Validation Report

Florida, SPS-5

Task Order 15, CLIN 2
September 13, 2006

List of Tables

List of Figures

1 Executive Summary

A visit was made to the Florida SPS-5 on September 13, 2006 for the purposes of conducting a validation of the WIM system located on US Route 1, 4.5 miles north of SR 706. This SPS-5 site is on the southbound, right-hand lane of a four-lane divided facility. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This is the third validation visit we have made to this site, the second being March 2nd and 3rd, 2005. At that time, this site met the precision requirements for research quality data.

Since the last Validation visit on March 2 and 3, 2005, the agency has replaced the solar panel on the service mast as the result of a lightning strike. Just prior to our visit, the piezo signal analysis board and the piezo signal amplifier board in the WIM controller were replaced; as the result of corrective actions for weight imbalance problems. The date range of the affected data could not be discerned while on site. Also, the insulation resistance levels for all sensors have degraded since the last visit and may be nearing failure.

This site meets LTPP precision requirements for loading data. The classification data is also of research quality.

The site is instrumented with Kistler quartz piezo sensors and IRD/PAT Traffic electronics and installed in asphalt concrete pavement. Lane 1 and Lane 4 are instrumented for WIM, while Lanes 2 and 3 are instrumented for classification only. The LTPP lane is identified as Lane 4 in the WIM controller.

The validation used the following trucks:

1) 5-axle tractor semi-trailer combination having a tractor with an air suspension tandem and a trailer with standard rear tandem and air suspension loaded to 74,730 lbs.
2) 2-axle single unit truck with tapered spring leaf suspension loaded to 23,170 lbs.

The validation speeds ranged from 41 to 55 miles per hour. The pavement temperatures ranged from 112 to 119 degrees Fahrenheit. The speed limit at the site is 55 mph. The desired speed range was met for this validation. The desired 30 degree Fahrenheit temperature range was not achieved.

Table 1-1 Post-Validation results – 120500 – 13-Sep-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	0.8 ± 8.8%	Pass
Single axles	±20 percent	0.0 ± 11.1%	Pass
Tandem axles	±15 percent	0.6 ± 7.4%	Pass
GVW	±10 percent	0.0 ± 7.6%	Pass
Speed	±1 mph [2 km/hr]	0.1 ± 0.6 mph	Pass
Axle spacing	± 0.5 ft [150mm]	0.1 ± 0.1 ft	Pass

The pavement condition was satisfactory for conducting a performance evaluation. There were no distresses observed that would influence truck motions significantly. A visual survey determined that there is no discernable bouncing or avoidance by trucks in the sensor area. A review of the profile data collected by the Regional Support Contractor (RSC) indicates that the WIM index is not exceeded at this site and the pavement smoothness did not appear to impact equipment performance.

If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 1-2 Results Based on ASTM E-1318-02 Test Procedures

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	98%	Pass

Based on the previous validations and data submittals this site has one year of research quality data. If data is submitted for 2005, there will be two years of research quality data for this site. An additional three years, 2007-2009, will be needed to meet the objective of five years of research quality data for this site.

Note: Data for 2005 and 2006 will need to be reviewed in light of the weight imbalance problem which required the replacement of the boards in the controller.

2 Corrective Actions Recommended

Both sections of both WIM sensors indicate minimal tolerances for insulation resistance levels. The right section of the trailing sensor indicates a value below the manufacturer's recommended tolerance, although all sensors appear to be working normally. **These sensors should be checked periodically and the data from the site should be reviewed on at least a monthly basis. Data that reflects variability and imbalance when comparing left and right axles may indicate that one of the sensors has failed.**

3 Post Calibration Analysis

This final analysis is based on test runs conducted September 13, 2006 from mid-day to mid-afternoon at test site 120500 on US Route 1, 4.5 miles north of SR 706. This SPS-5 site is located on the southbound, right-hand lane of a divided four-lane facility. No auto-calibration was used during test runs. The two trucks used for initial calibration and for the subsequent testing included:

1) 5-axle tractor semi-trailer combination having a tractor with an air suspension tandem and a trailer with standard rear tandem and air suspension loaded to 74,730 lbs.
2) 2-axle single unit truck with tapered spring leaf suspension loaded to 23,170 lbs.

The second truck has been a 2-axle single unit for every validation; since this is the truck generally seen at the site. The average number of Class 9s in a day is approximately twenty. Between sixty and eighty percent of the trucks observed on any given day of the week are Class 5 vehicles.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 41 to 55 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 112 to 119 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

As shown in Table 3-1, the site passed all of the performance criteria for weight, speed and spacing.

Table 3-1 Post-Validation Results - 120500 – 13-Sep-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	0.8 ± 8.8%	Pass
Class 9 Steering Axles	±20 percent	-0.4 ± 7.7%	Pass
Single axles	±20 percent	0.0 ± 11.1%	Pass
Tandem axles	±15 percent	0.6 ± 7.4%	Pass
GVW	±10 percent	0.0 ± 7.6%	Pass
Speed	±1 mph [2 km/hr]	0.1 ± 0.6 mph	Pass
Axle spacing	± 0.5 ft [150mm]	0.1 ± 0.1 ft	Pass

The test runs were conducted primarily during the mid-day to mid-afternoon hours, resulting in a very narrow range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and one temperature group. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the desired speed range was met during this validation. The desired 30 degree Fahrenheit temperature range was not achieved.

The speed groups were divided as follows: Low speed – 41 to 45 mph, Medium speed – 46 to 50 mph and High speed - 51+ mph. All test runs were grouped in to one temperature range, from 112 to 119 degrees Fahrenheit, which is identified as the Medium temperature range for this section.

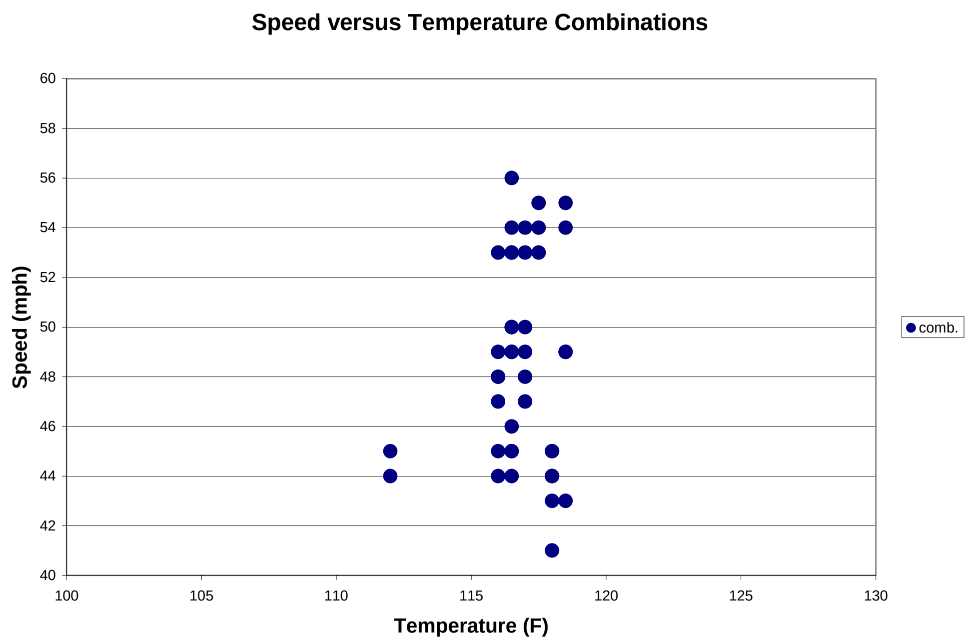


Figure 3-1 Post-Validation Speed-Temperature Distribution – 120500 – 13-Sep-2006

A series of graphs was developed to investigate visually any sign of a relationship between speed or temperature and the scale performance. Figure 3-2 shows the GVW Percent Error vs. Speed graph for the population as a whole.

From Figure 3-2, it appears that the equipment estimates GVW accurately throughout the entire speed range. There is a slight overestimation of GVW at the medium speeds. Variability appears to greater at low and medium speeds when compared with high speeds.

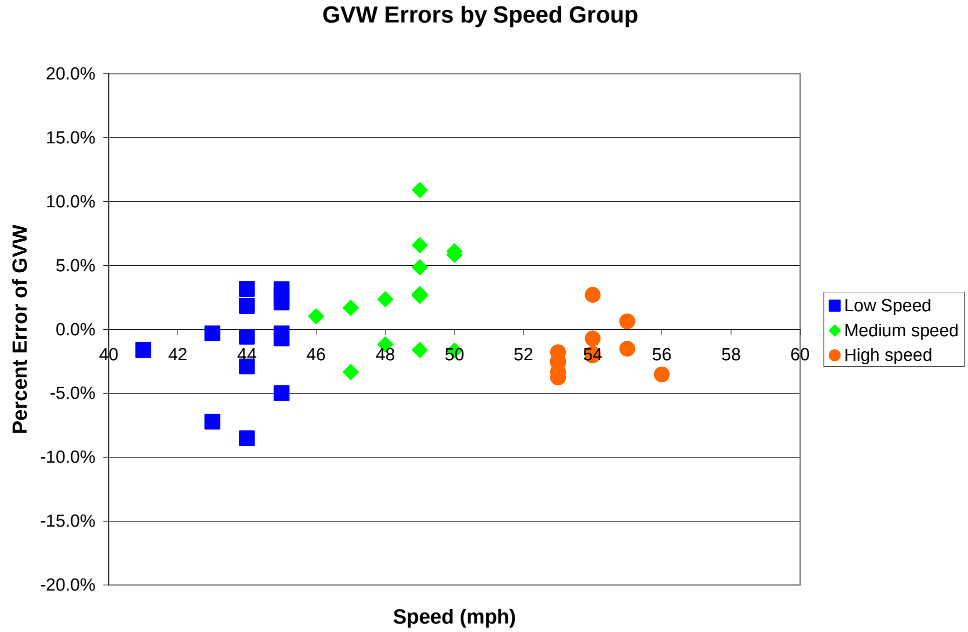


Figure 3-2 Post-Validation GVW Percent Error vs. Speed– 120500 –13-Sep-2006

Figure 3-3 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. From the figure, it appears that speed had no effect on the measurement of tandem axle spacing measurement. Maximum error appears to be limited to 0.1 feet (1.2 inches) and appears to be consistent throughout the entire speed range.

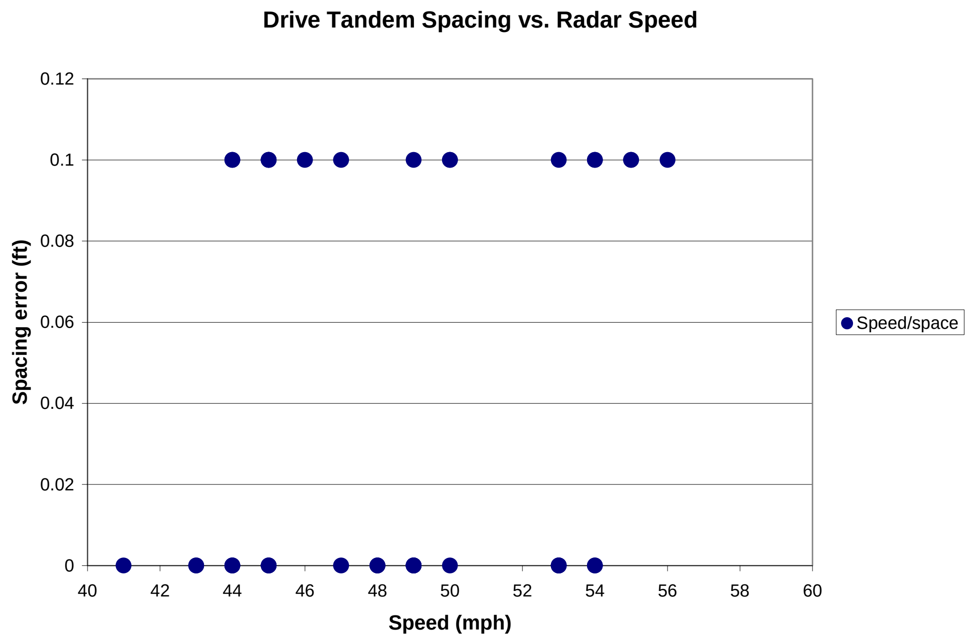


Figure 3-3 Post-Validation Spacing vs. Speed - 120500 – 13-Sep-2006

3.1 Temperature-based Analysis

There was insufficient variation in observed temperatures during this validation to assess temperature effects.

Table 3-2 Post-Validation Results by Temperature Bin – 120500 – 13-Sep-2006

Element	**95% Limit**	**Medium Temperature 112 - 119 °F**
Steering axles	±20 %	0.8 ± 8.8%
Class 9 Steering	±20 %	-0.4 ± 7.7%
Single axles	±20 %	0.0 ± 11.1%
Tandem axles	±15 %	0.6 ± 7.4%
GVW	±10 %	0.0 ± 7.6%
Speed	±1 mph	0.1 ± 0.6 mph
Axle spacing	± 0.5 ft	0.1 ± 0.1 ft

Figure 3-4 shows the distribution of GVW errors versus temperature by truck.

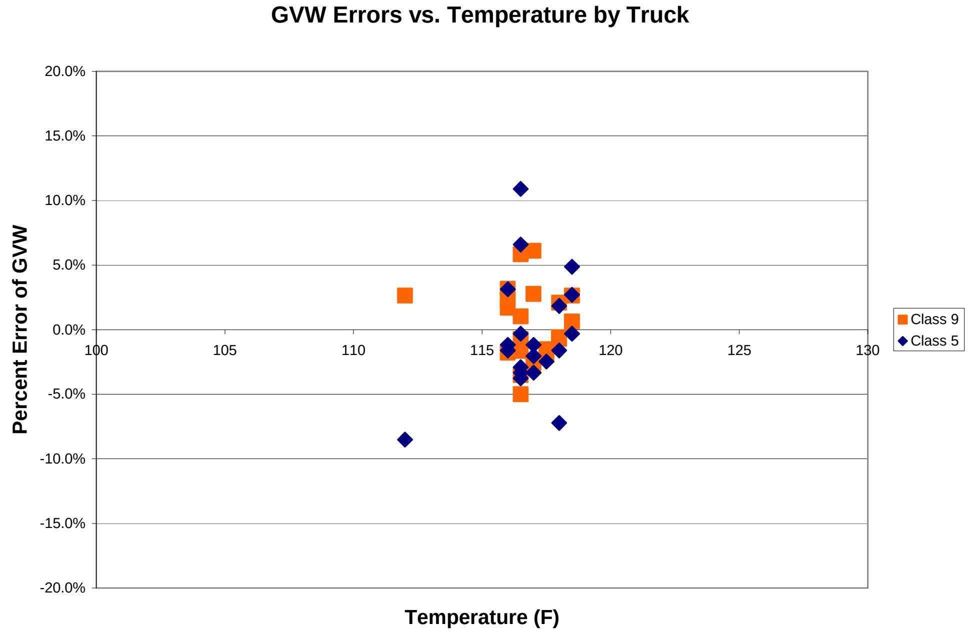


Figure 3-4 Post-Validation GVW Percent Error vs. Temperature by Truck – 120500 – 13-Sep-2006

Figure 3-5 shows the relation between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 5 vehicles.

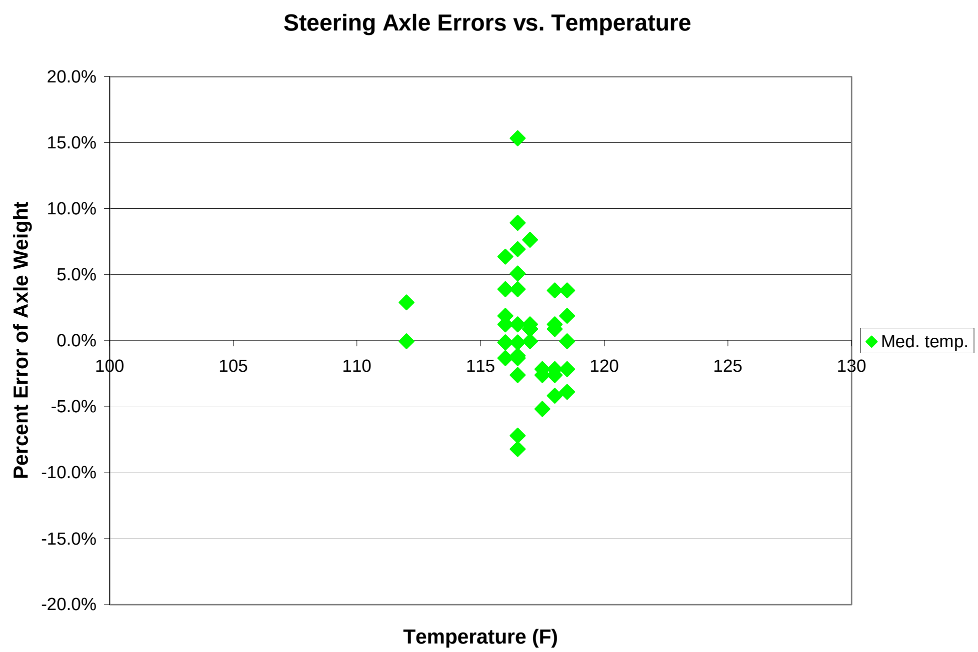


Figure 3-5 Post-Validation Steering Axle Error vs. Temperature by Group - 120500 – 13-Sep-2006

3.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 41 to 45 mph, Medium speed – 46 to 50 mph and High speed - 51+ mph.

Table 3-3 Post-Validation Results by Speed Bin – 120500 – 13-Sep-2006

Element	95% Limit	Low Speed 41 to 45 mph	Medium Speed 46 to 50 mph	High Speed 51+ mph
Steering axles	±20 %	1.2 ± 7.0%	1.5 ± 8.4%	-0.5 ± 13.0%
Class 9 Steering	±20 %	0.5 ± 8.0%	0.2 ± 9.2%	-1.9 ± 9.7%
Single axles	±20 %	-0.7 ± 10.2%	1.6 ± 11.6%	-1.4 ± 13.0%
Tandem axles	±15 %	0.1 ± 9.5%	2.9 ± 6.4%	-1.5 ± 4.7%
GVW	±10 %	-1.0 ± 8.1%	2.4 ± 8.4%	-1.7 ± 4.1%
Speed	±1 mph	0.1 ± 0.6 mph	0.1 ± 0.6 mph	0.2 ± 0.9 mph
Axle spacing	± 0.5 ft	0.1 ± 0.1 ft	0.1 ± 0.1 ft	0.1 ± 0.1 ft

As shown in Table 3-3, the equipment generally estimates all weights fairly accurately at all speeds. Variability appears to increase for single axles as speeds increase, decrease for tandem weights as speed increases, and decrease for GVW at high speeds.

