10 in	0.5 in	550	20	$5,763,397	$432,417	$271,031
11.00%	5.00%	10 in	0.5 in	550	40	$5,823,024	$492,044	$330,658
11.00%	5.00%	10 in	0.5 in	550	60	$5,907,632	$576,652	$415,266
11.00%	5.00%	10 in	0.5 in	550	80	$5,991,475	$660,495	$499,109
11.00%	5.00%	10 in	0.5 in	600	20	$5,337,264	$6,284	-$155,102
11.00%	5.00%	10 in	0.5 in	600	40	$5,380,815	$49,835	-$111,551
11.00%	5.00%	10 in	0.5 in	600	60	$5,457,302	$126,322	-$35,064
11.00%	5.00%	10 in	0.5 in	600	80	$5,545,974	$214,994	$53,608
11.00%	5.00%	10 in	0.5 in	650	20	$5,116,874	-$214,106	-$375,492
11.00%	5.00%	10 in	0.5 in	650	40	$5,135,143	-$195,837	-$357,223
11.00%	5.00%	10 in	0.5 in	650	60	$5,171,467	-$159,513	-$320,899
11.00%	5.00%	10 in	0.5 in	650	80	$5,228,304	-$102,676	-$264,062
11.00%	5.00%	10 in	2 in	450	20	$6,814,530	$1,483,550	$1,322,164
11.00%	5.00%	10 in	2 in	450	40	$6,820,007	$1,489,027	$1,327,641
11.00%	5.00%	10 in	2 in	450	60	$6,834,134	$1,503,154	$1,341,768
11.00%	5.00%	10 in	2 in	450	80	$6,855,183	$1,524,203	$1,362,817
11.00%	5.00%	10 in	2 in	500	20	$6,555,254	$1,224,274	$1,062,888

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
11.00%	5.00%	10 in	2 in	500	40	$6,561,980	$1,231,000	$1,069,614
11.00%	5.00%	10 in	2 in	500	60	$6,574,317	$1,243,337	$1,081,951
11.00%	5.00%	10 in	2 in	500	80	$6,592,962	$1,261,982	$1,100,596
11.00%	5.00%	10 in	2 in	550	20	$6,250,609	$919,629	$758,243
11.00%	5.00%	10 in	2 in	550	40	$6,258,704	$927,724	$766,338
11.00%	5.00%	10 in	2 in	550	60	$6,276,452	$945,472	$784,086
11.00%	5.00%	10 in	2 in	550	80	$6,302,449	$971,469	$810,083
11.00%	5.00%	10 in	2 in	600	20	$5,927,946	$596,966	$435,580
11.00%	5.00%	10 in	2 in	600	40	$5,935,295	$604,315	$442,929
11.00%	5.00%	10 in	2 in	600	60	$5,952,350	$621,370	$459,984
11.00%	5.00%	10 in	2 in	600	80	$5,978,507	$647,527	$486,141
11.00%	5.00%	10 in	2 in	650	20	$5,624,567	$293,587	$132,201
11.00%	5.00%	10 in	2 in	650	40	$5,634,479	$303,499	$142,113
11.00%	5.00%	10 in	2 in	650	60	$5,652,819	$321,839	$160,453
11.00%	5.00%	10 in	2 in	650	80	$5,678,076	$347,096	$185,710
6.50%	0.50%	16 in	0.5 in	450	20	$5,451,720	$120,740	-$40,646
6.50%	0.50%	16 in	0.5 in	450	40	$5,466,544	$135,564	-$25,822
6.50%	0.50%	16 in	0.5 in	450	60	$5,488,018	$157,038	-$4,348
6.50%	0.50%	16 in	0.5 in	450	80	$5,512,594	$181,614	$20,228
6.50%	0.50%	16 in	0.5 in	500	20	$5,536,734	$205,754	$44,368
6.50%	0.50%	16 in	0.5 in	500	40	$5,349,758	$18,778	-$142,608
6.50%	0.50%	16 in	0.5 in	500	60	$5,368,876	$37,896	-$123,490
6.50%	0.50%	16 in	0.5 in	500	80	$5,390,993	$60,013	-$101,373
6.50%	0.50%	16 in	0.5 in	550	20	$5,234,632	-$96,348	-$257,734
6.50%	0.50%	16 in	0.5 in	550	40	$5,245,654	-$85,326	-$246,712
6.50%	0.50%	16 in	0.5 in	550	60	$5,262,053	-$68,927	-$230,313
6.50%	0.50%	16 in	0.5 in	550	80	$5,281,585	-$49,395	-$210,781
6.50%	0.50%	16 in	0.5 in	600	20	$5,141,111	-$189,869	-$351,255
6.50%	0.50%	16 in	0.5 in	600	40	$5,151,101	-$179,879	-$341,265
6.50%	0.50%	16 in	0.5 in	600	60	$5,166,005	-$164,975	-$326,361
6.50%	0.50%	16 in	0.5 in	600	80	$5,183,340	-$147,640	-$309,026
6.50%	0.50%	16 in	0.5 in	650	20	$5,057,154	-$273,826	-$435,212
6.50%	0.50%	16 in	0.5 in	650	40	$5,066,414	-$264,566	-$425,952
6.50%	0.50%	16 in	0.5 in	650	60	$5,080,030	-$250,950	-$412,336
6.50%	0.50%	16 in	0.5 in	650	80	$5,094,794	-$236,186	-$397,572
6.50%	0.50%	16 in	2 in	450	20	$5,468,960	$137,980	-$23,406

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	0.50%	16 in	2 in	450	40	$5,480,728	$149,748	-$11,638
6.50%	0.50%	16 in	2 in	450	60	$5,500,172	$169,192	$7,806
6.50%	0.50%	16 in	2 in	450	80	$5,524,535	$193,555	$32,169
6.50%	0.50%	16 in	2 in	500	20	$5,352,818	$21,838	-$139,548
6.50%	0.50%	16 in	2 in	500	40	$5,363,203	$32,223	-$129,163
6.50%	0.50%	16 in	2 in	500	60	$5,379,834	$48,854	-$112,532
6.50%	0.50%	16 in	2 in	500	80	$5,400,326	$69,346	-$92,040
6.50%	0.50%	16 in	2 in	550	20	$5,248,857	-$82,123	-$243,509
6.50%	0.50%	16 in	2 in	550	40	$5,258,412	-$72,568	-$233,954
6.50%	0.50%	16 in	2 in	550	60	$5,273,099	-$57,881	-$219,267
6.50%	0.50%	16 in	2 in	550	80	$5,291,531	-$39,449	-$200,835
6.50%	0.50%	16 in	2 in	600	20	$5,154,362	-$176,618	-$338,004
6.50%	0.50%	16 in	2 in	600	40	$5,162,306	-$168,674	-$330,060
6.50%	0.50%	16 in	2 in	600	60	$5,175,637	-$155,343	-$316,729
6.50%	0.50%	16 in	2 in	600	80	$5,191,324	-$139,656	-$301,042
6.50%	0.50%	16 in	2 in	650	20	$5,069,528	-$261,452	-$422,838
6.50%	0.50%	16 in	2 in	650	40	$5,076,845	-$254,135	-$415,521
6.50%	0.50%	16 in	2 in	650	60	$5,088,711	-$242,269	-$403,655
6.50%	0.50%	16 in	2 in	650	80	$5,103,072	-$227,908	-$389,294
6.50%	0.50%	15 in	0.5 in	450	20	$5,507,335	$176,355	$14,969
6.50%	0.50%	15 in	0.5 in	450	40	$5,523,200	$192,220	$30,834
6.50%	0.50%	15 in	0.5 in	450	60	$5,545,535	$214,555	$53,169
6.50%	0.50%	15 in	0.5 in	450	80	$5,570,727	$239,747	$78,361
6.50%	0.50%	15 in	0.5 in	500	20	$5,388,206	$57,226	-$104,160
6.50%	0.50%	15 in	0.5 in	500	40	$5,401,599	$70,619	-$90,767
6.50%	0.50%	15 in	0.5 in	500	60	$5,421,420	$90,440	-$70,946
6.50%	0.50%	15 in	0.5 in	500	80	$5,444,004	$113,024	-$48,362
6.50%	0.50%	15 in	0.5 in	550	20	$5,281,055	-$49,925	-$211,311
6.50%	0.50%	15 in	0.5 in	550	40	$5,292,841	-$38,139	-$199,525
6.50%	0.50%	15 in	0.5 in	550	60	$5,310,845	-$20,135	-$181,521
6.50%	0.50%	15 in	0.5 in	550	80	$5,330,646	-$334	-$161,720
6.50%	0.50%	15 in	0.5 in	600	20	$5,183,602	-$147,378	-$308,764
6.50%	0.50%	15 in	0.5 in	600	40	$5,194,026	-$136,954	-$298,340
6.50%	0.50%	15 in	0.5 in	600	60	$5,209,146	-$121,834	-$283,220
6.50%	0.50%	15 in	0.5 in	600	80	$5,226,844	-$104,136	-$265,522
6.50%	0.50%	15 in	0.5 in	650	20	$5,096,596	-$234,384	-$395,770

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
6.50%	0.50%	15 in	0.5 in	650	40	$5,106,167	-$224,813	-$386,199
6.50%	0.50%	15 in	0.5 in	650	60	$5,120,334	-$210,646	-$372,032
6.50%	0.50%	15 in	0.5 in	650	80	$5,136,257	-$194,723	-$356,109
6.50%	0.50%	15 in	2 in	450	20	$5,528,273	$197,293	$35,907
6.50%	0.50%	15 in	2 in	450	40	$5,540,596	$209,616	$48,230
6.50%	0.50%	15 in	2 in	450	60	$5,561,252	$230,272	$68,886
6.50%	0.50%	15 in	2 in	450	80	$5,588,532	$257,552	$96,166
6.50%	0.50%	15 in	2 in	500	20	$5,405,171	$74,191	-$87,195
6.50%	0.50%	15 in	2 in	500	40	$5,415,868	$84,888	-$76,498
6.50%	0.50%	15 in	2 in	500	60	$5,433,639	$102,659	-$58,727
6.50%	0.50%	15 in	2 in	500	80	$5,455,633	$124,653	-$36,733
6.50%	0.50%	15 in	2 in	550	20	$5,296,549	-$34,431	-$195,817
6.50%	0.50%	15 in	2 in	550	40	$5,306,006	-$24,974	-$186,360
6.50%	0.50%	15 in	2 in	550	60	$5,321,201	-$9,779	-$171,165
6.50%	0.50%	15 in	2 in	550	80	$5,339,899	$8,919	-$152,467
6.50%	0.50%	15 in	2 in	600	20	$5,197,319	-$133,661	-$295,047
6.50%	0.50%	15 in	2 in	600	40	$5,205,900	-$125,080	-$286,466
6.50%	0.50%	15 in	2 in	600	60	$5,219,179	-$111,801	-$273,187
6.50%	0.50%	15 in	2 in	600	80	$5,236,893	-$94,087	-$255,473
6.50%	0.50%	15 in	2 in	650	20	$5,109,609	-$221,371	-$382,757
6.50%	0.50%	15 in	2 in	650	40	$5,116,769	-$214,211	-$375,597
6.50%	0.50%	15 in	2 in	650	60	$5,129,062	-$201,918	-$363,304
6.50%	0.50%	15 in	2 in	650	80	$5,143,752	-$187,228	-$348,614
6.50%	0.50%	14 in	0.5 in	450	20	$5,566,059	$235,079	$73,693
6.50%	0.50%	14 in	0.5 in	450	40	$5,581,255	$250,275	$88,889
6.50%	0.50%	14 in	0.5 in	450	60	$5,605,236	$274,256	$112,870
6.50%	0.50%	14 in	0.5 in	450	80	$5,633,524	$302,544	$141,158
6.50%	0.50%	14 in	0.5 in	500	20	$5,441,457	$110,477	-$50,909
6.50%	0.50%	14 in	0.5 in	500	40	$5,455,045	$124,065	-$37,321
6.50%	0.50%	14 in	0.5 in	500	60	$5,476,563	$145,583	-$15,803
6.50%	0.50%	14 in	0.5 in	500	80	$5,499,671	$168,691	$7,305
6.50%	0.50%	14 in	0.5 in	550	20	$5,330,052	-$928	-$162,314
6.50%	0.50%	14 in	0.5 in	550	40	$5,342,682	$11,702	-$149,684
6.50%	0.50%	14 in	0.5 in	550	60	$5,361,007	$30,027	-$131,359
6.50%	0.50%	14 in	0.5 in	550	80	$5,381,488	$50,508	-$110,878
6.50%	0.50%	14 in	0.5 in	600	20	$5,227,950	-$103,030	-$264,416

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	0.50%	14 in	0.5 in	600	40	$5,238,983	-$91,997	-$253,383
6.50%	0.50%	14 in	0.5 in	600	60	$5,255,819	-$75,161	-$236,547
6.50%	0.50%	14 in	0.5 in	600	80	$5,274,223	-$56,757	-$218,143
6.50%	0.50%	14 in	0.5 in	650	20	$5,137,836	-$193,144	-$354,530
6.50%	0.50%	14 in	0.5 in	650	40	$5,147,209	-$183,771	-$345,157
6.50%	0.50%	14 in	0.5 in	650	60	$5,161,960	-$169,020	-$330,406
6.50%	0.50%	14 in	0.5 in	650	80	$5,178,566	-$152,414	-$313,800
6.50%	0.50%	14 in	2 in	450	20	$5,602,176	$271,196	$109,810
6.50%	0.50%	14 in	2 in	450	40	$5,618,311	$287,331	$125,945
6.50%	0.50%	14 in	2 in	450	60	$5,644,696	$313,716	$152,330
6.50%	0.50%	14 in	2 in	450	80	$5,677,300	$346,320	$184,934
6.50%	0.50%	14 in	2 in	500	20	$5,463,897	$132,917	-$28,469
6.50%	0.50%	14 in	2 in	500	40	$5,475,769	$144,789	-$16,597
6.50%	0.50%	14 in	2 in	500	60	$5,495,702	$164,722	$3,336
6.50%	0.50%	14 in	2 in	500	80	$5,520,978	$189,998	$28,612
6.50%	0.50%	14 in	2 in	550	20	$5,347,305	$16,325	-$145,061
6.50%	0.50%	14 in	2 in	550	40	$5,357,681	$26,701	-$134,685
6.50%	0.50%	14 in	2 in	550	60	$5,373,704	$42,724	-$118,662
6.50%	0.50%	14 in	2 in	550	80	$5,394,329	$63,349	-$98,037
6.50%	0.50%	14 in	2 in	600	20	$5,242,665	-$88,315	-$249,701
6.50%	0.50%	14 in	2 in	600	40	$5,251,453	-$79,527	-$240,913
6.50%	0.50%	14 in	2 in	600	60	$5,265,869	-$65,111	-$226,497
6.50%	0.50%	14 in	2 in	600	80	$5,283,477	-$47,503	-$208,889
6.50%	0.50%	14 in	2 in	650	20	$5,151,388	-$179,592	-$340,978
6.50%	0.50%	14 in	2 in	650	40	$5,159,026	-$171,954	-$333,340
6.50%	0.50%	14 in	2 in	650	60	$5,171,766	-$159,214	-$320,600
6.50%	0.50%	14 in	2 in	650	80	$5,187,969	-$143,011	-$304,397
6.50%	0.50%	13 in	0.5 in	450	20	$5,629,494	$298,514	$137,128
6.50%	0.50%	13 in	0.5 in	450	40	$5,647,248	$316,268	$154,882
6.50%	0.50%	13 in	0.5 in	450	60	$5,675,165	$344,185	$182,799
6.50%	0.50%	13 in	0.5 in	450	80	$5,712,797	$381,817	$220,431
6.50%	0.50%	13 in	0.5 in	500	20	$5,497,206	$166,226	$4,840
6.50%	0.50%	13 in	0.5 in	500	40	$5,511,668	$180,688	$19,302
6.50%	0.50%	13 in	0.5 in	500	60	$5,533,778	$202,798	$41,412
6.50%	0.50%	13 in	0.5 in	500	80	$5,560,399	$229,419	$68,033
6.50%	0.50%	13 in	0.5 in	550	20	$5,380,696	$49,716	-$111,670

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
6.50%	0.50%	13 in	0.5 in	550	40	$5,392,927	$61,947	-$99,439
6.50%	0.50%	13 in	0.5 in	550	60	$5,412,867	$81,887	-$79,499
6.50%	0.50%	13 in	0.5 in	550	80	$5,434,735	$103,755	-$57,631
6.50%	0.50%	13 in	0.5 in	600	20	$5,274,630	-$56,350	-$217,736
6.50%	0.50%	13 in	0.5 in	600	40	$5,286,356	-$44,624	-$206,010
6.50%	0.50%	13 in	0.5 in	600	60	$5,303,317	-$27,663	-$189,049
6.50%	0.50%	13 in	0.5 in	600	80	$5,322,113	-$8,867	-$170,253
6.50%	0.50%	13 in	0.5 in	650	20	$5,180,154	-$150,826	-$312,212
6.50%	0.50%	13 in	0.5 in	650	40	$5,190,647	-$140,333	-$301,719
6.50%	0.50%	13 in	0.5 in	650	60	$5,205,701	-$125,279	-$286,665
6.50%	0.50%	13 in	0.5 in	650	80	$5,222,949	-$108,031	-$269,417
6.50%	0.50%	13 in	2 in	450	20	$5,736,398	$405,418	$244,032
6.50%	0.50%	13 in	2 in	450	40	$5,753,888	$422,908	$261,522
6.50%	0.50%	13 in	2 in	450	60	$5,787,421	$456,441	$295,055
6.50%	0.50%	13 in	2 in	450	80	$5,831,026	$500,046	$338,660
6.50%	0.50%	13 in	2 in	500	20	$5,552,058	$221,078	$59,692
6.50%	0.50%	13 in	2 in	500	40	$5,567,556	$236,576	$75,190
6.50%	0.50%	13 in	2 in	500	60	$5,592,856	$261,876	$100,490
6.50%	0.50%	13 in	2 in	500	80	$5,624,286	$293,306	$131,920
6.50%	0.50%	13 in	2 in	550	20	$5,412,166	$81,186	-$80,200
6.50%	0.50%	13 in	2 in	550	40	$5,423,560	$92,580	-$68,806
6.50%	0.50%	13 in	2 in	550	60	$5,443,084	$112,104	-$49,282
6.50%	0.50%	13 in	2 in	550	80	$5,468,218	$137,238	-$24,148
6.50%	0.50%	13 in	2 in	600	20	$5,295,432	-$35,548	-$196,934
6.50%	0.50%	13 in	2 in	600	40	$5,304,728	-$26,252	-$187,638
6.50%	0.50%	13 in	2 in	600	60	$5,320,666	-$10,314	-$171,700
6.50%	0.50%	13 in	2 in	600	80	$5,340,581	$9,601	-$151,785
6.50%	0.50%	13 in	2 in	650	20	$5,196,118	-$134,862	-$296,248
6.50%	0.50%	13 in	2 in	650	40	$5,204,341	-$126,639	-$288,025
6.50%	0.50%	13 in	2 in	650	60	$5,217,825	-$113,155	-$274,541
6.50%	0.50%	13 in	2 in	650	80	$5,235,278	-$95,702	-$257,088
6.50%	0.50%	12 in	0.5 in	450	20	$5,717,346	$386,366	$224,980
6.50%	0.50%	12 in	0.5 in	450	40	$5,743,902	$412,922	$251,536
6.50%	0.50%	12 in	0.5 in	450	60	$5,801,613	$470,633	$309,247
6.50%	0.50%	12 in	0.5 in	450	80	$5,883,079	$552,099	$390,713
6.50%	0.50%	12 in	0.5 in	500	20	$5,560,823	$229,843	$68,457

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	0.50%	12 in	0.5 in	500	40	$5,578,227	$247,247	$85,861
6.50%	0.50%	12 in	0.5 in	500	60	$5,605,493	$274,513	$113,127
6.50%	0.50%	12 in	0.5 in	500	80	$5,644,249	$313,269	$151,883
6.50%	0.50%	12 in	0.5 in	550	20	$5,434,983	$104,003	-$57,383
6.50%	0.50%	12 in	0.5 in	550	40	$5,448,887	$117,907	-$43,479
6.50%	0.50%	12 in	0.5 in	550	60	$5,469,539	$138,559	-$22,827
6.50%	0.50%	12 in	0.5 in	550	80	$5,494,755	$163,775	$2,389
6.50%	0.50%	12 in	0.5 in	600	20	$5,323,205	-$7,775	-$169,161
6.50%	0.50%	12 in	0.5 in	600	40	$5,335,158	$4,178	-$157,208
6.50%	0.50%	12 in	0.5 in	600	60	$5,353,035	$22,055	-$139,331
6.50%	0.50%	12 in	0.5 in	600	80	$5,373,803	$42,823	-$118,563
6.50%	0.50%	12 in	0.5 in	650	20	$5,224,567	-$106,413	-$267,799
6.50%	0.50%	12 in	0.5 in	650	40	$5,235,503	-$95,477	-$256,863
6.50%	0.50%	12 in	0.5 in	650	60	$5,251,938	-$79,042	-$240,428
6.50%	0.50%	12 in	0.5 in	650	80	$5,269,966	-$61,014	-$222,400
6.50%	0.50%	12 in	2 in	450	20	$6,011,830	$680,850	$519,464
6.50%	0.50%	12 in	2 in	450	40	$6,031,645	$700,665	$539,279
6.50%	0.50%	12 in	2 in	450	60	$6,068,161	$737,181	$575,795
6.50%	0.50%	12 in	2 in	450	80	$6,115,742	$784,762	$623,376
6.50%	0.50%	12 in	2 in	500	20	$5,734,606	$403,626	$242,240
6.50%	0.50%	12 in	2 in	500	40	$5,751,579	$420,599	$259,213
6.50%	0.50%	12 in	2 in	500	60	$5,782,654	$451,674	$290,288
6.50%	0.50%	12 in	2 in	500	80	$5,821,974	$490,994	$329,608
6.50%	0.50%	12 in	2 in	550	20	$5,533,553	$202,573	$41,187
6.50%	0.50%	12 in	2 in	550	40	$5,546,789	$215,809	$54,423
6.50%	0.50%	12 in	2 in	550	60	$5,569,933	$238,953	$77,567
6.50%	0.50%	12 in	2 in	550	80	$5,602,692	$271,712	$110,326
6.50%	0.50%	12 in	2 in	600	20	$5,379,010	$48,030	-$113,356
6.50%	0.50%	12 in	2 in	600	40	$5,391,067	$60,087	-$101,299
6.50%	0.50%	12 in	2 in	600	60	$5,410,804	$79,824	-$81,562
6.50%	0.50%	12 in	2 in	600	80	$5,435,538	$104,558	-$56,828
6.50%	0.50%	12 in	2 in	650	20	$5,258,202	-$72,778	-$234,164
6.50%	0.50%	12 in	2 in	650	40	$5,267,265	-$63,715	-$225,101
6.50%	0.50%	12 in	2 in	650	60	$5,284,033	-$46,947	-$208,333
6.50%	0.50%	12 in	2 in	650	80	$5,304,008	-$26,972	-$188,358
6.50%	0.50%	11 in	0.5 in	450	20	$6,037,720	$706,740	$545,354

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	0.50%	11 in	0.5 in	450	40	$6,113,896	$782,916	$621,530
6.50%	0.50%	11 in	0.5 in	450	60	$6,203,976	$872,996	$711,610
6.50%	0.50%	11 in	0.5 in	450	80	$6,286,453	$955,473	$794,087
6.50%	0.50%	11 in	0.5 in	500	20	$5,676,328	$345,348	$183,962
6.50%	0.50%	11 in	0.5 in	500	40	$5,716,754	$385,774	$224,388
6.50%	0.50%	11 in	0.5 in	500	60	$5,790,436	$459,456	$298,070
6.50%	0.50%	11 in	0.5 in	500	80	$5,882,585	$551,605	$390,219
6.50%	0.50%	11 in	0.5 in	550	20	$5,505,421	$174,441	$13,055
6.50%	0.50%	11 in	0.5 in	550	40	$5,523,184	$192,204	$30,818
6.50%	0.50%	11 in	0.5 in	550	60	$5,554,187	$223,207	$61,821
6.50%	0.50%	11 in	0.5 in	550	80	$5,604,227	$273,247	$111,861
6.50%	0.50%	11 in	0.5 in	600	20	$5,378,670	$47,690	-$113,696
6.50%	0.50%	11 in	0.5 in	600	40	$5,391,543	$60,563	-$100,823
6.50%	0.50%	11 in	0.5 in	600	60	$5,412,054	$81,074	-$80,312
6.50%	0.50%	11 in	0.5 in	600	80	$5,438,028	$107,048	-$54,338
6.50%	0.50%	11 in	0.5 in	650	20	$5,272,922	-$58,058	-$219,444
6.50%	0.50%	11 in	0.5 in	650	40	$5,284,354	-$46,626	-$208,012
6.50%	0.50%	11 in	0.5 in	650	60	$5,301,191	-$29,789	-$191,175
6.50%	0.50%	11 in	0.5 in	650	80	$5,321,250	-$9,730	-$171,116
6.50%	0.50%	11 in	2 in	450	20	$6,429,920	$1,098,940	$937,554
6.50%	0.50%	11 in	2 in	450	40	$6,440,923	$1,109,943	$948,557
6.50%	0.50%	11 in	2 in	450	60	$6,462,660	$1,131,680	$970,294
6.50%	0.50%	11 in	2 in	450	80	$6,493,210	$1,162,230	$1,000,844
6.50%	0.50%	11 in	2 in	500	20	$6,103,857	$772,877	$611,491
6.50%	0.50%	11 in	2 in	500	40	$6,120,349	$789,369	$627,983
6.50%	0.50%	11 in	2 in	500	60	$6,147,761	$816,781	$655,395
6.50%	0.50%	11 in	2 in	500	80	$6,183,320	$852,340	$690,954
6.50%	0.50%	11 in	2 in	550	20	$5,806,870	$475,890	$314,504
6.50%	0.50%	11 in	2 in	550	40	$5,819,981	$489,001	$327,615
6.50%	0.50%	11 in	2 in	550	60	$5,847,779	$516,799	$355,413
6.50%	0.50%	11 in	2 in	550	80	$5,882,598	$551,618	$390,232
6.50%	0.50%	11 in	2 in	600	20	$5,566,865	$235,885	$74,499
6.50%	0.50%	11 in	2 in	600	40	$5,579,807	$248,827	$87,441
6.50%	0.50%	11 in	2 in	600	60	$5,601,656	$270,676	$109,290
6.50%	0.50%	11 in	2 in	600	80	$5,632,220	$301,240	$139,854
6.50%	0.50%	11 in	2 in	650	20	$5,388,280	$57,300	-$104,086

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
6.50%	0.50%	11 in	2 in	650	40	$5,398,392	$67,412	-$93,974
6.50%	0.50%	11 in	2 in	650	60	$5,416,904	$85,924	-$75,462
6.50%	0.50%	11 in	2 in	650	80	$5,440,969	$109,989	-$51,397
6.50%	0.50%	10 in	0.5 in	450	20	$6,663,061	$1,332,081	$1,170,695
6.50%	0.50%	10 in	0.5 in	450	40	$6,684,557	$1,353,577	$1,192,191
6.50%	0.50%	10 in	0.5 in	450	60	$6,712,825	$1,381,845	$1,220,459
6.50%	0.50%	10 in	0.5 in	450	80	$6,739,763	$1,408,783	$1,247,397
6.50%	0.50%	10 in	0.5 in	500	20	$6,242,832	$911,852	$750,466
6.50%	0.50%	10 in	0.5 in	500	40	$6,291,204	$960,224	$798,838
6.50%	0.50%	10 in	0.5 in	500	60	$6,352,104	$1,021,124	$859,738
6.50%	0.50%	10 in	0.5 in	500	80	$6,408,163	$1,077,183	$915,797
6.50%	0.50%	10 in	0.5 in	550	20	$5,766,301	$435,321	$273,935
6.50%	0.50%	10 in	0.5 in	550	40	$5,826,629	$495,649	$334,263
6.50%	0.50%	10 in	0.5 in	550	60	$5,913,276	$582,296	$420,910
6.50%	0.50%	10 in	0.5 in	550	80	$6,000,417	$669,437	$508,051
6.50%	0.50%	10 in	0.5 in	600	20	$5,480,386	$149,406	-$11,980
6.50%	0.50%	10 in	0.5 in	600	40	$5,509,163	$178,183	$16,797
6.50%	0.50%	10 in	0.5 in	600	60	$5,562,690	$231,710	$70,324
6.50%	0.50%	10 in	0.5 in	600	80	$5,635,211	$304,231	$142,845
6.50%	0.50%	10 in	0.5 in	650	20	$5,337,390	$6,410	-$154,976
6.50%	0.50%	10 in	0.5 in	650	40	$5,351,659	$20,679	-$140,707
6.50%	0.50%	10 in	0.5 in	650	60	$5,375,936	$44,956	-$116,430
6.50%	0.50%	10 in	0.5 in	650	80	$5,413,002	$82,022	-$79,364
6.50%	0.50%	10 in	2 in	450	20	$6,813,586	$1,482,606	$1,321,220
6.50%	0.50%	10 in	2 in	450	40	$6,819,342	$1,488,362	$1,326,976
6.50%	0.50%	10 in	2 in	450	60	$6,834,093	$1,503,113	$1,341,727
6.50%	0.50%	10 in	2 in	450	80	$6,856,323	$1,525,343	$1,363,957
6.50%	0.50%	10 in	2 in	500	20	$6,556,011	$1,225,031	$1,063,645
6.50%	0.50%	10 in	2 in	500	40	$6,563,254	$1,232,274	$1,070,888
6.50%	0.50%	10 in	2 in	500	60	$6,577,031	$1,246,051	$1,084,665
6.50%	0.50%	10 in	2 in	500	80	$6,595,797	$1,264,817	$1,103,431
6.50%	0.50%	10 in	2 in	550	20	$6,271,322	$940,342	$778,956
6.50%	0.50%	10 in	2 in	550	40	$6,278,079	$947,099	$785,713
6.50%	0.50%	10 in	2 in	550	60	$6,294,157	$963,177	$801,791
6.50%	0.50%	10 in	2 in	550	80	$6,317,434	$986,454	$825,068
6.50%	0.50%	10 in	2 in	600	20	$5,969,010	$638,030	$476,644

