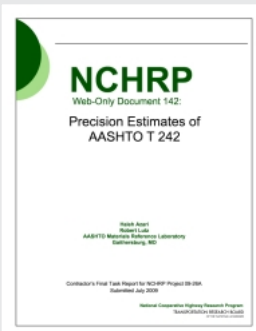

Precision Estimates of AASHTO T 242

DETAILS

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ABSTRACT

This report presents results of the study to prepare precision estimates for AASHTO T 242, "Frictional Properties of Paved Surfaces Using a Full-Scale Tire." The data used in this study were provided by Texas Transportation Institute (TTI) and Transportation Research Center (TRC) from evaluation of state friction measurement systems that have been calibrated at their field test centers. Two sets of data were analyzed from each test center: "Initial" or "Arrival" and "Final" or "Departure". The Initial set was collected by state systems as they arrived to each center for calibration. The Final set was collected after adjustments were made to the state systems to put them into compliance with AASHTO T 242. The variability of the friction measurements were examined for both Initial and Final systems to evaluate the effect of calibration on variability of the measurements. Only the Final State System data were used to determine the precision estimates for measuring frictional properties of paved surfaces. A draft precision statement for AASHTO T 242 is proposed and included in this report.

CHAPTER 1- INTRODUCTION AND RESEARCH APPROACH

1.1 INTRODUCTION

Under National Cooperative Highway Research Programs (NCHRP) Project 9-26, the AASHTO Materials Reference Laboratory (AMRL) is conducting a multi-phase research project to improve estimates of precision in AASHTO test methods for various highway construction materials. The report from Phase 1 of Project 9-26 includes precision estimates of selected volumetric properties of HMA using non-absorptive aggregates [1]. The report from Phase 2 discusses the results of an investigation into the cause of variations in HMA bulk specific gravity test results using non-absorptive aggregates [2]. The report from Phase 3 includes a robust technique developed by AMRL for analyzing proficiency sample data for the purpose of obtaining reliable single-operator and multilaboratory estimates of precision [3]. The report from phase 4 includes two parts. Part one covers the precision estimates of selected volumetric properties of HMA using absorptive aggregates. Part two of the report investigates the effect of aging period on the volumetric properties of HMA with absorptive aggregates [4]. The report from Phase 5 includes update of precision estimates for AASHTO Standard Test Method T 269 [5]. This report includes the results of Task 7 of NCHRP 9-26A to prepare precision estimates for AASHTO Standard Test Method T 242, "Frictional Properties of Paved Surfaces Using a Full-Scale Tire." [6]

Included in this study are friction data from evaluation of state friction measurement systems that have been calibrated at Texas Transportation Institute (TTI) and Transportation Research Center (TRC) field test centers. Two sets of data were analyzed in this report: "Initial" and "Final" as referred by TTI or "Arrival" and "Departure" as referred by TRC. The Initial or Arrival set was collected by state systems as they arrived to the center for calibration. The Final or Departure set was collected after adjustments were made to the state systems to put them into compliance with ASTM E 274 [7], which is equivalent to AASHTO T 242.

The precision statements for AASHTO T 242 standard method were determined based on the analysis of the friction data from the Final State Friction Systems at TTI and TRC. The analysis method suggested by ASTM E 691 was utilized for determining the single-operator and multilaboratory estimates of the precision.

1.2 PROBLEM STATEMENT

AASHTO Standard Test Methods applicable to highway materials require periodic studies to determine estimates of precision. Some precision estimates become outdated as a result of improvements in the methods while other estimates need to be verified to see if they are still accurate. Some precision estimates need to be expanded to take into account a wider range of materials while other newer test methods may not have precision estimates of any kind. The AASHTO T 242-96 (2004) lacks a precision statement. There is only a report of an acceptable standard deviation, which needs to be verified and expended using the most recent friction data for variety of surfaces and speeds.

1.3 RESEARCH OBJECTIVE

The objective of Task 7 of NCHRP 9-26A study is to prepare single-operator and multilaboratory precision estimates for the AASHTO T 242, "Frictional Properties of Paved Surfaces Using a Full-Scale Tire" using data collected based on the most recent version of the test method. The resulting precision estimates would reflect a variety of paved surfaces and vehicle speeds included in the evaluation of the state friction systems.

1.4 SCOPE OF STUDY

This work is limited to an evaluation of data collected from state friction systems participating in the TTI and TRC field center calibration program. The precision estimates for measuring frictional properties of paved surfaces are determined based on analysis of the final state friction data of TTI and TRC test centers when data were collected after adjustments were made to the state systems to put them into compliance with AASHTO T 242.

1.5 DATA USED IN STUDY

Included in the study are the most recent TTI and TRC friction data collected as part of evaluation of state friction measurement systems that are conducted annually. The reported friction numbers (FN) were determined from the forces required to slide the locked test tires on three paved surfaces at three different speeds. The following provide explanation of the data provided by the test centers for analysis in the study.

1.5.1 TTI Friction Data

The TTI data analyzed in this study were collected at the TTI test center and are referred to as Initial and Final friction measurements. The Initial data set consisted of 288 friction numbers from 12 run repeats of 8 state systems as they arrive to the center. The data were collected at one speed on three surfaces. The final data set consisted of 1260 friction numbers from 12 repeats of 12 state friction systems after they have been calibrated at the center. The data were collected at three speeds and on three surfaces. The surfaces referred as Pad 1, Pad 2, and Pad 3 correspond to HMA with seal coat, HMA with seal coat and sand, and hydraulic cement concrete, respectively. The three speeds and the number of friction systems operated at each speed are provided in Table 1-1.

Table 1-1- Number of friction systems operated at different speeds on various surfaces of the TTI test field

System	Speed, mph (km/h)	No. of Systems		
		Pad 1	Pad 2	Pad 3
Initial	40 (64.4)	8	8	8
Final	30 (48.3)	12	12	12
	40 (64.4)	12	12	12
	50 (80.5)	11	11	11

1.5.2 TRC Friction Data

The TRC data used in the study are referred as the Arrival (ARR) and Departure (DEP) friction measurements. The ARR data were collected as the state friction measuring systems arrived the center for calibration and the DEP data were collected after the systems were calibrated. The ARR data consisted of 1296 friction numbers from 12 run repeats of 12 state systems on three surfaces at three different speeds. The DEP data were received from either left (L), right (R), or both wheels of either ribbed (501), smooth (524), or both test tire types. A total of 5400 friction numbers from twelve skids of 50 different configurations of state friction systems were analyzed. The speeds at which each of the friction systems were run include 20, 40, and 60 mph (32.2, 64.4, and 96.6 km/h). The surfaces, which are referred to as Pad 4, Pad 5, and Pad 6, correspond to thick coating of coal-tar emulsion over asphalt, grade 5 aggregate (screened -1/4 + 10) set in epoxy over asphalt, and finish coat of Ohio DOT highway asphalt mix 404, respectively. Table 1-2 provides the number of ARR and DEP systems operated at the three speeds on the three pads.

Table 1-2- Number of friction systems operated at different speeds on various surfaces of the TRC field test

System	Speed, mph (km/h)	No. of Systems		
		Pad 4	Pad 5	Pad 6
ARR	20 (32.2)	14	14	14
	40 (64.4)	14	14	14
	60 (96.6)	14	14	14
DEP (501 Tire)	20 (32.2)	35	35	35
	40 (64.4)	35	35	35
	60 (96.6)	33	35	35
DEP (524 Tire)	20 (32.2)	15	15	15
	40 (64.4)	15	15	15
	60 (96.6)	13	15	15

CHAPTER 2- RESULTS OF ANALYSIS AND ESTIMATES OF PRECISION

This chapter provides statistics of the friction measurements of TTI and TRC friction test centers. Also provided in this chapter are the precision estimates for AASHTO T 242 computed based on the statistics of the TTI Final and TRC Departure State System data.

2.1 METHOD OF ANALYSIS

The analysis of friction data in this study was based on ASTM E 691 test method. Prior to the analysis, any partial sets of data were eliminated by following the procedures described in ASTM E 691 in determining repeatability (S_r) and reproducibility (S_R) estimates of precision [9]. Data exceeding critical *h* and *k* values were eliminated as described in Section 15.6 of the test method. Once identified for elimination, the same data were eliminated from any smaller subsets analyzed.

Test data from this study were displayed graphically using box plots. The box plot is a graphical data analysis technique for determining if differences exist between various levels of a 1-factor model. The box plot is in fact a graphical alternative to a 1-factor ANOVA. It is also a useful technique for summarizing and comparing data from two or more samples. A box plot is structured in the following manner. The bottom x is the data minimum and the top x is the data maximum. The bottom of the box is the estimated 25 percent point and the top of the box is estimated 75 percent point. The middle x in the box is the data median.

2.2 ANALYSIS OF TTI FRICTION DATA

2.2.1 Analysis of Initial State System Measurements

The Initial State System measurements were made upon arrival of the systems to the test center prior to any adjustments. Data obtained using the initial state are provided in Appendix A and shown on box plots in Figure 2-1 with the state systems identified alphabetically from A to M. The data were collected from 12 replicate runs of eight state systems operated at 40 mph (64.4 km/h) on three different surfaces (pads). The h- and k-statistics for the Initial State Systems are provided in Table A-1 of Appendix A and displayed in Figure 2-1. As indicted in the table and figure, the k-statistics of Pad 1 using State Systems A, the k-statistics of Pad 2 using State System F, and the k-statistic of Pad 3 using State System B exceeded the critical k-value and were eliminated from the analysis. The remaining data were re-analyzed according to E 691 method to determine the S_r and S_R standard deviations shown in Table 2-1 and Table 2-2.

2.2.2 Analysis of Final State System Measurements

The Final State System measurements were made after the adjustments were applied to the state systems to put them into compliance with ASTM E 274. The Final State Systems were operated on Pad 1, Pad 2, and Pad 3 at 30, 40, and 50 mph (48.3, 64.4, 80.5 km/h). The Final State Systems data are provided in Appendix B and are identified alphabetically from B through N.

The data obtained using the Final State Systems at 30, 40, and 50 mph (48.3, 64.4, 80.5 km/h) are shown on box plots in Figure 2-2, Figure 2-3, and Figure 2-4. Data were collected from 12 replicate runs on the three surfaces using 12 state systems. The h- and k- statistics of the Final State Systems at the three speeds and on the three pads are provided in Tables B-1 through B-3 of Appendix B and are also displayed in Figure 2-2, Figure 2-3, and Figure 2-4. At 30 mph, the k-statistic of Pad 1 and Pad 2 using System B and the h- and k-statistics of Pad 3 using System H exceeded the critical h- and k- values and were eliminated from the analysis (Table B-1 and Figure 2-2). At 40 mph, the k-statistic of Pad 2 using System H and k-statistic of Pad 3 using System E exceeded the critical k value and were eliminated from the analysis (Table B-2 and Figure 2-3). At 50 mph, the k-statistic from Pad 1 using System B exceeded the critical k value and was eliminated from the analysis (Table B-3 and Figure 2-4). The remaining data were re-analyzed according to E 691 method to determine the S_r and S_R standard deviations shown in Table 2-1 and Table 2-2.

Table 2-1- Number of data sets, averages, and standard deviations for friction numbers using different TTI measurement systems on three surfaces (Pads) at three speeds

System	Speed (mph)	No. of Systems			Average			Repeatability Std			Reproducibility Std		
		Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
Initial	40	7	7	7	20.1	27.4	41.1	0.69	1.35	0.82	2.44	3.47	1.66
Final	30	11	11	11	20.9	28.7	43.1	0.76	0.95	0.84	1.54	2.31	1.35
	40	12	11	11	19.7	26.2	40.1	0.72	1.02	0.74	1.65	2.40	2.23
	50	10	11	11	18.8	24.6	37.9	0.81	0.89	0.68	1.73	2.03	1.58

Table 2-2- Coefficients of variations for friction numbers using TTI measurement systems on three surfaces (Pads) at three speeds

State	Speed (mph)	Repeatability CV, %			Reproducibility CV, %		
		Pad 1	Pad 3	Pad 5	Pad 1	Pad 3	Pad 5
Initial	40	3.4	4.9	2.0	12.1	12.7	4.0
Final	30	3.6	3.3	1.9	7.4	8.1	3.1
	40	3.7	3.9	1.8	8.4	9.2	5.6
	50	4.3	3.6	1.8	9.2	8.3	4.2

2.2.3 Comparison of TTI Initial and Final Precisions

The comparison of the initial and final statistics would indicate if the calibration process improves the precision of the frictional measurements. The statistics in Table 2-1 and Table 2-2 of initial and final measurements at 40 mph shows that 5 out of 6 repeatability and reproducibility standard deviations or coefficient of variations have improved upon calibration of the systems. This indicates that the calibration process in addition to providing adjustment to the friction measurements would improve the precision of the collected friction data.

2.2.4 Selection of Form of Precision Estimates

A review of statistics of Final State System in Table 2-1 indicates that there are no significant correlations between averages and standard deviations. Therefore, standard deviations will be statistically tested if they can be combined for the precision estimate development. Statistical F-test was performed to examine the significance of the differences in variances of friction measurements from different surfaces and different speeds as explained in the following sections.

2.2.4.1 Test of Significance on Standard Deviations from Different Surfaces

Statistical F-test was performed to examine the significance of the differences in variances of friction measurements from different surfaces. The results of the F-test are provided in Table 2-3. The comparison of the computed and critical F values in the table indicates that for 1% level of significance the repeatability and reproducibility values of the three surfaces are not significantly different. Therefore, the standard deviations in Table 2-1 for the three surfaces were combined as reported in Table 2-4.

Table 2-3- Computed F- and critical F- values for comparison of precision estimates for different surfaces of TTI measurements

Comparison for Different Surfaces	Degrees of Frredom	Critical F	Computed F S_r	Decision	Computed F S_R	Decision
Pad 1 vs. Pad 2	31, 31	2.36	1.57	Accept	1.88	Accept
Pad 1 vs. Pad 3	31, 31	2.36	1.03	Accept	1.15	Accept
Pad 2 vs. Pad 3	31, 31	2.36	1.61	Accept	1.63	Accept

Note: The critical F values stand for 99% level of confidence.

Table 2-4- Combined standard deviations for friction numbers of different surfaces (Pads) at TTI

System	Speed (mph)	Repeatability Std	Reproducibility Std
Final	30	0.85	1.78
	40	0.83	2.1
	50	0.8	1.79

2.2.4.2 Test of Significance on Standard Deviations from Different Speeds

The evaluation of differences in variability of TTI friction measurements at different speeds would determine if statistics from different speeds could be combined. An F-test was performed to examine the significance of the differences. The results of the F-test are provided in Table 2-5. The comparison of the computed and critical F values in the table indicates that for 1% level of significance the repeatability and reproducibility of the friction numbers are not significantly different when measured at speeds of 30, 40, or 50 mph (48.2, 64.4, and 83.3 km/h). Therefore, the standard deviations of the three speeds were combined as reported in Table 2-6.

Table 2-5- Computed F- and critical F- values for comparison of the precision estimates for different speeds of TTI friction measurements

Comparison for Speeds	Degrees of Frredom	Critical F	Computed F S_r	Decision	Computed F S_R	Decision
30 vs. 40	33, 34	2.72	1.04	Accept	1.41	Accept
30 vs. 50	32, 33	2.3	1.15	Accept	1.01	Accept
40 vs. 50	34, 32	2.31	1.11	Accept	1.4	Accept

Note: The critical F values stand for 99% level of confidence.

Table 2-6- Combined repeatability and reproducibility precisions for frictional properties of TTI measurements

System	Pooled S_r	d2s-S_r	Pooled S_R	d2s-S_R
Final (30, 40, 50 mph)	0.83	2.35	1.9	5.37

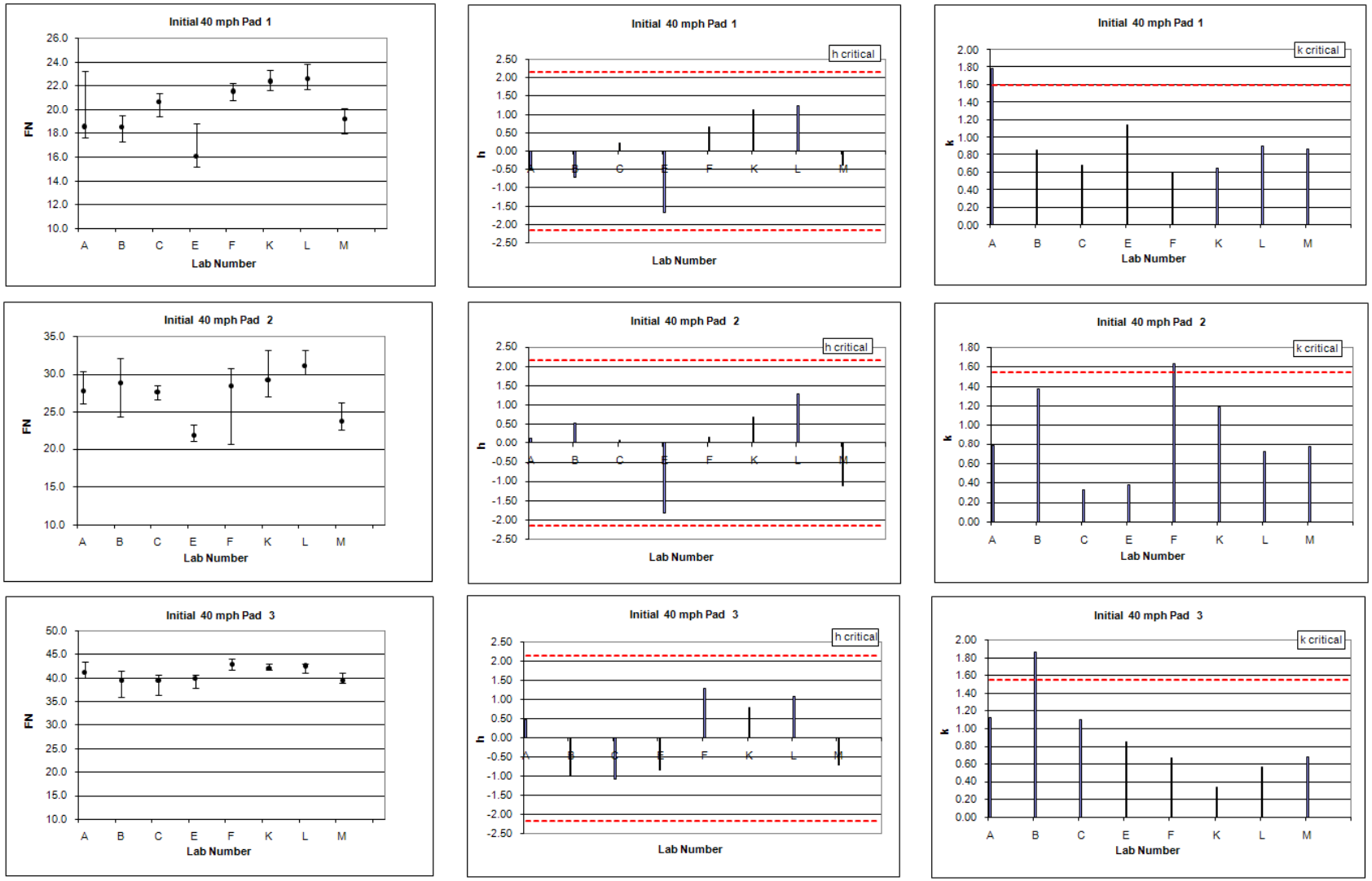

Figure 2-1- Box plots and h and k statistics for friction numbers of TTI Initial State System at 40 mph

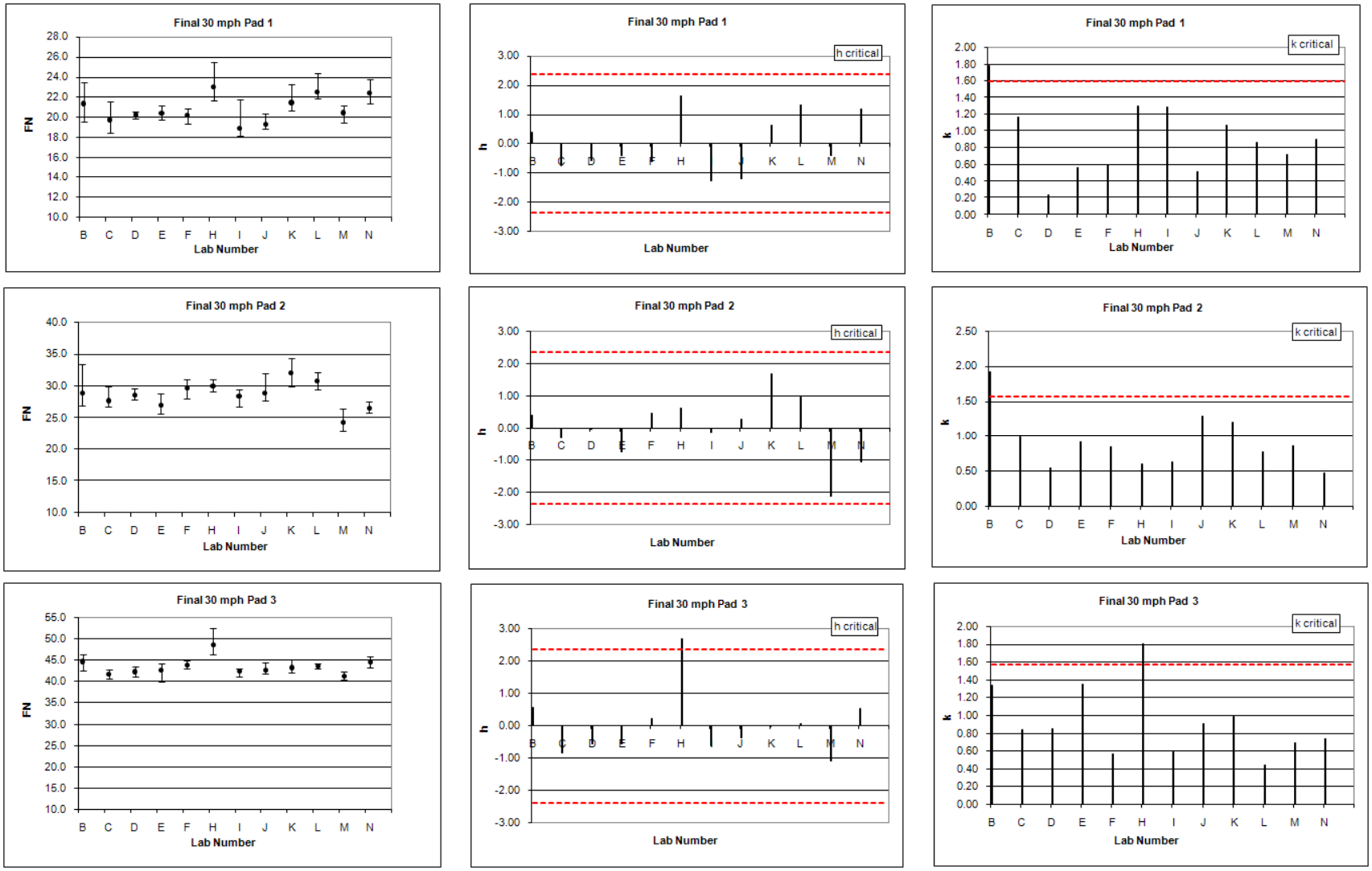

Figure 2-2- Box plots and h and k statistics for friction numbers of TTI Final State System at 30 mph

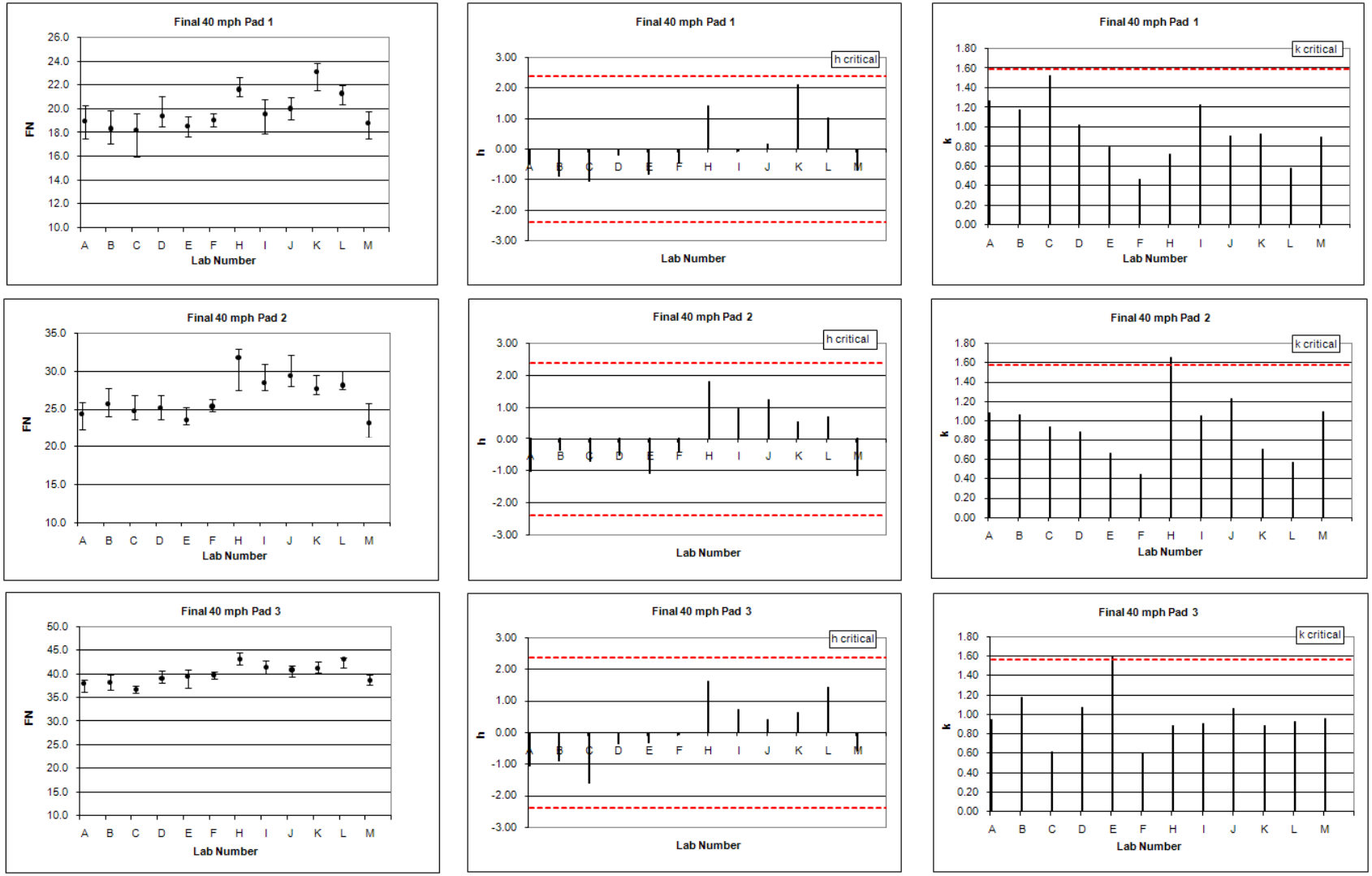

Figure 2-3- Box plots and h and k statistics for friction numbers of TTI Final State System at 40 mph

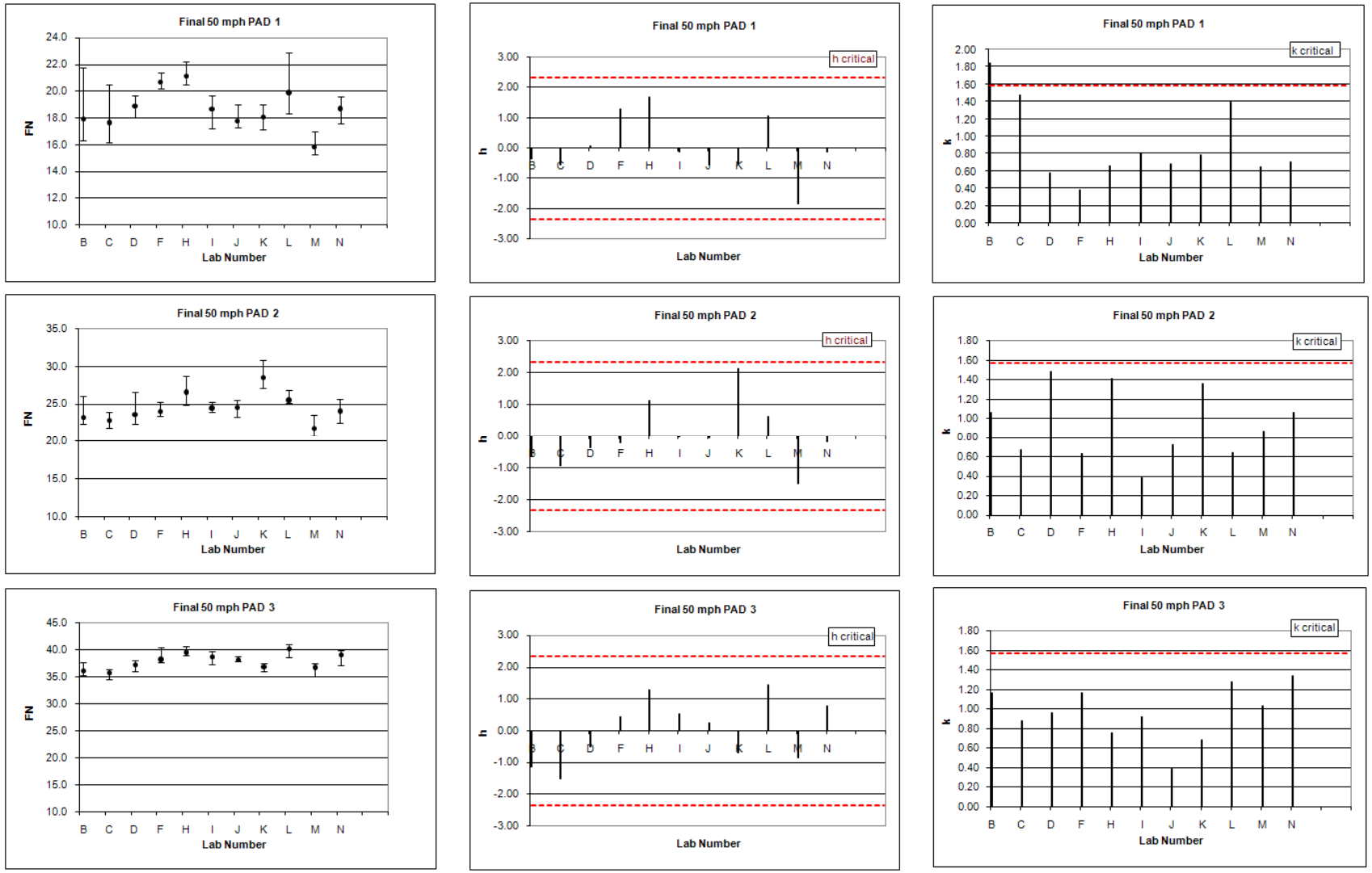

Figure 2-4- Box plots and h and k statistics for friction numbers of TTI Final State System at 50 mph

2.3 ANALYSIS OF TRC FRICTION DATA

2.3.1 Analysis of Arrival State System Measurements

The Arrival (ARR) State System measurements were made upon arrival of the systems to the TRC test center prior to any adjustments. The ARR data available for analysis were collected using ribbed 501 tire. The ARR Data are provided in Appendix C and shown on box plots in Figure 2-5, Figure 2-6, and Figure 2-7 with the state systems identified numerically from 1 to 12. The data were collected from 12 replicate runs on three different surfaces (pads) using 12 state systems operated at 20 mph (32.2 km/h), 40 mph (64.4 km/h), and 60 mph (96.6 km/h).