Figure 3-6 illustrates the ability of the equipment to estimate GVW for both trucks accurately over the entire speed range. Variability in error appears to increase at the medium speeds for both trucks.

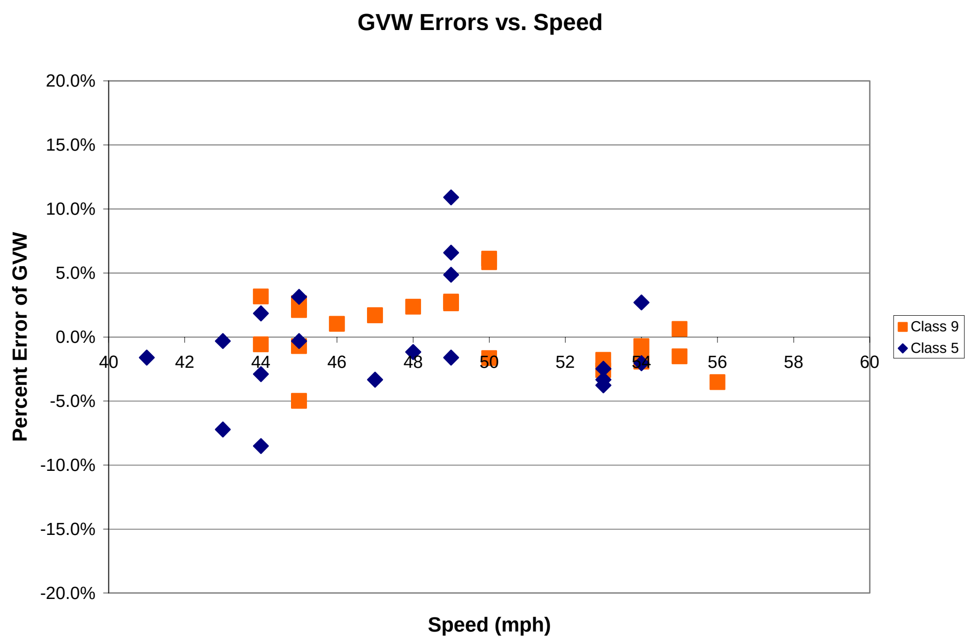


Figure 3-6 Post-Validation GVW Percent Error vs. Speed by Truck – 120500 – 13-Sep-2006

Figure 3-7 shows the relation between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 5 vehicles.

As shown in Figure 3-7, estimation of steering axle weights is fairly consistent over the entire speed range. There is a slight increase in variability at higher speeds.

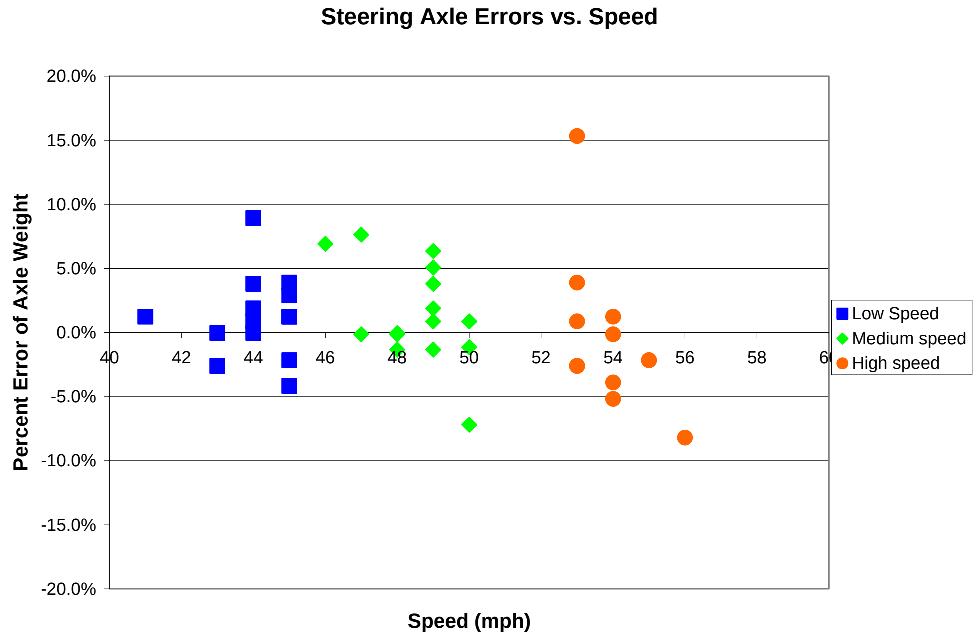


Figure 3-7 Post-Validation Steering Axle Percent Error vs. Speed by Group -120500 – 13-Sep-2006

In Figure 3-8, it can be seen that the equipment estimates the steering axles for both trucks similarly. The equipment exhibits a tendency to overestimate the steering axle weights of both trucks at low and medium speeds, and slightly underestimate their weights at high speeds.

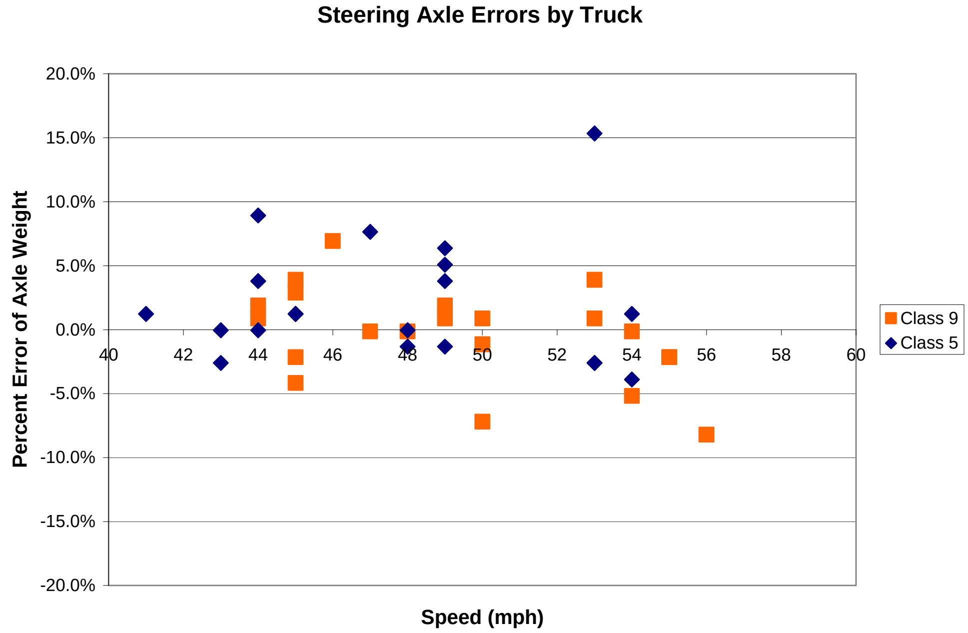


Figure 3-8 Post-Validation Steering Axle Errors by Truck and Speed - 120500 - 13-Sep-2006

3.3 Classification Validation

The agency uses a modified FHWA 13 bin classification scheme. The modification utilizes a Class 15 for unknown vehicles.

Due to the accuracies of the Pre-Validation speed (±0.5mph) and classification verification, a Post-Validation verification was not conducted. The Pre-Validation misclassification rate was 2.9%, however, the misclassified vehicles were utility pick-up trucks with dual rear tires, which are considered FHWA Class 5 vehicles. Due to the axle spacings and weight limitations of these vehicles, the equipment will classify them as Class 3 vehicles. Therefore, modifications of the equipment algorithm would not be able to improve the classification statistics of this site.

3.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 standard for a successful validation of Type I sites is 95% of the observed errors within the limits for allowable errors for each of the relevant statistics. If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 3-4 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	98%	Pass

4 Pavement Discussion

The pavement condition did not appear to influence truck movement across the sensors.

4.1 Profile analysis

The WIM site is a section of pavement that is 305 meters long with the WIM scale located at 274.5 meters from the beginning of the test section. An ICC profiler was used to collect longitudinal profiles of the test section with a sampling interval of 25 millimeters.

Profile data collected at the SPS WIM location by Fugro South, Inc. on July 27, 2006 were processed through the LTPP SPS WIM Index software, version 1.1. This WIM scale is installed on a flexible pavement.

A total of 8 profiler passes were conducted over the WIM site. Since the issuance of the LTPP directive on collection of longitudinal profile data for SPS WIM sections, the requirements have been a minimum of 3 passes in the center of the lane and one shifted to each side. For this site the RSC has completed 4 passes at the center of the lane, 2 passes shifted to the left side of the lane, and 2 passes shifted to the right side of the lane. Shifts to the sides of the lanes were made such that data were collected as close to the lane edges as was safely possible. For each profiler pass, profiles were recorded under the left wheel path (LWP) and the right wheel path (RWP).

The SPS WIM Index software was developed with four different indices: LRI, SRI, Peak LRI and Peak SRI. The LRI incorporates the pavement profile starting 25.8 m prior to the scale and ending 3.2 m after the scale in the direction of travel. The SRI incorporates a shorter section of pavement profile beginning 2.74 m prior to the WIM scale and ending 0.46 m after the scale. The LRI and SRI are the index values for the actual location of the WIM scale. Peak LRI is the highest value of LRI, within 30 m prior to the scale. Peak SRI indicates the highest value of SRI that is located between 2.45 m prior to the scale and 1.5 m after the scale. Also, a range for each of the indices was developed to provide the smoothness criteria. The ranges are shown in Table 4-1. When all of the values are below the lower thresholds, it is presumed unlikely that pavement smoothness will significantly influence sensor output. When one or more values exceed an upper threshold there is a reasonable expectation that the pavement smoothness will influence the outcome of the validation. When all values are below the upper threshold but not all below the lower threshold, the pavement smoothness may or may not influence the validation outcome.

Table 4-1 Thresholds for WIM Index Values

Index	Lower Threshold (m/km)	Upper Threshold (m/km)
LRI	0.50	2.1
SRI	0.50	2.1
Peak LRI	0.50	2.1
Peak SRI	0.75	2.9

Table 4-2 shows the computed index values for all 8 profiler passes for this WIM site. The average values over the passes in each path were also calculated when three or more passes were completed. These are shown in the right most column of the table. Values below the index limits are presented in italics and values above the index limits are presented in bold.

Table 4-2 WIM Index Values - 120500 – 27-Jul-2006

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Ave.
Center	LWP	LRI (m/km)	0.793	0.634	0.760	0.586	0.693
		SRI (m/km)	0.642	*0.475*	0.623	*0.480*	0.555
		Peak LRI (m/km)	0.822	0.742	0.822	0.685	0.768
		Peak SRI (m/km)	0.753	0.798	0.806	0.831	0.797
	RWP	LRI (m/km)	0.680	0.833	0.710	0.820	0.761
		SRI (m/km)	0.603	*0.486*	*0.435*	*0.410*	*0.484*
		Peak LRI (m/km)	0.840	0.848	0.743	0.849	0.820
		Peak SRI (m/km)	*0.684*	*0.660*	*0.616*	*0.602*	*0.640*
Left Shift	LWP	LRI (m/km)	0.843	0.812			
		SRI (m/km)	*0.383*	0.604			
		Peak LRI (m/km)	0.855	0.848			
		Peak SRI (m/km)	*0.558*	*0.613*			
	RWP	LRI (m/km)	0.591	0.527			
		SRI (m/km)	*0.284*	*0.308*			
		Peak LRI (m/km)	0.627	0.566			
		Peak SRI (m/km)	*0.499*	*0.548*			
Right Shift	LWP	LRI (m/km)	0.962	0.803			
		SRI (m/km)	0.801	0.721			
		Peak LRI (m/km)	0.964	0.980			
		Peak SRI (m/km)	1.015	0.845			
	RWP	LRI (m/km)	0.626	0.711			
		SRI (m/km)	0.558	0.808			
		Peak LRI (m/km)	0.632	0.720			
		Peak SRI (m/km)	*0.700*	0.845			

From Table 4-2 it can be seen that most of indices computed from the profiles are between the upper and lower threshold values. Eighteen of the SRI and Peak SRI values are below the lower threshold limit indicating that conditions close to the scale are highly unlikely to impact the measurements made by the scale.

Table 4-3 shows the computed index values for the prior site validation. Although the computations were done with an earlier version of the WIM Index software, the difference in LRI and SRI values between the two versions has been found to be less than 3 percent. Seventeen of the values computed for the prior visit were below the lower threshold values. Additionally, the values from this previous visit are lower than those from the current visit indicating some deterioration of the pavement around the scale.

Table 4-3 WIM Index values (1.0) - 120500 – 07-April-2004

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Ave.
Center	LWP	LRI (m/km)	0.580	0.573	0.621	0.575	0.587
		SRI (m/km)	*0.404*	*0.308*	*0.474*	*0.489*	*0.419*
	RWP	LRI (m/km)	0.715	0.594	0.589	0.626	0.631
		SRI (m/km)	*0.559*	*0.403*	*0.354*	*0.415*	*0.433*
Left Shift	LWP	LRI (m/km)	0.591	0.555			
		SRI (m/km)	0.702	*0.394*			
	RWP	LRI (m/km)	0.589	0.579			
		SRI (m/km)	*0.496*	*0.489*			
Right Shift	LWP	LRI (m/km)	0.535	0.509			
		SRI (m/km)	*0.447*	*0.450*			
	RWP	LRI (m/km)	0.725	0.720			
		SRI (m/km)	*0.407*	*0.628*			

4.2 Distress survey and any applicable photos

During a visual survey of the pavement, no distresses that would influence truck movement across the WIM scales were noted.

4.3 Vehicle-pavement interaction discussion

A visual observation of the trucks as they approach, transverse and leave the sensor area did not indicate any visible motion of the trucks that would affect the performance of the WIM scales. Trucks appear to track down the wheel path and daylight cannot be seen between the tires and any of the sensors for the equipment.

5 Equipment Discussion

The traffic monitoring equipment at this location includes Kistler quartz piezo sensors and an IRD/PAT Traffic DAW-190 controller. The sensors are installed in a staggered array, sixteen feet apart in asphalt concrete pavement.

Since the last Validation visit on March 2 and 3, 2005, the agency replaced the solar panel on the service mast as the result of a lightning strike. The piezo signal analysis board and the piezo signal amplifier board in the WIM controller were replaced just prior to our visit as the result of corrective actions for weight imbalance problems. The date range of the affected data could not be discerned while on site.

5.1 Pre-Evaluation Diagnostics

A complete electronic and electrical check of all system components including in-road sensors, electrical power, and telephone service were performed immediately prior to the evaluation. Both sections of each WIM sensor indicate low insulation resistance values. Although the values recorded are just above or even below (trailing sensor, right section) the manufacturer's recommended tolerance, the sensors appear to be working normally.

All other system components were found to be within operating parameters.

A complete visual inspection of all WIM system and support components was also performed. All components appear to be in good physical condition.

5.2 Calibration Process

The equipment underwent one-iteration of the calibration process between the initial 40 runs and the final 40 runs. The calibration adjustments were done at the Agency's request in order to improve data quality at the site since a discernable bias was observed from the Pre-Validation results and the GVW errors exceeded the limits for research quality data. All calibration adjustments were made by the agency representative.

5.2.1 Calibration Iteration 1

The results of the 40 Pre-Validation runs performed by the two test trucks produced a range of -12.6% to +5.3% for the average GVW error. The factor to be adjusted was the overall sensitivity, which is modified so that if weights are underestimated at all speeds it is increased. If weights are overestimated it is decreased. The adjustment increment used was the absolute value of the mean percent error at the low speed range. The value of the overall sensitivity compensation factor was increased by 4.0% from 780 to 810 to reduce the size of the underestimate for GVW at all speeds.

Table 5-1 and Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group - 120500 – 13-Sep-2006 (beginning 12:53PM)show the results of Calibration 1 adjustment based on 15 post-calibration runs. These runs were conducted at three different speeds and produced an average error of -0.5% for GVW. Based on this result and the values for the single and tandem axles it was determined that no further adjustments were needed. The equipment appears to estimate GVW accurately at all speeds. No further adjustments were deemed necessary and an additional 26 test runs were conducted to meet the 40 run Post-Validation test minimum.

Table 5-1 Calibration Iteration 1 Results - 120500 – 13-Sep-2006 (beginning 12:53PM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	1.6 ± 7.3%	Pass
Class 9 Steering	±20 percent	1.0 ± 7.2%	Pass
Single axles	±20 percent	0.1 ± 9.2%	Pass
Tandem axles	±15 percent	-0.1 ± 9.4%	Pass
GVW	±10 percent	-0.5 ± 6.9%	Pass
Speed	±1 mph	**0.2 ± 0.9 mph**	**Fail**
Axle spacing	± 0.5 ft	0.1 ± 0.1 ft	Pass

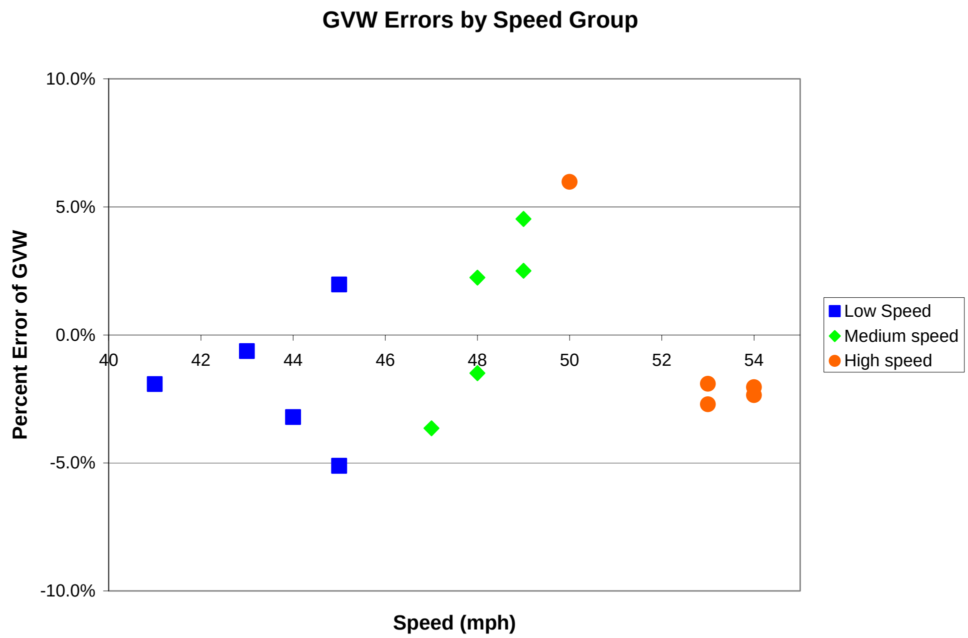


Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group - 120500 – 13-Sep-2006 (beginning 12:53PM)

5.3 Summary of Traffic Sheet 16s

This site has validation information from previous visits as well as the current one in the tables below. Table 5-2 has the information found in TRF_CALIBRATION_AVC for site visits and Sheet 16s submitted prior to this validation as well as the information for the current visit.