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	0.50%	10 in	2 in	600	40	$5,979,647	$648,667	$487,281
6.50%	0.50%	10 in	2 in	600	60	$6,000,409	$669,429	$508,043
6.50%	0.50%	10 in	2 in	600	80	$6,028,328	$697,348	$535,962
6.50%	0.50%	10 in	2 in	650	20	$5,693,954	$362,974	$201,588
6.50%	0.50%	10 in	2 in	650	40	$5,705,346	$374,366	$212,980
6.50%	0.50%	10 in	2 in	650	60	$5,726,972	$395,992	$234,606
6.50%	0.50%	10 in	2 in	650	80	$5,755,578	$424,598	$263,212
6.50%	2.00%	16 in	0.5 in	450	20	$5,653,984	$323,004	$161,618
6.50%	2.00%	16 in	0.5 in	450	40	$5,662,271	$331,291	$169,905
6.50%	2.00%	16 in	0.5 in	450	60	$5,674,295	$343,315	$181,929
6.50%	2.00%	16 in	0.5 in	450	80	$5,690,382	$359,402	$198,016
6.50%	2.00%	16 in	0.5 in	500	20	$5,522,562	$191,582	$30,196
6.50%	2.00%	16 in	0.5 in	500	40	$5,529,718	$198,738	$37,352
6.50%	2.00%	16 in	0.5 in	500	60	$5,540,301	$209,321	$47,935
6.50%	2.00%	16 in	0.5 in	500	80	$5,553,756	$222,776	$61,390
6.50%	2.00%	16 in	0.5 in	550	20	$5,405,247	$74,267	-$87,119
6.50%	2.00%	16 in	0.5 in	550	40	$5,410,756	$79,776	-$81,610
6.50%	2.00%	16 in	0.5 in	550	60	$5,420,748	$89,768	-$71,618
6.50%	2.00%	16 in	0.5 in	550	80	$5,432,189	$101,209	-$60,177
6.50%	2.00%	16 in	0.5 in	600	20	$5,297,462	-$33,518	-$194,904
6.50%	2.00%	16 in	0.5 in	600	40	$5,302,150	-$28,830	-$190,216
6.50%	2.00%	16 in	0.5 in	600	60	$5,310,223	-$20,757	-$182,143
6.50%	2.00%	16 in	0.5 in	600	80	$5,321,522	-$9,458	-$170,844
6.50%	2.00%	16 in	0.5 in	650	20	$5,201,556	-$129,424	-$290,810
6.50%	2.00%	16 in	0.5 in	650	40	$5,206,315	-$124,665	-$286,051
6.50%	2.00%	16 in	0.5 in	650	60	$5,214,333	-$116,647	-$278,033
6.50%	2.00%	16 in	0.5 in	650	80	$5,223,092	-$107,888	-$269,274
6.50%	2.00%	16 in	2 in	450	20	$5,657,778	$326,798	$165,412
6.50%	2.00%	16 in	2 in	450	40	$5,666,052	$335,072	$173,686
6.50%	2.00%	16 in	2 in	450	60	$5,678,178	$347,198	$185,812
6.50%	2.00%	16 in	2 in	450	80	$5,694,266	$363,286	$201,900
6.50%	2.00%	16 in	2 in	500	20	$5,527,055	$196,075	$34,689
6.50%	2.00%	16 in	2 in	500	40	$5,532,415	$201,435	$40,049
6.50%	2.00%	16 in	2 in	500	60	$5,542,955	$211,975	$50,589
6.50%	2.00%	16 in	2 in	500	80	$5,557,814	$226,834	$65,448
6.50%	2.00%	16 in	2 in	550	20	$5,408,262	$77,282	-$84,104

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
6.50%	2.00%	16 in	2 in	550	40	$5,414,075	$83,095	-$78,291
6.50%	2.00%	16 in	2 in	550	60	$5,423,168	$92,188	-$69,198
6.50%	2.00%	16 in	2 in	550	80	$5,435,050	$104,070	-$57,316
6.50%	2.00%	16 in	2 in	600	20	$5,300,155	-$30,825	-$192,211
6.50%	2.00%	16 in	2 in	600	40	$5,305,768	-$25,212	-$186,598
6.50%	2.00%	16 in	2 in	600	60	$5,314,181	-$16,799	-$178,185
6.50%	2.00%	16 in	2 in	600	80	$5,324,343	-$6,637	-$168,023
6.50%	2.00%	16 in	2 in	650	20	$5,204,958	-$126,022	-$287,408
6.50%	2.00%	16 in	2 in	650	40	$5,208,995	-$121,985	-$283,371
6.50%	2.00%	16 in	2 in	650	60	$5,216,248	-$114,732	-$276,118
6.50%	2.00%	16 in	2 in	650	80	$5,225,697	-$105,283	-$266,669
6.50%	2.00%	15 in	0.5 in	450	20	$5,719,138	$388,158	$226,772
6.50%	2.00%	15 in	0.5 in	450	40	$5,726,795	$395,815	$234,429
6.50%	2.00%	15 in	0.5 in	450	60	$5,739,527	$408,547	$247,161
6.50%	2.00%	15 in	0.5 in	450	80	$5,755,292	$424,312	$262,926
6.50%	2.00%	15 in	0.5 in	500	20	$5,581,874	$250,894	$89,508
6.50%	2.00%	15 in	0.5 in	500	40	$5,588,432	$257,452	$96,066
6.50%	2.00%	15 in	0.5 in	500	60	$5,599,703	$268,723	$107,337
6.50%	2.00%	15 in	0.5 in	500	80	$5,614,189	$283,209	$121,823
6.50%	2.00%	15 in	0.5 in	550	20	$5,458,486	$127,506	-$33,880
6.50%	2.00%	15 in	0.5 in	550	40	$5,465,599	$134,619	-$26,767
6.50%	2.00%	15 in	0.5 in	550	60	$5,474,992	$144,012	-$17,374
6.50%	2.00%	15 in	0.5 in	550	80	$5,487,311	$156,331	-$5,055
6.50%	2.00%	15 in	0.5 in	600	20	$5,346,932	$15,952	-$145,434
6.50%	2.00%	15 in	0.5 in	600	40	$5,351,825	$20,845	-$140,541
6.50%	2.00%	15 in	0.5 in	600	60	$5,361,146	$30,166	-$131,220
6.50%	2.00%	15 in	0.5 in	600	80	$5,371,085	$40,105	-$121,281
6.50%	2.00%	15 in	0.5 in	650	20	$5,246,407	-$84,573	-$245,959
6.50%	2.00%	15 in	0.5 in	650	40	$5,252,056	-$78,924	-$240,310
6.50%	2.00%	15 in	0.5 in	650	60	$5,258,996	-$71,984	-$233,370
6.50%	2.00%	15 in	0.5 in	650	80	$5,269,787	-$61,193	-$222,579
6.50%	2.00%	15 in	2 in	450	20	$5,725,285	$394,305	$232,919
6.50%	2.00%	15 in	2 in	450	40	$5,732,335	$401,355	$239,969
6.50%	2.00%	15 in	2 in	450	60	$5,746,544	$415,564	$254,178
6.50%	2.00%	15 in	2 in	450	80	$5,764,187	$433,207	$271,821
6.50%	2.00%	15 in	2 in	500	20	$5,585,160	$254,180	$92,794

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	2.00%	15 in	2 in	500	40	$5,593,238	$262,258	$100,872
6.50%	2.00%	15 in	2 in	500	60	$5,603,316	$272,336	$110,950
6.50%	2.00%	15 in	2 in	500	80	$5,618,264	$287,284	$125,898
6.50%	2.00%	15 in	2 in	550	20	$5,462,431	$131,451	-$29,935
6.50%	2.00%	15 in	2 in	550	40	$5,467,286	$136,306	-$25,080
6.50%	2.00%	15 in	2 in	550	60	$5,477,709	$146,729	-$14,657
6.50%	2.00%	15 in	2 in	550	80	$5,490,884	$159,904	-$1,482
6.50%	2.00%	15 in	2 in	600	20	$5,349,681	$18,701	-$142,685
6.50%	2.00%	15 in	2 in	600	40	$5,354,882	$23,902	-$137,484
6.50%	2.00%	15 in	2 in	600	60	$5,363,705	$32,725	-$128,661
6.50%	2.00%	15 in	2 in	600	80	$5,374,349	$43,369	-$118,017
6.50%	2.00%	15 in	2 in	650	20	$5,249,760	-$81,220	-$242,606
6.50%	2.00%	15 in	2 in	650	40	$5,254,706	-$76,274	-$237,660
6.50%	2.00%	15 in	2 in	650	60	$5,261,830	-$69,150	-$230,536
6.50%	2.00%	15 in	2 in	650	80	$5,271,947	-$59,033	-$220,419
6.50%	2.00%	14 in	0.5 in	450	20	$5,786,232	$455,252	$293,866
6.50%	2.00%	14 in	0.5 in	450	40	$5,794,072	$463,092	$301,706
6.50%	2.00%	14 in	0.5 in	450	60	$5,808,864	$477,884	$316,498
6.50%	2.00%	14 in	0.5 in	450	80	$5,825,414	$494,434	$333,048
6.50%	2.00%	14 in	0.5 in	500	20	$5,643,848	$312,868	$151,482
6.50%	2.00%	14 in	0.5 in	500	40	$5,650,359	$319,379	$157,993
6.50%	2.00%	14 in	0.5 in	500	60	$5,662,225	$331,245	$169,859
6.50%	2.00%	14 in	0.5 in	500	80	$5,676,438	$345,458	$184,072
6.50%	2.00%	14 in	0.5 in	550	20	$5,514,456	$183,476	$22,090
6.50%	2.00%	14 in	0.5 in	550	40	$5,520,978	$189,998	$28,612
6.50%	2.00%	14 in	0.5 in	550	60	$5,530,905	$199,925	$38,539
6.50%	2.00%	14 in	0.5 in	550	80	$5,543,923	$212,943	$51,557
6.50%	2.00%	14 in	0.5 in	600	20	$5,397,324	$66,344	-$95,042
6.50%	2.00%	14 in	0.5 in	600	40	$5,403,407	$72,427	-$88,959
6.50%	2.00%	14 in	0.5 in	600	60	$5,413,240	$82,260	-$79,126
6.50%	2.00%	14 in	0.5 in	600	80	$5,423,610	$92,630	-$68,756
6.50%	2.00%	14 in	0.5 in	650	20	$5,294,282	-$36,698	-$198,084
6.50%	2.00%	14 in	0.5 in	650	40	$5,298,821	-$32,159	-$193,545
6.50%	2.00%	14 in	0.5 in	650	60	$5,306,336	-$24,644	-$186,030
6.50%	2.00%	14 in	0.5 in	650	80	$5,316,660	-$14,320	-$175,706
6.50%	2.00%	14 in	2 in	450	20	$5,802,582	$471,602	$310,216

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	2.00%	14 in	2 in	450	40	$5,812,226	$481,246	$319,860
6.50%	2.00%	14 in	2 in	450	60	$5,830,225	$499,245	$337,859
6.50%	2.00%	14 in	2 in	450	80	$5,852,285	$521,305	$359,919
6.50%	2.00%	14 in	2 in	500	20	$5,650,434	$319,454	$158,068
6.50%	2.00%	14 in	2 in	500	40	$5,657,750	$326,770	$165,384
6.50%	2.00%	14 in	2 in	500	60	$5,671,923	$340,943	$179,557
6.50%	2.00%	14 in	2 in	500	80	$5,687,657	$356,677	$195,291
6.50%	2.00%	14 in	2 in	550	20	$5,519,372	$188,392	$27,006
6.50%	2.00%	14 in	2 in	550	40	$5,526,493	$195,513	$34,127
6.50%	2.00%	14 in	2 in	550	60	$5,535,992	$205,012	$43,626
6.50%	2.00%	14 in	2 in	550	80	$5,550,343	$219,363	$57,977
6.50%	2.00%	14 in	2 in	600	20	$5,401,402	$70,422	-$90,964
6.50%	2.00%	14 in	2 in	600	40	$5,406,279	$75,299	-$86,087
6.50%	2.00%	14 in	2 in	600	60	$5,414,954	$83,974	-$77,412
6.50%	2.00%	14 in	2 in	600	80	$5,427,508	$96,528	-$64,858
6.50%	2.00%	14 in	2 in	650	20	$5,297,240	-$33,740	-$195,126
6.50%	2.00%	14 in	2 in	650	40	$5,301,544	-$29,436	-$190,822
6.50%	2.00%	14 in	2 in	650	60	$5,310,906	-$20,074	-$181,460
6.50%	2.00%	14 in	2 in	650	80	$5,320,281	-$10,699	-$172,085
6.50%	2.00%	13 in	0.5 in	450	20	$5,857,003	$526,023	$364,637
6.50%	2.00%	13 in	0.5 in	450	40	$5,867,239	$536,259	$374,873
6.50%	2.00%	13 in	0.5 in	450	60	$5,882,677	$551,697	$390,311
6.50%	2.00%	13 in	0.5 in	450	80	$5,909,038	$578,058	$416,672
6.50%	2.00%	13 in	0.5 in	500	20	$5,706,899	$375,919	$214,533
6.50%	2.00%	13 in	0.5 in	500	40	$5,714,250	$383,270	$221,884
6.50%	2.00%	13 in	0.5 in	500	60	$5,727,577	$396,597	$235,211
6.50%	2.00%	13 in	0.5 in	500	80	$5,742,835	$411,855	$250,469
6.50%	2.00%	13 in	0.5 in	550	20	$5,574,046	$243,066	$81,680
6.50%	2.00%	13 in	0.5 in	550	40	$5,579,803	$248,823	$87,437
6.50%	2.00%	13 in	0.5 in	550	60	$5,590,535	$259,555	$98,169
6.50%	2.00%	13 in	0.5 in	550	80	$5,604,146	$273,166	$111,780
6.50%	2.00%	13 in	0.5 in	600	20	$5,450,694	$119,714	-$41,672
6.50%	2.00%	13 in	0.5 in	600	40	$5,457,700	$126,720	-$34,666
6.50%	2.00%	13 in	0.5 in	600	60	$5,466,076	$135,096	-$26,290
6.50%	2.00%	13 in	0.5 in	600	80	$5,478,619	$147,639	-$13,747
6.50%	2.00%	13 in	0.5 in	650	20	$5,343,191	$12,211	-$149,175

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	2.00%	13 in	0.5 in	650	40	$5,348,075	$17,095	-$144,291
6.50%	2.00%	13 in	0.5 in	650	60	$5,357,062	$26,082	-$135,304
6.50%	2.00%	13 in	0.5 in	650	80	$5,367,207	$36,227	-$125,159
6.50%	2.00%	13 in	2 in	450	20	$5,924,192	$593,212	$431,826
6.50%	2.00%	13 in	2 in	450	40	$5,936,166	$605,186	$443,800
6.50%	2.00%	13 in	2 in	450	60	$5,959,717	$628,737	$467,351
6.50%	2.00%	13 in	2 in	450	80	$5,995,460	$664,480	$503,094
6.50%	2.00%	13 in	2 in	500	20	$5,737,139	$406,159	$244,773
6.50%	2.00%	13 in	2 in	500	40	$5,747,053	$416,073	$254,687
6.50%	2.00%	13 in	2 in	500	60	$5,764,078	$433,098	$271,712
6.50%	2.00%	13 in	2 in	500	80	$5,787,113	$456,133	$294,747
6.50%	2.00%	13 in	2 in	550	20	$5,587,884	$256,904	$95,518
6.50%	2.00%	13 in	2 in	550	40	$5,595,279	$264,299	$102,913
6.50%	2.00%	13 in	2 in	550	60	$5,608,538	$277,558	$116,172
6.50%	2.00%	13 in	2 in	550	80	$5,624,563	$293,583	$132,197
6.50%	2.00%	13 in	2 in	600	20	$5,457,465	$126,485	-$34,901
6.50%	2.00%	13 in	2 in	600	40	$5,464,389	$133,409	-$27,977
6.50%	2.00%	13 in	2 in	600	60	$5,474,468	$143,488	-$17,898
6.50%	2.00%	13 in	2 in	600	80	$5,487,493	$156,513	-$4,873
6.50%	2.00%	13 in	2 in	650	20	$5,347,054	$16,074	-$145,312
6.50%	2.00%	13 in	2 in	650	40	$5,352,654	$21,674	-$139,712
6.50%	2.00%	13 in	2 in	650	60	$5,361,545	$30,565	-$130,821
6.50%	2.00%	13 in	2 in	650	80	$5,372,988	$42,008	-$119,378
6.50%	2.00%	12 in	0.5 in	450	20	$5,949,198	$618,218	$456,832
6.50%	2.00%	12 in	0.5 in	450	40	$5,964,701	$633,721	$472,335
6.50%	2.00%	12 in	0.5 in	450	60	$6,003,864	$672,884	$511,498
6.50%	2.00%	12 in	0.5 in	450	80	$6,060,796	$729,816	$568,430
6.50%	2.00%	12 in	0.5 in	500	20	$5,777,261	$446,281	$284,895
6.50%	2.00%	12 in	0.5 in	500	40	$5,787,472	$456,492	$295,106
6.50%	2.00%	12 in	0.5 in	500	60	$5,803,024	$472,044	$310,658
6.50%	2.00%	12 in	0.5 in	500	80	$5,833,089	$502,109	$340,723
6.50%	2.00%	12 in	0.5 in	550	20	$5,635,598	$304,618	$143,232
6.50%	2.00%	12 in	0.5 in	550	40	$5,641,967	$310,987	$149,601
6.50%	2.00%	12 in	0.5 in	550	60	$5,654,703	$323,723	$162,337
6.50%	2.00%	12 in	0.5 in	550	80	$5,669,383	$338,403	$177,017
6.50%	2.00%	12 in	0.5 in	600	20	$5,507,539	$176,559	$15,173

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	2.00%	12 in	0.5 in	600	40	$5,513,033	$182,053	$20,667
6.50%	2.00%	12 in	0.5 in	600	60	$5,522,764	$191,784	$30,398
6.50%	2.00%	12 in	0.5 in	600	80	$5,535,464	$204,484	$43,098
6.50%	2.00%	12 in	0.5 in	650	20	$5,393,536	$62,556	-$98,830
6.50%	2.00%	12 in	0.5 in	650	40	$5,399,744	$68,764	-$92,622
6.50%	2.00%	12 in	0.5 in	650	60	$5,408,517	$77,537	-$83,849
6.50%	2.00%	12 in	0.5 in	650	80	$5,419,617	$88,637	-$72,749
6.50%	2.00%	12 in	2 in	450	20	$6,158,462	$827,482	$666,096
6.50%	2.00%	12 in	2 in	450	40	$6,174,044	$843,064	$681,678
6.50%	2.00%	12 in	2 in	450	60	$6,199,113	$868,133	$706,747
6.50%	2.00%	12 in	2 in	450	80	$6,234,299	$903,319	$741,933
6.50%	2.00%	12 in	2 in	500	20	$5,899,612	$568,632	$407,246
6.50%	2.00%	12 in	2 in	500	40	$5,910,807	$579,827	$418,441
6.50%	2.00%	12 in	2 in	500	60	$5,934,666	$603,686	$442,300
6.50%	2.00%	12 in	2 in	500	80	$5,966,886	$635,906	$474,520
6.50%	2.00%	12 in	2 in	550	20	$5,699,532	$368,552	$207,166
6.50%	2.00%	12 in	2 in	550	40	$5,708,864	$377,884	$216,498
6.50%	2.00%	12 in	2 in	550	60	$5,725,364	$394,384	$232,998
6.50%	2.00%	12 in	2 in	550	80	$5,750,092	$419,112	$257,726
6.50%	2.00%	12 in	2 in	600	20	$5,541,196	$210,216	$48,830
6.50%	2.00%	12 in	2 in	600	40	$5,548,451	$217,471	$56,085
6.50%	2.00%	12 in	2 in	600	60	$5,562,308	$231,328	$69,942
6.50%	2.00%	12 in	2 in	600	80	$5,578,436	$247,456	$86,070
6.50%	2.00%	12 in	2 in	650	20	$5,412,011	$81,031	-$80,355
6.50%	2.00%	12 in	2 in	650	40	$5,417,843	$86,863	-$74,523
6.50%	2.00%	12 in	2 in	650	60	$5,427,255	$96,275	-$65,111
6.50%	2.00%	12 in	2 in	650	80	$5,442,023	$111,043	-$50,343
6.50%	2.00%	11 in	0.5 in	450	20	$6,191,205	$860,225	$698,839
6.50%	2.00%	11 in	0.5 in	450	40	$6,242,975	$911,995	$750,609
6.50%	2.00%	11 in	0.5 in	450	60	$6,313,541	$982,561	$821,175
6.50%	2.00%	11 in	0.5 in	450	80	$6,377,493	$1,046,513	$885,127
6.50%	2.00%	11 in	0.5 in	500	20	$5,889,539	$558,559	$397,173
6.50%	2.00%	11 in	0.5 in	500	40	$5,915,132	$584,152	$422,766
6.50%	2.00%	11 in	0.5 in	500	60	$5,964,048	$633,068	$471,682
6.50%	2.00%	11 in	0.5 in	500	80	$6,030,551	$699,571	$538,185
6.50%	2.00%	11 in	0.5 in	550	20	$5,709,811	$378,831	$217,445

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
6.50%	2.00%	11 in	0.5 in	550	40	$5,720,997	$390,017	$228,631
6.50%	2.00%	11 in	0.5 in	550	60	$5,741,108	$410,128	$248,742
6.50%	2.00%	11 in	0.5 in	550	80	$5,779,412	$448,432	$287,046
6.50%	2.00%	11 in	0.5 in	600	20	$5,569,044	$238,064	$76,678
6.50%	2.00%	11 in	0.5 in	600	40	$5,576,351	$245,371	$83,985
6.50%	2.00%	11 in	0.5 in	600	60	$5,588,024	$257,044	$95,658
6.50%	2.00%	11 in	0.5 in	600	80	$5,604,690	$273,710	$112,324
6.50%	2.00%	11 in	0.5 in	650	20	$5,449,002	$118,022	-$43,364
6.50%	2.00%	11 in	0.5 in	650	40	$5,454,794	$123,814	-$37,572
6.50%	2.00%	11 in	0.5 in	650	60	$5,463,896	$132,916	-$28,470
6.50%	2.00%	11 in	0.5 in	650	80	$5,476,693	$145,713	-$15,673
6.50%	2.00%	11 in	2 in	450	20	$6,499,632	$1,168,652	$1,007,266
6.50%	2.00%	11 in	2 in	450	40	$6,510,537	$1,179,557	$1,018,171
6.50%	2.00%	11 in	2 in	450	60	$6,531,406	$1,200,426	$1,039,040
6.50%	2.00%	11 in	2 in	450	80	$6,559,409	$1,228,429	$1,067,043
6.50%	2.00%	11 in	2 in	500	20	$6,209,857	$878,877	$717,491
6.50%	2.00%	11 in	2 in	500	40	$6,221,856	$890,876	$729,490
6.50%	2.00%	11 in	2 in	500	60	$6,243,646	$912,666	$751,280
6.50%	2.00%	11 in	2 in	500	80	$6,272,888	$941,908	$780,522
6.50%	2.00%	11 in	2 in	550	20	$5,938,593	$607,613	$446,227
6.50%	2.00%	11 in	2 in	550	40	$5,949,271	$618,291	$456,905
6.50%	2.00%	11 in	2 in	550	60	$5,970,574	$639,594	$478,208
6.50%	2.00%	11 in	2 in	550	80	$5,996,636	$665,656	$504,270
6.50%	2.00%	11 in	2 in	600	20	$5,707,546	$376,566	$215,180
6.50%	2.00%	11 in	2 in	600	40	$5,717,532	$386,552	$225,166
6.50%	2.00%	11 in	2 in	600	60	$5,734,494	$403,514	$242,128
6.50%	2.00%	11 in	2 in	600	80	$5,759,769	$428,789	$267,403
6.50%	2.00%	11 in	2 in	650	20	$5,529,708	$198,728	$37,342
6.50%	2.00%	11 in	2 in	650	40	$5,537,129	$206,149	$44,763
6.50%	2.00%	11 in	2 in	650	60	$5,550,403	$219,423	$58,037
6.50%	2.00%	11 in	2 in	650	80	$5,568,154	$237,174	$75,788
6.50%	2.00%	10 in	0.5 in	450	20	$6,688,457	$1,357,477	$1,196,091
6.50%	2.00%	10 in	0.5 in	450	40	$6,708,489	$1,377,509	$1,216,123
6.50%	2.00%	10 in	0.5 in	450	60	$6,735,510	$1,404,530	$1,243,144
6.50%	2.00%	10 in	0.5 in	450	80	$6,762,122	$1,431,142	$1,269,756
6.50%	2.00%	10 in	0.5 in	500	20	$6,310,107	$979,127	$817,741

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	2.00%	10 in	0.5 in	500	40	$6,352,679	$1,021,699	$860,313
6.50%	2.00%	10 in	0.5 in	500	60	$6,406,817	$1,075,837	$914,451
6.50%	2.00%	10 in	0.5 in	500	80	$6,457,897	$1,126,917	$965,531
6.50%	2.00%	10 in	0.5 in	550	20	$5,916,879	$585,899	$424,513
6.50%	2.00%	10 in	0.5 in	550	40	$5,958,903	$627,923	$466,537
6.50%	2.00%	10 in	0.5 in	550	60	$6,025,132	$694,152	$532,766
6.50%	2.00%	10 in	0.5 in	550	80	$6,096,163	$765,183	$603,797
6.50%	2.00%	10 in	0.5 in	600	20	$5,667,647	$336,667	$175,281
6.50%	2.00%	10 in	0.5 in	600	40	$5,687,252	$356,272	$194,886
6.50%	2.00%	10 in	0.5 in	600	60	$5,723,117	$392,137	$230,751
6.50%	2.00%	10 in	0.5 in	600	80	$5,776,379	$445,399	$284,013
6.50%	2.00%	10 in	0.5 in	650	20	$5,518,499	$187,519	$26,133
6.50%	2.00%	10 in	0.5 in	650	40	$5,525,109	$194,129	$32,743
6.50%	2.00%	10 in	0.5 in	650	60	$5,541,544	$210,564	$49,178
6.50%	2.00%	10 in	0.5 in	650	80	$5,568,524	$237,544	$76,158
6.50%	2.00%	10 in	2 in	450	20	$6,837,833	$1,506,853	$1,345,467
6.50%	2.00%	10 in	2 in	450	40	$6,844,859	$1,513,879	$1,352,493
6.50%	2.00%	10 in	2 in	450	60	$6,859,699	$1,528,719	$1,367,333
6.50%	2.00%	10 in	2 in	450	80	$6,882,409	$1,551,429	$1,390,043
6.50%	2.00%	10 in	2 in	500	20	$6,595,116	$1,264,136	$1,102,750
6.50%	2.00%	10 in	2 in	500	40	$6,603,903	$1,272,923	$1,111,537
6.50%	2.00%	10 in	2 in	500	60	$6,618,921	$1,287,941	$1,126,555
6.50%	2.00%	10 in	2 in	500	80	$6,637,844	$1,306,864	$1,145,478
6.50%	2.00%	10 in	2 in	550	20	$6,332,053	$1,001,073	$839,687
6.50%	2.00%	10 in	2 in	550	40	$6,339,173	$1,008,193	$846,807
6.50%	2.00%	10 in	2 in	550	60	$6,353,510	$1,022,530	$861,144
6.50%	2.00%	10 in	2 in	550	80	$6,375,738	$1,044,758	$883,372
6.50%	2.00%	10 in	2 in	600	20	$6,055,689	$724,709	$563,323
6.50%	2.00%	10 in	2 in	600	40	$6,062,987	$732,007	$570,621
6.50%	2.00%	10 in	2 in	600	60	$6,079,297	$748,317	$586,931
6.50%	2.00%	10 in	2 in	600	80	$6,104,226	$773,246	$611,860
6.50%	2.00%	10 in	2 in	650	20	$5,802,806	$471,826	$310,440
6.50%	2.00%	10 in	2 in	650	40	$5,810,800	$479,820	$318,434
6.50%	2.00%	10 in	2 in	650	60	$5,827,752	$496,772	$335,386
6.50%	2.00%	10 in	2 in	650	80	$5,849,091	$518,111	$356,725
6.50%	5.00%	16 in	0.5 in	450	20	$6,014,113	$683,133	$521,747

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	5.00%	16 in	0.5 in	450	40	$6,018,052	$687,072	$525,686
6.50%	5.00%	16 in	0.5 in	450	60	$6,023,635	$692,655	$531,269
6.50%	5.00%	16 in	0.5 in	450	80	$6,031,714	$700,734	$539,348
6.50%	5.00%	16 in	0.5 in	500	20	$5,874,725	$543,745	$382,359
6.50%	5.00%	16 in	0.5 in	500	40	$5,878,711	$547,731	$386,345
6.50%	5.00%	16 in	0.5 in	500	60	$5,883,942	$552,962	$391,576
6.50%	5.00%	16 in	0.5 in	500	80	$5,892,251	$561,271	$399,885
6.50%	5.00%	16 in	0.5 in	550	20	$5,742,574	$411,594	$250,208
6.50%	5.00%	16 in	0.5 in	550	40	$5,746,701	$415,721	$254,335
6.50%	5.00%	16 in	0.5 in	550	60	$5,752,173	$421,193	$259,807
6.50%	5.00%	16 in	0.5 in	550	80	$5,759,022	$428,042	$266,656
6.50%	5.00%	16 in	0.5 in	600	20	$5,616,273	$285,293	$123,907
6.50%	5.00%	16 in	0.5 in	600	40	$5,620,335	$289,355	$127,969
6.50%	5.00%	16 in	0.5 in	600	60	$5,625,391	$294,411	$133,025
6.50%	5.00%	16 in	0.5 in	600	80	$5,497,535	$166,555	$5,169
6.50%	5.00%	16 in	0.5 in	650	20	$5,497,535	$166,555	$5,169
6.50%	5.00%	16 in	0.5 in	650	40	$5,501,443	$170,463	$9,077
6.50%	5.00%	16 in	0.5 in	650	60	$5,507,238	$176,258	$14,872
6.50%	5.00%	16 in	0.5 in	650	80	$5,513,578	$182,598	$21,212
6.50%	5.00%	16 in	2 in	450	20	$6,014,076	$683,096	$521,710
6.50%	5.00%	16 in	2 in	450	40	$6,018,030	$687,050	$525,664
6.50%	5.00%	16 in	2 in	450	60	$6,023,029	$692,049	$530,663
6.50%	5.00%	16 in	2 in	450	80	$6,031,227	$700,247	$538,861
6.50%	5.00%	16 in	2 in	500	20	$5,874,191	$543,211	$381,825
6.50%	5.00%	16 in	2 in	500	40	$5,879,056	$548,076	$386,690
6.50%	5.00%	16 in	2 in	500	60	$5,883,360	$552,380	$390,994
6.50%	5.00%	16 in	2 in	500	80	$5,892,210	$561,230	$399,844
6.50%	5.00%	16 in	2 in	550	20	$5,742,436	$411,456	$250,070
6.50%	5.00%	16 in	2 in	550	40	$5,745,953	$414,973	$253,587
6.50%	5.00%	16 in	2 in	550	60	$5,752,762	$421,782	$260,396
6.50%	5.00%	16 in	2 in	550	80	$5,759,572	$428,592	$267,206
6.50%	5.00%	16 in	2 in	600	20	$5,614,610	$283,630	$122,244
6.50%	5.00%	16 in	2 in	600	40	$5,618,127	$287,147	$125,761
6.50%	5.00%	16 in	2 in	600	60	$5,624,435	$293,455	$132,069
6.50%	5.00%	16 in	2 in	600	80	$5,631,789	$300,809	$139,423
6.50%	5.00%	16 in	2 in	650	20	$5,497,775	$166,795	$5,409

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	5.00%	16 in	2 in	650	40	$5,502,138	$171,158	$9,772
6.50%	5.00%	16 in	2 in	650	60	$5,506,123	$175,143	$13,757
6.50%	5.00%	16 in	2 in	650	80	$5,513,255	$182,275	$20,889
6.50%	5.00%	15 in	0.5 in	450	20	$6,077,708	$746,728	$585,342
6.50%	5.00%	15 in	0.5 in	450	40	$6,081,521	$750,541	$589,155
6.50%	5.00%	15 in	0.5 in	450	60	$6,087,831	$756,851	$595,465
6.50%	5.00%	15 in	0.5 in	450	80	$6,094,623	$763,643	$602,257
6.50%	5.00%	15 in	0.5 in	500	20	$5,938,662	$607,682	$446,296
6.50%	5.00%	15 in	0.5 in	500	40	$5,943,063	$612,083	$450,697
6.50%	5.00%	15 in	0.5 in	500	60	$5,948,034	$617,054	$455,668
6.50%	5.00%	15 in	0.5 in	500	80	$5,955,560	$624,580	$463,194
6.50%	5.00%	15 in	0.5 in	550	20	$5,803,144	$472,164	$310,778
6.50%	5.00%	15 in	0.5 in	550	40	$5,807,436	$476,456	$315,070
6.50%	5.00%	15 in	0.5 in	550	60	$5,813,498	$482,518	$321,132
6.50%	5.00%	15 in	0.5 in	550	80	$5,820,953	$489,973	$328,587
6.50%	5.00%	15 in	0.5 in	600	20	$5,674,896	$343,916	$182,530
6.50%	5.00%	15 in	0.5 in	600	40	$5,679,654	$348,674	$187,288
6.50%	5.00%	15 in	0.5 in	600	60	$5,684,802	$353,822	$192,436
6.50%	5.00%	15 in	0.5 in	600	80	$5,691,021	$360,041	$198,655
6.50%	5.00%	15 in	0.5 in	650	20	$5,554,228	$223,248	$61,862
6.50%	5.00%	15 in	0.5 in	650	40	$5,558,225	$227,245	$65,859
6.50%	5.00%	15 in	0.5 in	650	60	$5,562,507	$231,527	$70,141
6.50%	5.00%	15 in	0.5 in	650	80	$5,570,527	$239,547	$78,161
6.50%	5.00%	15 in	2 in	450	20	$6,079,541	$748,561	$587,175
6.50%	5.00%	15 in	2 in	450	40	$6,083,618	$752,638	$591,252
6.50%	5.00%	15 in	2 in	450	60	$6,090,616	$759,636	$598,250
6.50%	5.00%	15 in	2 in	450	80	$6,098,485	$767,505	$606,119
6.50%	5.00%	15 in	2 in	500	20	$5,937,236	$606,256	$444,870
6.50%	5.00%	15 in	2 in	500	40	$5,940,660	$609,680	$448,294
6.50%	5.00%	15 in	2 in	500	60	$5,948,088	$617,108	$455,722
6.50%	5.00%	15 in	2 in	500	80	$5,956,378	$625,398	$464,012
6.50%	5.00%	15 in	2 in	550	20	$5,803,190	$472,210	$310,824
6.50%	5.00%	15 in	2 in	550	40	$5,808,231	$477,251	$315,865
6.50%	5.00%	15 in	2 in	550	60	$5,812,087	$481,107	$319,721
6.50%	5.00%	15 in	2 in	550	80	$5,819,817	$488,837	$327,451
6.50%	5.00%	15 in	2 in	600	20	$5,673,810	$342,830	$181,444