The h- and k- statistics for the Arrival State Systems are provided in Tables C-1 through C-3 of Appendix C and displayed in Figure 2-5, Figure 2-6, and Figure 2-7. At 20 mph, the k-statistic of Pad 4 and Pad 6 using System 10 exceeded the critical k- values and were eliminated from the analysis (Table C-1 and Figure 2-5). At 40 mph, the h-statistic of Pad 6 using System 9 exceeded the critical h value and was eliminated from the analysis (Table C-2 and Figure 2-6). At 60 mph, the k-statistic from Pad 6 using System 1 exceeded the critical k value and was eliminated from the analysis (Table C-3 and Figure 2-7). The remaining data were re-analyzed according to E 691 method to determine the S_r and S_R standard deviations shown in Table 2-7 and Table 2-8.

Table 2-7- Averages and standard deviations of TRC Arrival friction measurements using 501 tire

Type of Data & Tire	Speed (mph)	No. of Systems	Average			Repeatability Std			Reproducibility Std		
			Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
Arrival 501	20	12	20.2	49.4	71.8	1.82	1.38	2.31	3.29	3.28	6.82
	40	12	14.9	47.1	62.8	1.29	1.32	2.36	2.57	3.15	3.88
	60	12	12.0	48.6	50.4	1.03	1.49	2.08	2.64	3.48	4.96

Table 2-8- Coefficient of variation of TRC Arrival friction measurements using 501 tire

Type of Data & Tire	Speed (mph)	No. of Systems	Repeatability CV %			Reproducibility CV %		
			Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
Arrival 501	20	12	9.0	2.8	3.2	16.26	6.63	9.50
	40	12	8.7	2.8	3.8	17.28	6.69	6.19
	60	12	8.6	3.1	4.1	22.03	7.16	9.84

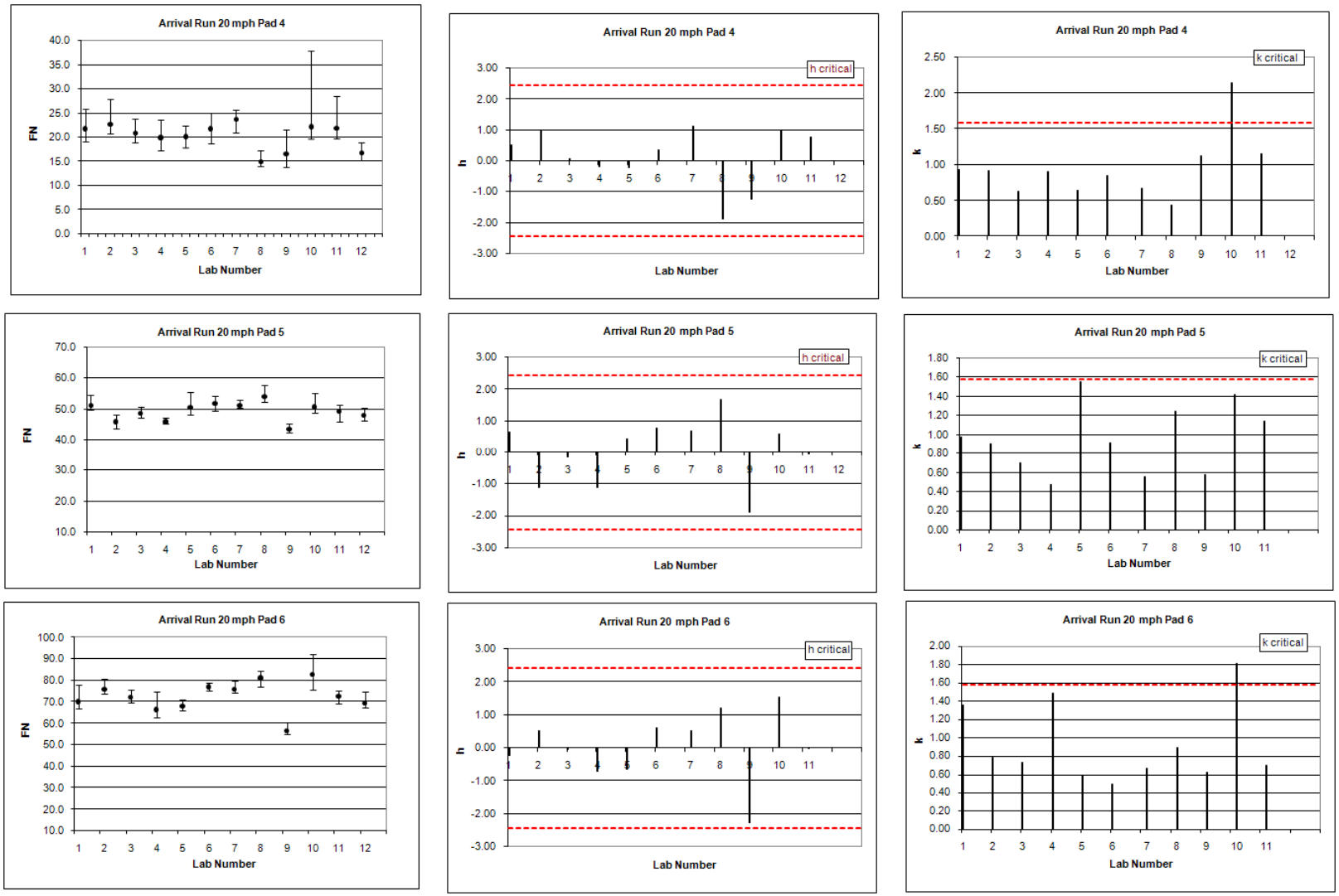

Figure 2-5- Box plots and h and k statistics for friction numbers of TRC Arrival State System at 20 mph

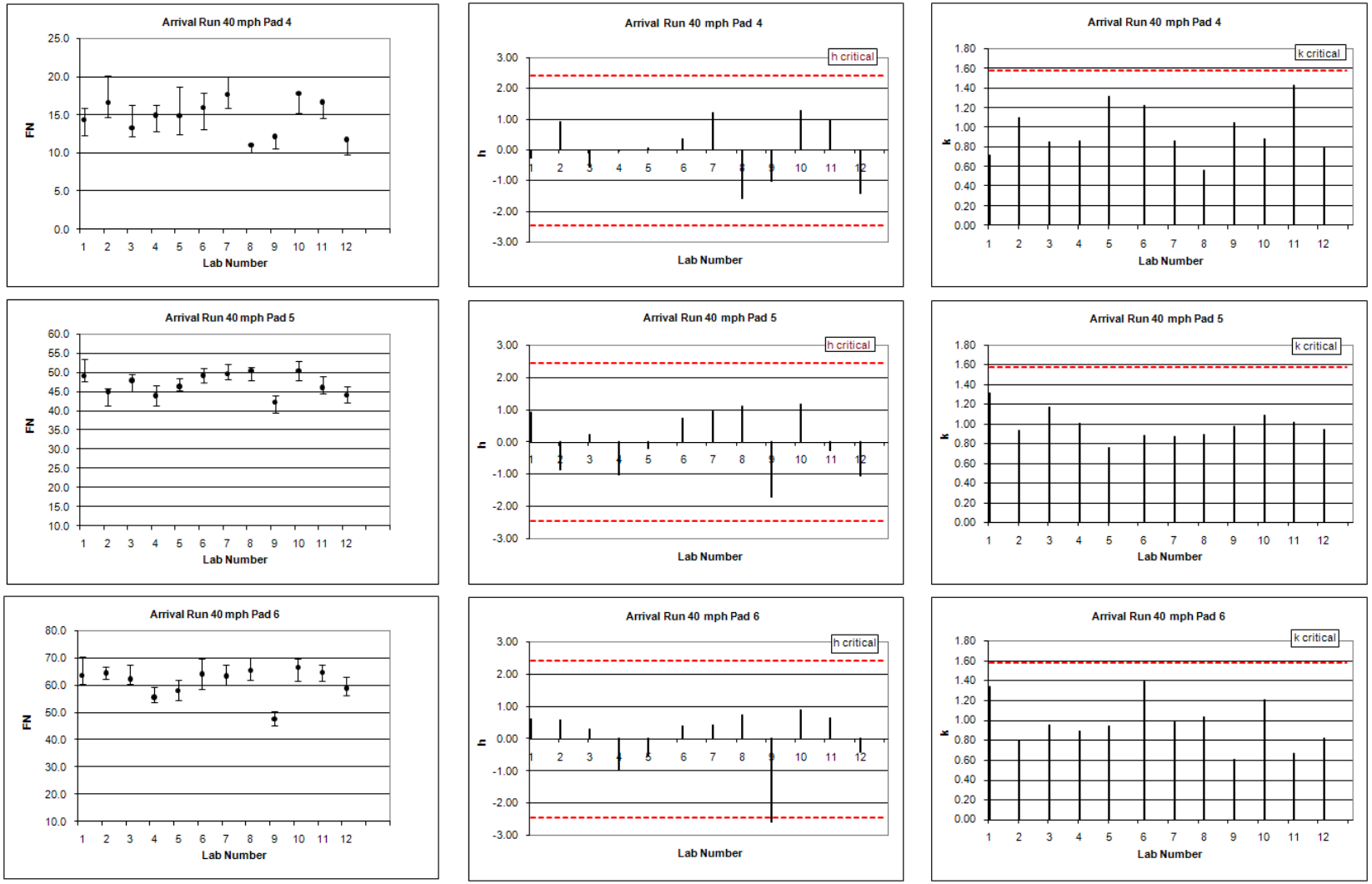

Figure 2-6- Box plots and h and k statistics for friction numbers of TRC Arrival State System at 40 mph

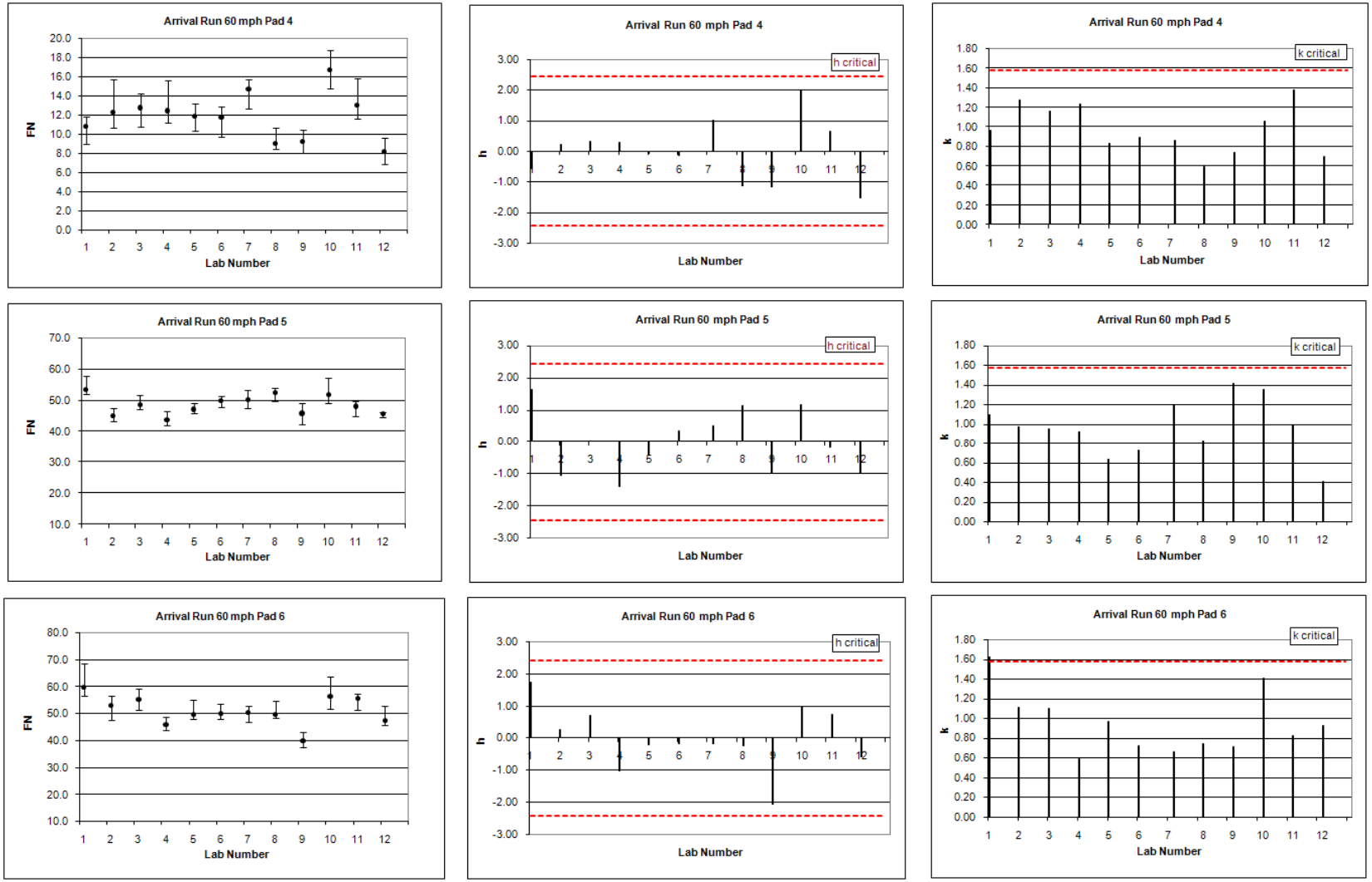

Figure 2-7- Box plots and h and k statistics for friction numbers of TRC Arrival State System at 60 mph

2.3.2 Analysis of Departure State System Measurements

The Departure (DEP) State System measurements were made after the adjustments were applied to the state systems to put them into compliance with ASTM E 274 (AASHTO T 242). The DEP State Systems were operated on the three surfaces of Pads 4, 5, and 6 and at three speeds of 20, 40, and 60 mph (32.2, 64.4, 96.6 km/h). There were 50 sets of data available for analysis. The data were collected from left or right wheel of the 1st, 2nd, or both friction systems of 12 states collected over the past 5 years. The DEP State System data are provided in Appendices E and F and are identified numerically from 1 to 35 for ribbed 501 tire and from 1 to 15 for smooth 524 tire.

2.3.2.1 Data from Ribbed 501 Tire

The DEP State System data using 501 tire at 20, 40, and 60 mph (32.2, 64.4, and 96.6 km/h) are shown on box plots in Figure 2-8, Figure 2-9, and Figure 2-10. There were 35 sets of data collected over the past 5 years from 12 replicate runs on three different surfaces using one or more friction measuring systems of 12 states. The h- and k-statistics of the DEP State Systems are provided in Appendix D and are also displayed in Figure 2-8, Figure 2-9, and Figure 2-10. As indicated from the tables and figures, based on the exceedance of h or k statistics from critical values, 4 sets of data were eliminated from 20 mph measurements (Table D-1 and Figure 2-8), 4 sets of data were eliminated from 40 mph measurements (Table D-2 and Figure 2-9), and 6 sets of data were eliminated from 60 mph measurements (Table D-3 and Figure 2-10). The remaining data were re-analyzed according to E 691 method to determine the S_r and S_R standard deviations shown in Table 2-9 and Table 2-10.

Table 2-9- Statistics of TRC Departure friction measurements for 501 tire

Type of Data & Tire	Speed (mph)	No. of Systems	Average			Repeatability Std			Reproducibility Std		
			Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
Departure 501	20	35	19.9	49.8	74.1	1.85	1.22	2.79	3.16	2.39	5.12
	40	35	13.6	47.2	61.4	1.13	1.15	2.55	2.17	2.20	5.12
	60	33	10.3	48.1	50.7	0.94	1.66	2.40	1.84	2.71	4.81

Table 2-10- Coefficient of variation of TRC Departure friction measurements for 501 tire types

Type of Data & Tire	Speed (mph)	No. of Systems	Repeatability CV %			Reproducibility CV %		
			Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
Departure 501	20	35	9.3	2.5	3.8	15.88	4.79	6.91
	40	35	8.3	2.4	4.2	15.95	4.66	8.34
	60	33	9.0	3.4	4.7	17.82	5.63	9.47

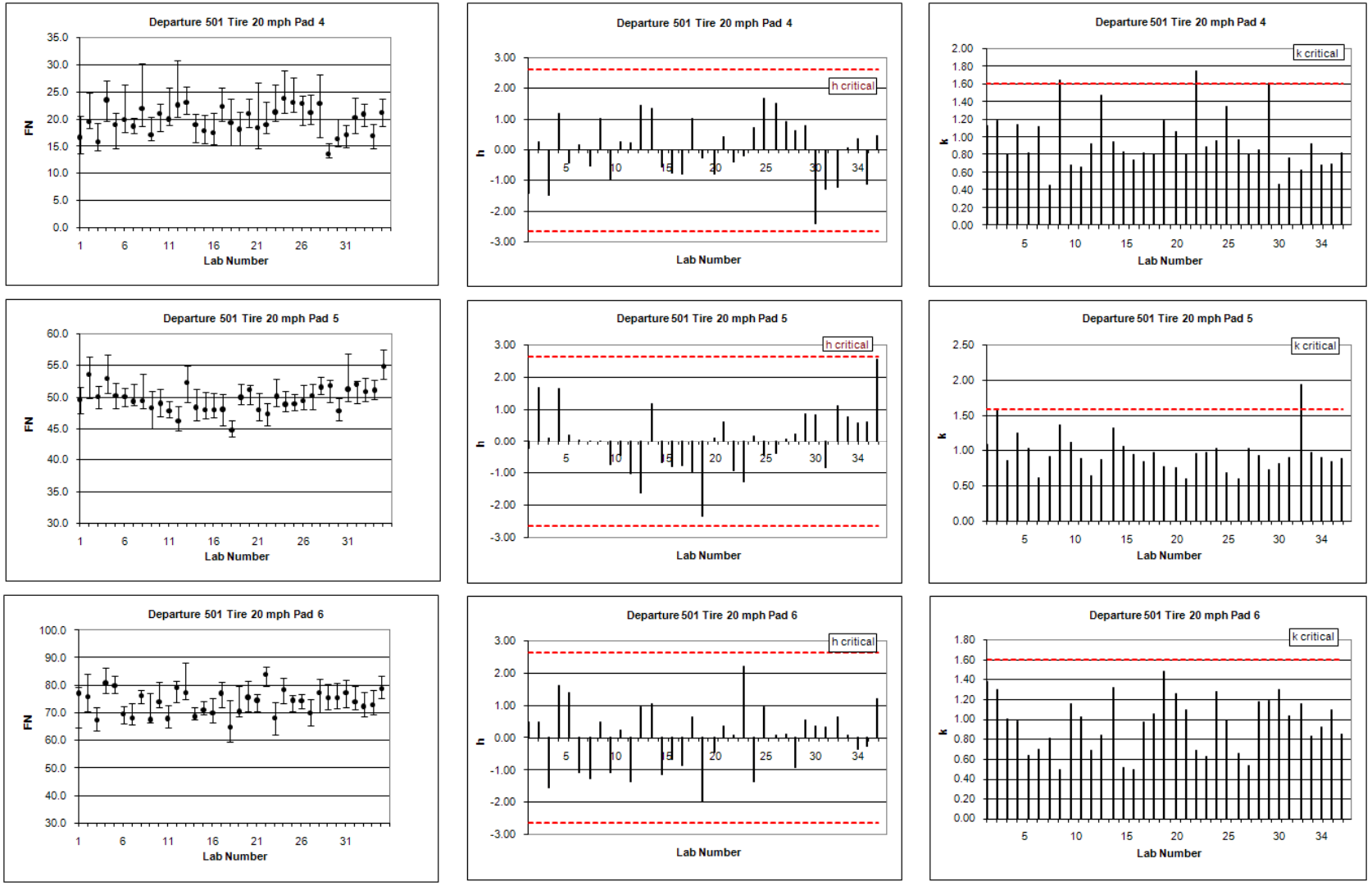

Figure 2-8- Box plots and h and k statistics for friction numbers of TRC Departure State System with 501 tire at 20 mph

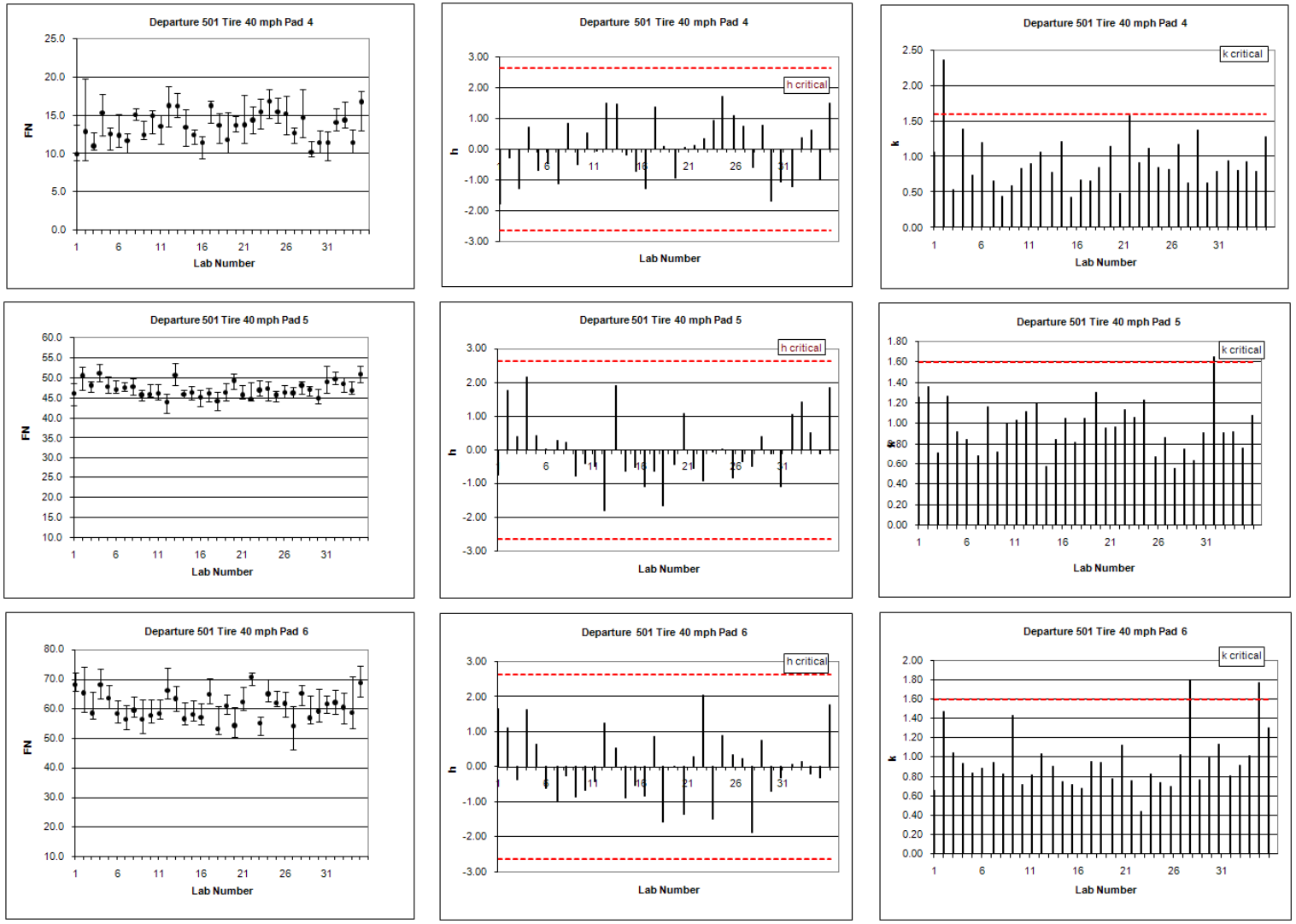

Figure 2-9- Box plots and h and k statistics for friction numbers of TRC Departure State System with 501 tire at 40 mph

Figure 2-10- Box plots and h and k statistics for friction numbers of TRC Departure State Systems with 501 tires at 60 mph

2.3.2.2 Data from Smooth 524 Tire

The DEP State System data from 524 tire at 20, 40, and 60 mph (32.2, 64.4, and 96.6 km/h) are shown on box plots in Figure 2-11, Figure 2-12, and Figure 2-13. There are fifteen sets of data available from 524 tire for analysis of precisions of friction measurements. The data were collected over the past 5 years from 12 replicate runs on three different surfaces using one or more friction measuring systems of 12 states. The h- and k- statistics of the DEP State Systems are provided in Tables E-1 through E-3 of Appendix E and are displayed in Figure 2-11, Figure 2-12, and Figure 2-13. As indicated from the tables and figures, based on exceedance of k statistics from critical value, 2 sets of data were eliminated from 20 mph measurements (Table E-1 and Figure 2-11), 1 set of data was eliminated from 40 mph measurements (Table E-2 and Figure 2-12), and 3 sets of data were eliminated from 60 mph measurements (Table E-3 and Figure 2-13). The remaining data were re-analyzed according to E 691 method to determine the S_r and S_R precision estimates shown in Table 2-11 and Table 2-12.