Table 5-2 Classification Validation History - 120500

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Class 5	Other 2	
9/13/06	Manual	0	0	0		0
3/03/05	Manual	0	0	-5		3
3/02/05	Manual	0	0	-5		1
12/04/03	Manual	0	0	36		2

Table 5-3 has the information found in TRF_CALIBRATION_WIM for site visits and Sheet 16s submitted prior to this validation as well as the information for the current visit.

Table 5-3 Weight Validation History - 120500

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
9/13/06	Test Trucks	0.0 (3.8)	0.0 (5.6)	0.6 (3.7)
9/13/06	Test Trucks	-4.4 (3.7)	-3.2 (6.0)	-4.6 (3.3)
3/3/05	Test Trucks	-1.6 (3.2)	1.7 (4.9)	-3.0 (2.9)
3/2/05	Test trucks	-1.2 (3.6)	2.0 (4.4)	-1.8 (3.1)
12/18/03	Test Trucks	-0.6 (2.6)	3.4 (4.5)	-0.3 (3.3)
7/10/03	Test Trucks	0.9 (2.5)	4.1 (3.1)	0.4 (3.3)

Mean errors and variability in error for each weight statistic appear to have remained fairly consistent since July 2003. The mean errors produced as a result of the Pre-Validation on September 13, 2006 appear to be larger than the typical values.

5.4 Projected Maintenance/Replacement Requirements

The WIM sensors should be checked periodically and the data from the site should be reviewed on at least a monthly basis. Data that reflects variability and imbalance when comparing left and right axles may indicate that one of the sensors has failed.

There are no other corrective maintenance actions required at this site at this time.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted on September 13, 2006 during the late morning hours at test site 120500 on US Route 1, 4.5 miles north of SR 706. This SPS-5 site is on the southbound, right-hand lane of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for initial calibration and for the subsequent testing included:

1. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and air suspension loaded to 74,830 lbs.
2. 2-axle single unit truck with tapered spring leaf suspension loaded to 23,250 lbs.

For the initial validation, each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 32 to 55 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 89 to 104 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 6-1.

As seen in Table 6-1 the site passed all of the performance criteria for research quality data except gross vehicle weight and speed. At least one-calibration iteration would be needed to resume collection of research quality data.

Table 6-1 Pre-Validation Results - 120500 – 13-Sep-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-1.8 ± 9.0%	Pass
Class 9 Steering	±20 percent	-2.7 ± 9.8%	Pass
Single axles	±20 percent	-3.2 ± 12.1%	Pass
Tandem axles	±15 percent	-4.6 ± 6.7%	Pass
GVW	±10 percent	**-4.4 ± 7.6%**	**Fail**
Speed	±1 mph [2 km/hr]	**0.3 ± 1.2 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.1 ± 0.0 ft	Pass

The test runs were conducted primarily during the late morning hours, resulting in a very narrow range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and one temperature group. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that the desired speed range was met during this validation. The desired 30 degree Fahrenheit temperature range was not achieved.

The speed groups were divided as follows: Low speed – 32 to 39 mph, Medium speed – 40 to 49 mph and High speed - 50+ mph. All test runs were grouped in to one temperature range, from 89 to 104 degrees, which is identified as the Medium temperature range for this section.

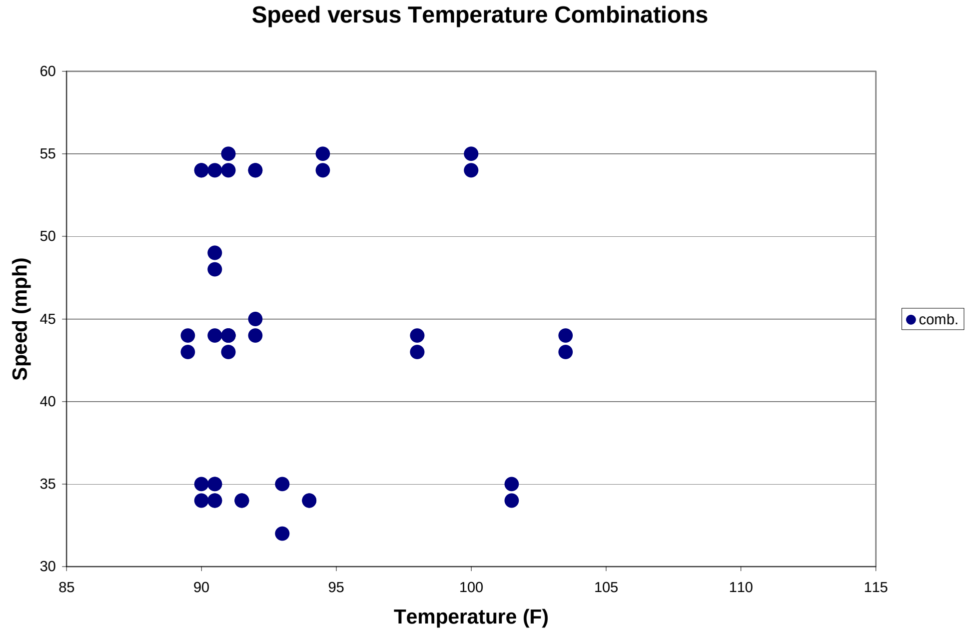


Figure 6-1 Pre-Validation Speed-Temperature Distribution – 120500 – 13-Sep-2006

A series of graphs was developed to investigate visually for any sign of any relationship between speed or temperature and the scale performance.

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. The WIM equipment appeared to underestimate the GVW at all speeds. Variability in GVW error is relatively constant throughout the entire speed range, with a slight increase at lower speeds.

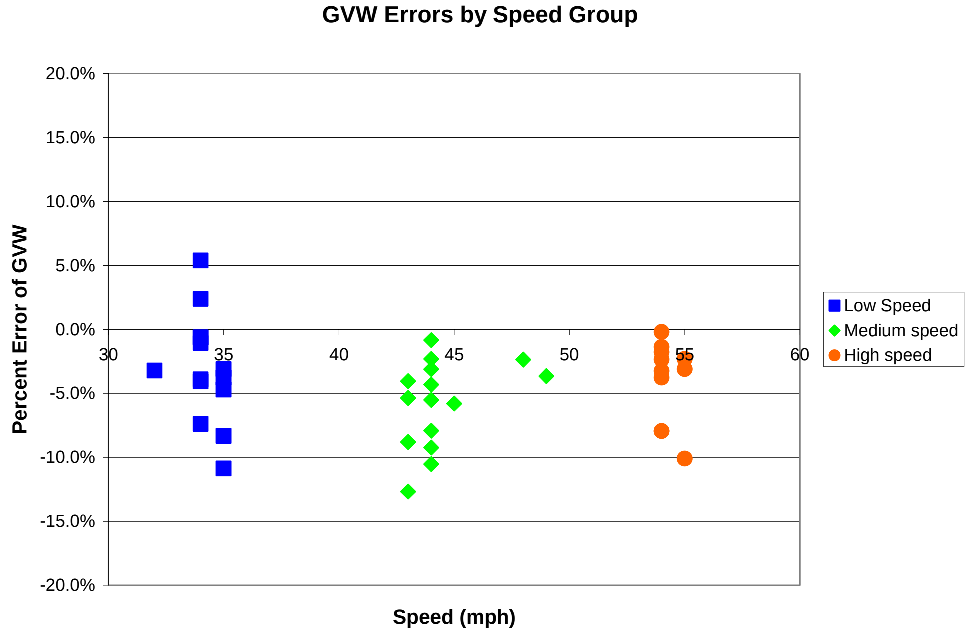


Figure 6-2 Pre-validation GVW Percent Error vs. Speed – 20500 – 13-Sep-2006

Figure 6-3 shows the relationship between temperature and GVW percentage error. Although the temperature range was limited, there appears to be a decrease in GVW estimation as temperature increases.

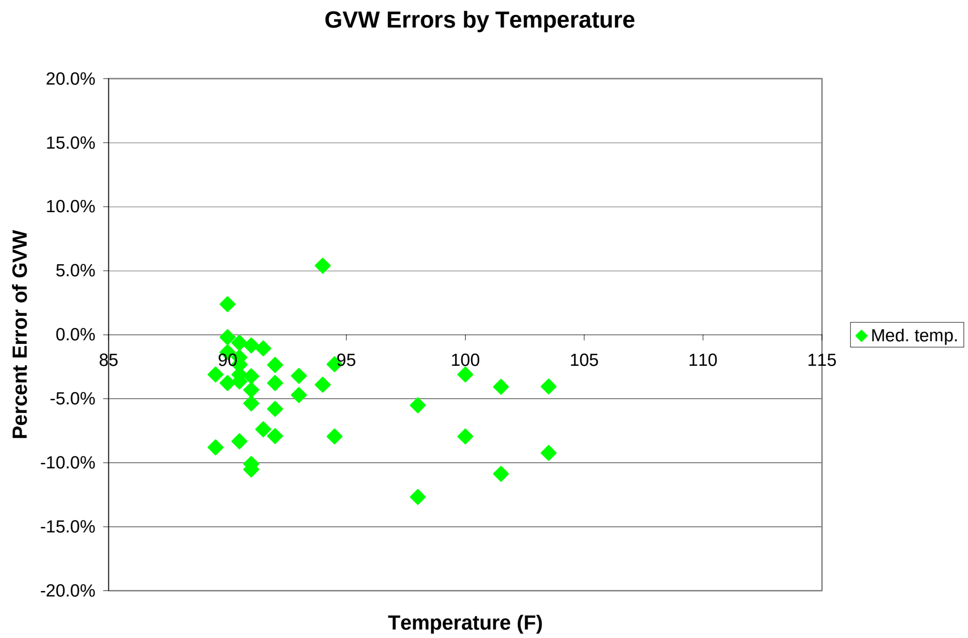


Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature – 120500 – 13-Sep-2006

Figure 6-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. The figure indicates that there is no effect from speed on the ability of the WIM equipment to measure axle spacing.

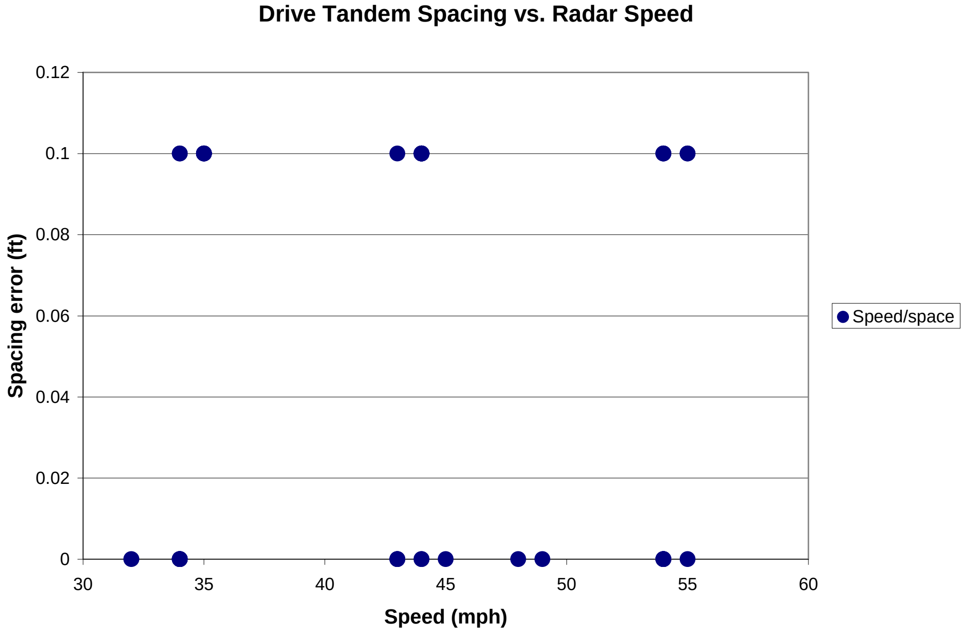


Figure 6-4 Pre-Validation Spacing vs. Speed - 120500 – 13-Sep-2006

6.1 Temperature-based Analysis

There was insufficient variation in observed temperatures during this validation to assess temperature effects.

Table 6-2 Pre-Validation Results by Temperature Bin - 120500 – 13-Sep-2006

Element	**95% Limit**	**Medium Temperature 89 - 104 °F**
Steering axles	±20 %	-1.8 ± 9.0%
Class 9 Steering	±20 %	-2.7 ± 9.8%
Single axles	±20 %	-3.2 ± 12.1%
Tandem axles	±15 %	-4.6 ± 6.7%
GVW	±10 %	-4.4 ± 7.6%
Speed	±1 mph	0.3 ± 1.2 mph
Axle spacing	± 0.5 ft	0.1 ± 0.0 ft

Figure 6-5 shows the distribution of GVW errors versus temperature by truck.

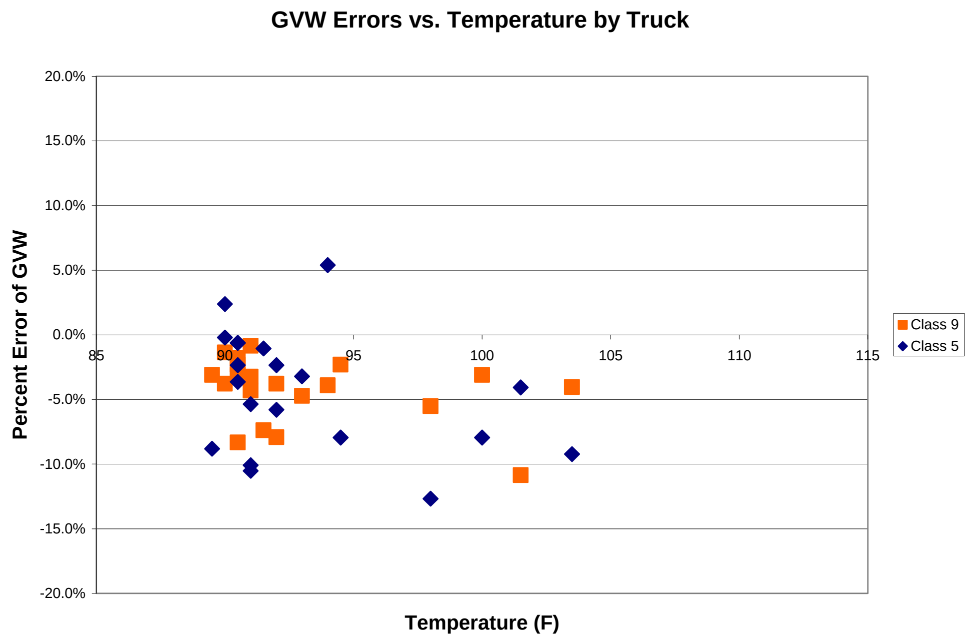


Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 120500 – 13-Sep-2006

Figure 6-6 shows the relationship between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 5 vehicles.

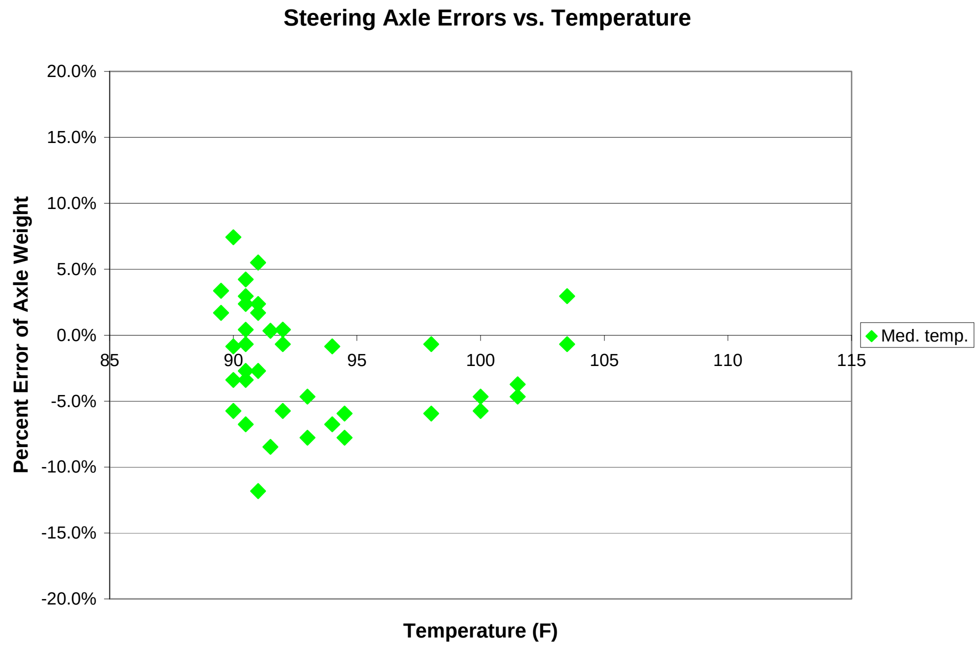


Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group - 120500 –13-Sep-2006

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 32 to 39 mph, Medium speed – 40 to 49 mph and High speed - 50+ mph.

