Validation Report

Texas, SPS 480100

Task Order 13, CLIN 2
May 9 through 11, 2006

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1 Executive Summary

A visit was made to the Texas SPS-1 beginning on May 9, 2006 and continuing through May 11, 2006 for the purposes of conducting a Validation of the WIM system located on US 281, 9.1 miles north of State Route 186, near Edinburg, TX. The validation procedures were in accordance with LTPP's Data Collection Guide dated August 31, 2001.

The site is instrumented with PAT bending plate and loop sensors with DAW-190 electronics.

The agency advised that they were utilizing the Texas 6 classification scheme for this set of sensors; however the classification algorithm programmed into the equipment does not appear to be the standard Texas 6 scheme, nor does it appear to be a modified FHWA 13-bin scheme.

The sensors are installed in the southbound direction in the outside (rightmost) lane. The controller identifies the LTPP lane as Lane #4. At the time of the installation of the LTPP lane, the State also instrumented the other southbound lane as well as the two northbound lanes at this location. They also installed Kistler quartz piezo sensors in the LTPP lane approximately 11 feet south of the trailing edge of the downstream bending plate sensor for this lane (this equipment is identified as SPS 480199 and was validated as an additional lane.)

The site was installed in February 2005 as part of a relocation and replacement of the WIM System sensors and equipment for the SPS-1 site. The WIM controller is housed in a shared cabinet along with the controller for the 0199 site. The sensors were installed in newly constructed portland cement concrete that was ground for smoothness prior to the installation.

This is the second validation visit to this site. Our last validation visit was completed on April 28, 2005. Since the last validation, the leading weigh pad WIM sensor was replaced. These repairs were conducted during the week of April 10, 2006.

This site meets LTPP precision requirements for weight and spacing. The site does not meet LTPP precision requirements for speed measurement. This is not considered sufficient to disqualify the site as having research quality data.

The classification algorithm indicates that the site is NOT currently classifying vehicles in either the FHWA 13-bin scheme or the Texas 6 scheme. The validation was performed according to the assumption that a 5-axle tractor trailer should be reported as a 10 and a 6-axle tractor-trailer as an 11.

The validation used the following trucks:

1) 3S2 with tractor having air suspension tandem and a trailer with a standard tandem and air suspension, loaded to 78,200 lbs.
2) 3S3 with a tractor having a walking beam tandem and a trailer with a tridem and air suspension, loaded to 75,900 lbs.
3) 3S2 with a tractor having an air suspension tandem and a trailer with standard rear tandem and air suspension, loaded to 56,500 lbs.

The validation speeds ranged from 49 to 72 miles per hour. The site is currently posted with a speed limit of 70 miles per hour.

The pavement temperatures ranged from 97 to approximately 142 degrees Fahrenheit.

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. There was a slight apparent dip in the left wheelpath of the asphalt pavement immediately prior to the concrete pad in which the WIM equipment was installed. Any movements in truck suspensions caused by this dip appeared to have dampened before the vehicles reached the WIM scale location.

Table 1-1 Post-Validation results – 480100 – 10-May-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.6% ± 5.7%	Pass
Tandem axles	±15 percent	-0.1% ± 8.7%	Pass
Tridem Axles	±15 percent	2.4% ± 2.8%	Pass
Axle Groups	±15 percent	0.2% ± 8.4%	Pass
GVW	±10 percent	-0.5% ± - 3.6%	Pass
Speed	**±1 mph [2 km/hr]**	**1.1 ± 2.2 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

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%	97%	Pass
GVW	± 10%	100%	Pass

2 Corrective Actions Recommended

The classification scheme being used at the site was identified as the Texas 6 by the agency; however the classification algorithm actually being used does not appear to be supporting the Texas 6 classification scheme. A review of the algorithm needs to be conducted to make corrections so that the vehicle classes are designated according to the Texas 6 classification scheme.

3 Post-Calibration Analysis

This final analysis is based on test runs conducted May 10, 2006 from early to mid-afternoon at test site 480100 on US Route 281. This SPS-1 site is located in Hidalgo County 9.1 miles north of State Route 186 on the southbound, right hand lane of a divided four-lane facility. It is identified in the WIM controller as Lane #4. No auto-calibration was used during test runs.

The three trucks used for initial calibration and for the subsequent testing included:

1) 3S2 with tractor having air suspension tandem and a trailer with a standard tandem and air suspension, loaded to 78,200 lbs.
2) 3S3 with a tractor having a walking beam tandem and a trailer with a tridem and air suspension, loaded to 75,900 lbs.
3) 3S2 with a tractor having an air suspension tandem and a trailer with standard rear tandem and air suspension, loaded to 56,500 lbs.

Each truck made between 9 (Loaded 3S3) and 16 (Golden 3S2 and Partial 3S2) passes over the WIM scale at speeds ranging from 49 to 72 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from 97 to 142 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 and spacing. It did not meet the requirements for speed. This is not considered sufficient to preclude the site from producing research quality data.

Since the axle spacing measurements (which are dependant on accurate speed measurements) did meet the performance requirements, it is possible that the failure of speed measurements is the result of errors in the speed values that were obtained by radar to which the WIM equipment output was compared or that the classification algorithm as programmed into the equipment may be affecting the speed computations of the equipment.

Table 3-1 Post-Validation Results - 480100 – 10-May-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.6% ± 5.7%	Pass
Tandem axles	±15 percent	-0.1% ± 8.7%	Pass
Tridem Axles	±15 percent	2.4% ± 2.8%	Pass
Axle Groups	±15 percent	0.2% ± 8.4%	Pass
GVW	±10 percent	-0.5% ±- 3.6%	Pass
Speed	**±1 mph [2 km/hr]**	**1.1 ± 2.2 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

The test runs were conducted mostly in the early afternoon resulting in very high pavement temperatures. Some precipitation near the end of testing brought some relatively cooler temperatures for a few runs. The runs were made at various speeds to determine the effects of this variable on WIM scale performance. The data was divided into three speed and three temperature groups.

The speed groups were divided as follows: Low speed – 49 to 55 mph, Medium speed – 56 to 65 mph and High speed – 66+ mph. The three temperature groups were created by splitting the runs between those at 97 to 105 degrees Fahrenheit for Low temperature, 106 to 130 degrees Fahrenheit for Medium temperature and 131 to 142 degrees Fahrenheit for High temperature.

The distribution of runs by speed and temperature is illustrated in Figure 3-1. The desired speed and temperature ranges were achieved for this set of evaluation runs.

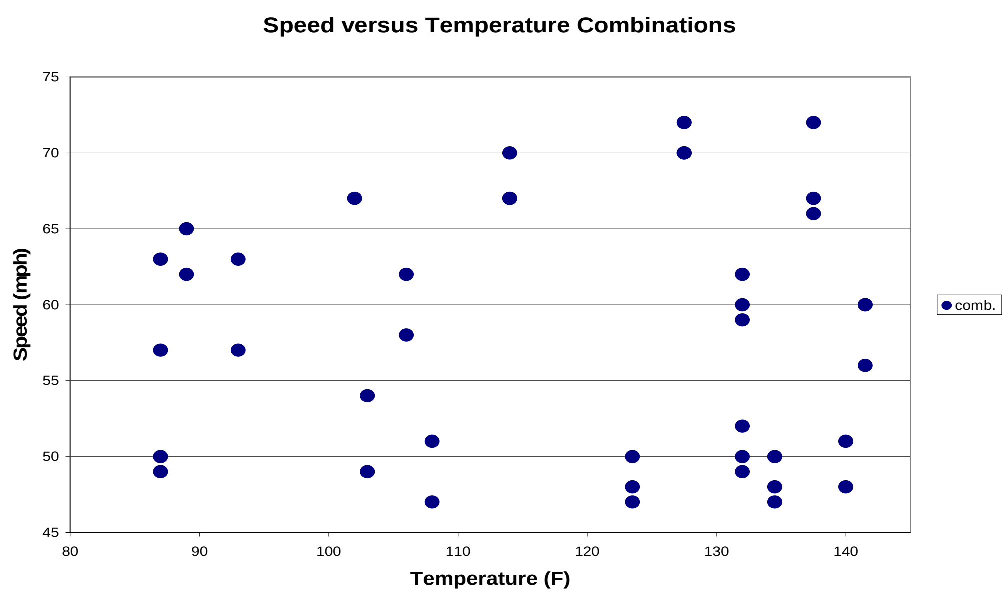


Figure 3-1 Post-Validation Speed-Temperature Distribution – 480100 – 10-May-2006

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.

This figure shows some increase in variability of GVW errors at higher speeds. Mean errors are very close to zero and do not change with changes in vehicle speed.

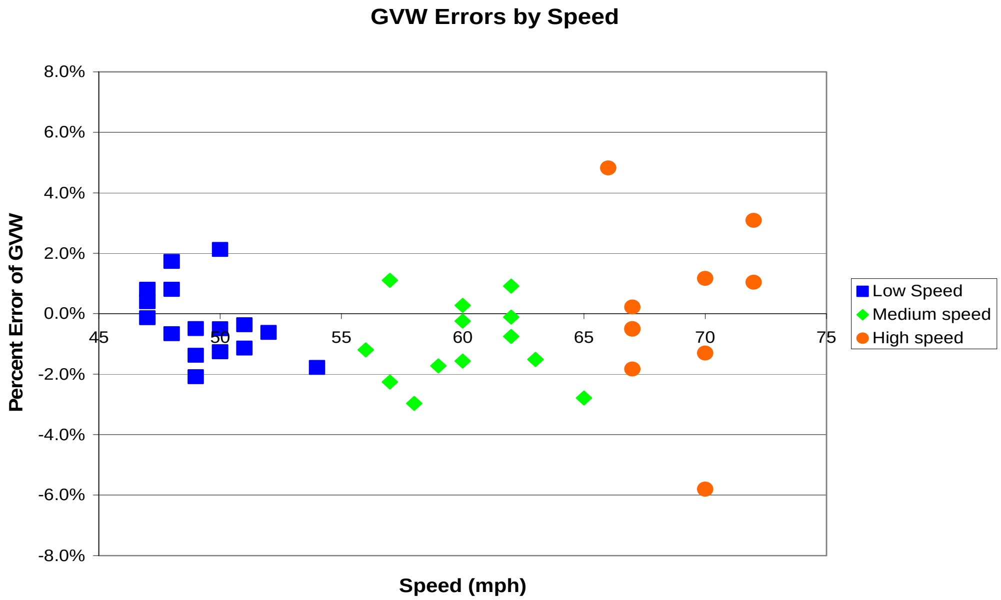


Figure 3-2 Post-Validation GVW Percent Error vs. Speed – 480100 –10-May-2006

Figure 3-3 shows the relationship between temperature and GVW percentage error. Errors tend to trend very slightly higher with increases in temperature. Mean errors are close to zero over the entire range.

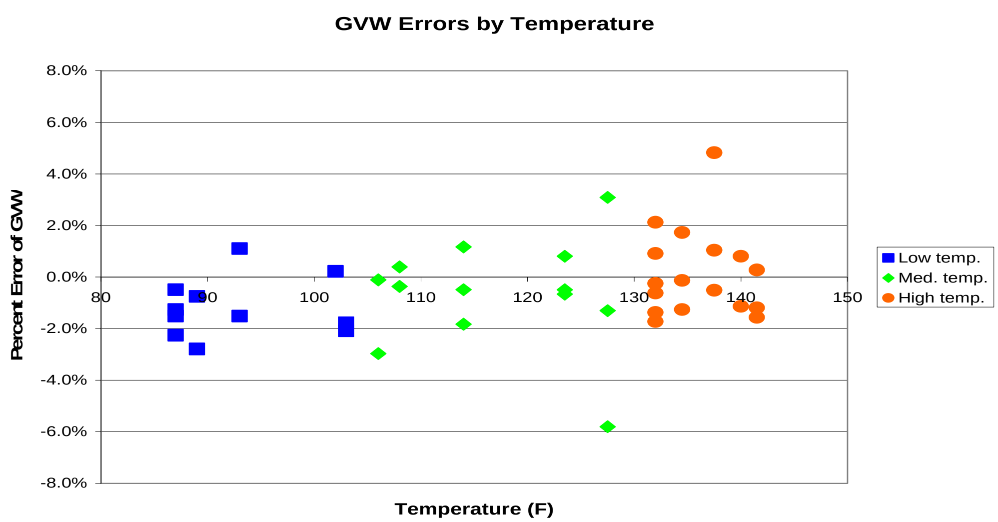


Figure 3-3 Post-Validation GVW Percent Error vs. Temperature – 480100 – 10-May-2006

Figure 3-4 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. For this site, both Class 9 and Class 10 drive tandems were plotted.

Axle spacing errors appear to be symmetrical and are limited to maximums of about 5 inches (0.4 feet). Vehicle speed has no apparent influence on the error of measured axle spacing.

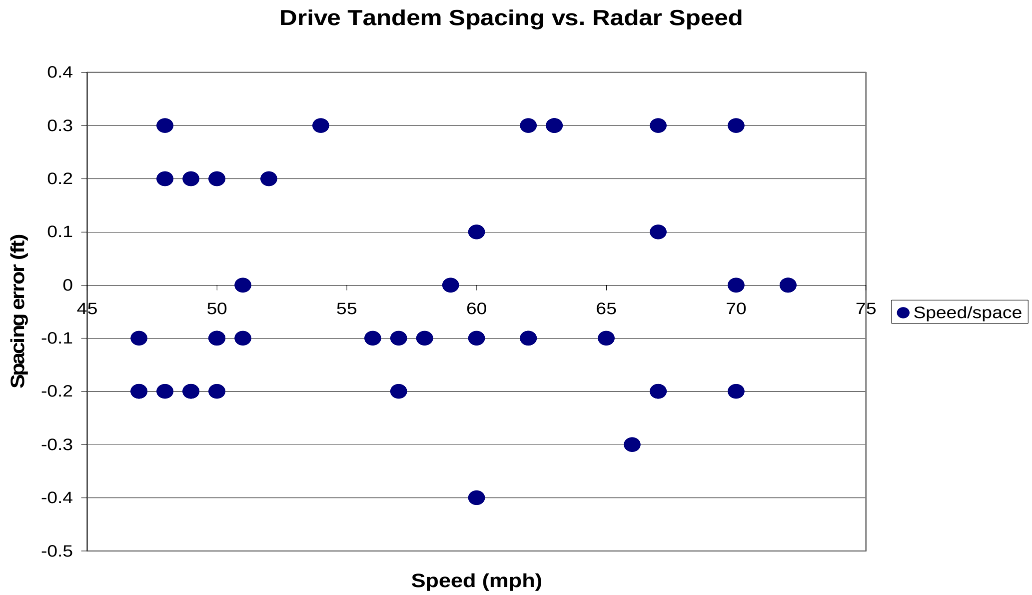


Figure 3-4 Post-Validation Spacing vs. Speed - 480100 – 10-May-2006

3.1 Temperature-Based Analysis

The three temperature groups were created by splitting the runs between those at 97 to 105 degrees Fahrenheit for Low temperature, 106 to 130 degrees Fahrenheit for Medium temperature and 131 to 142 degrees Fahrenheit for High temperature.

Table 3-2 shows small negative mean errors in most axle weights. Not shown are the results for tridem axles at low temperatures since there were not enough observations to calculate the statistics. The result is GVW mean errors that are near zero. Changes in temperature had little effect. However, lower temperatures did appear to result in slightly lower variability in axle weight and speed errors.

Table 3-2 Post-Validation Results by Temperature Bin – 480100 –10-May-2006

Element	**95% Limit**	**Low Temperature 97-105 °F**	**Medium Temperature 106-130 °F**	**High Temperature 131-142 °F**
Steering axles	±20 %	-3.2 ± 3.9%	-2.3 ± 6.8%	-2.5 ± 6.8%
Tandem axles	±15 %	-0.8 ± 6.4%	-0.7 ± 10.0%	1.0 ± 9.8%
Tridem axles	±15 %	n/a	2.2 ± 3.9%	2.5 ± 3.6%
Axle Groups	±15 %	-0.8 ± 6.4%	-0.4 ± 9.5%	1.3 ± 8.9%
GVW	±10 %	-1.2 ± 2.5%	-0.7 ± 4.6%	0.1 ± 3.6%
Speed	**±1 mph**	**0.4 +1.1 mph**	**1.6 + 2.6 mph**	**1.2 + 2.2 mph**
Axle spacing	± 0.5 ft	0.0 + 0.0 ft	0.0 + 0.1 ft	0.0 + 0.1 ft

Figure 3-5 shows the distribution of GVW errors versus temperature by truck. Note that the loaded 3S3 has no low temperature runs. This is because the truck was low on fuel and was forced to leave early before the precipitation lowered the pavement temperatures near the end of the day. The partially loaded 3S2 (triangles) showed an increase in GVW error variability at higher temperatures that did not appear to affect the other test vehicles.