Table 2-11- Statistics of TRC Departure friction measurements for 524 tire types

Type of Data & Tire	Speed (mph)	No. of Systems	Average			Repeatability Std			Reproducibility Std		
			Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
Departure 524	20	15	16.6	50.9	65.8	1.55	1.29	3.19	2.78	2.75	5.90
	40	15	9.2	44.4	37.9	0.66	1.24	3.78	2.10	2.52	6.22
	60	13	6.2	41.3	22.3	0.57	1.75	2.23	1.42	2.70	4.69

Table 2-12- Coefficient of variations of TRC Departure friction measurements using 524 tire

Type of Data & Tire	Speed (mph)	No. of Systems	Repeatability CV %			Reproducibility CV %		
			Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
Departure 524	20	15	9.4	2.5	4.8	16.8	5.4	9.0
	40	15	7.1	2.8	10.0	22.7	5.7	16.4
	60	13	9.2	4.2	10.0	22.9	6.5	21.0

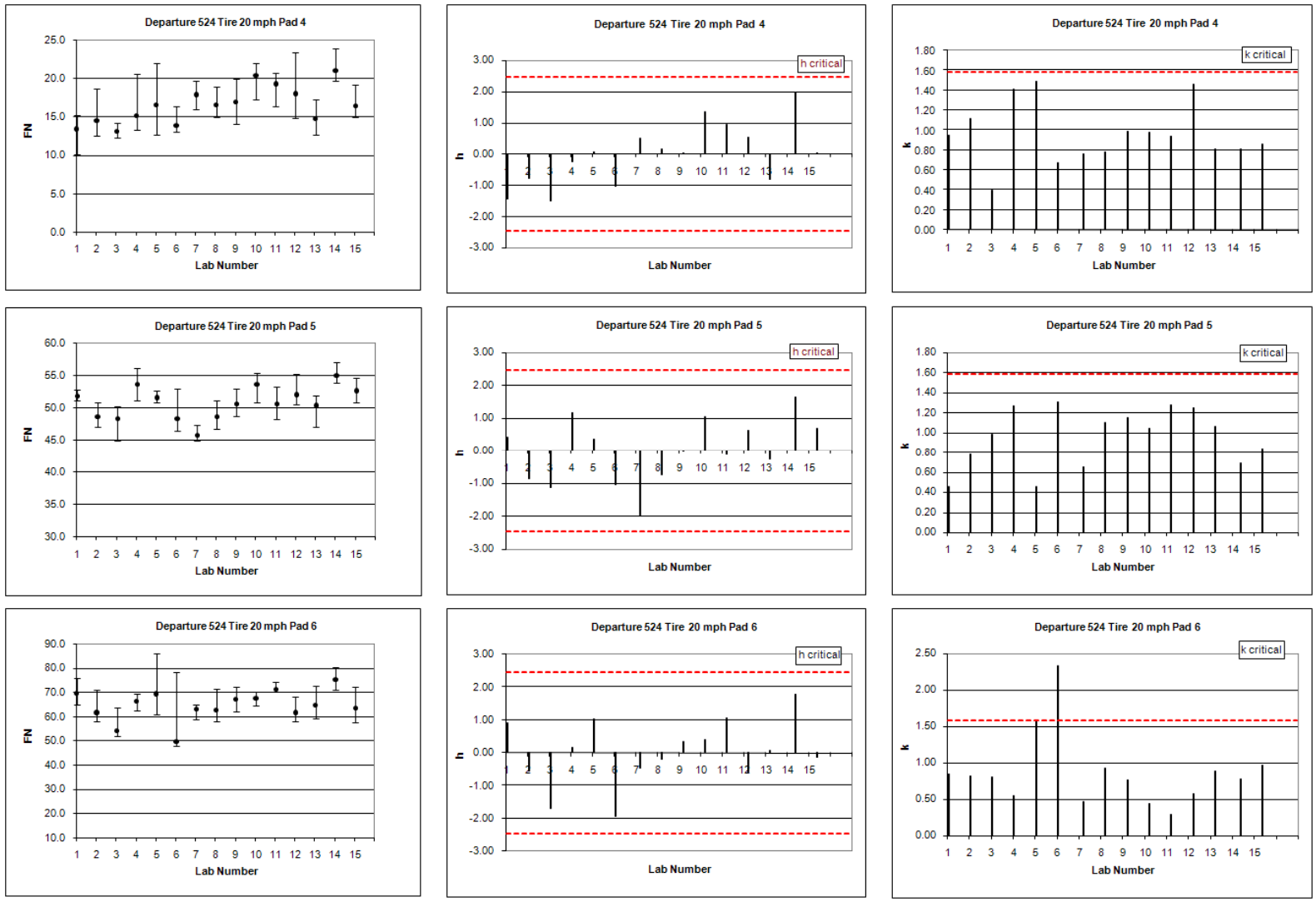

Figure 2-11- Box plots and h and k statistics for friction numbers of TRC Departure State Systems with 524 tires at 20 mph

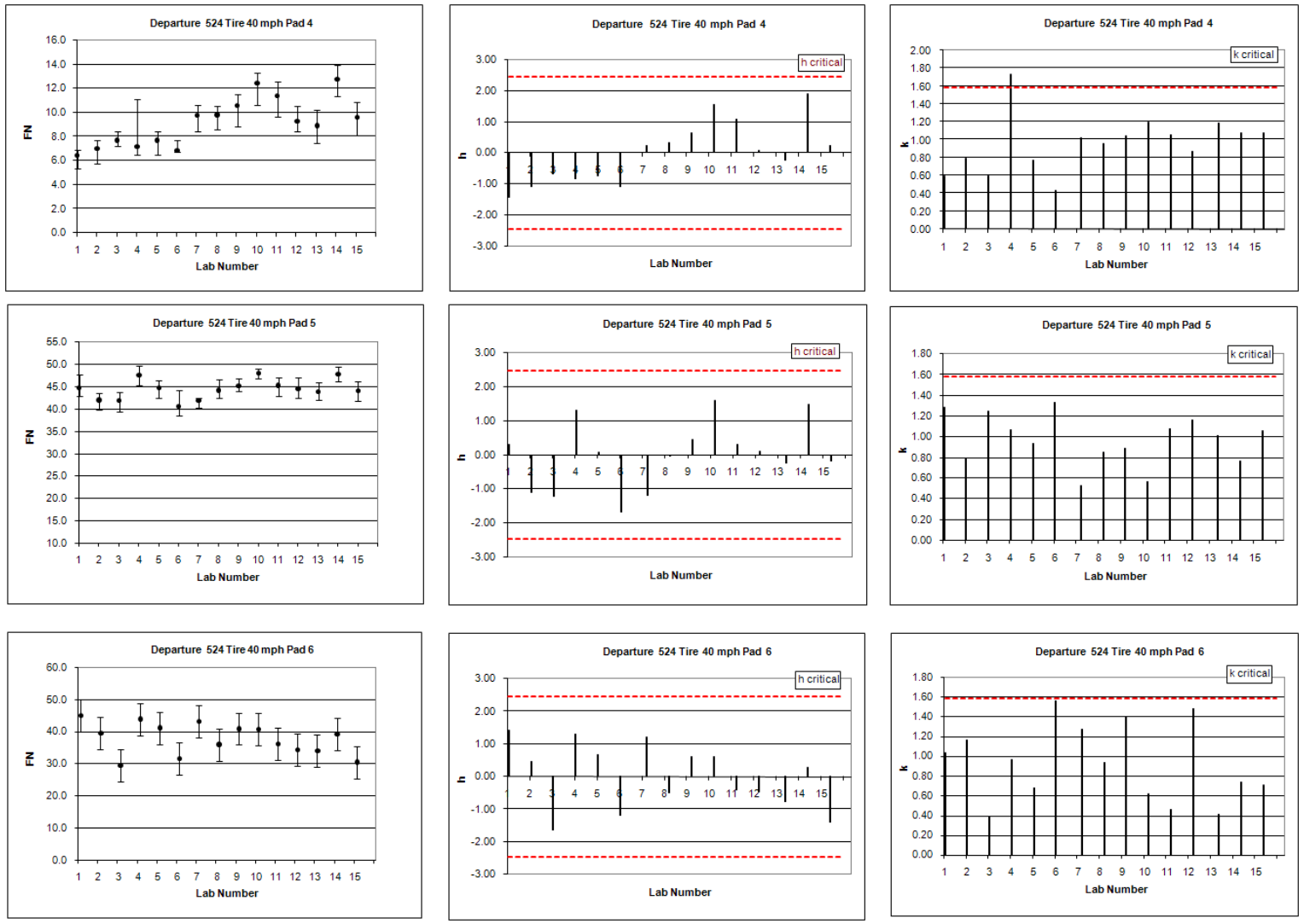

Figure 2-12- Box plots and h and k statistics for friction numbers of TRC Departure State Systems with 524 tires at 40 mph

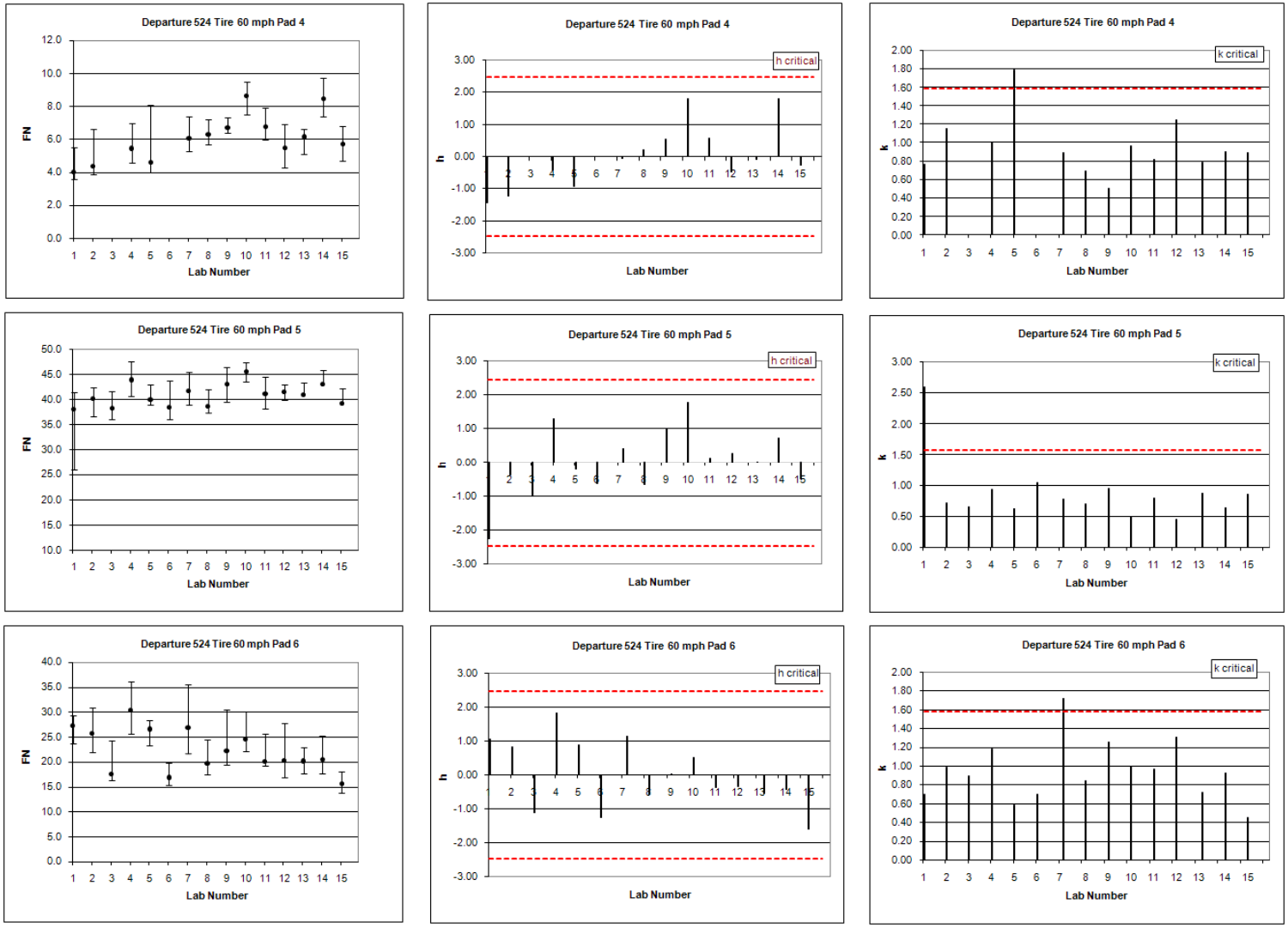

Figure 2-13- Box plots and h and k statistics for friction numbers of TRC Departure State Systems with 524 tires at 60 mph

2.3.3 Comparison of TRC Arrival and Departure Precisions

The comparison of the ARR and DEP statistics would indicate if the calibration process improves the precision of the frictional measurements. Table 2-13 provides the pooled standard deviations of the ARR and DEP State Systems with 501 tire. The comparison of the standard deviations in the table indicates that 4 out of 6 DEP standard deviations are smaller than those of ARR. This shows that the calibration process in addition to making adjustment to the friction measurements would improve the precision of the collected friction data.

Table 2-13- Pooled repeatability and reproducibility standard deviations of 501 tire Arrival and Departure friction data

Type of Measurement	Repeatability			Reproducibility		
	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
Arrival (501 tire)	1.82	1.40	2.25	3.29	3.31	5.36
Departure (501 tire)	1.85	1.36	2.58	3.16	2.44	5.02

2.3.4 Selection of Form of Precision Estimates

A review of statistics of TRC Departure State System in Table 2-9 and Table 2-11 indicates that there are no significant correlations between averages and standard deviations. Therefore, standard deviations will be statistically tested if they can be combined for the precision estimate development. Statistical F-test was performed to examine the significance of the differences in variances of friction measurements from different tire types, different surfaces, and different speeds as explained in the following sections.

2.3.4.1 Test of Significance on Standard Deviations of 501 and 524 Tires

The results of the F-test on significance of difference between standard deviations of 501 and 524 tires are provided in Table 2-14 and Table 2-15. The comparison of the computed and critical F values in the tables indicates that for 1% level of significance the repeatability and reproducibility standard deviations of the two tire types are not significantly different. Therefore, the standard deviations in Table 2-9 and Table 2-11 for the three surfaces and the three speeds were combined as reported in Table 2-16.

Table 2-14- Computed F- and critical F- values for comparison of precision estimates of 501 and 524 tires for different speeds

Speed, mph	Degrees of Freedom	Critical F	S_r Computed F	Decision	S_R Computed F	Decision
20	44, 104	1.76	1.12	Accept	1.20	Accept
40	104, 44	1.88	1.78	Accept	1.38	Accept
60	102, 42	1.94	1.12	Accept	1.08	Accept

Note: The critical F values stand for 99% level of confidence.

Table 2-15- Computed F- and critical F- values for comparison of precision estimates of 501 and 524 tires for different surfaces

Surface	Degrees of Freedom	Critical F	S_r Computed F	Decision	S_R Computed F	Decision
Pad 4	102, 42	1.94	1.77	Accept	1.28	Accept
Pad 5	44, 104	1.76	1.12	Accept	1.18	Accept
Pad 6	44, 104	1.76	1.47	Accept	1.26	Accept

Note: The critical F values stand for 99% level of confidence.

Table 2-16- Pooled repeatability and reproducibility standard deviations of 501 and 524 tires

Speed (mph)	Repeatability			Reproducibility		
	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
20	1.71	1.26	2.99	2.97	2.57	5.52
40	0.93	1.19	3.22	2.14	2.37	5.70
60	0.77	1.70	2.31	1.65	2.70	4.75

2.3.4.2 Test of Significance on Standard Deviations from Different Speeds

The evaluation of significance of differences in variability of TRC pooled friction measurements at 20, 40, and 60 mph (32.2, 64.4, and 96.6 km/h) in Table 2-16 would determine if statistics from different speeds could be combined. An F-test was performed to examine the significance of the differences. The results of the F-test are provided in Table 2-17. The comparison of the computed and critical F values in the table indicates that for 1% level of significance the repeatability and reproducibility of the friction numbers from pads 5 and 6 are not significantly different at 20, 40, or 60 mph. However, the repeatability of friction measurements of Pad 4 at 20 mph is significantly larger than those at 40 and 60 mph. In addition, the reproducibility of friction measurements of Pad 4

at 20 mph is significantly larger than that at 60 mph. Therefore, for Pads 5 and 6 the standard deviations of the three speeds were pooled and for Pad 4 the largest repeatability and reproducibility values would be selected for precision estimate determination as shown in Table 2-18.

Table 2-17- Computed F- and critical F- values for comparison of precision estimates of different speeds

Surface	Comparison (mph)	Degrees of Freedom	Critical F	S_r Computed F	Decision	S_R Computed F	Decision
Pad 4	20 vs 40	49, 49	1.95	3.41	Accept	1.94	Accept
Pad 4	20 vs 60	49, 45	2.00	4.87	Accept	3.26	Accept
Pad 4	40 vs 60	49, 45	2.00	1.43	Accept	1.69	Accept
Pad 5	20 vs 40	49, 49	1.95	1.11	Accept	1.18	Accept
Pad 5	20 vs 60	49, 45	2.00	1.84	Accept	1.10	Accept
Pad 5	40 vs 60	49, 45	2.00	2.04	Accept	1.30	Accept
Pad 6	20 vs 40	49, 49	1.95	1.16	Accept	1.07	Accept
Pad 6	20 vs 60	49, 45	2.00	1.67	Accept	1.35	Accept
Pad 6	40 vs 60	49, 45	2.00	1.94	Accept	1.44	Accept

Note: The critical F values stand for 99% level of confidence.

Table 2-18- Combined standard deviations of the 3 speeds for TRC surfaces

Surfaces	Repeatability	Reproducibility
Pad 4	1.71	2.97
Pad 5	1.40	2.55
Pad 6	2.87	5.34

2.3.4.3 Test of Significance on Standard Deviations from Different Surfaces

The evaluation of differences in variability of TRC friction measurements from different surfaces would determine if those statistics can be combined. Statistical F-test was performed to examine the significance of the difference in variances of friction measurements from different surfaces in Table 2-18. The results of the F-test are provided in Table 2-19. The comparison of the computed and critical F- values in the table indicates that for 1% level of significance the repeatability and reproducibility values of Pads 4 and 5 are not significantly different but they are significantly different from those of Pad 6. Therefore, as reported in Table 2-20, the standard deviations of Pads 4 and 5 in Table 2-18 are combined and those of Pad 6 are reported separately.

Table 2-19- Computed F- and critical F- values for comparison of precision estimates of different TRC surfaces

Comparison of Pads	Degrees of Freedom	Critical F	S_r Computed F	Decision	S_R Computed F	Decision
4 vs. 5	149, 145	1.42	0.67	Accept	0.74	Accept
4 vs. 6	149, 145	1.42	2.82	Reject	3.23	Reject
5 vs. 6	149, 149	1.40	4.19	Reject	4.38	Reject

Note: The critical F values stand for 99% level of confidence.

Table 2-20- Combined repeatability and reproducibility precisions for frictional properties of TRC measurements

Surface	Repeatability		Reproducibility	
	1s	d2s	1s	d2s
Pads 4 & 5	1.31	3.70	2.44	6.90
Pad 6	2.87	8.12	5.34	15.11

2.4 COMPARISON OF TTI AND TRC PRECISIONS

The comparison of the repeatability and reproducibility standard deviations of TTI (Table 2-6) and TRC (Table 2-20) friction measurements would indicate if the standard deviations can be combined. Statistical F-test was performed to examine the significance of the difference in variances of friction measurements from the two centers. The results of the F-test on pooled variances of TTI and pooled variances of Pad 4 and 5 of TRC are provided in Table 2-21. The comparison of the computed and critical F-values in the table indicates that for 1% level of significance the pooled repeatability of TTI measurements is significantly smaller than the pooled repeatability of Pads 4 and 5 of TRC. However, the reproducibility values are not significantly different. Since the same procedure should be followed for both repeatability and reproducibility, the larger of the standard deviations of the two centers that correspond to TRC surfaces would be used for the precision estimates development of AASHTO T 242.

Table 2-21- Computed F- and critical F- values for comparison of variances of TTI and TRC friction measurements

Comparison	Degrees of Freedom	Critical F	S_r Computed F	Decision	S_R Computed F	Decision
TTI & TRC	295, 98	1.50	2.49	Reject	1.64	Accept

Note: The critical F values stand for 99% level of confidence.

2.5 PRECISION ESTIMATES FOR AASHTO T 242

Since the variances of frictional measurements from TRC were significantly different from those of TTI test centers, the larger variances of the two sets were used to develop the precision estimates for AASHTO T 242. The pooled variances of Pads 4 and 5 of TRC were also kept separate from those of Pad 6. This pad, which is a hot mix asphalt surface, provided significantly larger variances than all other surfaces. Table 2-22 provides the proposed precision estimates for AASHTO T 242.

Table 2-22- Repeatability and reproducibility precisions for frictional measurements of various pavement surfaces

Surface	Repeatability Std		Reproducibility Std	
	1s	d2s	1s	d2s
Hot Mix Asphalt	2.87	8.12	5.34	15.11
Other Surfaces	1.56	4.42	2.77	7.84

2.6 COMPARISON WITH CURRENT PRECISION ESTIMATE IN AASHTO T 242

The current version of AASHTO T 242 includes only a repeatability standard deviation that can be compared with the repeatability standard deviation computed in this study. The repeatability standard deviation is reported as 2 FN (friction number unit) in AASHTO T 242-96 (2004), which is smaller than the proposed standard deviation for hot mix asphalt surface (2.87 FN) and larger than the repeatability proposed for other surfaces (1.56 FN). There is no reproducibility standard deviation reported in the current version of AASHTO T 242.

CHAPTER 3- CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

This study was conducted to prepare precision estimates for AASHTO T 242, "Frictional Properties of Paved Surfaces Using a Full-Scale Tire." The data for this study were collected by Texas Transportation Institute (TTI) and Transportation Research Center (TRC) for evaluation of state friction measurement systems. The measurements were done using state systems as they initially arrived to the center and after they were calibrated to be in compliance with AASHTO T 242. Each individual state system was operated with 12 repeats, on three different surfaces, at three different speeds. The TTI surfaces consist of seal coat over HMA, seal coat and sand over hot mix asphalt (HMA), and concrete and the speeds include 30, 40, and 50 mph (48.2, 64.4, 83.3 km/h). The TRC surfaces consist of thick coating of coal-tar emulsion over HMA, grade 5 aggregate (screened -1/4 + 10) set in epoxy over HMA, and finish coat of Ohio DOT HMA. The TRC speeds include 20, 40, and 60 mph (32.2, 64.4, and 96.6 km/h).

The statistics of the friction numbers were computed for both Initial (Arrival) and Final (Departure) measurement systems. The comparison of the statistics from the initial (arrival) measurements indicated that the calibration of the state systems in addition to providing adjustments to the measurement values, would improve the precision of the measurements.

The evaluation of the relation between standard deviations and averages of the friction data indicated that there is no significant correlation between standard deviations and averages of sets of friction values. This showed that standard deviations are applicable as precision estimates regardless of the average friction of the surfaces.

The precision estimates of AASHTO T 242 were computed using the statistics of TTI Final and TRC Departure Sate Systems. Statistical F-test was conducted to evaluate the difference in the repeatability and reproducibility standard deviations of the friction measurements from different tire types, different surfaces, different speeds, and different state systems of the two test centers. Results of the F-test indicated that for a 1% level of significance, the difference between the standard deviations of different speeds was not significant and they were combined. However, standard deviations of the surfaces in some cases were significantly different. For the case of hot mix asphalt surface, which had significantly larger standard deviation than all other surfaces, the precision estimates were reported separately. For other cases, the standard deviations of several surfaces were either combined or the larger one of them were selected for precision estimate development.

The comparison of the computed repeatability standard deviation and the current repeatability standard deviation in AASHTO T 242 indicated that the 2 FN (friction number unit) reported as the repeatability standard deviation in AASHTO T 242-96

(2004) is smaller than the standard deviation proposed for hot mix asphalt surface (2.87 FN) and larger than the repeatability proposed for other surfaces (1.56 FN).

3.2 RECOMMENDATIONS

The current version of AASHTO T 242 only includes a repeatability standard deviation, which is different from the ones computed in this study. It is recommended to adopt the precision statement provided in Section 3.3, which includes repeatability and reproducibility estimates based on a wide range of friction values measured according to the most recent version of AASHTO T 242 by state friction systems.

3.3 PRECISION STATEMENT FOR AASHTO T 242

PRECISION STATEMENT FOR AASHTO T 242 "FRICTIONAL PROPERTIES OF PAVED SURFACES USING A FULL-SCALE TIRE"

X. Precision and Bias

X.1 Precision

X.1.1 Single Operator Precision - The single operator standard deviation (1s limits) for friction number (FN) is shown in Table X-1. The results of two properly conducted friction test on the same surface, by the same operator, and using the same equipment, should be considered suspect if they differ by more than d2s single-operator limits shown in Table X-1.

X.1.2 Multilaboratory Precision - The multilaboratory standard deviation (1s limits) for friction number (FN) is shown in Table X-1. The results of two properly conducted tests on the same surface, by different operators, using different systems, should be considered suspect if they differ by more than d2s multilaboratory limits shown in Table X-1.

Table X-1- Precision Estimates

Condition of Test and Test Property	Standard Deviation, % (1s)[a]	Acceptable Range of Two Test Results, % (d2s)[a]
Single-Operator Precision:		
Hot mix asphalt	2.87	8.12
Other surfaces	1.56	4.42
Multilaboratory Precision:		
Hot mix asphalt	5.34	15.11
Other surfaces	2.77	7.84

[a] *These values represent the 1s and d2s limits described in ASTM Practice C670. Note: These limits are determined based on 6696 data from evaluation of 24 state friction systems calibrated and tested at TTI and TRC test centers. The TTI surfaces consist of seal coat over HMA, seal coat and sand over HMA, and concrete and the speeds include 30, 40, and 50 mph (48.2, 64.4, 83.33 km/h).The TRC surfaces consist of thick coating of coal-tar emulsion over HMA, aggregate (screened -1/4 + 10) set in epoxy over HMA, and finish coat of Ohio DOT HMA and the speeds include 20, 40, and 60 mph (32.2, 64.4, and 96.6 km/h).*

X.2 Bias

No information can be presented on the bias of the procedure because no material having an accepted reference value is available.

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APPENDIX A- TTI INITIAL STATE SYSTEM MEASUREMENTS AND THE CORRESPONDING STATISTICS

Table A-1- Initial State System measurements at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Initial 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3
A	19.2	26.9	42.6	18.95	27.87	41.63	1.49	1.23	1.15	-0.47	0.14	0.47	1.78	0.79	1.12	FALSE	27.87	41.63	FALSE	1.23	1.15
	19.8	26.1	41.0																		
	18.7	28.3	40.9																		
	18.7	27.7	40.8																		
	17.6	30.4	42.6																		
	17.9	29.4	40.6																		
	19.4	28.4	40.3																		
	18.2	27.2	43.5																		
	17.9	27.3	41.7																		
	23.2	26.4	42.7																		
	18.4	28.4	42.7																		
	18.4	27.9	40.1																		
B	18.0	28.6	41.6	18.39	29.03	39.42	0.71	2.14	1.90	-0.72	0.53	-1.01	0.85	1.38	1.86	18.39	29.03	FALSE	0.71	2.14	FALSE
	19.5	31.4	39.9																		
	18.8	31.7	37.3																		
	18.5	28.4	40.3																		
	18.5	28.5	35.9																		
	18.2	28.0	41.6																		
	17.4	29.1	41.6																		
	18.5	32.1	39.3																		
	19.4	29.2	38.8																		
	18.9	27.0	40.8																		
	17.7	24.4	38.6																		
	17.3	29.9	37.3																		
C	21.1	27.5	40.0	20.50	27.74	39.33	0.57	0.52	1.13	0.23	0.10	-1.07	0.68	0.34	1.10	20.50	27.74	39.33	0.57	0.52	1.13
	20.9	28.5	36.4																		
	20.5	27.9	38.2																		
	21.4	26.6	39.4																		
	20.1	28.3	39.9																		
	20.7	27.5	40.7																		
	20.8	28.3	39.5																		
	20.1	27.4	39.6																		
	20.8	27.5	38.8																		
	19.4	27.9	39.3																		
	19.8	28.0	39.9																		
	20.4	27.5	40.2																		
E	18.8	22.7	37.9	16.26	22.01	39.68	0.95	0.60	0.87	-1.68	-1.81	-0.83	1.14	0.38	0.85	16.26	22.01	39.68	0.95	0.60	0.87
	16.6	22.1	40.1																		
	16.8	22.0	38.4																		
	16.5	21.3	40.7																		
	15.6	21.6	39.9																		
	16.0	23.3	40.5																		
	16.0	22.1	40.1																		
	15.2	21.9	38.7																		
	16.1	22.2	39.9																		
	15.7	21.0	40.0																		
	15.3	21.9	39.9																		
	16.5	22.0	40.1																		
F	21.5	28.9	43.2	21.48	27.93	42.85	0.50	2.54	0.68	0.67	0.16	1.29	0.60	1.64	0.67	21.48	FALSE	42.85	0.50	FALSE	0.68
	21.8	20.6	41.8																		
	21.0	29.4	42.9																		
	22.1	29.2	43.1																		
	20.9	29.4	44.1																		
	22.0	28.2	43.4																		
	22.2	28.5	42.0																		
	21.2	27.0	43.1																		
	21.0	30.7	42.0																		
	21.5	28.5	43.3																		
	21.8	27.0	42.9																		
	20.8	27.8	42.4																		

Table A-1 (Cont.) - Initial State System measurements at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Initial 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3	Pad1	Pad 2	Pad 3
K	23.3	33.2	42.1	22.47	29.52	42.12	0.53	1.84	0.35	1.11	0.69	0.80	0.64	1.19	0.34	22.47	29.52	42.12	0.53	1.84	0.35
	23.0	31.8	42.1																		
	22.2	30.7	42.0																		
	22.2	30.8	41.8																		
	22.5	29.6	42.1																		
	22.0	29.8	43.0																		
	21.6	27.0	41.7																		
	22.7	28.7	42.3																		
	23.3	28.9	41.8																		
	22.1	28.0	42.3																		
	22.1	27.7	42.3																		
	22.6	28.0	41.9																		
L	23.6	32.8	43.1	22.75	31.35	42.53	0.75	1.12	0.58	1.24	1.30	1.07	0.90	0.72	0.57	22.75	31.35	42.53	0.75	1.12	0.58
	23.1	33.1	42.7																		
	22.5	31.4	42.8																		
	23.4	30.8	42.7																		
	23.8	31.3	43.0																		
	22.5	30.9	41.6																		
	22.2	30.9	42.7																		
	21.7	29.9	42.9																		
	23.7	31.8	42.9																		
	21.7	30.0	42.3																		
	22.6	33.0	42.4																		
	22.2	30.3	41.2																		
M	18.6	26.3	41.0	19.12	24.11	39.88	0.72	1.21	0.69	-0.39	-1.11	-0.70	0.87	0.78	0.68	19.12	24.11	39.88	0.72	1.21	0.69
	20.0	26.1	39.5																		
	20.1	23.5	39.5																		
	18.2	23.9	39.5																		
	18.3	23.8	40.6																		
	19.2	23.3	41.2																		
	19.9	24.0	39.5																		
	18.0	22.7	39.6																		
	19.2	22.6	39.3																		
	18.9	23.8	40.0																		
	19.4	25.4	39.9																		
	19.6	23.9	39.0																		
Number of Labs With Data				8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.00	7.00	7.00	7.00
				X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
				19.99	27.44	40.93	0.83	1.55	1.02	2.15	2.15	2.15	1.55	1.55	1.55	20.14	27.37	41.14	0.69	1.35	0.82
				2.22	3.01	1.49	2.36	3.34	1.77							2.36	3.24	1.47	2.44	3.47	1.66