Table 6-3 Pre-Validation Results by Speed Bin - 120500 –13-Sep-2006

Element	95% Limit	Low Speed 32 to 39 mph	Medium Speed 40 to 49 mph	High Speed 50+ mph
Steering axles	±20 %	-3.4 ± 7.7%	0.1 ± 9.5%	-2.3 ± 10.8%
Class 9 Steering	±20 %	-4.4 ± 7.8%	-0.8 ± 12.6%	-2.9 ± 13.9%
Single axles	±20 %	-1.9 ± 9.0%	-3.9 ± 15.2%	-4.0 ± 12.8%
Tandem axles	±15 %	-6.2 ± 9.0%	-4.5 ± 5.4%	-2.6 ± 3.6%
GVW	±10 %	-3.1 ± 9.1%	-5.8 ± 7.3%	-4.0 ± 7.1%
Speed	±1 mph	0.5 ± 1.4 mph	0.3 ± 1.3 mph	0.1 ± 1.2 mph
Axle spacing	± 0.5 ft	0.1 ± 0.0 ft	0.1 ± 0.0 ft	0.1 ± 0.1 ft

As shown in Table 6-3, the equipment generally underestimates all weights at all speeds. For the Class 9 steering axle, the underestimation decreases at medium speeds. For single axles as a whole, the underestimation increases as speed increases, however, tandem axle underestimation decreases as speed increases. GVW underestimation is fairly consistent throughout the entire speed range. The variability in single axle errors (single, steering, class 9 steering) increase as speed increases. Variability in tandem and GVW errors decrease as speed increases.

Figure 6-7 illustrates the tendency of the equipment to underestimate GVW at all speeds. Variability in error appears to be greater at low speeds when compared with medium and high speeds.

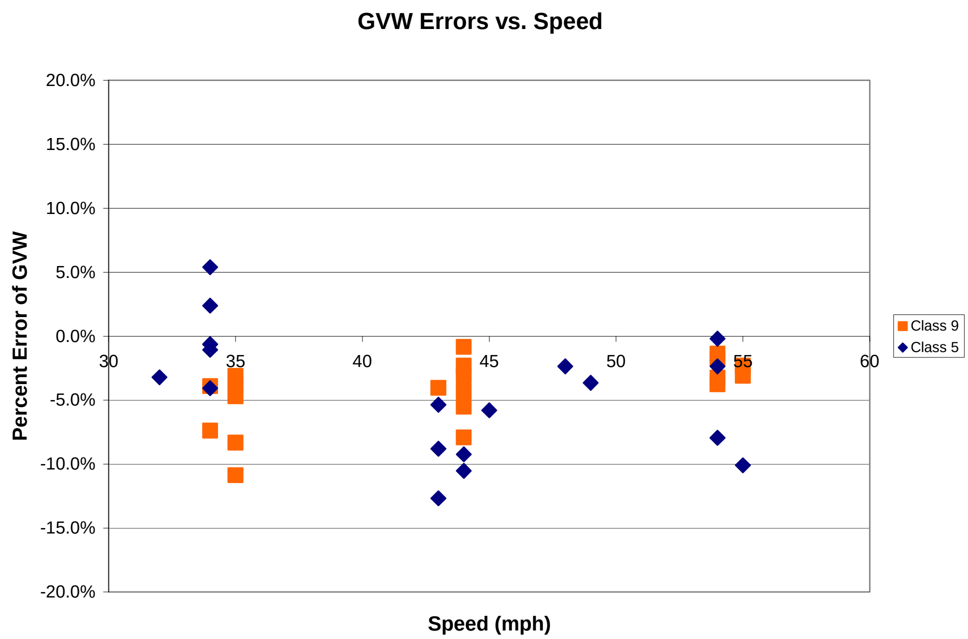


Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 120500 –13-Sep-2006

Figure 6-8 shows the relationship between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 5 vehicles.

From the figure, it can be seen that the equipment underestimates steering axle weights at low speeds. The underestimation progressively decreases as speeds increase. Variability in steering axle errors appear to be greater at medium and high speeds when compared with low speeds.

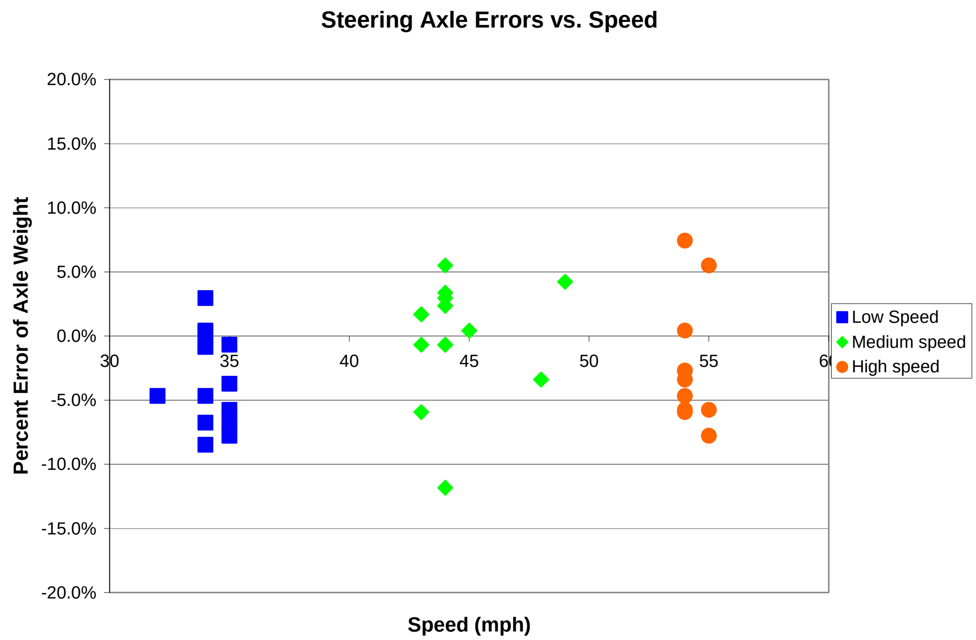


Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 120500 – 13-Sep-2006

In Figure 6-9, it can be seen that the equipment estimates the steering axles for both trucks similarly. The equipment exhibits a tendency to underestimate the steering axle weights of both trucks at low speeds, slightly underestimate at medium speeds, and estimate their weights accurately at high speeds.

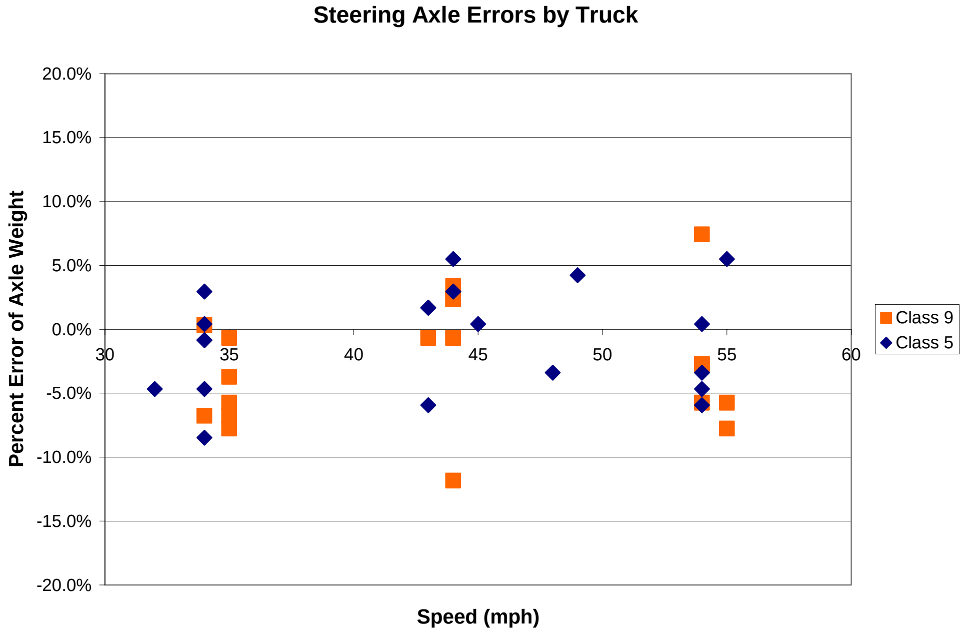


Figure 6-9 Pre-Validation Steering Axle Percent Errors by Truck and Speed - 120500 – 13-Sep-2006

6.3 Classification Validation

The agency uses a modified FHWA 13 bin classification scheme. The modification utilizes a Class 15 for unknown vehicles.

A sample of three hours of data was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on a 100 percent sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. percent. All of the misclassified vehicles were utility-type pick up trucks with dual rear axles, but with short axle spacings.
Table 6-4 has the classification error rates by class. The overall misclassification rate is 2.9 percent. All of the misclassified vehicles were utility-type pick up trucks with dual rear axles, but with short axle spacings.

Table 6-4 Truck Misclassification Percentages for 120500 - 13-Sep-2006

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	0	5	-5	6	0
7	0				
8	0	9	0	10	0
11	N/A	12	N/A	13	N/A

The misclassification percentage is computed as the probability that a pair containing the class of interest does NOT include a match. Thus if there are eight pairs of observations with at least one Class 9 and only six of them are matches, the error rate is 25 percent. The percent error and the mean differences reported below do not represent the same statistic. It is possible to have error rates greater than 0 with a mean difference of zero.

Table 6-5 Truck Classification Mean Differences for 120500 - 13-Sep-2006

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	0	5	5	6	0
7	0				
8	0	9	0	10	0
11	N/A	12	N/A	13	N/A

These error rates are normalized to represent how many vehicles of the class are expected to be over- or under-counted for every hundred of that class observed by the equipment. Thus a value of 0 means the class is identified correctly on average. A number between –1 and –100 indicates at least that number of vehicles either missed or not assigned to the class by the equipment. It is not possible to miss more than all of them or one hundred out of one hundred. Numbers 1 or larger indicate at least how many more vehicles are assigned to the class than the actual "hundred observed". Classes marked Unknown are those identified by the equipment but no vehicles of the type were seen the observer. There is no way to tell how many more than those that might actually be present exist. N/A means no vehicles of the class recorded by either the equipment or the observer. As can be seen in Table 6-5, the misclassifications appear to be limited to Class 5 vehicles.

6.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 for a successful validation of Type I sites is 95% of the observed errors within the limits for allowable errors for each of the relevant statistics. If this site had been evaluated using ASTM E-1318-02 it would not have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 6-6 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	98%	Pass

6.5 Prior Validations

The last validation at this site was March 2nd and 3rd, 2005. The validation was done with a Class 9 and a Class 5. The outcome is graphed in Figure 6-10. The mean GVW error appears to have trended to under estimating weights in the middle and upper speed ranges. In the low end of the speed range it appears to be underestimating to a lesser degree.

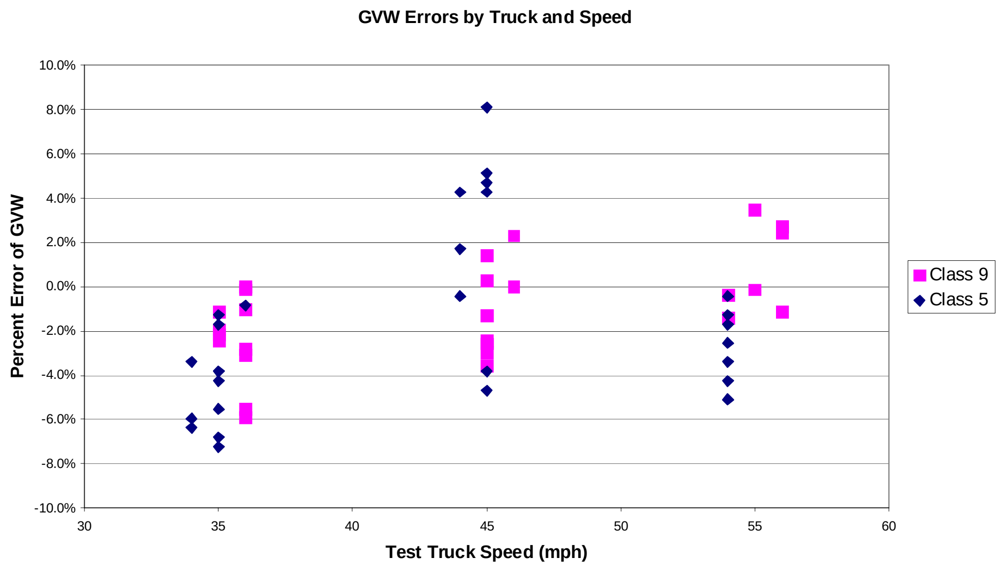


Figure 6-10 Post-validation GVW Percent Error vs. Speed by Truck – 120500 – 03 Mar 2005

Table 6-7 shows the overall numerical results at the end of that validation.

Table 6-7 Post-Validation Results – 120500 – 03 Mar 2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	1.7% ± 10.0%	Pass
Loaded tandem axles	±15 percent	-3.0% ± 5.9%	Pass
Gross vehicle weights	±10 percent	-1.6% ± 6.5%	Pass
Axle spacing length	± 0.5 ft [150 mm]	0.0 ± 0.0 ft	Pass

Table 6-8 contains the prior validation's results by speed group. These speed groups are essentially the same as those for the current validation.

Table 6-8 Post-Validation Results by Speed Bin – 120500 – 03 Mar 2005

Element	95% Limit	Low Speed 34 to 40 mph	Medium Speed 41 to 48 mph	High Speed 49+ mph
Single axles	±20 %	-1.3%±6.9%	2.6%±12.3%	4.2%±9.3%
Tandem axles	±15 %	-2.9%±6.9%	-4.0%±4.4%	-1.9%±7.2%
GVW	±10 %	-2.7%±4.9%	0.1%±8.5%	-2.2%±6.0%

Element	95% Limit	Low Speed 34 to 40 mph	Medium Speed 41 to 48 mph	High Speed 49+ mph
Axle spacing	± 0.5 ft	0.0±0.0 ft	0.0±0.0 ft	0.0±0.0 ft

Previous validations have occurred with ranges of 69 to 95 degrees that exhibited an underestimation of GVW and tandem weights at lower temperatures. For the prior validation, the temperature range was 73 to 78 degrees Fahrenheit for the Post-Validation runs. The values in Table 6-9 apply to the pre-validation analysis by temperature group. As the calibration done between the Pre-Validation and Post-Validation was to improve data quality rather than correct a failure, the temperature response is considered representative for the prior validation.

Table 6-9 Pre-Validation Results by Temperature Bin - 120500 – 02 Mar 2005

Element	95% Limit	Low Temperature 69 to 76°F	Medium Temperature 77 to 85°F	High Temperature 86 to 95°F
Single axles	±20 %	-0.4%±9.9%	3.7%±7.7%	2.5%±8.7%
Tandem axles	±15 %	-3.2%±5.9%	-1.1%±6.1%	-1.0%±6.3%
GVW	±10 %	-2.4%±7.9%	-0.7%±8.9%	-0.7%±7.0%
Axle spacing	±0.5 ft	0.0±0.0 ft	0.0±0.0 ft	0.0±0.1 ft

7 Data Availability and Quality

As of September 13, 2006, this site does not have at least 5 years of research quality data. Research quality data is defined to be at least 210 days in a year of data of known calibration meeting LTPP's precision requirements.

Data that has validation information available has been reviewed in light of the patterns present in the two weeks immediately following a validation/calibration activity. A determination of research quality data is based on the consistency with the validation pattern. Data that follows consistent and rational patterns in the absence of calibration information may be considered nominally of research quality pending validation information with which to compare it. Data that is inconsistent with expected patterns and has no supporting validation information is not considered research quality.

The amount and coverage for the site is shown in Table 7-1. The value for months is a measure of the seasonal variation in the data. The indicator of coverage indicates whether day of week variation has been accounted for on an annual basis. As can be seen from the table only 1994 and 1997 to 2004 have a sufficient quantity of classification data to be considered complete years of data. The years 1998, 1999, 2002, 2003 and 2004 have sufficient quantity of weight data to be considered complete years of data. Together with the previously gathered calibration information, it can be seen that at least 4 additional years of research quality data are needed to meet the goal of a minimum of 5 years of research weight data. As of this report, no data has been submitted from this site for 2005. While the 2006 data submission is incomplete since the year has not ended, the failure of the pre-validation runs and the equipment maintenance make it unlikely to consider 2006 a year of research quality data.

Upon submission and review of the 2005 data, we may only need 3 additional years to meet the goal of 5 years of research quality data, as this site was successfully validated in March of 2005.

Table 7-1 Amount of Traffic Data Available 120500 –13-Sep-2006

Year	**Classification Days**	**Months**	**Coverage**	**Weight Days**	**Months**	**Coverage**
1996	98	11	Full Week	84	12	Full Week
1997	215	10	Full Week	21	10	Full Week
1998	355	12	Full Week	341	12	Full Week
1999	257	6	Full Week	270	8	Full Week
2000	356	11	Full Week	31	11	Full Week
2001	352	12	Full Week			
2002	243	10	Full Week	336	11	Full Week
2003	261	10	Full Week	267	10	Full Week
2004	328	12	Full Week	332	12	Full Week
2006	121	4	Full Week	121	4	Full Week

GVW graphs and characteristics associated with them are used as data screening tools. As a result classes constituting more that ten percent of the truck population are considered major sub-groups whose evaluation characteristics should be identified for use in screening. The typical values to be used for reviewing incoming data after a validation are determined starting with data from the day after the completion of a validation.

Only Class 5s and Class 6s constitute more than 10 percent of the truck population. Based on the data collected from the end of the last calibration iteration the following are the expected values for these populations. The precise values to be used in data review will need to be determined by the RSC on receipt of the first 14 days of data after the successful validation. For sites that do not meet LTPP precision requirements, this period may still be used as a starting point from which to track scale changes.

Table 7-2 is generated with a column for every vehicle class 4 or higher that represents 10 percent or more of the truck (class 4-20) population. In creating Table 7-2 the following definitions are used:

- For Class 5 and 6 trucks, the typical axle configuration is used to determine the maximum allowable weight based on 18,000 pounds for single axles and 34,000 pounds for tandem axles. A ten percent cushion above that maximum is used to set the overweight threshold.
- For Class 5 and 6 trucks, in the absence of site-specific information the computation of under weights assumes the power unit weighs 10,000 pounds and each axle on a

trailer 5,000 pounds. Ninety percent of the total for the unloaded configuration is the value below which a truck is considered under weight.

There may be more than one bin identified for the unloaded or loaded peak due to the small sample size collected after validation. Where only one peak exists, the Peak rather than a loaded or unloaded peak is identified. This may happen with single unit trucks. It is not expected to occur with combination vehicles.

Table 7-2 GVW Characteristics of Major sub-groups of Trucks - 120500 –13-Sep-2006

Characteristic	Class 5	Class 6
Percentage Overweights	0	0
Percentage Underweights	0	0
Unloaded Peak	8,000 lbs	16,000 lbs
Loaded Peak	16,000 lbs	36,000 lbs and 56,000 lbs

The expected percentage of unclassified vehicles is 1.2%. This is based on the percentage of unclassified vehicles in the post-validation data download.