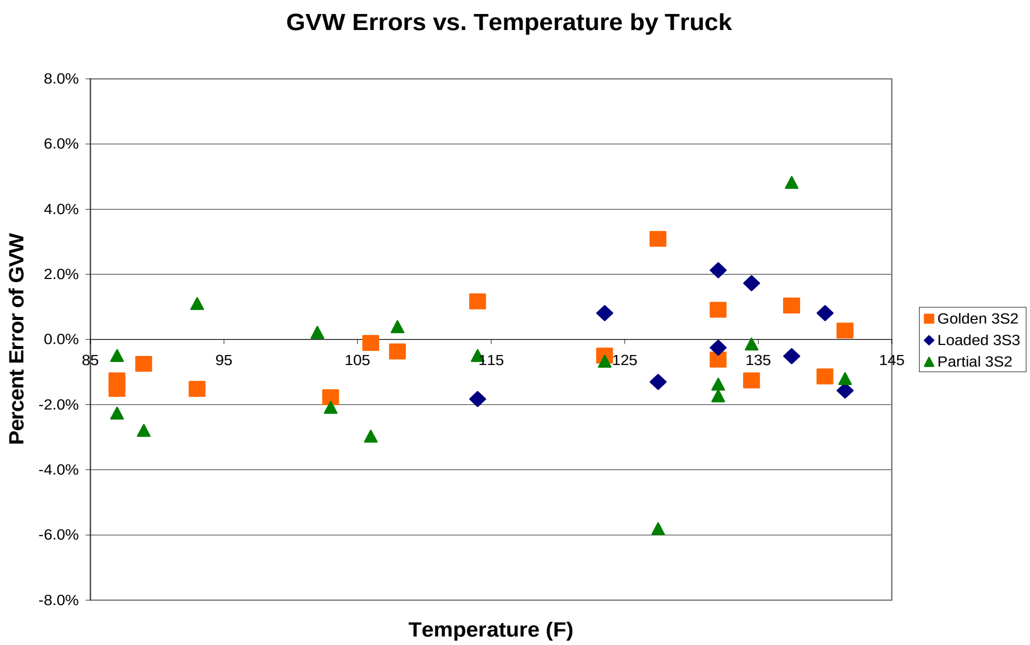


Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 480100 – 10-May-2006

Figure 3-6 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 both Class 9 and Class 10 vehicles. Steering axle errors are slightly negative throughout the range of temperatures and their variability increases very slightly at pavement temperatures above 125 degrees Fahrenheit.

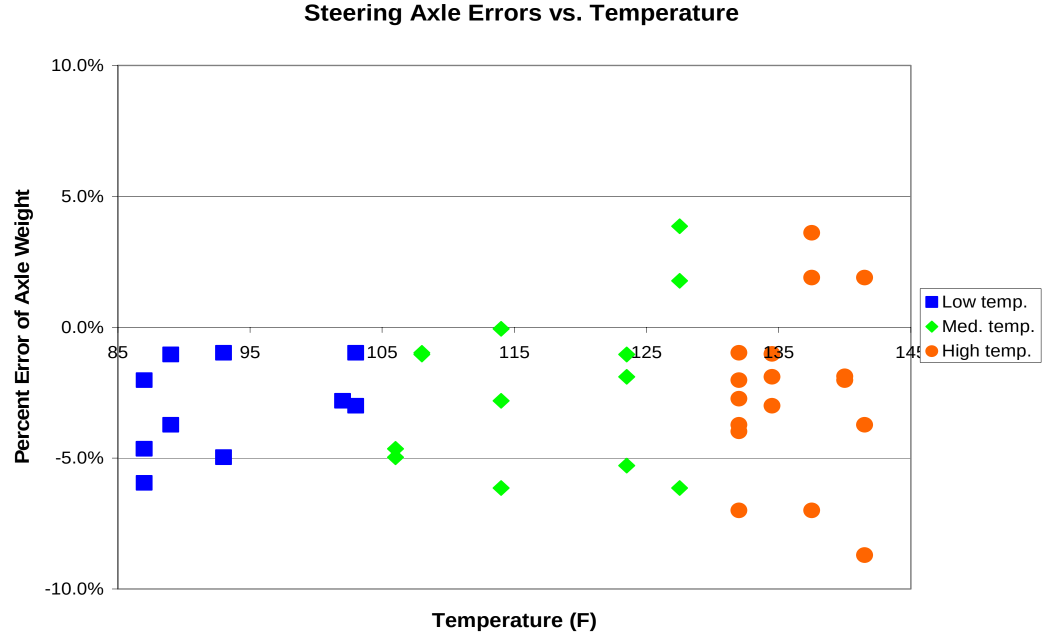


Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group - 480100 –10-May-2006

3.2 Speed-Based Analysis

The speed groups were divided as follows: Low speed – 49 to 55 mph, Medium speed – 56 to 65 mph and High speed – 66+ mph.

Table 3-3 Post-Validation Results by Speed Bin – 480100 – 10-May-2006

Element	95% Limit	Low Speed 49 to 55 mph	Medium Speed 56 to 65 mph	High Speed 66+ mph
Steering axles	±20 %	-2.5 ± 3.3%	-3.5 ± 5.9%	-1.4 ± 9.4%
Tandem axles	±15 %	0.5 ± 6.5%	-0.6 ± 5.7%	0.1 ± 12.2%
Tridem axles	±15 %	2.4 ± 1.8%	1.5 ± 16.4%	2.9 ± 7.9%
Axle Groups	±15 %	0.5 ± 6.5%	-0.6 ± 5.7%	0.1 ± 12.2%
GVW	±10 %	-0.3 ± 2.5%	-1.0 ± 2.8%	0.0 ± 6.5%
Speed	**±1 mph**	**1.1 ± 2.1 mph**	**0.9 ± 2.1 mph**	**1.4 ± 3.1 mph**
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

It appears that the WIM equipment at this site underestimates steering axle weights by a very small amount consistently throughout the speed range. The mean errors for other axle groups, for GVW and for axle spacing are very close to zero. There is an increase in variability of all weights at higher speeds.

Figure 3-7 illustrates the effect of speed on the GVW estimates for each of the individual trucks. The increased variability at higher speeds is due mostly to the lightly loaded truck (partial 3S2 - triangles).

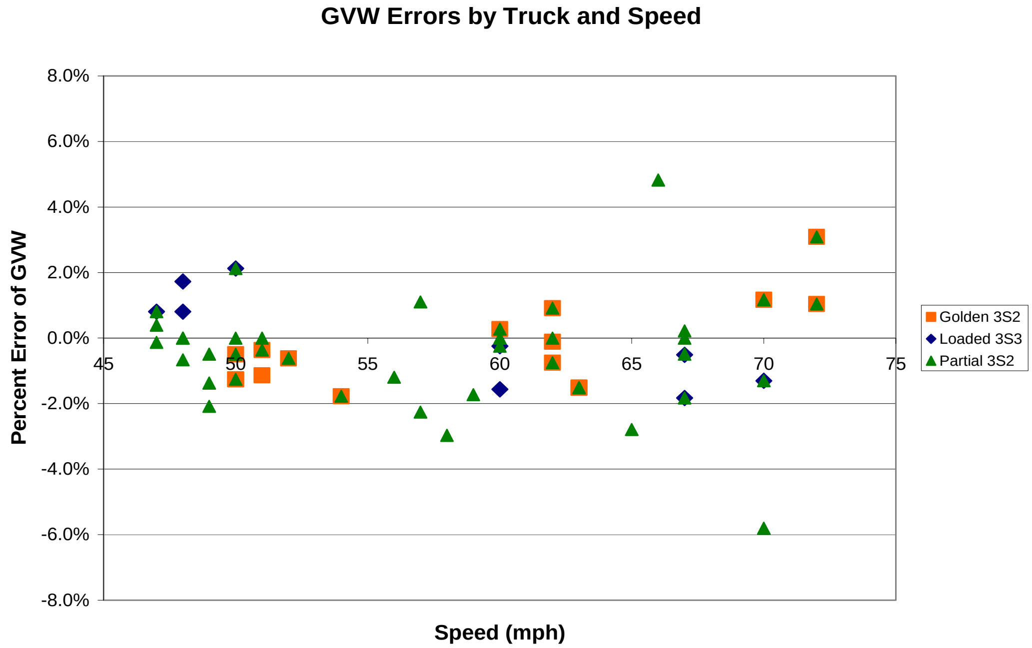


Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 480100 –10-May-2006

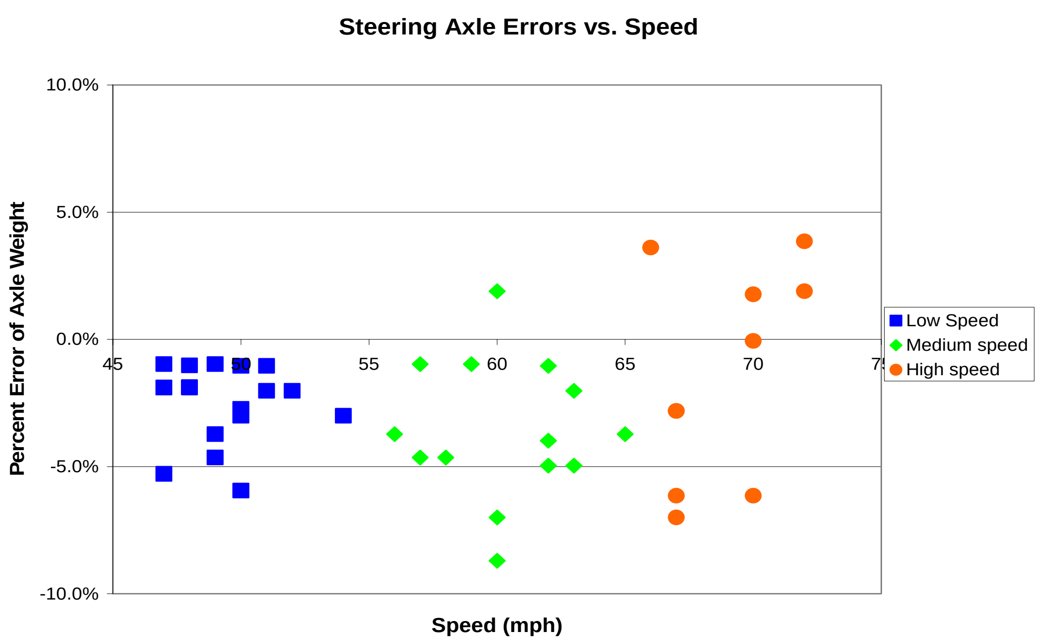


Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group – 480100 –10-May-2006

Figure 3-8 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 10 vehicles.

This figure shows that there is some small increase in steering axle weight error variability at higher speeds but that the mean stays between -1.5 and -3.5 percent over the entire range of speeds.

Figure 3-9 shows that speed influenced steering axle errors differently on each truck. The trend for the two 3S2s (squares and triangles) was upwards and for the 3S3 (diamonds) downwards.

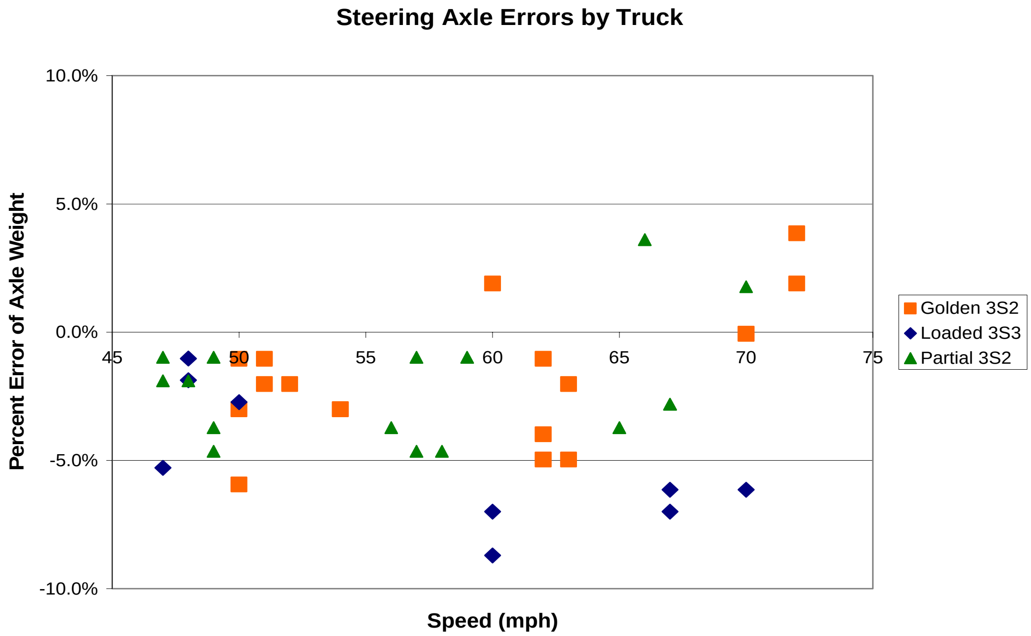


Figure 3-9 Post-Validation Steering Axle Error by Truck and Speed – 480100 –10-May-2006

3.3 Classification Validation

There were no changes made to the calibration of this equipment during the course of the validation. Hence, no additional post-calibration classification validation was required. The results of the initial classification validation can be found in section 6.3 of this document.

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%	97%	Pass
GVW	± 10%	100%	Pass

4 Pavement Discussion

The sensors are installed in newly constructed portland concrete cement which was ground for smoothness prior to the installation.

The pavement smoothness did not contribute to out-of-range results.

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

It was observed that the pavement condition did influence truck movement near the upstream interface between the asphalt concrete pavement and the PCC slab. However this movement was damped before the trucks reached the WIM 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.

For this Texas SPS-1 WIM site, the WIM scale is comprised of two staggered bending plates. The leading plate was installed on the right half of the lane and the tailing plate was installed on the left. The distance between these two plates is about 4.8 meters (16 feet). As the midpoint of these two bending plates is 274.5 meters from the beginning of the test section, the leading and trailing plates are located at 272.1 and 276.9 meters, respectively, from the starting point of the profiling.

Profile data collected at the SPS WIM location by Furgo-BRE, Inc. on May 27, 2005 were processed through the LTPP SPS WIM Index software, version 1.0. This WIM scale is installed on a portland cement concrete pavement.

A total of 11 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 5 passes at the center of the lane, 3 passes shifted to the left side of the lane, and 3 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, version 1.0 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 SRI	0.75	2.9
Peak LRI	0.50	2.1

Table 4-2 shows the computed index values for all 11 profiler passes for this WIM site. The index values for the left wheel path were calculated at 276.9 m from the beginning of the test section while the index values on the right wheel path were calculated at 272.1 m from the beginning of the test section. The average values of 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 lower limits are presented in *italics*. Values above the upper limits are in **bold**.