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		**$5,330,980**	**$5,492,366**
6.50%	5.00%	15 in	2 in	600	40	$5,677,382	$346,402	$185,016
6.50%	5.00%	15 in	2 in	600	60	$5,683,792	$352,812	$191,426
6.50%	5.00%	15 in	2 in	600	80	$5,689,963	$358,983	$197,597
6.50%	5.00%	15 in	2 in	650	20	$5,554,364	$223,384	$61,998
6.50%	5.00%	15 in	2 in	650	40	$5,556,437	$225,457	$64,071
6.50%	5.00%	15 in	2 in	650	60	$5,562,967	$231,987	$70,601
6.50%	5.00%	15 in	2 in	650	80	$5,569,417	$238,437	$77,051
6.50%	5.00%	14 in	0.5 in	450	20	$6,141,477	$810,497	$649,111
6.50%	5.00%	14 in	0.5 in	450	40	$6,146,064	$815,084	$653,698
6.50%	5.00%	14 in	0.5 in	450	60	$6,152,503	$821,523	$660,137
6.50%	5.00%	14 in	0.5 in	450	80	$6,159,223	$828,243	$666,857
6.50%	5.00%	14 in	0.5 in	500	20	$6,002,416	$671,436	$510,050
6.50%	5.00%	14 in	0.5 in	500	40	$6,005,520	$674,540	$513,154
6.50%	5.00%	14 in	0.5 in	500	60	$6,011,365	$680,385	$518,999
6.50%	5.00%	14 in	0.5 in	500	80	$6,018,541	$687,561	$526,175
6.50%	5.00%	14 in	0.5 in	550	20	$5,866,188	$535,208	$373,822
6.50%	5.00%	14 in	0.5 in	550	40	$5,870,539	$539,559	$378,173
6.50%	5.00%	14 in	0.5 in	550	60	$5,875,346	$544,366	$382,980
6.50%	5.00%	14 in	0.5 in	550	80	$5,883,181	$552,201	$390,815
6.50%	5.00%	14 in	0.5 in	600	20	$5,734,251	$403,271	$241,885
6.50%	5.00%	14 in	0.5 in	600	40	$5,738,013	$407,033	$245,647
6.50%	5.00%	14 in	0.5 in	600	60	$5,743,765	$412,785	$251,399
6.50%	5.00%	14 in	0.5 in	600	80	$5,751,373	$420,393	$259,007
6.50%	5.00%	14 in	0.5 in	650	20	$5,611,988	$281,008	$119,622
6.50%	5.00%	14 in	0.5 in	650	40	$5,616,082	$285,102	$123,716
6.50%	5.00%	14 in	0.5 in	650	60	$5,621,074	$290,094	$128,708
6.50%	5.00%	14 in	0.5 in	650	80	$5,627,714	$296,734	$135,348
6.50%	5.00%	14 in	2 in	450	20	$6,153,299	$822,319	$660,933
6.50%	5.00%	14 in	2 in	450	40	$6,157,615	$826,635	$665,249
6.50%	5.00%	14 in	2 in	450	60	$6,165,398	$834,418	$673,032
6.50%	5.00%	14 in	2 in	450	80	$6,175,770	$844,790	$683,404
6.50%	5.00%	14 in	2 in	500	20	$6,004,598	$673,618	$512,232
6.50%	5.00%	14 in	2 in	500	40	$6,008,625	$677,645	$516,259
6.50%	5.00%	14 in	2 in	500	60	$6,015,697	$684,717	$523,331
6.50%	5.00%	14 in	2 in	500	80	$6,023,516	$692,536	$531,150
6.50%	5.00%	14 in	2 in	550	20	$5,866,102	$535,122	$373,736

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	5.00%	14 in	2 in	550	40	$5,870,759	$539,779	$378,393
6.50%	5.00%	14 in	2 in	550	60	$5,876,820	$545,840	$384,454
6.50%	5.00%	14 in	2 in	550	80	$5,884,516	$553,536	$392,150
6.50%	5.00%	14 in	2 in	600	20	$5,733,922	$402,942	$241,556
6.50%	5.00%	14 in	2 in	600	40	$5,738,507	$407,527	$246,141
6.50%	5.00%	14 in	2 in	600	60	$5,743,640	$412,660	$251,274
6.50%	5.00%	14 in	2 in	600	80	$5,751,364	$420,384	$258,998
6.50%	5.00%	14 in	2 in	650	20	$5,610,610	$279,630	$118,244
6.50%	5.00%	14 in	2 in	650	40	$5,613,850	$282,870	$121,484
6.50%	5.00%	14 in	2 in	650	60	$5,621,311	$290,331	$128,945
6.50%	5.00%	14 in	2 in	650	80	$5,627,091	$296,111	$134,725
6.50%	5.00%	13 in	0.5 in	450	20	$6,207,815	$876,835	$715,449
6.50%	5.00%	13 in	0.5 in	450	40	$6,211,466	$880,486	$719,100
6.50%	5.00%	13 in	0.5 in	450	60	$6,220,188	$889,208	$727,822
6.50%	5.00%	13 in	0.5 in	450	80	$6,236,061	$905,081	$743,695
6.50%	5.00%	13 in	0.5 in	500	20	$6,065,425	$734,445	$573,059
6.50%	5.00%	13 in	0.5 in	500	40	$6,068,065	$737,085	$575,699
6.50%	5.00%	13 in	0.5 in	500	60	$6,075,292	$744,312	$582,926
6.50%	5.00%	13 in	0.5 in	500	80	$6,082,925	$751,945	$590,559
6.50%	5.00%	13 in	0.5 in	550	20	$5,929,083	$598,103	$436,717
6.50%	5.00%	13 in	0.5 in	550	40	$5,932,759	$601,779	$440,393
6.50%	5.00%	13 in	0.5 in	550	60	$5,938,978	$607,998	$446,612
6.50%	5.00%	13 in	0.5 in	550	80	$5,946,005	$615,025	$453,639
6.50%	5.00%	13 in	0.5 in	600	20	$5,794,899	$463,919	$302,533
6.50%	5.00%	13 in	0.5 in	600	40	$5,799,605	$468,625	$307,239
6.50%	5.00%	13 in	0.5 in	600	60	$5,804,530	$473,550	$312,164
6.50%	5.00%	13 in	0.5 in	600	80	$5,812,339	$481,359	$319,973
6.50%	5.00%	13 in	0.5 in	650	20	$5,671,346	$340,366	$178,980
6.50%	5.00%	13 in	0.5 in	650	40	$5,675,023	$344,043	$182,657
6.50%	5.00%	13 in	0.5 in	650	60	$5,680,783	$349,803	$188,417
6.50%	5.00%	13 in	0.5 in	650	80	$5,686,864	$355,884	$194,498
6.50%	5.00%	13 in	2 in	450	20	$6,253,773	$922,793	$761,407
6.50%	5.00%	13 in	2 in	450	40	$6,260,667	$929,687	$768,301
6.50%	5.00%	13 in	2 in	450	60	$6,272,246	$941,266	$779,880
6.50%	5.00%	13 in	2 in	450	80	$6,292,804	$961,824	$800,438
6.50%	5.00%	13 in	2 in	500	20	$6,086,725	$755,745	$594,359

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
6.50%	5.00%	13 in	2 in	500	40	$6,090,324	$759,344	$597,958
6.50%	5.00%	13 in	2 in	500	60	$6,098,204	$767,224	$605,838
6.50%	5.00%	13 in	2 in	500	80	$6,111,188	$780,208	$618,822
6.50%	5.00%	13 in	2 in	550	20	$5,934,718	$603,738	$442,352
6.50%	5.00%	13 in	2 in	550	40	$5,939,465	$608,485	$447,099
6.50%	5.00%	13 in	2 in	550	60	$5,947,474	$616,494	$455,108
6.50%	5.00%	13 in	2 in	550	80	$5,956,320	$625,340	$463,954
6.50%	5.00%	13 in	2 in	600	20	$5,798,244	$467,264	$305,878
6.50%	5.00%	13 in	2 in	600	40	$5,801,984	$471,004	$309,618
6.50%	5.00%	13 in	2 in	600	60	$5,808,165	$477,185	$315,799
6.50%	5.00%	13 in	2 in	600	80	$5,815,088	$484,108	$322,722
6.50%	5.00%	13 in	2 in	650	20	$5,670,749	$339,769	$178,383
6.50%	5.00%	13 in	2 in	650	40	$5,674,832	$343,852	$182,466
6.50%	5.00%	13 in	2 in	650	60	$5,680,686	$349,706	$188,320
6.50%	5.00%	13 in	2 in	650	80	$5,688,012	$357,032	$195,646
6.50%	5.00%	12 in	0.5 in	450	20	$6,285,265	$954,285	$792,899
6.50%	5.00%	12 in	0.5 in	450	40	$6,299,116	$968,136	$806,750
6.50%	5.00%	12 in	0.5 in	450	60	$6,322,509	$991,529	$830,143
6.50%	5.00%	12 in	0.5 in	450	80	$6,355,641	$1,024,661	$863,275
6.50%	5.00%	12 in	0.5 in	500	20	$6,133,150	$802,170	$640,784
6.50%	5.00%	12 in	0.5 in	500	40	$6,138,555	$807,575	$646,189
6.50%	5.00%	12 in	0.5 in	500	60	$6,147,348	$816,368	$654,982
6.50%	5.00%	12 in	0.5 in	500	80	$6,165,986	$835,006	$673,620
6.50%	5.00%	12 in	0.5 in	550	20	$5,993,273	$662,293	$500,907
6.50%	5.00%	12 in	0.5 in	550	40	$5,996,530	$665,550	$504,164
6.50%	5.00%	12 in	0.5 in	550	60	$6,002,969	$671,989	$510,603
6.50%	5.00%	12 in	0.5 in	550	80	$6,011,200	$680,220	$518,834
6.50%	5.00%	12 in	0.5 in	600	20	$5,857,184	$526,204	$364,818
6.50%	5.00%	12 in	0.5 in	600	40	$5,860,922	$529,942	$368,556
6.50%	5.00%	12 in	0.5 in	600	60	$5,866,886	$535,906	$374,520
6.50%	5.00%	12 in	0.5 in	600	80	$5,873,533	$542,553	$381,167
6.50%	5.00%	12 in	0.5 in	650	20	$5,730,104	$399,124	$237,738
6.50%	5.00%	12 in	0.5 in	650	40	$5,733,738	$402,758	$241,372
6.50%	5.00%	12 in	0.5 in	650	60	$5,739,805	$408,825	$247,439
6.50%	5.00%	12 in	0.5 in	650	80	$5,747,025	$416,045	$254,659
6.50%	5.00%	12 in	2 in	450	20	$6,426,746	$1,095,766	$934,380

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	5.00%	12 in	2 in	450	40	$6,434,400	$1,103,420	$942,034
6.50%	5.00%	12 in	2 in	450	60	$6,450,919	$1,119,939	$958,553
6.50%	5.00%	12 in	2 in	450	80	$6,470,990	$1,140,010	$978,624
6.50%	5.00%	12 in	2 in	500	20	$6,216,648	$885,668	$724,282
6.50%	5.00%	12 in	2 in	500	40	$6,222,452	$891,472	$730,086
6.50%	5.00%	12 in	2 in	500	60	$6,236,130	$905,150	$743,764
6.50%	5.00%	12 in	2 in	500	80	$6,257,017	$926,037	$764,651
6.50%	5.00%	12 in	2 in	550	20	$6,035,467	$704,487	$543,101
6.50%	5.00%	12 in	2 in	550	40	$6,039,179	$708,199	$546,813
6.50%	5.00%	12 in	2 in	550	60	$6,048,472	$717,492	$556,106
6.50%	5.00%	12 in	2 in	550	80	$6,063,622	$732,642	$571,256
6.50%	5.00%	12 in	2 in	600	20	$5,878,101	$547,121	$385,735
6.50%	5.00%	12 in	2 in	600	40	$5,881,217	$550,237	$388,851
6.50%	5.00%	12 in	2 in	600	60	$5,890,127	$559,147	$397,761
6.50%	5.00%	12 in	2 in	600	80	$5,899,399	$568,419	$407,033
6.50%	5.00%	12 in	2 in	650	20	$5,739,306	$408,326	$246,940
6.50%	5.00%	12 in	2 in	650	40	$5,744,586	$413,606	$252,220
6.50%	5.00%	12 in	2 in	650	60	$5,750,040	$419,060	$257,674
6.50%	5.00%	12 in	2 in	650	80	$5,759,034	$428,054	$266,668
6.50%	5.00%	11 in	0.5 in	450	20	$6,477,293	$1,146,313	$984,927
6.50%	5.00%	11 in	0.5 in	450	40	$6,503,535	$1,172,555	$1,011,169
6.50%	5.00%	11 in	0.5 in	450	60	$6,541,563	$1,210,583	$1,049,197
6.50%	5.00%	11 in	0.5 in	450	80	$6,583,176	$1,252,196	$1,090,810
6.50%	5.00%	11 in	0.5 in	500	20	$6,234,340	$903,360	$741,974
6.50%	5.00%	11 in	0.5 in	500	40	$6,250,830	$919,850	$758,464
6.50%	5.00%	11 in	0.5 in	500	60	$6,280,956	$949,976	$788,590
6.50%	5.00%	11 in	0.5 in	500	80	$6,320,110	$989,130	$827,744
6.50%	5.00%	11 in	0.5 in	550	20	$6,066,974	$735,994	$574,608
6.50%	5.00%	11 in	0.5 in	550	40	$6,072,366	$741,386	$580,000
6.50%	5.00%	11 in	0.5 in	550	60	$6,087,233	$756,253	$594,867
6.50%	5.00%	11 in	0.5 in	550	80	$6,110,823	$779,843	$618,457
6.50%	5.00%	11 in	0.5 in	600	20	$5,923,488	$592,508	$431,122
6.50%	5.00%	11 in	0.5 in	600	40	$5,926,474	$595,494	$434,108
6.50%	5.00%	11 in	0.5 in	600	60	$5,934,061	$603,081	$441,695
6.50%	5.00%	11 in	0.5 in	600	80	$5,945,307	$614,327	$452,941
6.50%	5.00%	11 in	0.5 in	650	20	$5,791,698	$460,718	$299,332

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
6.50%	5.00%	11 in	0.5 in	650	40	$5,795,841	$464,861	$303,475
6.50%	5.00%	11 in	0.5 in	650	60	$5,800,927	$469,947	$308,561
6.50%	5.00%	11 in	0.5 in	650	80	$5,809,422	$478,442	$317,056
6.50%	5.00%	11 in	2 in	450	20	$6,669,499	$1,338,519	$1,177,133
6.50%	5.00%	11 in	2 in	450	40	$6,676,347	$1,345,367	$1,183,981
6.50%	5.00%	11 in	2 in	450	60	$6,690,169	$1,359,189	$1,197,803
6.50%	5.00%	11 in	2 in	450	80	$6,709,346	$1,378,366	$1,216,980
6.50%	5.00%	11 in	2 in	500	20	$6,443,010	$1,112,030	$950,644
6.50%	5.00%	11 in	2 in	500	40	$6,447,888	$1,116,908	$955,522
6.50%	5.00%	11 in	2 in	500	60	$6,462,406	$1,131,426	$970,040
6.50%	5.00%	11 in	2 in	500	80	$6,478,182	$1,147,202	$985,816
6.50%	5.00%	11 in	2 in	550	20	$6,220,309	$889,329	$727,943
6.50%	5.00%	11 in	2 in	550	40	$6,226,261	$895,281	$733,895
6.50%	5.00%	11 in	2 in	550	60	$6,239,853	$908,873	$747,487
6.50%	5.00%	11 in	2 in	550	80	$6,257,315	$926,335	$764,949
6.50%	5.00%	11 in	2 in	600	20	$6,014,584	$683,604	$522,218
6.50%	5.00%	11 in	2 in	600	40	$6,020,010	$689,030	$527,644
6.50%	5.00%	11 in	2 in	600	60	$6,031,186	$700,206	$538,820
6.50%	5.00%	11 in	2 in	600	80	$6,049,521	$718,541	$557,155
6.50%	5.00%	11 in	2 in	650	20	$5,843,838	$512,858	$351,472
6.50%	5.00%	11 in	2 in	650	40	$5,849,503	$518,523	$357,137
6.50%	5.00%	11 in	2 in	650	60	$5,857,714	$526,734	$365,348
6.50%	5.00%	11 in	2 in	650	80	$5,870,372	$539,392	$378,006
6.50%	5.00%	10 in	0.5 in	450	20	$6,797,561	$1,466,581	$1,305,195
6.50%	5.00%	10 in	0.5 in	450	40	$6,810,321	$1,479,341	$1,317,955
6.50%	5.00%	10 in	0.5 in	450	60	$6,828,913	$1,497,933	$1,336,547
6.50%	5.00%	10 in	0.5 in	450	80	$6,853,628	$1,522,648	$1,361,262
6.50%	5.00%	10 in	0.5 in	500	20	$6,526,004	$1,195,024	$1,033,638
6.50%	5.00%	10 in	0.5 in	500	40	$6,550,054	$1,219,074	$1,057,688
6.50%	5.00%	10 in	0.5 in	500	60	$6,584,136	$1,253,156	$1,091,770
6.50%	5.00%	10 in	0.5 in	500	80	$6,616,703	$1,285,723	$1,124,337
6.50%	5.00%	10 in	0.5 in	550	20	$6,238,653	$907,673	$746,287
6.50%	5.00%	10 in	0.5 in	550	40	$6,262,239	$931,259	$769,873
6.50%	5.00%	10 in	0.5 in	550	60	$6,298,576	$967,596	$806,210
6.50%	5.00%	10 in	0.5 in	550	80	$6,341,892	$1,010,912	$849,526
6.50%	5.00%	10 in	0.5 in	600	20	$6,019,908	$688,928	$527,542

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
6.50%	5.00%	10 in	0.5 in	600	40	$6,032,201	$701,221	$539,835
6.50%	5.00%	10 in	0.5 in	600	60	$6,053,852	$722,872	$561,486
6.50%	5.00%	10 in	0.5 in	600	80	$6,088,060	$757,080	$595,694
6.50%	5.00%	10 in	0.5 in	650	20	$5,863,909	$532,929	$371,543
6.50%	5.00%	10 in	0.5 in	650	40	$5,870,218	$539,238	$377,852
6.50%	5.00%	10 in	0.5 in	650	60	$5,881,822	$550,842	$389,456
6.50%	5.00%	10 in	0.5 in	650	80	$5,899,278	$568,298	$406,912
6.50%	5.00%	10 in	2 in	450	20	$6,924,092	$1,593,112	$1,431,726
6.50%	5.00%	10 in	2 in	450	40	$6,931,468	$1,600,488	$1,439,102
6.50%	5.00%	10 in	2 in	450	60	$6,947,189	$1,616,209	$1,454,823
6.50%	5.00%	10 in	2 in	450	80	$6,970,122	$1,639,142	$1,477,756
6.50%	5.00%	10 in	2 in	500	20	$6,721,700	$1,390,720	$1,229,334
6.50%	5.00%	10 in	2 in	500	40	$6,729,466	$1,398,486	$1,237,100
6.50%	5.00%	10 in	2 in	500	60	$6,739,908	$1,408,928	$1,247,542
6.50%	5.00%	10 in	2 in	500	80	$6,754,565	$1,423,585	$1,262,199
6.50%	5.00%	10 in	2 in	550	20	$6,507,815	$1,176,835	$1,015,449
6.50%	5.00%	10 in	2 in	550	40	$6,513,061	$1,182,081	$1,020,695
6.50%	5.00%	10 in	2 in	550	60	$6,522,505	$1,191,525	$1,030,139
6.50%	5.00%	10 in	2 in	550	80	$6,538,007	$1,207,027	$1,045,641
6.50%	5.00%	10 in	2 in	600	20	$6,280,008	$949,028	$787,642
6.50%	5.00%	10 in	2 in	600	40	$6,284,970	$953,990	$792,604
6.50%	5.00%	10 in	2 in	600	60	$6,294,352	$963,372	$801,986
6.50%	5.00%	10 in	2 in	600	80	$6,309,622	$978,642	$817,256
6.50%	5.00%	10 in	2 in	650	20	$6,060,052	$729,072	$567,686
6.50%	5.00%	10 in	2 in	650	40	$6,065,527	$734,547	$573,161
6.50%	5.00%	10 in	2 in	650	60	$6,078,536	$747,556	$586,170
6.50%	5.00%	10 in	2 in	650	80	$6,094,197	$763,217	$601,831
4.00%	0.50%	16 in	0.5 in	450	20	$6,147,087	$816,107	$654,721
4.00%	0.50%	16 in	0.5 in	450	40	$6,169,158	$838,178	$676,792
4.00%	0.50%	16 in	0.5 in	450	60	$6,202,159	$871,179	$709,793
4.00%	0.50%	16 in	0.5 in	450	80	$6,239,878	$908,898	$747,512
4.00%	0.50%	16 in	0.5 in	500	20	$5,971,149	$640,169	$478,783
4.00%	0.50%	16 in	0.5 in	500	40	$5,991,055	$660,075	$498,689
4.00%	0.50%	16 in	0.5 in	500	60	$6,021,003	$690,023	$528,637
4.00%	0.50%	16 in	0.5 in	500	80	$6,053,266	$722,286	$560,900
4.00%	0.50%	16 in	0.5 in	550	20	$5,814,028	$483,048	$321,662

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	0.50%	16 in	0.5 in	550	40	$5,832,073	$501,093	$339,707
4.00%	0.50%	16 in	0.5 in	550	60	$5,857,424	$526,444	$365,058
4.00%	0.50%	16 in	0.5 in	550	80	$5,886,553	$555,573	$394,187
4.00%	0.50%	16 in	0.5 in	600	20	$5,671,050	$340,070	$178,684
4.00%	0.50%	16 in	0.5 in	600	40	$5,686,114	$355,134	$193,748
4.00%	0.50%	16 in	0.5 in	600	60	$5,708,773	$377,793	$216,407
4.00%	0.50%	16 in	0.5 in	600	80	$5,735,016	$404,036	$242,650
4.00%	0.50%	16 in	0.5 in	650	20	$5,544,027	$213,047	$51,661
4.00%	0.50%	16 in	0.5 in	650	40	$5,557,555	$226,575	$65,189
4.00%	0.50%	16 in	0.5 in	650	60	$5,577,907	$246,927	$85,541
4.00%	0.50%	16 in	0.5 in	650	80	$5,600,997	$270,017	$108,631
4.00%	0.50%	16 in	2 in	450	20	$6,173,278	$842,298	$680,912
4.00%	0.50%	16 in	2 in	450	40	$6,191,664	$860,684	$699,298
4.00%	0.50%	16 in	2 in	450	60	$6,220,655	$889,675	$728,289
4.00%	0.50%	16 in	2 in	450	80	$6,256,606	$925,626	$764,240
4.00%	0.50%	16 in	2 in	500	20	$5,996,226	$665,246	$503,860
4.00%	0.50%	16 in	2 in	500	40	$6,011,293	$680,313	$518,927
4.00%	0.50%	16 in	2 in	500	60	$6,037,127	$706,147	$544,761
4.00%	0.50%	16 in	2 in	500	80	$6,068,791	$737,811	$576,425
4.00%	0.50%	16 in	2 in	550	20	$5,836,533	$505,553	$344,167
4.00%	0.50%	16 in	2 in	550	40	$5,850,243	$519,263	$357,877
4.00%	0.50%	16 in	2 in	550	60	$5,873,330	$542,350	$380,964
4.00%	0.50%	16 in	2 in	550	80	$5,900,462	$569,482	$408,096
4.00%	0.50%	16 in	2 in	600	20	$5,690,645	$359,665	$198,279
4.00%	0.50%	16 in	2 in	600	40	$5,703,062	$372,082	$210,696
4.00%	0.50%	16 in	2 in	600	60	$5,723,286	$392,306	$230,920
4.00%	0.50%	16 in	2 in	600	80	$5,747,290	$416,310	$254,924
4.00%	0.50%	16 in	2 in	650	20	$5,563,005	$232,025	$70,639
4.00%	0.50%	16 in	2 in	650	40	$5,573,645	$242,665	$81,279
4.00%	0.50%	16 in	2 in	650	60	$5,591,139	$260,159	$98,773
4.00%	0.50%	16 in	2 in	650	80	$5,613,590	$282,610	$121,224
4.00%	0.50%	15 in	0.5 in	450	20	$6,232,364	$901,384	$739,998
4.00%	0.50%	15 in	0.5 in	450	40	$6,255,945	$924,965	$763,579
4.00%	0.50%	15 in	0.5 in	450	60	$6,290,736	$959,756	$798,370
4.00%	0.50%	15 in	0.5 in	450	80	$6,330,847	$999,867	$838,481
4.00%	0.50%	15 in	0.5 in	500	20	$6,049,917	$718,937	$557,551

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	0.50%	15 in	0.5 in	500	40	$6,069,877	$738,897	$577,511
4.00%	0.50%	15 in	0.5 in	500	60	$6,099,639	$768,659	$607,273
4.00%	0.50%	15 in	0.5 in	500	80	$6,134,507	$803,527	$642,141
4.00%	0.50%	15 in	0.5 in	550	20	$5,885,680	$554,700	$393,314
4.00%	0.50%	15 in	0.5 in	550	40	$5,903,656	$572,676	$411,290
4.00%	0.50%	15 in	0.5 in	550	60	$5,931,064	$600,084	$438,698
4.00%	0.50%	15 in	0.5 in	550	80	$5,961,130	$630,150	$468,764
4.00%	0.50%	15 in	0.5 in	600	20	$5,735,646	$404,666	$243,280
4.00%	0.50%	15 in	0.5 in	600	40	$5,752,632	$421,652	$260,266
4.00%	0.50%	15 in	0.5 in	600	60	$5,776,447	$445,467	$284,081
4.00%	0.50%	15 in	0.5 in	600	80	$5,803,627	$472,647	$311,261
4.00%	0.50%	15 in	0.5 in	650	20	$5,603,969	$272,989	$111,603
4.00%	0.50%	15 in	0.5 in	650	40	$5,618,051	$287,071	$125,685
4.00%	0.50%	15 in	0.5 in	650	60	$5,638,689	$307,709	$146,323
4.00%	0.50%	15 in	0.5 in	650	80	$5,663,951	$332,971	$171,585
4.00%	0.50%	15 in	2 in	450	20	$6,261,111	$930,131	$768,745
4.00%	0.50%	15 in	2 in	450	40	$6,279,915	$948,935	$787,549
4.00%	0.50%	15 in	2 in	450	60	$6,311,274	$980,294	$818,908
4.00%	0.50%	15 in	2 in	450	80	$6,346,913	$1,015,933	$854,547
4.00%	0.50%	15 in	2 in	500	20	$6,075,151	$744,171	$582,785
4.00%	0.50%	15 in	2 in	500	40	$6,091,704	$760,724	$599,338
4.00%	0.50%	15 in	2 in	500	60	$6,119,089	$788,109	$626,723
4.00%	0.50%	15 in	2 in	500	80	$6,151,691	$820,711	$659,325
4.00%	0.50%	15 in	2 in	550	20	$5,909,442	$578,462	$417,076
4.00%	0.50%	15 in	2 in	550	40	$5,923,267	$592,287	$430,901
4.00%	0.50%	15 in	2 in	550	60	$5,947,213	$616,233	$454,847
4.00%	0.50%	15 in	2 in	550	80	$5,976,411	$645,431	$484,045
4.00%	0.50%	15 in	2 in	600	20	$5,757,208	$426,228	$264,842
4.00%	0.50%	15 in	2 in	600	40	$5,769,960	$438,980	$277,594
4.00%	0.50%	15 in	2 in	600	60	$5,790,835	$459,855	$298,469
4.00%	0.50%	15 in	2 in	600	80	$5,815,762	$484,782	$323,396
4.00%	0.50%	15 in	2 in	650	20	$5,623,426	$292,446	$131,060
4.00%	0.50%	15 in	2 in	650	40	$5,634,737	$303,757	$142,371
4.00%	0.50%	15 in	2 in	650	60	$5,653,409	$322,429	$161,043
4.00%	0.50%	15 in	2 in	650	80	$5,676,454	$345,474	$184,088
4.00%	0.50%	14 in	0.5 in	450	20	$6,322,619	$991,639	$830,253

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	0.50%	14 in	0.5 in	450	40	$6,348,419	$1,017,439	$856,053
4.00%	0.50%	14 in	0.5 in	450	60	$6,382,756	$1,051,776	$890,390
4.00%	0.50%	14 in	0.5 in	450	80	$6,423,099	$1,092,119	$930,733
4.00%	0.50%	14 in	0.5 in	500	20	$6,130,867	$799,887	$638,501
4.00%	0.50%	14 in	0.5 in	500	40	$6,152,505	$821,525	$660,139
4.00%	0.50%	14 in	0.5 in	500	60	$6,185,122	$854,142	$692,756
4.00%	0.50%	14 in	0.5 in	500	80	$6,221,887	$890,907	$729,521
4.00%	0.50%	14 in	0.5 in	550	20	$5,960,001	$629,021	$467,635
4.00%	0.50%	14 in	0.5 in	550	40	$5,978,854	$647,874	$486,488
4.00%	0.50%	14 in	0.5 in	550	60	$6,006,840	$675,860	$514,474
4.00%	0.50%	14 in	0.5 in	550	80	$6,039,017	$708,037	$546,651
4.00%	0.50%	14 in	0.5 in	600	20	$5,804,969	$473,989	$312,603
4.00%	0.50%	14 in	0.5 in	600	40	$5,821,151	$490,171	$328,785
4.00%	0.50%	14 in	0.5 in	600	60	$5,845,761	$514,781	$353,395
4.00%	0.50%	14 in	0.5 in	600	80	$5,873,864	$542,884	$381,498
4.00%	0.50%	14 in	0.5 in	650	20	$5,666,560	$335,580	$174,194
4.00%	0.50%	14 in	0.5 in	650	40	$5,680,933	$349,953	$188,567
4.00%	0.50%	14 in	0.5 in	650	60	$5,703,413	$372,433	$211,047
4.00%	0.50%	14 in	0.5 in	650	80	$5,728,626	$397,646	$236,260
4.00%	0.50%	14 in	2 in	450	20	$6,353,388	$1,022,408	$861,022
4.00%	0.50%	14 in	2 in	450	40	$6,372,879	$1,041,899	$880,513
4.00%	0.50%	14 in	2 in	450	60	$6,404,904	$1,073,924	$912,538
4.00%	0.50%	14 in	2 in	450	80	$6,439,580	$1,108,600	$947,214
4.00%	0.50%	14 in	2 in	500	20	$6,158,586	$827,606	$666,220
4.00%	0.50%	14 in	2 in	500	40	$6,175,708	$844,728	$683,342
4.00%	0.50%	14 in	2 in	500	60	$6,203,600	$872,620	$711,234
4.00%	0.50%	14 in	2 in	500	80	$6,237,324	$906,344	$744,958
4.00%	0.50%	14 in	2 in	550	20	$5,984,461	$653,481	$492,095
4.00%	0.50%	14 in	2 in	550	40	$6,000,092	$669,112	$507,726
4.00%	0.50%	14 in	2 in	550	60	$6,025,240	$694,260	$532,874
4.00%	0.50%	14 in	2 in	550	80	$6,055,578	$724,598	$563,212
4.00%	0.50%	14 in	2 in	600	20	$5,827,051	$496,071	$334,685
4.00%	0.50%	14 in	2 in	600	40	$5,840,253	$509,273	$347,887
4.00%	0.50%	14 in	2 in	600	60	$5,862,620	$531,640	$370,254
4.00%	0.50%	14 in	2 in	600	80	$5,888,881	$557,901	$396,515
4.00%	0.50%	14 in	2 in	650	20	$5,687,136	$356,156	$194,770