The graphical screening comparison figures are found in Figure 7-2 through Figure 7-4. These are based on data collected immediately after the validation and may not be wholly representative of the population at the site. They should however provide a sense of the statistics expected when SPS comparison data is computed for the Post-Validation Sheet 16.

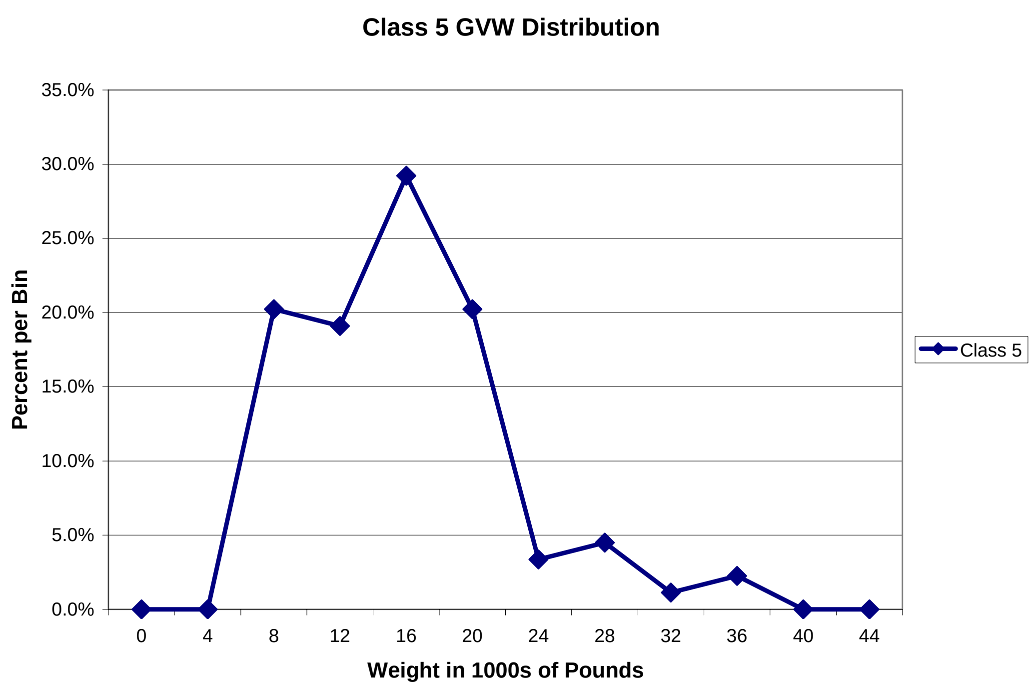


Figure 7-1 Expected GVW Distribution Class 5 – 120500 – 13-Sep-2006

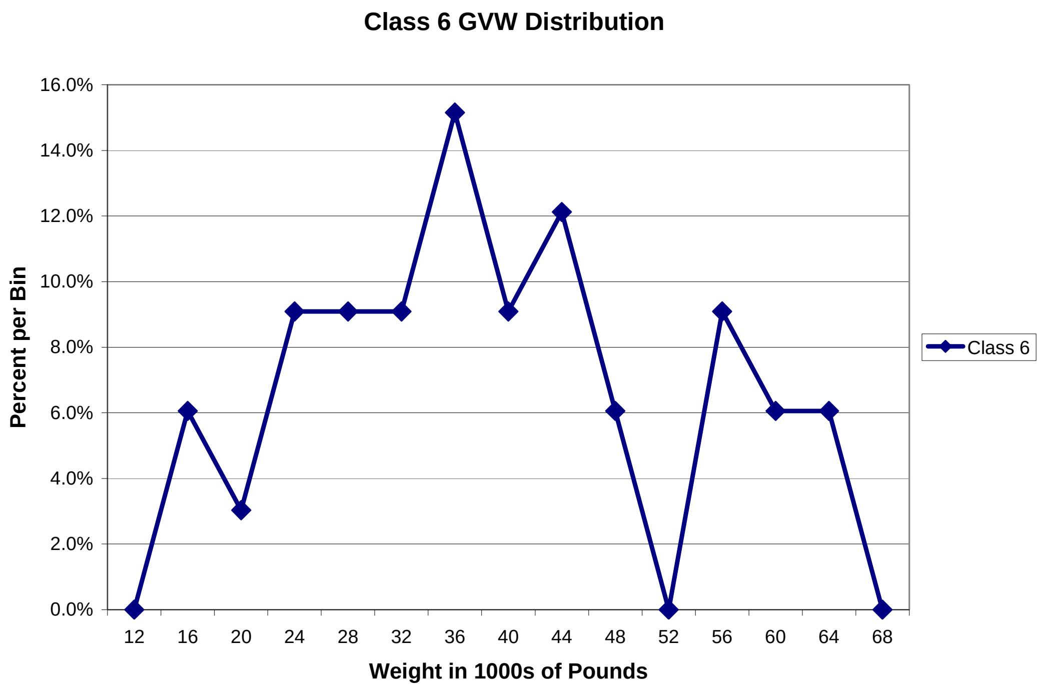


Figure 7-2 Expected GVW Distribution Class 6 – 120500 – 13-Sep-2006

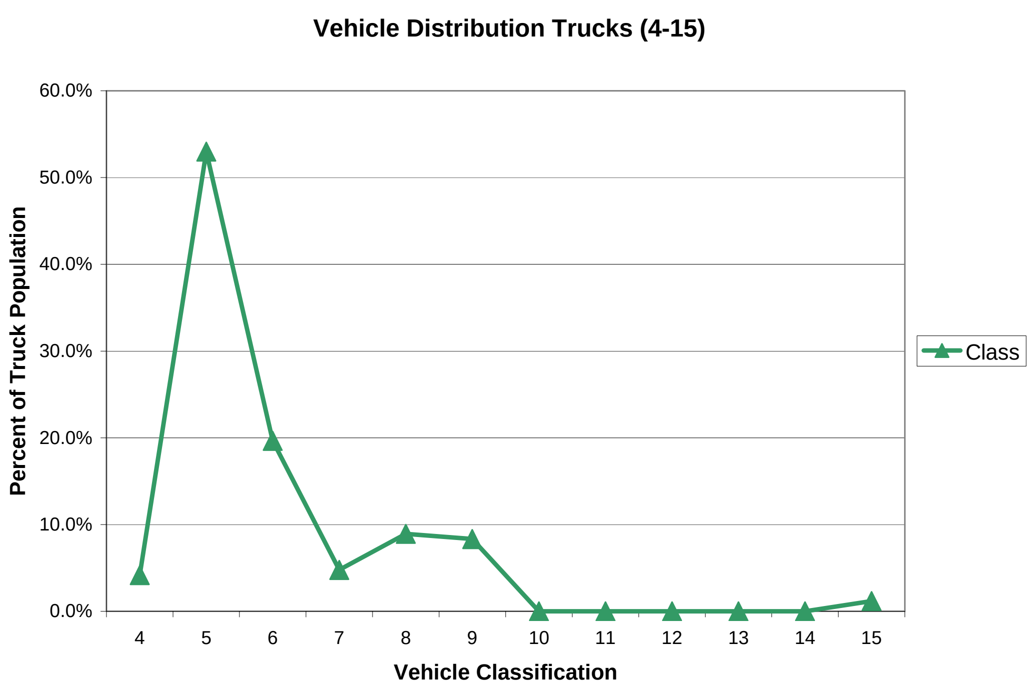


Figure 7-3 Expected Vehicle Distribution - 120500 – 13-Sep-2006

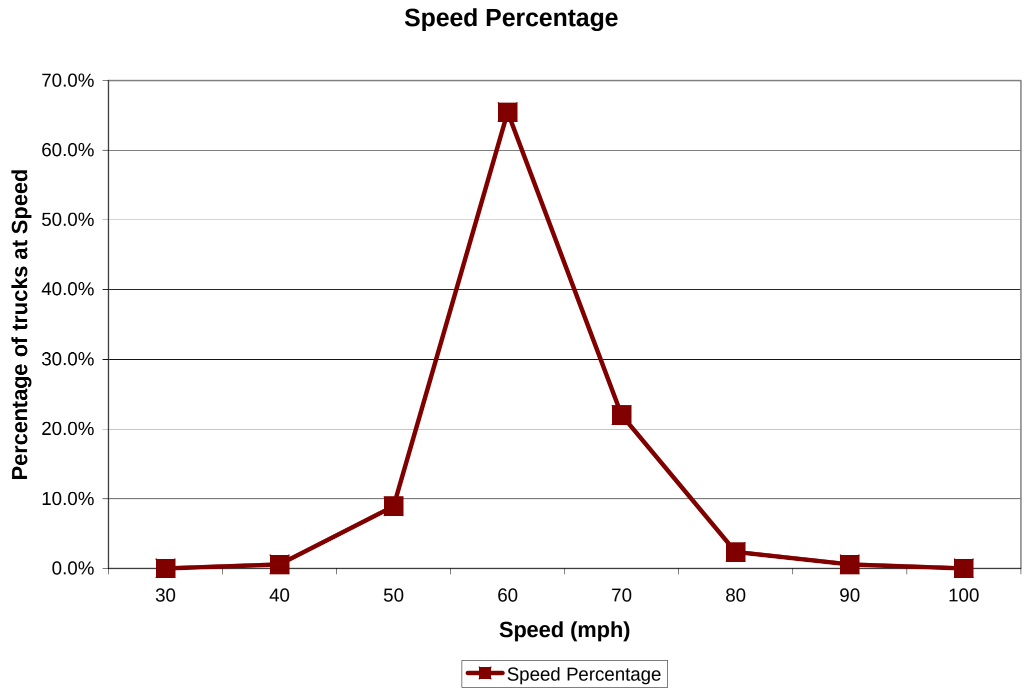


Figure 7-4 Expected Speed Distribution - 120500 – 13-Sep-2006

8 Data Sheets

The following is a listing of data sheets incorporated in Appendix A.

Sheet 19 – Truck 1 – 3S2 loaded air suspension (4 pages)
Sheet 19 – Truck 2 – 2D (FHWA Class 5) spring leaf suspension (4 pages)

Sheet 20 – Speed and Classification verification Pre-Validation (3 pages)

Sheet 21 – Pre-Validation (3 pages)
Sheet 21 – Calibration Iteration 1 (1 page)
Sheet 21 – Post-Validation (2 pages)

Calibration Iteration 1 Worksheets (1 page)

Test Truck Photographs (6 pages)

FDOT – Axle Spacing Scheme (1 page)

FDOT – Class Table (7 pages)

9 Updated Handout Guide and Sheet 17

A copy of the handout has been included following this page. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided from the Pre-Visit Handout Guide.

10 Updated Sheet 18

A current Sheet 18 indicating the contacts, conditions for assessments and evaluations has been attached following the updated handout guide.

11 Traffic Sheet 16(s)

Sheet 16s for the pre-validation and post-validation conditions are attached following the current Sheet 18 information at the very end of the report.

POST-VISIT HANDOUT GUIDE FOR SPS WIM VALIDATION

STATE: Florida

SHRP ID: 0500

Figures

1. General Information

SITE ID: *120500*

LOCATION: *US 1 South, 4.5 miles North of SR 706*

VISIT DATE: *September 13th, 2006*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

Validation Team: *Dean J. Wolf, 301-210-5105, djwolf@mactec.com*

Agency: *Richard Reel, 850-414-4709, richard.reel@dot.state.fl*

Walton Jones, 850-414-4726, walton.jones@dot.state.fl.us

Mike Leggett, 850-414-4727, michael.Leggett@dot.state.fl.us

FHWA COTR: *Debbie Walker, 202-493-3068, deborah.walker@fhwa.dot.gov*

FHWA Division Office Liaison: *Norbert Munoz, 850-942-9650, ext. 3036, norbert.munoz@fhwa.dot.gov*

LTPP SPS WIM WEB PAGE: *http://www.tfhrc.gov/pavement/ltpp/spstraffic/index.htm*

3. Agenda

BRIEFING DATE: *None requested.*

ONSITE PERIOD: *September 13, 2006*

TRUCK ROUTE CHECK: N/A

4. Site Location/ Directions

NEAREST AIRPORT: *Palm Beach International Airport, West Palm Beach, Florida or Fort Lauderdale/Hollywood International Airport, Fort Lauderdale, Florida.*

DIRECTIONS TO THE SITE: *4.5 miles north of SR 706, near Tequesta.*

MEETING LOCATION: *On Site – September 13, 2006; 9:00 am*

WIM SITE LOCATION: *US 1 (Latitude: 26.99734; Longitude: -80.09726)*

WIM SITE LOCATION MAP: *See Figure 4.1*

Figure 4-1: Site 120500 in Florida

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *Brown Mayflower Moving and Storage, 1900 Old Okeechobee Rd., West Palm Beach, FL. $10.00 per run, open M-F, 8:00am to 4:45pm. Contact – Henry Wilkinson, 561-686-1400. Located off of Okeechobee Blvd.*

TRUCK ROUTE:

- *Northbound Turnaround: 1.779 miles from the site (27^0 00.783' North and 80^0 06.246' West).*
- *Southbound Turnaround: 0.52 miles from site (26^0 59.399' North and 80^0 05.659' West).*

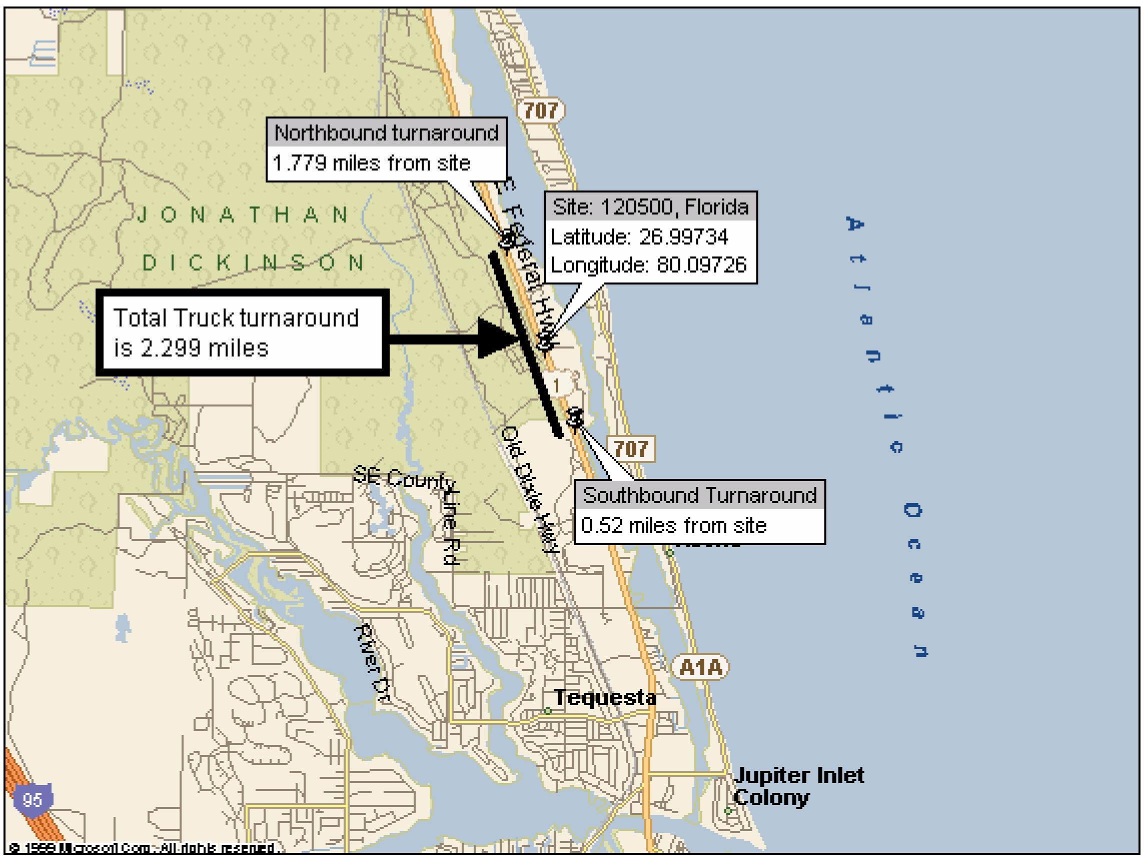


Figure 5-1: Truck Route map of 120500

6. Sheet 17 – Florida (120500)

1.* ROUTE ___US 1____ MILEPOST __N/A_____LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade ___< 1_____ % Sag vertical Y / N
Nearest SPS section upstream of the site _0__ _5__ _5__ _4__
Distance from sensor to nearest upstream SPS Section ___ _1__ _8__ _2__ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction __2__ Lane width _1_ _2_ ft

Median - 1 – painted
2 – physical barrier
3 – grass
4 – none

Shoulder - 1 – curb and gutter
2 – paved AC
3 – paved PCC
4 – unpaved
5 – none

Shoulder width ___ _4__ ft

4.* PAVEMENT TYPE ______Asphalt Concrete_____ ______________

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _09/13/06_ Filename: Downstream_TO_15_12_2.70_0500_09_13_06.JPG_______
Date _09/13/06_ Filename: Upstream_TO_15_12_2.70_0500_09_13_06.JPG _________
Date _________ Filename: ____

6. * SENSOR SEQUENCE _____Quartz Sensor – Loop – Quartz Sensor___

7. * REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __

8. RAMPS OR INTERSECTIONS
Intersection/driveway within 300 m upstream of sensor location Y / N
distance __________
Intersection/driveway within 300 m downstream of sensor location Y / N
distance __________
Is shoulder routinely used for turns or passing? Y / N

9. DRAINAGE (*Bending plate and load cell systems only)*

1 – Open to ground
2 – Pipe to culvert
3 – None

Clearance under plate ___ ___ . ___ in
Clearance/access to flush fines from under system Y / N

10. * CABINET LOCATION
Same side of road as LTPP lane Y / N Median Y/ N Behind barrier Y / N
Distance from edge of traveled lane _3_ _2_ ft
Distance from system __1_2_9 __ ft
TYPE _______334 B____________________

CABINET ACCESS controlled by LTPP / STATE / JOINT
Contact - name and phone number _____Kip Jones (850) 414-4726__
Alternate - name and phone number __Michael Leggett (850) 414-4726__

11. * POWER
Distance to cabinet from drop ___ ___ _5__ ft Overhead / underground / solar / AC in cabinet?
Service provider ______________ Phone number _____________________

12. * TELEPHONE
Distance to cabinet from drop ___ _2__ _0__ ft Overhead / under ground / cell?
Service provider _________________ Phone Number ________________

13.* SYSTEM (software & version no.)- _________PAT DAW 190 Ver. 3.18 4/2/03__
Computer connection – RS232 / Parallel port / USB / Other _______________

14. * TEST TRUCK TURNAROUND time ___6____ minutes DISTANCE _3.4__ mi.