Table 4-2 WIM Index Values - 480100 –27-May-2005

<table>
<tr><th colspan="3">Profiler Passes</th><th>Pass 1</th><th>Pass 2</th><th>Pass 3</th><th>Pass 4</th><th>Pass 5</th><th>Ave.</th></tr>
<tr><td rowspan="8">Center</td><td rowspan="4">LWP</td><td>LRI (m/km)</td><td>0.860</td><td>0.913</td><td>0.917</td><td>0.870</td><td>0.960</td><td>0.904</td></tr>
<tr><td>SRI (m/km)</td><td>0.799</td><td>0.712</td><td>0.775</td><td>0.686</td><td>0.901</td><td>0.775</td></tr>
<tr><td>Peak LRI (m/km)</td><td>0.899</td><td>0.961</td><td>1.052</td><td>0.964</td><td>0.989</td><td>0.973</td></tr>
<tr><td>Peak SRI (m/km)</td><td>0.926</td><td>0.927</td><td>1.004</td><td>0.918</td><td>1.066</td><td>0.968</td></tr>
<tr><td rowspan="4">RWP</td><td>LRI (m/km)</td><td>1.124</td><td>1.076</td><td>1.132</td><td>0.785</td><td>1.106</td><td>1.045</td></tr>
<tr><td>SRI (m/km)</td><td>1.180</td><td>1.355</td><td>1.982</td><td>0.683</td><td>0.967</td><td>1.233</td></tr>
<tr><td>Peak LRI (m/km)</td><td>1.150</td><td>1.078</td><td>1.142</td><td>1.054</td><td>1.196</td><td>1.124</td></tr>
<tr><td>Peak SRI (m/km)</td><td>1.283</td><td>1.474</td><td>2.136</td><td>0.782</td><td>1.026</td><td>1.340</td></tr>
</table>

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Ave.**
Left Shift	LWP	LRI (m/km)	1.029	0.827	1.013			0.956
		SRI (m/km)	1.166	0.963	1.088			1.072
		Peak LRI (m/km)	1.089	0.867	1.021			0.992
		Peak SRI (m/km)	1.366	1.091	1.088			1.182
	RWP	LRI (m/km)	1.103	1.221	1.181			1.168
		SRI (m/km)	1.133	1.220	1.416			1.256
		Peak LRI (m/km)	1.202	1.306	1.224			1.244
		Peak SRI (m/km)	1.420	1.483	1.519			1.474
Right Shift	LWP	LRI (m/km)	1.087	0.874	1.092			1.018
		SRI (m/km)	1.012	0.850	1.013			0.958
		Peak LRI (m/km)	1.313	0.913	1.277			1.168
		Peak SRI (m/km)	1.033	0.894	1.143			1.023
	RWP	LRI (m/km)	1.191	0.925	1.249			1.122
		SRI (m/km)	1.342	1.363	1.457			1.387
		Peak LRI (m/km)	1.279	1.026	1.290			1.198
		Peak SRI (m/km)	1.342	1.374	1.479			1.398

From Table 4-2 it can be seen that all indices computed from the profiles are between the upper and the lower threshold values. 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. Based on the profile data analysis, the Texas SPS-1 WIM site does not meet the requirements for WIM site locations. No remedial action is suggested since this site has met the performance criteria for loading and grinding was just performed on this site. It should be noted that the grinding makes it less likely that the resulting profile index values will be below the performance threshold (lower index limit.)

Before pavement grinding, a total of 5 profiler passes were conducted for the same site. Table 4-3 gives the computed index values for those passes. The results show that except that 5 out of 40 index values were larger than the upper limits, all of the index values were between the upper and lower threshold values. 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.

Table 4-3 WIM Index Values - 480100 – 21-January-2005

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Ave.**
Center	LWP	LRI (m/km)	1.915	1.903	1.881	1.900
		SRI (m/km)	0.849	0.830	0.994	0.891
		Peak LRI (m/km)	1.915	1.904	1.881	1.900
		Peak SRI (m/km)	1.844	1.822	1.861	1.842
	RWP	LRI (m/km)	1.317	1.420	1.316	1.351
		SRI (m/km)	1.922	1.809	1.511	1.747
		Peak LRI (m/km)	1.319	1.426	1.321	1.355
		Peak SRI (m/km)	2.489	2.207	2.415	2.370

Profiler Passes			Pass 1	Pass 2	Pass 3	Ave.
Left Shift	LWP	LRI (m/km)	1.997			
		SRI (m/km)	2.056			
		Peak LRI (m/km)	2.018			
		Peak SRI (m/km)	**3.184**			
	RWP	LRI (m/km)	1.483			
		SRI (m/km)	**2.588**			
		Peak LRI (m/km)	1.483			
		Peak SRI (m/km)	2.753			
Right Shift	LWP	LRI (m/km)	1.837			
		SRI (m/km)	0.703			
		Peak LRI (m/km)	1.843			
		Peak SRI (m/km)	1.972			
	RWP	LRI (m/km)	**2.155**			
		SRI (m/km)	1.480			
		Peak LRI (m/km)	**2.155**			
		Peak SRI (m/km)	**3.647**			

Comparison of the index values in Table 4-2 and Table 4-3 also show that some significant reductions (up to 50% improvement) of the index values were observed since the previous profile trip. Therefore, it can be concluded that pavement grinding on Texas SPS-1 WIM site did improve pavement smoothness to a great extent.

4.2 Distress Survey and any applicable photos

During the visit, a site pavement distress survey was conducted from 400 feet prior to the WIM scales to 100 feet following the WIM scales. No major distresses in the approach area, the WIM scale area or the exit area were observed with the exception of the items noted below.

4.3 Vehicle-pavement interaction discussion

All sensors are installed in a Portland cement concrete slab. Pavement condition in the area near these sensors is excellent with no significant distress of any kind. The asphalt concrete surface beyond this slab has little rutting and few other distresses. However, there is a transverse crack near the interface between the AC and PCC surfaces and a slight dip has developed in the left wheel path of the AC pavement immediately prior to the PCC slab. The truck traffic shows some suspension movement at this area but it dampens by the time these vehicles reach the WIM scale. Figure 4-1 and Figure 4-2 show the area near the WIM sensors.

Vehicles display no bouncing as they pass over the scale. They appear to track straight over the wheel paths with no sign of weaving. As noted previously, there was some suspension movement as the trucks passed over the AC and PCC pavement surfaces upstream of the WIM scale but this movement was no longer visible before the vehicles reached the WIM scale.

Figure 4-1 Photo of the WIM Sensors – Downstream View – 480100 – 10-May-2006

Figure 4-2 Photo of the AC/PCC Pavement Interface - 480100 - 09-May-2006

5 Equipment Discussion

The traffic monitoring equipment at this location includes two vehicle detection loops in the center of the southbound lane, longitudinally separated by 12 feet. Two bending plates are installed in the right and left wheel paths, offset longitudinally by 17 feet.

These sensors are installed such that the first loop is followed by a bending plate, then the other loop and finally the last bending plate. These sensors are installed in a PCC pavement section. The roadway outside this short section is asphalt. The controller is a PAT model DAW-190 that is also used to collect WIM and classification information from similar equipment installed on each of the other three lanes.

The leading weigh pad WIM sensor was replaced during the week of April 10, 2006. There were no other changes in basic equipment operating conditions since the completion of the last validation visit completed on April 28, 2005.

5.1 Pre-Evaluation Diagnostics

A complete electronic check of all system components including in-road sensors, electrical power and telephone service was performed at the time of the validation. All sensors and system components were found to be within operating parameters.

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

5.2 Calibration Process

The equipment required no iterations of the calibration process between the initial 43 runs and the final 41 runs. Both the initial and final runs produced excellent results from the WIM equipment at this site.

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 5-1 has the information found in TRF_CALIBRATION_AVC for site visits and Sheet 16s submitted prior to this validation.

Table 5-1 Classification Validation History - 480100 – 9-May-2006

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Class 5	Class 10	
5-09-06	No. of Trucks	-3.0			0	2
4-27-05	No. of Trucks	0		-13.0		0
4-26-05	No. of Trucks	-5.0				0

Table 5-2 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 5-2 Weight Validation History – 480100 – 10-May-2006

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
5-10-06	Test Trucks	-0.5% (1.8)	-2.6% (2.8)	-0.1% (4.4)
5-09-06	Test Trucks	0.5% (2.4)	-2.4% (2.2)	1.2% (6.1)
4-27-05	Test Trucks	1.4% (1.3)	-4.9% (3.1)	1.8% (3.3)
4-26-05	Test Trucks	0.5% (2.0)	-2.5% (2.5)	0.5% (3.4)

5.4 Projected Maintenance/Replacement Requirements

No corrective measures need to be performed at this time to the equipment or the pavement; with the exception of the corrections to the classification algorithm installed.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted May 9, 2006 from late morning until early evening at test site 480100 on US Route 281. This SPS-1 site is located in Hidalgo County 9.1 miles north of State Highway 186 on the southbound, right hand lane of a divided four-lane facility. No auto-calibration was used during test runs.

The trucks used for initial calibration and for the subsequent testing included:

1. 3S2 with tractor having air suspension tandem and a trailer with a standard tandem and air suspension, loaded to 78,200 lbs.
2. 3S3 with a tractor having a walking beam tandem and a trailer with a tridem and air suspension, loaded to 76,100 lbs.
3. 3S2 with a tractor having an air suspension tandem and a trailer with standard rear tandem and air suspension, loaded to 56,100 lbs.

Each truck made between 11 (the partial 3S2) and 16 (the Golden 3S2 and the loaded 3S3) passes over the WIM scale at speeds ranging from 49 to 70 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from 88 to 108 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are in Table 6-1.

Table 6-1 Pre-Validation Results - 480100 – 09-May-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.4 ± 4.3%	Pass
Tandem axles	±15 percent	1.2 ± 12.2%	Pass
Tridem axles	±15 percent	2.7 ± 4.9%	Pass
Axle Groups	±15 percent	1.5 ± 11.2 %	Pass
GVW	±10 percent	0.5 ± 4.9%	Pass
Speed	**±1 mph [2 km/hr]**	**0.9 ± 2.7 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

This site meets all precision requirements except speed measurements. This is not considered sufficient to preclude the site from producing research quality data. Since axle spacing measurements (which are dependant on accurate speed measurements) did meet these requirements, it is likely that the failure of speed measurements to do so is the result of errors in the speed values obtained by radar to which the WIM output was compared or that the classification algorithm as programmed into the equipment may be affecting the speed computations of the equipment. Since weight precision requirements were met, no calibration of the weight sensors was warranted.

The test runs were conducted in late morning and early afternoon resulting in a narrower than desired range of pavement temperatures. The runs were conducted at various speeds to determine the effects of this variable on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and two temperature groups. The range of pavement surface temperatures encountered during the tests was insufficient to allow for three temperature ranges. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that the desired distribution of speed and temperature combinations was not achieved for this set of validation runs. The shortcoming was a very narrow band of temperature values.

The speed groups were divided as follows: Low speed – 49 to 55 mph, Medium speed – 56 to 65 mph and High speed – 66+ mph. The three temperature groups were created by splitting the runs between those at 88 to 98 degrees Fahrenheit for Low temperature, 99 to 108 degrees Fahrenheit for High temperature. There were no Medium temperature readings since the range of temperatures spanned less than 30 degrees Fahrenheit.

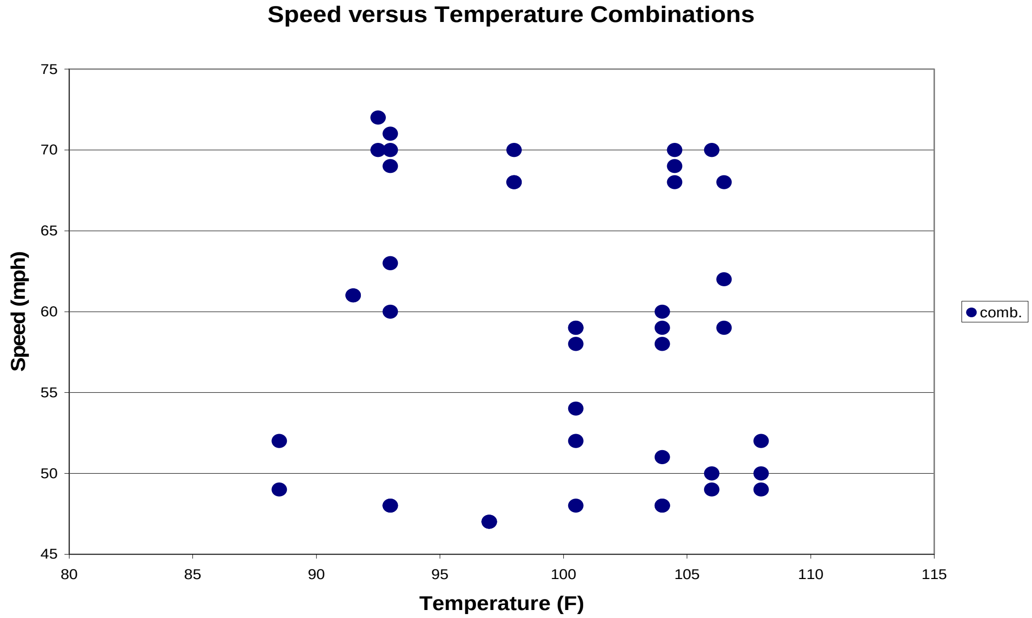


Figure 6-1 Pre-Validation Speed-Temperature Distribution – 480100 – 09-May-2006

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. GVW appears to be measured accurately over the entire range of speeds. Most measurement errors were within +/-3% but there is a single anomalous measurement of the partially loaded 3S2 at 69 mph where the recorded GVW is over 6% higher than the statically measured weight. The cause of this single instance is unknown.

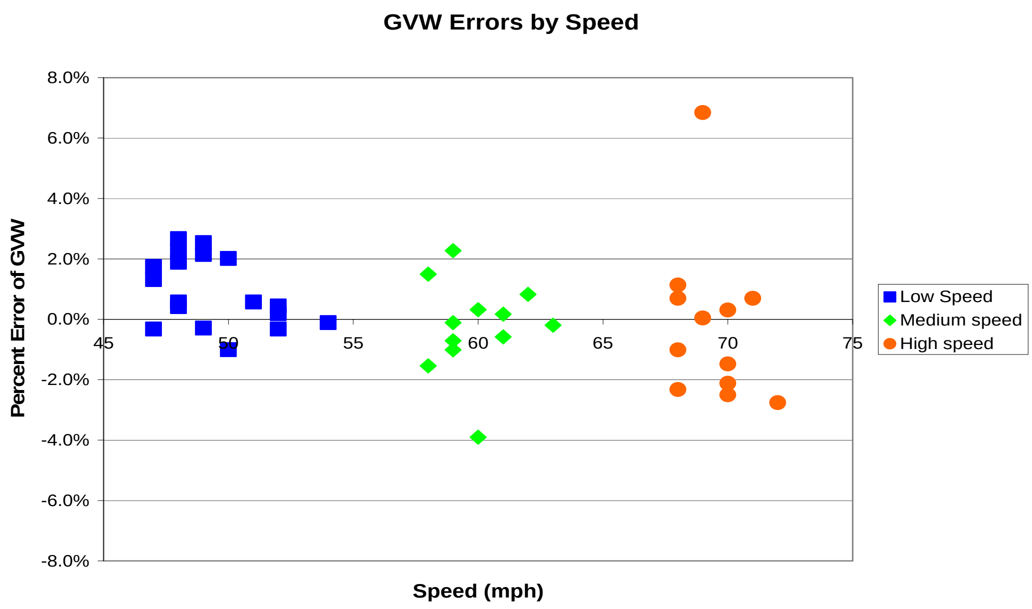


Figure 6-2 Pre-Validation GVW Percent Error vs. Speed– 480100 – 09-May-2006

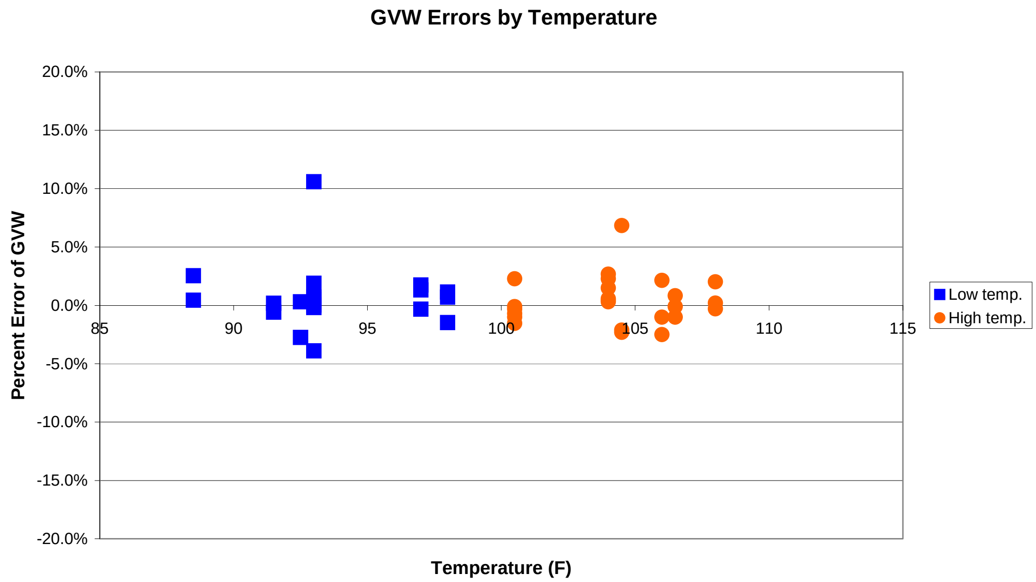


Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature – 480100 – 09-May-2006

Figure 6-3 shows the relationship between temperature and GVW percentage error. There appears to no temperature effects on the accuracy of this WIM equipment. Bias is near zero throughout the range of pavement surface temperatures and most GVW measurements are within +/-3% of the statically weighed values. The two very high data points are partially loaded 3S2.