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	0.50%	14 in	2 in	650	40	$5,698,495	$367,515	$206,129
4.00%	0.50%	14 in	2 in	650	60	$5,718,147	$387,167	$225,781
4.00%	0.50%	14 in	2 in	650	80	$5,741,291	$410,311	$248,925
4.00%	0.50%	13 in	0.5 in	450	20	$6,416,912	$1,085,932	$924,546
4.00%	0.50%	13 in	0.5 in	450	40	$6,441,766	$1,110,786	$949,400
4.00%	0.50%	13 in	0.5 in	450	60	$6,479,757	$1,148,777	$987,391
4.00%	0.50%	13 in	0.5 in	450	80	$6,517,873	$1,186,893	$1,025,507
4.00%	0.50%	13 in	0.5 in	500	20	$6,217,381	$886,401	$725,015
4.00%	0.50%	13 in	0.5 in	500	40	$6,239,391	$908,411	$747,025
4.00%	0.50%	13 in	0.5 in	500	60	$6,272,687	$941,707	$780,321
4.00%	0.50%	13 in	0.5 in	500	80	$6,309,568	$978,588	$817,202
4.00%	0.50%	13 in	0.5 in	550	20	$6,038,080	$707,100	$545,714
4.00%	0.50%	13 in	0.5 in	550	40	$6,057,668	$726,688	$565,302
4.00%	0.50%	13 in	0.5 in	550	60	$6,087,262	$756,282	$594,896
4.00%	0.50%	13 in	0.5 in	550	80	$6,120,819	$789,839	$628,453
4.00%	0.50%	13 in	0.5 in	600	20	$5,875,343	$544,363	$382,977
4.00%	0.50%	13 in	0.5 in	600	40	$5,892,765	$561,785	$400,399
4.00%	0.50%	13 in	0.5 in	600	60	$5,918,061	$587,081	$425,695
4.00%	0.50%	13 in	0.5 in	600	80	$5,948,286	$617,306	$455,920
4.00%	0.50%	13 in	0.5 in	650	20	$5,731,528	$400,548	$239,162
4.00%	0.50%	13 in	0.5 in	650	40	$5,747,193	$416,213	$254,827
4.00%	0.50%	13 in	0.5 in	650	60	$5,770,306	$439,326	$277,940
4.00%	0.50%	13 in	0.5 in	650	80	$5,797,257	$466,277	$304,891
4.00%	0.50%	13 in	2 in	450	20	$6,455,275	$1,124,295	$962,909
4.00%	0.50%	13 in	2 in	450	40	$6,474,453	$1,143,473	$982,087
4.00%	0.50%	13 in	2 in	450	60	$6,504,492	$1,173,512	$1,012,126
4.00%	0.50%	13 in	2 in	450	80	$6,540,881	$1,209,901	$1,048,515
4.00%	0.50%	13 in	2 in	500	20	$6,249,299	$918,319	$756,933
4.00%	0.50%	13 in	2 in	500	40	$6,268,373	$937,393	$776,007
4.00%	0.50%	13 in	2 in	500	60	$6,297,676	$966,696	$805,310
4.00%	0.50%	13 in	2 in	500	80	$6,331,694	$1,000,714	$839,328
4.00%	0.50%	13 in	2 in	550	20	$6,066,327	$735,347	$573,961
4.00%	0.50%	13 in	2 in	550	40	$6,081,846	$750,866	$589,480
4.00%	0.50%	13 in	2 in	550	60	$6,108,175	$777,195	$615,809
4.00%	0.50%	13 in	2 in	550	80	$6,139,036	$808,056	$646,670
4.00%	0.50%	13 in	2 in	600	20	$5,899,355	$568,375	$406,989

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	0.50%	13 in	2 in	600	40	$5,913,204	$582,224	$420,838
4.00%	0.50%	13 in	2 in	600	60	$5,936,394	$605,414	$444,028
4.00%	0.50%	13 in	2 in	600	80	$5,965,503	$634,523	$473,137
4.00%	0.50%	13 in	2 in	650	20	$5,753,126	$422,146	$260,760
4.00%	0.50%	13 in	2 in	650	40	$5,765,402	$434,422	$273,036
4.00%	0.50%	13 in	2 in	650	60	$5,785,527	$454,547	$293,161
4.00%	0.50%	13 in	2 in	650	80	$5,810,051	$479,071	$317,685
4.00%	0.50%	12 in	0.5 in	450	20	$6,517,891	$1,186,911	$1,025,525
4.00%	0.50%	12 in	0.5 in	450	40	$6,544,008	$1,213,028	$1,051,642
4.00%	0.50%	12 in	0.5 in	450	60	$6,581,945	$1,250,965	$1,089,579
4.00%	0.50%	12 in	0.5 in	450	80	$6,616,628	$1,285,648	$1,124,262
4.00%	0.50%	12 in	0.5 in	500	20	$6,307,434	$976,454	$815,068
4.00%	0.50%	12 in	0.5 in	500	40	$6,330,151	$999,171	$837,785
4.00%	0.50%	12 in	0.5 in	500	60	$6,364,858	$1,033,878	$872,492
4.00%	0.50%	12 in	0.5 in	500	80	$6,404,150	$1,073,170	$911,784
4.00%	0.50%	12 in	0.5 in	550	20	$6,119,925	$788,945	$627,559
4.00%	0.50%	12 in	0.5 in	550	40	$6,140,721	$809,741	$648,355
4.00%	0.50%	12 in	0.5 in	550	60	$6,171,506	$840,526	$679,140
4.00%	0.50%	12 in	0.5 in	550	80	$6,206,158	$875,178	$713,792
4.00%	0.50%	12 in	0.5 in	600	20	$5,949,320	$618,340	$456,954
4.00%	0.50%	12 in	0.5 in	600	40	$5,967,853	$636,873	$475,487
4.00%	0.50%	12 in	0.5 in	600	60	$5,995,481	$664,501	$503,115
4.00%	0.50%	12 in	0.5 in	600	80	$6,025,740	$694,760	$533,374
4.00%	0.50%	12 in	0.5 in	650	20	$5,799,933	$468,953	$307,567
4.00%	0.50%	12 in	0.5 in	650	40	$5,815,054	$484,074	$322,688
4.00%	0.50%	12 in	0.5 in	650	60	$5,839,605	$508,625	$347,239
4.00%	0.50%	12 in	0.5 in	650	80	$5,866,894	$535,914	$374,528
4.00%	0.50%	12 in	2 in	450	20	$6,578,833	$1,247,853	$1,086,467
4.00%	0.50%	12 in	2 in	450	40	$6,596,207	$1,265,227	$1,103,841
4.00%	0.50%	12 in	2 in	450	60	$6,625,227	$1,294,247	$1,132,861
4.00%	0.50%	12 in	2 in	450	80	$6,657,007	$1,326,027	$1,164,641
4.00%	0.50%	12 in	2 in	500	20	$6,360,081	$1,029,101	$867,715
4.00%	0.50%	12 in	2 in	500	40	$6,377,510	$1,046,530	$885,144
4.00%	0.50%	12 in	2 in	500	60	$6,407,012	$1,076,032	$914,646
4.00%	0.50%	12 in	2 in	500	80	$6,442,251	$1,111,271	$949,885
4.00%	0.50%	12 in	2 in	550	20	$6,161,811	$830,831	$669,445

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	0.50%	12 in	2 in	550	40	$6,178,219	$847,239	$685,853
4.00%	0.50%	12 in	2 in	550	60	$6,205,304	$874,324	$712,938
4.00%	0.50%	12 in	2 in	550	80	$6,237,784	$906,804	$745,418
4.00%	0.50%	12 in	2 in	600	20	$5,982,850	$651,870	$490,484
4.00%	0.50%	12 in	2 in	600	40	$5,997,276	$666,296	$504,910
4.00%	0.50%	12 in	2 in	600	60	$6,021,496	$690,516	$529,130
4.00%	0.50%	12 in	2 in	600	80	$6,050,614	$719,634	$558,248
4.00%	0.50%	12 in	2 in	650	20	$5,826,169	$495,189	$333,803
4.00%	0.50%	12 in	2 in	650	40	$5,838,635	$507,655	$346,269
4.00%	0.50%	12 in	2 in	650	60	$5,860,077	$529,097	$367,711
4.00%	0.50%	12 in	2 in	650	80	$5,887,593	$556,613	$395,227
4.00%	0.50%	11 in	0.5 in	450	20	$6,642,312	$1,311,332	$1,149,946
4.00%	0.50%	11 in	0.5 in	450	40	$6,670,063	$1,339,083	$1,177,697
4.00%	0.50%	11 in	0.5 in	450	60	$6,700,921	$1,369,941	$1,208,555
4.00%	0.50%	11 in	0.5 in	450	80	$6,733,379	$1,402,399	$1,241,013
4.00%	0.50%	11 in	0.5 in	500	20	$6,412,550	$1,081,570	$920,184
4.00%	0.50%	11 in	0.5 in	500	40	$6,437,260	$1,106,280	$944,894
4.00%	0.50%	11 in	0.5 in	500	60	$6,474,023	$1,143,043	$981,657
4.00%	0.50%	11 in	0.5 in	500	80	$6,514,815	$1,183,835	$1,022,449
4.00%	0.50%	11 in	0.5 in	550	20	$6,210,038	$879,058	$717,672
4.00%	0.50%	11 in	0.5 in	550	40	$6,230,535	$899,555	$738,169
4.00%	0.50%	11 in	0.5 in	550	60	$6,264,431	$933,451	$772,065
4.00%	0.50%	11 in	0.5 in	550	80	$6,302,077	$971,097	$809,711
4.00%	0.50%	11 in	0.5 in	600	20	$6,028,802	$697,822	$536,436
4.00%	0.50%	11 in	0.5 in	600	40	$6,048,465	$717,485	$556,099
4.00%	0.50%	11 in	0.5 in	600	60	$6,077,305	$746,325	$584,939
4.00%	0.50%	11 in	0.5 in	600	80	$6,110,025	$779,045	$617,659
4.00%	0.50%	11 in	0.5 in	650	20	$5,870,529	$539,549	$378,163
4.00%	0.50%	11 in	0.5 in	650	40	$5,887,305	$556,325	$394,939
4.00%	0.50%	11 in	0.5 in	650	60	$5,912,807	$581,827	$420,441
4.00%	0.50%	11 in	0.5 in	650	80	$5,941,931	$610,951	$449,565
4.00%	0.50%	11 in	2 in	450	20	$6,743,986	$1,413,006	$1,251,620
4.00%	0.50%	11 in	2 in	450	40	$6,755,999	$1,425,019	$1,263,633
4.00%	0.50%	11 in	2 in	450	60	$6,778,578	$1,447,598	$1,286,212
4.00%	0.50%	11 in	2 in	450	80	$6,803,770	$1,472,790	$1,311,404
4.00%	0.50%	11 in	2 in	500	20	$6,516,089	$1,185,109	$1,023,723

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	0.50%	11 in	2 in	500	40	$6,531,460	$1,200,480	$1,039,094
4.00%	0.50%	11 in	2 in	500	60	$6,557,004	$1,226,024	$1,064,638
4.00%	0.50%	11 in	2 in	500	80	$6,586,468	$1,255,488	$1,094,102
4.00%	0.50%	11 in	2 in	550	20	$6,299,715	$968,735	$807,349
4.00%	0.50%	11 in	2 in	550	40	$6,314,348	$983,368	$821,982
4.00%	0.50%	11 in	2 in	550	60	$6,339,675	$1,008,695	$847,309
4.00%	0.50%	11 in	2 in	550	80	$6,372,489	$1,041,509	$880,123
4.00%	0.50%	11 in	2 in	600	20	$6,097,447	$766,467	$605,081
4.00%	0.50%	11 in	2 in	600	40	$6,111,770	$780,790	$619,404
4.00%	0.50%	11 in	2 in	600	60	$6,136,355	$805,375	$643,989
4.00%	0.50%	11 in	2 in	600	80	$6,166,897	$835,917	$674,531
4.00%	0.50%	11 in	2 in	650	20	$5,920,650	$589,670	$428,284
4.00%	0.50%	11 in	2 in	650	40	$5,934,838	$603,858	$442,472
4.00%	0.50%	11 in	2 in	650	60	$5,957,985	$627,005	$465,619
4.00%	0.50%	11 in	2 in	650	80	$5,985,264	$654,284	$492,898
4.00%	0.50%	10 in	0.5 in	450	20	$6,825,551	$1,494,571	$1,333,185
4.00%	0.50%	10 in	0.5 in	450	40	$6,841,365	$1,510,385	$1,348,999
4.00%	0.50%	10 in	0.5 in	450	60	$6,862,838	$1,531,858	$1,370,472
4.00%	0.50%	10 in	0.5 in	450	80	$6,889,845	$1,558,865	$1,397,479
4.00%	0.50%	10 in	0.5 in	500	20	$6,570,555	$1,239,575	$1,078,189
4.00%	0.50%	10 in	0.5 in	500	40	$6,597,460	$1,266,480	$1,105,094
4.00%	0.50%	10 in	0.5 in	500	60	$6,632,641	$1,301,661	$1,140,275
4.00%	0.50%	10 in	0.5 in	500	80	$6,667,219	$1,336,239	$1,174,853
4.00%	0.50%	10 in	0.5 in	550	20	$6,332,124	$1,001,144	$839,758
4.00%	0.50%	10 in	0.5 in	550	40	$6,356,648	$1,025,668	$864,282
4.00%	0.50%	10 in	0.5 in	550	60	$6,393,284	$1,062,304	$900,918
4.00%	0.50%	10 in	0.5 in	550	80	$6,434,504	$1,103,524	$942,138
4.00%	0.50%	10 in	0.5 in	600	20	$6,126,007	$795,027	$633,641
4.00%	0.50%	10 in	0.5 in	600	40	$6,146,026	$815,046	$653,660
4.00%	0.50%	10 in	0.5 in	600	60	$6,178,174	$847,194	$685,808
4.00%	0.50%	10 in	0.5 in	600	80	$6,215,634	$884,654	$723,268
4.00%	0.50%	10 in	0.5 in	650	20	$5,951,389	$620,409	$459,023
4.00%	0.50%	10 in	0.5 in	650	40	$5,970,548	$639,568	$478,182
4.00%	0.50%	10 in	0.5 in	650	60	$5,998,389	$667,409	$506,023
4.00%	0.50%	10 in	0.5 in	650	80	$6,029,979	$698,999	$537,613
4.00%	0.50%	10 in	2 in	450	20	$6,954,769	$1,623,789	$1,462,403

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	0.50%	10 in	2 in	450	40	$6,964,997	$1,634,017	$1,472,631
4.00%	0.50%	10 in	2 in	450	60	$6,984,207	$1,653,227	$1,491,841
4.00%	0.50%	10 in	2 in	450	80	$7,011,786	$1,680,806	$1,519,420
4.00%	0.50%	10 in	2 in	500	20	$6,741,429	$1,410,449	$1,249,063
4.00%	0.50%	10 in	2 in	500	40	$6,750,293	$1,419,313	$1,257,927
4.00%	0.50%	10 in	2 in	500	60	$6,768,271	$1,437,291	$1,275,905
4.00%	0.50%	10 in	2 in	500	80	$6,790,710	$1,459,730	$1,298,344
4.00%	0.50%	10 in	2 in	550	20	$6,519,643	$1,188,663	$1,027,277
4.00%	0.50%	10 in	2 in	550	40	$6,530,339	$1,199,359	$1,037,973
4.00%	0.50%	10 in	2 in	550	60	$6,548,870	$1,217,890	$1,056,504
4.00%	0.50%	10 in	2 in	550	80	$6,574,338	$1,243,358	$1,081,972
4.00%	0.50%	10 in	2 in	600	20	$6,295,116	$964,136	$802,750
4.00%	0.50%	10 in	2 in	600	40	$6,306,175	$975,195	$813,809
4.00%	0.50%	10 in	2 in	600	60	$6,326,864	$995,884	$834,498
4.00%	0.50%	10 in	2 in	600	80	$6,354,151	$1,023,171	$861,785
4.00%	0.50%	10 in	2 in	650	20	$6,086,320	$755,340	$593,954
4.00%	0.50%	10 in	2 in	650	40	$6,098,571	$767,591	$606,205
4.00%	0.50%	10 in	2 in	650	60	$6,120,378	$789,398	$628,012
4.00%	0.50%	10 in	2 in	650	80	$6,145,493	$814,513	$653,127
4.00%	2.00%	16 in	0.5 in	450	20	$6,404,787	$1,073,807	$912,421
4.00%	2.00%	16 in	0.5 in	450	40	$6,411,199	$1,080,219	$918,833
4.00%	2.00%	16 in	0.5 in	450	60	$6,426,294	$1,095,314	$933,928
4.00%	2.00%	16 in	0.5 in	450	80	$6,440,322	$1,109,342	$947,956
4.00%	2.00%	16 in	0.5 in	500	20	$6,223,458	$892,478	$731,092
4.00%	2.00%	16 in	0.5 in	500	40	$6,232,022	$901,042	$739,656
4.00%	2.00%	16 in	0.5 in	500	60	$6,246,616	$915,636	$754,250
4.00%	2.00%	16 in	0.5 in	500	80	$6,263,008	$932,028	$770,642
4.00%	2.00%	16 in	0.5 in	550	20	$6,051,166	$720,186	$558,800
4.00%	2.00%	16 in	0.5 in	550	40	$6,061,242	$730,262	$568,876
4.00%	2.00%	16 in	0.5 in	550	60	$6,074,675	$743,695	$582,309
4.00%	2.00%	16 in	0.5 in	550	80	$6,092,253	$761,273	$599,887
4.00%	2.00%	16 in	0.5 in	600	20	$5,891,726	$560,746	$399,360
4.00%	2.00%	16 in	0.5 in	600	40	$5,900,189	$569,209	$407,823
4.00%	2.00%	16 in	0.5 in	600	60	$5,911,982	$581,002	$419,616
4.00%	2.00%	16 in	0.5 in	600	80	$5,927,456	$596,476	$435,090
4.00%	2.00%	16 in	0.5 in	650	20	$5,747,278	$416,298	$254,912

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	2.00%	16 in	0.5 in	650	40	$5,753,395	$422,415	$261,029
4.00%	2.00%	16 in	0.5 in	650	60	$5,764,374	$433,394	$272,008
4.00%	2.00%	16 in	0.5 in	650	80	$5,779,536	$448,556	$287,170
4.00%	2.00%	16 in	2 in	450	20	$6,408,763	$1,077,783	$916,397
4.00%	2.00%	16 in	2 in	450	40	$6,416,000	$1,085,020	$923,634
4.00%	2.00%	16 in	2 in	450	60	$6,427,251	$1,096,271	$934,885
4.00%	2.00%	16 in	2 in	450	80	$6,442,123	$1,111,143	$949,757
4.00%	2.00%	16 in	2 in	500	20	$6,227,795	$896,815	$735,429
4.00%	2.00%	16 in	2 in	500	40	$6,235,697	$904,717	$743,331
4.00%	2.00%	16 in	2 in	500	60	$6,250,498	$919,518	$758,132
4.00%	2.00%	16 in	2 in	500	80	$6,266,003	$935,023	$773,637
4.00%	2.00%	16 in	2 in	550	20	$6,055,689	$724,709	$563,323
4.00%	2.00%	16 in	2 in	550	40	$6,064,943	$733,963	$572,577
4.00%	2.00%	16 in	2 in	550	60	$6,078,167	$747,187	$585,801
4.00%	2.00%	16 in	2 in	550	80	$6,095,300	$764,320	$602,934
4.00%	2.00%	16 in	2 in	600	20	$5,896,949	$565,969	$404,583
4.00%	2.00%	16 in	2 in	600	40	$5,903,527	$572,547	$411,161
4.00%	2.00%	16 in	2 in	600	60	$5,916,286	$585,306	$423,920
4.00%	2.00%	16 in	2 in	600	80	$5,932,352	$601,372	$439,986
4.00%	2.00%	16 in	2 in	650	20	$5,751,543	$420,563	$259,177
4.00%	2.00%	16 in	2 in	650	40	$5,758,386	$427,406	$266,020
4.00%	2.00%	16 in	2 in	650	60	$5,769,547	$438,567	$277,181
4.00%	2.00%	16 in	2 in	650	80	$5,783,511	$452,531	$291,145
4.00%	2.00%	15 in	0.5 in	450	20	$6,485,261	$1,154,281	$992,895
4.00%	2.00%	15 in	0.5 in	450	40	$6,493,883	$1,162,903	$1,001,517
4.00%	2.00%	15 in	0.5 in	450	60	$6,505,823	$1,174,843	$1,013,457
4.00%	2.00%	15 in	0.5 in	450	80	$6,517,988	$1,187,008	$1,025,622
4.00%	2.00%	15 in	0.5 in	500	20	$6,305,063	$974,083	$812,697
4.00%	2.00%	15 in	0.5 in	500	40	$6,313,681	$982,701	$821,315
4.00%	2.00%	15 in	0.5 in	500	60	$6,329,477	$998,497	$837,111
4.00%	2.00%	15 in	0.5 in	500	80	$6,343,731	$1,012,751	$851,365
4.00%	2.00%	15 in	0.5 in	550	20	$6,131,669	$800,689	$639,303
4.00%	2.00%	15 in	0.5 in	550	40	$6,139,245	$808,265	$646,879
4.00%	2.00%	15 in	0.5 in	550	60	$6,152,917	$821,937	$660,551
4.00%	2.00%	15 in	0.5 in	550	80	$6,170,027	$839,047	$677,661
4.00%	2.00%	15 in	0.5 in	600	20	$5,965,325	$634,345	$472,959

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		$5,330,980	$5,492,366
4.00%	2.00%	15 in	0.5 in	600	40	$5,974,730	$643,750	$482,364
4.00%	2.00%	15 in	0.5 in	600	60	$5,986,534	$655,554	$494,168
4.00%	2.00%	15 in	0.5 in	600	80	$6,003,476	$672,496	$511,110
4.00%	2.00%	15 in	0.5 in	650	20	$5,815,375	$484,395	$323,009
4.00%	2.00%	15 in	0.5 in	650	40	$5,822,385	$491,405	$330,019
4.00%	2.00%	15 in	0.5 in	650	60	$5,834,415	$503,435	$342,049
4.00%	2.00%	15 in	0.5 in	650	80	$5,848,935	$517,955	$356,569
4.00%	2.00%	15 in	2 in	450	20	$6,490,034	$1,159,054	$997,668
4.00%	2.00%	15 in	2 in	450	40	$6,497,152	$1,166,172	$1,004,786
4.00%	2.00%	15 in	2 in	450	60	$6,507,102	$1,176,122	$1,014,736
4.00%	2.00%	15 in	2 in	450	80	$6,518,973	$1,187,993	$1,026,607
4.00%	2.00%	15 in	2 in	500	20	$6,309,624	$978,644	$817,258
4.00%	2.00%	15 in	2 in	500	40	$6,317,905	$986,925	$825,539
4.00%	2.00%	15 in	2 in	500	60	$6,330,757	$999,777	$838,391
4.00%	2.00%	15 in	2 in	500	80	$6,346,683	$1,015,703	$854,317
4.00%	2.00%	15 in	2 in	550	20	$6,135,272	$804,292	$642,906
4.00%	2.00%	15 in	2 in	550	40	$6,143,905	$812,925	$651,539
4.00%	2.00%	15 in	2 in	550	60	$6,157,673	$826,693	$665,307
4.00%	2.00%	15 in	2 in	550	80	$6,173,463	$842,483	$681,097
4.00%	2.00%	15 in	2 in	600	20	$5,969,305	$638,325	$476,939
4.00%	2.00%	15 in	2 in	600	40	$5,978,642	$647,662	$486,276
4.00%	2.00%	15 in	2 in	600	60	$5,990,375	$659,395	$498,009
4.00%	2.00%	15 in	2 in	600	80	$6,005,878	$674,898	$513,512
4.00%	2.00%	15 in	2 in	650	20	$5,819,514	$488,534	$327,148
4.00%	2.00%	15 in	2 in	650	40	$5,826,568	$495,588	$334,202
4.00%	2.00%	15 in	2 in	650	60	$5,838,670	$507,690	$346,304
4.00%	2.00%	15 in	2 in	650	80	$5,853,671	$522,691	$361,305
4.00%	2.00%	14 in	0.5 in	450	20	$6,567,261	$1,236,281	$1,074,895
4.00%	2.00%	14 in	0.5 in	450	40	$6,573,511	$1,242,531	$1,081,145
4.00%	2.00%	14 in	0.5 in	450	60	$6,580,652	$1,249,672	$1,088,286
4.00%	2.00%	14 in	0.5 in	450	80	$6,591,898	$1,260,918	$1,099,532
4.00%	2.00%	14 in	0.5 in	500	20	$6,387,850	$1,056,870	$895,484
4.00%	2.00%	14 in	0.5 in	500	40	$6,397,673	$1,066,693	$905,307
4.00%	2.00%	14 in	0.5 in	500	60	$6,408,998	$1,078,018	$916,632
4.00%	2.00%	14 in	0.5 in	500	80	$6,424,739	$1,093,759	$932,373
4.00%	2.00%	14 in	0.5 in	550	20	$6,212,008	$881,028	$719,642

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	2.00%	14 in	0.5 in	550	40	$6,219,846	$888,866	$727,480
4.00%	2.00%	14 in	0.5 in	550	60	$6,234,387	$903,407	$742,021
4.00%	2.00%	14 in	0.5 in	550	80	$6,250,717	$919,737	$758,351
4.00%	2.00%	14 in	0.5 in	600	20	$6,042,290	$711,310	$549,924
4.00%	2.00%	14 in	0.5 in	600	40	$6,049,994	$719,014	$557,628
4.00%	2.00%	14 in	0.5 in	600	60	$6,062,580	$731,600	$570,214
4.00%	2.00%	14 in	0.5 in	600	80	$6,079,334	$748,354	$586,968
4.00%	2.00%	14 in	0.5 in	650	20	$5,885,813	$554,833	$393,447
4.00%	2.00%	14 in	0.5 in	650	40	$5,894,611	$563,631	$402,245
4.00%	2.00%	14 in	0.5 in	650	60	$5,906,710	$575,730	$414,344
4.00%	2.00%	14 in	0.5 in	650	80	$5,921,659	$590,679	$429,293
4.00%	2.00%	14 in	2 in	450	20	$6,569,986	$1,239,006	$1,077,620
4.00%	2.00%	14 in	2 in	450	40	$6,575,984	$1,245,004	$1,083,618
4.00%	2.00%	14 in	2 in	450	60	$6,584,838	$1,253,858	$1,092,472
4.00%	2.00%	14 in	2 in	450	80	$6,596,519	$1,265,539	$1,104,153
4.00%	2.00%	14 in	2 in	500	20	$6,393,572	$1,062,592	$901,206
4.00%	2.00%	14 in	2 in	500	40	$6,400,051	$1,069,071	$907,685
4.00%	2.00%	14 in	2 in	500	60	$6,412,081	$1,081,101	$919,715
4.00%	2.00%	14 in	2 in	500	80	$6,427,274	$1,096,294	$934,908
4.00%	2.00%	14 in	2 in	550	20	$6,214,800	$883,820	$722,434
4.00%	2.00%	14 in	2 in	550	40	$6,223,188	$892,208	$730,822
4.00%	2.00%	14 in	2 in	550	60	$6,237,269	$906,289	$744,903
4.00%	2.00%	14 in	2 in	550	80	$6,254,003	$923,023	$761,637
4.00%	2.00%	14 in	2 in	600	20	$6,046,185	$715,205	$553,819
4.00%	2.00%	14 in	2 in	600	40	$6,054,604	$723,624	$562,238
4.00%	2.00%	14 in	2 in	600	60	$6,067,840	$736,860	$575,474
4.00%	2.00%	14 in	2 in	600	80	$6,083,080	$752,100	$590,714
4.00%	2.00%	14 in	2 in	650	20	$5,891,234	$560,254	$398,868
4.00%	2.00%	14 in	2 in	650	40	$5,897,761	$566,781	$405,395
4.00%	2.00%	14 in	2 in	650	60	$5,909,641	$578,661	$417,275
4.00%	2.00%	14 in	2 in	650	80	$5,925,787	$594,807	$433,421
4.00%	2.00%	13 in	0.5 in	450	20	$6,642,643	$1,311,663	$1,150,277
4.00%	2.00%	13 in	0.5 in	450	40	$6,647,108	$1,316,128	$1,154,742
4.00%	2.00%	13 in	0.5 in	450	60	$6,654,720	$1,323,740	$1,162,354
4.00%	2.00%	13 in	0.5 in	450	80	$6,665,859	$1,334,879	$1,173,493
4.00%	2.00%	13 in	0.5 in	500	20	$6,417,687	$1,086,707	$925,321

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	2.00%	13 in	0.5 in	500	40	$6,478,804	$1,147,824	$986,438
4.00%	2.00%	13 in	0.5 in	500	60	$6,488,583	$1,157,603	$996,217
4.00%	2.00%	13 in	0.5 in	500	80	$6,502,650	$1,171,670	$1,010,284
4.00%	2.00%	13 in	0.5 in	550	20	$6,292,920	$961,940	$800,554
4.00%	2.00%	13 in	0.5 in	550	40	$6,302,526	$971,546	$810,160
4.00%	2.00%	13 in	0.5 in	550	60	$6,315,979	$984,999	$823,613
4.00%	2.00%	13 in	0.5 in	550	80	$6,331,984	$1,001,004	$839,618
4.00%	2.00%	13 in	0.5 in	600	20	$6,120,287	$789,307	$627,921
4.00%	2.00%	13 in	0.5 in	600	40	$6,127,966	$796,986	$635,600
4.00%	2.00%	13 in	0.5 in	600	60	$6,141,757	$810,777	$649,391
4.00%	2.00%	13 in	0.5 in	600	80	$6,157,548	$826,568	$665,182
4.00%	2.00%	13 in	0.5 in	650	20	$5,961,100	$630,120	$468,734
4.00%	2.00%	13 in	0.5 in	650	40	$5,968,554	$637,574	$476,188
4.00%	2.00%	13 in	0.5 in	650	60	$5,980,229	$649,249	$487,863
4.00%	2.00%	13 in	0.5 in	650	80	$5,996,517	$665,537	$504,151
4.00%	2.00%	13 in	2 in	450	20	$6,650,088	$1,319,108	$1,157,722
4.00%	2.00%	13 in	2 in	450	40	$6,655,300	$1,324,320	$1,162,934
4.00%	2.00%	13 in	2 in	450	60	$6,664,007	$1,333,027	$1,171,641
4.00%	2.00%	13 in	2 in	450	80	$6,677,643	$1,346,663	$1,185,277
4.00%	2.00%	13 in	2 in	500	20	$6,478,334	$1,147,354	$985,968
4.00%	2.00%	13 in	2 in	500	40	$6,486,922	$1,155,942	$994,556
4.00%	2.00%	13 in	2 in	500	60	$6,497,113	$1,166,133	$1,004,747
4.00%	2.00%	13 in	2 in	500	80	$6,510,035	$1,179,055	$1,017,669
4.00%	2.00%	13 in	2 in	550	20	$6,299,622	$968,642	$807,256
4.00%	2.00%	13 in	2 in	550	40	$6,307,393	$976,413	$815,027
4.00%	2.00%	13 in	2 in	550	60	$6,320,376	$989,396	$828,010
4.00%	2.00%	13 in	2 in	550	80	$6,335,899	$1,004,919	$843,533
4.00%	2.00%	13 in	2 in	600	20	$6,123,458	$792,478	$631,092
4.00%	2.00%	13 in	2 in	600	40	$6,132,719	$801,739	$640,353
4.00%	2.00%	13 in	2 in	600	60	$6,145,482	$814,502	$653,116
4.00%	2.00%	13 in	2 in	600	80	$6,162,734	$831,754	$670,368
4.00%	2.00%	13 in	2 in	650	20	$5,964,715	$633,735	$472,349
4.00%	2.00%	13 in	2 in	650	40	$5,973,075	$642,095	$480,709
4.00%	2.00%	13 in	2 in	650	60	$5,985,567	$654,587	$493,201
4.00%	2.00%	13 in	2 in	650	80	$6,000,586	$669,606	$508,220
4.00%	2.00%	12 in	0.5 in	450	20	$6,714,945	$1,383,965	$1,222,579