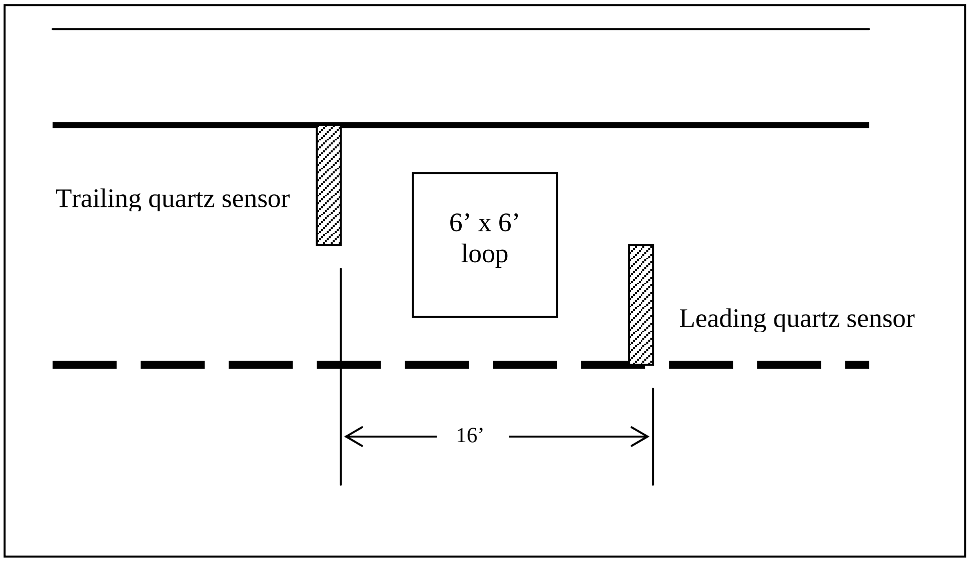
15. PHOTOS FILENAME
Power source _ Solar_Panel_TO_15_12_2.70_0500_09_13_06.JPG _________
Phone source _ Telephone_Service_TO_15_12_2.70_0500_09_13_06.JPG____
Cabinet exterior _ Cabinet_Exterior_TO_15_12_2.70_0500_09_13_06.JPG______
Cabinet interior _ Cabinet_Interior_TO_15_12_2.70_0500_09_13_06.JPG______
Weight sensors _ Leading_WIM_Sensor_TO_15_12_2.70_0500_09_13_06.JPG_
_ Trailing_WIM_Sensor_TO_15_12_2.70_0500_09_13_06.JPG_
Classification sensors ____
Other sensors _ Loop_Sensor_TO_15_12_2.70_0500_09_13_06.JPG ________
Description ___Loop Detector_______________________________________
Downstream direction at sensors on LTPP lane
___ Downstream_TO_15_12_2.70_0500_09_13_06.JPG_________________
Upstream direction at sensors on LTPP lane
___ Upstream_TO_15_12_2.70_0500_09_13_06.JPG ___________________

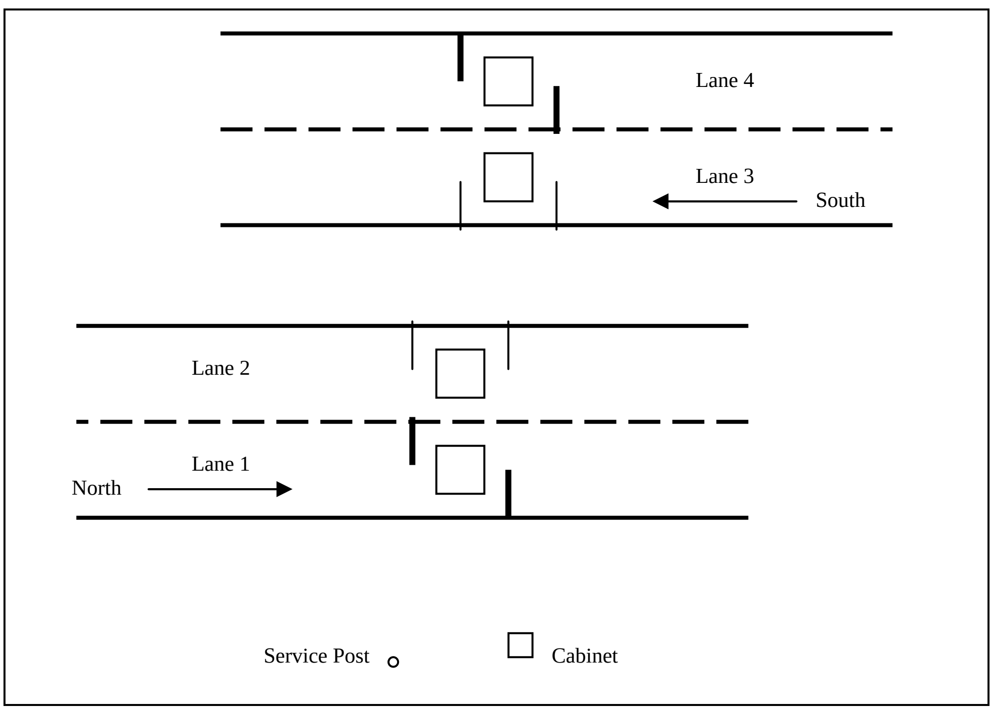
COMMENTS ____________GPS Coordinates: Latitude: 26.99734; Longitude: -80.09726
______________Amenities:____
______________ ____
_______________ Various Hotels, Restaurants, Gas Stations located 5 miles South of site in Jupiter.____
___________Types of Trucks: One Class 9 and One Class 5__________________________
___________Expected Weight Ranges: For Class 9 – 72,000 to 80,000 lbs.; For Class 5: 10,000-12,000 lbs____
___________Speeds to be run: 45 to 55 mph_____________________________________

COMPLETED BY _____Dean J. Wolf____

PHONE __301-210-5105_________ DATE COMPLETED _0_9_ /_1_3_ / _2_0_0_6__

Sketch of equipment layout





Site Map

Figure 6-1: Site Map of 120500

Figure 6-2 - Solar_Panel_TO_15_12_2.70_0500_09_13_06.JPG

Figure 6-3 - Telephone_Service_TO_15_12_2.70_0500_09_13_06.JPG

Figure 6-4 - Cabinet_Exterior_TO_15_12_2.70_0500_09_13_06.JPG

Figure 6-5 - Cabinet_Interior_Front_TO_15_12_2.70_0500_09_13_06.JPG

Figure 6-6 - Leading_WIM_Sensor_TO_15_12_2.70_0500_09_13_06.JPG

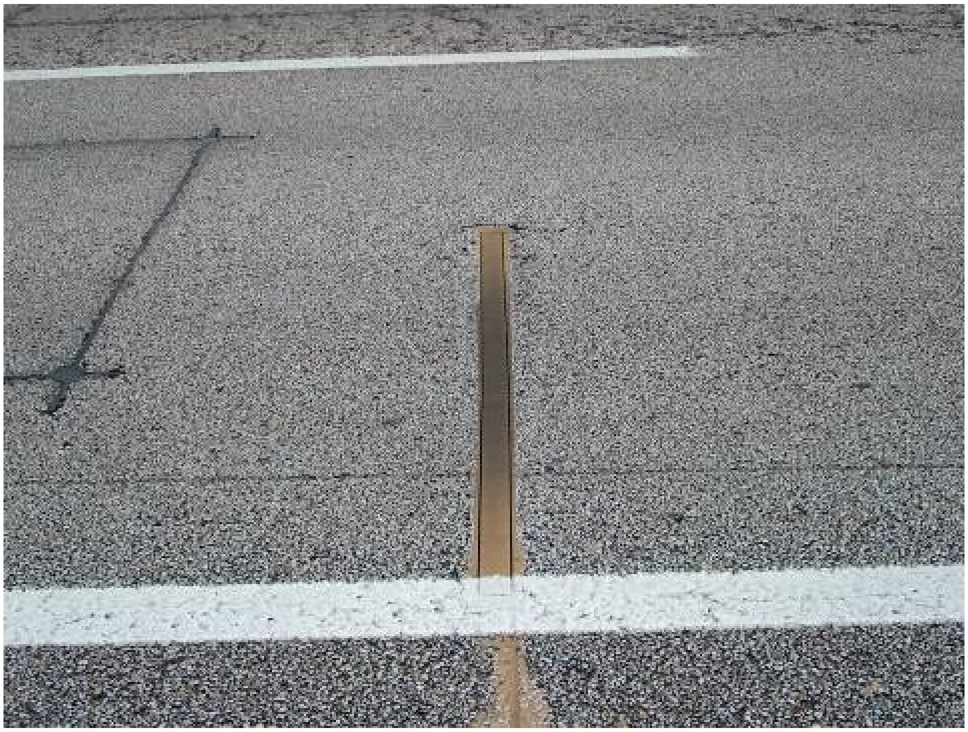


Figure 6-7 - Trailing_WIM_Sensor_TO_15_12_2.70_0500_09_13_06.JPG

Figure 6-8 - Loop_Sensor_TO_15_12_2.70_0500_09_13_06.JPG

Figure 6-9 - Downstream_TO_15_12_2.70_0500_09_13_06.JPG

Figure 6-10 - Upstream_TO_15_12_2.70_0500_09_13_06.JPG

SHEET 18	STATE CODE [_1_2_]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0_5_0_0]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) _0_9_ / _1_3_ / _2_0_0_6_

Rev. 05/25/04

1. DATA PROCESSING –
   a. Down load –
      X State only
      ☐ LTPP read only
      ☐ LTPP download
      ☐ LTPP download and copy to state

   b. Data Review –
      X State per LTPP guidelines
      ☐ State – ☐ Weekly ☐ Twice a Month ☐ Monthly ☐ Quarterly
      ☐ LTPP

   c. Data submission –
      ☐ State – ☐ Weekly ☐ Twice a month X Monthly ☐ Quarterly
      X LTPP

2. EQUIPMENT –
   a. Purchase –
      X State
      ☐ LTPP

   b. Installation –
      X Included with purchase
      ☐ Separate contract by State
      ☐ State personnel
      ☐ LTPP contract

   c. Maintenance –
      ☐ Contract with purchase – Expiration Date ________
      ☐ Separate contract LTPP – Expiration Date ________
      X Separate contract State – Expiration Date ________
      ☐ State personnel

   d. Calibration –
      X Vendor
      ☐ State
      ☐ LTPP

   e. Manuals and software control –
      X State
      ☐ LTPP

   f. Power –
      i. Type –
         ☐ Overhead
         ☐ Underground
         X Solar
      ii. Payment –
         ☐ State
         ☐ LTPP
         ☐ N/A

g. Communication –

i. Type –
   - X Landline
   - ☐ Cellular
   - ☐ Other

ii. Payment –
   - X State
   - ☐ LTPP
   - ☐ N/A

3. PAVEMENT –

a. Type –
   - ☐ Portland Concrete Cement
   - X Asphalt Concrete

b. Allowable rehabilitation activities –
   - ☐ Always new
   - X Replacement as needed
   - ☐ Grinding and maintenance as needed
   - ☐ Maintenance only
   - ☐ No remediation

c. Profiling Site Markings –
   - ☐ Permanent
   - X Temporary

4. ON SITE ACTIVITIES –

a. WIM Validation Check - advance notice required ___14__ X days ☐ weeks

b. Notice for straightedge and grinding check - ___4___ ☐ days X weeks

i. On site lead –
   - X State
   - ☐ LTPP

ii. Accept grinding –
   - X State
   - ☐ LTPP

c. Authorization to calibrate site –
   - X State only
   - ☐ LTPP

d. Calibration Routine –
   - X LTPP – ☐ Semi-annually X Annually
   - ☐ State per LTPP protocol – ☐ Semi-annually ☐ Annually
   - X State other – ____________________________

e. Test Vehicles
   i. Trucks –
      1st – Air suspension 3S2 ☐ State X LTPP
      2nd – Class 5 ☐ State X LTPP
      3rd – ________________ ☐ State ☐ LTPP
      4th – ________________ ☐ State ☐ LTPP
   ii. Loads – ☐ State X LTPP
   iii. Drivers – ☐ State X LTPP

f. Contractor(s) with prior successful experience in WIM calibration in state:

   _______FTE, DTS, MACTEC Engineering and Consulting, Inc._______________

g. Access to cabinet
   i. Personnel Access –
      X State only
      ☐ Joint
      ☐ LTPP
   ii. Physical Access –
      X Key
      ☐ Combination

h. State personnel required on site – X Yes ☐No

i. Traffic Control Required – ☐Yes X No

j. Enforcement Coordination Required – ☐Yes X No

5. SITE SPECIFIC CONDITIONS –
   a. Funds and accountability – ____
   b. Reports – ____
   c. Other – ____
   d. Special Conditions – ____

6. CONTACTS –
   a. Equipment (operational status, access, etc.) –

      Name: ___Michael Leggett_______ Phone: __(850) 414-4727____

      Agency: ____ARA_______________________________

b. Maintenance (equipment) –

Name: ___Kip Jones___________ Phone: __(850) 414-4726___

Agency: ____________________

c. Data Processing and Pre-Visit Data –

Name: ____________________ Phone: ____________

Agency: ____________________

d. Construction schedule and verification –

Name: ____________________ Phone: ____________

Agency: ____________________

e. Test Vehicles (trucks, loads, drivers) –

Name: __Billy Graham__________ Phone: __(352) 210-5032___

Agency: ______Graham Trucking______________

f. Traffic Control –

Name: ____________________ Phone: ____________

Agency: ____________________

g. Enforcement Coordination –

Name: ____________________ Phone: ____________

Agency: ____________________

h. Nearest Static Scale

Name: __Brown Moving and Storage____________________

Location: __1900 Old Okeechobee Blvd, West Palm Beach, FL________

Phone: ___ (561) 686-1400______________________

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [__9_9_2_1_] *STATE CODE [_1_2_] *SHRP SECTION ID [__0_5_0_0_]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_9_ / _1_3_ / _2_0_0_6__] use date of 9/12/2006 for database entry.

2. * TYPE OF EQUIPMENT CALIBRATED _x_ WIM __ CLASSIFIER ___ BOTH

3. * REASON FOR CALIBRATION
____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
____ EQUIPMENT REPLACEMENT ____ TRAINING
____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
_x__ OTHER (SPECIFY) _LTPP Validation____________________

4. * SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
____ BARE ROUND PIEZO CERAMIC ____ BARE FLAT PIEZO ____ BENDING PLATES
____ CHANNELIZED ROUND PIEZO ____ LOAD CELLS _x__ QUARTZ PIEZO
____ CHANNELIZED FLAT PIEZO __x_ INDUCTANCE LOOPS ____ CAPACITANCE PADS
____ OTHER (SPECIFY) ____________________

5. EQUIPMENT MANUFACTURER ____IRD/PAT Traffic____________________

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) __x_ TEST TRUCKS

__ __ __ NUMBER OF TRUCKS COMPARED __ _2 __ NUMBER OF TEST TRUCKS USED

__2_0__ PASSES PER TRUCK

TYPE PER FHWA 13 BIN SYSTEM
SUSPENSION: 1 - AIR; 2 - LEAF SPRING
3 - OTHER (DESCRIBE)

TRUCK	TYPE	SUSPENSION
1	____9___	__1________________
2	____5___	__2________________
3	________	___________________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ ___ _- 4 . 4_ STANDARD DEVIATION __ _3 . 7_
DYNAMIC AND STATIC SINGLE AXLES ___ ___ _- 3 . 2_ STANDARD DEVIATION __ _6 . 0_
DYNAMIC AND STATIC DOUBLE AXLES ___ ___ _- 4 . 6_ STANDARD DEVIATION __ _3 . 3_

8. ___3____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ______ ____35, _ 45, _ 55______ ______ ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___ __8_1_0___ ___

11.** IS AUTO-CALIBRATION USED AT THIS SITE? (Y/N) _N___
IF YES, LIST AND DEFINE AUTO-CALIBRATION VALUE: ____________________
____
____

CLASSIFIER TEST SPECIFICS***

12.*** METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
___ VIDEO _x_ MANUAL ___ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT __x_ TIME ____ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:

*** FHWA CLASS 9 ____ ___0____	FHWA CLASS ____ ____ ____ ____ ____
*** FHWA CLASS 8 ____ ___0____	FHWA CLASS ____ ____ ____ ____ ____
	FHWA CLASS ____ ____ ____ ____ ____
	FHWA CLASS ____ ____ ____ ____ ____

*** PERCENT "UNCLASSIFIED" VEHICLES: ____ ___0 . 0___

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, __MACTEC E&C_____________________________
CONTACT INFORMATION: __301-210-5105____ rev. November 9, 1999

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [__9_9_2_1_] *STATE CODE [_1_2_] *SHRP SECTION ID [__0_5_0_0_]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_9_ / _1_3_ / _2_0_0_6__]

2. * TYPE OF EQUIPMENT CALIBRATED _x_ WIM __ CLASSIFIER ___ BOTH

3. * REASON FOR CALIBRATION
____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
____ EQUIPMENT REPLACEMENT ____ TRAINING
____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
_x__ OTHER (SPECIFY) _LTPP Validation____

4. * SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
____ BARE ROUND PIEZO CERAMIC ____ BARE FLAT PIEZO ____ BENDING PLATES
____ CHANNELIZED ROUND PIEZO ____ LOAD CELLS _x__ QUARTZ PIEZO
____ CHANNELIZED FLAT PIEZO __x_ INDUCTANCE LOOPS ____ CAPACITANCE PADS
____ OTHER (SPECIFY) ____

5. EQUIPMENT MANUFACTURER ____IRD/PAT Traffic____

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) __x_ TEST TRUCKS

__ __ __ NUMBER OF TRUCKS COMPARED __ _2 __ NUMBER OF TEST TRUCKS USED

__2_0__ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	____9___	__1________________
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	____5___	__2________________
3 - OTHER (DESCRIBE)	3	________	___________________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ ___ __ 0 . 0_ STANDARD DEVIATION __ _3 . 8_
DYNAMIC AND STATIC SINGLE AXLES ___ ___ __ 0 . 8_ STANDARD DEVIATION __ _4 . 4_
DYNAMIC AND STATIC DOUBLE AXLES ___ ___ __ 0 . 6_ STANDARD DEVIATION __ _3 . 7_

8. ___3____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ______ ____35, _ 45, _ 55______ ______ ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___ __8_1_0___ ___

11.** IS AUTO-CALIBRATION USED AT THIS SITE? (Y/N) _N___
IF YES, LIST AND DEFINE AUTO-CALIBRATION VALUE: ________________________________
____
____

CLASSIFIER TEST SPECIFICS***

12.*** METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
___ VIDEO _x_ MANUAL ___ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT __x_ TIME ____ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ ___0____ FHWA CLASS ____ ____ ____ ____ ____
*** FHWA CLASS 8 ____ ___0____ FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ ___0 . 0___

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, __MACTEC E&C______________________________
CONTACT INFORMATION: __301-210-5105____ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE 17
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 1	* DATE 9·13·06

Rev. 08/31/01

PART I.