APPENDIX B- TTI FINAL STATE SYSTEM FRICTION MEASUREMENTS AND THE CORRESPONDING STATISTICS

Table B-1- Final State System measurements at 30 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 30 mph			X_bar			S			h			k			X_bar_corr			S_corr	
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2
B	22.8	31.6	43.6	21.48	29.57	44.63	1.51	2.12	1.26	0.38	0.41	0.55	1.78	1.93	1.34	FALSE	FALSE	44.63	FALSE	FALSE
	22.5	33.5	42.7																	
	22.8	31.6	43.1																	
	23.4	32.1	45.8																	
	22.1	28.6	43.0																	
	20.4	29.4	45.7																	
	20.4	29.0	45.6																	
	20.6	27.3	45.6																	
	19.8	28.3	46.4																	
	19.6	27.6	44.5																	
	19.8	28.8	44.8																	
	23.5	27.0	44.7																	
C	21.6	29.7	41.4	20.02	28.08	41.86	0.99	1.09	0.79	-0.73	-0.32	-0.86	1.16	0.99	0.84	20.02	28.08	41.86	0.99	1.09
	21.0	29.9	42.7																	
	20.6	27.8	41.7																	
	21.5	27.3	42.9																	
	20.1	28.2	41.4																	
	19.9	27.7	40.8																	
	19.5	27.4	42.9																	
	19.6	29.7	41.8																	
	19.4	27.6	40.8																	
	19.0	27.8	42.2																	
	18.4	27.0	41.1																	
	19.6	26.8	42.6																	
D	20.3	29.4	43.4	20.21	28.67	42.43	0.20	0.60	0.80	-0.58	-0.03	-0.56	0.23	0.54	0.85	20.21	28.67	42.43	0.20	0.60
	20.2	28.3	42.7																	
	20.4	29.5	43.6																	
	20.0	29.6	41.3																	
	20.3	28.5	42.0																	
	20.6	27.9	41.4																	
	20.3	28.8	41.9																	
	19.9	28.0	43.4																	
	20.0	28.2	43.0																	
	20.3	28.9	42.7																	
	20.1	28.1	41.8																	
	20.1	28.8	42.0																	
E	20.8	28.8	43.5	20.47	27.18	42.45	0.47	1.01	1.27	-0.39	-0.76	-0.55	0.56	0.92	1.35	20.47	27.18	42.45	0.47	1.01
	20.8	28.3	40.5																	
	20.8	26.9	43.7																	
	20.4	28.6	41.5																	
	20.4	27.1	43.1																	
	21.1	26.8	42.4																	
	20.2	25.7	42.6																	
	21.2	27.8	43.0																	
	19.9	27.1	41.9																	
	19.9	26.8	44.2																	
	20.3	26.2	43.0																	
	19.8	26.0	40.0																	
F	20.5	29.8	45.0	20.16	29.68	43.97	0.50	0.93	0.53	-0.62	0.46	0.22	0.59	0.85	0.57	20.16	29.68	43.97	0.50	0.93
	20.8	30.9	43.6																	
	20.2	29.7	43.9																	
	20.4	29.5	43.2																	
	20.9	29.8	43.8																	
	20.6	31.1	44.1																	
	20.2	30.7	43.5																	
	19.8	28.8	44.0																	
	19.7	28.0	44.1																	
	19.9	29.3	44.2																	
	19.6	28.6	43.4																	
	19.3	29.9	44.8																	

Table B-1 (Cont.) - Final State System measurements at 30 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 30 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
H	23.7	30.8	49.9	23.11	30.03	48.85	1.10	0.66	1.70	1.63	0.63	2.70	1.30	0.60	1.81	23.11	30.03	FALSE	1.10	0.66	FALSE
	22.6	30.8	46.5																		
	22.3	30.1	52.7																		
	22.2	30.2	49.9																		
	21.7	29.5	49.4																		
	22.3	31.0	46.9																		
	22.1	30.0	47.8																		
	23.6	29.4	48.4																		
	23.7	29.5	48.8																		
	23.4	29.3	48.6																		
	25.5	29.1	50.0																		
	24.2	30.6	47.3																		
I	20.1	29.5	41.8	19.33	28.45	42.34	1.09	0.70	0.56	-1.25	-0.14	-0.61	1.28	0.64	0.59	19.33	28.45	42.34	1.09	0.70	0.56
	18.8	28.5	42.6																		
	18.9	28.3	42.5																		
	18.4	28.3	42.8																		
	19.0	29.1	42.7																		
	18.9	28.5	43.0																		
	18.7	28.9	41.2																		
	20.1	27.8	41.9																		
	18.1	28.6	41.7																		
	20.6	28.1	42.7																		
	21.8	26.8	42.4																		
	18.6	29.0	42.8																		
J	19.7	30.5	42.0	19.41	29.32	42.81	0.44	1.42	0.86	-1.20	0.29	-0.37	0.51	1.29	0.91	19.41	29.32	42.81	0.44	1.42	0.86
	19.7	31.1	43.0																		
	20.4	30.7	42.5																		
	19.2	29.2	42.1																		
	19.4	29.3	42.2																		
	19.2	28.2	43.4																		
	19.3	28.1	43.4																		
	19.2	28.0	44.6																		
	18.8	27.7	42.8																		
	19.8	28.3	41.8																		
	18.9	32.0	43.8																		
	19.3	28.7	42.1																		
K	20.7	34.1	43.2	21.80	32.17	43.49	0.91	1.32	0.93	0.63	1.68	-0.02	1.07	1.20	0.99	21.80	32.17	43.49	0.91	1.32	0.93
	23.3	33.2	43.4																		
	21.4	31.9	43.7																		
	22.7	33.1	44.4																		
	23.0	31.3	43.1																		
	21.2	31.2	44.6																		
	21.0	32.4	43.1																		
	22.8	31.1	43.2																		
	21.5	32.3	42.1																		
	21.8	34.3	43.8																		
	20.9	31.2	45.2																		
	21.3	29.9	42.1																		
L	24.4	32.2	44.0	22.71	30.74	43.65	0.73	0.85	0.41	1.33	0.98	0.06	0.86	0.77	0.44	22.71	30.74	43.65	0.73	0.85	0.41
	23.4	30.4	43.8																		
	23.5	30.9	43.1																		
	22.3	30.9	44.2																		
	22.3	31.0	44.1																		
	22.5	31.2	43.8																		
	22.9	31.2	43.3																		
	22.1	30.9	43.3																		
	22.1	31.6	43.5																		
	21.9	29.7	44.2																		
	22.6	29.4	43.3																		
	22.5	29.5	43.2																		

Table B-1 (Cont.) - Final State System measurements at 30 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 30 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
M	20.8	23.5	42.1	20.43	24.39	41.40	0.61	0.94	0.65	-0.41	-2.12	-1.09	0.72	0.86	0.69	20.43	24.39	41.40	0.61	0.94	0.65
	21.1	24.7	41.2																		
	21.0	25.3	40.6																		
	21.0	24.3	40.7																		
	20.4	24.8	40.8																		
	20.3	26.4	41.5																		
	21.2	24.0	41.2																		
	20.5	25.0	40.7																		
	19.5	24.4	42.5																		
	19.5	23.3	42.0																		
	20.0	23.0	42.1																		
	19.9	24.0	41.4																		
N	21.7	27.0	44.8	22.54	26.56	44.61	0.76	0.52	0.70	1.20	-1.06	0.54	0.89	0.47	0.74	22.54	26.56	44.61	0.76	0.52	0.70
	23.2	26.8	44.4																		
	23.0	25.9	44.3																		
	22.3	26.0	43.3																		
	23.8	26.6	45.0																		
	21.8	27.5	44.1																		
	22.3	26.6	45.2																		
	23.7	27.1	44.7																		
	22.3	26.8	43.8																		
	22.5	26.4	45.2																		
	22.5	25.8	44.6																		
	21.4	26.2	45.9																		
Number of Labs With Data				12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.00	11.00	11.00	11.00
				X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
				20.97	28.73	43.54	0.85	1.10	0.94	2.38	2.38	2.38	1.57	1.57	1.57	20.93	28.66	43.06	0.76	0.95	0.84
				1.31	2.04	1.97	1.54	2.30	2.16							1.36	2.13	1.08	1.54	2.31	1.35

Table B-2– Final State System measurements at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
A	20.3	24.6	36.3	18.99	24.02	37.83	0.91	1.21	0.75	-0.49	-1.01	-1.07	1.27	1.09	0.95	18.99	24.02	37.83	0.91	1.21	0.75
	19.8	24.6	38.3																		
	18.2	25.5	37.1																		
	18.9	22.4	38.2																		
	20.1	24.2	36.8																		
	20.0	22.7	38.1																		
	19.1	25.9	38.6																		
	19.2	23.4	37.7																		
	18.5	25.0	37.6																		
	18.1	24.6	38.8																		
	17.5	22.7	38.1																		
	18.2	22.6	38.3																		
B	19.3	27.2	39.6	18.39	25.69	38.15	0.84	1.19	0.94	-0.90	-0.35	-0.91	1.17	1.06	1.18	18.39	25.69	38.15	0.84	1.19	0.94
	18.1	25.2	38.3																		
	17.1	25.1	38.4																		
	19.9	24.3	38.0																		
	18.4	24.3	38.2																		
	17.8	26.8	37.8																		
	17.3	24.1	37.3																		
	18.7	27.8	37.0																		
	18.3	26.4	38.3																		
	17.7	25.7	36.6																		
	19.1	25.7	38.5																		
	19.0	25.7	39.8																		
C	17.7	24.8	37.5	18.14	24.82	36.74	1.10	1.05	0.49	-1.06	-0.69	-1.60	1.53	0.94	0.61	18.14	24.82	36.74	1.10	1.05	0.49
	19.3	25.7	36.0																		
	17.4	26.8	36.6																		
	17.3	26.2	36.8																		
	16.0	23.7	37.1																		
	17.1	23.7	37.6																		
	18.0	24.8	36.8																		
	19.6	23.9	36.5																		
	18.7	24.2	36.7																		
	18.5	23.7	36.8																		
	19.6	25.5	36.1																		
	18.5	24.8	36.4																		
D	21.1	25.3	39.1	19.46	25.24	39.30	0.74	0.99	0.85	-0.18	-0.52	-0.34	1.02	0.89	1.07	19.46	25.24	39.30	0.74	0.99	0.85
	19.4	25.2	39.0																		
	19.8	25.2	40.8																		
	18.6	25.9	38.6																		
	19.4	26.1	40.8																		
	19.2	26.5	39.0																		
	19.8	23.7	38.1																		
	18.7	24.7	39.7																		
	19.1	26.9	38.3																		
	18.5	23.8	39.6																		
	19.7	25.1	39.3																		
	20.2	24.5	39.3																		
E	18.7	25.3	38.8	18.52	23.84	39.35	0.57	0.74	1.26	-0.81	-1.08	-0.32	0.80	0.66	1.59	18.52	23.84	FALSE	0.57	0.74	FALSE
	18.1	23.7	39.2																		
	17.7	23.1	40.3																		
	17.9	24.5	40.9																		
	19.4	23.4	40.5																		
	18.0	25.0	39.2																		
	18.7	23.9	40.1																		
	19.4	23.3	37.3																		
	18.1	24.0	39.9																		
	18.4	23.4	38.2																		
	19.0	23.0	37.2																		
	18.8	23.5	40.6																		

Table B-2 (Cont.) - Final State System measurements at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
F	19.6	25.1	39.8	19.02	25.51	39.87	0.33	0.49	0.48	-0.48	-0.42	-0.06	0.46	0.44	0.61	19.02	25.51	39.87	0.33	0.49	0.48
	19.2	25.7	40.5																		
	19.1	25.9	40.1																		
	18.5	25.4	39.2																		
	19.2	24.7	39.3																		
	18.8	26.0	40.6																		
	19.1	25.1	39.7																		
	18.8	25.0	40.1																		
	19.0	26.1	39.1																		
	19.5	25.4	39.9																		
	18.7	25.4	40.2																		
	18.7	26.3	39.9																		
H	22.6	32.5	43.8	21.85	31.10	43.33	0.52	1.84	0.70	1.42	1.79	1.64	0.72	1.65	0.88	21.85	FALSE	43.33	0.52	FALSE	0.70
	22.7	32.7	42.9																		
	22.2	29.5	44.7																		
	21.4	32.6	42.5																		
	21.5	29.7	43.2																		
	21.6	31.8	43.2																		
	21.1	30.7	43.9																		
	21.5	33.0	43.3																		
	21.7	32.7	42.1																		
	22.4	31.8	43.4																		
	22.0	28.7	43.0																		
	21.5	27.5	44.0																		
I	20.6	30.8	41.8	19.61	28.96	41.52	0.88	1.18	0.72	-0.08	0.95	0.75	1.22	1.06	0.91	19.61	28.96	41.52	0.88	1.18	0.72
	20.2	31.0	41.8																		
	20.1	30.7	40.9																		
	19.4	28.6	41.6																		
	20.4	28.5	42.3																		
	20.8	28.2	41.5																		
	19.3	28.9	41.4																		
	19.6	27.5	42.8																		
	17.9	28.3	41.8																		
	19.6	28.5	41.6																		
	19.0	28.2	40.2																		
	18.4	28.3	40.5																		
J	20.4	31.3	40.9	19.98	29.68	40.81	0.65	1.37	0.85	0.16	1.23	0.40	0.91	1.23	1.07	19.98	29.68	40.81	0.65	1.37	0.85
	20.7	30.7	41.5																		
	20.5	32.2	41.7																		
	20.5	30.7	41.1																		
	20.1	30.4	39.6																		
	20.0	29.3	40.4																		
	21.0	28.8	41.5																		
	19.4	28.5	40.2																		
	19.4	28.0	41.9																		
	19.2	29.6	39.4																		
	19.4	28.0	41.4																		
	19.1	28.6	40.1																		
K	23.9	27.4	41.2	22.87	27.92	41.32	0.67	0.78	0.70	2.10	0.53	0.65	0.92	0.70	0.88	22.87	27.92	41.32	0.67	0.78	0.70
	23.3	27.4	40.3																		
	23.3	28.3	42.0																		
	23.4	29.0	41.4																		
	23.0	28.3	40.6																		
	23.2	28.3	41.2																		
	22.4	27.3	41.6																		
	23.2	27.0	40.7																		
	21.6	27.7	41.6																		
	22.8	29.5	40.6																		
	22.0	27.8	41.9																		
	22.3	27.0	42.7																		

Table B-2 (Cont.) - Final State System measurements at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
L	21.3	30.1	43.2	21.24	28.38	42.92	0.41	0.63	0.73	1.01	0.72	1.44	0.57	0.57	0.92	21.24	28.38	42.92	0.41	0.63	0.73
	21.4	28.1	41.8																		
	20.4	27.8	42.6																		
	22.0	28.5	42.3																		
	21.5	28.2	43.6																		
	21.1	28.2	43.4																		
	21.5	28.1	43.4																		
	20.9	27.6	43.6																		
	20.9	28.8	41.4																		
	21.3	28.2	43.0																		
	21.6	28.4	43.4																		
	21.0	28.6	43.3																		
M	18.8	23.3	39.2	18.72	23.63	38.82	0.64	1.22	0.76	-0.68	-1.16	-0.58	0.89	1.09	0.96	18.72	23.63	38.82	0.64	1.22	0.76
	19.8	24.0	38.9																		
	19.0	24.3	39.0																		
	18.2	23.2	39.7																		
	17.7	22.5	40.0																		
	18.6	25.8	39.9																		
	19.2	24.4	38.5																		
	18.8	23.2	38.4																		
	19.1	23.1	38.0																		
	17.5	25.3	38.4																		
	19.0	23.2	38.0																		
	18.9	21.3	37.8																		
Number of Labs With Data				12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	12.00	11.00	11.00

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
19.73	26.57	40.00	0.72	1.11	0.79	2.38	2.38	2.38	1.57	1.57	1.57	19.73	26.15	40.05	0.72	1.02	0.74
1.50	2.53	2.03	1.65	2.74	2.17							1.50	2.19	2.12	1.65	2.40	2.23

Table B-3- Final State System measurements at 50 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 50 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
B	20.8	26.1	36.0	18.23	23.45	36.26	1.70	0.95	0.79	-0.36	-0.63	-1.14	1.84	1.06	1.17	FALSE	23.45	36.26	FALSE	0.95	0.79
	21.8	24.1	35.5																		
	18.3	23.1	36.3																		
	18.0	23.6	36.3																		
	19.3	23.6	36.0																		
	17.6	23.3	37.7																		
	17.0	22.4	37.4																		
	16.3	23.2	35.6																		
	16.3	22.8	37.2																		
	17.8	23.3	35.5																		
	18.5	23.2	35.3																		
	17.0	22.7	36.3																		
C	17.5	23.2	36.1	17.93	22.87	35.71	1.36	0.60	0.60	-0.56	-0.94	-1.52	1.47	0.67	0.88	17.93	22.87	35.71	1.36	0.60	0.60
	16.3	23.8	34.5																		
	19.6	23.9	35.2																		
	16.2	22.9	35.1																		
	20.5	23.2	35.7																		
	16.4	22.4	36.5																		
	18.4	22.7	35.6																		
	17.2	22.7	35.3																		
	18.8	22.6	36.1																		
	19.0	22.9	36.2																		
	17.7	22.3	36.4																		
	17.6	21.8	35.8																		
D	19.7	25.8	36.5	18.88	23.93	37.18	0.54	1.33	0.65	0.08	-0.36	-0.50	0.58	1.49	0.96	18.88	23.93	37.18	0.54	1.33	0.65
	19.2	23.6	38.0																		
	19.1	24.2	37.1																		
	18.5	25.4	37.9																		
	18.4	23.4	36.0																		
	19.7	23.6	36.4																		
	18.9	22.3	37.7																		
	18.9	22.7	37.4																		
	18.2	26.6	37.7																		
	18.9	23.0	37.7																		
	18.0	23.0	36.8																		
	19.1	23.6	37.0																		
F	21.4	24.5	39.8	20.68	24.23	38.53	0.35	0.56	0.79	1.29	-0.21	0.43	0.38	0.63	1.17	20.68	24.23	38.53	0.35	0.56	0.79
	20.9	25.3	38.2																		
	21.0	24.2	38.2																		
	21.0	23.9	38.4																		
	20.4	25.0	37.7																		
	20.8	24.5	38.2																		
	20.2	23.9	38.1																		
	20.4	23.8	40.4																		
	20.5	23.4	38.4																		
	20.6	24.6	38.7																		
	20.7	23.8	38.5																		
	20.3	23.8	37.8																		
H	21.9	28.2	40.3	21.24	26.71	39.77	0.61	1.26	0.51	1.67	1.14	1.28	0.66	1.41	0.76	21.24	26.71	39.77	0.61	1.26	0.51
	22.2	26.3	40.7																		
	22.1	28.4	39.2																		
	21.0	27.2	39.6																		
	21.0	26.9	39.6																		
	21.7	27.0	40.1																		
	21.3	25.2	40.2																		
	20.6	26.1	39.6																		
	20.5	25.8	39.0																		
	21.2	28.7	39.6																		
	20.9	24.8	39.2																		
	20.5	25.9	40.1																		

Table B-3 (Cont.) - Final State System measurements at 50 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 50 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
I	19.2	25.2	38.3	18.59	24.57	38.69	0.75	0.35	0.62	-0.12	-0.02	0.54	0.81	0.39	0.92	18.59	24.57	38.69	0.75	0.35	0.62
	17.2	24.4	38.7																		
	18.1	25.0	39.2																		
	17.7	24.5	39.7																		
	19.7	24.5	39.1																		
	19.3	24.8	39.2																		
	19.1	23.9	37.4																		
	18.5	24.3	38.3																		
	19.2	24.6	38.8																		
	18.8	24.8	38.4																		
	18.1	24.3	39.1																		
	18.2	24.5	38.1																		
J	17.8	24.3	38.1	17.95	24.48	38.26	0.62	0.65	0.26	-0.55	-0.07	0.24	0.68	0.72	0.39	17.95	24.48	38.26	0.62	0.65	0.26
	18.6	24.3	38.3																		
	19.0	25.5	38.8																		
	18.9	25.0	38.4																		
	17.3	24.8	38.0																		
	18.4	24.8	38.2																		
	17.4	25.2	38.2																		
	17.4	24.6	38.5																		
	17.7	23.3	37.8																		
	17.6	23.7	38.5																		
	18.0	23.8	38.1																		
	17.3	24.5	38.2																		
K	18.5	30.8	37.4	17.99	28.55	36.91	0.72	1.21	0.47	-0.52	2.14	-0.69	0.78	1.36	0.69	17.99	28.55	36.91	0.72	1.21	0.47
	18.6	29.4	36.5																		
	19.0	29.6	37.5																		
	17.1	28.6	37.1																		
	17.1	28.4	36.9																		
	18.4	27.1	37.5																		
	17.3	27.8	36.5																		
	17.7	27.1	36.6																		
	17.5	27.3	36.0																		
	17.3	27.6	36.8																		
	18.7	29.9	36.8																		
	18.7	29.0	37.3																		
L	22.3	26.8	40.1	20.32	25.78	40.02	1.29	0.58	0.87	1.05	0.64	1.46	1.39	0.65	1.28	20.32	25.78	40.02	1.29	0.58	0.87
	22.9	25.3	40.5																		
	19.6	25.2	39.0																		
	21.0	25.5	40.4																		
	19.9	26.3	40.0																		
	19.6	26.3	41.1																		
	19.9	25.1	40.4																		
	19.6	25.6	38.7																		
	19.5	26.3	39.4																		
	21.0	25.2	40.9																		
	18.3	25.5	41.0																		
	20.2	26.3	38.7																		
M	15.4	21.8	36.1	16.04	21.84	36.68	0.59	0.78	0.70	-1.84	-1.50	-0.86	0.64	0.87	1.03	16.04	21.84	36.68	0.59	0.78	0.70
	17.0	22.0	36.4																		
	15.6	21.0	36.0																		
	16.9	21.8	36.6																		
	16.5	23.0	37.6																		
	16.6	23.6	37.3																		
	15.8	21.5	37.3																		
	15.9	21.5	35.1																		
	16.3	21.4	36.9																		
	15.6	20.8	36.6																		
	15.3	21.9	37.2																		
	15.6	21.8	37.0																		

Table B-3 (Cont.) - Final State System measurements at 50 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Final 50 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3	Pad 1	Pad 2	Pad 3
N	17.8	25.6	39.6	18.57	24.25	39.03	0.64	0.94	0.91	-0.13	-0.19	0.78	0.70	1.06	1.34	18.57	24.25	39.03	0.64	0.94	0.91
	19.0	25.6	39.9																		
	18.1	24.4	40.0																		
	17.9	24.2	38.2																		
	18.7	22.5	38.2																		
	18.7	24.8	39.9																		
	17.6	25.3	39.8																		
	19.0	24.0	38.3																		
	19.2	23.9	39.4																		
	19.6	23.4	39.0																		
	18.1	23.8	37.1																		
	19.1	23.5	39.0																		
Number of Labs With Data				11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	10.00	11.00	11.00	10.00	11.00	11.00
				X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
				18.77	24.61	37.91	0.92	0.89	0.68	2.34	2.34	2.34	1.57	1.57	1.57	18.82	24.61	37.91	0.81	0.89	0.68
				1.48	1.85	1.45	1.72	2.03	1.58							1.55	1.85	1.45	1.73	2.03	1.58

APPENDIX C- TRC ARRIVAL STATE SYSTEM MEASUREMENTS AND THE CORRESPONDING STATISTICS

Table C-1– TRC Arrival State System measurements at 20 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Arrival Run 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	20.8	54.4	71.0	21.88	51.32	71.14	2.06	1.35	3.55	0.50	0.64	-0.23	0.93	0.98	1.37	21.88	51.32	71.14	2.06	1.35	3.55
	23.5	51.2	67.1																		
	25.8	52.6	77.8																		
H	19.9	51.2	68.7																		
1	22.7	50.2	67.2																		
2	23.9	49.7	68.8																		
L	20.4	52.0	71.7																		
501	19.1	49.8	76.7																		
	23.3	52.0	74.9																		
	20.8	50.7	69.9																		
	19.6	51.8	69.1																		
	22.7	50.2	70.8																		
2	24.3	45.2	76.4	23.29	46.11	76.38	2.03	1.25	2.04	1.00	-1.10	0.52	0.91	0.90	0.79	23.29	46.11	76.38	2.03	1.25	2.04
	22.7	48.1	73.7																		
	22.1	45.0	75.0																		
K	25.3	47.4	75.7																		
1	22.4	45.3	78.0																		
6	20.7	45.6	74.0																		
L	27.9	46.2	77.5																		
501	24.5	46.7	74.6																		
	21.8	45.8	75.5																		
	24.1	47.3	77.1																		
	22.7	43.7	78.3																		
	21.0	47.0	80.7																		
3	21.6	48.7	74.3	20.63	48.96	72.33	1.40	0.97	1.92	0.06	-0.15	-0.06	0.63	0.70	0.74	20.63	48.96	72.33	1.40	0.97	1.92
	18.8	48.7	70.0																		
	23.9	49.6	73.9																		
L	19.5	48.6	70.6																		
1	21.1	50.8	75.7																		
5	20.7	47.1	72.8																		
L	21.0	49.5	72.1																		
501	19.9	48.6	69.7																		
	19.4	49.1	71.6																		
	21.3	48.7	70.4																		
	19.2	50.1	73.9																		
	21.2	48.0	73.0																		
4	20.8	47.1	74.5	19.97	46.08	67.69	1.99	0.65	3.87	-0.18	-1.11	-0.72	0.89	0.47	1.49	19.97	46.08	67.69	1.99	0.65	3.87
	23.7	46.2	71.3																		
	19.6	45.4	74.7																		
L	22.3	46.5	67.9																		
2	18.4	45.6	66.0																		
5	17.3	45.3	62.7																		
L	20.2	46.8	66.8																		
501	21.4	46.1	63.6																		
	19.0	45.6	66.2																		
	21.1	45.9	65.2																		
	18.5	45.4	67.0																		
	17.3	47.0	66.4																		
5	21.4	55.4	69.1	19.87	50.68	68.03	1.43	2.15	1.55	-0.22	0.43	-0.67	0.64	1.56	0.60	19.87	50.68	68.03	1.43	2.15	1.55
	20.9	51.4	68.5																		
	22.3	52.0	70.8																		
L	18.5	50.8	65.9																		
3	20.8	50.7	67.0																		
5	20.5	48.8	66.0																		
L	20.2	53.3	69.5																		
501	18.3	48.0	68.8																		
	20.1	50.6	66.4																		
	18.2	48.4	67.8																		
	19.4	49.1	69.3																		
	17.8	49.7	67.3																		
6	25.1	52.6	75.0	21.48	51.73	76.97	1.87	1.26	1.30	0.36	0.78	0.60	0.84	0.91	0.50	21.48	51.73	76.97	1.87	1.26	1.30
	23.2	49.9	77.4																		
	21.7	52.2	77.5																		
L	22.2	51.8	79.0																		
5	21.8	52.7	78.5																		
7	19.9	51.5	76.7																		
L	22.5	50.8	77.7																		
501	21.3	51.8	76.1																		
	19.5	54.1	75.1																		
	19.3	51.3	77.0																		
	18.6	52.5	75.6																		
	22.6	49.5	78.0																		