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	2.00%	12 in	0.5 in	450	40	$6,718,454	$1,387,474	$1,226,088
4.00%	2.00%	12 in	0.5 in	450	60	$6,727,557	$1,396,577	$1,235,191
4.00%	2.00%	12 in	0.5 in	450	80	$6,740,452	$1,409,472	$1,248,086
4.00%	2.00%	12 in	0.5 in	500	20	$6,553,101	$1,222,121	$1,060,735
4.00%	2.00%	12 in	0.5 in	500	40	$6,559,181	$1,228,201	$1,066,815
4.00%	2.00%	12 in	0.5 in	500	60	$6,568,572	$1,237,592	$1,076,206
4.00%	2.00%	12 in	0.5 in	500	80	$6,579,300	$1,248,320	$1,086,934
4.00%	2.00%	12 in	0.5 in	550	20	$6,377,256	$1,046,276	$884,890
4.00%	2.00%	12 in	0.5 in	550	40	$6,384,441	$1,053,461	$892,075
4.00%	2.00%	12 in	0.5 in	550	60	$6,397,410	$1,066,430	$905,044
4.00%	2.00%	12 in	0.5 in	550	80	$6,412,021	$1,081,041	$919,655
4.00%	2.00%	12 in	0.5 in	600	20	$6,199,055	$868,075	$706,689
4.00%	2.00%	12 in	0.5 in	600	40	$6,208,834	$877,854	$716,468
4.00%	2.00%	12 in	0.5 in	600	60	$6,221,550	$890,570	$729,184
4.00%	2.00%	12 in	0.5 in	600	80	$6,238,627	$907,647	$746,261
4.00%	2.00%	12 in	0.5 in	650	20	$6,037,616	$706,636	$545,250
4.00%	2.00%	12 in	0.5 in	650	40	$6,044,280	$713,300	$551,914
4.00%	2.00%	12 in	0.5 in	650	60	$6,057,871	$726,891	$565,505
4.00%	2.00%	12 in	0.5 in	650	80	$6,072,479	$741,499	$580,113
4.00%	2.00%	12 in	2 in	450	20	$6,742,617	$1,411,637	$1,250,251
4.00%	2.00%	12 in	2 in	450	40	$6,748,666	$1,417,686	$1,256,300
4.00%	2.00%	12 in	2 in	450	60	$6,757,931	$1,426,951	$1,265,565
4.00%	2.00%	12 in	2 in	450	80	$6,770,600	$1,439,620	$1,278,234
4.00%	2.00%	12 in	2 in	500	20	$6,572,539	$1,241,559	$1,080,173
4.00%	2.00%	12 in	2 in	500	40	$6,577,809	$1,246,829	$1,085,443
4.00%	2.00%	12 in	2 in	500	60	$6,588,060	$1,257,080	$1,095,694
4.00%	2.00%	12 in	2 in	500	80	$6,602,632	$1,271,652	$1,110,266
4.00%	2.00%	12 in	2 in	550	20	$6,391,876	$1,060,896	$899,510
4.00%	2.00%	12 in	2 in	550	40	$6,399,931	$1,068,951	$907,565
4.00%	2.00%	12 in	2 in	550	60	$6,412,378	$1,081,398	$920,012
4.00%	2.00%	12 in	2 in	550	80	$6,427,240	$1,096,260	$934,874
4.00%	2.00%	12 in	2 in	600	20	$6,209,585	$878,605	$717,219
4.00%	2.00%	12 in	2 in	600	40	$6,217,531	$886,551	$725,165
4.00%	2.00%	12 in	2 in	600	60	$6,231,256	$900,276	$738,890
4.00%	2.00%	12 in	2 in	600	80	$6,250,218	$919,238	$757,852
4.00%	2.00%	12 in	2 in	650	20	$6,043,824	$712,844	$551,458

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	2.00%	12 in	2 in	650	40	$6,051,207	$720,227	$558,841
4.00%	2.00%	12 in	2 in	650	60	$6,065,984	$735,004	$573,618
4.00%	2.00%	12 in	2 in	650	80	$6,080,718	$749,738	$588,352
4.00%	2.00%	11 in	0.5 in	450	20	$6,796,285	$1,465,305	$1,303,919
4.00%	2.00%	11 in	0.5 in	450	40	$6,804,631	$1,473,651	$1,312,265
4.00%	2.00%	11 in	0.5 in	450	60	$6,817,117	$1,486,137	$1,324,751
4.00%	2.00%	11 in	0.5 in	450	80	$6,832,280	$1,501,300	$1,339,914
4.00%	2.00%	11 in	0.5 in	500	20	$6,634,939	$1,303,959	$1,142,573
4.00%	2.00%	11 in	0.5 in	500	40	$6,641,364	$1,310,384	$1,148,998
4.00%	2.00%	11 in	0.5 in	500	60	$6,652,563	$1,321,583	$1,160,197
4.00%	2.00%	11 in	0.5 in	500	80	$6,667,992	$1,337,012	$1,175,626
4.00%	2.00%	11 in	0.5 in	550	20	$6,463,219	$1,132,239	$970,853
4.00%	2.00%	11 in	0.5 in	550	40	$6,470,629	$1,139,649	$978,263
4.00%	2.00%	11 in	0.5 in	550	60	$6,482,291	$1,151,311	$989,925
4.00%	2.00%	11 in	0.5 in	550	80	$6,496,465	$1,165,485	$1,004,099
4.00%	2.00%	11 in	0.5 in	600	20	$6,282,820	$951,840	$790,454
4.00%	2.00%	11 in	0.5 in	600	40	$6,291,485	$960,505	$799,119
4.00%	2.00%	11 in	0.5 in	600	60	$6,305,408	$974,428	$813,042
4.00%	2.00%	11 in	0.5 in	600	80	$6,321,936	$990,956	$829,570
4.00%	2.00%	11 in	0.5 in	650	20	$6,115,047	$784,067	$622,681
4.00%	2.00%	11 in	0.5 in	650	40	$6,122,801	$791,821	$630,435
4.00%	2.00%	11 in	0.5 in	650	60	$6,136,039	$805,059	$643,673
4.00%	2.00%	11 in	0.5 in	650	80	$6,151,774	$820,794	$659,408
4.00%	2.00%	11 in	2 in	450	20	$6,862,975	$1,531,995	$1,370,609
4.00%	2.00%	11 in	2 in	450	40	$6,869,878	$1,538,898	$1,377,512
4.00%	2.00%	11 in	2 in	450	60	$6,880,614	$1,549,634	$1,388,248
4.00%	2.00%	11 in	2 in	450	80	$6,896,620	$1,565,640	$1,404,254
4.00%	2.00%	11 in	2 in	500	20	$6,692,786	$1,361,806	$1,200,420
4.00%	2.00%	11 in	2 in	500	40	$6,698,601	$1,367,621	$1,206,235
4.00%	2.00%	11 in	2 in	500	60	$6,708,796	$1,377,816	$1,216,430
4.00%	2.00%	11 in	2 in	500	80	$6,721,629	$1,390,649	$1,229,263
4.00%	2.00%	11 in	2 in	550	20	$6,510,567	$1,179,587	$1,018,201
4.00%	2.00%	11 in	2 in	550	40	$6,514,739	$1,183,759	$1,022,373
4.00%	2.00%	11 in	2 in	550	60	$6,528,509	$1,197,529	$1,036,143
4.00%	2.00%	11 in	2 in	550	80	$6,542,286	$1,211,306	$1,049,920
4.00%	2.00%	11 in	2 in	600	20	$6,316,262	$985,282	$823,896

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	2.00%	11 in	2 in	600	40	$6,325,006	$994,026	$832,640
4.00%	2.00%	11 in	2 in	600	60	$6,339,497	$1,008,517	$847,131
4.00%	2.00%	11 in	2 in	600	80	$6,354,054	$1,023,074	$861,688
4.00%	2.00%	11 in	2 in	650	20	$6,137,670	$806,690	$645,304
4.00%	2.00%	11 in	2 in	650	40	$6,145,772	$814,792	$653,406
4.00%	2.00%	11 in	2 in	650	60	$6,158,926	$827,946	$666,560
4.00%	2.00%	11 in	2 in	650	80	$6,177,756	$846,776	$685,390
4.00%	2.00%	10 in	0.5 in	450	20	$6,925,067	$1,594,087	$1,432,701
4.00%	2.00%	10 in	0.5 in	450	40	$6,933,258	$1,602,278	$1,440,892
4.00%	2.00%	10 in	0.5 in	450	60	$6,948,387	$1,617,407	$1,456,021
4.00%	2.00%	10 in	0.5 in	450	80	$6,969,560	$1,638,580	$1,477,194
4.00%	2.00%	10 in	0.5 in	500	20	$6,747,616	$1,416,636	$1,255,250
4.00%	2.00%	10 in	0.5 in	500	40	$6,756,733	$1,425,753	$1,264,367
4.00%	2.00%	10 in	0.5 in	500	60	$6,771,294	$1,440,314	$1,278,928
4.00%	2.00%	10 in	0.5 in	500	80	$6,789,514	$1,458,534	$1,297,148
4.00%	2.00%	10 in	0.5 in	550	20	$6,564,498	$1,233,518	$1,072,132
4.00%	2.00%	10 in	0.5 in	550	40	$6,573,435	$1,242,455	$1,081,069
4.00%	2.00%	10 in	0.5 in	550	60	$6,589,936	$1,258,956	$1,097,570
4.00%	2.00%	10 in	0.5 in	550	80	$6,607,989	$1,277,009	$1,115,623
4.00%	2.00%	10 in	0.5 in	600	20	$6,376,893	$1,045,913	$884,527
4.00%	2.00%	10 in	0.5 in	600	40	$6,384,492	$1,053,512	$892,126
4.00%	2.00%	10 in	0.5 in	600	60	$6,399,622	$1,068,642	$907,256
4.00%	2.00%	10 in	0.5 in	600	80	$6,419,079	$1,088,099	$926,713
4.00%	2.00%	10 in	0.5 in	650	20	$6,198,698	$867,718	$706,332
4.00%	2.00%	10 in	0.5 in	650	40	$6,208,864	$877,884	$716,498
4.00%	2.00%	10 in	0.5 in	650	60	$6,221,057	$890,077	$728,691
4.00%	2.00%	10 in	0.5 in	650	80	$6,240,140	$909,160	$747,774
4.00%	2.00%	10 in	2 in	450	20	$7,033,709	$1,702,729	$1,541,343
4.00%	2.00%	10 in	2 in	450	40	$7,041,453	$1,710,473	$1,549,087
4.00%	2.00%	10 in	2 in	450	60	$7,057,525	$1,726,545	$1,565,159
4.00%	2.00%	10 in	2 in	450	80	$7,082,222	$1,751,242	$1,589,856
4.00%	2.00%	10 in	2 in	500	20	$6,855,107	$1,524,127	$1,362,741
4.00%	2.00%	10 in	2 in	500	40	$6,861,190	$1,530,210	$1,368,824
4.00%	2.00%	10 in	2 in	500	60	$6,869,660	$1,538,680	$1,377,294
4.00%	2.00%	10 in	2 in	500	80	$6,883,898	$1,552,918	$1,391,532
4.00%	2.00%	10 in	2 in	550	20	$6,677,954	$1,346,974	$1,185,588

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	2.00%	10 in	2 in	550	40	$6,682,324	$1,351,344	$1,189,958
4.00%	2.00%	10 in	2 in	550	60	$6,690,636	$1,359,656	$1,198,270
4.00%	2.00%	10 in	2 in	550	80	$6,702,730	$1,371,750	$1,210,364
4.00%	2.00%	10 in	2 in	600	20	$6,480,276	$1,149,296	$987,910
4.00%	2.00%	10 in	2 in	600	40	$6,484,408	$1,153,428	$992,042
4.00%	2.00%	10 in	2 in	600	60	$6,498,028	$1,167,048	$1,005,662
4.00%	2.00%	10 in	2 in	600	80	$6,513,044	$1,182,064	$1,020,678
4.00%	2.00%	10 in	2 in	650	20	$6,280,708	$949,728	$788,342
4.00%	2.00%	10 in	2 in	650	40	$6,288,891	$957,911	$796,525
4.00%	2.00%	10 in	2 in	650	60	$6,302,295	$971,315	$809,929
4.00%	2.00%	10 in	2 in	650	80	$6,319,582	$988,602	$827,216
4.00%	5.00%	16 in	0.5 in	450	20	$6,516,865	$1,185,885	$1,024,499
4.00%	5.00%	16 in	0.5 in	450	40	$6,519,993	$1,189,013	$1,027,627
4.00%	5.00%	16 in	0.5 in	450	60	$6,525,018	$1,194,038	$1,032,652
4.00%	5.00%	16 in	0.5 in	450	80	$6,530,620	$1,199,640	$1,038,254
4.00%	5.00%	16 in	0.5 in	500	20	$6,376,534	$1,045,554	$884,168
4.00%	5.00%	16 in	0.5 in	500	40	$6,382,268	$1,051,288	$889,902
4.00%	5.00%	16 in	0.5 in	500	60	$6,387,694	$1,056,714	$895,328
4.00%	5.00%	16 in	0.5 in	500	80	$6,394,243	$1,063,263	$901,877
4.00%	5.00%	16 in	0.5 in	550	20	$6,237,969	$906,989	$745,603
4.00%	5.00%	16 in	0.5 in	550	40	$6,242,428	$911,448	$750,062
4.00%	5.00%	16 in	0.5 in	550	60	$6,247,958	$916,978	$755,592
4.00%	5.00%	16 in	0.5 in	550	80	$6,254,564	$923,584	$762,198
4.00%	5.00%	16 in	0.5 in	600	20	$6,094,684	$763,704	$602,318
4.00%	5.00%	16 in	0.5 in	600	40	$6,097,974	$766,994	$605,608
4.00%	5.00%	16 in	0.5 in	600	60	$6,102,525	$771,545	$610,159
4.00%	5.00%	16 in	0.5 in	600	80	$6,109,565	$778,585	$617,199
4.00%	5.00%	16 in	0.5 in	650	20	$5,942,345	$611,365	$449,979
4.00%	5.00%	16 in	0.5 in	650	40	$5,949,527	$618,547	$457,161
4.00%	5.00%	16 in	0.5 in	650	60	$5,954,854	$623,874	$462,488
4.00%	5.00%	16 in	0.5 in	650	80	$5,964,019	$633,039	$471,653
4.00%	5.00%	16 in	2 in	450	20	$6,514,446	$1,183,466	$1,022,080
4.00%	5.00%	16 in	2 in	450	40	$6,517,338	$1,186,358	$1,024,972
4.00%	5.00%	16 in	2 in	450	60	$6,523,239	$1,192,259	$1,030,873
4.00%	5.00%	16 in	2 in	450	80	$6,528,802	$1,197,822	$1,036,436
4.00%	5.00%	16 in	2 in	500	20	$6,378,703	$1,047,723	$886,337

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	5.00%	16 in	2 in	500	40	$6,381,611	$1,050,631	$889,245
4.00%	5.00%	16 in	2 in	500	60	$6,387,906	$1,056,926	$895,540
4.00%	5.00%	16 in	2 in	500	80	$6,394,559	$1,063,579	$902,193
4.00%	5.00%	16 in	2 in	550	20	$6,236,517	$905,537	$744,151
4.00%	5.00%	16 in	2 in	550	40	$6,241,248	$910,268	$748,882
4.00%	5.00%	16 in	2 in	550	60	$6,246,116	$915,136	$753,750
4.00%	5.00%	16 in	2 in	550	80	$6,252,847	$921,867	$760,481
4.00%	5.00%	16 in	2 in	600	20	$6,088,693	$757,713	$596,327
4.00%	5.00%	16 in	2 in	600	40	$6,093,062	$762,082	$600,696
4.00%	5.00%	16 in	2 in	600	60	$6,097,569	$766,589	$605,203
4.00%	5.00%	16 in	2 in	600	80	$6,104,496	$773,516	$612,130
4.00%	5.00%	16 in	2 in	650	20	$5,940,590	$609,610	$448,224
4.00%	5.00%	16 in	2 in	650	40	$5,944,637	$613,657	$452,271
4.00%	5.00%	16 in	2 in	650	60	$5,952,383	$621,403	$460,017
4.00%	5.00%	16 in	2 in	650	80	$5,959,998	$629,018	$467,632
4.00%	5.00%	15 in	0.5 in	450	20	$6,579,838	$1,248,858	$1,087,472
4.00%	5.00%	15 in	0.5 in	450	40	$6,581,809	$1,250,829	$1,089,443
4.00%	5.00%	15 in	0.5 in	450	60	$6,585,710	$1,254,730	$1,093,344
4.00%	5.00%	15 in	0.5 in	450	80	$6,591,849	$1,260,869	$1,099,483
4.00%	5.00%	15 in	0.5 in	500	20	$6,441,021	$1,110,041	$948,655
4.00%	5.00%	15 in	0.5 in	500	40	$6,443,705	$1,112,725	$951,339
4.00%	5.00%	15 in	0.5 in	500	60	$6,450,092	$1,119,112	$957,726
4.00%	5.00%	15 in	0.5 in	500	80	$6,457,156	$1,126,176	$964,790
4.00%	5.00%	15 in	0.5 in	550	20	$6,303,164	$972,184	$810,798
4.00%	5.00%	15 in	0.5 in	550	40	$6,308,430	$977,450	$816,064
4.00%	5.00%	15 in	0.5 in	550	60	$6,314,091	$983,111	$821,725
4.00%	5.00%	15 in	0.5 in	550	80	$6,319,505	$988,525	$827,139
4.00%	5.00%	15 in	0.5 in	600	20	$6,162,927	$831,947	$670,561
4.00%	5.00%	15 in	0.5 in	600	40	$6,167,326	$836,346	$674,960
4.00%	5.00%	15 in	0.5 in	600	60	$6,171,392	$840,412	$679,026
4.00%	5.00%	15 in	0.5 in	600	80	$6,177,446	$846,466	$685,080
4.00%	5.00%	15 in	0.5 in	650	20	$6,018,069	$687,089	$525,703
4.00%	5.00%	15 in	0.5 in	650	40	$6,020,994	$690,014	$528,628
4.00%	5.00%	15 in	0.5 in	650	60	$6,026,848	$695,868	$534,482
4.00%	5.00%	15 in	0.5 in	650	80	$6,034,475	$703,495	$542,109
4.00%	5.00%	15 in	2 in	450	20	$6,576,157	$1,245,177	$1,083,791

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	5.00%	15 in	2 in	450	40	$6,579,526	$1,248,546	$1,087,160
4.00%	5.00%	15 in	2 in	450	60	$6,584,908	$1,253,928	$1,092,542
4.00%	5.00%	15 in	2 in	450	80	$6,589,629	$1,258,649	$1,097,263
4.00%	5.00%	15 in	2 in	500	20	$6,440,458	$1,109,478	$948,092
4.00%	5.00%	15 in	2 in	500	40	$6,445,064	$1,114,084	$952,698
4.00%	5.00%	15 in	2 in	500	60	$6,450,899	$1,119,919	$958,533
4.00%	5.00%	15 in	2 in	500	80	$6,456,112	$1,125,132	$963,746
4.00%	5.00%	15 in	2 in	550	20	$6,303,852	$972,872	$811,486
4.00%	5.00%	15 in	2 in	550	40	$6,306,842	$975,862	$814,476
4.00%	5.00%	15 in	2 in	550	60	$6,312,845	$981,865	$820,479
4.00%	5.00%	15 in	2 in	550	80	$6,318,191	$987,211	$825,825
4.00%	5.00%	15 in	2 in	600	20	$6,160,448	$829,468	$668,082
4.00%	5.00%	15 in	2 in	600	40	$6,162,756	$831,776	$670,390
4.00%	5.00%	15 in	2 in	600	60	$6,167,440	$836,460	$675,074
4.00%	5.00%	15 in	2 in	600	80	$6,175,005	$844,025	$682,639
4.00%	5.00%	15 in	2 in	650	20	$6,012,965	$681,985	$520,599
4.00%	5.00%	15 in	2 in	650	40	$6,016,318	$685,338	$523,952
4.00%	5.00%	15 in	2 in	650	60	$6,023,312	$692,332	$530,946
4.00%	5.00%	15 in	2 in	650	80	$6,030,309	$699,329	$537,943
4.00%	5.00%	14 in	0.5 in	450	20	$6,639,531	$1,308,551	$1,147,165
4.00%	5.00%	14 in	0.5 in	450	40	$6,641,785	$1,310,805	$1,149,419
4.00%	5.00%	14 in	0.5 in	450	60	$6,644,974	$1,313,994	$1,152,608
4.00%	5.00%	14 in	0.5 in	450	80	$6,651,731	$1,320,751	$1,159,365
4.00%	5.00%	14 in	0.5 in	500	20	$6,505,227	$1,174,247	$1,012,861
4.00%	5.00%	14 in	0.5 in	500	40	$6,508,602	$1,177,622	$1,016,236
4.00%	5.00%	14 in	0.5 in	500	60	$6,512,762	$1,181,782	$1,020,396
4.00%	5.00%	14 in	0.5 in	500	80	$6,518,630	$1,187,650	$1,026,264
4.00%	5.00%	14 in	0.5 in	550	20	$6,367,832	$1,036,852	$875,466
4.00%	5.00%	14 in	0.5 in	550	40	$6,372,430	$1,041,450	$880,064
4.00%	5.00%	14 in	0.5 in	550	60	$6,378,146	$1,047,166	$885,780
4.00%	5.00%	14 in	0.5 in	550	80	$6,385,204	$1,054,224	$892,838
4.00%	5.00%	14 in	0.5 in	600	20	$6,229,474	$898,494	$737,108
4.00%	5.00%	14 in	0.5 in	600	40	$6,234,100	$903,120	$741,734
4.00%	5.00%	14 in	0.5 in	600	60	$6,239,084	$908,104	$746,718
4.00%	5.00%	14 in	0.5 in	600	80	$6,245,449	$914,469	$753,083
4.00%	5.00%	14 in	0.5 in	650	20	$6,090,171	$759,191	$597,805

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.		**$5,330,980**	**$5,492,366**
4.00%	5.00%	14 in	0.5 in	650	40	$6,092,742	$761,762	$600,376
4.00%	5.00%	14 in	0.5 in	650	60	$6,098,815	$767,835	$606,449
4.00%	5.00%	14 in	0.5 in	650	80	$6,103,896	$772,916	$611,530
4.00%	5.00%	14 in	2 in	450	20	$6,637,636	$1,306,656	$1,145,270
4.00%	5.00%	14 in	2 in	450	40	$6,641,475	$1,310,495	$1,149,109
4.00%	5.00%	14 in	2 in	450	60	$6,645,362	$1,314,382	$1,152,996
4.00%	5.00%	14 in	2 in	450	80	$6,651,309	$1,320,329	$1,158,943
4.00%	5.00%	14 in	2 in	500	20	$6,504,173	$1,173,193	$1,011,807
4.00%	5.00%	14 in	2 in	500	40	$6,507,090	$1,176,110	$1,014,724
4.00%	5.00%	14 in	2 in	500	60	$6,513,534	$1,182,554	$1,021,168
4.00%	5.00%	14 in	2 in	500	80	$6,518,889	$1,187,909	$1,026,523
4.00%	5.00%	14 in	2 in	550	20	$6,368,102	$1,037,122	$875,736
4.00%	5.00%	14 in	2 in	550	40	$6,372,645	$1,041,665	$880,279
4.00%	5.00%	14 in	2 in	550	60	$6,378,351	$1,047,371	$885,985
4.00%	5.00%	14 in	2 in	550	80	$6,384,572	$1,053,592	$892,206
4.00%	5.00%	14 in	2 in	600	20	$6,227,500	$896,520	$735,134
4.00%	5.00%	14 in	2 in	600	40	$6,230,965	$899,985	$738,599
4.00%	5.00%	14 in	2 in	600	60	$6,236,875	$905,895	$744,509
4.00%	5.00%	14 in	2 in	600	80	$6,243,203	$912,223	$750,837
4.00%	5.00%	14 in	2 in	650	20	$6,083,809	$752,829	$591,443
4.00%	5.00%	14 in	2 in	650	40	$6,088,390	$757,410	$596,024
4.00%	5.00%	14 in	2 in	650	60	$6,092,824	$761,844	$600,458
4.00%	5.00%	14 in	2 in	650	80	$6,099,568	$768,588	$607,202
4.00%	5.00%	13 in	0.5 in	450	20	$6,697,457	$1,366,477	$1,205,091
4.00%	5.00%	13 in	0.5 in	450	40	$6,700,707	$1,369,727	$1,208,341
4.00%	5.00%	13 in	0.5 in	450	60	$6,705,069	$1,374,089	$1,212,703
4.00%	5.00%	13 in	0.5 in	450	80	$6,711,283	$1,380,303	$1,218,917
4.00%	5.00%	13 in	0.5 in	500	20	$6,568,680	$1,237,700	$1,076,314
4.00%	5.00%	13 in	0.5 in	500	40	$6,571,610	$1,240,630	$1,079,244
4.00%	5.00%	13 in	0.5 in	500	60	$6,575,174	$1,244,194	$1,082,808
4.00%	5.00%	13 in	0.5 in	500	80	$6,580,721	$1,249,741	$1,088,355
4.00%	5.00%	13 in	0.5 in	550	20	$6,432,231	$1,101,251	$939,865
4.00%	5.00%	13 in	0.5 in	550	40	$6,435,333	$1,104,353	$942,967
4.00%	5.00%	13 in	0.5 in	550	60	$6,441,392	$1,110,412	$949,026
4.00%	5.00%	13 in	0.5 in	550	80	$6,447,506	$1,116,526	$955,140
4.00%	5.00%	13 in	0.5 in	600	20	$6,294,177	$963,197	$801,811

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	5.00%	13 in	0.5 in	600	40	$6,298,453	$967,473	$806,087
4.00%	5.00%	13 in	0.5 in	600	60	$6,304,508	$973,528	$812,142
4.00%	5.00%	13 in	0.5 in	600	80	$6,311,281	$980,301	$818,915
4.00%	5.00%	13 in	0.5 in	650	20	$6,158,452	$827,472	$666,086
4.00%	5.00%	13 in	0.5 in	650	40	$6,162,653	$831,673	$670,287
4.00%	5.00%	13 in	0.5 in	650	60	$6,166,865	$835,885	$674,499
4.00%	5.00%	13 in	0.5 in	650	80	$6,173,018	$842,038	$680,652
4.00%	5.00%	13 in	2 in	450	20	$6,707,203	$1,376,223	$1,214,837
4.00%	5.00%	13 in	2 in	450	40	$6,708,685	$1,377,705	$1,216,319
4.00%	5.00%	13 in	2 in	450	60	$6,714,522	$1,383,542	$1,222,156
4.00%	5.00%	13 in	2 in	450	80	$6,724,068	$1,393,088	$1,231,702
4.00%	5.00%	13 in	2 in	500	20	$6,570,305	$1,239,325	$1,077,939
4.00%	5.00%	13 in	2 in	500	40	$6,573,338	$1,242,358	$1,080,972
4.00%	5.00%	13 in	2 in	500	60	$6,578,144	$1,247,164	$1,085,778
4.00%	5.00%	13 in	2 in	500	80	$6,584,809	$1,253,829	$1,092,443
4.00%	5.00%	13 in	2 in	550	20	$6,433,970	$1,102,990	$941,604
4.00%	5.00%	13 in	2 in	550	40	$6,439,679	$1,108,699	$947,313
4.00%	5.00%	13 in	2 in	550	60	$6,444,190	$1,113,210	$951,824
4.00%	5.00%	13 in	2 in	550	80	$6,449,704	$1,118,724	$957,338
4.00%	5.00%	13 in	2 in	600	20	$6,294,381	$963,401	$802,015
4.00%	5.00%	13 in	2 in	600	40	$6,298,603	$967,623	$806,237
4.00%	5.00%	13 in	2 in	600	60	$6,303,928	$972,948	$811,562
4.00%	5.00%	13 in	2 in	600	80	$6,310,115	$979,135	$817,749
4.00%	5.00%	13 in	2 in	650	20	$6,156,008	$825,028	$663,642
4.00%	5.00%	13 in	2 in	650	40	$6,158,496	$827,516	$666,130
4.00%	5.00%	13 in	2 in	650	60	$6,162,827	$831,847	$670,461
4.00%	5.00%	13 in	2 in	650	80	$6,169,464	$838,484	$677,098
4.00%	5.00%	12 in	0.5 in	450	20	$6,759,025	$1,428,045	$1,266,659
4.00%	5.00%	12 in	0.5 in	450	40	$6,763,189	$1,432,209	$1,270,823
4.00%	5.00%	12 in	0.5 in	450	60	$6,771,355	$1,440,375	$1,278,989
4.00%	5.00%	12 in	0.5 in	450	80	$6,781,964	$1,450,984	$1,289,598
4.00%	5.00%	12 in	0.5 in	500	20	$6,629,977	$1,298,997	$1,137,611
4.00%	5.00%	12 in	0.5 in	500	40	$6,632,114	$1,301,134	$1,139,748
4.00%	5.00%	12 in	0.5 in	500	60	$6,636,276	$1,305,296	$1,143,910
4.00%	5.00%	12 in	0.5 in	500	80	$6,644,363	$1,313,383	$1,151,997
4.00%	5.00%	12 in	0.5 in	550	20	$6,495,553	$1,164,573	$1,003,187