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. For this site both Class 9 and Class 10 spacings were plotted. With the exception of one outlier, the errors are small and appear to be independent of truck speeds. There is a slight bias (approx 0.1 ft) that persists over the range of vehicle speeds.

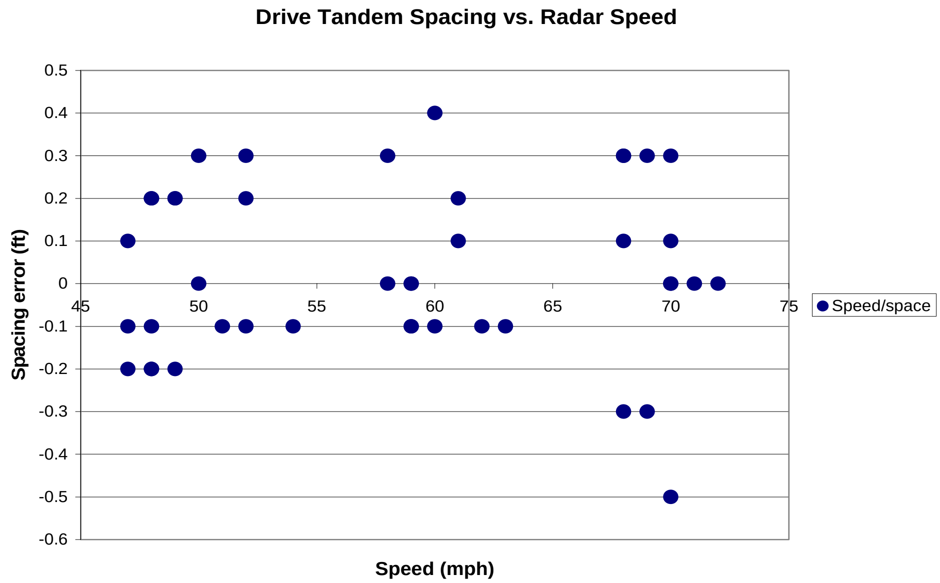


Figure 6-4 Pre-Validation Spacing vs. Speed - 480100 – 09-May-2006

6.1 Temperature-Based Analysis

The two temperature groups were created by splitting the runs between those at 88 to 98 degrees Fahrenheit for Low temperature and 99 to 108 degrees Fahrenheit for High temperature. There were no Medium temperature runs.

Table 6-2 Pre-Validation Results by Temperature Bin - 480100 – 09-May-2006

Element	**95% Limit**	**Low Temperature 88-99 °F**	**High Temperature 100-108 °F**
Steering axles	±20 %	-2.1 ± 4.9%	-2.6 ± 4.2%
Tandem axles	±15 %	1.4 ± 16.6%	1.1 ± 8.5%
Tridem axles	±15 %	2.7 ± 5.2%	2.6 ± 6.0%
Axle Groups	±15 %	1.7 ± 14.7%	1.3 ± 8.0%
GVW	±10 %	0.7 ± 6.0%	0.4 ± 4.2%
Speed	**±1 mph**	**0.9 ± 3.2 mph**	**0.8 ± 2.6 mph**
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft

Very high variability in tandem axle group and GVW estimates within the low temperature group result from a single measurement of partially loaded 3S2 where the rear tandem axle group weight was severely overestimated. Without this single anomalous measurement, all weights would have been within the 95% tolerance limits.

Figure 6-5 shows the distribution of GVW errors versus temperature by truck. The anomalous partially loaded 3S2 error is clearly seen. The approximately 10% error in GVW measurement is mostly the result of a large error in measuring the weight of the rear tandem axle group. Setting aside this single error, the remaining data points show a very consistent absence of temperature effects. Mean errors for all three trucks fall near zero over the entire temperature range.

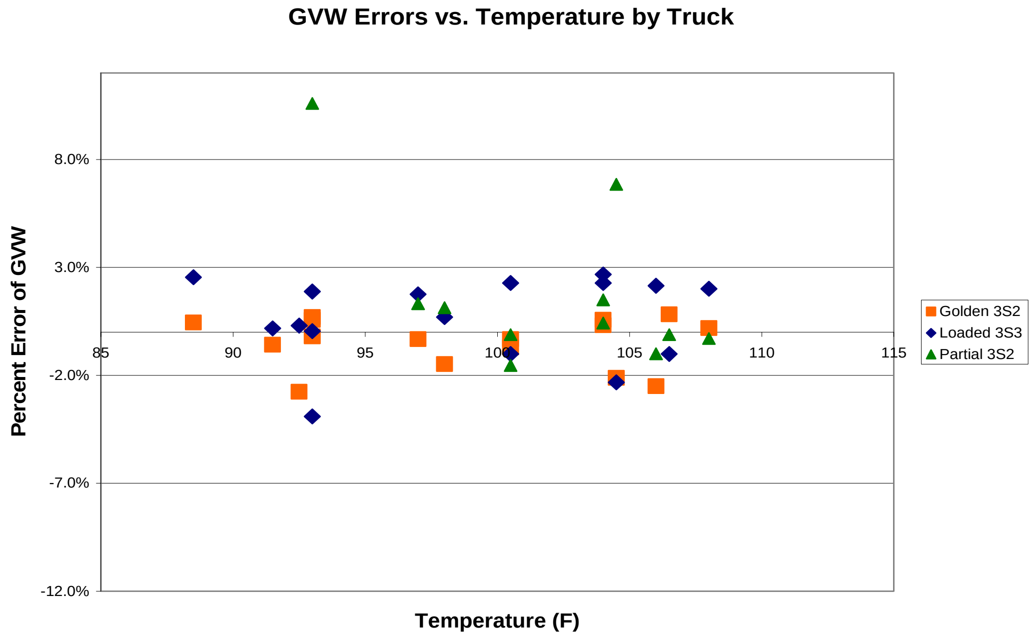


Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 480100 – 09-May-2006

Figure 6-6 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 auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 10 vehicles.

Steering axle weight errors for these trucks are consistent over the range of temperatures and fall for the most part between 0 and -5.0%.

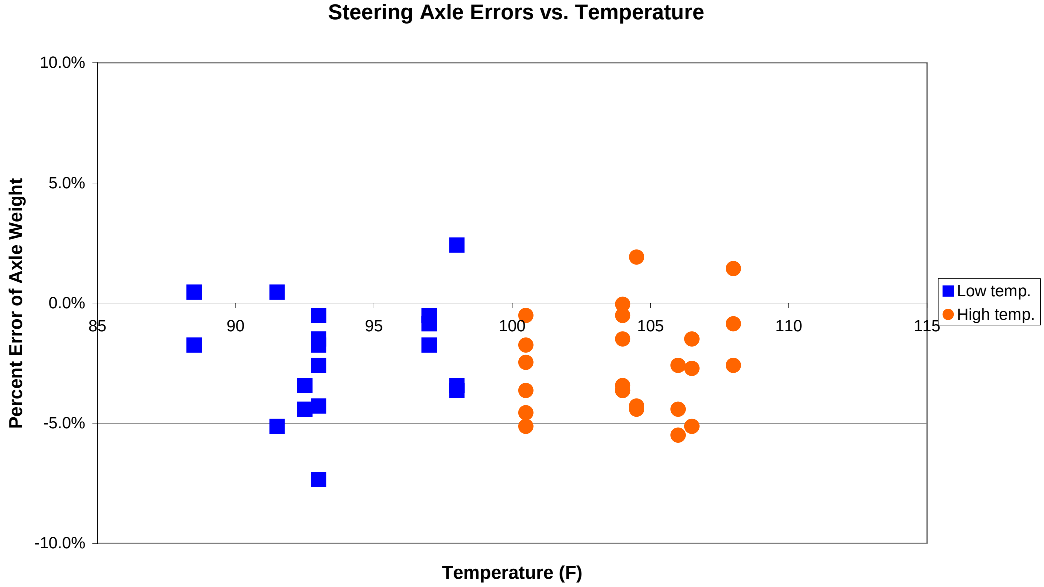


Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 480100 – 09-May-2006

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 49 to 55 mph, Medium speed – 56 to 65 mph and High speed – 66+ mph.

Table 6-3 Pre-Validation Results by Speed Bin - 480100 –09-May-2006

Element	**95% Limit**	**Low Speed 49 to 55 mph**	**Medium Speed 56 to 65 mph**	**High Speed 66+ mph**
Steering axles	±20 %	-1.7 ± 3.6%	-2.6± 4.4%	-3.0 ± 5.9%
Tandem axles	±15 %	2.1 ± 6.4%	0.2± 4.4%	0.1 ± 19.4%
Tridem axles	±15 %	3.1 ± 1.3%	2.6± 14.0%	2.0 ± 5.2%
Axle Groups	±15 %	2.1 ± 6.4%	0.2± 4.4%	0.1 ± 19.4%
GVW	±10 %	0.9 ± 2.4%	-0.2± 3.4%	0.6 ± 8.5%
Speed	**±1 mph**	**0.9 ± 2.9 mph**	**0.9 ± 3.2 mph**	**0.7 ± 2.9 mph**
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft

Very high variability in tandem axle group and GVW estimates within the High speed group result from a single measurement of the partially loaded 3S2 where the rear tandem axle group weight was severely overestimated. Without this single anomalous measurement, all weights would have been within the 95% tolerance limits.

Figure 6-7 shows GVW percent errors by Truck and Speed. Errors are consistently small with a bias near zero over the range of speeds. However, there are two very high GVW estimates for the partially loaded 3S2 at higher speeds. Possibly the dynamics of lightly loaded vehicles produces this result. Most of the error is from a greatly inflated estimate of the rear tandem axle group weight.

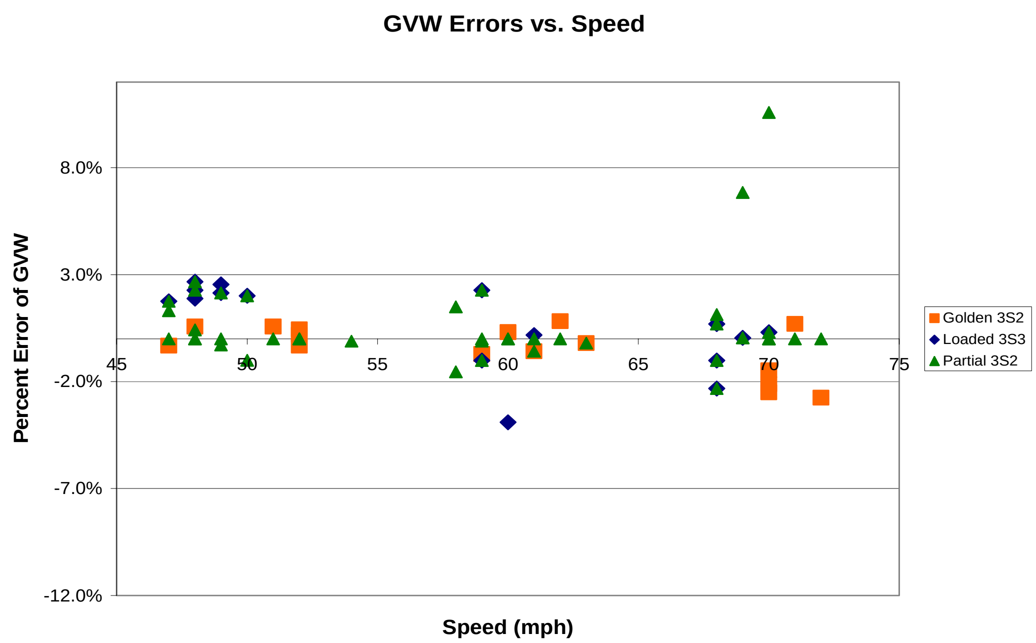


Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 480100 – 09-May-2006

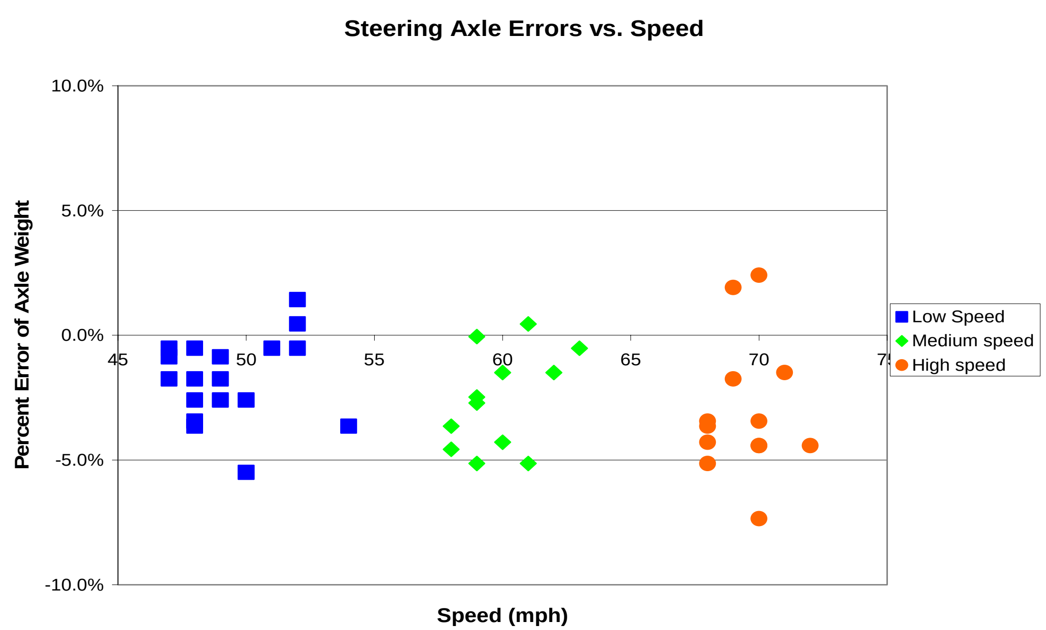


Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group – 480100 – 09-May-2006

Figure 6-8 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 auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 10 vehicles.

Steering axle weight errors for these trucks are consistent over the range of speeds and fall for the most part between 0 and -5.0%. There is a very slight increase the variability of steering axle weight errors at higher speeds. The bias of these measurements remains constant.

6.3 Classification Validation

The agency uses the Texas 6 vehicle classification scheme. Although this scheme sorts vehicles into 13 bins it differs from the FHWA 13-bin system for vehicles with less than five axles. Both are described in Table 6-4. Unclassified vehicles are labeled Class 15 under the Texas system.

Table 6-4 Texas 6 vs. FHWA 13-bin Classification Schemes

Class	**Texas 6**	**FHWA 13-bin**
1	Passenger Vehicles	Motorcycles
2	Other 2 axle 4-tire vehicles	Passenger Cars
3	Buses	Pickups/Vans
4	2 axle, 6 tire vehicles	Buses
5	3 axle single unit trucks	2 axle, 6 tire vehicles
6	4 or more axle single unit trucks	3 axle single unit trucks
7	3 axle, single trailer trucks	4 or more axle single unit trucks
8	4 axle single trailer trucks	4 or fewer axle single trailer trucks
9	5 axle, single trailer trucks	5 axle, single trailer trucks
10	6 or more axle single trailer trucks	6 axle, single trailer trucks
11	5 or less axle, multi-trailer trucks	5 or less axle, multi-trailer trucks
12	6 axle, multi-trailer trucks	6 axle, multi-trailer trucks
13	7 or more axle, multi-trailer trucks	7 or more axle, multi-trailer trucks

Unfortunately, the version of Texas 6 programmed into the equipment at this location did not appear to match the description in Table 6-4 that was extracted from the TXDOT Traffic Data and Analysis Manual. Observations of vehicles in the field indicated that the algorithm installed in this equipment classified similarly to the FHWA 13 bin system except that FHWA 10 vehicles are classed as Texas 11 and that FHWA 9 vehicles are classed as Texas 10. Only four FHWA class 8 vehicles were observed. The system classed one correctly as an 8, one as a Texas 15 (unclassified), one as a Texas 9 and one as a Texas 5. According to the TXDOT manual, these should be classed either as 7 or 8. The following table shows the relationship between vehicle classes based on the visuals and descriptions of the Texas 6 and FHWA 13-bin system and the algorithm for the site. Weight as well as axle spacing is used to differentiate between classes with the same number of axles.