Table C-1 (Cont.) - TRC Arrival State System measurements at 20 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Arrival Run 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
7	23.1	51.2	75.7	23.61	51.47	76.38	1.47	0.77	1.75	1.12	0.69	0.52	0.66	0.56	0.67	23.61	51.47	76.38	1.47	0.77	1.75
	23.8	50.6	74.7																		
	25.0	52.9	76.4																		
A	25.7	51.2	75.9																		
1	24.7	50.3	77.7																		
5	21.3	51.2	78.1																		
L	23.5	51.9	79.9																		
501	23.4	50.8	74.3																		
	23.9	52.6	76.6																		
	25.2	51.9	75.3																		
	22.8	51.6	74.1																		
	20.9	51.4	77.9																		
8	15.0	57.8	83.0	15.19	54.38	81.23	0.94	1.71	2.33	-1.89	1.66	1.21	0.42	1.24	0.90	15.19	54.38	81.23	0.94	1.71	2.33
	16.1	56.7	77.1																		
	16.2	53.0	77.3																		
A	14.7	55.8	81.2																		
1	14.6	53.4	81.5																		
7	14.3	54.2	82.1																		
L	15.0	54.6	83.9																		
501	14.7	52.3	81.1																		
	17.3	53.5	81.0																		
	15.5	55.1	84.5																		
	15.0	52.3	82.6																		
	13.9	53.8	79.4																		
9	20.6	44.6	60.3	16.96	43.73	56.82	2.48	0.80	1.63	-1.26	-1.89	-2.27	1.11	0.58	0.63	16.96	43.73	56.82	2.48	0.80	1.63
	16.9	44.7	55.3																		
	16.2	43.9	56.5																		
C	19.6	43.6	55.8																		
2	15.8	43.0	55.4																		
6	14.3	42.5	57.4																		
L	21.6	43.1	57.1																		
501	17.1	43.3	54.8																		
	14.9	45.1	57.6																		
	17.3	43.8	57.5																		
	13.8	43.0	58.8																		
	15.4	44.2	55.3																		
10	22.0	51.7	79.5	23.28	51.12	83.46	4.77	1.97	4.73	1.00	0.57	1.52	2.14	1.42	1.82	FALSE	51.12	FALSE	FALSE	1.97	FALSE
	23.0	48.7	82.3																		
	38.0	51.1	79.5																		
D	23.5	50.4	83.4																		
2	20.9	50.4	75.4																		
5	20.7	53.7	79.1																		
L	21.1	51.8	85.4																		
501	23.0	49.1	86.9																		
	19.8	49.4	92.1																		
	23.0	52.8	87.6																		
	22.4	55.0	88.0																		
	21.9	49.3	82.3																		
11	25.9	51.3	73.5	22.62	49.20	72.52	2.55	1.57	1.83	0.76	-0.07	-0.03	1.14	1.14	0.70	22.62	49.20	72.52	2.55	1.57	1.83
	22.9	51.2	73.7																		
	22.1	49.5	75.0																		
D	24.4	48.9	71.5																		
3	20.0	47.6	71.4																		
6	21.1	49.5	69.4																		
L	28.6	48.1	74.3																		
501	21.4	45.8	70.4																		
	21.7	49.9	70.8																		
	22.1	50.8	73.7																		
	19.8	48.8	72.0																		
	21.4	49.0	74.5																		
12	16.0	50.3	72.6	16.97	48.04	70.13	1.07	1.20	2.15	-1.25	-0.45	-0.37	0.48	0.87	0.83	16.97	48.04	70.13	1.07	1.20	2.15
	19.0	49.1	67.3																		
	17.3	48.9	68.9																		
F	18.3	48.1	69.6																		
1	16.4	47.1	67.7																		
7	17.5	48.2	69.1																		
L	16.7	46.7	74.6																		
501	17.8	47.1	69.6																		
	16.6	46.3	70.8																		
	16.8	49.3	69.1																		
	16.0	48.1	69.7																		
	15.2	47.3	72.6																		
Number of Labs With Data				12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	11.00	12.00	11.00	11.00	12.00	11.00

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
20.48	49.40	72.76	2.22	1.38	2.60	2.44	2.44	2.44	1.58	1.58	1.58	20.22	49.40	71.78	1.82	1.38	2.31
2.80	3.00	7.02	3.52	3.28	7.45							2.79	3.00	6.46	3.29	3.28	6.82

Table C-2 -TRC Arrival State System measurements at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Arrival Run 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	14.7	48.7	62.7	14.29	49.82	64.83	0.92	1.74	3.07	-0.25	0.94	0.62	0.71	1.31	1.34	14.29	49.82	64.83	0.92	1.74	3.07
	14.5	47.8	63.2																		
	14.8	48.8	70.7																		
H	16.0	48.0	62.7																		
1	13.4	50.7	63.1																		
2	15.0	49.1	68.3																		
L	14.5	51.8	64.4																		
501	14.2	48.5	60.6																		
	13.9	51.0	67.1																		
	14.5	49.2	61.5																		
	12.3	53.6	67.3																		
	13.7	50.6	66.3																		
2	18.1	45.3	66.5	16.96	44.64	64.57	1.41	1.24	1.84	0.93	-0.86	0.58	1.10	0.94	0.80	16.96	44.64	64.57	1.41	1.24	1.84
	16.5	44.4	62.5																		
	16.4	43.8	62.6																		
K	16.3	45.4	67.0																		
1	14.8	45.4	65.9																		
6	17.8	45.5	66.5																		
L	20.2	45.7	65.9																		
501	17.4	44.8	62.3																		
	15.4	41.5	63.7																		
	16.9	46.0	62.7																		
	16.1	44.0	65.8																		
	17.6	43.9	63.4																		
3	13.9	49.0	63.0	13.62	47.79	63.10	1.10	1.55	2.20	-0.55	0.23	0.30	0.85	1.17	0.96	13.62	47.79	63.10	1.10	1.55	2.20
	12.2	46.7	62.7																		
	13.5	46.4	64.8																		
L	12.8	45.1	67.7																		
1	13.1	48.7	60.8																		
5	13.2	48.1	62.5																		
L	13.7	49.3	62.5																		
501	12.6	47.9	60.5																		
	16.4	49.7	62.1																		
	13.3	46.0	61.5																		
	14.5	46.9	62.5																		
	14.2	49.7	66.6																		
4	15.2	42.9	54.7	14.89	44.13	56.47	1.10	1.34	2.06	0.01	-1.03	-0.97	0.86	1.01	0.90	14.89	44.13	56.47	1.10	1.34	2.06
	16.3	41.4	58.6																		
	15.2	44.9	59.5																		
L	15.4	43.6	54.0																		
2	13.8	44.7	55.3																		
5	13.5	43.5	58.8																		
L	14.9	44.9	56.5																		
501	16.2	43.8	58.6																		
	14.9	45.2	55.0																		
	16.2	46.8	57.6																		
	14.2	44.2	55.2																		
	12.9	43.7	53.8																		
5	15.8	47.4	58.4	15.01	46.53	58.69	1.69	1.01	2.16	0.07	-0.20	-0.54	1.32	0.76	0.94	15.01	46.53	58.69	1.69	1.01	2.16
	14.0	45.3	61.5																		
	18.8	48.5	57.5																		
L	12.6	45.4	59.3																		
3	15.2	46.5	54.6																		
5	16.6	45.5	56.4																		
L	15.1	46.2	59.7																		
501	14.6	46.2	58.2																		
	15.6	47.1	57.4																		
	12.5	46.9	62.0																		
	14.4	47.7	61.0																		
	14.9	45.7	58.3																		
6	17.0	47.6	65.7	15.66	49.26	63.56	1.58	1.17	3.19	0.35	0.74	0.38	1.23	0.89	1.39	15.66	49.26	63.56	1.58	1.17	3.19
	16.5	50.4	62.2																		
	14.2	48.2	65.5																		
L	17.0	50.5	65.2																		
5	17.9	49.7	59.6																		
7	14.5	49.1	63.9																		
L	15.7	51.3	64.9																		
501	16.9	49.5	60.4																		
	13.1	47.7	61.5																		
	16.5	50.0	70.0																		
	15.3	48.5	65.1																		
	13.3	48.6	58.7																		

Table C-2 (Cont.) - TRC Arrival State System measurements at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Arrival Run 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
6	17.0	47.6	65.7	15.66	49.26	63.56	1.58	1.17	3.19	0.35	0.74	0.38	1.23	0.89	1.39	15.66	49.26	63.56	1.58	1.17	3.19
	16.5	50.4	62.2																		
	14.2	48.2	65.5																		
L	17.0	50.5	65.2																		
5	17.9	49.7	59.6																		
7	14.5	49.1	63.9																		
L	15.7	51.3	64.9																		
501	16.9	49.5	60.4																		
	13.1	47.7	61.5																		
	16.5	50.0	70.0																		
	15.3	48.5	65.1																		
	13.3	48.6	58.7																		
7	16.7	49.5	65.0	17.58	49.84	63.73	1.10	1.16	2.26	1.21	0.94	0.42	0.86	0.88	0.99	17.58	49.84	63.73	1.10	1.16	2.26
	17.9	48.3	62.7																		
	17.9	49.1	66.4																		
A	20.0	49.9	67.6																		
1	16.4	49.4	64.3																		
5	17.6	50.4	63.0																		
L	17.2	51.6	61.9																		
501	18.4	49.3	62.7																		
	16.7	48.5	64.3																		
	18.0	50.0	60.7																		
	15.9	52.3	65.9																		
	18.3	49.8	60.3																		
8	10.8	49.5	70.2	11.28	50.34	65.37	0.72	1.18	2.38	-1.59	1.12	0.73	0.56	0.89	1.04	11.28	50.34	65.37	0.72	1.18	2.38
	10.9	50.2	66.7																		
	12.0	48.5	64.4																		
A	11.8	50.6	66.2																		
1	11.2	51.4	62.1																		
7	10.1	50.2	67.8																		
L	11.1	51.5	66.0																		
501	12.9	48.1	65.0																		
	11.4	49.9	62.3																		
	11.5	51.5	62.5																		
	10.9	51.6	65.1																		
	10.7	51.1	66.1																		
9	12.9	42.3	48.8	12.53	42.13	47.90	1.35	1.30	1.39	-1.04	-1.73	-2.60	1.05	0.98	0.61	12.53	42.13	FALSE	1.35	1.30	FALSE
	15.5	39.5	50.5																		
	12.1	40.5	48.6																		
C	14.4	44.2	47.9																		
2	11.3	41.8	47.6																		
6	11.6	42.7	47.3																		
L	12.3	42.3	48.1																		
501	12.2	41.8	48.5																		
	12.6	43.5	45.2																		
	13.1	42.7	47.8																		
	10.6	41.2	45.8																		
	11.7	43.1	48.7																		
10	19.0	50.3	66.6	17.75	50.48	66.18	1.14	1.45	2.77	1.28	1.17	0.88	0.88	1.09	1.21	17.75	50.48	66.18	1.14	1.45	2.77
	16.8	48.0	68.7																		
	17.5	53.0	69.0																		
D	17.5	51.3	65.3																		
2	17.9	49.2	66.9																		
5	15.3	52.4	68.8																		
L	18.8	49.9	64.7																		
501	17.9	50.6	61.9																		
	18.9	51.7	70.0																		
	18.8	49.5	63.9																		
	16.4	49.2	61.6																		
	18.2	50.7	66.8																		
11	17.0	48.1	67.6	17.06	46.38	64.85	1.83	1.34	1.53	0.98	-0.25	0.63	1.43	1.01	0.67	17.06	46.38	64.85	1.83	1.34	1.53
	16.6	44.6	66.0																		
	16.6	45.0	66.1																		
D	17.6	45.9	65.3																		
3	14.6	47.0	63.7																		
6	19.1	47.2	65.4																		
L	20.6	45.6	61.9																		
501	16.2	45.1	64.5																		
	17.1	45.9	66.1																		
	19.2	49.2	63.9																		
	14.8	46.7	64.0																		
	15.3	46.3	63.7																		
12	11.2	42.9	61.2	11.70	44.05	59.28	1.01	1.26	1.89	-1.40	-1.06	-0.43	0.79	0.95	0.82	11.70	44.05	59.28	1.01	1.26	1.89
	11.9	43.9	56.6																		
	13.2	43.0	60.0																		
F	11.7	44.1	63.3																		
1	10.4	44.5	57.4																		
7	13.4	44.8	60.5																		
L	9.8	44.1	58.8																		
501	11.8	45.7	57.8																		
	12.0	42.8	59.6																		
	11.1	46.5	58.3																		
	12.0	44.2	57.7																		
	11.9	42.1	60.1																		
Number of Labs With Data				12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	11.00	12.00	12.00	11.00

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
14.86	47.12	61.54	1.29	1.32	2.29	2.44	2.44	2.44	1.58	1.58	1.58	14.86	47.12	62.78	1.29	1.32	2.36
2.25	2.89	5.25	2.57	3.15	5.69							2.25	2.89	3.17	2.57	3.15	3.88

Table C-3- TRC Arrival State System measurements at 60 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Arrival Run 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	11.5	53.3	65.8	10.63	53.86	60.37	0.99	1.64	3.66	-0.55	1.65	1.76	0.96	1.10	1.62	10.63	53.86	FALSE	0.99	1.64	FALSE
	10.3	52.1	68.6																		
	10.6	54.2	62.2																		
H	11.6	53.0	57.2																		
1	9.1	53.5	58.6																		
2	10.3	52.4	59.4																		
L	11.8	57.9	56.5																		
501	9.6	52.3	61.0																		
	11.1	55.4	57.6																		
	11.7	53.2	57.3																		
	9.0	54.0	59.8																		
	11.0	55.0	60.4																		
2	10.7	44.5	53.1	12.51	45.29	52.62	1.32	1.46	2.52	0.22	-1.05	0.26	1.28	0.98	1.12	12.51	45.29	52.62	1.32	1.46	2.52
	12.5	47.4	50.2																		
	12.1	45.2	56.7																		
K	13.9	43.2	52.8																		
1	12.1	46.5	50.6																		
6	13.1	44.1	54.4																		
L	15.7	46.7	54.0																		
501	12.6	44.7	50.3																		
	11.4	45.4	52.6																		
	12.8	45.2	54.6																		
	11.4	47.4	47.6																		
	11.8	43.2	54.5																		
3	12.6	47.1	57.1	12.74	48.75	54.96	1.20	1.43	2.50	0.32	0.04	0.72	1.16	0.96	1.11	12.74	48.75	54.96	1.20	1.43	2.50
	11.1	49.3	55.7																		
	13.7	48.7	54.8																		
L	12.6	47.7	55.8																		
1	11.3	51.7	52.5																		
5	14.2	47.8	54.2																		
L	13.5	47.2	56.2																		
501	10.8	50.5	51.3																		
	14.2	48.6	57.9																		
	12.9	47.7	52.8																		
	13.8	50.2	51.9																		
	12.2	48.5	59.3																		
4	12.5	44.1	47.2	12.70	44.16	45.93	1.27	1.38	1.34	0.30	-1.40	-1.02	1.23	0.92	0.59	12.70	44.16	45.93	1.27	1.38	1.34
	13.4	44.7	44.1																		
	12.3	43.4	48.9																		
L	14.0	46.1	44.9																		
2	11.7	44.2	44.3																		
5	11.6	45.6	45.4																		
L	15.6	43.4	46.3																		
501	12.7	42.7	45.9																		
	12.4	43.7	47.1																		
	13.6	46.6	45.9																		
	11.4	42.0	45.7																		
	11.2	43.4	45.4																		
5	12.7	47.4	52.3	11.82	47.39	50.18	0.86	0.96	2.19	-0.06	-0.38	-0.20	0.83	0.64	0.97	11.82	47.39	50.18	0.86	0.96	2.19
	12.3	48.9	51.3																		
	11.9	48.1	51.9																		
L	10.3	46.8	48.6																		
3	11.8	48.9	50.6																		
5	12.7	46.3	50.2																		
L	12.1	48.1	47.9																		
501	10.8	45.9	49.1																		
	11.6	46.8	47.9																		
	13.2	47.0	48.0																		
	11.5	47.6	55.1																		
	10.9	46.9	49.2																		
6	11.8	49.2	51.7	11.62	49.76	50.30	0.92	1.09	1.64	-0.14	0.36	-0.18	0.89	0.73	0.73	11.62	49.76	50.30	0.92	1.09	1.64
	12.0	50.7	51.9																		
	11.2	48.1	50.8																		
L	11.7	51.0	48.3																		
5	12.7	49.9	49.6																		
7	12.9	49.8	49.8																		
L	12.3	49.9	48.0																		
501	11.3	50.2	50.9																		
	10.4	47.8	49.7																		
	11.3	51.3	48.9																		
	9.7	48.9	50.2																		
	12.1	50.3	53.8																		

Table C-3 (Cont.) - TRC Arrival State System measurements at 60 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Arrival Run 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
7	14.7	50.0	50.3	14.48	50.29	50.35	0.89	1.80	1.49	1.03	0.53	-0.17	0.86	1.21	0.66	14.48	50.29	50.35	0.89	1.80	1.49
	15.6	48.8	50.2																		
	14.7	50.7	51.1																		
A	15.7	53.4	50.2																		
1	13.8	50.5	51.8																		
5	13.9	47.6	52.8																		
L	14.1	50.4	50.5																		
501	15.3	52.6	49.0																		
	14.7	49.4	51.0																		
	14.9	52.6	49.3																		
	13.6	48.6	46.9																		
	12.7	48.9	51.1																		
8	9.1	50.6	54.7	9.23	52.28	50.08	0.61	1.22	1.70	-1.12	1.16	-0.22	0.59	0.82	0.75	9.23	52.28	50.08	0.61	1.22	1.70
	9.7	49.7	48.8																		
	8.7	52.0	50.4																		
A	9.4	54.0	48.5																		
1	8.9	52.3	48.9																		
7	8.4	52.7	49.8																		
L	8.7	53.0	51.0																		
501	9.7	52.1	49.5																		
	9.0	52.5	51.0																		
	9.7	53.8	48.7																		
	10.6	53.0	49.3																		
	8.9	51.7	50.3																		
9	9.8	44.3	37.6	9.17	45.58	40.47	0.76	2.11	1.62	-1.15	-0.96	-2.07	0.73	1.41	0.72	9.17	45.58	40.47	0.76	2.11	1.62
	9.6	42.6	40.0																		
	8.3	43.6	40.0																		
C	10.4	47.5	43.1																		
2	8.2	42.2	43.1																		
6	8.0	47.6	40.8																		
L	9.4	44.8	38.9																		
501	9.9	46.4	39.7																		
	8.8	45.4	41.3																		
	9.7	48.9	39.6																		
	9.1	46.9	39.9																		
	8.8	46.7	41.6																		
10	16.6	49.0	58.9	16.90	52.37	56.33	1.09	2.02	3.19	2.02	1.18	0.98	1.05	1.36	1.41	16.90	52.37	56.33	1.09	2.02	3.19
	18.2	51.7	54.2																		
	18.0	54.0	56.0																		
D	15.9	51.6	57.2																		
2	16.2	52.1	55.5																		
5	14.8	51.3	51.9																		
L	16.5	51.1	56.4																		
501	17.3	50.7	52.1																		
	18.8	53.7	63.9																		
	16.8	53.2	57.3																		
	17.1	53.0	57.5																		
	16.6	57.0	55.0																		
11	15.8	47.2	57.5	13.58	48.07	55.10	1.42	1.48	1.88	0.66	-0.17	0.74	1.37	0.99	0.83	13.58	48.07	55.10	1.42	1.48	1.88
	13.1	45.0	53.4																		
	13.7	49.3	56.1																		
D	15.6	49.4	54.1																		
3	12.4	49.2	55.6																		
6	13.0	48.5	55.8																		
L	15.1	47.3	51.5																		
501	12.9	49.7	55.5																		
	12.7	49.7	57.5																		
	12.2	47.9	52.4																		
	11.6	46.6	55.7																		
	14.9	47.0	56.1																		
12	7.8	44.7	46.9	8.25	45.51	48.23	0.71	0.61	2.11	-1.52	-0.98	-0.58	0.69	0.41	0.93	8.25	45.51	48.23	0.71	0.61	2.11
	9.1	46.0	46.9																		
	8.0	46.3	49.3																		
F	8.2	46.0	50.2																		
1	8.7	45.2	52.9																		
7	9.6	46.0	50.7																		
L	6.9	45.6	46.8																		
501	8.0	44.5	45.8																		
	8.4	45.9	47.4																		
	8.2	45.9	46.6																		
	8.6	44.7	47.9																		
	7.5	45.3	47.3																		
Number of Labs With Data				12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	11.00	12.00	12.00	11.00

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
11.97	48.61	51.24	1.03	1.49	2.26	2.44	2.44	2.44	1.58	1.58	1.58	11.97	48.61	50.41	1.03	1.49	2.08
2.44	3.17	5.20	2.64	3.48	5.63							2.44	3.17	4.54	2.64	3.48	4.96

APPENDIX D- TRC DEPARTURE STATE SYSTEM FRICTION MEASUREMENTS USING 501 TIRE AND THE CORRESPONDING STATISTICS

Table D-1- TRC Departure State System measurements using 501 tire at 20 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	13.9	50.4	76.8	16.43	49.43	76.14	2.29	1.40	3.85	-1.41	-0.22	0.48	1.13	1.09	1.38	16.43	49.43	76.14	2.29	1.40	3.85
	16.3	47.7	77.8																		
	13.7	50.1	64.8																		
F	14.2	51.6	74.9																		
1	18.4	49.5	75.8																		
1	17.1	51.2	79.3																		
L	17.0	50.4	78.4																		
501	20.6	47.8	77.9																		
	13.7	48.3	75.0																		
	18.3	49.7	76.7																		
	18.6	47.4	77.3																		
	15.3	49.1	79.0																		
2	19.4	54.0	76.5	20.68	53.38	76.14	2.42	2.04	3.63	0.27	1.68	0.48	1.19	1.60	1.30	20.68	53.38	76.14	2.42	2.04	3.63
	21.6	55.4	70.5																		
	24.9	55.7	75.1																		
D	21.7	53.3	77.0																		
1	18.9	49.8	76.1																		
2	18.4	50.7	78.2																		
L	19.7	54.7	71.2																		
501	18.6	52.3	74.6																		
	24.7	56.3	84.1																		
	19.1	53.9	80.0																		
	22.9	51.4	74.8																		
	18.3	53.0	75.6																		
3	18.2	51.3	68.7	16.21	50.13	67.38	1.64	1.10	2.80	-1.50	0.11	-1.55	0.81	0.86	1.00	16.21	50.13	67.38	1.64	1.10	2.80
	19.3	49.2	71.9																		
	18.1	48.6	71.1																		
H	16.0	50.2	63.8																		
1	16.8	50.0	70.4																		
2	16.8	50.5	64.6																		
L	14.2	51.6	67.7																		
501	15.2	48.2	65.4																		
	14.9	49.8	68.4																		
	14.6	51.7	65.4																		
	14.7	50.0	67.1																		
	15.7	50.4	64.0																		
4	24.6	53.0	78.4	23.01	53.31	81.10	2.32	1.60	2.74	1.19	1.65	1.63	1.14	1.25	0.98	23.01	53.31	81.10	2.32	1.60	2.74
	27.1	52.3	84.2																		
	24.0	52.7	86.4																		
C	20.5	53.0	83.0																		
2	25.2	53.7	78.4																		
2	23.4	51.8	77.4																		
L	19.6	52.9	79.4																		
501	23.0	50.7	82.8																		
	20.8	53.4	81.1																		
	20.0	56.7	80.3																		
	24.3	55.6	79.1																		
	23.6	53.9	82.7																		
5	18.1	49.3	82.4	18.88	50.30	80.10	1.65	1.32	1.78	-0.44	0.19	1.40	0.81	1.03	0.64	18.88	50.30	80.10	1.65	1.32	1.78
	20.9	49.2	83.5																		
	21.2	51.2	78.5																		
C	18.3	52.2	80.0																		
1	18.5	52.0	80.6																		
3	19.3	49.6	80.0																		
L	14.6	49.4	81.8																		
501	19.3	48.3	78.3																		
	18.7	51.1	79.3																		
	19.0	51.0	79.8																		
	18.9	51.4	77.2																		
	19.7	48.9	79.8																		
6	18.8	49.2	72.4	20.41	50.02	69.39	2.26	0.78	1.96	0.16	0.06	-1.08	1.11	0.61	0.70	20.41	50.02	69.39	2.26	0.78	1.96
	20.3	51.4	70.5																		
	26.3	50.5	69.7																		
I	21.4	48.5	70.7																		
2	19.2	50.1	70.7																		
3	21.6	50.0	69.1																		
L	18.7	49.7	71.7																		
501	19.1	50.4	67.4																		
	22.0	50.9	69.5																		
	20.0	50.3	68.1																		
	17.7	49.9	66.6																		
	19.8	49.3	66.3																		

Table D-1 (Cont.) - TRC Departure State System measurements using 501 tire at 20 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
7	17.4	52.0	68.3	18.63	49.88	68.59	0.91	1.17	2.27	-0.54	-0.01	-1.27	0.45	0.91	0.81	18.63	49.88	68.59	0.91	1.17	2.27
	20.3	50.8	73.5																		
	18.8	48.8	66.8																		
A	18.5	50.6	68.3																		
1	17.6	49.1	71.7																		
4	19.4	49.6	66.0																		
L	18.4	48.7	68.3																		
501	17.8	48.8	66.7																		
	19.4	48.9	67.9																		
	18.8	51.2	67.7																		
	17.6	49.0	70.9																		
	19.5	51.0	67.0																		
8	30.3	53.7	77.6	22.57	49.88	76.20	3.34	1.76	1.40	1.02	-0.01	0.49	1.65	1.38	0.50	FALSE	49.88	76.20	FALSE	1.76	1.40
	27.3	48.2	75.7																		
	24.5	48.4	76.4																		
B	22.0	50.1	78.3																		
1	22.7	50.1	75.8																		
4	21.8	48.6	76.1																		
L	21.0	51.6	76.2																		
501	20.0	48.2	73.9																		
	22.1	50.8	77.6																		
	18.7	48.5	73.7																		
	20.8	51.6	75.9																		
	19.6	48.8	77.2																		
9	20.4	47.7	67.6	17.61	48.37	69.42	1.37	1.43	3.24	-0.94	-0.74	-1.08	0.68	1.12	1.16	17.61	48.37	69.42	1.37	1.43	3.24
	18.4	48.0	69.9																		
	16.7	47.7	69.4																		
B	18.3	48.3	71.1																		
1	17.4	49.9	67.2																		
4	16.8	48.4	66.7																		
R	19.8	50.9	67.4																		
501	16.9	45.1	67.7																		
	16.9	48.5	77.4																		
	17.5	49.6	67.6																		
	16.1	48.5	67.3																		
	16.1	47.8	73.7																		
10	20.8	51.2	79.0	20.68	48.98	75.04	1.34	1.14	2.88	0.27	-0.44	0.22	0.66	0.89	1.03	20.68	48.98	75.04	1.34	1.14	2.88
	22.8	48.2	72.0																		
	21.6	49.9	73.0																		
A	21.6	48.5	73.7																		
1	20.2	49.2	75.8																		
5	17.8	49.9	73.9																		
L	20.1	48.0	81.4																		
501	21.2	47.0	72.5																		
	20.2	48.9	73.9																		
	21.7	49.6	76.9																		
	19.0	49.5	75.8																		
	21.2	47.9	72.6																		
11	25.9	49.3	64.7	20.56	47.82	68.21	1.86	0.82	1.93	0.22	-1.01	-1.36	0.92	0.64	0.69	20.56	47.82	68.21	1.86	0.82	1.93
	19.0	47.0	67.0																		
	21.8	47.0	67.9																		
L	20.0	48.1	69.2																		
1	20.2	48.2	67.8																		
5	21.1	46.8	69.2																		
L	20.0	47.6	68.2																		
501	19.4	49.0	66.5																		
	19.8	47.9	72.8																		
	19.5	46.9	67.7																		
	20.7	47.7	68.4																		
	19.3	48.3	69.1																		
12	25.3	45.8	78.8	23.68	46.53	78.17	3.00	1.11	2.36	1.46	-1.63	0.95	1.47	0.87	0.85	23.68	46.53	78.17	3.00	1.11	2.36
	22.0	46.9	79.3																		
	22.5	46.3	79.8																		
B	30.9	46.5	79.5																		
2	23.9	48.1	78.9																		
5	20.5	45.9	79.4																		
L	22.7	45.8	79.7																		
501	22.3	44.8	74.0																		
	22.1	45.8	76.1																		
	27.9	46.1	74.3																		
	22.8	48.5	76.6																		
	21.3	47.9	81.6																		

Table D-1 (Cont.) - TRC Departure State System measurements using 501 tire at 20 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
13	24.0	54.9	77.4	23.44	52.35	78.65	1.91	1.69	3.68	1.36	1.19	1.06	0.94	1.32	1.32	23.44	52.35	78.65	1.91	1.69	3.68
	22.2	53.9	76.4																		
	26.0	53.8	78.9																		
D	25.4	52.0	77.1																		
2	25.8	49.2	77.1																		
5	21.3	50.9	75.3																		
L	20.9	54.0	74.9																		
501	22.0	51.4	77.3																		
	21.9	52.5	88.1																		
	25.8	53.0	79.2																		
	23.6	50.3	78.9																		
	22.4	52.3	83.2																		
14	19.9	49.9	72.0	18.58	48.52	69.15	1.68	1.35	1.45	-0.56	-0.67	-1.14	0.82	1.06	0.52	18.58	48.52	69.15	1.68	1.35	1.45
	20.1	51.3	67.9																		
	20.9	48.6	68.6																		
L	20.1	48.4	68.7																		
2	18.6	49.3	68.9																		
5	16.4	48.1	68.6																		
L	19.2	49.4	70.5																		
501	17.7	46.3	68.7																		
	17.5	47.2	68.7																		
	19.8	48.4	67.6																		
	16.9	48.2	71.7																		
	15.8	47.1	67.9																		
15	20.8	49.4	71.3	18.10	48.23	71.20	1.49	1.20	1.38	-0.75	-0.80	-0.66	0.73	0.94	0.50	18.10	48.23	71.20	1.49	1.20	1.38
	17.8	49.6	69.5																		
	18.7	50.8	71.7																		
L	15.5	48.3	71.3																		
3	19.2	48.6	70.4																		
5	17.6	46.6	69.8																		
L	19.3	47.6	72.7																		
501	16.6	46.9	72.1																		
	17.9	47.6	70.3																		
	17.2	47.9	71.1																		
	19.7	48.0	74.3																		
	16.9	47.5	69.9																		
16	17.2	49.1	69.8	18.03	48.32	70.36	1.67	1.08	2.71	-0.78	-0.76	-0.86	0.82	0.85	0.97	18.03	48.32	70.36	1.67	1.08	2.71
	16.6	49.2	72.8																		
	21.1	48.9	74.5																		
L	19.0	47.7	66.4																		
1	17.3	50.7	70.7																		
5	19.9	47.8	70.7																		
R	18.4	47.8	70.1																		
501	15.3	47.8	69.5																		
	19.9	48.2	75.3																		
	16.8	47.0	67.0																		
	17.2	48.8	68.7																		
	17.6	46.8	68.8																		
17	23.7	48.7	77.0	22.59	47.94	76.81	1.63	1.23	2.95	1.03	-0.95	0.63	0.80	0.97	1.06	22.59	47.94	76.81	1.63	1.23	2.95
	23.7	48.3	71.9																		
	22.1	48.7	72.8																		
B	25.8	47.5	79.8																		
2	22.3	47.6	76.3																		
5	21.9	48.4	74.0																		
R	22.3	47.9	78.9																		
501	21.7	45.5	75.1																		
	20.6	47.1	77.4																		
	23.4	48.4	80.1																		
	23.9	50.5	81.3																		
	19.7	46.7	77.1																		
18	21.5	46.0	66.6	19.36	45.08	65.47	2.40	0.98	4.15	-0.25	-2.33	-1.99	1.18	0.77	1.49	19.36	45.08	65.47	2.40	0.98	4.15
	20.7	43.8	62.6																		
	17.7	45.8	64.6																		
L	21.3	44.2	65.3																		
2	17.6	46.1	65.5																		
5	17.4	44.6	64.4																		
R	23.7	46.3	70.9																		
501	21.1	44.2	59.5																		
	18.7	46.4	64.3																		
	19.9	44.5	74.7																		
	17.5	44.0	66.7																		
	15.2	45.0	60.5																		