1.* FHWA Class 9   2.* Number of Axles 5

AXLES - units - lbs / 100s lbs / kg

	3. Empty Truck Axle Weight	4.* Pre-Test Average Loaded Axle Weight	5.* Post-Test Average Loaded Axle Weight	6.* Measured D)irectly or C)alculated?
A		9870		D / C
B		16600		D / C
C		16600		D / C
D		15880		D / C
E		15880		D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight 74830

*c) Post Test Loaded Weight ______

*d) Difference Post Test – Pre-test ______

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / Conventional   b) * Sleeper Cab? Y / N

9. a) * Make: KENWORTH   b) * Model: W900

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS FROM FRONT TO 3/4 BACK. STEEL BEAMS OVER REAR TANDEM

11. a) Tractor Tare Weight (units): ______

b). Trailer Tare Weight (units): ______

Sheet 19	* STATE CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 1	* DATE 9-13-05

Rev. 08/31/01

12.* Axle Spacing – units m / feet and inches / feet and tenths

A to B 19.1 B to C 4.4 C to D 32.3

D to E 4.2 E to F ______

Wheelbased (measured A to last) ______ Computed 60.0

13. *Kingpin Offset From Axle B (units) +3.0 (______)
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R24.5	4 FULL LEAF SPRINGS
B	11R24.5	AIR
C	11R24.5	AIR
D	11R24.5	AIR
E	11R24.5	AIR
F		

16. Cold Tire Pressures (psi) – from right to left

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 1	* DATE	9-13-06

Rev. 08/31/01

PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 1	* DATE 9-13-06

Rev. 08/31/01

Table 4 . Axle and GVW computations -

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 5. Raw data – Axle scales – pre-test · day 1 pre-validation

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9940	16560	16560	15920	15920		74900
2	9800	16610	16610	15850	15850		74720
3	9860	16620	16620	15880	15880		74860
Average	9870	16600	16600	15880	15880		74830

Table 6. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1							
2							
3							
Average							

Table 7. Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9960	16410	16410	15930	15930		74640
2							
3							
Average	9960	16410	16410	15930	15930		74640

Measured By [signature] Verified By ______

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 2	* DATE	9-13-06

Rev. 08/31/01

PART I.

1.* FHWA Class 5 2.* Number of Axles 2

AXLES - units - lbs / 100s lbs / kg

	3. Empty Truck Axle Weight	4.* Pre-Test Average Loaded Axle Weight	5.* Post-Test Average Loaded Axle Weight	6.* Measured D)irectly or C)alculated?
A		7870	7740	D / C
B		15380	15360	D / C
C				D / C
D				D / C
E				D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight 23250
*c) Post Test Loaded Weight 23100
*d) Difference Post Test – Pre-test -150

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / Conventional b) * Sleeper Cab? Y / N

9. a) * Make: INTERNATIONAL b) * Model: 4300

10.* Trailer Load Distribution Description:

steel beams loaded mid way back

11. a) Tractor Tare Weight (units): ______

b). Trailer Tare Weight (units): ______

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0800
*CALIBRATION TEST TRUCK # 2	* DATE 9-13-06

Rev. 08/31/01

12.* Axle Spacing – units m / feet and inches / feet and tenths

A to B 21.1 B to C ____________ C to D ____________

D to E ____________ E to F ____________

Wheelbased (measured A to last) 21.1 Computed ____________

13. *Kingpin Offset From Axle B (units) ____________(____________)__
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R22.5	2 full leaf springs
B	11R22.5	4 tapered leaf springs
C		
D		
E		
F		

16. Cold Tire Pressures (psi) – from right to left

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 2	* DATE	9-13-06

Rev. 08/31/01

PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 2	* DATE	9-13-06

Rev. 08/31/01

Table 4 . Axle and GVW computations -

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI-VII		VII-VIII		VIII-IX		IX`		X	
										XI	
Avg.											

Table 5. Raw data – Axle scales – pre-test - day 1

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	7820	15440					23260
2	7900	15340					23240
3	7880	15360					23240
Average	7870	15380					23250

Table 6. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1							
2							
3							
Average							

Table 7. Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	7740	15360					23100
2							
3							
Average	7740	15360					23100

Measured By DJW Verified By ______________

Sheet 20	* STATE_CODE 1 2
LTPP Traffic Data	*SPS PROJECT_ID 0 5 0 0
Speed and Classification Checks * 1 of* 3	* DATE 9 / 1 3 / 2 0 0 6

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
56	9	7475	56	9	50	9	8293	50	9
47	5	7482	46	5	49	5	8295	49	5
60	5	7510	60	5	60	9	8296	60	9
64	5	7583	63	5	54	9	8311	54	9
56	3	7608	56	5	55	4	8319	55	4
64	5	7626	64	5	56	9	8350	56	9
51	9	7717	51	9	55	5	8352	55	5
58	5	7764	58	5	44	9	8409	44	9
55	5	7835	55	5	45	5	8414	45	5
54	5	7836	54	5	66	5	8429	66	5
54	5	7846	54	5	50	9	8480	50	9
57	6	7851	57	6	49	5	8482	48	5
64	5	7860	64	5	54	9	8534	54	9
61	6	7881	61	6	54	5	8535	54	5
55	9	7919	56	9	46	9	8617	45	9
49	6	8017	49	6	45	5	8620	45	5
51	5	8031	51	5	51	9	8631	51	9
54	5	8076	54	5	57	5	8644	56	5
58	7	8113	58	7	49	9	8688	49	9
53	8	8135	53	8	49	5	8691	49	5
60	5	8182	59	5	65	6	8710	65	6
51	5	8200	51	5	53	9	8759	53	9
46	9	8237	46	9	53	5	8782	53	5
41	3	8242	40	5	58	5	8801	57	5
51	5	8289	50	5	62	6	8832	62	6

utility plu truck (duals)

utility plu truck w/ duals

Recorded by __DJW________Direction __S__ Lane __4_ Time from _12:02 PM_ to _1:29 PM_

Sheet 20	* STATE_CODE 1 2
LTPP Traffic Data	*SPS PROJECT_ID 0 5 0 0
Speed and Classification Checks * 2 of* 3	* DATE 9 / 1 3 / 2 0 0 6

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
60	5	8834	60	5	60	9	9634	60	9
54	9	8970	54	9	57	4	9637	56	4
46	9	9066	46	9	57	9	9673	57	9
44	5	9068	44	5	54	5	9680	54	5
52	9	9154	50	9	54	5	9687	54	5
50	5	9155	50	5	67	3	9691	67	5 utility truck (duals)
60	5	9208	60	5	46	9	9744	46	9
56	9	9230	56	9	44	5	9749	44	5
54	5	9233	54	5	65	5	9757	64	5
55	6	9273	55	6	49	5	9770	49	5
55	9	9280	55	9	50	9	9837	50	9
45	9	9292	46	9	48	5	9839	48	5
45	5	9294	45	5	58	5	9846	58	5
48	9	9358	48	9	56	9	9909	56	9
49	5	9360	48	5	53	5	9911	51	5
56	9	9408	56	9	46	5	9939	46	5
50	6	9415	50	6	60	5	9945	60	5
55	5	9418	55	5	67	5	9952	67	5
56	5	9420	56	5	45	9	9968	45	9
46	9	9482	46	9	44	5	9972	44	5
45	5	9488	45	5	60	10	10064	60	10
51	9	9594	51	9	56	5	10107	56	5
49	5	9597	49	5	53	5	10160	53	5
45	8	9602	45	8	57	6	10233	56	6
53	4	9633	52	4	45	8	10285	45	8

Recorded by __DJW_______ Direction __S__ Lane __4_ Time from _1:29 PM_ to _2:51 PM_

Sheet 20	* STATE_CODE 1 2
LTPP Traffic Data	*SPS PROJECT_ID 0 5 0 0
Speed and Classification Checks * 3 of* 3	* DATE 9 / 1 3 / 2 0 0 6

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
56	5	10319	56	5					
54	5	10355	54	5					
57	8	10418	57	8					
40	5	10422	40	5					
53	5	10424	53	5					

Recorded by __DJW_______ Direction __S__ Lane __4_ Time from _2:53 PM_ to _2:59 PM_

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 1 of 3	* DATE	09/13/2006

Rev. 08/31/2001

~~HEAD~~ VALVE PRE-VAL

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
90°	35	1		09:52:48	5342	35	4.6/4.7	8.7/7.3	8.3/7.2	8.4/7.5	7.3/7.5		72.0	19.2	4.5	32.3	4.1	
90°	34	2		09:52:50	5344	34	4.4/3.4	9.7/6.3					23.8	21.2				
90.5	44	1		09:57:13	5429	44	5.1/5.0	8.4/7.2	8.7/7.7	8.1/7.4	7.6/7.9		73.1	19.2	4.4	32.3	4.0	
90.5	49	2		09:57:18	5430	48	4.3/3.9	7.5/6.8					22.4	21.1				
92.0	54	1		10:02:23	5524	54	4.2/5.1	8.9/7.5	9.0/7.2	8.0/7.6	7.1/7.4		72.0	19.2	4.5	32.4	4.1	
92.0	54	2		10:02:27	5525	55	4.3/3.6	8.4/6.5					22.7	21.2				
93.0	~~32~~ 35	1		10:06:26	5584	35	4.0/5.1	8.0/7.5	8.0/6.9	9.3/7.7	7.8/7.0		71.3	19.2	4.5	32.3	4.1	
93.0	32	2		10:06:27	5585	32	4.1/3.4	8.2/6.8					22.5	21.1				
91.0	44	1		10:10:14	5641	44	4.9/5.2	8.7/7.9	8.5/7.8	8.6/7.4	7.3/7.7		74.2	19.2	4.5	32.4	4.1	
91.0	44	2		10:10:21	5642	44	4.4/3.9	6.2/6.3					20.8	21.2				
90.5	54	1		10:14:11	5695	54	4.8/4.8	9.4/7.4	9.2/7.3	7.8/7.0	7.7/8.1		73.5	19.1	4.4	32.3	4.0	
90.5	48	2		10:14:41	5698	48	4.2/3.4	8.0/7.1					22.7	21.2				
90.5	35	1		10:18:19	5740	36	4.7/5.1	8.2/7.0	8.3/6.6	8.1/6.8	6.8/7.0		68.6	19.1	4.5	32.2	4.1	
90.5	34	2		10:18:22	5743	34	4.5/3.6	8.5/6.5					23.1	21.2				
89.5	44	1		10:23:39	5848	44	4.8/5.4	8.4/8.2	8.3/7.5	8.1/7.1	7.2/7.6		72.5	19.2	4.5	32.3	4.1	
89.5	43	2		10:23:43	5849	44	4.2/3.8	7.3/5.9					21.2	21.2				

Recorded by ____________________ Checked by ____________________

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 2 of 3	* DATE 09/13/2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
90.0	54	1		10:28:09	5919	53	5.1/5.5	8.7/8.0	8.8/7.2	7.6/8.1	6.9/8.0		73.8	19.1	4.5	32.3	4.1	
90.0	53	2		10:28:12	5920	55	4.0/3.6	8.3/7.2					23.2	21.1				
90.5	35	1		10:31:40	5977	36	4.6/4.6	8.2/8.0	8.5/7.3	8.7/7.7	7.3/7.7		72.5	19.1	4.5	32.2	4.1	
90.5	34	2		10:38:45	5981	35	4.4/3.5	8.5/6.8					23.1	21.1				
91.0	44	1		10:35:42	6041	45	4.3/4.4	8.7/7.6	8.6/7.4	8.2/7.1	7.3/8.0		71.6	19.1	4.5	32.3	4.1	
91.0	43	2		10:35:45	6043	44	4.0/4.0	7.5/6.5					22.0	21.2				
91.0	64	1		10:39:45	6118	64	4.6/5.0	8.5/7.8	8.8/7.4	7.8/7.3	7.2/7.9		72.4	19.1	4.5	32.3	4.0	
91.0	55	2		10:39:48	6121	55	4.2/4.1	5.7/6.9					20.9	21.3				
91.5	34	1		10:44:14	6201	36	4.8/5.1	8.2/7.2	9.0/6.6	8.4/6.9	7.3/6.7		69.3	19.1	4.5	32.2	4.1	
91.5	34	2		10:44:20	6203	34	4.2/3.0	8.8/7.1					23.0	21.1				
92.0	44	1		10:49:04	6288	44	4.7/5.1	8.4/7.0	8.3/6.8	7.8/6.6	6.9/7.4		68.9	19.1	4.5	32.2	4.0	
92.0	45	2		10:49:09	6290	45	4.1/3.8	7.0/7.0					21.9	21.2				
94.5	55	1		10:53:19	6349	55	4.2/4.9	8.7/7.6	9.1/7.3	8.4/7.4	7.4/8.1		73.1	19.1	4.5	32.3	4.0	
94.5	54	2		10:53:23	6351	54	4.1/3.3	8.2/5.8					21.4	21.2				
94.0	34	1		10:57:59	6418	36	4.4/4.8	8.1/7.3	8.7/7.1	8.5/7.7	7.7/7.4		71.9	19.1	4.5	32.1	4.1	
94.0	34	2		10:58:02	6420	34	4.4/3.4	10.0/6.7					24.5	21.1				

Recorded by ______________________ Checked by ______________________

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 3 of 3	* DATE 09/13/2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
98.0	44	1		11:01:38	6497	44	5.0/4.8	8.6/7.4	8.1/7.3	8.0/6.7	7.3/7.4		70.7	19.2	4.5	32.3	4.1	
98.0	43	2		11:01:41	6489	44	3.9/3.5	7.3/5.5					20.3	21.1				
100.0	55	1		11:05:15	6551	55	4.6/4.7	8.8/7.5	8.7/7.5	8.1/7.7	7.0/7.4		72.5	19.2	4.5	32.4	4.1	
100.0	54	2		11:05:19	6553	54	4.0/3.5	7.5/6.5					21.4	21.2				
101.5	35	1		11:09:17	6627	36	4.5/5.0	8.2/6.9	8.1/6.2	7.5/6.8	6.5/6.9		66.7	19.1	4.5	32.2	4.1	
101.5	34	2		11:09:22	6631	34	4.2/3.3	8.5/6.3					22.3	21.1				
103.5	43	1		11:14:04	6696	44	5.1/4.7	8.2/7.8	8.5/7.3	7.4/7.5	7.2/7.6		71.8	19.1	4.5	32.2	4.1	
103.5	44	2		11:14:08	6699	44	4.3/3.8	7.8/5.3					21.1	21.2				

Recorded by ______________________ Checked by ______________________

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 1 of 1	* DATE 09/13/2006

Rev. 08/31/2001

Cal 1

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
118.0	45	1		12:53:09	8237	45	4.7/5.0	8.4/8.0	9.9/8.1	8.6/8.0	7.2/7.9		76.3	19.2	4.4	32.2	4.1	
118.0	41	2		12:53:21	8242	41	4.5/3.4	8.4/6.5					22.8	21.1				
117.0	~~47~~ 50	1		12:57:45	8293	50	5.0/6.0	9.5/8.2	9.6/7.5	8.6/8.6	8.0/9.1		79.3	19.1	4.5	32.3	4.1	
117.0	48	2		12:57:49	8295	48	4.5/3.9	7.0/7.0					22.4	21.2				
117.5	54	1		13:01:37	8350	55	4.6/4.8	8.5/7.9	9.1/7.0	8.0/7.7	7.6/8.2		73.3	19.1	4.5	32.2	4.0	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	^				[illegible]	[illegible]				
~~118.5~~ 116	43	1		13:25:42	8359	53	5.0/5.3	8.6/7.7	9.4/6.8	8.3/7.2	7.5/7.6		73.4	19.2	4.5	32.3	4.0	
118.5	43	2		13:05:01	8414	44	4.5/3.3	8.4/6.9					23.1	21.1				
118.6	49	1		13:09:16	8480	49	4.8/5.3	9.0/7.9	9.5/7.5	9.1/8.1	7.9/7.6		76.7	19.2	4.5	32.4	4.1	
118.5	49	2		13:09:18	8482	49	4.3/3.8	9.0/7.2					24.3	21.2				
117.0	53	1		13:13:08	8534	53	4.7/5.3	8.7/7.9	9.5/6.5	7.4/7.2	7.4/7.7		72.8	19.2	4.4	32.3	4.0	
117.0	54	2		13:13:12	8535	54	4.0/3.9	8.4/6.4					22.7	21.1				
116.5	45	1		13:17:50	8617	45	4.9/5.4	8.8/7.2	9.0/6.9	7.9/7.0	6.7/7.2		71.0	19.1	4.5	32.3	4.1	
116.5	44	2		13:17:54	8620	44	4.4/4.1	7.0/7.0					22.5	21.2				
116.0	48	1		13:21:25	8688	48	5.1/4.8	8.8/8.1	9.7/7.4	8.2/7.8	8.0/8.5		76.5	19.1	4.4	32.3	4.0	
116.0	48	2		13:21:28	8691	48	4.3/3.4	8.2/7.1					22.9	21.1				