Table 6-5 Rough Comparison of Classification Schemes

Scheme	**2-axle class possibilities**					
Site		2	3	4	5	
FHWA	1	2	3	4	5	
Texas-6		1	2	3	4	
Scheme	**3-axle class possibilities**					
Site	2	3	4	5	6	8
FHWA			4		6	8
Texas-6			3		5	7
	4-axle class possibilities					
Site	2	3	5	7	9	
FHWA				7	8	
Texas-6				6	8	
	5-axle class possibilities					
Site	3	5	6	10	12	
FHWA				9	11	
Texas-6				9	11	
	6-axle class possibilities					
Site	11	13				
FHWA	10	12				
Texas-6	10	12				
	7-axle class possibilities					
Site	11	14				
FHWA	13	13				
Texas-6	13	13				

For the purpose of this analysis, it was assumed that the classification system in use was programmed to place 5 axle, single trailer vehicles into Class 10 and 6 axle single trailer units into Class 11. Within the tables below, misclassification percentages are reported based on converting the site scheme to equivalent FHWA class numbers.

A sample of 104 trucks was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on the 104 surveyed heavy trucks, the system classified 2 of them as Class 15(unclassified), for a 2% percent rate of unclassified trucks. The unclassified vehicles were observed to be a FHWA 8 and 9. The system also classed one Class 3 light truck as a Class 15.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 6-6 has the classification error rates by class. The overall misclassification rate is 11.2%.

Table 6-6 Truck Misclassification Percentage for 480100 - 09-May-2006

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	100%	5	38%	6	50%
7	N/A				
8	75%	9	5%	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 6-7 Truck Classification Mean Differences for 480100 - 09-May-2006

FHWA Class	Mean Difference	FHWA Class	Mean Difference	FHWA Class	Mean Difference
4	100	5	60	6	100
7	N/A				
8	-75	9	-2.5	10	0
11	N/A	12	N/A	13	N/A

The mean difference in truck classifications is shown in Table 6-7. 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 might actually the equipment may report than actually exist. N/A means no vehicles of the class recorded by either the equipment or the observer.

It is recommended that before any future classification verification efforts are undertaken, the classification scheme in use should be defined precisely and validated. It is clear that the scheme that is presently programmed into this equipment does **NOT** match the Texas 6 scheme as defined within the TXDOT Traffic Data and Analysis Manual.

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 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 6-8 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%	97%	Pass
GWV	± 10%	97%	Pass

7 Data Availability and Quality

As of May 11, 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. This table is current through the May 2006 LTPP upload. 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 year 2002 has a sufficient quantity to be considered a complete year 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.

Table 7-1 Amount of Traffic Data Available 480100 –11-May-2006

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
2000	30	1	Full Week	122	4	Full Week
2001	128	5	Full Week	142	5	Full Week
2002	**256**	**9**	**Full Week**	**279**	**10**	**Full Week**
2003	63	3	Full Week	151	6	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.

At this site Class 10 (FHWA Class 9) and Class 5 (a vehicle with 2-5 axles weighing less than 21,000 pounds) vehicles 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 this site since there is a one to one correspondence between the site's Class 10 and the FHWA Class 9, the Class 9 definitions that follow apply to the site's Class 10 population.

- Class 9 overweights are defined as the percentage of vehicles greater than 88,000 pounds
- Class 9 underweights are defined as the percentage of vehicles less than 20,000 pounds.
- Class 9 unloaded peak is the bin less than 44,000 pounds with the greatest percentage of trucks.
- Class 9 loaded peak is the bin 60,000 pounds or larger with the greatest percentage of trucks.
- For all other 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 all other 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.
- For all trucks other than class 9s that have a bi-modal distribution the unloaded peak is defined to be in a bin less than or equal to half of the allowable maximum weight.
- For all trucks other than class 9s that have a bi-modal distribution the loaded peak is defined to be in a bin greater than or equal to half of the allowable maximum 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 - 480100 –11-May-2006 (In Site Classes)

Characteristic	Class 10	Class 5
Percentage Overweights	1%	0.0%
Percentage Underweights	0%	45%
Unloaded Peak	28 kips	
Loaded Peak	76 kips	
Peak		11 kips

The expected percentage of unclassified vehicles is 2.4%. This is based on the percentage of unclassified vehicles in the post-validation data download.

The graphical screening comparison figures are found in Figure 7-1 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.   The results are those for use in reviewing data using the Agency graphs in the LTAS software. They reflect the classes for the data as it is collected on site.

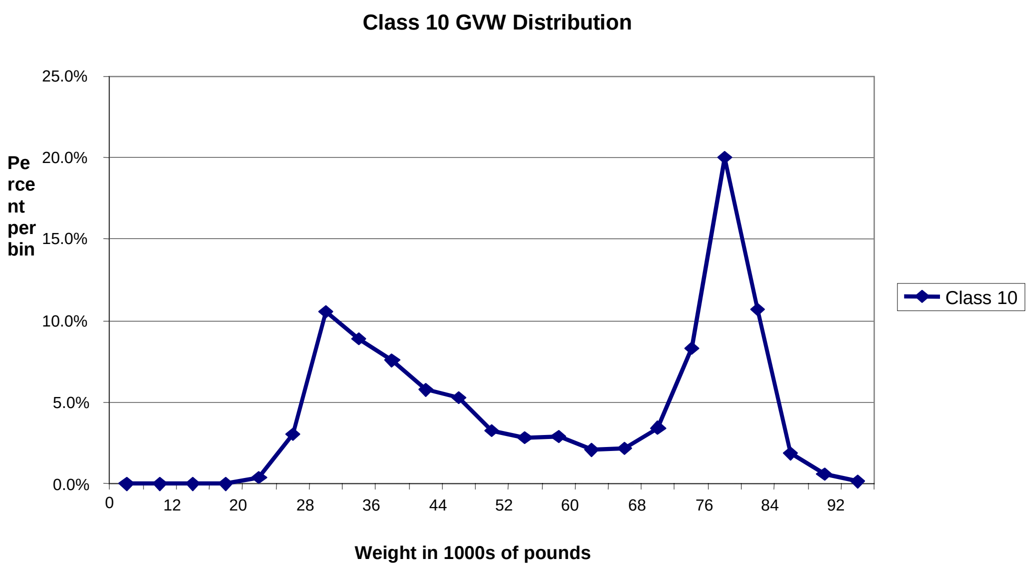


Figure 7-1 Expected GVW Distribution Class 10 – 480100 – 11-May-2006 (Site Classification)

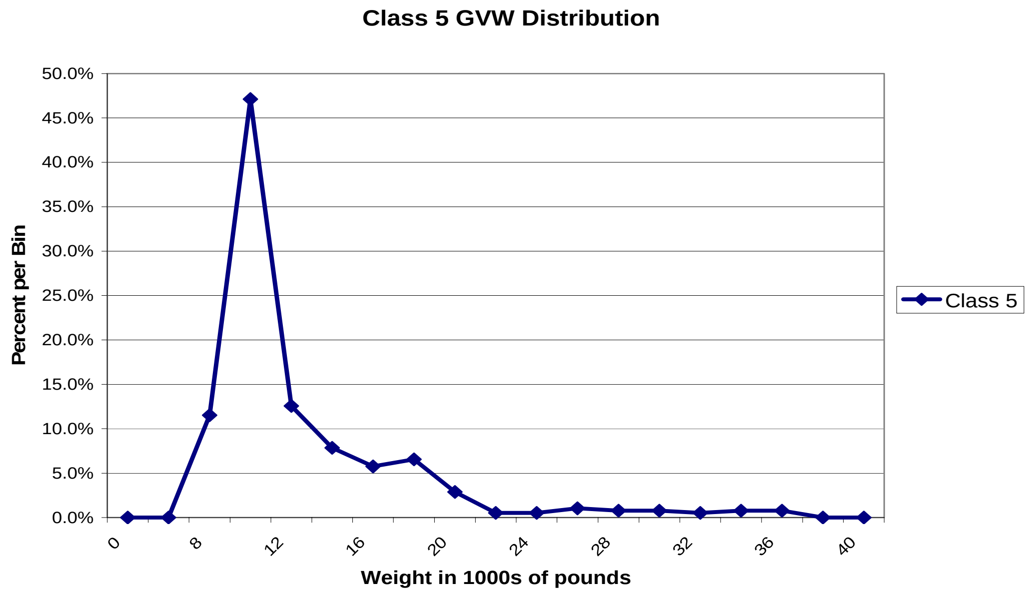


Figure 7-2 Expected GVW Distribution Class 5 – 480100 – 11-May-2006 (Site Classification)

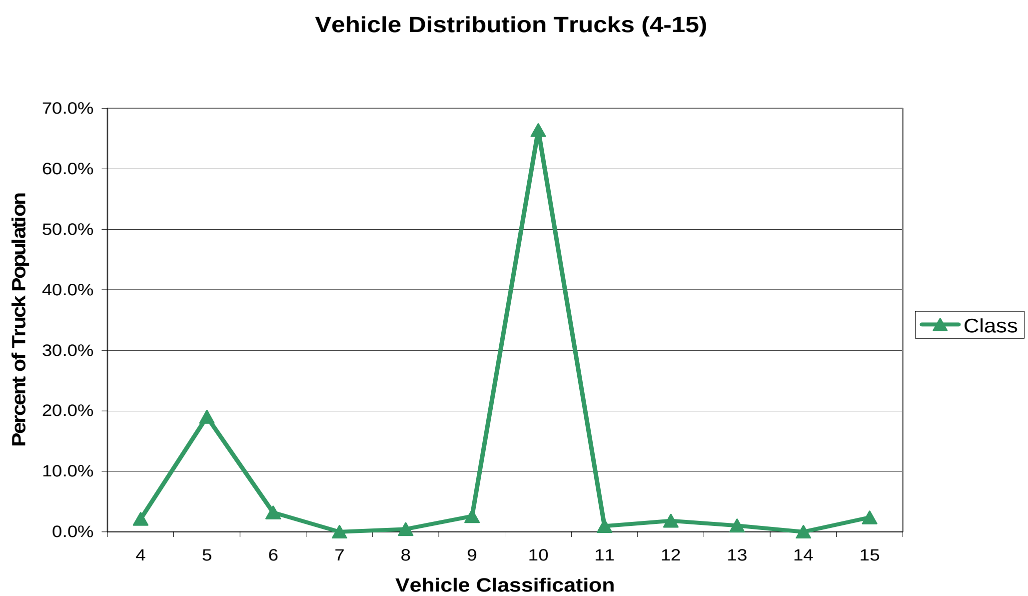


Figure 7-3 Expected Vehicle Distribution - 480100 – 11-May-2006 (Site Classification)

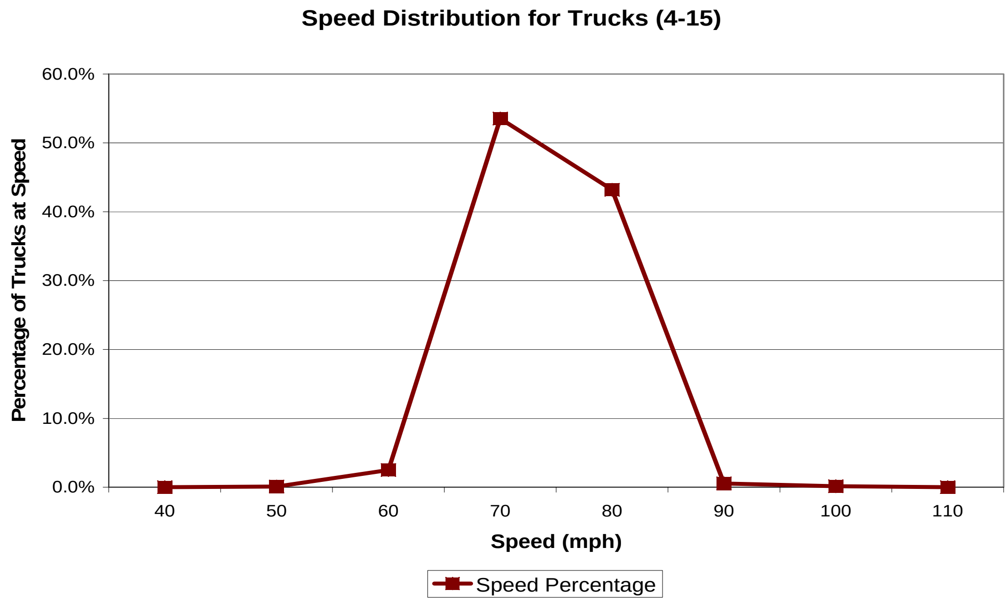


Figure 7-4 Expected Speed Distribution - 480100 – 11-May-2006

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 – 3S3 loaded steel spring tractor/air suspension trailer (4 pages)
Sheet 19 – Truck 3 – 3S2 lightly loaded air suspension (4 pages)

Sheet 20 – Classification verification – pre-validation (2 pages)

Sheet 21 – Pre-Validation (5 pages)
Sheet 21 – Post-Validation (4 pages)

Test Truck Photographs – (7 pages)

9 Updated Handout Guide and Sheet 17

A copy of the updated Handout Guide has been included following page 33. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided.

10 Updated Sheet 18

A current Sheet 18 indicating the contacts, conditions for assessments and evaluations has been attached following the updated handout guide. The information contained in the Sheet 18 is exactly the same as submitted in our report from the Validation visit in April

2005. The Agency Representative indicated that there has been no change in the contact information since that time.

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: Texas

SHRP ID: 480100

Figures

1. General Information

SITE ID: *480100*

LOCATION: *US 281 South, 9.1 Miles North of State Route 186*

VISIT DATE: *May 9 through May 11, 2006*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

Validation Team: *Dean J. Wolf, 301-210-5105, djwolf@mactec.com*
Randy Plett, 775-825-5885, rwplett@mactec.com

Highway Agency: *Dar Hao Chen, 512-467-3963, dchen@dot.state.tx.us*
James Neidigh, 512-465-7657, JNeidigh@dot.state.tx.us
Luis Peralez, lperalez@dot.state.tx.us

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

FHWA Division Office Liaison: *Jim Travis, 512-536-5922, james.travis@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *No briefing requested for this visit.*

ON-SITE PERIOD: *Beginning May 9, and continuing through May 11, 2006.*

TRUCK ROUTE CHECK: *Completed on previous visit to site.*

4. Site Location/ Directions

NEAREST AIRPORT: *McAllen International Airport, McAllen, Texas.*

DIRECTIONS TO THE SITE: *9.1 Miles North of SR -186, approximately 30 miles north of Pharr, Texas.*

MEETING LOCATION: *Beginning at 9 a.m., May 9, 2006.*

WIM SITE LOCATION: *US 281 South, 9.1 Miles North of State Route 186 (Latitude: 26.6860; Longitude: -98.1147)*

WIM SITE LOCATION MAP:

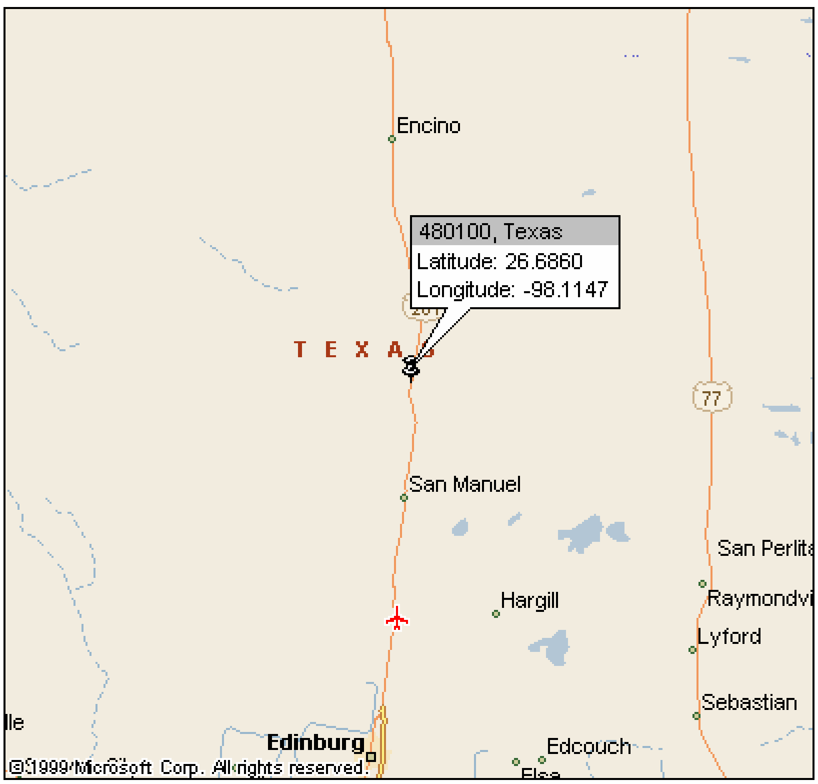


Figure 4-1 - Site 4810100 in Texas

5. Truck Route Information

ROUTE RESTRICTIONS: *None.*

SCALE LOCATION: *Love's Country Stores, Hwy 281 & FM 2812, Edinburg, Texas; Manager – Jeff Taylor, Phone – (956) 316-1782; Lat: 26.45269, Long: -98.13128*