Table D-1 (Cont.) - TRC Final State System measurements using 501 tire at 20 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
19	18.8	50.3	69.9	18.01	50.12	72.07	2.14	0.96	3.50	-0.78	0.11	-0.46	1.06	0.75	1.26	18.01	50.12	72.07	2.14	0.96	3.50
	21.4	50.1	68.6																		
	17.5	49.7	73.6																		
L	15.2	49.9	68.7																		
3	19.4	49.0	79.7																		
5	16.2	51.3	70.6																		
R	19.0	51.1	73.0																		
501	20.6	52.1	70.4																		
	17.2	49.4	70.4																		
	15.3	48.9	68.7																		
	19.9	50.1	74.8																		
	15.6	49.5	76.4																		
20	23.7	51.2	75.9	21.10	51.17	75.58	1.63	0.77	3.06	0.44	0.61	0.35	0.80	0.60	1.10	21.10	51.17	75.58	1.63	0.77	3.06
	22.3	51.3	76.1																		
	20.5	51.4	78.7																		
E	23.5	51.3	75.5																		
1	19.6	51.0	76.9																		
6	20.2	51.6	70.8																		
L	21.7	51.9	73.4																		
501	21.6	48.9	74.6																		
	18.6	51.2	81.7																		
	22.0	51.9	78.2																		
	20.2	51.4	73.0																		
	19.4	51.0	72.2																		
21	26.8	48.3	77.0	19.01	47.98	74.45	3.54	1.22	1.94	-0.39	-0.93	0.09	1.74	0.96	0.70	FALSE	47.98	74.45	FALSE	1.22	1.94
	19.0	50.6	70.7																		
	17.9	49.4	74.3																		
F	17.5	47.2	71.9																		
1	14.6	48.5	74.1																		
6	21.3	48.0	72.7																		
L	23.3	46.8	74.9																		
501	15.5	46.5	74.1																		
	17.4	46.4	75.1																		
	19.6	48.5	75.4																		
	15.2	47.6	76.9																		
	20.0	47.9	76.3																		
22	21.3	48.6	83.3	19.48	47.29	83.70	1.80	1.24	1.75	-0.20	-1.26	2.23	0.88	0.97	0.63	19.48	47.29	83.70	1.80	1.24	1.75
	20.3	46.8	82.8																		
	19.4	46.2	84.5																		
K	21.2	49.0	86.8																		
1	17.6	48.4	82.7																		
6	17.5	45.6	82.7																		
L	23.2	48.3	85.1																		
501	18.4	45.7	83.8																		
	18.4	46.2	85.2																		
	20.3	48.2	84.0																		
	18.3	46.5	79.7																		
	17.8	48.0	83.8																		
23	23.6	51.4	65.7	21.83	50.24	68.18	1.95	1.31	3.57	0.73	0.17	-1.36	0.96	1.02	1.28	21.83	50.24	68.18	1.95	1.31	3.57
	26.4	52.9	62.3																		
	21.8	51.0	66.4																		
C	23.5	49.2	70.0																		
2	19.9	51.1	67.7																		
6	20.8	51.2	65.2																		
L	22.7	49.2	68.6																		
501	21.3	49.0	69.0																		
	19.9	49.1	73.3																		
	21.1	50.3	73.9																		
	19.7	48.5	64.6																		
	21.3	50.0	71.5																		
24	28.1	48.0	75.5	24.23	48.98	78.18	2.74	0.87	2.77	1.68	-0.44	0.95	1.35	0.68	0.99	24.23	48.98	78.18	2.74	0.87	2.77
	24.2	49.3	73.6																		
	23.1	50.9	80.7																		
D	25.3	48.7	76.0																		
3	21.2	48.6	77.9																		
6	24.6	48.3	80.4																		
L	27.4	48.4	75.7																		
501	23.3	47.8	79.0																		
	21.9	49.8	79.4																		
	21.6	49.1	80.7																		
	21.1	49.5	76.4																		
	29.0	49.4	82.9																		

Table D-1 (Cont.) - TRC Departure State System measurements using 501 tire at 20 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
25	27.7	49.1	76.2	23.85	49.11	74.39	1.97	0.77	1.85	1.52	-0.38	0.07	0.97	0.61	0.66	23.85	49.11	74.39	1.97	0.77	1.85
	24.9	49.2	73.2																		
	22.8	49.6	72.6																		
L	26.9	50.5	75.2																		
4	22.4	50.2	73.9																		
6	23.3	48.9	73.9																		
L	23.8	48.9	76.6																		
501	22.8	48.3	70.6																		
	21.4	48.3	76.1																		
	25.4	49.6	76.3																		
	22.2	47.9	75.2																		
	22.6	48.8	72.9																		
26	23.5	51.9	72.7	22.33	50.05	74.57	1.64	1.31	1.51	0.92	0.07	0.11	0.81	1.02	0.54	22.33	50.05	74.57	1.64	1.31	1.51
	22.6	51.2	73.8																		
	24.4	51.9	75.0																		
L	22.1	48.1	71.8																		
5	20.5	48.9	74.6																		
6	21.4	51.4	76.3																		
L	23.2	49.5	77.0																		
501	23.8	49.3	74.1																		
	23.7	50.8	74.9																		
	23.1	49.0	74.0																		
	18.9	49.3	76.4																		
	20.8	49.3	74.2																		
27	23.6	49.7	75.0	21.55	50.40	70.13	1.73	1.18	3.28	0.62	0.24	-0.91	0.85	0.92	1.18	21.55	50.40	70.13	1.73	1.18	3.28
	22.1	49.5	71.2																		
	24.6	52.2	74.5																		
E	23.1	51.3	73.2																		
1	23.1	50.2	68.0																		
6	20.1	50.5	69.8																		
R	19.4	50.3	66.4																		
501	20.6	51.5	70.0																		
	20.6	48.1	69.4																		
	21.1	52.1	72.7																		
	21.4	49.8	65.6																		
	19.2	49.8	65.8																		
28	25.0	51.5	72.5	22.02	51.69	76.51	3.28	0.93	3.33	0.80	0.87	0.56	1.61	0.73	1.19	FALSE	51.69	76.51	FALSE	0.93	3.33
	22.2	50.5	70.1																		
	23.6	52.3	74.4																		
L	23.5	53.2	78.6																		
4	19.2	52.5	75.7																		
6	18.6	52.2	78.6																		
R	23.5	50.6	78.0																		
501	23.9	51.7	74.2																		
	21.2	51.0	78.3																		
	28.2	52.9	78.8																		
	18.7	51.3	76.5																		
	16.6	50.6	82.4																		
29	13.3	51.5	78.8	13.91	51.65	75.64	0.94	1.03	3.62	-2.40	0.85	0.36	0.46	0.81	1.30	13.91	51.65	75.64	0.94	1.03	3.62
	13.8	51.5	72.4																		
	15.5	51.8	71.6																		
A	14.4	52.7	78.0																		
1	13.8	50.3	77.5																		
7	15.2	52.1	72.1																		
L	13.3	52.0	79.2																		
501	15.2	49.2	71.2																		
	13.4	51.3	73.4																		
	13.1	52.0	79.9																		
	13.0	52.7	80.5																		
	12.9	52.7	73.1																		
30	17.4	49.1	75.4	16.73	48.15	75.53	1.54	1.14	2.90	-1.29	-0.84	0.34	0.76	0.89	1.04	16.73	48.15	75.53	1.54	1.14	2.90
	20.0	49.8	72.4																		
	18.6	47.7	72.8																		
F	18.1	49.8	73.5																		
1	15.7	47.1	71.8																		
7	15.1	47.8	73.3																		
L	16.0	47.3	80.9																		
501	16.6	49.3	75.7																		
	16.9	46.3	78.2																		
	15.8	48.5	79.1																		
	15.0	47.2	77.4																		
	15.6	47.9	75.9																		

Table D-1 (Cont.) - TRC Departure State System measurements using 501 tire at 20 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
31	17.0	49.3	79.7	16.87	52.18	76.89	1.25	2.47	3.24	-1.24	1.10	0.65	0.62	1.94	1.16	16.87	FALSE	76.89	1.25	FALSE	3.24
	17.4	56.0	79.4																		
	17.9	56.8	74.5																		
J	15.9	51.6	80.3																		
1	17.2	51.0	77.9																		
7	16.3	52.8	78.5																		
L	17.4	50.2	82.1																		
501	16.2	50.4	72.0																		
	18.2	53.7	74.8																		
	19.0	50.2	76.7																		
	15.1	50.1	73.0																		
	14.8	54.0	73.8																		
32	21.4	50.3	73.7	20.20	51.51	74.35	1.87	1.24	2.33	0.08	0.78	0.06	0.92	0.97	0.84	20.20	51.51	74.35	1.87	1.24	2.33
	22.2	52.6	73.4																		
	18.3	51.9	72.7																		
L	24.0	52.3	76.2																		
4	20.3	51.0	74.2																		
7	18.2	51.7	71.2																		
L	20.3	52.5	79.7																		
501	19.5	52.4	73.5																		
	19.2	52.4	76.4																		
	20.2	52.4	74.9																		
	17.4	49.6	71.5																		
	21.4	49.0	74.8																		
33	22.4	50.8	72.2	20.89	51.08	72.49	1.38	1.16	2.57	0.36	0.57	-0.37	0.68	0.91	0.92	20.89	51.08	72.49	1.38	1.16	2.57
	21.1	53.1	72.5																		
	18.8	50.8	70.2																		
L	19.6	49.8	73.0																		
5	19.0	51.4	74.2																		
7	22.1	51.0	69.9																		
L	22.8	52.1	77.5																		
501	20.2	52.5	68.8																		
	20.7	49.3	72.9																		
	20.2	49.6	76.2																		
	22.6	51.6	72.2																		
	21.2	50.9	70.3																		
34	16.3	51.8	70.4	17.12	51.15	72.98	1.40	1.07	3.06	-1.14	0.61	-0.25	0.69	0.84	1.10	17.12	51.15	72.98	1.40	1.07	3.06
	19.1	49.7	70.1																		
	19.1	51.0	74.7																		
J	17.6	51.9	72.3																		
1	15.9	49.8	70.2																		
7	14.7	49.9	74.9																		
R	16.6	52.7	78.4																		
501	19.0	52.3	69.7																		
	17.0	51.1	74.8																		
	16.8	51.2	77.1																		
	17.4	52.3	69.5																		
	15.9	50.1	73.6																		
35	22.4	57.5	79.4	21.18	55.20	79.30	1.65	1.14	2.37	0.47	2.56	1.21	0.81	0.89	0.85	21.18	55.20	79.30	1.65	1.14	2.37
	20.6	54.9	80.5																		
	20.3	54.8	79.6																		
L	22.0	54.3	77.9																		
5	23.4	52.9	78.1																		
7	21.6	56.1	81.4																		
R	22.1	54.9	83.4																		
501	20.7	55.7	78.2																		
	18.8	54.9	82.7																		
	19.8	54.8	78.3																		
	18.7	55.3	75.5																		
	23.8	56.3	76.6																		
Number of Labs With Data	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	32.00	34.00	35.00	32.00	34.00	35.00			

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
19.99	49.90	74.07	2.03	1.28	2.79	2.64	2.64	2.64	1.60	1.60	1.60	19.88	49.83	74.07	1.85	1.22	2.79
2.53	2.07	4.32	3.23	2.42	5.12							2.58	2.06	4.32	3.16	2.39	5.12

Table D-2- TRC Departure State System measurements using 501 tire at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	9.5	44.2	67.9	10.34	45.85	68.73	1.29	1.48	1.81	-1.78	-0.75	1.66	1.06	1.26	0.66	10.34	45.85	68.73	1.29	1.48	1.81
	10.1	43.1	68.3																		
	10.2	46.0	66.1																		
F	9.3	46.3	66.9																		
1	13.8	45.0	67.0																		
1	9.6	46.0	68.2																		
L	9.2	46.3	67.8																		
501	11.3	44.4	70.1																		
	9.8	46.3	70.3																		
	10.3	48.6	70.9																		
	11.3	46.9	69.2																		
	9.7	47.1	72.1																		
2	10.4	51.1	65.8	13.08	50.66	66.16	2.89	1.60	4.05	-0.29	1.78	1.10	2.37	1.36	1.48	FALSE	50.66	66.16	FALSE	1.60	4.05
	12.5	50.2	63.8																		
	19.8	52.9	64.9																		
D	14.2	50.3	61.6																		
1	13.3	48.9	69.6																		
2	14.5	47.1	64.4																		
L	9.1	50.2	67.8																		
501	12.3	50.4	59.0																		
	13.8	52.7	74.0																		
	10.9	50.9	68.4																		
	10.4	52.1	64.6																		
	15.7	51.1	70.0																		
3	10.9	48.2	58.4	11.23	48.05	59.45	0.65	0.84	2.88	-1.29	0.41	-0.36	0.53	0.72	1.05	11.23	48.05	59.45	0.65	0.84	2.88
	11.0	47.1	58.6																		
	11.8	48.3	59.6																		
H	11.5	46.6	57.2																		
1	10.7	48.3	58.2																		
2	11.8	48.9	63.9																		
L	10.5	48.8	56.5																		
501	10.7	48.5	65.7																		
	12.8	46.7	61.8																		
	11.2	47.9	57.3																		
	10.9	48.1	57.3																		
	11.0	49.2	58.9																		
4	12.5	52.6	71.2	14.93	51.39	68.60	1.68	1.48	2.57	0.72	2.17	1.63	1.38	1.26	0.94	14.93	51.39	68.60	1.68	1.48	2.57
	15.3	49.2	70.6																		
	16.5	50.8	66.5																		
C	12.4	53.5	68.0																		
2	15.4	53.1	68.1																		
2	15.4	50.3	73.4																		
L	13.9	49.7	67.7																		
501	16.3	50.5	68.3																		
	15.5	50.0	69.7																		
	12.9	51.6	63.3																		
	15.3	52.7	66.9																		
	17.8	52.7	69.5																		
5	13.3	48.3	66.2	12.33	48.13	64.07	0.90	1.08	2.30	-0.70	0.45	0.64	0.74	0.92	0.84	12.33	48.13	64.07	0.90	1.08	2.30
	12.7	47.0	67.2																		
	12.2	47.6	68.1																		
C	12.5	48.8	61.9																		
1	12.7	49.2	60.1																		
3	13.4	47.7	64.7																		
L	10.5	50.5	63.3																		
501	12.2	47.9	62.8																		
	11.7	48.6	65.0																		
	12.9	46.3	62.8																		
	10.9	47.7	62.7																		
	12.9	47.9	64.0																		
6	10.9	46.6	59.8	12.78	47.35	58.28	1.45	0.99	2.44	-0.46	0.04	-0.62	1.19	0.84	0.89	12.78	47.35	58.28	1.45	0.99	2.44
	11.8	47.1	62.9																		
	13.1	47.9	59.3																		
I	12.7	46.7	61.9																		
2	12.1	46.6	58.7																		
3	12.8	46.4	58.3																		
L	11.1	47.1	56.4																		
501	14.6	46.6	56.2																		
	15.2	49.5	55.5																		
	12.1	47.3	56.6																		
	11.9	47.4	55.3																		
	15.0	49.0	58.4																		

Table D-2 (Cont.) - TRC Departure State System measurements using 501 tire at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
7	10.2	48.1	60.1	11.55	47.83	56.66	0.80	0.81	2.60	-1.12	0.29	-0.97	0.65	0.69	0.95	11.55	47.83	56.66	0.80	0.81	2.60
	12.0	46.8	56.2																		
	12.7	47.0	59.5																		
A	11.7	48.6	54.1																		
1	10.8	47.4	57.6																		
4	12.3	48.9	54.7																		
L	10.5	49.0	55.7																		
501	10.8	47.2	52.9																		
	12.0	48.7	57.7																		
	11.5	47.2	61.1																		
	11.8	47.1	54.0																		
	12.3	47.9	56.3																		
8	15.8	47.9	64.2	15.16	47.76	59.98	0.54	1.37	2.26	0.84	0.25	-0.25	0.44	1.16	0.82	15.16	47.76	59.98	0.54	1.37	2.26
	15.3	45.8	62.4																		
	15.9	47.9	63.1																		
B	14.7	45.9	61.0																		
1	15.4	49.2	60.2																		
4	14.4	49.3	58.5																		
L	15.8	48.6	58.4																		
501	14.8	49.9	59.1																		
	15.0	46.6	59.8																		
	14.9	46.3	57.7																		
	14.4	47.7	58.2																		
	15.5	48.0	57.2																		
9	13.5	46.0	62.6	12.68	45.81	57.12	0.71	0.85	3.93	-0.50	-0.77	-0.87	0.59	0.72	1.43	12.68	45.81	57.12	0.71	0.85	3.93
	13.4	44.9	56.4																		
	12.7	46.8	63.0																		
B	12.5	44.5	60.2																		
1	12.3	47.0	56.1																		
4	12.6	46.3	60.8																		
R	12.0	45.7	53.7																		
501	11.9	45.5	58.8																		
	12.5	45.2	52.6																		
	12.0	46.9	53.0																		
	12.5	46.1	56.4																		
	14.3	44.8	51.8																		
10	14.9	48.5	63.1	14.62	46.48	58.05	1.01	1.18	1.98	0.55	-0.42	-0.67	0.83	1.00	0.72	14.62	46.48	58.05	1.01	1.18	1.98
	15.7	46.3	59.6																		
	15.2	45.5	57.8																		
A	15.3	45.4	59.0																		
1	13.7	45.6	57.6																		
5	15.6	46.8	58.0																		
L	13.8	47.8	58.7																		
501	15.4	48.1	57.1																		
	14.2	45.4	57.2																		
	15.5	47.3	56.3																		
	13.4	45.6	56.9																		
	12.7	45.4	55.3																		
11	15.1	46.3	57.9	13.50	46.33	59.13	1.09	1.22	2.23	-0.06	-0.50	-0.43	0.90	1.04	0.81	13.50	46.33	59.13	1.09	1.22	2.23
	11.3	48.5	61.9																		
	13.7	44.7	58.3																		
L	14.6	44.9	63.2																		
1	13.3	44.6	60.3																		
5	12.2	47.4	56.7																		
L	14.2	46.8	58.1																		
501	12.4	47.8	57.1																		
	14.5	46.0	58.3																		
	13.7	46.0	57.0																		
	13.6	46.2	58.4																		
	13.4	46.7	62.3																		
12	16.0	43.2	66.5	16.39	43.86	66.78	1.29	1.31	2.85	1.51	-1.80	1.23	1.06	1.11	1.04	16.39	43.86	66.78	1.29	1.31	2.85
	17.0	43.7	66.1																		
	13.6	44.6	64.8																		
B	18.8	43.0	73.9																		
2	16.0	44.3	64.2																		
5	16.0	44.1	68.6																		
L	16.6	46.0	67.2																		
501	17.3	42.0	68.6																		
	15.1	44.0	66.0																		
	17.6	44.8	64.2																		
	16.3	41.4	67.9																		
	16.4	45.2	63.3																		

Table D-2 (Cont.) - TRC Departure State System measurements using 501 tire at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
13	15.5	51.3	67.3	16.30	50.91	63.53	0.95	1.41	2.48	1.46	1.91	0.53	0.78	1.20	0.90	16.30	50.91	63.53	0.95	1.41	2.48
	16.0	48.3	64.2																		
	16.1	50.9	63.0																		
D	16.4	49.9	65.5																		
2	16.4	50.3	67.5																		
5	15.1	50.1	62.3																		
L	16.5	51.6	64.0																		
501	16.8	52.8	62.5																		
	16.2	50.4	62.9																		
	17.8	53.8	63.8																		
	18.0	50.5	60.1																		
	14.8	51.0	59.3																		
14	15.8	46.0	56.8	13.27	46.05	57.05	1.48	0.67	2.04	-0.19	-0.65	-0.89	1.21	0.57	0.74	13.27	46.05	57.05	1.48	0.67	2.04
	14.7	45.2	58.9																		
	12.1	45.9	56.8																		
L	15.0	45.8	55.8																		
2	13.4	45.5	55.8																		
5	11.1	45.0	54.5																		
L	12.7	46.6	56.1																		
501	14.0	45.8	56.4																		
	13.5	46.9	59.2																		
	13.6	46.0	55.7																		
	12.0	47.0	56.6																		
	11.3	46.9	62.0																		
15	12.7	45.7	61.2	12.29	46.29	58.71	0.51	0.99	1.97	-0.72	-0.52	-0.52	0.41	0.84	0.72	12.29	46.29	58.71	0.51	0.99	1.97
	11.3	47.0	58.4																		
	12.6	46.6	60.9																		
L	12.0	46.6	57.9																		
3	12.5	46.0	57.2																		
5	12.5	47.4	62.8																		
L	12.5	46.3	57.8																		
501	11.7	44.9	57.9																		
	13.2	47.0	57.0																		
	11.9	44.7	56.0																		
	12.2	47.9	58.3																		
	12.4	45.4	59.1																		
16	12.0	45.6	58.6	11.26	45.18	57.33	0.82	1.23	1.85	-1.28	-1.11	-0.83	0.67	1.05	0.67	11.26	45.18	57.33	0.82	1.23	1.85
	10.3	44.2	54.6																		
	12.3	45.0	56.8																		
L	11.3	45.1	57.8																		
1	11.8	45.9	57.1																		
5	10.9	43.9	58.5																		
R	11.7	46.9	56.5																		
501	9.4	45.9	61.8																		
	11.8	47.1	58.1																		
	10.8	42.9	56.4																		
	11.7	45.4	56.1																		
	11.1	44.2	55.6																		
17	16.6	45.7	65.0	16.12	46.09	65.07	0.79	0.95	2.63	1.36	-0.63	0.86	0.65	0.81	0.96	16.12	46.09	65.07	0.79	0.95	2.63
	16.3	46.6	68.0																		
	16.1	45.8	67.5																		
B	16.9	45.1	70.2																		
2	16.1	46.7	67.0																		
5	14.0	46.6	62.9																		
R	16.5	45.5	62.3																		
501	15.8	45.7	62.9																		
	16.4	47.4	65.2																		
	16.8	44.1	63.2																		
	16.5	46.6	64.8																		
	15.4	47.3	61.8																		
18	14.5	43.4	60.9	13.78	44.12	53.87	1.02	1.24	2.58	0.09	-1.67	-1.58	0.84	1.05	0.94	13.78	44.12	53.87	1.02	1.24	2.58
	14.2	43.1	53.4																		
	13.2	43.1	53.0																		
L	14.9	44.5	52.6																		
2	13.6	45.8	53.1																		
5	11.4	44.6	51.4																		
R	13.7	43.3	53.1																		
501	13.5	44.4	57.0																		
	13.8	46.6	53.4																		
	14.4	44.1	53.6																		
	15.3	44.4	52.6																		
	12.9	42.1	52.3																		

Table D-2 (Cont.) - TRC Departure State System measurements using 501 tire at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
19	12.1	44.3	62.1	11.91	46.46	61.13	1.39	1.53	2.14	-0.93	-0.43	0.00	1.14	1.30	0.78	11.91	46.46	61.13	1.39	1.53	2.14
	15.4	44.7	63.3																		
	12.3	47.6	60.5																		
L	10.2	45.6	60.3																		
3	12.2	46.7	64.6																		
5	11.9	48.1	58.5																		
R	13.0	48.6	62.9																		
501	10.9	44.5	59.8																		
	11.7	46.3	61.5																		
	10.1	46.8	63.3																		
	11.7	48.5	58.5																		
	11.4	45.8	58.3																		
20	13.4	48.7	60.4	13.71	49.33	54.92	0.59	1.13	3.09	0.05	1.08	-1.35	0.48	0.96	1.13	13.71	49.33	54.92	0.59	1.13	3.09
	14.1	47.2	58.8																		
	13.0	47.9	59.6																		
E	14.0	50.8	54.4																		
1	13.2	48.8	54.1																		
6	12.9	48.9	53.6																		
L	13.9	49.4	54.3																		
501	14.9	49.5	53.3																		
	13.5	51.1	54.0																		
	14.3	49.9	51.7																		
	14.0	49.7	50.3																		
	13.3	50.2	54.7																		
21	15.6	45.8	67.4	13.83	46.20	62.44	1.92	1.14	2.08	0.12	-0.57	0.29	1.57	0.97	0.76	13.83	46.20	62.44	1.92	1.14	2.08
	13.6	44.8	59.5																		
	12.8	45.4	62.3																		
F	15.8	48.0	61.4																		
1	11.4	48.3	64.0																		
6	14.7	45.1	60.1																		
L	14.1	46.0	63.2																		
501	14.0	45.7	63.4																		
	13.1	45.8	63.1																		
	17.7	47.6	61.7																		
	11.5	46.1	60.8																		
	11.7	45.8	62.4																		
22	16.2	44.7	70.0	14.25	45.51	70.53	1.11	1.33	1.21	0.35	-0.93	2.05	0.91	1.13	0.44	14.25	45.51	70.53	1.11	1.33	1.21
	14.8	46.0	69.0																		
	15.7	44.8	70.7																		
K	15.0	46.7	71.7																		
1	13.9	44.4	71.6																		
6	14.5	45.7	71.1																		
L	14.4	44.5	71.1																		
501	14.5	46.4	70.8																		
	13.0	44.7	70.0																		
	13.3	48.9	70.2																		
	13.0	44.5	72.2																		
	12.7	44.8	67.9																		
23	15.5	45.5	54.5	15.36	47.22	54.32	1.37	1.25	2.26	0.95	-0.03	-1.48	1.12	1.06	0.82	15.36	47.22	54.32	1.37	1.25	2.26
	17.2	46.5	55.3																		
	15.0	46.9	55.4																		
C	17.2	46.5	55.5																		
2	15.2	47.2	51.3																		
6	13.7	48.8	56.7																		
L	15.5	46.7	51.2																		
501	16.2	47.3	51.8																		
	15.6	45.6	54.8																		
	16.6	49.4	57.1																		
	13.3	47.3	51.5																		
	13.3	48.9	56.7																		
24	18.3	47.8	62.5	16.78	47.38	65.22	1.03	1.45	2.01	1.72	0.05	0.89	0.84	1.23	0.73	16.78	47.38	65.22	1.03	1.45	2.01
	16.4	46.3	62.4																		
	17.0	47.4	70.0																		
D	17.0	46.9	65.1																		
3	15.6	44.3	64.8																		
6	16.8	49.3	65.9																		
L	17.0	49.1	65.0																		
501	18.4	47.5	64.5																		
	16.5	46.6	65.9																		
	16.3	49.2	67.0																		
	17.4	46.3	64.1																		
	14.7	47.8	65.4																		