Recorded by ______________

Checked by ______________

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 1 of 2	* DATE	09/13/2006

Rev. 08/31/2001

POST VAI

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
112.0	44	1		13:44:08	9066	45	4.7/5.5	9.1/8.2	9.2/7.6	9.0/8.1	7.3/7.9		76.7	19.2	4.5	32.4	4.1	
112.0	44	2		13:44:11	9068	44	4.2/3.6	7.0/6.4					21.2	21.2				
116.5	51	1		13:48:17	9154	51	4.2/5.0	8.5/7.7	9.6/7.2	8.2/7.9	7.1/8.2		73.5	19.2	4.4	32.4	4.1	
116.5	49	2		13:48:20	9155	49	4.3/3.4	9.7/7.4					24.7	21.2				
116.5	54	1		13:52:18	9230	55	4.8/5.1	9.2/8.1	9.1/7.1	8.0/7.6	7.4/7.9		74.2	19.1	4.5	32.2	4.0	
116.5	53	2		13:52:22	9233	53	4.2/3.4	8.5/6.3					22.4	21.1				
116.0	44	1		13:56:06	9292	44	5.1/5.0	8.7/8.4	9.2/8.0	8.4/8.2	7.2/8.8		77.1	19.2	4.5	32.4	4.1	
116.0	45	2		13:56:12	9294	45	4.3/3.6	9.2/6.7					23.9	21.2				
116.0	47	1		13:59:46	9358	47	5.0/4.9	9.0/8.2	9.6/7.8	8.1/7.4	7.6/8.3		76.0	19.2	4.5	32.3	4.0	
116.0	49	2		13:59:52	9360	49	4.5/3.8	8.1/6.4					22.8	21.2				
118.5	55	1		14:03:11	9408	55	4.9/4.8	8.9/8.0	9.1/7.3	8.4/7.9	7.7/8.2		75.2	19.2	4.5	32.3	4.1	
118.5	54	2		14:04:02	9418	54	4.0/3.5	9.1/7.1					23.8	21.1				
116.5	46	1		14:08:20	9482	46	4.6/6.0	8.7/8.1	8.7/7.2	8.7/7.4	8.4/7.8		75.5	19.2	4.5	32.3	4.1	
116.5	45	2		14:08:28	9488	45	4.4/3.5	8.8/6.4					23.1	21.1				
116.5	50	1		14:13:36	9594	50	5.1/4.7	9.6/8.3	10.2/7.6	8.6/8.3	7.6/9.0		79.1	19.1	4.5	32.3	4.0	
116.5	49	2		14:13:41	9597	49	4.3/3.9	10.2/7.3					25.7	21.2				

Recorded by ____________ Checked by ____________

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 2 of 2	* DATE	09/13/2006

Rev. 08/31/2001

POST VAI [illegible]

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
116.5	56	1		14:17:17	9673	56	4.3/4.8	9.0/7.2	9.3/7.0	7.7/7.5	7.0/8.4		72.1	19.1	4.5	32.3	4.1	
116.5	53	2		14:17:22	9680	53	4.3/4.7	6.2/7.1					22.3	21.2				
118.0	45	1		14:21:28	9744	45	4.8/4.7	8.4/8.3	9.2/7.8	8.2/7.4	7.2/7.8		74.2	19.2	4.5	32.3	4.1	
118.0	44	2		14:21:40	9749	44	4.5/3.6	8.6/6.9					23.6	21.1				
117.0	49	1		14:25:59	9837	49	4.8/5.2	9.2/7.9	9.8/7.7	8.0/8.1	7.4/8.3		76.8	19.2	4.4	32.3	4.1	
117.0	48	2		14:26:05	9839	48	4.1/3.7	8.7/6.4					22.9	21.2				
117.5	55	1		14:29:44	9909	55	4.7/5.0	8.6/8.2	9.4/7.2	7.8/7.7	7.0/8.1		73.6	19.3	4.5	32.5	4.1	
117.5	53	2		14:29:45	9911	53	3.8/3.8	8.6/6.3					22.6	21.2				
118.0	44	1		14:33:02	9968	44	5.0/5.0	8.8/8.0	9.1/7.6	8.2/7.5	7.3/7.4		74.3	19.2	4.5	32.4	4.1	
118.0	43	2		14:33:07	9972	43	4.2/3.4	7.0/6.9					21.5	21.2				

Recorded by ____________________ Checked by ____________________

Calibration Worksheet

Site: 120500

Calibration Iteration 1 Date 9/13/06

Beginning factors:

Speed Point (mph)	Name	Value
Overall	v	810
Front Axle	✓	
1 – (40)	SP1	1020
2 – (50)	SP2	1030
3 – (60)	SP3	1030
4 – ( )		
5 – ( )		

Errors:

	Speed Point 1	Speed Point 2	Speed Point 3	Speed Point 4	Speed Point 5
F/A	-3%	0%	0%		
Tandem	-6%	-4%	-2%		
GVW	-4%	-4%	-4%		

Adjustments:

	Raise	Lower	Percentage
Overall	☑	☐	5%
Front Axle	☐	☐	
Speed Point 1	☐	☐	
Speed Point 2	☐	☐	
Speed Point 3	☐	☐	
Speed Point 4	☐	☐	
Speed Point 5	☐	☐	

End factors:

Speed Point (mph)	Name	Value
overall	overall sens	1080

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

September 13, 2006

STATE: Florida

SHRP ID: 0500

Photo 1 - Truck_1_Tractor_TO_15_12_2.70_0500_09_11_06.JPG

Photo 2 - Truck_1_Trailer_TO_15_12_2.70_0500_09_11_06.JPG

Photo 3 - Truck_1_Suspension_1_TO_15_12_2.70_0500_09_11_06.JPG

Photo 4 - Truck_1_Suspension_2_TO_15_12_2.70_0500_09_11_06.JPG

Photo 5 - Truck_1_Suspension_3_TO_15_12_2.70_0500_09_11_06.JPG

Photo 6 - Truck_2 _TO_15_12_2.70_0500_09_13_06.JPG

Photo 7 - Truck_2_Suspension_1_TO_15_12_2.70_0500_09_13_06.JPG

Photo 8 - Truck_2_Suspension_2_TO_15_12_2.70_0500_09_13_06.JPG

Photo 9 - Truck_2_Load_TO_15_12_2.70_0500_09_13_06.JPG

FLORIDA DOT NEW CLASSIFIER AXLE SPACING SCHEME 8-31-06

ORDER	CLASS	VECHICLE DESCRIPTION	# AXLE	SPACING	SPACING	SPACING	SPACING	SPACING	SPACING	SPACING	SPACING
1	1	MOTORCYCLE	2	0.1 - 6.0							
2	2	AUTO , PICKUP	2	6.01- 9.49							
3	5	2 D	2	13.29-23.00							
4	3	OTHER(VAN, RV)	2	9.50-13.28							
5	4	BUS	2	23.01-40.00							
1	8	2S1, 21	3	6.01- 23.0	11.0 - 40.0						
2	4	BUS	3	23.01-40.0	0.1 - 6.0						
3	6	3 AXLE	3	6.01 - 23.0	0.1 - 5.99						
4	5	2D W 1 AXLE TRLR	3	13.29-23.00	6.0 - 28.40						
5	3	OTHER W/1 AXLE TRAILER	3	9.50-13.28	6.0 -28.40						
6	2	AUTO W /1 AXLE TRAILER	3	6.01-9.49	6.0-28.40						
1	8	2S2	4	6.01-23.0	11.0 - 40.0	0.10 - 10.99					
2	8	3S1 , 31	4	6.01 - 23.0	0.1 - 6.0	6.01 - 44.0					
3	7	4 AXLE	4	6.01 - 23.0	0.1 - 6.0	0.1-13.00					
4	5	2D W / 2 AXLE TRLR	4	13.29 - 23.00	6.0 - 28.4	0.1 - 8.7					
5	3	OTHER W/ 2 AXLE TRAILER	4	9.5 - 13.28	6.0 - 28.4	0.1 - 8.7					
6	2	AUTO W / 2 AXLE TRLR	4	6.01-9.49	6.0 - 28.4	0.1 - 8.7					
1	9	3S2	5	6.01 - 26.0	0.1 - 6.0	6.01 - 46.0	0.1 - 12.00				
2	9	32	5	6.01 - 26.0	0.1 - 6.0	6.01- 23.0	11.0 - 27.0				
3	9	2S3(NEW)	5	6.01-27.00	6.01 -46.0	0.1-6.00	0.1-6.00				
4	11	2S12	5	6.00 - 26.0	11.0 - 26.0	6.10 - 20.0	11.01 - 26.0				
5	5	2D W / 3 AXLE TRLR	5	13.29-23.00	6.00-28.40	0.10-8.70	0.10-8.70				
6	3	OTHER W / 3 AXLE TRLR	5	9.50-13.28	6.0-28.40	0.1-8.70	0.10-8.70				
1	10	3S3 , 33	6	6.01 - 26.0	0.1 - 6.0	0.1 - 46.0	0.1 - 11.0	0.1 - 11.0			
2	12	3S12	6	6.01 - 26.0	0.1 - 6.0	11.01 - 26.0	6.01 - 24.0	11.01 - 26.0			
1	10	3S4	7	6.01-21.00	0.1 - 6.0	13.3 - 40.0	0.1 - 6.0	0.1 - 6.0	0.1 - 6.0		
2	10	4S4(NEW)	7	6.01-21.00	0.1 - 6.0	0.1-6.0	13.3-40.0	0.1 - 6.0	0.1- 6.0		
3	13	2S23,3S22,3S13	7	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0		
1	13	3S23	8	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	
1	13	PERMIT	9	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0
	15	ERROR / UNCLASSIFIED	ALL	VEHICLES	NOT MEETING	AXLE CONFIG	SPACINGS	FOR CLASS 1	THROUGH	CLASS 13	
		VEHICLE	AXLE #	ONE-TWO	TWO-THREE	THREE-FOUR	FOUR-FIVE	FIVE-SIX	SIX-SEVEN	SEVEN-EIGHT	EIGHT-NINE

No. of axles: 2

Vehicle type:	1
Axle distance (lower limit):	10
Axle distance (upper limit):	600
Vehicle weight (lower limit):	10
Vehicle weight (upper limit):	0
max. gross weight limit:	8000
Vehicle type:	2
Axle distance (lower limit):	601
Axle distance (upper limit):	949
Vehicle weight (lower limit):	100
Vehicle weight (upper limit):	0
max. gross weight limit:	8000
Vehicle type:	5
Axle distance (lower limit):	1271
Axle distance (upper limit):	2300
Vehicle weight (lower limit):	100
Vehicle weight (upper limit):	0
max. gross weight limit:	8000
Vehicle type:	3
Axle distance (lower limit):	950
Axle distance (upper limit):	1270
Vehicle weight (lower limit):	0
Vehicle weight (upper limit):	0
max. gross weight limit:	8000
Vehicle type:	4
Axle distance (lower limit):	2301
Axle distance (upper limit):	4000
Vehicle weight (lower limit):	1200
Vehicle weight (upper limit):	0
max. gross weight limit:	8000

```
No. of axles: 3

Vehicle type:                        8
Axle distance (lower limit):       601
Axle distance (upper limit):      2300
Axle distance (lower limit):      1100
Axle distance (upper limit):      4000
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

Vehicle type:                        4
Axle distance (lower limit):      2301
Axle distance (upper limit):      4000
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

Vehicle type:                        6
Axle distance (lower limit):       601
Axle distance (upper limit):      2300
Axle distance (lower limit):        10
Axle distance (upper limit):       599
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

Vehicle type:                        5
Axle distance (lower limit):      1271
Axle distance (upper limit):      2300
Axle distance (lower limit):       600
Axle distance (upper limit):      2840
Vehicle weight (lower limit):      100
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

Vehicle type:                        3
Axle distance (lower limit):       950
Axle distance (upper limit):      1270
Axle distance (lower limit):       600
Axle distance (upper limit):      2840
Vehicle weight (lower limit):      100
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

Vehicle type:                        2
Axle distance (lower limit):       601
Axle distance (upper limit):       949
Axle distance (lower limit):       600
Axle distance (upper limit):      2840
Vehicle weight (lower limit):      100
Vehicle weight (upper limit):        0
max. gross weight limit:          8000
```

```
No. of axles: 4
Vehicle type:                          8
Axle distance (lower limit):         601
Axle distance (upper limit):        2300
Axle distance (lower limit):        1100
Axle distance (upper limit):        4000
Axle distance (lower limit):          10
Axle distance (upper limit):        1099
Vehicle weight (lower limit):       1200
Vehicle weight (upper limit):          0
max. gross weight limit:            8000

Vehicle type:                          8
Axle distance (lower limit):         601
Axle distance (upper limit):        2300
Axle distance (lower limit):          10
Axle distance (upper limit):         600
Axle distance (lower limit):         601
Axle distance (upper limit):        4400
Vehicle weight (lower limit):       1200
Vehicle weight (upper limit):          0
max. gross weight limit:            8000

Vehicle type:                          7
Axle distance (lower limit):         601
Axle distance (upper limit):        2300
Axle distance (lower limit):          10
Axle distance (upper limit):         600
Axle distance (lower limit):          10
Axle distance (upper limit):        1300
Vehicle weight (lower limit):       1200
Vehicle weight (upper limit):          0
max. gross weight limit:            8000

Vehicle type:                          5
Axle distance (lower limit):        1271
Axle distance (upper limit):        2300
Axle distance (lower limit):         600
Axle distance (upper limit):        2840
Axle distance (lower limit):          10
Axle distance (upper limit):         870
Vehicle weight (lower limit):        100
Vehicle weight (upper limit):          0
max. gross weight limit:            8000
Vehicle type:                          3
Axle distance (lower limit):         950
Axle distance (upper limit):        1270
Axle distance (lower limit):         600
Axle distance (upper limit):        2840
Axle distance (lower limit):          10
Axle distance (upper limit):         870
Vehicle weight (lower limit):        100
Vehicle weight (upper limit):          0
max. gross weight limit:            8000

Vehicle type:                          2
Axle distance (lower limit):         601
Axle distance (upper limit):         949
Axle distance (lower limit):         600
Axle distance (upper limit):        2840
Axle distance (lower limit):          10
Axle distance (upper limit):         870
Vehicle weight (lower limit):        100
Vehicle weight (upper limit):          0
max. gross weight limit:            8000
```

```
No. of axles: 5

Vehicle type:                        9
Axle distance (lower limit):       601
Axle distance (upper limit):      2600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):       601
Axle distance (upper limit):      4600
Axle distance (lower limit):        10
Axle distance (upper limit):      1090
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

Vehicle type:                        9
Axle distance (lower limit):       601
Axle distance (upper limit):      2600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):       601
Axle distance (upper limit):      2300
Axle distance (lower limit):      1100
Axle distance (upper limit):      2700
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

Vehicle type:                        9
Axle distance (lower limit):       601
Axle distance (upper limit):      2600
Axle distance (lower limit):       601
Axle distance (upper limit):      4600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000


Vehicle type:                       11
Axle distance (lower limit):       601
Axle distance (upper limit):      2600
Axle distance (lower limit):      1100
Axle distance (upper limit):      2600
Axle distance (lower limit):       610
Axle distance (upper limit):      2000
Axle distance (lower limit):      1101
Axle distance (upper limit):      2600
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000
Vehicle type:                        5
Axle distance (lower limit):      1271
Axle distance (upper limit):      2300
Axle distance (lower limit):       600
Axle distance (upper limit):      2840
Axle distance (lower limit):        10
Axle distance (upper limit):       870
Axle distance (lower limit):        10
Axle distance (upper limit):       870
Vehicle weight (lower limit):      100
Vehicle weight (upper limit):        0
max. gross weight limit:          8000
```

```
Vehicle type:                        3
Axle distance (lower limit):       950
Axle distance (upper limit):      1270
Axle distance (lower limit):       600
Axle distance (upper limit):      2840
Axle distance (lower limit):        10
Axle distance (upper limit):       870
Axle distance (lower limit):        10
Axle distance (upper limit):       870
Vehicle weight (lower limit):      100
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

No. of axles: 6

Vehicle type:                       10
Axle distance (lower limit):       601
Axle distance (upper limit):      2600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):        10
Axle distance (upper limit):      4600
Axle distance (lower limit):        10
Axle distance (upper limit):      1100
Axle distance (lower limit):        10
Axle distance (upper limit):      1100
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000

Vehicle type:                       12
Axle distance (lower limit):       601
Axle distance (upper limit):      2600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):      1101
Axle distance (upper limit):      2600
Axle distance (lower limit):       601
Axle distance (upper limit):      2400
Axle distance (lower limit):      1101
Axle distance (upper limit):      2600
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000
```

```
No. of axles: 7

Vehicle type:                     10
Axle distance (lower limit):     601
Axle distance (upper limit):    1670
Axle distance (lower limit):      10
Axle distance (upper limit):     600
Axle distance (lower limit):    1330
Axle distance (upper limit):    4000
Axle distance (lower limit):      10
Axle distance (upper limit):     600
Axle distance (lower limit):      10
Axle distance (upper limit):     600
Axle distance (lower limit):      10
Axle distance (upper limit):     600
Vehicle weight (lower limit):   1200
Vehicle weight (upper limit):      0
max. gross weight limit:        8000

Vehicle type:                     10
Axle distance (lower limit):     601
Axle distance (upper limit):    1670
Axle distance (lower limit):      10
Axle distance (upper limit):     600
Axle distance (lower limit):      10
Axle distance (upper limit):     600
Axle distance (lower limit):    1330
Axle distance (upper limit):    4000
Axle distance (lower limit):      10
Axle distance (upper limit):     600
Axle distance (lower limit):      10
Axle distance (upper limit):     600
Vehicle weight (lower limit):   1200
Vehicle weight (upper limit):      0
max. gross weight limit:        8000

Vehicle type:                     13
Axle distance (lower limit):     100
Axle distance (upper limit):    4500
Axle distance (lower limit):     100
Axle distance (upper limit):    4500
Axle distance (lower limit):     100
Axle distance (upper limit):    4500
Axle distance (lower limit):     100
Axle distance (upper limit):    4500
Axle distance (lower limit):     100
Axle distance (upper limit):    4500
Axle distance (lower limit):     100
Axle distance (upper limit):    4500
Vehicle weight (lower limit):   1200
Vehicle weight (upper limit):      0
max. gross weight limit:        8000
```

No. of axles: 8

```
Vehicle type:                       10
Axle distance (lower limit):       601
Axle distance (upper limit):      1670
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):      1330
Axle distance (upper limit):      4000
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Axle distance (lower limit):        10
Axle distance (upper limit):       600
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000
```

```
Vehicle type:                       13
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000
```

No. of axles: 9

```
Vehicle type:                       13
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Axle distance (lower limit):       100
Axle distance (upper limit):      4500
Vehicle weight (lower limit):     1200
Vehicle weight (upper limit):        0
max. gross weight limit:          8000
```