TRUCK ROUTE: *See Figure 5-1.*

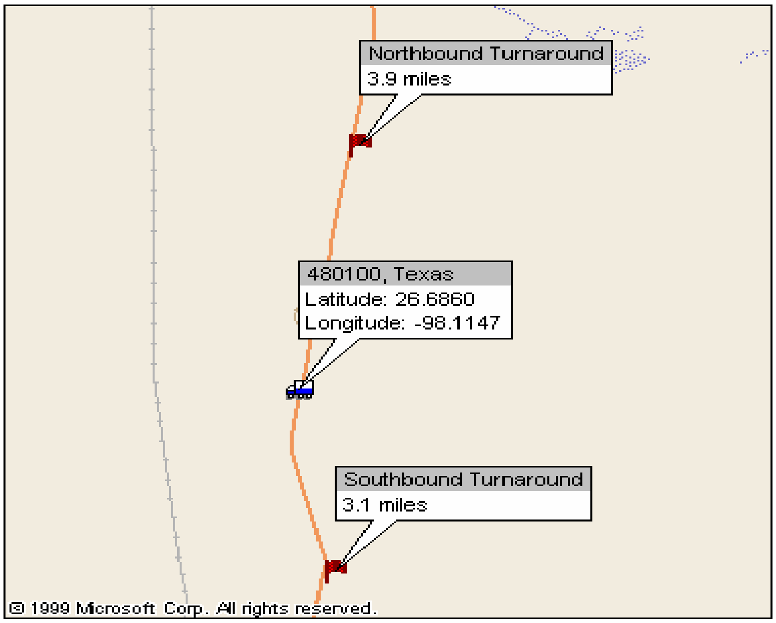


Figure 5-1 - Truck Route at 480100 in Texas

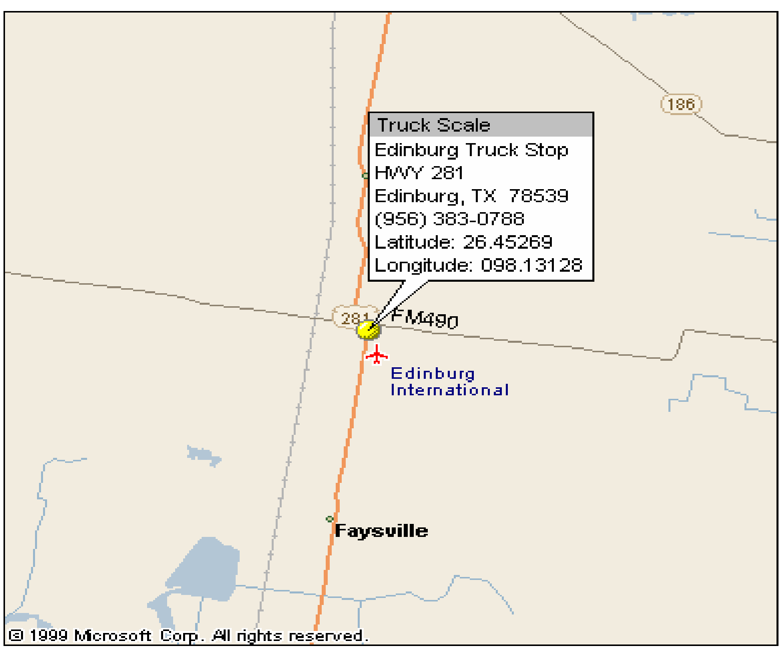


Figure 5-2 - Truck Scale Location for 480100 in Texas

6. Sheet 17 – Texas (480100)

1.* ROUTE ___US 281____ 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 __4_8_0_1_6_6__
Distance from sensor to nearest upstream SPS Section ____1_6_5_3______ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction _2___ Lane width __1_2__ ft

Median -		Shoulder -	
	1 – painted		1 – curb and gutter
	2 – physical barrier		2 – paved AC
	3 – grass		3 – paved PCC
	4 – none		4 – unpaved
			5 – none

Shoulder width _1_0_ ft

4.* PAVEMENT TYPE ___Portland Concrete Cement______________________

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _4/25/05_Photo__Asphalt_to_Concrete_Transition_TO_9_48_2.48_0100.jpg
Date _4/25/05_Photo__Grinding_Start_TO_9_48_2.48_0100.jpg ______
Date _4/25/05_Photo__Transverse_Crack_TO_9_48_2.48_0100_.jpg____

6. * SENSOR SEQUENCE _____Loop – Bending Plate – Loop – Bending Plate_____

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 ___ __6_. _0__ 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 _6_8__ ft

Distance from system __8_0__ ft

TYPE _____M________________________

CABINET ACCESS controlled by LTPP / STATE / JOINT

Contact - name and phone number _Jim Neidigh_512-465-7657________

Alternate - name and phone number _Mike Lloyd____________________

11. * POWER

Distance to cabinet from drop __8_5_5____ ft Overhead / underground / solar / AC in cabinet?

Service provider ____________________ Phone number _________________

12. * TELEPHONE

Distance to cabinet from drop ___1___ ___ ft overhead / under ground / cell?

Service provider ___ Valley Telephone __ Phone Number __800-292-7596___

13.* SYSTEM (software & version no.)- ____DAW-190______________

Computer connection – RS232 / Parallel port / USB / Other_______________

14. * TEST TRUCK TURNAROUND time __1_0__ minutes DISTANCE _6_._0_ mi.

15. PHOTOS FILENAME

Power source __ Power_Service_Box_TO_9_48_2.48_0100_04_25_05.jpg __

Phone source __ Telephone_Service_Box_TO_9_48_2.48_0100_04_27_05.jpg

Cabinet exterior __ Cabinet_Exterior_TO_9_48_2.48_0100_04_25_05.jpg_____

Cabinet interior __ Cabinet_Interior_TO_9_48_2.48_0100_04_25_05.jpg ____

Weight sensors __ Leading_Bending_Plate_TO_9_48_2.48_0100_04_25_05.jpg

__ Trailing_Bending_Plate_TO_9_48_2.48_0100_04_25_05.jpg

Classification sensors ____

Other sensors ______________________________

Description _Pull Box _TO_9_48_2.48_0100_04_27_05.jpg __________________

Downstream direction at sensors on LTPP lane

_Downstream_TO_13_48_2.60_0100_05_09_06.jpg

Upstream direction at sensors on LTPP lane

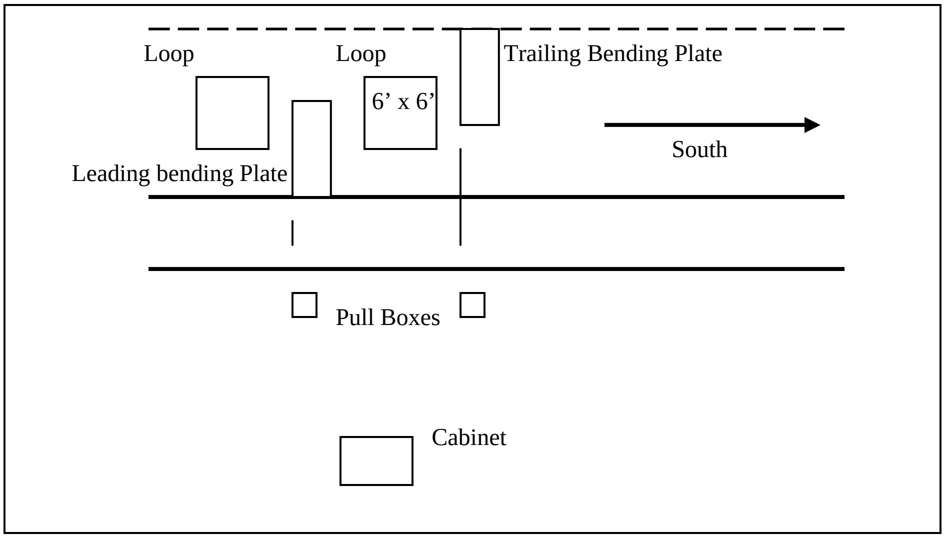
_Upstream_TO_13_48_2.60_0100_05_09_06.jpg ____

COMMENTS _______GPS Coordinates: Latitude: 26.6860; Longitude -98.1147______
_ Posted speed limit – 70 mph ____
________Amenities:____

COMPLETED BY ____Dean J. Wolf____________________________

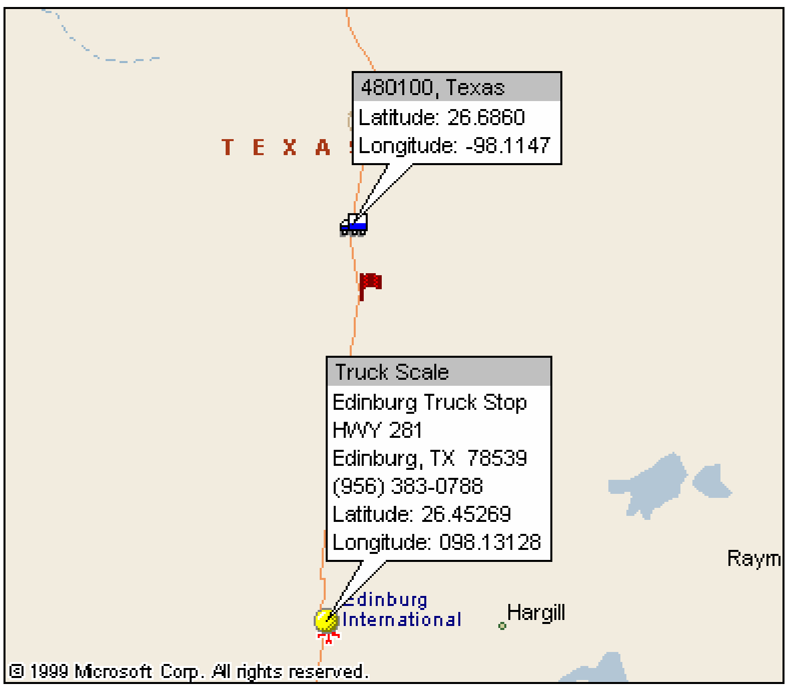
PHONE __(301) 210-5105_____________ DATE COMPLETED ___05/09/2006____

Sketch of equipment layout



Sketch of Equipment Layout - 480100 in Texas

Site Map



Site Map 480100 in Texas

Photo 1 - Cabinet Exterior_TO_9_2.48_0100_04_25_05.jpg

Photo 2 - Cabinet_Interior_TO_9_48_2.48_0100_04_25_05_jpg

Photo 3 - Power_Service_Box_TO_9_48_2.48_0100_04_25_05.jpg

Photo 4 - Telephone_Box_TO_9_48_2.48_0100_04_25_05.jpg

Photo 5 - Telephone_Service_Box_TO_9_48_2.48_0100_04_27_05.jpg

Photo 6 - Leading_Loop_TO_9_48_2.48_0100_04_25_05.jpg

Photo 7 - Leading_Bending_Plate_TO_9_48_2.48_0100_04_25_05.jpg

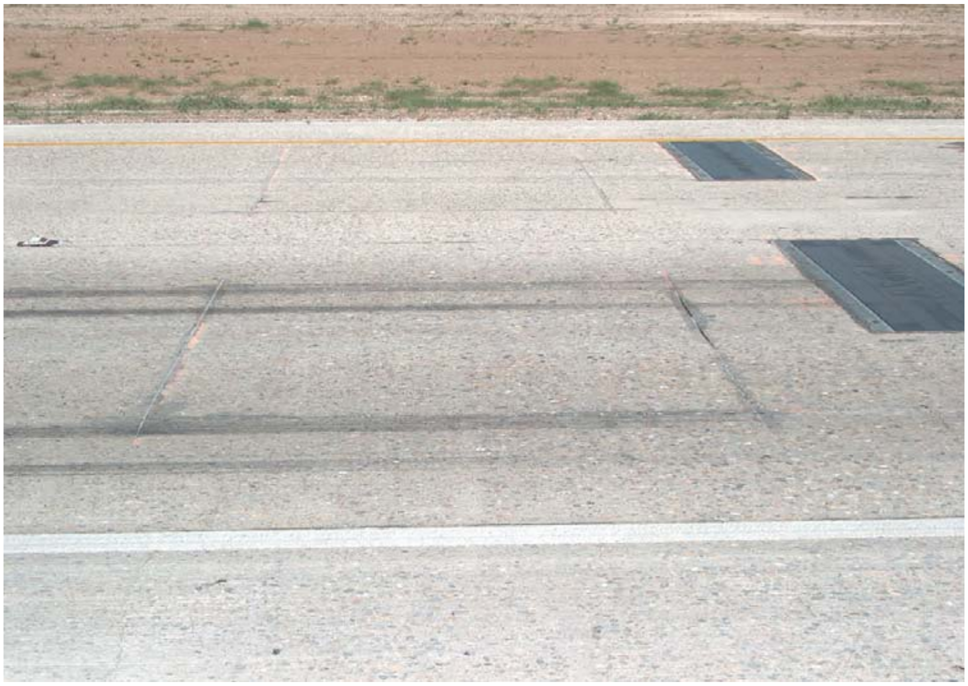


Photo 8 - Trailing_Loop_TO_9_48_2.48_0100_04_25_05.jpg

Photo 9 - Trailing_Bending_Plate_TO_9_48_2.48_0100_04_25_05.jpg

Photo 10 - Pull_Box_TO_9_48_2.48_0100_04_27_05.jpg

Photo 11 - Asphalt_to_Concrete_Transition_TO_9_48_2.48_0100_04_25_05.jpg

Photo 12 - Grinding_Start_TO_9_48_2.48_0100_04_25_05.jpg

Photo 13 - Transverse_Crack_TO_9_48_2.48_0100_04_25_05.jpg

Photo 14 - Upstream_TO_13_48_2.60_100_05_09_06.jpg

Photo 15 - Downstream_TO_13_48_2.60_100_05_09_06.jpg

SHEET 18	STATE CODE [48]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0100]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 04/25/2005

Rev. 05/25/04

1. DATA PROCESSING –
   a. Down load –
      - ☒ State only
      - ☐ LTPP read only
      - ☐ LTPP download
      - ☐ LTPP download and copy to state
   b. Data Review –
      - ☒ State per LTPP guidelines
      - ☐ State – ☐ Weekly ☐ Twice a Month ☐ Monthly ☐ Quarterly
      - ☐ LTPP
   c. Data submission –
      - ☐ State – ☐ Weekly ☐ Twice a month ☐ Monthly ☒ Quarterly
      - ☐ LTPP
2. EQUIPMENT –
   a. Purchase –
      - ☒ State
      - ☐ LTPP
   b. Installation –
      - ☐ Included with purchase
      - ☐ Separate contract by State
      - ☒ State personnel
      - ☐ LTPP contract
   c. Maintenance –
      - ☐ Contract with purchase – Expiration Date _______
      - ☐ Separate contract LTPP – Expiration Date _______
      - ☐ Separate contract State – Expiration Date _______
      - ☒ State personnel
   d. Calibration –
      - ☐ Vendor
      - ☒ State
      - ☐ LTPP
   e. Manuals and software control –
      - ☒ State
      - ☐ LTPP
   f. Power –
      i. Type –
         - ☐ Overhead
         - ☒ Underground
         - ☐ Solar

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

SHEET 18	STATE CODE [48]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [01_00]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 04/25/2005

Rev. 05/25/04

g. Communication –
   i. Type –
      ☒ Landline
      ☐ Cellular
      ☐ Other
   ii. Payment –
      ☒ State
      ☐ LTPP
      ☐ N/A

3. PAVEMENT –
   a. Type –
      ☒ Portland Concrete Cement
      ☐ Asphalt Concrete
   b. Allowable rehabilitation activities –
      ☐ Always new
      ☐ Replacement as needed
      ☒ Grinding and maintenance as needed
      ☐ Maintenance only
      ☐ No remediation
   c. Profiling Site Markings –
      ☐ Permanent
      ☒ Temporary

4. ON SITE ACTIVITIES –
   a. WIM Validation Check - advance notice required 6 ☐ days ☒ weeks
   b. Notice for straightedge and grinding check - 6 ☐ days ☒ weeks
      i. On site lead –
         ☒ State
         ☐ LTPP
      ii. Accept grinding –
         ☒ State
         ☐ LTPP
   c. Authorization to calibrate site –
      ☒ State only
      ☐ LTPP
   d. Calibration Routine –
      ☐ LTPP – ☐ Semi-annually ☐ Annually
      ☐ State per LTPP protocol – ☐ Semi-annually ☐ Annually
      ☒ State other – 4 per year