Table D-2 (Cont.) - TRC Departure State System measurements using 501 tire at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
25	15.5	45.8	61.5	15.64	45.69	62.68	0.99	0.79	1.90	1.10	-0.84	0.34	0.81	0.68	0.69	15.64	45.69	62.68	0.99	0.79	1.90
	17.3	44.1	65.9																		
	14.9	45.3	62.0																		
L	16.9	46.8	65.2																		
4	15.1	45.9	61.2																		
6	14.3	45.3	61.2																		
L	16.0	45.9	61.2																		
501	15.4	44.7	60.7																		
	15.5	46.3	61.8																		
	16.1	46.7	65.8																		
	14.1	45.3	63.0																		
	16.6	46.2	62.7																		
26	15.3	46.5	60.7	15.02	46.60	62.23	1.42	1.02	2.82	0.76	-0.36	0.24	1.16	0.86	1.03	15.02	46.60	62.23	1.42	1.02	2.82
	17.6	48.3	65.8																		
	15.9	47.6	65.0																		
L	15.2	45.0	59.3																		
5	14.5	46.9	60.7																		
6	13.8	45.4	64.5																		
L	16.0	46.1	61.4																		
501	14.0	46.0	65.1																		
	16.2	46.4	59.5																		
	15.8	48.0	57.4																		
	12.6	45.9	62.1																		
	13.3	47.1	65.2																		
27	13.3	47.9	60.7	12.55	46.33	52.53	0.76	0.65	4.95	-0.58	-0.50	-1.87	0.63	0.56	1.80	12.55	46.33	FALSE	0.76	0.65	FALSE
	11.5	45.9	57.0																		
	13.3	46.3	52.5																		
E	12.8	46.1	47.0																		
1	13.2	46.4	55.5																		
6	11.8	45.9	55.5																		
R	12.4	46.3	55.5																		
501	13.1	46.7	47.9																		
	11.6	45.1	47.2																		
	12.7	46.4	46.3																		
	13.4	46.3	56.8																		
	11.5	46.7	48.5																		
28	18.4	47.8	65.1	15.03	48.08	64.54	1.67	0.88	2.09	0.77	0.42	0.75	1.37	0.75	0.76	15.03	48.08	64.54	1.67	0.88	2.09
	15.0	48.3	65.4																		
	14.0	48.2	62.1																		
L	17.5	48.6	65.5																		
4	13.8	48.8	65.7																		
6	12.2	49.1	64.2																		
R	15.2	48.7	67.9																		
501	16.0	46.0	66.0																		
	13.9	47.6	61.3																		
	15.2	48.9	62.0																		
	14.5	47.1	66.7																		
	14.6	47.9	62.6																		
29	9.9	47.0	64.4	10.48	47.11	57.92	0.77	0.75	2.73	-1.70	-0.09	-0.70	0.63	0.64	1.00	10.48	47.11	57.92	0.77	0.75	2.73
	10.1	46.3	61.2																		
	11.6	46.7	59.3																		
A	10.8	47.4	59.3																		
1	10.2	47.6	56.5																		
7	9.8	46.9	57.0																		
L	10.1	48.1	57.9																		
501	11.7	45.5	54.9																		
	11.7	47.5	56.2																		
	10.3	47.5	56.1																		
	9.9	46.7	55.5																		
	9.7	48.1	56.7																		
30	10.1	45.1	61.1	11.64	45.23	59.68	0.97	1.07	3.11	-1.07	-1.08	-0.31	0.79	0.91	1.13	11.64	45.23	59.68	0.97	1.07	3.11
	12.5	47.3	62.6																		
	13.0	44.1	66.6																		
F	11.2	44.9	58.5																		
1	11.6	43.8	58.7																		
7	10.5	44.8	58.8																		
L	11.8	45.2	60.2																		
501	13.1	46.0	56.0																		
	12.5	44.6	61.9																		
	11.1	47.1	55.6																		
	11.4	45.1	59.5																		
	10.9	44.7	56.6																		

Table D-2 (Cont.) - TRC Departure State System measurements using 501 tire at 40 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
31	10.8	48.5	62.0	11.38	49.33	61.38	1.14	1.94	2.22	-1.21	1.08	0.06	0.93	1.65	0.81	11.38	FALSE	61.38	1.14	FALSE	2.22
	10.6	48.0	59.3																		
	12.9	47.9	64.1																		
J	12.8	50.9	58.8																		
1	11.3	46.3	64.1																		
7	11.7	50.9	62.1																		
L	10.5	49.5	64.3																		
501	12.0	47.2	58.4																		
	12.3	49.4	61.0																		
	10.4	48.9	62.7																		
	12.2	53.1	58.5																		
	9.1	51.3	61.3																		
32	14.0	50.1	60.9	14.32	50.01	61.83	0.98	1.07	2.52	0.38	1.44	0.16	0.81	0.91	0.92	14.32	50.01	61.83	0.98	1.07	2.52
	14.8	51.6	63.8																		
	13.4	49.1	62.3																		
L	15.2	49.5	66.2																		
4	15.7	51.7	60.7																		
7	14.3	49.4	63.1																		
L	13.3	48.6	62.7																		
501	15.0	48.5	58.2																		
	13.6	50.7	61.8																		
	13.6	50.8	64.9																		
	13.0	49.6	58.4																		
	15.9	50.5	59.0																		
33	15.4	47.4	60.7	14.78	48.26	60.18	1.13	1.08	2.78	0.64	0.52	-0.20	0.93	0.92	1.01	14.78	48.26	60.18	1.13	1.08	2.78
	15.1	47.8	57.5																		
	14.2	47.4	65.4																		
L	15.4	48.9	59.3																		
5	14.1	48.6	62.7																		
7	13.4	50.2	58.8																		
L	16.7	46.8	57.9																		
501	14.6	46.5	60.9																		
	13.9	48.6	63.1																		
	16.8	49.2	60.4																		
	14.3	48.9	60.5																		
	13.5	48.8	55.0																		
34	13.0	46.0	57.1	11.78	47.09	59.70	0.95	0.89	4.87	-1.00	-0.10	-0.31	0.78	0.76	1.77	11.78	47.09	FALSE	0.95	0.89	FALSE
	13.1	49.2	54.4																		
	13.2	46.3	61.5																		
J	12.2	47.7	70.8																		
1	12.0	46.8	53.4																		
7	11.5	46.8	63.4																		
R	11.4	47.1	57.1																		
501	11.5	47.0	58.6																		
	11.2	46.2	61.9																		
	11.3	46.9	58.6																		
	10.7	48.1	63.8																		
	10.2	47.0	55.8																		
35	17.6	51.7	74.5	16.38	50.83	69.28	1.56	1.27	3.58	1.50	1.87	1.78	1.28	1.08	1.30	16.38	50.83	69.28	1.56	1.27	3.58
	18.2	49.4	67.2																		
	16.0	50.1	73.8																		
L	17.8	53.0	69.5																		
5	16.8	52.2	73.9																		
7	13.1	49.7	71.0																		
R	17.4	50.9	71.0																		
501	16.9	48.9	64.1																		
	14.8	49.7	66.3																		
	16.4	51.7	66.7																		
	17.2	51.6	65.0																		
	14.3	51.1	68.3																		
Number of Labs With Data	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.00	34.00	33.00	34.00	34.00	33.00			

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
13.61	47.28	61.12	1.22	1.18	2.74	2.64	2.64	2.64	1.60	1.60	1.60	13.63	47.22	61.42	1.13	1.15	2.55
1.84	1.90	4.59	2.20	2.22	5.32							1.87	1.89	4.46	2.17	2.20	5.12

Table D-3- TRC Departure State System measurements using 501 tire at 60 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	8.1	47.1	61.9	7.49	46.58	57.91	0.65	1.94	1.88	-1.76	-0.69	1.63	0.60	1.17	0.65	7.49	46.58	57.91	0.65	1.94	1.88
	8.5	44.3	60.5																		
	7.2	46.2	55.8																		
F	6.7	47.5	57.3																		
1	7.9	47.2	57.8																		
1	7.4	47.1	57.9																		
L	6.6	46.0	57.5																		
501	6.7	43.1	58.9																		
	7.8	46.1	58.5																		
	7.2	45.6	55.6																		
	8.4	47.7	55.8																		
	7.4	51.0	57.4																		
2	7.5	51.5	53.1	9.94	51.06	58.43	1.81	1.44	4.23	-0.34	1.39	1.75	1.68	0.87	1.47	FALSE	51.06	58.43	FALSE	1.44	4.23
	11.1	51.3	57.2																		
	13.0	52.3	65.1																		
D	9.2	50.0	59.4																		
1	9.6	49.6	56.3																		
2	9.7	52.1	58.5																		
L	8.0	49.3	52.5																		
501	9.4	49.0	61.2																		
	13.5	53.5	64.5																		
	8.6	50.9	55.1																		
	10.2	50.4	62.7																		
	9.5	52.8	55.6																		
3	9.5	51.8	50.0	8.73	50.68	50.71	0.77	1.25	2.00	-1.04	1.21	0.12	0.71	0.76	0.70	8.73	50.68	50.71	0.77	1.25	2.00
	9.4	49.5	49.4																		
	9.7	48.7	53.2																		
H	8.9	49.1	51.5																		
1	8.1	51.8	49.7																		
2	9.4	52.9	49.0																		
L	8.3	49.9	48.6																		
501	7.6	50.9	50.5																		
	8.5	50.4	50.9																		
	9.5	50.3	48.1																		
	7.6	51.6	53.2																		
	8.2	51.2	54.4																		
4	8.5	48.5	54.8	9.87	49.19	56.32	1.00	1.32	2.73	-0.38	0.53	1.30	0.92	0.80	0.95	9.87	49.19	56.32	1.00	1.32	2.73
	11.7	49.6	62.1																		
	10.2	48.9	57.0																		
C	9.2	51.3	54.9																		
2	10.1	49.8	53.5																		
2	10.6	49.8	57.2																		
L	8.4	48.7	52.7																		
501	10.1	47.7	57.7																		
	9.4	49.0	55.2																		
	10.0	51.6	55.5																		
	9.1	48.2	54.9																		
	11.1	47.2	60.3																		
5	9.1	47.7	53.5	9.86	46.30	53.14	0.70	1.03	2.70	-0.39	-0.81	0.63	0.64	0.62	0.94	9.86	46.30	53.14	0.70	1.03	2.70
	10.4	44.7	49.6																		
	10.6	48.1	54.8																		
C	10.5	45.6	53.4																		
1	9.0	46.5	55.2																		
3	10.5	46.5	49.5																		
L	9.0	46.9	58.2																		
501	9.5	44.8	55.9																		
	10.8	46.8	50.6																		
	9.8	45.8	50.5																		
	9.1	45.8	52.8																		
	10.0	46.4	53.7																		
6	9.3	49.4	48.1	9.48	49.85	49.91	0.95	1.39	2.31	-0.61	0.83	-0.05	0.88	0.84	0.80	9.48	49.85	49.91	0.95	1.39	2.31
	8.3	51.2	48.7																		
	9.8	50.5	55.0																		
I	11.1	49.1	51.6																		
2	8.5	47.0	49.4																		
3	9.5	50.3	51.3																		
L	8.1	48.3	49.8																		
501	9.0	51.9	52.6																		
	10.9	51.0	49.1																		
	10.0	49.6	48.7																		
	10.0	49.0	47.2																		
	9.2	50.9	47.4																		

Table D-3 (Cont.) - TRC Departure State System measurements using 501 tire at 60 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
7	8.4	49.6	46.6	8.83	49.86	47.21	0.83	1.42	2.49	-0.99	0.83	-0.62	0.77	0.86	0.86	8.83	49.86	47.21	0.83	1.42	2.49
	8.6	49.3	44.6																		
	8.7	48.8	50.7																		
A	10.5	50.0	45.0																		
1	7.6	50.8	48.0																		
4	9.8	48.2	47.2																		
L	8.0	50.3	44.4																		
501	9.5	53.0	51.1																		
	8.0	48.2	47.8																		
	9.3	51.4	43.4																		
	8.6	48.5	48.9																		
	8.9	50.2	48.8																		
8	0.0	50.4	48.4		49.78	47.43		1.25	1.18		0.80	-0.58		0.75	0.41		49.78	47.43		1.25	1.18
	0.0	51.1	48.8																		
	0.0	49.9	48.6																		
B	0.0	49.3	47.5																		
1	0.0	50.6	46.5																		
4	0.0	50.5	49.0																		
L	0.0	51.0	48.5																		
501	0.0	48.2	47.0																		
	0.0	48.3	46.1																		
	0.0	50.5	45.8																		
	0.0	47.2	46.5																		
	0.0	50.3	46.4																		
9		46.3	46.5		45.83	45.23		1.56	1.66		-1.03	-1.04		0.94	0.57		45.83	45.23		1.56	1.66
		46.5	45.5																		
		47.0	48.7																		
B		46.0	46.8																		
1		47.7	45.6																		
4		44.1	43.6																		
R		44.8	44.5																		
501		49.1	43.7																		
		44.4	44.0																		
		45.0	42.8																		
		45.1	46.1																		
		44.0	44.9																		
10	10.7	46.1	42.8	11.44	45.81	43.20	0.93	1.79	2.22	0.53	-1.04	-1.47	0.86	1.08	0.77	11.44	45.81	43.20	0.93	1.79	2.22
	11.2	44.5	44.8																		
	11.7	43.0	44.4																		
A	13.2	48.8	41.5																		
1	11.3	46.9	39.2																		
5	9.7	46.1	47.2																		
L	11.8	43.9	44.7																		
501	12.3	45.7	44.4																		
	11.1	44.0	44.4																		
	12.5	48.7	40.3																		
	10.9	46.0	42.1																		
	10.9	46.0	42.6																		
11	12.2	46.8	54.0	12.12	46.41	52.38	0.85	1.32	2.35	0.92	-0.76	0.47	0.78	0.80	0.82	12.12	46.41	52.38	0.85	1.32	2.35
	10.3	47.8	54.8																		
	13.1	48.7	53.5																		
L	11.5	46.9	55.8																		
1	12.5	45.8	48.5																		
5	13.2	47.4	54.2																		
L	11.9	46.3	50.1																		
501	11.3	47.1	52.0																		
	12.9	45.6	50.4																		
	12.7	43.8	53.3																		
	12.2	45.3	49.1																		
	11.6	45.4	52.8																		
12	12.7	46.3	59.3	12.29	49.33	57.31	0.72	1.78	2.63	1.02	0.59	1.51	0.67	1.07	0.91	12.29	49.33	57.31	0.72	1.78	2.63
	13.1	47.4	59.3																		
	13.1	53.2	58.4																		
B	13.3	51.3	58.7																		
2	11.6	49.3	62.7																		
5	11.3	49.4	53.6																		
L	12.4	48.0	56.1																		
501	12.1	50.2	56.0																		
	12.0	48.9	54.3																		
	12.9	49.6	54.3																		
	11.4	49.3	56.8																		
	11.6	49.0	58.2																		

Table D-3 (Cont.) - TRC Departure State System measurements using 501 tire at 60 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
13	12.6	52.8	52.5	15.18	53.49	53.68	1.14	2.24	2.32	2.70	2.52	0.74	1.05	1.35	0.81	FALSE	53.49	53.68	FALSE	2.24	2.32
	14.2	52.1	51.6																		
	15.3	52.5	51.4																		
D	14.7	56.2	55.4																		
2	14.9	52.3	55.6																		
5	15.3	50.7	49.8																		
L	15.4	50.4	55.1																		
501	15.9	56.0	52.7																		
	15.9	55.4	57.7																		
	16.5	57.4	54.7																		
	16.9	53.2	55.6																		
	14.5	52.9	52.0																		
14	10.2	47.4	52.5	10.24	47.61	47.98	1.06	1.40	2.81	-0.17	-0.21	-0.46	0.98	0.85	0.97	10.24	47.61	47.98	1.06	1.40	2.81
	11.1	49.2	48.2																		
	10.5	47.0	48.6																		
L	11.6	47.8	54.1																		
2	10.1	50.9	45.2																		
5	8.0	47.7	46.6																		
L	11.0	45.9	48.1																		
501	11.1	46.3	46.0																		
	10.3	46.3	48.8																		
	10.9	48.0	45.1																		
	9.1	46.6	46.7																		
	9.0	48.2	45.9																		
15	9.5	44.2	50.2	9.71	46.16	50.48	0.94	1.53	2.38	-0.47	-0.88	0.07	0.87	0.92	0.82	9.71	46.16	50.48	0.94	1.53	2.38
	9.2	44.9	54.6																		
	10.7	44.3	50.2																		
L	8.2	46.6	48.7																		
3	10.3	48.9	52.8																		
5	9.5	48.8	53.8																		
L	9.6	45.1	49.3																		
501	9.5	46.1	48.0																		
	11.3	45.6	47.9																		
	8.2	47.0	52.7																		
	10.6	46.1	48.4																		
	9.9	46.3	49.1																		
16	10.1	47.1	47.2	9.08	46.66	46.15	1.47	2.14	3.89	-0.84	-0.65	-0.84	1.36	1.29	1.35	9.08	46.66	46.15	1.47	2.14	3.89
	7.3	46.9	47.2																		
	11.8	51.1	45.6																		
L	8.5	46.1	43.2																		
1	8.6	44.9	47.8																		
5	9.8	44.5	44.9																		
R	8.8	47.2	47.1																		
501	7.1	46.6	44.9																		
	11.4	50.1	56.9																		
	8.5	44.9	43.5																		
	9.1	44.0	41.5																		
	7.9	46.5	44.0																		
17	13.7	47.1	56.3	13.29	48.18	57.13	0.69	1.89	1.95	1.60	0.06	1.47	0.63	1.14	0.68	13.29	48.18	57.13	0.69	1.89	1.95
	12.0	46.9	57.3																		
	12.4	50.9	58.0																		
B	14.1	47.8	58.9																		
2	14.1	47.9	61.0																		
5	12.7	50.6	58.1																		
R	13.6	47.6	59.0																		
501	13.4	50.7	55.4																		
	13.8	47.8	55.3																		
	13.8	49.6	54.4																		
	13.1	44.8	56.6																		
	12.8	46.5	55.2																		
18	12.2	44.0	49.8	10.87	43.83	46.67	1.37	2.01	1.88	0.20	-1.96	-0.74	1.26	1.22	0.65	10.87	43.83	46.67	1.37	2.01	1.88
	11.7	41.7	46.7																		
	10.5	42.9	47.4																		
L	14.0	46.8	45.5																		
2	10.5	42.9	49.4																		
5	9.1	43.5	45.8																		
R	11.5	42.8	46.2																		
501	10.2	45.4	43.8																		
	9.9	41.9	45.6																		
	10.8	48.2	44.6																		
	10.9	42.1	48.9																		
	9.1	43.8	46.3																		

Table D-3 (Cont.) - TRC Departure State System measurements using 501 tire at 60 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
19	9.1	49.7	47.7	9.23	51.13	49.88	1.22	2.04	1.70	-0.75	1.42	-0.06	1.13	1.23	0.59	9.23	51.13	49.88	1.22	2.04	1.70
	9.2	49.2	51.4																		
	10.0	52.4	53.7																		
L	8.3	51.4	48.4																		
3	9.0	51.0	51.3																		
5	8.8	51.2	50.3																		
R	10.4	56.2	49.8																		
501	9.6	47.8	50.4																		
	11.2	50.3	48.6																		
	6.2	51.3	49.3																		
	9.7	51.1	49.6																		
	9.2	52.0	48.0																		
20	8.9	51.9	53.0	9.33	49.42	41.45	0.51	1.55	6.55	-0.69	0.63	-1.84	0.47	0.94	2.27	9.33	49.42	FALSE	0.51	1.55	FALSE
	9.6	48.6	51.4																		
	10.0	50.9	45.6																		
E	9.6	49.4	43.3																		
1	8.9	50.7	41.2																		
6	9.4	49.4	33.7																		
L	8.9	48.6	45.4																		
501	10.4	49.5	40.4																		
	8.8	49.9	32.8																		
	9.4	49.8	39.0																		
	8.9	45.6	36.7																		
	9.2	48.7	35.2																		
21	14.9	47.4	51.1	11.17	48.73	53.32	1.76	1.04	2.60	0.37	0.31	0.67	1.63	0.63	0.90	FALSE	48.73	53.32	FALSE	1.04	2.60
	10.3	48.7	50.8																		
	10.2	50.3	51.2																		
F	10.5	48.6	52.7																		
1	9.3	46.9	55.0																		
6	9.6	49.8	55.8																		
L	13.0	49.0	57.4																		
501	11.4	47.3	52.2																		
	11.2	48.8	57.9																		
	13.6	49.5	50.8																		
	9.9	49.2	53.5																		
	10.1	49.2	51.4																		
22	12.5	45.9	57.4	11.66	47.55	57.38	1.12	1.12	2.00	0.66	-0.23	1.52	1.03	0.68	0.69	11.66	47.55	57.38	1.12	1.12	2.00
	11.4	48.4	58.6																		
	11.0	48.1	60.3																		
K	12.1	48.3	58.6																		
1	10.3	45.6	59.5																		
6	12.5	47.4	56.8																		
L	9.5	48.4	56.0																		
501	12.2	49.4	54.6																		
	10.8	46.8	54.6																		
	12.2	47.6	59.8																		
	11.8	46.7	57.1																		
	13.6	48.0	55.3																		
23	12.5	47.4	44.5	12.03	48.21	44.40	1.24	1.30	0.83	0.87	0.07	-1.21	1.15	0.79	0.29	12.03	48.21	44.40	1.24	1.30	0.83
	12.9	49.1	44.5																		
	11.9	47.2	45.2																		
C	13.4	49.0	43.9																		
2	10.7	46.7	43.5																		
6	10.4	49.1	46.5																		
L	12.7	48.4	43.9																		
501	13.7	49.4	44.0																		
	11.7	46.7	44.7																		
	13.4	50.8	43.7																		
	10.4	46.8	43.8																		
	10.7	47.9	44.6																		
24	13.4	46.6	54.0	11.97	48.11	51.48	0.86	1.71	2.16	0.84	0.02	0.28	0.80	1.03	0.75	11.97	48.11	51.48	0.86	1.71	2.16
	11.8	50.0	53.5																		
	12.7	47.1	52.1																		
D	12.8	49.9	51.3																		
3	10.8	50.3	51.3																		
6	11.6	44.6	50.4																		
L	12.7	47.8	51.0																		
501	12.0	46.9	52.6																		
	12.0	49.8	52.7																		
	11.0	48.2	45.9																		
	10.6	47.6	49.9																		
	12.2	48.5	53.1																		

Table D-3 (Cont.) - TRC Departure State System measurements using 501 tire at 60 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
25	12.5	46.0	49.5	11.16	47.02	48.24	0.92	1.22	1.82	0.37	-0.48	-0.40	0.85	0.74	0.63	11.16	47.02	48.24	0.92	1.22	1.82
	11.2	45.1	49.6																		
	11.2	45.5	50.8																		
L	12.3	48.8	46.6																		
4	11.8	46.8	46.7																		
6	10.6	48.3	48.6																		
L	11.2	47.9	47.6																		
501	10.1	46.0	48.9																		
	11.0	46.8	50.3																		
	12.2	48.0	44.7																		
	10.2	46.7	46.5																		
	9.6	48.3	49.1																		
26	11.6	45.6	53.3	11.53	48.86	50.98	0.88	1.82	2.18	0.58	0.37	0.17	0.82	1.10	0.76	11.53	48.86	50.98	0.88	1.82	2.18
	13.2	49.9	55.2																		
	12.4	50.0	49.6																		
L	12.0	48.8	53.4																		
5	10.3	47.5	50.3																		
6	10.8	48.8	52.1																		
L	11.5	49.9	48.6																		
501	10.1	51.6	51.7																		
	11.7	49.9	49.0																		
	11.8	49.5	50.9																		
	10.9	45.5	48.5																		
	12.0	49.3	49.2																		
27	7.9	48.8	49.7	7.76	44.19	39.39	0.44	2.18	7.62	-1.60	-1.79	-2.27	0.41	1.32	2.64	7.76	44.19	FALSE	0.44	2.18	FALSE
	7.7	47.4	40.8																		
	7.8	43.3	51.8																		
E	7.9	43.7	44.8																		
1	8.9	45.0	43.8																		
6	7.8	43.0	40.2																		
R	7.1	43.1	37.6																		
501	7.6	45.6	27.0																		
	7.4	42.7	36.1																		
	7.4	42.6	33.0																		
	7.9	43.9	39.5																		
	7.7	41.2	28.4																		
28	13.1	48.1	52.1	11.08	48.80	52.51	2.37	1.05	2.15	0.32	0.34	0.50	2.19	0.63	0.75	FALSE	48.80	52.51	FALSE	1.05	2.15
	11.4	47.3	53.1																		
	10.6	49.2	51.5																		
L	17.6	50.3	57.5																		
4	9.6	49.4	51.5																		
6	8.8	49.4	52.4																		
R	10.7	49.5	53.1																		
501	10.0	47.2	48.8																		
	9.5	50.2	54.8																		
	11.9	48.7	53.0																		
	9.8	48.6	51.0																		
	10.0	47.7	51.3																		
29	7.8	45.6	46.2	8.17	46.08	44.72	0.42	2.21	2.83	-1.37	-0.91	-1.15	0.39	1.33	0.98	8.17	46.08	44.72	0.42	2.21	2.83
	8.3	46.2	41.0																		
	7.9	42.9	48.2																		
A	8.7	48.8	45.5																		
1	8.3	42.6	42.4																		
7	7.6	46.7	46.9																		
L	7.7	46.6	45.1																		
501	8.6	48.8	45.0																		
	8.6	45.1	45.1																		
	8.5	49.3	46.5																		
	8.4	44.0	38.2																		
	7.6	46.4	46.5																		
30	8.8	44.1	48.1	9.36	46.03	48.57	0.83	1.88	2.77	-0.68	-0.94	-0.34	0.76	1.13	0.96	9.36	46.03	48.57	0.83	1.88	2.77
	9.2	48.0	47.9																		
	8.7	43.5	49.1																		
F	9.3	47.9	48.8																		
1	11.3	44.5	49.6																		
7	8.8	46.2	46.4																		
L	8.7	46.7	49.0																		
501	10.3	48.2	46.1																		
	8.8	44.9	55.5																		
	10.2	48.6	44.7																		
	9.4	43.6	50.8																		
	8.8	46.2	46.8																		

Table D-3 (Cont.) - TRC Departure State System measurements using 501 tire at 60 mph on three surfaces (Pads) and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
31	9.1	49.7	46.5	8.93	48.98	47.88	0.71	1.47	2.31	-0.93	0.43	-0.48	0.65	0.89	0.80	8.93	48.98	47.88	0.71	1.47	2.31
	8.9	46.8	47.1																		
	9.2	47.3	47.7																		
J	9.3	49.5	48.2																		
1	9.4	48.0	47.9																		
7	7.7	48.9	52.8																		
L	7.8	49.3	48.9																		
501	9.2	50.0	46.5																		
	8.4	48.4	46.6																		
	8.8	52.5	47.3																		
	9.0	48.3	43.9																		
	10.3	49.1	51.2																		
32	12.6	44.6	51.8	11.86	44.28	53.47	0.81	1.94	1.94	0.77	-1.75	0.70	0.75	1.17	0.67	11.86	44.28	53.47	0.81	1.94	1.94
	13.0	44.0	50.2																		
	12.0	43.0	55.7																		
L	11.3	43.3	54.2																		
4	10.9	43.3	54.6																		
7	12.1	44.8	54.1																		
L	12.3	39.9	52.5																		
501	12.6	45.4	51.5																		
	11.0	46.2	56.7																		
	10.5	43.3	54.3																		
	11.4	46.6	54.5																		
	12.6	46.9	51.5																		
33	12.3	47.9	48.3	12.16	49.11	51.28	1.15	1.72	1.91	0.95	0.49	0.24	1.06	1.04	0.66	12.16	49.11	51.28	1.15	1.72	1.91
	13.4	47.7	51.6																		
	14.4	48.4	49.6																		
L	13.6	50.8	54.9																		
5	10.8	46.5	49.5																		
7	11.0	52.1	50.2																		
L	11.8	47.7	50.0																		
501	12.2	48.1	53.2																		
	11.4	49.6	53.4																		
	12.6	51.5	52.1																		
	11.1	48.9	51.7																		
	11.3	50.1	50.8																		
34	8.8	46.9	48.5	9.05	48.48	48.90	0.91	1.52	2.14	-0.86	0.20	-0.27	0.84	0.92	0.74	9.05	48.48	48.90	0.91	1.52	2.14
	9.0	49.7	47.5																		
	9.0	48.7	51.3																		
J	10.2	50.3	49.7																		
1	8.6	46.3	52.2																		
7	6.8	47.7	45.3																		
R	9.8	47.9	51.5																		
501	9.0	49.0	46.0																		
	8.3	46.5	47.7																		
	9.8	51.3	48.3																		
	9.4	49.1	48.9																		
	9.9	48.4	49.9																		
35	12.3	48.4	50.9	12.55	50.42	50.42	1.17	2.10	3.22	1.17	1.09	0.05	1.08	1.27	1.12	12.55	50.42	50.42	1.17	2.10	3.22
	12.8	53.0	46.0																		
	14.5	50.2	49.4																		
L	14.0	51.3	50.2																		
5	13.5	48.3	47.1																		
7	12.5	50.1	56.7																		
R	11.3	51.3	52.8																		
501	10.9	52.0	46.7																		
	11.2	48.7	53.7																		
	13.5	54.5	48.5																		
	12.6	49.8	49.7																		
	11.5	47.4	53.3																		
Number of Labs With Data				33.00	35.00	35.00	33.00	35.00	35.00	33.00	35.00	35.00	33.00	35.00	35.00	29.00	35.00	33.00	29.00	35.00	33.00

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
10.53	48.06	50.16	1.08	1.66	2.88	2.64	2.64	2.64	1.60	1.60	1.60	10.34	48.06	50.75	0.94	1.66	2.40
1.72	2.16	4.74	2.03	2.71	5.53							1.60	2.16	4.19	1.84	2.71	4.81