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	5.00%	12 in	0.5 in	550	40	$6,499,651	$1,168,671	$1,007,285
4.00%	5.00%	12 in	0.5 in	550	60	$6,503,975	$1,172,995	$1,011,609
4.00%	5.00%	12 in	0.5 in	550	80	$6,511,299	$1,180,319	$1,018,933
4.00%	5.00%	12 in	0.5 in	600	20	$6,359,494	$1,028,514	$867,128
4.00%	5.00%	12 in	0.5 in	600	40	$6,363,572	$1,032,592	$871,206
4.00%	5.00%	12 in	0.5 in	600	60	$6,369,462	$1,038,482	$877,096
4.00%	5.00%	12 in	0.5 in	600	80	$6,374,310	$1,043,330	$881,944
4.00%	5.00%	12 in	0.5 in	650	20	$6,225,365	$894,385	$732,999
4.00%	5.00%	12 in	0.5 in	650	40	$6,228,932	$897,952	$736,566
4.00%	5.00%	12 in	0.5 in	650	60	$6,233,939	$902,959	$741,573
4.00%	5.00%	12 in	0.5 in	650	80	$6,240,547	$909,567	$748,181
4.00%	5.00%	12 in	2 in	450	20	$6,798,284	$1,467,304	$1,305,918
4.00%	5.00%	12 in	2 in	450	40	$6,803,193	$1,472,213	$1,310,827
4.00%	5.00%	12 in	2 in	450	60	$6,808,373	$1,477,393	$1,316,007
4.00%	5.00%	12 in	2 in	450	80	$6,818,846	$1,487,866	$1,326,480
4.00%	5.00%	12 in	2 in	500	20	$6,650,699	$1,319,719	$1,158,333
4.00%	5.00%	12 in	2 in	500	40	$6,653,502	$1,322,522	$1,161,136
4.00%	5.00%	12 in	2 in	500	60	$6,659,837	$1,328,857	$1,167,471
4.00%	5.00%	12 in	2 in	500	80	$6,670,190	$1,339,210	$1,177,824
4.00%	5.00%	12 in	2 in	550	20	$6,508,563	$1,177,583	$1,016,197
4.00%	5.00%	12 in	2 in	550	40	$6,511,177	$1,180,197	$1,018,811
4.00%	5.00%	12 in	2 in	550	60	$6,517,573	$1,186,593	$1,025,207
4.00%	5.00%	12 in	2 in	550	80	$6,525,328	$1,194,348	$1,032,962
4.00%	5.00%	12 in	2 in	600	20	$6,365,043	$1,034,063	$872,677
4.00%	5.00%	12 in	2 in	600	40	$6,371,664	$1,040,684	$879,298
4.00%	5.00%	12 in	2 in	600	60	$6,376,643	$1,045,663	$884,277
4.00%	5.00%	12 in	2 in	600	80	$6,382,518	$1,051,538	$890,152
4.00%	5.00%	12 in	2 in	650	20	$6,225,472	$894,492	$733,106
4.00%	5.00%	12 in	2 in	650	40	$6,228,693	$897,713	$736,327
4.00%	5.00%	12 in	2 in	650	60	$6,236,023	$905,043	$743,657
4.00%	5.00%	12 in	2 in	650	80	$6,242,584	$911,604	$750,218
4.00%	5.00%	11 in	0.5 in	450	20	$6,848,023	$1,517,043	$1,355,657
4.00%	5.00%	11 in	0.5 in	450	40	$6,853,585	$1,522,605	$1,361,219
4.00%	5.00%	11 in	0.5 in	450	60	$6,865,725	$1,534,745	$1,373,359
4.00%	5.00%	11 in	0.5 in	450	80	$6,882,301	$1,551,321	$1,389,935
4.00%	5.00%	11 in	0.5 in	500	20	$6,696,987	$1,366,007	$1,204,621

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	5.00%	11 in	0.5 in	500	40	$6,702,001	$1,371,021	$1,209,635
4.00%	5.00%	11 in	0.5 in	500	60	$6,713,849	$1,382,869	$1,221,483
4.00%	5.00%	11 in	0.5 in	500	80	$6,726,326	$1,395,346	$1,233,960
4.00%	5.00%	11 in	0.5 in	550	20	$6,562,887	$1,231,907	$1,070,521
4.00%	5.00%	11 in	0.5 in	550	40	$6,566,259	$1,235,279	$1,073,893
4.00%	5.00%	11 in	0.5 in	550	60	$6,571,711	$1,240,731	$1,079,345
4.00%	5.00%	11 in	0.5 in	550	80	$6,580,867	$1,249,887	$1,088,501
4.00%	5.00%	11 in	0.5 in	600	20	$6,423,996	$1,093,016	$931,630
4.00%	5.00%	11 in	0.5 in	600	40	$6,427,347	$1,096,367	$934,981
4.00%	5.00%	11 in	0.5 in	600	60	$6,433,581	$1,102,601	$941,215
4.00%	5.00%	11 in	0.5 in	600	80	$6,440,570	$1,109,590	$948,204
4.00%	5.00%	11 in	0.5 in	650	20	$6,290,584	$959,604	$798,218
4.00%	5.00%	11 in	0.5 in	650	40	$6,294,819	$963,839	$802,453
4.00%	5.00%	11 in	0.5 in	650	60	$6,300,504	$969,524	$808,138
4.00%	5.00%	11 in	0.5 in	650	80	$6,306,494	$975,514	$814,128
4.00%	5.00%	11 in	2 in	450	20	$6,926,163	$1,595,183	$1,433,797
4.00%	5.00%	11 in	2 in	450	40	$6,930,235	$1,599,255	$1,437,869
4.00%	5.00%	11 in	2 in	450	60	$6,939,851	$1,608,871	$1,447,485
4.00%	5.00%	11 in	2 in	450	80	$6,952,705	$1,621,725	$1,460,339
4.00%	5.00%	11 in	2 in	500	20	$6,766,871	$1,435,891	$1,274,505
4.00%	5.00%	11 in	2 in	500	40	$6,770,085	$1,439,105	$1,277,719
4.00%	5.00%	11 in	2 in	500	60	$6,778,005	$1,447,025	$1,285,639
4.00%	5.00%	11 in	2 in	500	80	$6,788,114	$1,457,134	$1,295,748
4.00%	5.00%	11 in	2 in	550	20	$6,610,787	$1,279,807	$1,118,421
4.00%	5.00%	11 in	2 in	550	40	$6,613,158	$1,282,178	$1,120,792
4.00%	5.00%	11 in	2 in	550	60	$6,621,539	$1,290,559	$1,129,173
4.00%	5.00%	11 in	2 in	550	80	$6,631,156	$1,300,176	$1,138,790
4.00%	5.00%	11 in	2 in	600	20	$6,457,511	$1,126,531	$965,145
4.00%	5.00%	11 in	2 in	600	40	$6,461,730	$1,130,750	$969,364
4.00%	5.00%	11 in	2 in	600	60	$6,467,812	$1,136,832	$975,446
4.00%	5.00%	11 in	2 in	600	80	$6,475,643	$1,144,663	$983,277
4.00%	5.00%	11 in	2 in	650	20	$6,309,112	$978,132	$816,746
4.00%	5.00%	11 in	2 in	650	40	$6,313,821	$982,841	$821,455
4.00%	5.00%	11 in	2 in	650	60	$6,319,041	$988,061	$826,675
4.00%	5.00%	11 in	2 in	650	80	$6,325,429	$994,449	$833,063
4.00%	5.00%	10 in	0.5 in	450	20	$6,991,731	$1,660,751	$1,499,365

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	5.00%	10 in	0.5 in	450	40	$6,998,029	$1,667,049	$1,505,663
4.00%	5.00%	10 in	0.5 in	450	60	$7,009,763	$1,678,783	$1,517,397
4.00%	5.00%	10 in	0.5 in	450	80	$7,033,104	$1,702,124	$1,540,738
4.00%	5.00%	10 in	0.5 in	500	20	$6,819,994	$1,489,014	$1,327,628
4.00%	5.00%	10 in	0.5 in	500	40	$6,827,939	$1,496,959	$1,335,573
4.00%	5.00%	10 in	0.5 in	500	60	$6,841,716	$1,510,736	$1,349,350
4.00%	5.00%	10 in	0.5 in	500	80	$6,856,891	$1,525,911	$1,364,525
4.00%	5.00%	10 in	0.5 in	550	20	$6,652,979	$1,321,999	$1,160,613
4.00%	5.00%	10 in	0.5 in	550	40	$6,659,309	$1,328,329	$1,166,943
4.00%	5.00%	10 in	0.5 in	550	60	$6,672,046	$1,341,066	$1,179,680
4.00%	5.00%	10 in	0.5 in	550	80	$6,687,805	$1,356,825	$1,195,439
4.00%	5.00%	10 in	0.5 in	600	20	$6,498,192	$1,167,212	$1,005,826
4.00%	5.00%	10 in	0.5 in	600	40	$6,503,694	$1,172,714	$1,011,328
4.00%	5.00%	10 in	0.5 in	600	60	$6,513,511	$1,182,531	$1,021,145
4.00%	5.00%	10 in	0.5 in	600	80	$6,528,366	$1,197,386	$1,036,000
4.00%	5.00%	10 in	0.5 in	650	20	$6,358,897	$1,027,917	$866,531
4.00%	5.00%	10 in	0.5 in	650	40	$6,363,890	$1,032,910	$871,524
4.00%	5.00%	10 in	0.5 in	650	60	$6,370,504	$1,039,524	$878,138
4.00%	5.00%	10 in	0.5 in	650	80	$6,378,993	$1,048,013	$886,627
4.00%	5.00%	10 in	2 in	450	20	$7,102,598	$1,771,618	$1,610,232
4.00%	5.00%	10 in	2 in	450	40	$7,108,193	$1,777,213	$1,615,827
4.00%	5.00%	10 in	2 in	450	60	$7,123,059	$1,792,079	$1,630,693
4.00%	5.00%	10 in	2 in	450	80	$7,147,378	$1,816,398	$1,655,012
4.00%	5.00%	10 in	2 in	500	20	$6,923,365	$1,592,385	$1,430,999
4.00%	5.00%	10 in	2 in	500	40	$6,928,347	$1,597,367	$1,435,981
4.00%	5.00%	10 in	2 in	500	60	$6,936,394	$1,605,414	$1,444,028
4.00%	5.00%	10 in	2 in	500	80	$6,948,287	$1,617,307	$1,455,921
4.00%	5.00%	10 in	2 in	550	20	$6,760,646	$1,429,666	$1,268,280
4.00%	5.00%	10 in	2 in	550	40	$6,766,374	$1,435,394	$1,274,008
4.00%	5.00%	10 in	2 in	550	60	$6,772,387	$1,441,407	$1,280,021
4.00%	5.00%	10 in	2 in	550	80	$6,780,821	$1,449,841	$1,288,455
4.00%	5.00%	10 in	2 in	600	20	$6,596,959	$1,265,979	$1,104,593
4.00%	5.00%	10 in	2 in	600	40	$6,599,774	$1,268,794	$1,107,408
4.00%	5.00%	10 in	2 in	600	60	$6,609,166	$1,278,186	$1,116,800
4.00%	5.00%	10 in	2 in	600	80	$6,620,451	$1,289,471	$1,128,085
4.00%	5.00%	10 in	2 in	650	20	$6,433,992	$1,103,012	$941,626

TABLE
(Continued)

Air Content		Thickness		Strength		LCC	Comparison 1 (15-in slab)	Comparison 2 (12-in slab)
Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		**$5,330,980**	**$5,492,366**
4.00%	5.00%	10 in	2 in	650	40	$6,439,461	$1,108,481	$947,095
4.00%	5.00%	10 in	2 in	650	60	$6,446,076	$1,115,096	$953,710
4.00%	5.00%	10 in	2 in	650	80	$6,455,682	$1,124,702	$963,316

APPENDIX C. QRSS INPUT1 DATA FOR STUDYING

No.	Input			Value
1	Agency Name			INDOT
2	Project ID			–
3	Project Name			–
4	Analysis Date			–
5	Operator's Name			–
6	Mode	Mix Design		
		Pay Performance Factors		Check
7	Design Speed (mph)			40
8	Design Life (yrs)			9
9	Design ESALs	Year 1 Daily ESALs (Design Lane)		350
10		Annual Growth Rate 'r' (%)		1.0
11		Total ESALs		1,202,804
12	Material Properties	AC Surface	Thickness (in)	1.5
13			Characterization Option	Job Mix Formula with Predicted Property Models
14			Input	See Input No. 32-57
15		AC Binder	Thickness (in)	5
16			Characterization Option	Job Mix Formula with Predicted Property Models
17			Input	See Input No. 58-83
18		AC Base	Thickness (in)	–
19			Characterization Option	–
20			Input	–
21		Base	Thickness (in)	7
22			Mr (psi)	100000
23		Subbase	Thickness (in)	–
24			Mr (psi)	–
25		Subgrade	Mr (psi)	5000
26	Desired Distress	AC Surface	Rutting	Check
27			Thermal Fracture	–
28			IRI	Check
29		AC Binder	Rutting	Check
30		AC Base	Rutting	–
31			Fatigue Cracking	–
32	(AC 1) Design Volumetrics	Air Voids (%)		4.0
33		Asphalt Content by Weight (%)		4.7
34	(AC 1) Binder Characteristics	Binder Type		PG76-22
35		Direct Input	A (RTFO)	9.715
			VTS (RTFO)	-3.208
			Gb	1.030

TABLE
(Continued)

No.	Input			Value
36	(AC 1) Target In-Situ Volumetrics	Air Voids – Va (%)		8.0
37		Gsb		2.672
38		Maximum Theoretical Specific Gravity (Gmm)		2.450
39		Bulk Density – Gmb		2.254
40		Asphalt Content by Weight (%)		4.7
41		Effective Binder Content by Volume – Vbeff (%)		11.608
42		VMA (%)		19.6
43		VFA (%)		59.2
44	(AC 1) TargetAggregate Gradation	1 1/2″		–
45		1″		–
46		3/4″		92
47		1/2″		–
48		3/8″		53
49		#4		34
50		#8		–
51		#10		–
52		#16		–
53		#30		–
54		#40		–
55		#50		–
56		#100		–
57		#200		4.1
58	(AC 2) Design Volumetrics	Air Voids (%)		4.0
59		Asphalt Content by Weight (%)		4.7
60	(AC 2) Binder Characteristics	Binder Type		AC 20
61		Direct Input	A (RTFO)	10.771
			VTS (RTFO)	-3.602
			Gb	1.030
62	(AC 2) Target In-Situ Volumetrics	Air Voids – Va (%)		6.0
63		Gsb		2.613
64		Maximum Theoretical Specific Gravity (Gmm)		2.450
65		Bulk Density – Gmb		2.303
66		Asphalt Content by Weight (%)		4.7
67		Effective Binder Content by Volume – Vbeff (%)		10.006
68		VMA (%)		16.0
69		VFA (%)		62.5

TABLE
(Continued)

No.	Input		Value
70	(AC 2) Aggregate Gradation	1 1/2″	–
71		1″	–
72		3/4″	97
73		1/2″	–
74		3/8″	69
75		#4	43
76		#8	–
77		#10	–
78		#16	–
79		#30	–
80		#40	–
81		#50	–
82		#100	–
83		#200	2
84	Positioning	Longitude (degrees.mins)	-85.792
85		Latitude (degress.mins)	41.527
86		Elevation (ft)	825
87		Mean Annual Air Temp. (F)	49.26
88		Mean Monthly Air Temp. St. Dev. (F)	17.05
89		Mean Annual Wind Speed (mph)	7.89
90		Mean Annual Sunshine (%)	56.52
91		Annual Cum. Rainfall Depth (in)	30.59
92	Average Allowable Distress Value	AC Rutting (in)	0.75
93		Fatigue Cracking (%)	–
94		Thermal Fracture (ft/mile)	–
95	SPT Recommend Frequency (HZ)		25
96	Max Bonus, Y1 (%) / Rutting		110
97	Max Penalty, Y2 (%) / Rutting		70
98	Max PLD, X1 (yr) / Rutting		6
99	Max PLD, X2 (yr) / Rutting		-5
100	PLD for No Bonus, X3 (yr) / Rutting		2
101	PLD for No Bonus, X4 (yr) / Rutting		-2
102	PLD for Remove / Replace, X5 (yr) / Rutting		-7
103	Max Bonus, Y1 (%) / IRI		0
104	Max Penalty, Y2 (%) / IRI		0
105	Min IRI, X1 (in/mile) / IRI		30
106	Min IRI, X2 (in/mile) / IRI		80
107	IRI for No Bonus, X3 (in/mile)		60
108	IRI for No Penalty, X4 (in/mile)		70
109	IRI for Corrective Action, X5 (in/mile)		95

TABLE
(Continued)

No.	Input		Value
110	Historical Standard Deviation for AC1 Rutting	Total Thickness	0.891
111		Layer Thickness	0.723
112		Air Voids – Va (%)	0.690
113		Retained ¾	0.830
114		Retained 3/8	3.100
115		Retained #4	3.330
116		Passing #200	0.530
117		Asphalt Content by Weight (%)	0.220
118		Bulk Density – Gmb	0.011
119		Gmm	0.011
120		Gsb	0.015
121	Historical Standard Deviation for AC2 Rutting	Total Thickness	0.891
122		Layer Thickness	0.723
123		Air Voids – Va (%)	0.690
124		Retained ¾	0.830
125		Retained 3/8	3.100
126		Retained #4	3.330
127		Passing #200	0.530
128		Asphalt Content by Weight (%)	0.220
129		Bulk Density – Gmb	0.011
130		Gmm	0.011
131		Gsb	0.015
132	General Information for AC1	Constant Tonnage	600
133		Lots	5
134	(AC 1) In-SituAggregate Gradation	1-1/2″	–
135		1″	–
136		3/4″	92
137		1/2″	–
138		3/8″	53
139		#4	34
140		#8	–
141		#10	–
142		#16	–
143		#30	–
144		#40	–
145		#50	–
146		#100	–
147		#200	4.1
148	(AC 1) In-Situ Volumetrics	Asphalt Content by Weight (%)	4.7
149		Maximum Theoretical Specific Gravity (Gmm)	2.450
150		In-Situ Bulk Density (PCF)	140.650
151		In-Situ Air Voids (%)	8.0
152		Thickness (inch)	1.5
153		Gsb	2.672

TABLE
(Continued)

No.	Input		Value
154	General Information for AC2	Constant Tonnage	600
155		Lots	5
156	(AC 2) In-SituAggregate Gradation	1-1/2″	–
157		1″	–
158		3/4″	97
159		1/2″	–
160		3/8″	69
161		#4	43
162		#8	–
163		#10	–
164		#16	–
165		#30	–
166		#40	–
167		#50	–
168		#100	–
169		#200	2
170	(AC 2) In-Situ Volumetrics	Asphalt Content by Weight (%)	4.7
171		Maximum Theoretical Specific Gravity (Gmm)	2.450
172		In-Situ Bulk Density (PCF)	143.707
173		In-Situ Air Voids (%)	6.0
174		Thickness (inch)	5.0
175		Gsb	2.613

Target		Sample	Samples						Standard		Service Life Differences					
Mean	St. Dev.	Number	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean	Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
4.00	0.10	4	3.89	3.96	3.97	4.14	4.05	4.00	0.10	0	-0.060	-0.055	-0.054	-0.042	-0.048	-0.052
4.00	0.20	1	4.20	3.73	4.18	3.92	3.95	4.00	0.20	7	-0.038	-0.071	-0.039	-0.058	-0.056	-0.052
4.00	0.30	14	3.84	4.26	3.72	3.82	4.38	4.00	0.30	16	-0.063	-0.034	-0.072	-0.065	-0.026	-0.052
4.00	0.40	2	3.88	4.40	4.07	3.38	4.27	4.00	0.40	22	-0.061	-0.024	-0.047	-0.097	-0.033	-0.052
4.00	0.50	11	4.12	4.54	3.78	3.25	4.31	4.00	0.50	26	-0.044	-0.015	-0.068	-0.107	-0.030	-0.053
4.00	0.60	10	3.92	4.14	3.80	4.88	3.24	4.00	0.60	28	-0.058	-0.042	-0.066	0.008	-0.107	-0.053
4.00	0.70	24	3.33	4.59	4.51	4.42	3.14	4.00	0.70	28	-0.101	-0.011	-0.017	-0.023	-0.115	-0.053
4.00	0.80	13	4.70	4.35	2.82	4.58	3.53	4.00	0.80	27	-0.004	-0.028	-0.139	-0.012	-0.086	-0.054
4.00	0.90	17	3.97	4.67	2.53	4.77	4.05	4.00	0.90	26	-0.054	-0.006	-0.162	0.001	-0.048	-0.054
4.00	1.00	29	4.20	3.89	3.71	2.72	5.49	4.00	1.00	25	-0.038	-0.060	-0.073	-0.147	0.048	-0.054
4.10	0.10	3	4.15	4.06	4.02	4.01	4.25	4.10	0.10	2	-0.041	-0.048	-0.051	-0.051	-0.034	-0.045
4.10	0.20	7	4.21	4.17	4.31	3.83	3.96	4.10	0.20	16	-0.037	-0.040	-0.030	-0.064	-0.055	-0.045
4.10	0.30	4	4.47	3.79	4.36	3.95	3.94	4.10	0.30	25	-0.019	-0.067	-0.027	-0.056	-0.056	-0.045
4.10	0.40	2	4.61	4.19	3.61	4.30	3.78	4.10	0.40	30	-0.010	-0.039	-0.080	-0.031	-0.068	-0.046
4.10	0.50	21	4.41	3.40	4.73	3.94	4.03	4.10	0.50	32	-0.023	-0.095	-0.002	-0.056	-0.050	-0.045
4.10	0.60	6	3.29	3.98	3.82	4.71	4.68	4.10	0.60	32	-0.104	-0.053	-0.065	-0.003	-0.005	-0.046
4.10	0.70	19	4.89	3.88	4.46	4.23	3.04	4.10	0.70	31	0.009	-0.061	-0.020	-0.036	-0.122	-0.046
4.10	0.80	15	3.31	4.30	3.99	3.54	5.35	4.10	0.80	30	-0.102	-0.031	-0.053	-0.085	0.039	-0.046
4.10	0.90	11	4.58	4.35	4.09	2.58	4.92	4.10	0.90	28	-0.012	-0.028	-0.046	-0.158	0.011	-0.047
4.10	1.00	8	3.67	4.10	5.11	4.96	2.67	4.10	1.00	26	-0.076	-0.045	0.023	0.013	-0.151	-0.047
4.20	0.10	2	4.25	4.13	4.07	4.31	4.24	4.20	0.10	16	-0.034	-0.043	-0.047	-0.030	-0.035	-0.038
4.20	0.20	1	4.40	4.31	4.20	3.87	4.23	4.20	0.20	31	-0.024	-0.030	-0.038	-0.061	-0.036	-0.038
4.20	0.30	13	3.79	4.23	4.01	4.44	4.51	4.20	0.30	37	-0.067	-0.036	-0.051	-0.021	-0.017	-0.038
4.20	0.40	5	4.45	3.61	4.54	4.43	3.96	4.20	0.40	39	-0.021	-0.080	-0.015	-0.022	-0.055	-0.039
4.20	0.50	14	4.12	3.54	4.35	4.08	4.91	4.20	0.50	38	-0.044	-0.085	-0.028	-0.046	0.010	-0.039

TABLE
(Continued)

Target		Sample	Samples						Standard		Service Life Differences					
Mean	St. Dev.	Number	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean	Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
4.20	0.60	22	4.55	3.20	4.46	4.08	4.70	4.20	0.60	37	-0.014	-0.110	-0.020	-0.046	-0.004	-0.039
4.20	0.70	26	4.34	5.13	3.28	4.46	3.79	4.20	0.70	34	-0.028	0.025	-0.104	-0.020	-0.067	-0.039
4.20	0.80	15	5.51	4.02	3.32	4.16	3.99	4.20	0.80	32	0.049	-0.051	-0.101	-0.041	-0.053	-0.039
4.20	0.90	31	3.83	3.38	5.15	5.18	3.46	4.20	0.90	30	-0.064	-0.097	0.026	0.028	-0.091	-0.040
4.20	1.00	14	4.35	2.72	4.15	5.53	4.25	4.20	1.00	28	-0.028	-0.147	-0.041	0.050	-0.034	-0.040
4.30	0.10	9	4.25	4.16	4.41	4.37	4.30	4.30	0.10	50	-0.034	-0.041	-0.023	-0.026	-0.031	-0.031
4.30	0.20	6	4.21	4.16	4.11	4.59	4.41	4.30	0.20	50	-0.037	-0.041	-0.044	-0.011	-0.023	-0.031
4.30	0.30	10	4.30	4.17	4.66	3.88	4.51	4.30	0.30	50	-0.031	-0.040	-0.006	-0.061	-0.017	-0.031
4.30	0.40	8	3.95	3.98	4.42	4.22	4.94	4.30	0.40	48	-0.056	-0.053	-0.023	-0.037	0.012	-0.031
4.30	0.50	3	4.42	5.07	4.23	3.99	3.77	4.30	0.50	45	-0.023	0.021	-0.036	-0.053	-0.068	-0.032
4.30	0.60	2	4.57	5.17	3.66	4.19	3.89	4.30	0.60	41	-0.013	0.027	-0.076	-0.039	-0.060	-0.032
4.30	0.70	8	4.45	4.76	3.41	3.78	5.12	4.30	0.70	37	-0.021	0.000	-0.095	-0.068	0.024	-0.032
4.30	0.80	11	3.71	3.55	5.57	4.41	4.24	4.30	0.80	34	-0.073	-0.084	0.053	-0.023	-0.035	-0.032
4.30	0.90	13	4.92	4.63	3.21	3.48	5.24	4.30	0.90	31	0.011	-0.009	-0.110	-0.089	0.032	-0.033
4.30	1.00	34	3.52	3.69	4.17	6.02	4.12	4.30	1.00	29	-0.087	-0.074	-0.040	0.081	-0.044	-0.033
4.40	0.10	2	4.29	4.36	4.44	4.54	4.36	4.40	0.10	84	-0.032	-0.027	-0.021	-0.015	-0.027	-0.024
4.40	0.20	5	4.43	4.68	4.50	4.17	4.24	4.40	0.20	69	-0.022	-0.005	-0.017	-0.040	-0.035	-0.024
4.40	0.30	17	4.89	4.17	4.21	4.46	4.25	4.40	0.30	62	0.009	-0.040	-0.037	-0.020	-0.034	-0.024
4.40	0.40	1	4.61	4.12	3.85	4.83	4.57	4.40	0.40	56	-0.010	-0.044	-0.063	0.005	-0.013	-0.025
4.40	0.50	7	4.27	4.79	3.58	4.61	4.73	4.40	0.50	50	-0.033	0.002	-0.082	-0.010	-0.002	-0.025
4.40	0.60	12	4.02	3.61	5.15	4.63	4.59	4.40	0.60	44	-0.051	-0.080	0.026	-0.009	-0.011	-0.025
4.40	0.70	17	5.15	4.12	4.91	4.43	3.38	4.40	0.70	40	0.026	-0.044	0.010	-0.022	-0.097	-0.025
4.40	0.80	24	4.59	4.29	5.52	4.29	3.29	4.40	0.80	36	-0.011	-0.032	0.050	-0.032	-0.104	-0.026
4.40	0.90	16	3.89	4.32	5.13	3.23	5.44	4.40	0.90	33	-0.060	-0.030	0.025	-0.108	0.045	-0.026
4.40	1.00	11	3.62	3.24	5.07	5.67	4.40	4.40	1.00	30	-0.079	-0.107	0.021	0.059	-0.024	-0.026
4.50	0.10	11	4.37	4.62	4.43	4.58	4.49	4.50	0.10	98	-0.026	-0.009	-0.022	-0.021	-0.018	-0.019
4.50	0.20	4	4.55	4.58	4.73	4.21	4.42	4.50	0.20	84	-0.014	-0.012	-0.002	-0.037	-0.023	-0.018

TABLE
(Continued)

Target		Sample	Samples						Standard		Service Life Differences					
Mean	St. Dev.	Number	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean	Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
4.50	0.30	6	4.74	4.20	4.24	4.43	4.87	4.50	0.30	72	-0.001	-0.038	-0.035	-0.022	0.008	-0.018
4.50	0.40	3	5.03	4.26	4.04	4.40	4.77	4.50	0.40	62	0.018	-0.034	-0.049	-0.024	0.001	-0.018
4.50	0.50	5	4.49	4.08	4.23	4.33	5.35	4.50	0.50	54	-0.018	-0.046	-0.036	-0.029	0.039	-0.018
4.50	0.60	2	4.69	4.73	3.58	5.19	4.31	4.50	0.60	47	-0.004	-0.002	-0.082	0.028	-0.030	-0.018
4.50	0.70	22	4.68	4.83	5.27	4.29	3.41	4.50	0.70	42	-0.005	0.005	0.034	-0.032	-0.095	-0.019
4.50	0.80	14	4.70	3.37	5.42	4.07	4.95	4.50	0.80	37	-0.004	-0.098	0.043	-0.047	0.013	-0.019
4.50	0.90	15	5.33	4.46	4.03	3.28	5.41	4.50	0.90	34	0.037	-0.020	-0.050	-0.104	0.043	-0.019
4.50	1.00	7	5.23	3.64	5.12	5.29	3.20	4.50	1.00	31	0.031	-0.078	0.024	0.035	-0.110	-0.020
4.60	0.10	5	4.50	4.62	4.58	4.52	4.76	4.60	0.10	100	-0.017	-0.009	-0.012	-0.016	0.000	-0.011
4.60	0.20	4	4.81	4.72	4.30	4.50	4.67	4.60	0.20	93	0.004	-0.002	-0.031	-0.017	-0.006	-0.010
4.60	0.30	6	4.88	4.09	4.60	4.73	4.72	4.60	0.30	79	0.008	-0.046	-0.011	-0.002	-0.002	-0.011
4.60	0.40	3	4.47	4.04	5.12	4.59	4.77	4.60	0.40	67	-0.019	-0.049	0.024	-0.011	0.001	-0.011
4.60	0.50	4	5.02	4.60	4.31	3.94	5.15	4.60	0.50	57	0.017	-0.011	-0.030	-0.056	0.026	-0.011
4.60	0.60	2	4.20	5.49	4.93	4.07	4.32	4.60	0.60	49	-0.038	0.048	0.011	-0.047	-0.030	-0.011
4.60	0.70	5	4.92	3.78	4.36	5.61	4.31	4.60	0.70	43	0.011	-0.068	-0.027	0.055	-0.030	-0.012
4.60	0.80	9	4.93	4.59	3.27	5.36	4.87	4.60	0.80	38	0.011	-0.011	-0.105	0.039	0.008	-0.012
4.60	0.90	19	3.50	5.13	5.72	4.71	3.92	4.60	0.90	34	-0.088	0.025	0.062	-0.003	-0.058	-0.012
4.60	1.00	14	4.72	3.37	4.14	4.69	6.09	4.60	1.00	31	-0.002	-0.098	-0.042	-0.004	0.085	-0.012
4.70	0.10	16	4.82	4.64	4.58	4.77	4.70	4.70	0.10	100	0.004	-0.008	-0.012	0.001	-0.004	-0.004
4.70	0.20	13	4.49	4.79	4.47	4.89	4.85	4.70	0.20	95	-0.018	0.002	-0.019	0.009	0.006	-0.004
4.70	0.30	6	4.28	4.80	4.69	5.11	4.64	4.70	0.30	82	-0.032	0.003	-0.004	0.023	-0.008	-0.004
4.70	0.40	5	5.37	4.72	4.55	4.45	4.39	4.70	0.40	68	0.040	-0.002	-0.014	-0.021	-0.025	-0.004
4.70	0.50	20	4.70	4.43	5.48	4.13	4.76	4.70	0.50	58	-0.004	-0.022	0.047	-0.043	0.000	-0.004
4.70	0.60	3	4.92	4.68	5.48	3.81	4.61	4.70	0.60	50	0.011	-0.005	0.047	-0.066	-0.010	-0.005
4.70	0.70	4	4.12	5.54	4.15	4.29	5.38	4.70	0.70	43	-0.044	0.051	-0.041	-0.032	0.041	-0.005
4.70	0.80	17	5.31	5.04	3.63	5.43	4.07	4.70	0.80	38	0.036	0.019	-0.079	0.044	-0.047	-0.005
4.70	0.90	2	5.24	5.07	5.14	4.94	3.09	4.70	0.90	34	0.032	0.021	0.025	0.012	-0.119	-0.006

TABLE
(Continued)