SHEET 18	STATE CODE [48]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [01_00]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 04/25/2005

Rev. 05/25/04

e. Test Vehicles
   i. Trucks –
      1st – Air suspension 3S2 ☐ State ☐ LTPP HALE BOYS ☒
      2nd – ______ ☒ State ☐ LTPP
      3rd – ______ ☒ State ☐ LTPP
      4th – ______ ☐ State ☐ LTPP
   ii. Loads – ☒ State 2+3 ☐ LTPP
   iii. Drivers – ☒ State 2+3 ☐ LTPP

f. Contractor(s) with prior successful experience in WIM calibration in state:
   ~~HALE~~ ~~BOYS~~ IRD / ECM

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

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

i. Traffic Control Required – ☐Yes ☒No

j. Enforcement Coordination Required – ☐Yes ☒No

5. SITE SPECIFIC CONDITIONS –
   a. Funds and accountability – STATE + POOLED FUND
   b. Reports – ______
   c. Other – ______
   d. Special Conditions – ______

6. CONTACTS –
   a. Equipment (operational status, access, etc.) –
      Name: JIM Phone: ______
      Agency: TXDOT

SHEET 18	STATE CODE [48]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0 1 0 0]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 0 4 / 2 5 / 2 0 0 5

Rev. 05/25/04

b. Maintenance (equipment) –

Name: JIM Phone: ______

Agency: ______

c. Data Processing and Pre-Visit Data –

Name: JIM Phone: ______

Agency: ______

d. Construction schedule and verification –

Name: JIM Phone: ______

Agency: ______

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

Name: JIM Phone: ______

Agency: ______

f. Traffic Control –

Name: JIM Phone: ______

Agency: ______

g. Enforcement Coordination – N/A

Name: ______ Phone: ______

Agency: ______

h. Nearest Static Scale

Name: TA Location: 22 MILES SOUTH - EDINBURG

Phone: ______

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [LW523] *STATE CODE [48] *SHRP SECTION ID [0100]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [05/09/2006]

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

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

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

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
   3 NUMBER OF TEST TRUCKS USED

   16 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	10	1
3	9	1

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---

DYNAMIC AND STATIC GVW	0.5	STANDARD DEVIATION	2.4
DYNAMIC AND STATIC SINGLE AXLES	-2.4	STANDARD DEVIATION	2.2
DYNAMIC AND STATIC DOUBLE AXLES	1.2	STANDARD DEVIATION	6.1

8. 3 NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) 45-55, 56-65, 66+

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) 2600. __ __

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 ___ MANUAL ___ PARALLEL CLASSIFIERS

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:

*** FHWA CLASS 9 ____ -3.0
*** FHWA CLASS 8 ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____

*** PERCENT "UNCLASSIFIED" VEHICLES: ____ 2.0

PERSON LEADING CALIBRATION EFFORT: Randy Plett, Master Engineering + Consulting, Inc
CONTACT INFORMATION: 301-210-5105
rev. November 9, 1999

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [LW523] *STATE CODE [48] *SHRP SECTION ID [0 1 0 0]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [05 / 10 / 2006]

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

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

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

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

3 NUMBER OF TEST TRUCKS USED

14 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	10	1
3	9	1

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---

DYNAMIC AND STATIC GVW	-0.5	STANDARD DEVIATION	1.8
DYNAMIC AND STATIC SINGLE AXLES	-2.6	STANDARD DEVIATION	2.8
DYNAMIC AND STATIC DOUBLE AXLES	-0.1	STANDARD DEVIATION	4.4

8. 3 NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) 45-55, 56-65, 66+

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) 2600 . __ __

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

<u>CLASSIFIER TEST SPECIFICS***</u>

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

13. METHOD TO DETERMINE LENGTH OF COUNT ___ TIME X NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ___ -3.0
*** FHWA CLASS 8 ___ ___ ___
FHWA CLASS ___ ___ ___ ___ ___
FHWA CLASS ___ ___ ___ ___ ___
FHWA CLASS ___ ___ ___ ___ ___
FHWA CLASS ___ ___ ___ ___ ___
*** PERCENT "UNCLASSIFIED" VEHICLES: ___ 2.0

PERSON LEADING CALIBRATION EFFORT: Dean Wolf, Mactec Engineering + Consulting, Inc
CONTACT INFORMATION: 301-210-5105

rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE	48
LTPP Traffic Data	* SPS PROJECT ID	0100 / 0199
*CALIBRATION TEST TRUCK # 1	* DATE	05/09/06

Rev. 08/31/01

PART I.

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

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		10390		D / C
B		16990		D / C
C		16990		D / C
D		16980		D / C
E		16980		D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight 78330
*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: FREIGHTLINER b) * Model: FL112

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS LOADED EVENLY ALONG TRAILER

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

b). Trailer Tare Weight (units): ______

Sheet 19	* STATE CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100/ 0199
*CALIBRATION TEST TRUCK # 1	* DATE MAY 9/ 06

Rev. 08/31/01

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

A to B 12.1 B to C 4.3 C to D 31.3

D to E 4.1 E to F ____________

Wheelbased (measured A to last) ____________ Computed ____________

13. *Kingpin Offset From Axle B (units) + 1.5 (____________)

(+ 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	leaf, 2 full
B	"	AIR
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 48
LTPP Traffic Data	* SPS PROJECT ID 0100 / 0199
*CALIBRATION TEST TRUCK # 1	* DATE 05-09-06

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 48
LTPP Traffic Data	* SPS PROJECT ID 0100 / 0199
*CALIBRATION TEST TRUCK # 1	* DATE 5/9/2006

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10,400	16980	16,980	16,980	16,980		78320
2	10,480	16,930	16,930	17,000	17,000		78,340
3	10,280	17,060	17,060	16,960	16,960		78,320
Average	10,390	16,990	16,990	16,980	16,980		78,330
day 1 post	10,120	16,980	16,980	16,950	16,950		77,980

Table 6. Raw data – Axle scales – day 2 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10,400	16 980	16 980	16970	16970		78300
2	10,280	17 050	17050	16970	16970		78320
3	10,440	16,950	16,950	16990	16990		78,320
Average	10,370	16,990	16 990	16980	16980		78,310
day 2 post	10,040	16,970	16,970	17,040	17,040		78,060

Table 7. Raw data – Axle scales – ~~post-test~~ day 3 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10460	16970	16970	17010	17010		78420
2	10600	16890	16890	17040	17040		78460
3	10460	16970	16970	17020	17020		78440
Average	10510	16940	16940	17020	17020		78440
day 3 post	10300	16890	16890	17010	17010		78100

Measured By R. Platt Verified By ____________________

Sheet 19	* STATE_CODE	48
LTPP Traffic Data	* SPS PROJECT ID	0100/0199
*CALIBRATION TEST TRUCK # 2	* DATE	05/09/06

Rev. 08/31/01

PART I.

1.* FHWA Class 10   2.* Number of Axles 6   TxDOT

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		11890		D / C
B		13270		D / C
C		13270		D / C
D		12560		D / C
E		12560		D / C
F		12560		D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight 76120
*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: STERLING   b) * Model: ______

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS LOADED TOWARD REAR OF TRAILER

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

b). Trailer Tare Weight (units): ______

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100/0199
*CALIBRATION TEST TRUCK # 2	* DATE 5/9/2006

Rev. 08/31/01

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

A to B 13.6 B to C 4.4 C to D 31.9

D to E 4.2 E to F 4.2

Wheelbased (measured A to last) ______ Computed ______

13. *Kingpin Offset From Axle B (units) +1.2 (______)
(+ 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	LEAF, 8 STEEL TAPERED
B	"	LEAF, 13 SPRING, WALKING BEAM
C	~~255/70R22.5~~ "	~~AIR~~ "
D	255/70R22.5	AIR
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
LTPP Traffic Data	* SPS PROJECT ID
*CALIBRATION TEST TRUCK #___	* DATE

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 48
LTPP Traffic Data	* SPS PROJECT ID 0100/0199
*CALIBRATION TEST TRUCK # 2	* DATE 05/09/2006

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW	
1	11,860	13,280	13280	12560	12560	12560	76100	
2	11,920	13240	13240	12570	12570	12570	76110	
3	11,900	13,280	13,280	12,560	12,560	12,560	76140	
Average	11,890	13,270	13,270	12,560	12,560	12,560	76120	
day 1 post	11,720	13,310	13,310	12,560	12,560	12,560	76020	(100)

Table 6. Raw data – Axle scales – day 2 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW	
1	11940	13230	13230	12570	12570	12570	76100	
2	12060	13170	13170	12570	12570	12570	76120	
3	11940	13240	13240	12560	12560	12560	76100	
Average	11980	13210	13210	12570	12570	12570	76110	
day 2 post	11460	13280	13280	12550	12550	12550	75670	(440)

Table 7. Raw data – Axle scales – ~~post-test~~ day 3 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW	
1	12020	13200	13200	12570	12570	12570	76090	
2	11940	13250	13250	12560	12560	12560	76120	
3	11960	13250	13250	12550	12550	12550	76100	
Average	11970	13230	13230	12560	12560	12560	~~76090~~ 76120	
day 3 post	11880	13070	13070	12600	12600	12600	75820	(270)

Measured By R. Platt Verified By ____________

Sheet 19	* STATE CODE	48
LTPP Traffic Data	* SPS PROJECT ID	0100/0199
*CALIBRATION TEST TRUCK # 3	* DATE	05/09/06

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		10850		D / C
B		12990		D / C
C		12990		D / C
D		9690		D / C
E		9690		D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______________

*b) Average Pre-Test Loaded weight 56210
*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: Peterbilt b) * Model: 106

10.* Trailer Load Distribution Description:

CONCRETE BLOCK OVER DRIVE TANDEM / MIDDLE

~~FORKLIFT OVER REAR TANDEM~~

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

b). Trailer Tare Weight (units): ______________

Sheet 19	* STATE CODE
LTPP Traffic Data	* SPS PROJECT ID
*CALIBRATION TEST TRUCK #	* DATE

Rev. 08/31/01

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

A to B 19.9 B to C 4.4 C to D 30.0

D to E 4.2 E to F ______

Wheelbased (measured A to last) ______ Computed ______

13. *Kingpin Offset From Axle B (units) +2.2 (______)__
(+ 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	LEAF, 2 full
B	11R24.5	AIR
C	11R24.5	AIR
D	235/75R17.5	AIR
E	235/75R17.5	AIR
F		

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

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 48
LTPP Traffic Data	* SPS PROJECT ID 0100/0199
*CALIBRATION TEST TRUCK # 3	* DATE 05/09/2006

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10840	12990	12990	9690	9690		56180
2	10860	12990	12990	9690	9690		56200
3	10840	12990	12990	9690	9690		56180
Average	10850	12990	12,990	9,690	9,690		56210

day 1 post 10740 12930 12,930 9,660 9,660 55920 (290)

Table 6. Raw data – Axle scales – day 2 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10960	13080	13080	9650	9650		56,420
2	10980	13070	13070	9660	9660		56,440
3	10980	13060	13060	9670	9670		56,440
Average	10970	13070	13070	9660	9660		56,430

day 2 post 10840 13050 13050 9790 9790 56,520 +90

Table 7. Raw data – Axle scales – ~~post-test~~ day 3 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10820	13030	13030	9700	9700		56280
2	10840	13020	13020	9700	9700		56280
3	10840	13030	13030	9700	9700		56300
Average	10830	13030	13030	9700	9700		56290

day 3 post 10680 12910 12910 9640 9640 55780 (510)

Measured By R. Platt Verified By ____________________

Sheet 20	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 1 of* 3	* DATE 05/09/2006

Rev. 08/31/2001….

pre-validation

	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	
	59	11	3961	58	10	77	2	4262	76	2	
	72	10	3967	72	9	70	2	4264	69	2 2+2	
1 -	63	10	3975	60	9	63	10	4266	62	9	- 1
2 -	60	11	3978	59	10	70	11	4269	68	10	- 2
3 -	60	10	3982	58	9	58	10	4271	59	9	- 3
	69	10	4013	68	9	70	3	4283	69	3	
	71	6	4049	66	6	67	10	4285	66	9	
	67	10	4053	66	9	65	3	4288	63	3	
	65	10	4055	65	9	70	2	4289	71	2	
	73	10	4056	72	9	73	10	4291	69	9	
	65	10	4059	63	9	67	10	4295	65	9	
	68	10	4064	67	9	54	15	4297	55	3 2+2	
	70	2	4070	68	3	65	3	4304	68	3	
1 -	72	10	4074	70	9	65	10	4305	62	9	
2 -	68	11	4077	68	10	73	10	4316	73	9	
3 -	68	10	4079	69	9	66	3	4320	67	3 2+1	
	75	10	4089	73	9	75	10	4325	74	9	
1 -	52	10	4165	51	9	69	5	4328	69	5	
2 -	49	11	4171	48	10	70	3	4341	71	3	
3 -	48	10	4176	48	9	73	10	4343	72	9	
	71	10	4232	70	9	69	3	unk	69	3	
	71	5	4236	69	5	72	10	4357	70	9	- 1
	66	10	4249	66	9	49	11	4363	49	10	- 2
	67	10	4252	66	9	51	10	4364	50	9	- 3
	69	3	4254	68	3 2+2	65	10	4368	64	9	

Recorded by DLW Direction S Lane 4 Time from 11:40 to 12:36

Sheet 20	* STATE_CODE 4 8
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
Speed and Classification Checks * 2 of* 3	* DATE 0 5 / 0 9 / 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	
68	3	unk	68	3	79	3	4472	82	3	
62	10	4370	60	9	67	10	4480	65	9	
69	10	4376	68	9	75	6	4482	69	9	?
75	2	unk	75	2	68	2	4484	68	2	
74	3	unk	74	3	51	15	4488	50	8 (S+2)	
76	3	unk	76	3	54	3	4489	51	3	
71	5	4400	71	5	69	5	4491	68	3	
73	10	4401	70	9	73	10	4492	70	9	
67	10	4405	65	9	73	3	4493	72	3 (S)	
58	11	4407	57	10	68	5	4495	67	3	
70	3	4409	70	3	65	10	4496	65	9	
67	16	4416	65	9	53	10	4500	52	9	- 1
57	3	4419	56	3 (S)	50	11	4503	50	10	- 2
58	2	4424	57	2	49	10	4504	49	9	- 3
70	5	4423	70	5 RV+2	60	10	4506	59	9	
58	2	4425	58	2	71	10	4515	71	9	
68	10	4428	67	9	65	10	4527	64	9	
73	10	4447	71	9	62	5	4575	62	5	
67	10	4449	65	9	71	10	4577	70	9	
65	10	4450	66	9	67	10	4643	69	9	
73	10	4453	72	9	60	3	5466	59	3	
64	3	4464	64	3	69	10	5472	67	9	
62	15	4465	61	9	67	10	5474	66	9	
71	2	4467	71	2	63	3	5476	63	3 (2+2)	
63	5	4469	62	8	72	3	5477	72	3	

Recorded by DJW Direction 3 Lane 4 Time from 12:36 to 2:24

Sheet 20	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 3 of* 3	* DATE 05/09/2006

Rev. 08/31/2001….