APPENDIX E- TRC DEPARTURE STATE SYSTEM FRICTION MEASUREMENTS USING 524 TIRE AND THE CORRESPONDING STATISTICS

Table E-1- TRC Departure State System measurements at 20 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	10.1	52.7	75.1	13.27	51.93	70.53	1.47	0.59	3.66	-1.42	0.43	0.89	0.95	0.46	0.85	13.27	51.93	70.53	1.47	0.59	3.66
	14.9	51.9	75.8																		
	15.2	51.1	72.8																		
G	12.5	51.7	74.6																		
2	13.3	51.2	73.4																		
3	13.9	51.8	68.5																		
L	14.3	52.5	66.7																		
524	14.0	51.1	69.6																		
	13.5	52.8	69.5																		
	13.2	52.3	68.4																		
	11.1	52.2	66.9																		
	13.2	51.8	65.0																		
2	14.1	50.1	71.1	14.76	48.77	62.01	1.72	1.01	3.57	-0.78	-0.86	-0.58	1.11	0.79	0.83	14.76	48.77	62.01	1.72	1.01	3.57
	16.6	50.9	61.3																		
	18.6	48.9	63.4																		
I	14.2	48.3	61.0																		
2	13.6	47.1	63.4																		
3	15.1	48.7	64.9																		
L	12.5	49.2	62.1																		
524	15.4	48.6	62.0																		
	15.8	48.3	57.9																		
	13.8	47.9	58.9																		
	12.6	49.2	58.9																		
	14.8	48.0	59.2																		
3	14.2	48.9	55.1	13.12	48.16	55.53	0.61	1.27	3.51	-1.48	-1.11	-1.70	0.39	0.99	0.81	13.12	48.16	55.53	0.61	1.27	3.51
	12.9	50.2	53.8																		
	13.0	48.8	54.3																		
B	12.2	48.0	59.4																		
1	13.4	48.8	53.5																		
4	12.4	47.3	53.1																		
L	12.7	47.8	63.7																		
524	12.6	48.0	58.8																		
	13.2	47.5	52.7																		
	14.0	48.7	51.7																		
	13.5	48.9	53.5																		
	13.3	45.0	56.7																		
4	20.6	56.1	69.5	16.01	53.78	66.26	2.18	1.64	2.42	-0.25	1.19	0.16	1.40	1.27	0.56	16.01	53.78	66.26	2.18	1.64	2.42
	15.1	56.2	68.6																		
	17.4	53.6	66.4																		
G	15.0	55.3	65.5																		
1	13.3	54.4	66.4																		
4	15.7	54.5	67.4																		
L	19.8	51.1	68.8																		
524	15.2	53.0	68.4																		
	15.5	52.4	62.8																		
	15.1	53.8	63.2																		
	14.3	51.5	65.5																		
	15.1	53.5	62.6																		
5	15.3	52.6	77.6	16.78	51.81	71.23	2.31	0.60	6.84	0.08	0.38	1.01	1.49	0.46	1.58	16.78	51.81	FALSE	2.31	0.60	FALSE
	17.9	52.6	77.6																		
	21.9	51.3	85.8																		
I	18.7	52.3	71.1																		
1	14.6	51.4	68.3																		
4	17.4	51.3	67.9																		
L	12.7	52.3	68.9																		
524	16.4	51.3	69.9																		
	16.7	50.9	75.8																		
	17.9	52.4	64.7																		
	15.4	51.7	66.1																		
	16.4	51.6	61.0																		
6	13.2	48.6	49.5	14.20	48.33	54.05	1.04	1.69	10.09	-1.02	-1.04	-1.95	0.67	1.31	2.33	14.20	48.33	FALSE	1.04	1.69	FALSE
	15.6	48.4	78.1																		
	14.7	48.0	50.0																		
B	13.7	52.9	51.1																		
1	13.9	49.1	48.2																		
4	16.3	48.7	51.0																		
R	15.0	47.6	49.3																		
524	13.4	48.5	49.6																		
	13.8	46.9	49.1																		
	13.2	46.5	48.0																		
	14.6	48.4	72.6																		
	13.0	46.4	52.1																		

Table E-1- (Cont.)- TRC Departure State System measurements at 20 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
7	18.1	45.7	58.7	17.83	46.08	62.50	1.18	0.85	2.02	0.53	-1.96	-0.49	0.76	0.66	0.47	17.83	46.08	62.50	1.18	0.85	2.02
	17.7	45.5	60.9																		
	17.0	45.9	65.0																		
B	18.0	46.3	64.1																		
2	19.6	47.4	63.1																		
5	19.3	45.3	63.2																		
L	18.4	45.8	60.7																		
524	17.2	44.9	64.3																		
	16.0	46.5	62.2																		
	19.0	45.2	64.0																		
	17.8	47.4	64.0																		
	15.9	47.0	59.8																		
8	16.5	50.5	70.2	16.96	49.08	64.06	1.20	1.42	4.05	0.16	-0.73	-0.22	0.77	1.10	0.94	16.96	49.08	64.06	1.20	1.42	4.05
	18.9	51.1	63.2																		
	18.2	50.0	62.3																		
G	17.9	48.5	61.8																		
2	16.1	48.1	68.5																		
5	16.6	48.6	58.1																		
L	16.5	50.8	71.5																		
524	16.3	47.3	62.0																		
	18.5	48.3	61.2																		
	17.3	50.2	62.8																		
	15.7	48.8	65.6																		
	15.0	46.7	61.5																		
9	17.5	52.1	67.4	16.68	50.85	67.33	1.53	1.49	3.35	0.04	-0.01	0.34	0.99	1.16	0.78	16.68	50.85	67.33	1.53	1.49	3.35
	19.9	52.9	72.1																		
	17.3	51.5	69.8																		
I	15.5	50.0	70.1																		
3	17.4	53.0	72.2																		
5	14.7	51.2	62.0																		
L	17.6	50.1	66.5																		
524	17.1	49.9	67.1																		
	14.1	49.5	65.1																		
	16.8	52.2	67.2																		
	16.5	49.1	66.4																		
	15.8	48.7	62.0																		
10	20.6	54.5	66.7	19.80	53.43	67.58	1.50	1.35	1.91	1.37	1.05	0.39	0.97	1.05	0.44	19.80	53.43	67.58	1.50	1.35	1.91
	20.6	54.1	70.2																		
	20.1	54.5	70.3																		
G	21.3	54.5	67.4																		
1	17.5	52.6	67.6																		
6	21.9	52.0	64.4																		
L	19.1	54.4	70.2																		
524	20.6	50.9	67.8																		
	18.8	53.1	67.2																		
	21.1	55.4	65.3																		
	18.8	52.0	67.9																		
	17.2	53.2	66.0																		
11	20.1	53.2	74.2	18.85	50.60	71.43	1.45	1.65	1.27	0.97	-0.11	1.05	0.93	1.28	0.29	18.85	50.60	71.43	1.45	1.65	1.27
	19.4	52.7	70.4																		
	20.7	51.8	73.1																		
I	19.6	50.8	71.3																		
1	17.8	48.8	72.4																		
6	19.7	49.3	71.8																		
L	19.0	51.6	70.2																		
524	20.3	49.2	70.6																		
	19.2	48.3	71.0																		
	16.4	51.9	71.5																		
	17.4	50.6	70.0																		
	16.6	49.0	70.6																		
12	23.4	54.1	61.7	17.90	52.48	61.96	2.25	1.61	2.54	0.56	0.65	-0.59	1.45	1.25	0.59	17.90	52.48	61.96	2.25	1.61	2.54
	18.1	53.6	60.8																		
	16.5	52.4	61.9																		
L	18.4	53.3	61.7																		
5	19.2	51.4	60.0																		
6	19.4	54.5	68.0																		
L	17.2	50.5	59.8																		
524	18.2	55.2	63.9																		
	14.8	50.8	62.8																		
	16.5	51.2	63.7																		
	15.2	50.9	61.3																		
	17.9	51.8	57.9																		
13	15.5	51.7	70.7	14.68	50.28	65.76	1.26	1.38	3.87	-0.82	-0.24	0.07	0.81	1.07	0.90	14.68	50.28	65.76	1.26	1.38	3.87
	14.7	51.4	70.1																		
	17.2	49.3	72.5																		
I	14.7	51.6	61.9																		
3	14.6	51.9	64.3																		
7	12.6	50.7	63.4																		
L	15.1	49.6	64.2																		
524	15.4	47.0	65.2																		
	15.1	49.6	68.3																		
	13.8	49.7	64.6																		
	14.8	50.3	64.6																		
	12.6	50.5	59.3																		

Table E-1- (Cont.)- TRC Departure State System measurements at 20 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 20 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
14	23.8	55.5	74.8	21.25	54.91	75.55	1.25	0.89	3.38	1.99	1.65	1.76	0.80	0.69	0.78	21.25	54.91	75.55	1.25	0.89	3.38
	20.5	55.1	79.6																		
	22.2	54.0	75.5																		
G	21.1	55.2	80.1																		
1	20.9	57.1	73.8																		
7	20.2	55.1	71.6																		
L	22.1	55.1	73.2																		
524	22.4	54.4	77.5																		
	21.9	53.8	80.3																		
	20.5	53.9	77.3																		
	19.8	54.9	72.0																		
	19.6	54.8	70.9																		
15	19.2	52.9	64.2	16.68	52.62	64.46	1.32	1.09	4.23	0.04	0.71	-0.15	0.85	0.84	0.98	16.68	52.62	64.46	1.32	1.09	4.23
	16.7	53.0	72.1																		
	16.4	52.8	67.7																		
L	15.8	52.6	68.9																		
5	17.6	52.3	68.6																		
7	18.3	51.8	61.1																		
L	16.0	51.4	60.9																		
524	16.4	50.9	66.2																		
	18.0	54.6	62.6																		
	15.7	53.7	61.8																		
	15.2	53.8	61.7																		
	14.9	51.6	57.7																		
Number of Labs With Data				15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	13.00	15.00	15.00	13.00

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
16.58	50.87	65.35	1.55	1.29	4.32	2.47	2.47	2.47	1.58	1.58	1.58	16.58	50.87	65.76	1.55	1.29	3.19
2.34	2.45	5.79	2.78	2.75	7.14							2.34	2.45	5.04	2.78	2.75	5.90

Table E-2- TRC Departure State System measurements at 40 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	6.0	46.0	42.1	6.31	45.04	45.03	0.42	1.58	3.92	-1.42	0.31	1.42	0.60	1.28	1.04	6.31	45.04	45.03	0.42	1.58	3.92
	6.5	44.8	50.7																		
	6.1	44.3	44.0																		
G	6.4	47.6	46.3																		
2	6.6	44.9	45.6																		
3	6.7	44.4	39.8																		
L	5.3	44.5	42.0																		
524	6.1	44.0	45.1																		
	6.5	43.0	53.6																		
	6.9	47.3	44.6																		
	6.5	42.8	45.3																		
	6.1	46.9	41.2																		
2	5.7	42.0	37.7	6.96	41.88	40.09	0.56	0.99	4.40	-1.09	-1.12	0.44	0.79	0.80	1.17	6.96	41.88	40.09	0.56	0.99	4.40
	6.3	43.1	41.7																		
	7.0	42.3	50.1																		
I	7.4	42.4	46.4																		
2	6.6	41.0	41.3																		
3	7.4	41.3	37.2																		
L	7.5	41.9	34.6																		
524	7.7	42.3	39.3																		
	7.1	41.2	37.1																		
	6.9	43.5	39.9																		
	6.9	39.8	39.6																		
	7.0	41.7	36.2																		
3	8.3	41.5	31.2	7.75	41.63	29.49	0.42	1.54	1.51	-0.69	-1.23	-1.66	0.59	1.24	0.40	7.75	41.63	29.49	0.42	1.54	1.51
	7.3	43.3	29.6																		
	8.2	42.3	28.3																		
B	7.4	43.3	28.0																		
1	7.3	42.5	29.4																		
4	7.7	42.7	31.1																		
L	7.2	39.6	29.0																		
524	7.7	40.1	28.1																		
	8.1	39.4	32.3																		
	8.4	40.9	27.2																		
	7.8	40.3	29.5																		
	7.6	43.7	30.2																		
4	11.1	48.9	41.7	7.48	47.30	44.36	1.22	1.32	3.66	-0.83	1.32	1.29	1.73	1.06	0.97	FALSE	47.30	44.36	FALSE	1.32	3.66
	6.6	48.1	46.9																		
	7.1	47.1	43.3																		
G	7.3	48.2	45.6																		
1	6.5	45.9	51.8																		
4	7.4	47.5	41.9																		
L	8.1	47.6	41.2																		
524	7.2	49.5	48.7																		
	7.5	45.2	45.9																		
	7.1	47.6	42.4																		
	6.7	45.7	44.4																		
	7.1	46.3	38.5																		
5	7.2	44.2	45.1	7.63	44.57	41.16	0.54	1.16	2.58	-0.75	0.09	0.65	0.77	0.94	0.68	7.63	44.57	41.16	0.54	1.16	2.58
	7.8	45.3	44.0																		
	7.6	46.1	44.9																		
I	8.4	44.7	39.8																		
1	7.3	42.7	41.8																		
4	8.0	44.0	38.5																		
L	6.5	44.8	41.0																		
524	7.3	46.3	41.1																		
	8.1	44.7	40.6																		
	7.8	45.0	41.6																		
	7.3	42.4	38.9																		
	8.3	44.6	36.6																		
6	7.7	40.7	28.1	7.00	40.64	31.78	0.30	1.65	5.90	-1.07	-1.67	-1.21	0.43	1.33	1.56	7.00	40.64	31.78	0.30	1.65	5.90
	6.8	41.5	34.5																		
	6.9	41.7	31.3																		
B	6.8	44.2	42.0																		
1	7.4	40.8	41.1																		
4	7.0	40.5	31.7																		
R	6.8	39.9	26.1																		
524	7.1	42.4	36.5																		
	7.2	38.5	25.9																		
	6.8	38.8	26.6																		
	6.8	39.7	24.5																		
	6.7	39.0	33.0																		

Table E-2- (Cont.)- TRC Departure State System measurements at 40 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
7	9.7	41.6	44.7	9.56	41.69	44.00	0.72	0.65	4.83	0.22	-1.20	1.21	1.02	0.53	1.28	9.56	41.69	44.00	0.72	0.65	4.83
	10.6	41.1	43.5																		
	8.9	41.9	45.1																		
B	10.1	42.2	54.5																		
2	10.0	40.2	42.7																		
5	8.4	42.4	41.4																		
L	9.5	41.8	40.8																		
524	10.3	41.6	42.1																		
	8.8	42.2	40.5																		
	9.8	41.9	51.4																		
	8.6	42.4	44.7																		
	10.0	41.0	36.6																		
8	8.6	44.7	40.5	9.78	44.29	35.33	0.67	1.06	3.56	0.33	-0.03	-0.50	0.95	0.85	0.94	9.78	44.29	35.33	0.67	1.06	3.56
	10.1	46.5	34.1																		
	10.5	44.2	36.0																		
G	9.8	44.1	39.6																		
2	9.7	44.2	37.3																		
5	9.3	45.6	31.7																		
L	9.8	44.6	33.8																		
524	8.6	43.4	36.3																		
	10.5	42.4	32.6																		
	10.3	44.3	38.4																		
	10.5	44.2	35.8																		
	9.6	43.3	27.9																		
9	10.3	46.8	38.3	10.39	45.36	40.87	0.73	1.10	5.31	0.64	0.45	0.59	1.04	0.89	1.41	10.39	45.36	40.87	0.73	1.10	5.31
	11.5	46.3	47.8																		
	10.9	44.4	42.3																		
I	10.7	46.1	42.4																		
3	10.8	44.8	39.6																		
5	8.8	44.3	36.0																		
L	10.6	44.8	37.1																		
524	10.5	46.8	43.2																		
	10.5	44.1	42.1																		
	10.2	46.5	52.1																		
	10.7	45.5	36.2																		
	9.2	43.9	33.3																		
10	12.5	47.4	38.9	12.23	47.91	40.83	0.84	0.69	2.35	1.57	1.59	0.59	1.19	0.56	0.62	12.23	47.91	40.83	0.84	0.69	2.35
	13.3	48.0	45.5																		
	12.7	48.6	40.9																		
G	13.2	48.9	42.9																		
1	11.5	47.3	38.4																		
6	10.6	47.9	39.9																		
L	12.1	48.5	37.7																		
524	12.6	47.1	42.0																		
	12.4	46.8	40.3																		
	13.0	48.6	40.9																		
	11.5	48.4	38.8																		
	11.3	47.4	43.8																		
11	12.5	44.5	35.1	11.28	45.07	35.81	0.74	1.34	1.77	1.09	0.32	-0.41	1.05	1.08	0.47	11.28	45.07	35.81	0.74	1.34	1.77
	12.1	45.5	37.4																		
	11.4	45.2	38.0																		
I	11.6	46.1	38.3																		
1	10.5	47.0	36.4																		
6	11.3	45.3	35.5																		
L	11.0	44.0	33.5																		
524	11.4	45.8	36.5																		
	11.4	43.3	32.4																		
	11.6	47.0	36.6																		
	10.9	44.3	35.6																		
	9.6	42.8	34.4																		
12	9.4	44.5	50.9	9.25	44.60	35.42	0.61	1.44	5.60	0.07	0.11	-0.49	0.86	1.16	1.48	9.25	44.60	35.42	0.61	1.44	5.60
	9.0	46.4	39.7																		
	9.3	44.0	33.7																		
L	9.9	45.3	34.8																		
5	8.8	43.8	31.7																		
6	10.5	46.5	33.0																		
L	8.4	44.5	30.7																		
524	9.0	44.4	37.9																		
	9.3	42.6	31.0																		
	9.8	43.8	35.4																		
	8.4	42.5	34.7																		
	9.2	46.9	31.5																		

Table E-2- (Cont.)- TRC Departure State System measurements at 40 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 40 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
13	8.5	45.0	34.7	8.68	43.82	33.95	0.83	1.25	1.58	-0.22	-0.25	-0.78	1.18	1.01	0.42	8.68	43.82	33.95	0.83	1.25	1.58
	9.1	45.9	36.4																		
	7.9	44.4	35.3																		
I	9.3	44.7	34.0																		
3	9.2	45.2	35.3																		
7	7.4	42.7	31.0																		
L	8.0	43.1	32.7																		
524	8.9	42.9	32.9																		
	8.9	43.6	33.9																		
	9.2	44.0	33.3																		
	10.2	42.0	32.3																		
	7.5	42.3	35.6																		
14	13.0	48.8	41.3	12.89	47.67	39.26	0.75	0.95	2.81	1.90	1.49	0.27	1.07	0.77	0.75	12.89	47.67	39.26	0.75	0.95	2.81
	13.2	47.3	44.0																		
	12.2	46.1	39.3																		
G	12.5	48.4	39.8																		
1	13.9	46.8	39.1																		
7	13.9	48.4	38.6																		
L	13.8	46.7	32.7																		
524	12.7	46.9	41.9																		
	12.7	47.9	38.2																		
	12.8	47.8	37.8																		
	12.7	47.6	41.0																		
	11.3	49.3	37.4																		
15	9.8	44.7	31.2	9.62	43.99	30.77	0.76	1.31	2.70	0.25	-0.17	-1.41	1.07	1.06	0.72	9.62	43.99	30.77	0.76	1.31	2.70
	10.8	46.1	37.4																		
	9.9	44.5	32.7																		
L	9.1	45.4	30.7																		
5	9.3	43.4	31.5																		
7	8.8	44.5	28.2																		
L	9.5	43.3	27.5																		
524	10.6	41.9	32.8																		
	10.3	43.7	29.2																		
	9.6	45.1	30.2																		
	9.6	43.5	29.5																		
	8.1	41.8	28.3																		
	Number of Labs With Data			15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	14.00	15.00	15.00	14.00	15.00	15.00

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
9.12	44.36	37.88	0.71	1.24	3.78	2.47	2.47	2.47	1.58	1.58	1.58	9.24	44.36	37.88	0.66	1.24	3.78
1.98	2.22	5.04	2.10	2.52	6.22							2.00	2.22	5.04	2.10	2.52	6.22

Table E-3- TRC Departure State System measurements at 60 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
1	4.5	40.6	24.4	4.22	35.07	27.13	0.48	5.92	1.69	-1.34	-2.07	1.08	0.74	2.54	0.75	4.22	FALSE	27.13	0.48	FALSE	1.69
	4.0	39.8	27.6																		
	4.4	38.5	27.0																		
G	4.1	41.4	27.6																		
2	3.8	38.8	29.4																		
3	4.3	40.4	28.3																		
L	5.5	31.5	23.7																		
524	4.0	27.8	27.1																		
	4.0	25.9	26.6																		
	4.0	37.7	27.5																		
	3.6	26.6	29.3																		
	4.4	31.8	27.0																		
2	6.6	39.5	23.6	4.52	39.96	26.18	0.73	1.62	2.37	-1.13	-0.32	0.86	1.12	0.70	1.05	4.52	39.96	26.18	0.73	1.62	2.37
	4.7	41.3	28.6																		
	4.4	39.4	25.2																		
I	4.7	42.1	27.2																		
2	3.9	37.9	27.7																		
3	4.5	40.1	25.0																		
L	4.1	40.5	21.9																		
524	3.9	42.4	25.6																		
	4.8	40.2	25.9																		
	4.4	40.3	27.4																		
	4.1	36.7	30.9																		
	4.1	39.1	25.1																		
3		37.3	17.9		38.36	17.97		1.47	2.14		-0.89	-1.05		0.63	0.95		38.36	17.97		1.47	2.14
		38.0	18.1																		
		39.7	17.0																		
B		38.4	18.8																		
1		41.7	16.6																		
4		38.6	17.2																		
L		37.2	16.8																		
524		38.8	24.3																		
		36.1	16.3																		
		37.3	18.1																		
		39.5	16.5																		
		37.7	18.0																		
4	5.9	43.2	26.7	5.58	44.31	30.42	0.63	2.13	2.86	-0.39	1.24	1.85	0.97	0.91	1.26	5.58	44.31	30.42	0.63	2.13	2.86
	5.1	47.6	29.8																		
	6.3	44.1	31.8																		
G	5.5	46.5	33.5																		
1	5.1	40.6	29.6																		
4	5.4	45.8	30.8																		
L	7.0	43.1	25.6																		
524	5.2	43.3	31.3																		
	5.8	43.8	28.1																		
	5.7	46.9	36.1																		
	4.6	41.7	31.7																		
	5.3	45.1	30.0																		
5	8.1	40.3	27.6	4.92	40.37	26.39	1.13	1.41	1.40	-0.85	-0.17	0.91	1.74	0.60	0.62	FALSE	40.37	26.39	FALSE	1.41	1.40
	5.0	43.0	24.8																		
	5.6	39.4	26.7																		
I	5.3	42.2	26.5																		
1	4.0	38.9	28.4																		
4	4.4	42.3	26.6																		
L	4.1	40.4	23.3																		
524	4.0	40.6	25.3																		
	4.3	39.0	27.0																		
	5.0	39.1	25.9																		
	4.4	39.6	27.8																		
	4.8	39.6	26.8																		
6		37.9	19.8		39.24	17.30		2.38	1.68		-0.57	-1.21		1.02	0.74	0.00	39.24	17.30		2.38	1.68
		40.8	17.0																		
		40.1	16.5																		
B		43.4	15.6																		
1		36.0	18.4																		
4		39.0	15.4																		
R		38.6	19.9																		
524		37.5	19.4																		
		38.0	16.0																		
		43.8	15.5																		
		37.5	17.3																		
		38.3	16.8																		

Table E-3- (Cont.)- TRC Departure State System measurements at 60 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
7	6.0	40.1	29.4	6.03	41.96	27.49	0.56	1.77	4.14	-0.07	0.39	1.07	0.88	0.77	1.70	6.03	41.96	FALSE	0.56	1.77	FALSE
	6.2	44.6	30.8																		
	6.1	45.5	22.6																		
B	6.2	41.9	27.6																		
2	7.4	42.7	35.6																		
5	5.3	41.7	25.4																		
L	5.6	39.0	25.1																		
524	6.0	41.7	33.2																		
	6.2	42.5	27.4																		
	6.4	41.5	24.6																		
	5.7	40.9	21.8																		
	5.3	41.4	26.4																		
8	6.0	38.6	19.3	6.38	39.22	20.25	0.44	1.58	2.02	0.18	-0.63	-0.60	0.69	0.69	0.83	6.38	39.22	20.25	0.44	1.58	2.02
	6.8	41.1	24.4																		
	6.6	39.3	19.5																		
G	6.5	42.1	19.7																		
2	6.3	38.3	19.7																		
5	5.7	37.5	18.0																		
L	6.0	39.2	21.6																		
524	7.2	38.4	21.7																		
	6.9	38.6	22.7																		
	6.3	41.8	20.4																		
	6.2	37.7	18.5																		
	6.0	38.0	17.5																		
9	7.3	39.6	21.1	6.81	43.56	22.82	0.32	2.17	3.01	0.50	0.98	-0.01	0.50	0.95	1.23	6.81	43.56	22.82	0.32	2.17	3.01
	7.3	45.6	26.0																		
	7.3	41.4	30.5																		
I	6.8	45.9	23.8																		
3	6.7	45.0	19.4																		
5	6.8	43.0	20.0																		
L	6.5	41.3	22.4																		
524	6.7	46.4	20.6																		
	6.7	43.1	22.0																		
	6.7	45.8	22.5																		
	6.5	42.8	22.0																		
	6.4	42.8	23.5																		
10	8.0	43.6	22.7	8.47	45.53	24.83	0.61	1.15	2.41	1.71	1.71	0.46	0.95	0.50	0.99	8.47	45.53	24.83	0.61	1.15	2.41
	8.8	47.4	28.1																		
	9.0	46.1	24.7																		
G	8.5	46.1	24.5																		
1	7.5	43.7	25.4																		
6	7.6	47.1	22.5																		
L	8.7	45.6	22.8																		
524	9.5	45.7	30.1																		
	8.9	44.7	24.6																		
	8.8	45.5	24.0																		
	7.9	45.4	26.5																		
	8.4	45.4	22.1																		
11	6.5	41.2	20.3	6.86	41.25	21.13	0.52	1.80	2.33	0.54	0.12	-0.39	0.80	0.78	0.95	6.86	41.25	21.13	0.52	1.80	2.33
	7.9	44.6	25.6																		
	7.0	39.8	23.9																		
I	6.6	42.6	19.5																		
1	6.0	41.8	19.3																		
6	6.4	42.5	19.8																		
L	7.2	40.9	20.4																		
524	6.7	41.0	24.9																		
	7.1	38.1	19.2																		
	7.5	43.1	21.5																		
	6.8	39.4	19.8																		
	6.6	40.0	19.4																		
12	5.1	40.7	19.8	5.51	41.62	21.18	0.79	1.02	3.14	-0.45	0.26	-0.38	1.23	0.45	1.28	5.51	41.62	21.18	0.79	1.02	3.14
	5.8	41.7	23.6																		
	5.6	41.3	27.8																		
L	5.4	41.5	21.3																		
5	6.5	40.0	18.1																		
6	6.9	43.0	19.3																		
L	4.6	40.5	16.9																		
524	5.6	41.7	23.9																		
	4.7	42.8	24.2																		
	5.3	42.7	19.7																		
	4.3	42.8	18.6																		
	6.3	40.7	20.9																		

Table E-3- (Cont.)- TRC Departure State System measurements at 60 mph on three surfaces (Pads) using 524 tire and the corresponding statistics based on ASTM E 691, the data in shaded cells were considered outliers and were eliminated from the analysis

	Departure 60 mph			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6	Pad 4	Pad 5	Pad 6
13	6.5	40.9	22.7	6.02	40.96	20.33	0.50	1.99	1.73	-0.08	0.01	-0.55	0.78	0.88	0.72	6.02	40.96	20.33	0.50	1.99	1.73
	6.5	40.9	23.0																		
	6.1	39.6	22.4																		
I	6.6	42.7	20.1																		
3	6.2	42.6	21.0																		
7	5.4	39.7	18.8																		
L	5.6	39.0	19.7																		
524	6.4	43.3	20.8																		
	5.5	37.6	20.3																		
	6.2	42.9	17.7																		
	6.1	43.4	18.4																		
	5.1	38.9	19.0																		
14	8.7	42.3	17.6	8.47	42.83	20.81	0.57	1.44	2.23	1.79	0.74	-0.44	0.90	0.63	0.93	8.47	42.83	20.81	0.57	1.44	2.23
	8.6	43.3	24.1																		
	8.3	43.1	20.2																		
G	8.8	43.1	21.1																		
1	8.0	42.5	22.6																		
7	7.4	44.4	18.7																		
L	8.8	41.0	20.1																		
524	9.7	45.8	25.2																		
	8.3	40.7	19.0																		
	8.7	43.4	20.9																		
	8.3	41.3	20.9																		
	8.0	43.1	19.3																		
15	6.0	37.7	15.4	5.78	39.60	15.86	0.56	1.93	1.09	-0.26	-0.51	-1.61	0.89	0.85	0.46	5.78	39.60	15.86	0.56	1.93	1.09
	5.7	38.8	17.3																		
	5.3	40.7	16.3																		
L	6.6	41.7	15.5																		
5	6.8	39.7	15.1																		
7	4.7	38.3	15.6																		
L	5.7	37.8	15.7																		
524	5.6	42.3	18.0																		
	5.8	37.0	16.4																		
	6.1	42.3	16.0																		
	5.5	37.9	13.7																		
	5.5	41.0	15.3																		
	Number of Labs With Data			13.00	15.00	15.00	13.00	15.00	15.00	13.00	15.00	15.00	13.00	15.00	15.00	13.00	14.00	14.00	12.00	14.00	14.00

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
6.12	40.92	22.67	0.63	2.28	2.40	2.47	2.47	2.47	1.58	1.58	1.58	5.74	41.34	22.33	0.57	1.75	2.23
1.31	2.60	4.23	1.44	3.40	4.83							2.13	2.11	4.17	2.20	2.70	4.69