Target		Sample	Samples						Standard		Service Life Differences					
Mean	St. Dev.	Number	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean	Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
4.70	1.00	24	3.28	6.09	4.82	4.72	4.60	4.70	1.00	31	-0.104	0.085	0.004	-0.002	-0.011	-0.006
4.80	0.10	4	4.64	4.82	4.76	4.85	4.91	4.80	0.10	100	-0.008	0.004	0.000	0.006	0.010	0.002
4.80	0.20	2	4.59	4.63	4.93	5.05	4.79	4.80	0.20	93	-0.011	-0.009	0.011	0.019	0.002	0.002
4.80	0.30	3	4.87	4.78	4.64	4.46	5.25	4.80	0.30	79	0.008	0.002	-0.008	-0.020	0.032	0.003
4.80	0.40	2	4.79	5.45	4.65	4.73	4.36	4.80	0.40	67	0.002	0.045	-0.007	-0.002	-0.027	0.002
4.80	0.50	2	4.97	4.98	4.33	4.26	5.46	4.80	0.50	57	0.014	0.015	-0.029	-0.034	0.046	0.002
4.80	0.60	1	4.62	4.98	4.06	4.67	5.69	4.80	0.60	49	-0.009	0.015	-0.048	-0.006	0.060	0.002
4.80	0.70	20	4.53	4.59	3.89	5.43	5.57	4.80	0.70	43	-0.015	-0.011	-0.060	0.044	0.053	0.002
4.80	0.80	16	4.38	5.76	3.70	4.88	5.28	4.80	0.80	38	-0.026	0.065	-0.073	0.008	0.034	0.002
4.80	0.90	7	5.82	5.61	3.77	4.14	4.66	4.80	0.90	34	0.068	0.055	-0.068	-0.042	-0.006	0.001
4.80	1.00	25	6.04	5.07	4.23	3.43	5.21	4.80	1.00	31	0.082	0.021	-0.036	-0.093	0.030	0.001
4.90	0.10	4	4.90	4.93	4.75	4.93	5.01	4.90	0.10	98	0.010	0.011	0.000	0.011	0.017	0.010
4.90	0.20	10	5.21	4.92	4.68	4.91	4.77	4.90	0.20	84	0.030	0.011	-0.005	0.010	0.001	0.009
4.90	0.30	11	4.51	4.73	5.13	5.24	4.88	4.90	0.30	72	-0.017	-0.002	0.025	0.032	0.008	0.009
4.90	0.40	5	4.72	5.27	5.38	4.49	4.65	4.90	0.40	62	-0.002	0.034	0.041	-0.018	-0.007	0.010
4.90	0.50	6	4.82	5.47	4.55	5.34	4.32	4.90	0.50	54	0.004	0.046	-0.014	0.038	-0.030	0.009
4.90	0.60	2	5.20	4.41	4.56	4.50	5.82	4.90	0.60	47	0.029	-0.023	-0.013	-0.017	0.068	0.009
4.90	0.70	27	5.41	5.02	4.63	3.84	5.61	4.90	0.70	42	0.043	0.017	-0.009	-0.063	0.055	0.009
4.90	0.80	5	5.82	5.72	4.17	4.53	4.27	4.90	0.80	37	0.068	0.062	-0.040	-0.015	-0.033	0.008
4.90	0.90	14	4.52	5.64	4.24	6.06	4.04	4.90	0.90	34	-0.016	0.057	-0.035	0.083	-0.049	0.008
4.90	1.00	13	6.18	4.47	5.75	4.02	4.09	4.90	1.00	31	0.090	-0.019	0.064	-0.051	-0.046	0.008
5.00	0.10	1	4.97	5.12	4.85	4.98	5.06	5.00	0.10	84	0.014	0.024	0.006	0.015	0.020	0.016
5.00	0.20	1	4.94	5.15	5.24	4.91	4.75	5.00	0.20	69	0.012	0.026	0.032	0.010	0.000	0.016
5.00	0.30	2	4.73	5.23	4.64	5.32	5.08	5.00	0.30	62	-0.002	0.031	-0.008	0.037	0.021	0.016
5.00	0.40	24	5.18	5.42	5.24	4.59	4.56	5.00	0.40	56	0.028	0.043	0.032	-0.011	-0.013	0.016
5.00	0.50	10	5.36	5.14	4.62	4.35	5.53	5.00	0.50	50	0.039	0.025	-0.009	-0.028	0.050	0.015
5.00	0.60	12	4.16	4.76	4.89	5.63	5.53	5.00	0.60	44	-0.041	0.000	0.009	0.056	0.050	0.015

TABLE
(Continued)

Target		Sample	Samples						Standard		Service Life Differences					
Mean	St. Dev.	Number	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean	Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
5.00	0.70	22	5.32	4.01	5.43	4.55	5.68	5.00	0.70	40	0.037	-0.051	0.044	-0.014	0.060	0.015
5.00	0.80	14	5.27	5.56	3.60	5.15	5.44	5.00	0.80	36	0.034	0.052	-0.081	0.026	0.045	0.015
5.00	0.90	6	4.51	5.36	4.64	4.12	6.39	5.00	0.90	33	-0.017	0.039	-0.008	-0.041	0.103	0.015
5.00	1.00	16	5.39	5.92	5.80	4.16	3.72	5.00	1.00	30	0.041	0.074	0.067	-0.041	-0.072	0.014
5.10	0.10	5	5.14	5.01	4.98	5.15	5.20	5.10	0.10	50	0.025	0.017	0.015	0.026	0.029	0.022
5.10	0.20	8	5.38	4.96	5.17	4.87	5.11	5.10	0.20	50	0.041	0.013	0.027	0.008	0.023	0.022
5.10	0.30	4	4.85	5.38	4.79	5.02	5.44	5.10	0.30	50	0.006	0.041	0.002	0.017	0.045	0.022
5.10	0.40	2	4.87	5.70	4.84	4.77	5.31	5.10	0.40	48	0.008	0.061	0.006	0.001	0.036	0.022
5.10	0.50	9	4.95	4.92	5.60	4.43	5.58	5.10	0.50	45	0.013	0.011	0.055	-0.022	0.053	0.022
5.10	0.60	8	5.71	4.39	5.40	5.48	4.51	5.10	0.60	41	0.061	-0.025	0.042	0.047	-0.017	0.022
5.10	0.70	3	5.68	4.23	5.41	4.45	5.71	5.10	0.70	37	0.060	-0.036	0.043	-0.021	0.061	0.021
5.10	0.80	14	3.85	4.87	5.75	5.84	5.18	5.10	0.80	34	-0.063	0.008	0.064	0.070	0.028	0.021
5.10	0.90	27	5.41	5.66	5.56	3.51	5.37	5.10	0.90	31	0.043	0.058	0.052	-0.087	0.040	0.021
5.10	1.00	24	5.72	4.28	6.56	4.37	4.59	5.10	1.00	29	0.062	-0.032	0.113	-0.026	-0.011	0.021
5.20	0.10	2	5.24	5.09	5.09	5.23	5.33	5.20	0.10	16	0.032	0.022	0.022	0.031	0.037	0.029
5.20	0.20	3	5.46	5.26	5.21	4.91	5.16	5.20	0.20	31	0.046	0.033	0.030	0.010	0.027	0.029
5.20	0.30	7	5.10	4.86	5.11	5.27	5.66	5.20	0.30	37	0.023	0.007	0.023	0.034	0.058	0.029
5.20	0.40	4	5.53	5.53	4.65	5.38	4.90	5.20	0.40	39	0.050	0.050	-0.007	0.041	0.010	0.029
5.20	0.50	16	4.91	5.14	5.38	5.93	4.62	5.20	0.50	38	0.010	0.025	0.041	0.075	-0.009	0.028
5.20	0.60	5	5.05	5.08	6.16	5.19	4.51	5.20	0.60	37	0.019	0.021	0.089	0.028	-0.017	0.028
5.20	0.70	6	4.67	5.46	6.21	4.43	5.25	5.20	0.70	34	-0.006	0.046	0.092	-0.022	0.032	0.028
5.20	0.80	11	4.60	5.09	5.50	4.42	6.41	5.20	0.80	32	-0.011	0.022	0.048	-0.023	0.104	0.028
5.20	0.90	23	4.95	5.15	6.73	4.41	4.74	5.20	0.90	30	0.013	0.026	0.123	-0.023	-0.001	0.028
5.20	1.00	14	6.03	5.66	5.98	3.75	4.59	5.20	1.00	28	0.081	0.058	0.078	-0.070	-0.011	0.027
5.30	0.10	1	5.32	5.19	5.45	5.26	5.27	5.30	0.10	2	0.037	0.028	0.045	0.033	0.034	0.035
5.30	0.20	4	5.33	5.03	5.47	5.50	5.17	5.30	0.20	16	0.037	0.018	0.046	0.048	0.027	0.035
5.30	0.30	1	5.01	5.39	4.95	5.60	5.55	5.30	0.30	25	0.017	0.041	0.013	0.055	0.051	0.035

TABLE
(Continued)

Target		Sample	Samples						Standard		Service Life Differences					
Mean	St. Dev.	Number	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean	Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
5.30	0.40	7	5.07	4.78	5.38	5.39	5.86	5.30	0.40	30	0.021	0.002	0.041	0.041	0.071	0.035
5.30	0.50	12	6.01	5.18	4.62	5.45	5.26	5.30	0.50	32	0.080	0.028	-0.009	0.045	0.033	0.035
5.30	0.60	19	4.55	5.92	5.62	4.77	5.65	5.30	0.60	32	-0.014	0.074	0.056	0.001	0.058	0.035
5.30	0.70	9	4.90	6.21	5.14	4.45	5.78	5.30	0.70	31	0.010	0.092	0.025	-0.021	0.066	0.034
5.30	0.80	22	4.28	6.25	5.48	4.72	5.79	5.30	0.80	30	-0.032	0.095	0.047	-0.002	0.066	0.035
5.30	0.90	14	6.52	5.79	4.65	5.28	4.27	5.30	0.90	28	0.111	0.066	-0.007	0.034	-0.033	0.034
5.30	1.00	26	5.99	4.32	4.66	4.86	6.69	5.30	1.00	26	0.079	-0.030	-0.006	0.007	0.121	0.034
5.40	0.10	3	5.52	5.24	5.36	5.42	5.44	5.40	0.10	0	0.050	0.032	0.039	0.043	0.045	0.042
5.40	0.20	5	5.72	5.44	5.20	5.36	5.28	5.40	0.20	7	0.062	0.045	0.029	0.039	0.034	0.042
5.40	0.30	1	5.01	5.61	5.72	5.18	5.46	5.40	0.30	16	0.017	0.055	0.062	0.028	0.046	0.042
5.40	0.40	9	5.62	5.37	4.81	5.31	5.88	5.40	0.40	22	0.056	0.040	0.004	0.036	0.072	0.042
5.40	0.50	15	4.93	5.06	5.62	6.17	5.24	5.40	0.50	26	0.011	0.020	0.056	0.090	0.032	0.042
5.40	0.60	12	5.41	4.97	5.13	5.06	6.44	5.40	0.60	28	0.043	0.014	0.025	0.020	0.106	0.042
5.40	0.70	21	6.39	4.70	4.79	5.75	5.39	5.40	0.70	28	0.103	-0.004	0.002	0.064	0.041	0.041
5.40	0.80	24	6.06	5.91	5.70	4.07	5.27	5.40	0.80	27	0.083	0.074	0.061	-0.047	0.034	0.041
5.40	0.90	14	5.92	6.24	4.09	5.91	4.85	5.40	0.90	26	0.074	0.094	-0.046	0.074	0.006	0.040
5.40	1.00	13	4.61	5.01	4.63	6.99	5.77	5.40	1.00	25	-0.010	0.017	-0.009	0.138	0.065	0.040

APPENDIX E. RELATIONSHIPS BETWEEN SERVICE LIFE DIFFERENCES AND PWLS OF ROADWAY CORE DENSITY ANALYSIS RESULTS

Target			Samples													Service Life Differences					
Mean	St. Dev.	Sample Number	Sublot 1-1	Sublot 1-2	Sublot 2-1	Sublot 2-2	Sublot 3-1	Sublot 3-2	Sublot 4-1	Sublot 4-2	Sublot 5-1	Sublot 5-2	Mean	Standard Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
5.50	0.10	1	5.34	5.37	5.47	5.48	5.49	5.51	5.53	5.53	5.60	5.67	5.50	0.10	100	-0.349	-0.335	-0.333	-0.329	-0.318	-0.333
5.50	0.20	7	5.15	5.32	5.34	5.39	5.45	5.56	5.67	5.68	5.68	5.73	5.50	0.20	100	-0.362	-0.348	-0.332	-0.313	-0.310	-0.333
5.50	0.30	1	5.06	5.21	5.25	5.26	5.51	5.51	5.71	5.74	5.77	5.97	5.50	0.30	100	-0.372	-0.359	-0.332	-0.307	-0.291	-0.332
5.50	0.40	11	5.05	5.12	5.22	5.33	5.34	5.37	5.42	5.89	5.99	6.23	5.50	0.40	100	-0.377	-0.357	-0.349	-0.315	-0.262	-0.332
5.50	0.50	9	4.61	4.98	5.13	5.27	5.50	5.56	5.74	5.92	6.09	6.15	5.50	0.50	100	-0.406	-0.365	-0.329	-0.295	-0.261	-0.331
5.50	0.60	6	4.63	5.02	5.04	5.05	5.16	5.52	5.96	6.16	6.19	6.24	5.50	0.60	100	-0.403	-0.381	-0.350	-0.268	-0.249	-0.330
5.50	0.70	21	4.40	4.64	4.84	5.43	5.44	5.55	5.82	6.25	6.26	6.40	5.50	0.70	100	-0.433	-0.371	-0.333	-0.271	-0.235	-0.329
5.50	0.80	5	3.83	4.86	4.95	5.38	5.39	5.67	5.93	6.20	6.33	6.45	5.50	0.80	100	-0.445	-0.369	-0.329	-0.267	-0.227	-0.327
5.50	0.90	16	4.04	4.40	4.97	5.13	5.14	5.81	6.15	6.16	6.40	6.75	5.50	0.90	100	-0.460	-0.381	-0.334	-0.256	-0.204	-0.327
5.50	1.00	3	3.83	4.45	4.89	5.10	5.36	5.37	5.97	6.60	6.72	6.74	5.50	1.00	100	-0.466	-0.387	-0.347	-0.240	-0.183	-0.325
5.50	1.10	18	3.89	4.13	4.35	5.20	5.33	5.95	6.09	6.62	6.62	6.85	5.50	1.10	100	-0.478	-0.406	-0.316	-0.231	-0.183	-0.323
5.50	1.20	29	4.04	4.16	4.27	4.94	5.49	5.68	6.12	6.19	6.19	7.90	5.50	1.20	100	-0.470	-0.424	-0.323	-0.256	-0.133	-0.321
5.50	1.30	3	3.54	4.01	4.53	4.94	4.97	5.83	6.41	6.46	7.02	7.33	5.50	1.30	100	-0.496	-0.412	-0.342	-0.222	-0.124	-0.319
5.50	1.40	28	3.19	4.53	4.66	4.74	5.04	5.24	6.21	6.24	7.26	7.86	5.50	1.40	99	-0.483	-0.416	-0.372	-0.248	-0.069	-0.318
5.50	1.50	6	3.41	3.45	4.67	5.03	5.29	5.45	5.92	6.69	6.85	8.19	5.50	1.50	99	-0.523	-0.401	-0.347	-0.237	-0.070	-0.316
5.50	1.60	16	2.27	4.82	4.87	4.93	4.95	5.66	5.85	5.96	7.69	7.95	5.50	1.60	99	-0.482	-0.396	-0.353	-0.286	-0.030	-0.309
5.50	1.70	4	2.79	3.22	4.96	4.97	5.25	5.25	6.20	7.11	7.11	8.16	5.50	1.70	98	-0.551	-0.389	-0.360	-0.192	-0.056	-0.310
5.50	1.80	12	3.35	3.56	4.75	4.76	4.76	5.19	5.60	5.99	7.92	9.10	5.50	1.80	97	-0.521	-0.410	-0.388	-0.299	0.078	-0.308
5.50	1.90	7	2.63	3.00	4.43	4.79	5.09	5.71	6.01	7.73	7.75	7.89	5.50	1.90	97	-0.562	-0.424	-0.343	-0.156	-0.031	-0.303
5.50	2.00	10	2.92	3.48	3.93	4.45	4.61	5.01	6.70	7.03	8.36	8.46	5.50	2.00	96	-0.545	-0.462	-0.405	-0.166	0.059	-0.304
6.00	0.10	3	5.84	5.89	5.97	5.97	5.98	6.02	6.02	6.07	6.09	6.19	6.00	0.10	100	-0.291	-0.279	-0.275	-0.270	-0.258	-0.275
6.00	0.20	1	5.68	5.75	5.78	5.96	6.01	6.03	6.09	6.20	6.23	6.23	6.00	0.20	100	-0.308	-0.291	-0.273	-0.258	-0.247	-0.275
6.00	0.30	2	5.31	5.83	5.88	5.93	5.93	6.11	6.13	6.21	6.31	6.35	6.00	0.30	100	-0.324	-0.286	-0.273	-0.255	-0.235	-0.275
6.00	0.40	4	5.49	5.61	5.64	5.79	5.89	5.91	6.09	6.30	6.61	6.63	6.00	0.40	100	-0.327	-0.309	-0.287	-0.252	-0.198	-0.275
6.00	0.50	9	5.07	5.60	5.62	5.89	5.92	6.15	6.19	6.20	6.66	6.71	6.00	0.50	100	-0.350	-0.304	-0.271	-0.251	-0.189	-0.273
6.00	0.60	7	5.00	5.44	5.53	5.97	5.99	5.99	6.21	6.22	6.42	7.19	6.00	0.60	100	-0.363	-0.304	-0.276	-0.249	-0.173	-0.273
6.00	0.70	1	5.21	5.29	5.31	5.52	5.86	6.11	6.34	6.47	6.55	7.37	6.00	0.70	100	-0.360	-0.342	-0.277	-0.225	-0.152	-0.271
6.00	0.80	13	5.05	5.15	5.32	5.62	5.67	5.92	6.16	6.79	6.84	7.45	6.00	0.80	100	-0.376	-0.336	-0.299	-0.216	-0.127	-0.271
6.00	0.90	14	4.62	4.98	5.06	5.72	5.96	6.10	6.53	6.86	6.95	7.19	6.00	0.90	100	-0.406	-0.344	-0.272	-0.188	-0.138	-0.270

TABLE
(Continued)

Target			Samples													Service Life Differences					
Mean	St. Dev.	Sample Number	Sublot 1-1	Sublot 1-2	Sublot 2-1	Sublot 2-2	Sublot 3-1	Sublot 3-2	Sublot 4-1	Sublot 4-2	Sublot 5-1	Sublot 5-2	Mean	Standard Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
6.00	1.00	2	4.80	5.19	5.27	5.67	5.69	5.79	6.32	6.39	6.57	8.35	6.00	1.00	100	-0.386	-0.336	-0.306	-0.232	-0.074	-0.267
6.00	1.10	7	4.09	4.97	5.27	5.53	5.82	5.97	6.58	6.98	7.12	7.71	6.00	1.10	100	-0.429	-0.344	-0.288	-0.177	-0.089	-0.265
6.00	1.20	3	3.87	4.49	4.99	5.87	6.14	6.20	6.75	7.02	7.12	7.50	6.00	1.20	99	-0.462	-0.338	-0.255	-0.163	-0.105	-0.265
6.00	1.30	5	3.92	4.28	5.14	5.61	5.84	6.23	6.74	7.04	7.09	8.06	6.00	1.30	99	-0.470	-0.346	-0.271	-0.162	-0.065	-0.263
6.00	1.40	20	4.26	4.52	4.68	5.39	5.48	5.53	6.86	7.70	7.71	7.82	6.00	1.40	98	-0.445	-0.381	-0.332	-0.108	-0.039	-0.261
6.00	1.50	17	3.09	4.73	5.02	5.51	5.69	6.10	6.95	7.41	7.56	7.89	6.00	1.50	98	-0.474	-0.358	-0.287	-0.123	-0.045	-0.257
6.00	1.60	13	4.29	4.31	4.32	4.78	5.51	6.47	6.75	6.76	8.29	8.49	6.00	1.60	97	-0.453	-0.430	-0.274	-0.180	0.056	-0.256
6.00	1.70	25	3.96	4.26	4.29	5.29	5.57	6.23	6.46	6.53	8.66	8.73	6.00	1.70	96	-0.469	-0.404	-0.286	-0.214	0.105	-0.254
6.00	1.80	22	2.51	4.62	4.73	5.19	6.01	6.77	6.81	6.87	7.59	8.85	6.00	1.80	95	-0.492	-0.390	-0.226	-0.169	0.033	-0.249
6.00	1.90	19	2.80	3.71	4.21	5.02	6.69	6.94	7.26	7.62	7.73	8.05	6.00	1.90	94	-0.532	-0.422	-0.172	-0.086	-0.021	-0.247
6.00	2.00	3	3.20	3.31	4.60	5.10	5.77	6.05	7.27	7.46	8.05	9.20	6.00	2.00	93	-0.535	-0.401	-0.286	-0.097	0.096	-0.245
6.50	0.10	4	6.37	6.37	6.43	6.48	6.51	6.51	6.53	6.55	6.58	6.69	6.50	0.10	100	-0.230	-0.219	-0.212	-0.208	-0.196	-0.213
6.50	0.20	2	6.17	6.25	6.28	6.43	6.52	6.61	6.61	6.67	6.68	6.76	6.50	0.20	100	-0.250	-0.232	-0.205	-0.195	-0.185	-0.213
6.50	0.30	3	6.13	6.16	6.29	6.30	6.42	6.53	6.59	6.71	6.92	6.96	6.50	0.30	100	-0.258	-0.239	-0.217	-0.194	-0.156	-0.213
6.50	0.40	9	5.74	6.17	6.24	6.34	6.48	6.61	6.65	6.67	7.03	7.06	6.50	0.40	100	-0.280	-0.240	-0.208	-0.193	-0.141	-0.212
6.50	0.50	6	5.96	6.01	6.07	6.22	6.37	6.41	6.68	6.69	7.23	7.39	6.50	0.50	100	-0.277	-0.258	-0.227	-0.189	-0.105	-0.211
6.50	0.60	7	5.41	5.62	6.01	6.63	6.67	6.73	6.83	6.84	7.01	7.20	6.50	0.60	100	-0.331	-0.235	-0.187	-0.170	-0.133	-0.211
6.50	0.70	11	5.31	5.70	5.74	6.30	6.77	6.84	6.89	6.92	7.14	7.38	6.50	0.70	100	-0.332	-0.272	-0.174	-0.160	-0.112	-0.210
6.50	0.80	16	5.41	5.47	5.80	5.87	6.70	6.77	6.79	7.23	7.47	7.50	6.50	0.80	100	-0.339	-0.295	-0.183	-0.146	-0.080	-0.209
6.50	0.90	24	4.74	5.71	5.85	6.14	6.62	6.73	6.91	7.33	7.37	7.64	6.50	0.90	100	-0.360	-0.276	-0.191	-0.131	-0.077	-0.207
6.50	1.00	3	4.94	5.14	5.72	6.18	6.64	6.76	6.99	7.05	7.79	7.82	6.50	1.00	99	-0.382	-0.281	-0.188	-0.145	-0.033	-0.206
6.50	1.10	15	4.44	5.48	6.10	6.30	6.35	6.72	6.90	6.96	7.14	8.65	6.50	1.10	99	-0.387	-0.251	-0.209	-0.157	-0.014	-0.204
6.50	1.20	11	4.58	5.41	5.45	5.90	6.41	6.60	6.72	7.67	7.91	8.30	6.50	1.20	98	-0.384	-0.313	-0.213	-0.119	0.012	-0.203
6.50	1.30	9	3.95	5.32	5.88	5.97	6.53	6.72	6.72	7.89	7.90	8.14	6.50	1.30	97	-0.415	-0.284	-0.197	-0.102	-0.001	-0.200
6.50	1.40	32	4.05	5.12	5.79	6.01	6.18	6.32	7.37	7.66	7.80	8.74	6.50	1.40	96	-0.423	-0.287	-0.245	-0.076	0.039	-0.198
6.50	1.50	17	3.64	5.05	5.54	6.14	6.29	6.95	7.02	7.55	8.37	8.42	6.50	1.50	95	-0.441	-0.293	-0.197	-0.108	0.057	-0.196
6.50	1.60	6	4.59	4.65	4.85	5.77	5.83	6.80	7.28	7.82	8.37	8.99	6.50	1.60	94	-0.423	-0.351	-0.234	-0.070	0.057	-0.204
6.50	1.70	23	4.54	4.57	4.57	5.92	6.15	6.29	7.34	7.93	8.26	9.38	6.50	1.70	93	-0.430	-0.354	-0.248	-0.056	0.128	-0.192
6.50	1.80	12	4.57	4.71	5.13	5.50	6.19	6.49	7.02	7.23	7.49	10.67	6.50	1.80	92	-0.422	-0.353	-0.234	-0.131	0.200	-0.188
6.50	1.90	19	3.91	4.05	4.56	6.23	6.40	7.02	7.07	7.89	7.97	9.85	6.50	1.90	91	-0.480	-0.334	-0.186	-0.079	0.149	-0.186
6.50	2.00	9	3.79	4.03	4.63	5.49	5.97	7.16	8.04	8.05	8.38	9.48	6.50	2.00	89	-0.486	-0.378	-0.201	0.003	0.146	-0.183

TABLE
(Continued)

Target			Samples													Service Life Differences					
Mean	St. Dev.	Sample Number	Sublot 1-1	Sublot 1-2	Sublot 2-1	Sublot 2-2	Sublot 3-1	Sublot 3-2	Sublot 4-1	Sublot 4-2	Sublot 5-1	Sublot 5-2	Mean	Standard Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
7.00	0.10	6	6.81	6.85	6.95	7.01	7.01	7.02	7.04	7.08	7.10	7.13	7.00	0.10	100	-0.170	-0.150	-0.145	-0.139	-0.132	-0.147
7.00	0.20	1	6.64	6.78	6.84	6.86	7.08	7.10	7.14	7.15	7.17	7.19	7.00	0.20	100	-0.186	-0.168	-0.135	-0.128	-0.123	-0.148
7.00	0.30	2	6.68	6.74	6.79	6.84	6.86	6.92	7.05	7.16	7.32	7.66	7.00	0.30	100	-0.186	-0.172	-0.162	-0.133	-0.079	-0.146
7.00	0.40	3	6.31	6.60	6.86	6.89	7.01	7.01	7.02	7.28	7.31	7.75	7.00	0.40	100	-0.219	-0.164	-0.146	-0.127	-0.073	-0.146
7.00	0.50	15	6.22	6.42	6.80	6.87	6.92	7.07	7.08	7.09	7.76	7.78	7.00	0.50	100	-0.236	-0.170	-0.148	-0.136	-0.038	-0.146
7.00	0.60	13	6.14	6.42	6.63	6.63	6.99	7.08	7.11	7.13	7.58	8.25	7.00	0.60	100	-0.228	-0.196	-0.143	-0.131	-0.016	-0.143
7.00	0.70	4	6.30	6.31	6.41	6.61	6.74	6.82	6.96	7.84	7.90	8.13	7.00	0.70	100	-0.238	-0.212	-0.177	-0.090	-0.002	-0.144
7.00	0.80	9	5.87	5.94	6.30	6.52	7.10	7.23	7.51	7.60	7.64	8.25	7.00	0.80	99	-0.286	-0.225	-0.125	-0.070	-0.012	-0.144
7.00	0.90	2	5.14	6.08	6.72	6.90	7.01	7.34	7.39	7.41	7.50	8.48	7.00	0.90	99	-0.318	-0.173	-0.124	-0.092	-0.004	-0.142
7.00	1.00	20	5.72	5.84	5.91	6.51	7.13	7.14	7.23	7.90	8.03	8.63	7.00	1.00	98	-0.301	-0.249	-0.129	-0.068	0.047	-0.140
7.00	1.10	14	5.98	6.03	6.29	6.47	6.55	6.78	7.08	7.14	8.12	9.55	7.00	1.10	97	-0.274	-0.229	-0.192	-0.132	0.132	-0.139
7.00	1.20	11	5.16	5.85	6.33	6.43	6.73	6.86	7.42	7.51	8.71	8.98	7.00	1.20	95	-0.331	-0.229	-0.175	-0.083	0.129	-0.138
7.00	1.30	5	5.41	5.80	6.04	6.18	6.47	7.39	7.45	7.61	7.80	9.84	7.00	1.30	94	-0.321	-0.262	-0.155	-0.073	0.137	-0.135
7.00	1.40	39	4.92	5.20	6.08	6.59	7.10	7.14	7.39	7.51	8.62	9.44	7.00	1.40	92	-0.380	-0.234	-0.131	-0.085	0.161	-0.134
7.00	1.50	14	4.34	5.46	5.85	6.48	6.70	7.45	7.75	8.31	8.64	8.97	7.00	1.50	91	-0.392	-0.254	-0.136	0.001	0.123	-0.132
7.00	1.60	23	4.72	5.03	5.54	6.50	6.59	7.18	7.95	8.50	8.73	9.27	7.00	1.60	89	-0.399	-0.270	-0.163	0.031	0.155	-0.129
7.00	1.70	18	4.59	5.02	5.14	6.70	6.87	7.53	7.65	7.78	9.13	9.61	7.00	1.70	88	-0.405	-0.277	-0.119	-0.047	0.217	-0.126
7.00	1.80	24	5.03	5.98	6.00	6.09	6.16	6.56	6.97	7.80	7.89	11.47	7.00	1.80	87	-0.330	-0.270	-0.231	-0.093	0.312	-0.122
7.00	1.90	10	4.41	5.10	5.44	6.56	6.66	6.77	6.88	8.20	9.66	10.27	7.00	1.90	85	-0.409	-0.272	-0.186	-0.068	0.323	-0.122
7.00	2.00	7	4.44	4.73	5.10	5.95	6.09	7.84	8.08	8.37	9.34	10.09	7.00	2.00	84	-0.427	-0.328	-0.143	0.030	0.278	-0.118
7.50	0.10	2	7.31	7.39	7.46	7.48	7.49	7.52	7.54	7.55	7.57	7.68	7.50	0.10	100	-0.099	-0.082	-0.077	-0.071	-0.060	-0.078
7.50	0.20	3	7.22	7.24	7.37	7.44	7.47	7.50	7.59	7.60	7.80	7.81	7.50	0.20	100	-0.116	-0.091	-0.080	-0.064	-0.033	-0.077
7.50	0.30	13	7.05	7.33	7.35	7.35	7.37	7.44	7.49	7.64	7.92	8.04	7.50	0.30	100	-0.122	-0.099	-0.091	-0.068	-0.007	-0.077
7.50	0.40	4	6.87	6.88	7.35	7.41	7.45	7.63	7.65	7.72	7.92	8.08	7.50	0.40	100	-0.164	-0.095	-0.072	-0.051	-0.004	-0.077
7.50	0.50	3	6.99	7.05	7.09	7.24	7.26	7.57	7.62	7.68	7.81	8.65	7.50	0.50	100	-0.145	-0.125	-0.090	-0.056	0.032	-0.077
7.50	0.60	21	6.84	6.99	7.11	7.16	7.20	7.30	7.59	7.89	8.23	8.72	7.50	0.60	99	-0.159	-0.129	-0.113	-0.043	0.070	-0.075
7.50	0.70	7	6.11	6.73	7.12	7.31	7.64	7.71	7.71	8.13	8.16	8.35	7.50	0.70	98	-0.223	-0.118	-0.052	-0.016	0.035	-0.075
7.50	0.80	12	5.94	6.88	6.89	7.33	7.35	7.40	8.18	8.25	8.27	8.48	7.50	0.80	97	-0.223	-0.132	-0.095	0.029	0.054	-0.073
7.50	0.90	20	5.91	6.76	6.88	6.98	7.32	7.66	8.03	8.23	8.25	8.94	7.50	0.90	95	-0.233	-0.157	-0.079	0.016	0.089	-0.073
7.50	1.00	12	5.99	6.40	6.94	7.10	7.32	7.37	7.89	8.09	8.43	9.42	7.50	1.00	93	-0.251	-0.145	-0.100	-0.006	0.144	-0.072
7.50	1.10	17	5.36	6.84	7.04	7.17	7.31	7.64	7.86	7.90	8.13	9.70	7.50	1.10	91	-0.256	-0.133	-0.081	-0.022	0.147	-0.069

TABLE
(Continued)

Target			Samples													Service Life Differences					
Mean	St. Dev.	Sample Number	Sublot 1-1	Sublot 1-2	Sublot 2-1	Sublot 2-2	Sublot 3-1	Sublot 3-2	Sublot 4-1	Sublot 4-2	Sublot 5-1	Sublot 5-2	Mean	Standard Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
7.50	1.20	8	6.12	6.18	6.27	6.60	7.00	7.95	8.23	8.45	8.83	9.32	7.50	1.20	89	-0.257	-0.222	-0.079	0.048	0.167	-0.069
7.50	1.30	22	4.46	6.48	7.06	7.30	7.74	7.81	8.28	8.30	8.76	8.79	7.50	1.30	88	-0.321	-0.123	-0.038	0.041	0.118	-0.065
7.50	1.40	29	4.73	6.12	6.61	7.31	7.59	7.62	8.13	8.53	9.01	9.39	7.50	1.40	86	-0.335	-0.152	-0.062	0.047	0.188	-0.063
7.50	1.50	13	5.62	5.90	6.64	6.90	7.21	7.43	7.49	8.09	8.92	10.75	7.50	1.50	84	-0.303	-0.178	-0.103	-0.035	0.308	-0.062
7.50	1.60	11	4.31	5.89	6.85	7.01	7.39	7.69	8.23	8.91	9.31	9.45	7.50	1.60	83	-0.367	-0.157	-0.072	0.085	0.219	-0.058
7.50	1.70	19	5.15	5.96	6.66	6.80	6.91	6.95	7.98	8.07	9.60	10.87	7.50	1.70	81	-0.325	-0.184	-0.157	0.000	0.375	-0.058
7.50	1.80	13	4.45	4.49	6.82	7.46	7.79	7.91	8.51	8.84	8.91	9.79	7.50	1.80	80	-0.438	-0.128	-0.027	0.101	0.215	-0.055
7.50	1.90	20	5.48	5.52	5.69	5.83	6.93	8.08	8.31	8.72	9.64	10.83	7.50	1.90	79	-0.333	-0.303	-0.074	0.076	0.375	-0.052
7.50	2.00	15	5.07	6.10	6.13	6.26	6.75	7.13	8.19	8.31	8.95	12.06	7.50	2.00	77	-0.320	-0.252	-0.156	0.034	0.452	-0.048
8.00	0.10	2	7.86	7.88	7.94	7.94	7.97	8.00	8.02	8.06	8.12	8.17	8.00	0.10	100	-0.023	-0.013	-0.006	0.002	0.018	-0.004
8.00	0.20	2	7.67	7.76	7.90	7.93	7.95	8.04	8.11	8.16	8.25	8.26	8.00	0.20	100	-0.046	-0.017	-0.005	0.017	0.035	-0.003
8.00	0.30	3	7.61	7.61	7.76	7.84	7.92	8.01	8.19	8.26	8.29	8.49	8.00	0.30	100	-0.062	-0.034	-0.009	0.031	0.056	-0.004
8.00	0.40	1	7.33	7.56	7.77	7.80	7.88	8.18	8.23	8.25	8.26	8.69	8.00	0.40	99	-0.086	-0.036	0.000	0.033	0.070	-0.004
8.00	0.50	4	6.90	7.41	7.83	7.96	8.20	8.21	8.31	8.32	8.32	8.56	8.00	0.50	98	-0.126	-0.020	0.028	0.045	0.064	-0.002
8.00	0.60	7	6.79	7.53	7.59	7.61	8.25	8.26	8.33	8.42	8.45	8.78	8.00	0.60	95	-0.125	-0.063	0.035	0.054	0.092	-0.001
8.00	0.70	5	6.57	7.47	7.63	7.82	7.96	8.01	8.38	8.47	8.75	8.97	8.00	0.70	92	-0.143	-0.045	-0.006	0.062	0.132	0.000
8.00	0.80	21	6.80	7.32	7.59	7.66	7.85	7.86	7.87	8.56	9.07	9.45	8.00	0.80	89	-0.139	-0.060	-0.026	0.029	0.199	0.001
8.00	0.90	7	6.96	7.10	7.36	7.44	7.77	7.99	8.02	8.64	8.95	9.81	8.00	0.90	87	-0.143	-0.092	-0.022	0.047	0.220	0.002
8.00	1.00	11	6.65	6.79	7.37	7.43	7.70	8.13	8.31	8.59	9.39	9.59	8.00	1.00	84	-0.185	-0.092	-0.017	0.066	0.238	0.002
8.00	1.10	6	6.17	6.65	7.17	7.28	8.20	8.40	8.71	9.02	9.15	9.22	8.00	1.10	82	-0.225	-0.117	0.042	0.132	0.186	0.004
8.00	1.20	22	5.88	6.25	7.72	7.95	8.00	8.09	8.18	9.11	9.42	9.43	8.00	1.20	80	-0.267	-0.029	0.003	0.098	0.227	0.006
8.00	1.30	13	5.54	6.08	7.84	7.93	7.94	8.36	8.50	9.12	9.18	9.54	8.00	1.30	78	-0.297	-0.021	0.019	0.124	0.216	0.008
8.00	1.40	17	6.56	6.66	6.73	6.76	7.39	8.02	8.48	9.49	9.75	10.19	8.00	1.40	76	-0.199	-0.182	-0.048	0.154	0.323	0.010
8.00	1.50	27	5.92	6.29	6.43	7.75	8.07	8.12	8.23	9.04	9.60	10.58	8.00	1.50	75	-0.262	-0.131	0.011	0.096	0.347	0.012
8.00	1.60	21	5.47	6.57	6.78	7.50	7.53	8.30	8.43	8.93	9.34	11.11	8.00	1.60	73	-0.269	-0.128	-0.016	0.102	0.378	0.013
8.00	1.70	15	6.11	6.35	7.02	7.03	7.42	7.66	7.68	9.28	10.09	11.37	8.00	1.70	72	-0.247	-0.144	-0.072	0.077	0.468	0.016
8.00	1.80	14	6.04	6.50	7.04	7.31	7.46	7.56	7.93	8.16	9.81	12.22	8.00	1.80	71	-0.242	-0.124	-0.076	0.003	0.537	0.020
8.00	1.90	31	5.05	6.37	6.37	7.63	7.93	8.06	8.63	8.88	9.04	11.99	8.00	1.90	70	-0.304	-0.143	-0.005	0.114	0.450	0.022
8.00	2.00	25	5.48	5.61	6.41	7.38	7.91	7.92	8.05	8.84	11.15	11.21	8.00	2.00	69	-0.328	-0.160	-0.017	0.066	0.554	0.023
8.50	0.10	4	8.31	8.39	8.43	8.47	8.48	8.50	8.53	8.58	8.61	8.65	8.50	0.10	100	0.050	0.066	0.072	0.082	0.094	0.073
8.50	0.20	1	8.01	8.38	8.41	8.51	8.53	8.56	8.58	8.59	8.62	8.76	8.50	0.20	99	0.026	0.067	0.081	0.087	0.104	0.073

TABLE
(Continued)

Target			Samples													Service Life Differences					
Mean	St. Dev.	Sample Number	Sublot 1-1	Sublot 1-2	Sublot 2-1	Sublot 2-2	Sublot 3-1	Sublot 3-2	Sublot 4-1	Sublot 4-2	Sublot 5-1	Sublot 5-2	Mean	Standard Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
8.50	0.30	10	8.09	8.10	8.19	8.47	8.49	8.53	8.62	8.75	8.80	8.96	8.50	0.30	95	0.011	0.047	0.075	0.103	0.135	0.074
8.50	0.40	2	7.85	8.06	8.17	8.34	8.46	8.55	8.63	8.83	9.04	9.05	8.50	0.40	89	-0.011	0.035	0.074	0.110	0.163	0.074
8.50	0.50	1	7.88	8.12	8.15	8.16	8.25	8.37	8.62	8.94	9.02	9.44	8.50	0.50	84	-0.004	0.020	0.044	0.119	0.194	0.075
8.50	0.60	11	7.62	7.92	8.06	8.21	8.35	8.56	8.61	8.75	9.35	9.52	8.50	0.60	80	-0.038	0.017	0.066	0.102	0.229	0.075
8.50	0.70	7	7.34	7.69	7.76	8.28	8.49	8.85	8.93	9.01	9.29	9.32	8.50	0.70	76	-0.076	-0.001	0.101	0.150	0.207	0.076
8.50	0.80	14	6.97	7.82	7.93	8.33	8.43	8.57	8.89	9.08	9.16	9.77	8.50	0.80	73	-0.091	0.016	0.074	0.152	0.234	0.077
8.50	0.90	6	6.73	7.55	7.91	8.23	8.59	8.82	8.99	9.13	9.29	9.71	8.50	0.90	71	-0.127	0.007	0.106	0.165	0.240	0.078
8.50	1.00	18	6.49	7.60	7.83	8.34	8.56	8.85	8.91	8.97	9.41	10.02	8.50	1.00	69	-0.138	0.009	0.106	0.145	0.278	0.080
8.50	1.10	27	7.24	7.34	7.55	8.14	8.28	8.37	8.87	8.95	9.29	10.92	8.50	1.10	68	-0.107	-0.027	0.046	0.140	0.354	0.081
8.50	1.20	15	6.93	7.18	7.61	7.76	7.86	8.86	9.12	9.36	9.70	10.60	8.50	1.20	66	-0.140	-0.051	0.053	0.195	0.357	0.083
8.50	1.30	33	6.32	7.17	7.42	8.03	8.04	8.80	9.58	9.79	9.92	9.97	8.50	1.30	65	-0.180	-0.045	0.062	0.272	0.319	0.086
8.50	1.40	10	5.55	7.47	7.68	8.16	8.43	8.72	9.18	9.61	9.72	10.45	8.50	1.40	64	-0.200	-0.016	0.085	0.222	0.345	0.087
8.50	1.50	7	5.66	6.56	8.22	8.26	8.76	8.89	9.09	9.11	9.42	11.05	8.50	1.50	63	-0.260	0.033	0.126	0.172	0.378	0.090
8.50	1.60	11	5.52	7.09	7.77	7.94	8.08	8.43	9.64	9.65	9.81	11.11	8.50	1.60	62	-0.230	-0.026	0.035	0.266	0.417	0.092
8.50	1.70	17	4.73	6.94	7.71	8.04	8.85	9.34	9.37	9.93	9.97	10.16	8.50	1.70	62	-0.277	-0.023	0.171	0.264	0.341	0.095
8.50	1.80	19	6.42	7.01	7.20	7.74	7.94	7.94	7.99	10.02	10.78	11.95	8.50	1.80	61	-0.185	-0.082	-0.013	0.167	0.593	0.096
8.50	1.90	24	6.03	6.26	7.48	7.85	8.01	8.04	9.02	9.19	11.23	11.85	8.50	1.90	60	-0.258	-0.054	0.000	0.172	0.626	0.097
8.50	2.00	18	6.09	6.77	7.20	7.26	7.65	7.85	8.99	9.63	11.53	11.99	8.50	2.00	60	-0.221	-0.116	-0.041	0.207	0.671	0.100
9.00	0.10	2	8.80	8.91	8.95	8.98	8.99	9.00	9.01	9.11	9.12	9.13	9.00	0.10	50	0.131	0.149	0.154	0.165	0.176	0.155
9.00	0.20	7	8.57	8.77	8.97	8.99	9.02	9.03	9.09	9.12	9.15	9.26	9.00	0.20	50	0.101	0.152	0.159	0.173	0.189	0.155
9.00	0.30	5	8.63	8.75	8.91	8.92	8.94	8.96	8.98	9.00	9.12	9.76	9.00	0.30	50	0.104	0.141	0.147	0.153	0.230	0.155
9.00	0.40	5	8.23	8.73	8.79	8.83	8.84	9.04	9.15	9.26	9.46	9.62	9.00	0.40	50	0.070	0.124	0.145	0.189	0.247	0.155
9.00	0.50	7	8.25	8.35	8.41	8.92	9.15	9.22	9.27	9.29	9.45	9.66	9.00	0.50	50	0.042	0.100	0.186	0.202	0.250	0.156
9.00	0.60	1	7.98	8.58	8.59	8.74	8.86	8.88	9.20	9.64	9.68	9.89	9.00	0.60	50	0.039	0.100	0.134	0.226	0.290	0.158
9.00	0.70	14	8.15	8.36	8.55	8.61	8.73	8.82	9.27	9.34	9.66	10.50	9.00	0.70	50	0.035	0.086	0.118	0.206	0.344	0.158
9.00	0.80	2	7.78	8.12	8.47	8.65	8.89	9.11	9.25	9.29	10.16	10.24	9.00	0.80	50	-0.012	0.083	0.155	0.201	0.366	0.159
9.00	0.90	4	7.28	8.28	8.52	8.54	9.14	9.16	9.39	9.48	9.52	10.64	9.00	0.90	50	-0.035	0.078	0.180	0.229	0.351	0.161
9.00	1.00	22	7.43	8.33	8.52	8.52	8.63	8.86	8.96	9.69	10.05	10.97	9.00	1.00	50	-0.021	0.077	0.113	0.210	0.424	0.161
9.00	1.10	17	7.56	7.92	8.27	8.44	8.45	9.00	9.13	9.98	10.30	10.96	9.00	1.10	50	-0.043	0.051	0.110	0.251	0.446	0.163
9.00	1.20	11	6.33	7.94	8.57	8.97	9.10	9.16	9.37	9.95	10.31	10.32	9.00	1.20	50	-0.122	0.117	0.177	0.268	0.387	0.165
9.00	1.30	12	7.00	7.43	8.23	8.43	8.78	9.39	9.43	9.65	10.27	11.34	9.00	1.30	50	-0.118	0.047	0.169	0.247	0.482	0.165

TABLE
(Continued)

Target			Samples													Service Life Differences					
Mean	St. Dev.	Sample Number	Sublot 1-1	Sublot 1-2	Sublot 2-1	Sublot 2-2	Sublot 3-1	Sublot 3-2	Sublot 4-1	Sublot 4-2	Sublot 5-1	Sublot 5-2	Mean	Standard Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
9.00	1.40	37	6.14	7.43	8.24	8.54	9.34	9.58	9.88	10.08	10.34	10.38	9.00	1.40	50	-0.172	0.056	0.233	0.325	0.395	0.167
9.00	1.50	23	7.00	7.69	7.96	8.04	8.34	8.52	9.64	10.65	10.71	11.42	9.00	1.50	50	-0.099	-0.004	0.062	0.357	0.531	0.169
9.00	1.60	13	6.95	7.14	7.75	7.95	8.44	9.26	9.77	10.20	11.21	11.30	9.00	1.60	50	-0.141	-0.027	0.131	0.326	0.569	0.172
9.00	1.70	25	5.97	6.50	7.67	9.21	9.42	9.82	9.84	10.33	10.45	10.82	9.00	1.70	50	-0.246	0.070	0.261	0.344	0.447	0.175
9.00	1.80	26	6.16	6.50	7.52	8.50	9.14	9.50	9.80	10.67	10.92	11.25	9.00	1.80	50	-0.235	-0.001	0.209	0.373	0.534	0.176
9.00	1.90	29	6.09	6.66	7.05	8.76	9.24	9.31	9.84	10.45	10.58	12.02	9.00	1.90	50	-0.229	-0.010	0.201	0.355	0.582	0.180
9.00	2.00	14	5.17	6.95	8.41	8.91	8.97	9.05	9.81	9.89	10.02	12.79	9.00	2.00	50	-0.257	0.099	0.157	0.302	0.621	0.184
9.50	0.10	1	9.34	9.42	9.44	9.46	9.46	9.47	9.53	9.53	9.57	9.73	9.50	0.10	0	0.219	0.232	0.234	0.245	0.266	0.239
9.50	0.20	1	9.23	9.24	9.35	9.41	9.42	9.54	9.58	9.59	9.78	9.81	9.50	0.20	1	0.195	0.219	0.237	0.255	0.292	0.240
9.50	0.30	1	9.20	9.32	9.34	9.35	9.35	9.38	9.50	9.62	9.69	10.23	9.50	0.30	5	0.199	0.213	0.217	0.250	0.322	0.240
9.50	0.40	2	8.80	9.08	9.11	9.42	9.46	9.66	9.75	9.81	9.85	10.04	9.50	0.40	11	0.145	0.199	0.250	0.289	0.319	0.240
9.50	0.50	2	8.73	8.93	9.09	9.35	9.37	9.67	9.71	9.94	9.99	10.26	9.50	0.50	16	0.127	0.192	0.243	0.297	0.352	0.242
9.50	0.60	3	8.55	8.55	9.14	9.23	9.75	9.82	9.86	9.88	10.02	10.24	9.50	0.60	20	0.082	0.186	0.290	0.306	0.352	0.243
9.50	0.70	14	8.75	8.87	8.89	8.94	9.04	9.72	9.78	9.98	10.17	10.81	9.50	0.70	24	0.124	0.141	0.220	0.307	0.420	0.242
9.50	0.80	17	7.63	9.16	9.18	9.20	9.59	9.60	9.80	9.97	10.40	10.44	9.50	0.80	27	0.063	0.187	0.257	0.308	0.407	0.244
9.50	0.90	10	7.76	8.44	9.12	9.42	9.42	9.69	9.90	9.93	10.49	10.79	9.50	0.90	29	0.012	0.200	0.249	0.314	0.448	0.245
9.50	1.00	22	7.53	8.24	9.03	9.41	9.49	10.03	10.03	10.20	10.51	10.57	9.50	1.00	31	-0.021	0.192	0.286	0.350	0.429	0.247
9.50	1.10	31	7.82	7.82	8.60	9.34	9.52	9.81	10.19	10.61	10.61	10.66	9.50	1.10	32	-0.031	0.151	0.269	0.403	0.447	0.248
9.50	1.20	27	7.50	7.87	8.66	9.15	9.79	9.81	9.95	10.27	10.83	11.18	9.50	1.20	34	-0.051	0.139	0.293	0.349	0.519	0.250
9.50	1.30	13	6.83	8.54	8.92	9.22	9.36	9.62	9.99	10.19	10.56	11.72	9.50	1.30	35	-0.043	0.166	0.238	0.345	0.548	0.251
9.50	1.40	10	7.19	7.85	8.69	9.11	9.44	9.47	9.89	10.72	10.81	11.82	9.50	1.40	36	-0.074	0.138	0.232	0.386	0.582	0.253
9.50	1.50	16	6.71	8.63	8.65	8.84	9.26	9.43	9.45	10.79	11.34	11.86	9.50	1.50	37	-0.042	0.113	0.213	0.354	0.638	0.255
9.50	1.60	19	7.13	7.62	8.40	8.65	9.02	9.96	10.14	10.75	11.58	11.76	9.50	1.60	38	-0.095	0.077	0.240	0.411	0.653	0.257
9.50	1.70	12	7.51	7.56	7.86	8.53	8.55	9.80	10.68	11.16	11.51	11.83	9.50	1.70	38	-0.073	0.026	0.187	0.502	0.653	0.259
9.50	1.80	11	6.74	8.09	8.12	8.82	9.01	9.33	10.00	10.21	11.93	12.71	9.50	1.80	39	-0.085	0.069	0.183	0.348	0.791	0.261
9.50	1.90	32	6.48	7.78	8.44	8.76	8.91	9.77	10.01	10.28	11.23	13.29	9.50	1.90	40	-0.125	0.089	0.213	0.355	0.788	0.264
9.50	2.00	25	6.06	7.13	8.74	8.79	9.01	9.05	11.18	11.41	11.68	11.91	9.50	2.00	40	-0.198	0.116	0.160	0.576	0.679	0.267
10.00	0.10	2	9.89	9.92	9.94	9.95	9.97	9.98	10.02	10.03	10.08	10.22	10.00	0.10	0	0.312	0.319	0.325	0.334	0.356	0.329
10.00	0.20	2	9.77	9.79	9.84	9.87	9.99	10.01	10.06	10.06	10.30	10.33	10.00	0.20	0	0.290	0.303	0.329	0.340	0.387	0.330
10.00	0.30	1	9.76	9.79	9.80	9.84	9.88	9.95	10.01	10.01	10.26	10.73	10.00	0.30	0	0.289	0.297	0.314	0.331	0.420	0.330
10.00	0.40	6	9.46	9.56	9.71	9.80	9.84	9.92	10.35	10.36	10.36	10.67	10.00	0.40	1	0.242	0.285	0.307	0.394	0.424	0.330

TABLE
(Continued)

Target			Samples													Service Life Differences					
Mean	St. Dev.	Sample Number	Sublot 1-1	Sublot 1-2	Sublot 2-1	Sublot 2-2	Sublot 3-1	Sublot 3-2	Sublot 4-1	Sublot 4-2	Sublot 5-1	Sublot 5-2	Mean	Standard Deviation	PWL	Sublot 1	Sublot 2	Sublot 3	Sublot 4	Sublot 5	Mean
10.00	0.50	7	9.33	9.48	9.49	9.71	9.84	10.15	10.32	10.43	10.46	10.82	10.00	0.50	2	0.224	0.257	0.328	0.398	0.448	0.331
10.00	0.60	3	8.80	9.16	9.83	9.99	10.10	10.19	10.33	10.45	10.57	10.60	10.00	0.60	5	0.151	0.313	0.355	0.401	0.438	0.332
10.00	0.70	2	8.66	9.32	9.77	9.80	9.82	10.04	10.27	10.51	10.69	11.11	10.00	0.70	8	0.154	0.290	0.316	0.401	0.498	0.332
10.00	0.80	5	8.39	9.05	9.77	9.78	9.97	10.15	10.59	10.62	10.73	10.90	10.00	0.80	11	0.109	0.289	0.340	0.442	0.482	0.332
10.00	0.90	8	8.89	9.19	9.31	9.40	9.55	9.86	10.38	10.79	11.20	11.45	10.00	0.90	13	0.161	0.215	0.276	0.437	0.582	0.334
10.00	1.00	13	8.25	8.78	9.41	9.63	10.22	10.28	10.36	10.46	11.16	11.48	10.00	1.00	16	0.076	0.243	0.375	0.405	0.581	0.336
10.00	1.10	11	8.44	8.89	8.90	9.30	10.23	10.34	10.36	10.80	10.83	11.95	10.00	1.10	18	0.100	0.172	0.381	0.437	0.598	0.338
10.00	1.20	18	8.24	8.90	9.14	9.55	9.76	10.23	10.28	10.60	10.76	12.58	10.00	1.20	20	0.085	0.213	0.328	0.410	0.661	0.339
10.00	1.30	21	8.09	8.84	8.90	9.92	10.01	10.27	10.32	10.32	10.45	12.90	10.00	1.30	22	0.069	0.226	0.354	0.388	0.670	0.341
10.00	1.40	14	8.12	8.53	8.77	8.91	9.43	10.85	10.88	10.98	11.33	12.15	10.00	1.40	24	0.046	0.128	0.359	0.504	0.668	0.341
10.00	1.50	12	7.82	8.08	9.27	9.74	9.86	9.97	10.18	10.41	12.26	12.41	10.00	1.50	25	-0.012	0.241	0.314	0.383	0.794	0.344
10.00	1.60	11	7.79	8.65	8.75	8.89	9.65	10.03	10.80	11.06	11.18	13.21	10.00	1.60	27	0.031	0.125	0.300	0.504	0.774	0.347
10.00	1.70	21	7.62	8.59	8.64	9.64	9.69	9.84	10.63	10.77	10.80	13.82	10.00	1.70	28	0.014	0.180	0.287	0.460	0.815	0.351
10.00	1.80	24	6.73	7.90	9.35	9.57	10.04	10.18	10.30	11.27	11.61	13.00	10.00	1.80	29	-0.101	0.233	0.349	0.477	0.791	0.350
10.00	1.90	33	6.58	8.05	8.40	9.05	10.20	10.62	11.29	11.45	12.14	12.21	10.00	1.90	30	-0.098	0.110	0.404	0.592	0.759	0.353
10.00	2.00	20	5.34	8.10	9.61	10.00	10.19	10.81	10.97	10.98	11.84	12.15	10.00	2.00	31	-0.158	0.294	0.422	0.513	0.721	0.358

APPENDIX F. PAVESPEC INPUT DATA FOR VALIDATION

No.	Input		Value
1	Specification Level		Develop a Level 1 and Level 2 Specification at the same time.
2	Traffic Direction		NB and SB
3	Lane configuration		Four. Divided
4	Lane width		12ft
5	Lane Accept		Check
6	Shoulder type		Tied PCC
7	Widened by (Widened Lane Selected Only)		–
	Stress load transfer efficiency (Tied PCC Selected Only)		20%
8	Inner lane cracking as % of outer lane		10%
9	Road Location		Urban
10	Project length		5620ft
11	Pavement Design Modules (Design Inputs)	Design Life	30years
12		Pavement Type	Jointed Plain (JPCP), Doweled
13		Dowel Bar Diameter	1.25in
14		Transverse Joint Spacing	15ft
15		PCC modulus of elasticity	4,000,000psi
16		Transverse Joint Sealant type	Silicone
17		Modulus of Subgrade Reaction (static k-value)	150psi/in
18		Water-Cement Ratio	0.42
19		Percent Subgrade Material Passing the #200 Sieve	88%
20	Pavement Design Modules (Base Variables)	Base Permeability	Permiable
21		Base Thickness	9in
22		Base Modulus of Elasticity	25,000psi
23		PCC-Base Interface	Unbonded
24		Base Erodibility Factor	5
25	Design Traffic Modules	Defined traffic based on	Average Daily Traffic (ADT)
26		Specific traffic for year	1
27		ADT at that year	9,400
–		Cumulative ESALs at that year (millions)	Calculated by PaveSpec
28		Growth Rate	1.050%
29		Growth Type	Compound
30		ESAL-to ADT Directional factor	50%
31		Percent of trucks	12%
32		Percent trucks in outer lane	90%
33		Average truck load equivalency factor	2ESALs/truck

TABLE
(Continued)

No.	Input		Value
34	Climate Variable Modules	Average Annual Freezing Index	0F-days
35		Average Annual Precipitation	42.8in
36		Average Annual Air Freeze-Thaw Cycles	65cycles
37		Average Annual Number of Days over 90F	13days
38		Climatic Zone	Wet-Nonfreeze
39	Distress Indicators		Transverse Joint Spalling
			Transverse Slab Cracking
			Decreasing Smoothness
40	Acceptance Quality Characteristics (AQC's)		Concrete Strength
			Slab Thickness
			Air Content
			Initial Smoothness
41	Strength	Sampling Method	Beams
42		Timing of Cores	–
43		Number of Samples per Sublot	1
44		Number of Replicates per Sample	2
45		Target Timing of Testing	28days
46		Test Maturity	–
47		Core-to-cylinder strength relationship	–
48		Lab-created maturity equation	–
49		Compressive-to-flexural relationship	–
50	Thickness	Sampling Method	Independent Cores
51		Timing of Samples	4days
52		Number of Samples per Sublot	2
53		Number of Replicates per Sample	1
54	Air Content	Sampling Method	Air pressure Meter
55		Timing of Samples	–
56		Number of Samples per Sublot	2
57		Number of Replicates per Sample	1
58	Initial Smoothness	Initial Smoothness Indicator	Profile Index (0.0-in blanking band)
59		Initial Smoothness Relationship	–
60		Number of Pass Locations per Sublot	1
61		Pass Locations (describe)	
62		Number of Replications per Pass Location	2
63		Timing of Samples (describe)	
64		Profilograph Reduction Method	v

TABLE
(Continued)

No.	Input		Value
65	Determine target LCC by		Estimate LCC through Simulation
66	Concrete Strength	Sample Method	Distribution
67		Mean	700psi
68		Std Dev	40psi
69	Slab Thickness	Sample Method	Distribution
70		Mean	9.5in
71		Std Dev	0.5in
72	Air Content	Sample Method	Distribution
73		Mean	6.50%
74		Std Dev	0.50%
75	Initial Smoothness	Sample Method	Distribution
76		Mean	32in/mi
77		Std Dev	8in/mi
78	Percent Consol. Around Dowels	Sample Method	–
79		Mean	–
80		Std Dev	–
81	Maintenance and Rehabilitation Plan Modules (Maintenance)	Maintenance Transverse Joints	Check
82		Seal	40%
83		Regular Maintenance Year	5years
84		Maintenance Longitudinal Joints	Check
85		Seal	25%
86		Regular Maintenance Year	5years
87		Maintenance Transverse Cracks	Check
88		Seal	100%
89		Regular Maintenance Year	3years
90	Maintenance and Rehabilitation Plan Modules (Local Rehab)	Step 1 (defined)	Always do full-depth repairs to 100% of spalled joints.
		Step 2 (defined)	If cumulative percent cracked slabs exceed 10.00%, then consider the sublot failed.
		Step 3 (defined)	If cumulative percent spalled joints exceeds 10.00%, then consider the sublot failed.
		Step 4 (defined)	If average transverse joint faulting exceeds 0.2500 in, then consider the sublot failed.
		Step 5 (defined)	If percent failed sublots exceed 25%, then begin global rehab scenario 1.

TABLE
(Continued)

No.		Input	Value
91	Maintenance and Rehabilitation Plan Modules (Global Rehab)	Repair Spalled Joints	Check
92		% of spalled joints to be repaired	100%
93		Repair Type	Partial-depth repairs
94		Repair Cracked Slabs	Check
95		% of cracked slabs to be repaired	100%
96		Repair Type	Partial slab replacements
97		1st Global Rehabilitation to Apply	AC Overlay
98		Assumed life of 1st global rehabilitation	7years
99		Start IRI of 1st global rehabilitation	90in/mi
100		End IRI of 1st global rehabilitation	200in/mi
101		2nd Global Rehabilitation to Apply	AC Overlay
102		Assumed life of 2nd global rehabilitation	7years
103		Start IRI of 2nd global rehabilitation	95in/mi
104		End IRI of 2nd global rehabilitation	200in/mi
105		3rd Global Rehabilitation to Apply	AC Overlay
106		Assumed life of 3rd global rehabilitation	5years
107		Start IRI of 3rd global rehabilitation	100in/mi
108		End IRI of 3rd global rehabilitation	200in/mi
109		4th Global Rehabilitation to Apply	AC Overlay
110		Assumed life of 4th global rehabilitation	3years
111		Start IRI of 4th global rehabilitation	105in/mi
112		End IRI of 4th global rehabilitation	200in/mi
113	Unit Costs Modules (Maintenance)	Transverse Joint Sealing	\$1.20 per ft
114		Longitudinal Joint Sealing	\$1.00 per ft
115		Transverse Crack Sealing	\$1.00 per ft
116	Unit Costs Modules (Rehabilitation)	Full-depth repairs of transverse joints	\$159 per sq. yd
117		Partial-depth repairs of transverse joints	\$364 per sq. yd
118		Full slab replacements	–
119		Partial slab replacements	\$135 per sq. yd
120		AC overlay	\$11 per sq. yd
121		PCC overlay	–
122		Diamond grinding	–

TABLE
(Continued)

No.		Input	Value
123	Unit Costs Modules (Other)	Annual inflation rate	3%
124		Annual interest rate	6%
125		Assumed width of a full-depth repair of a transverse joint	6ft
126		Assumed width of a partial-depth repair of a transverse joint	6ft
127		Assumed width of a partial slab replacement	6ft
128		User cost percentage to include	0%
129		Year of construction	2012
130	Generic Settings	Number of lots to simulate at each factorial point	500
131		Minimum number of sublots per lot to simulate	3
132		Maximum number of sublots per lot to simulate	3
133		Average bid price	$20/sq.yd
134		Analysis life	30 years

About the Joint Transportation Research Program (JTRP)

On March 11, 1937, the Indiana Legislature passed an act which authorized the Indiana State Highway Commission to cooperate with and assist Purdue University in developing the best methods of improving and maintaining the highways of the state and the respective counties thereof. That collaborative effort was called the Joint Highway Research Project (JHRP). In 1997 the collaborative venture was renamed as the Joint Transportation Research Program (JTRP) to reflect the state and national efforts to integrate the management and operation of various transportation modes.

The first studies of JHRP were concerned with Test Road No. 1—evaluation of the weathering characteristics of stabilized materials. After World War II, the JHRP program grew substantially and was regularly producing technical reports. Over 1,500 technical reports are now available, published as part of the JHRP and subsequently JTRP collaborative venture between Purdue University and what is now the Indiana Department of Transportation.

Free online access to all reports is provided through a unique collaboration between JTRP and Purdue Libraries. These are available at: http://docs.lib.purdue.edu/jtrp

Further information about JTRP and its current research program is available at: http://www.purdue.edu/jtrp

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