	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	
	71	3	5486	71	3	64	8	unk	64	8	
1 -	53	10	5492	51	9	77	3	unk	77	3	
3 -	51	10	5493	48	9	59	11	5624	59	10	
	71	10	5516	71	9	71	10	5627	71	9	
	71	10	5518	70	9	71	10	5630	69	9	
	64	10	5527	64	9	73	10	5643	72	9	- 1
	71	10	5537	69	9	71	11	5646	69	10	- 2
	69	10	5538	68	9	71	10	5647	69	9	- 3
	77	10	5547	78	9	64	10	5665	62	9	
	75	10	5549	75	9	73	10	5671	72	9	
	73	10	5551	72	9	69	10	5673	67	9	
	69	10	5554	70	9	67	10	5676	66	9	
	67	10	5557	66	9	67	10	5694	65	9	
	71	10	5559	68	9						
	65	3	5562	65	3						
	71	10	5567	70	9						
	65	3	5570	65	3						
1 -	64	10	5575	62	9						
	69	10	5580	69	9						
2 -	62	11	5582	60	10						
3 -	60	10	5584	58	9						
	80	9	5592	77	8 2+2						
	75	10	5594	72	9						
	53	3	unk	53	3 2+2						
	52	3	unk	52	3 2+2						

Recorded by DJW Direction S Lane 4 Time from 2:24 to 2:43

480100

LANE 4 RE-VALIDATION

5-09-06

La	Mo	Da	Yr	Hr	Min	Sec	Veh#	Cls	GVW	Length	Speed	Vio	Ax1R	Ax1L	Ax2R	Ax2L	1to2	Ax3R	Ax3L	2to3	Ax4R	Ax4L	3to4	Ax5R	Ax5L	4to5	Ax6R	Ax6L	5to6
4	5	9	6	10	5	27	3054	10	78.5	56.9	52.7	10	5.3	5	8.5	8.4	12.2	8.7	8.5	4.2	9	8.1	31.3	8.6	8.4	4.2			
4	5	9	6	10	5	51	3056	11	78	63.6	49.5	2	6.2	5.3	6.6	7.4	14	7.2	7.5	4.2	6.4	6.3	32	6	6.6	4.2	6.4	6	4.2
4	5	9	6	10	15	17	3152	10	77.7	56.1	61.9	0	5.4	4.9	8.6	8.7	11.8	8.3	8	4.5	8.4	7.8	30.6	9	8.6	4.1			
4	5	9	6	10	15	32	3158	11	76.2	63.9	61.9	2	5.5	5.7	6.4	6.4	13.5	7.1	6.8	4.5	7	6.7	32.3	6.3	6.2	4.5	6.4	5.7	4.1
4	5	9	6	10	25	1	3240	10	76	55.5	72.8	10	5.1	4.7	8.4	8.1	12	7.6	7.9	4.3	9.1	8.9	30.8	8.6	7.7	4.3			
4	5	9	6	10	25	14	3245	11	76.4	64.5	70.7	2	5.8	5.6	6.1	5.9	14	6.6	6.4	4.7	6.8	6.6	32.7	6.9	6.6	4.2	6.5	6.4	4.2
4	5	9	6	10	36	2	3341	10	78.6	56.3	51.6	10	5.4	4.9	8.7	8.4	11.9	8.4	8.5	4.1	9	8.2	31	8.7	8.4	4.1			
4	5	9	6	10	36	25	3343	11	77.5	64	50.5	2	6.1	5.4	6.4	7.5	14	7.4	7.2	4.3	6.4	6.3	32.3	6.3	6.1	4.3	6	6.4	4
4	5	9	6	10	46	56	3440	10	78	57.7	63.5	10	5.4	4.8	8.9	8.6	12.1	7.9	8.9	4.2	8.8	7.4	31.9	8.5	8.7	4.2			
4	5	9	6	10	47	9	3443	11	73.1	62.6	60.4	2	5.8	5.5	6.3	6	13.5	6.1	6.8	4.8	6.8	5.8	31.9	6.2	5.8	4.4	6.5	5.5	4
4	5	9	6	10	57	54	3560	10	78.7	56.5	72.8	10	5.3	4.8	8.2	8.7	12	8.1	8.9	4.3	8.9	8.3	31.2	8.8	8.7	4.3			
4	5	9	6	10	58	14	3563	11	76.1	65	70.7	2	5.9	5.7	6.5	5.5	14	7.2	6.5	4.7	6.6	6.4	32.2	6.4	6.6	4.7	6.5	6.3	4.2
4	5	9	6	10	58	22	3566	10	62	74.8	68.8	0	4.6	5.4	6.7	6	19.5	6.2	6.4	4.5	6.6	7.5	30.4	5.6	7	4.1			
4	5	9	6	11	7	52	3642	10	77.9	56.9	52.7	10	5.3	4.9	8.8	8.4	12.2	8.4	8.5	4.2	8.5	8.2	31.3	8.7	8.2	4.2			
4	5	9	6	11	8	10	3646	11	77.4	62.3	49.5	2	6.2	5.4	6.6	7.5	13.7	7.2	7.2	4.2	6.7	5.9	32	6.2	6.1	3.9	6.1	6.1	4.2
4	5	9	6	11	8	22	3648	10	56.8	73.2	48.5	0	5.4	5.4	6.9	6.5	19.5	6.6	6.1	4.5	4.6	4.4	29.8	5.6	5.2	4.2			
4	5	9	6	11	17	24	3746	10	77.6	57.7	63.5	10	4.8	5.1	8.6	8.3	12.1	8.7	8.5	4.2	8.1	8	31.9	8.5	8.9	3.8			
4	5	9	6	11	17	37	3750	11	75.3	63.3	60.4	2	5.6	5.6	6.7	6.2	13.5	6.3	7.3	4.4	6.6	6.1	31.9	6.6	5.8	4	6.5	6.1	4.4
4	5	9	6	11	17	44	3752	10	55.2	73.8	59	0	5.1	5.2	6.1	6.4	19.5	6.4	6.1	4.7	4.2	5.4	30	4.6	5.7	4.3			
4	5	9	6	11	26	46	3829	10	76.9	56.5	72.8	10	5.5	5	8.2	7.7	12.5	8.5	7.6	3.8	8.1	8.5	31.7	9.3	8.5	3.8			
4	5	9	6	11	27	17	3836	11	76.6	65	70.7	2	5.6	5.8	6.9	5.7	13.5	6.5	5.9	4.7	6.6	6.9	32.2	6.6	6.8	4.2	6.8	6.3	4.2
4	5	9	6	11	27	23	3838	10	56.7	73.9	68.8	0	5.1	5.3	6.2	5.6	20	6.5	6.4	4.1	4.8	5.6	30.4	5.2	6	4.1			
4	5	9	6	11	36	21	3914	10	77.9	56.9	52.7	0	5.2	5	8.5	8.5	11.8	8.5	8.3	4.5	8.4	8.1	31.3	8.8	8.4	4.2			
4	5	9	6	11	36	48	3916	11	77.8	63.9	49.5	2	6.1	5.5	6.8	7.4	13.7	7.6	6.7	4.6	6.5	6.3	32	6.2	6.1	4.2	6.6	6	4.2
4	5	9	6	11	36	51	3918	10	56	74.7	53.8	0	5.2	5.2	6.4	6.9	19.9	6.5	6.6	4.3	4.8	4.6	30.2	4.9	4.8	4.3			
4	5	9	6	11	45	20	3975	10	78.4	57.7	63.5	10	5.1	5	8.9	8.2	12.1	8.2	8.8	4.2	8.2	8.2	31.9	8.8	9	3.8			
4	5	9	6	11	45	35	3978	11	77.8	63.3	60.4	2	6.1	5.7	6.8	6.2	13.5	7.1	7.3	4.4	7.2	6.3	31.9	7	6.4	4	6.3	5.5	4.4
4	5	9	6	11	45	45	3982	10	56.9	74.5	60.4	0	5.2	5.2	6.6	6.4	19.9	7.1	6.6	4.4	4.4	5.5	30.7	4.6	5.3	4.4			
4	5	9	6	11	55	6	4074	10	76.5	57	72.8	0	4.7	5.1	8.8	7.8	12	8.4	8.1	4.3	8.1	8.5	31.7	9.1	7.9	3.8			
4	5	9	6	11	55	16	4077	11	74.3	61.6	68.8	2	5.8	5.5	7	5.3	13.6	6.8	5.7	4.5	6.5	6.9	31.8	6.1	6.2	4.1	6.5	6.2	4.1
4	5	9	6	11	55	22	4079	10	59.9	74.4	68.8	0	5.3	5.6	6.1	6.1	20	7.2	6.2	4.1	5.7	5.9	30.4	5.7	6	4.5			
4	5	9	6	12	4	54	4165	10	78.6	57.3	52.7	10	5.2	5	8.3	8.5	12.2	8.6	8.5	4.2	8.7	8.3	31.6	9.1	8.4	3.8			
4	5	9	6	12	5	32	4171	11	78.1	63	49.5	2	6.1	5.4	6.7	7.6	13.7	7.4	6.8	4.6	6.5	6.2	32	6.3	6.4	4.2	6.3	6.4	4.2
4	5	9	6	12	5	47	4176	10	56.3	73.8	48.5	0	5.2	5.1	6.6	6.7	19.8	6.7	6.1	4.2	4.6	4.5	30.1	5.5	5.1	4.2			
4	5	9	6	12	14	40	4266	10	78.8	57.3	63.5	10	5.3	4.8	9.1	8.2	12.1	8.2	8.7	4.2	8.5	8.5	31.4	9.3	8.4	4.2			
4	5	9	6	12	14	50	4269	11	75.3	63.6	70.7	2	5.5	5.7	6.1	6.3	13.5	6.4	6.6	4.7	6.3	6.5	32.2	6.5	6.5	4.2	6.6	6.4	4.2
4	5	9	6	12	15	5	4271	10	56	73.4	59	0	5.3	5.2	6.5	6.3	19.8	6.4	6.7	4.3	4.2	5.3	30.3	4.6	5.5	3.9			
4	5	9	6	12	25	20	4357	10	76.2	57	72.8	0	5.3	4.5	7.9	8.5	12	7.8	8.7	4.3	8.8	8.4	31.2	8.8	7.6	4.3			

4	5	9	6	12	25	59	4363	11	77.7	63.9	49.5	2	6.1	5.5	6.6	7.3	14	7.5	6.7	4.6	6.3	6.4	32.3	6.1	6.5	3.9	6.3	6.3	4.2
4	5	9	6	12	26	1	4364	10	55.5	73	51.6	0	5.2	5.1	6.1	6.8	19.8	6.1	7	4.4	4.5	4.4	30	5.4	4.9	4.1			
4	5	9	6	12	42	42	4500	10	78.3	57.6	53.8	0	5.5	5	8.6	8.3	12.1	8.5	8.6	4.6	8.8	8	31.6	8.9	8.2	3.9			
4	5	9	6	12	43	3	4503	11	77.6	63.1	50.5	2	6.1	5.4	6.7	7.3	13.6	7.1	7.4	4.7	6.4	6.2	32.3	6.6	6	4	6.1	6.3	4.3
4	5	9	6	12	43	7	4504	10	55.9	74.4	49.5	0	5.2	5.5	6.8	6.3	19.9	7	6.1	4.6	4.6	4.4	30	4.9	5.2	4.2			

4 LN 4

SB

Sheet 21	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 1 of 3	* DATE 05/09/2006

Rev. 08/31/2001

LANE 4 PRE VAL 5/9/06 (SOME LANE 1)

LANE	Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
4	88.5					3054	52							78.5					
4	88.5					3056	49							78.0					
4	91.5					3152	61							77.7					
4	91.5					3158	61							76.2					
4 4	92.5					3240 3245	68 70							76.9 76.3					
4 4	93.0	48				3341 3343	51 50							78.6 77.5					
4 4						3440 3443	63 60							78.0 73.1					
4 4 4			71 69 70			3560 3563 3566	72 70 68							78.7 76.1 62.0					
4 4 4	97.0		47			3642 3646 3648	52 49 48							77.9 77.4 56.8					

Recorded by ______________ Checked by ______________

Ln. 4

4

Sheet 21	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 3	* DATE 05/09/2006

Rev. 08/31/2001

LANE 4 PRE VAL 5/9/06

	Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
4	100.5	59				3746	63							77.6					
4		59				3750	60							75.3					
4		58				3752	58							55.2					
4	98.0	70				3829	72							77.0					
4		68				3836	70							76.6					
4		68				3838	68							56.2					
1					LANE 1	3877	52							80.2					
1						3879	50							79.1					
1						3885	60							55.6					
4	100.5	52				3914	52							77.9					
4		48				3916	49							49.0					
4		54				3918	53							56.0					
4	104	60				3975	63							78.4					
4		59				3978	60							77.8					
4		58				3982	60							56.9					
4	104.5	70			4074+	4074	72							76.5					
4		68				40.77	68							74.3					
4		69				4079	68							59.9					
	104.0	51				4165	52							78.6					
		48				4171	49							78.1					
		48				4176	48							56.3					
	106.5	62				4266	63							78.8					
		~~68~~ 68				4269	70							75.3					
		59				4271	58							56.0					

Recorded by ____________ Checked by ____________

Ln. 4

Sheet 21	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 3 of 3	* DATE 05/09/2006

Rev. 08/31/2001

LANE 4 PRE VAL 5/9/06

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
106	70 49 50				4357 4363 4364	72 49 51							76.2 77.7 55.5					
108	~~50~~ 52 ~~49~~ 50 ~~59~~ 49				4500 4503 ~~55~~4504	53 50 49							78.3 77.6 55.9					

Recorded by ____________________ Checked by ____________________

480100 LANE 4 POST VALIDATION

5-10-06

La	Mc	Day	Yr	Hr	Min	Sec	Veh#	Cls	GVW	Length	Speed	Vio	Ax1R	Ax1L	Ax2R	Ax2L	1to2	Ax3R	Ax3L	2to3	Ax4R	Ax4L	3to4	Ax5R	Ax5L	4to5	Ax6R	Ax6L	5to6
4	5	10	6	14	9	14	5194	10	77.3	56.2	52.7	0	5.1	4.9	8.5	8.4	12.2	8.3	8.3	4.2	8.5	8	31.3	8.8	8.3	4.2			
4	5	10	6	14	9	30	5198	11	76.5	63	49.5	2	6.2	5.3	6.6	7.5	13.4	7	7.4	4.6	6.6	5.7	31.7	6	6.3	4.2	6.1	5.7	4.2
4	5	10	6	14	9	49	5204	10	57.2	64.8	68.8	0	5.9	5.4	7.2	7.1	12.7	7.3	5.8	4.1	5.4	3	36.3	6.1	3.8	4.1			
4	5	10	6	14	22	39	5325	10	78.4	57.3	63.5	10	5.4	5	8.7	8.5	12.1	8.3	8.4	4.2	8.9	7.8	31.4	8.9	8.7	4.2			
4	5	10	6	14	22	56	5327	11	74.7	62.9	60.4	2	5.5	5.2	6.9	5.7	13.9	7.1	6.7	4	6.5	5.9	31.9	6.5	5.9	4.4	6.5	6.2	4
4	5	10	6	14	23	0	5330	10	55.8	74.6	59	0	5.4	5.1	6.6	6.4	19.8	6.8	6.4	4.3	4.2	4.8	30.3	4.8	5.2	4.3			
4	5	10	6	14	31	59	5421	10	78.9	57.4	72.8	10	5.4	4.9	9	8.5	12	8.7	8.9	4.3	9.2	8	31.2	8	8.3	4.3			
4	5	10	6	14	32	8	5422	11	75.4	63.1	70.7	2	5.5	5.4	5.9	6	14	6.3	6.8	4.2	7	6.7	32.2	6.9	6.5	4.2	6.5	5.9	4.2
4	5	10	6	14	32	14	5424	10	59.2	73.9	68.8	0	5.6	5.7	5.8	6.5	20	6.8	6.1	4.1	5.3	6.2	30.4	5.3	6.1	4.1			
4	5	10	6	14	41	31	5512	10	77.2	55.9	52.7	0	5.1	4.8	8.6	8.3	11.8	8.3	8.6	4.5	8.5	7.7	30.9	8.7	8.4	4.2			
4	5	10	6	14	41	45	5515	11	77.2	63.6	49.5	2	6	5.6	6.3	7.7	13.7	7.7	6.7	4.2	6.4	6.3	31.7	6.2	6	4.2	6.3	5.9	4.2
4	5	10	6	14	41	53	5516	10	56.4	74.1	49.5	0	5.1	5.6	6.5	6.7	19.9	6.6	6	4.2	4.3	4.4	30.4	5.7	5.4	4.2			
4	5	10	6	15	41	58	6162	10	77.7	55.9	52.7	10	5.2	4.8	8.6	8.5	11.8	8.6	8.4	4.5	8.6	7.9	30.9	8.7	8.5	4.2			
4	5	10	6	15	42	13	6164	11	77.5	63.4	50.5	2	5.9	5.5	6.7	7.5	14	7.5	7.2	4.3	6.7	5.9	32.3	6	6.2	4.3	6.2	6.1	4.3
4	5	10	6	15	42	19	6166	10	55.7	74.7	49.5	0	5.2	5.3	6.8	6	20.2	6.8	5.8	4.2	4.5	4.6	30.4	5.5	5.2	4.2			
4	5	10	6	15	50	30	6251	10	78.9	57.3	63.5	10	4.8	5	8.3	8.6	12.1	8.6	8.3	4.2	8.5	8.8	31.4	9.3	8.9	4.2			
4	5	10	6	15	51	29	6260	11	75.7	64.7	61.9	2	5.8	5.1	6.4	6.6	13.9	6.8	7.3	4.5	6.5	6.2	32.3	6.4	6.2	4.1	6.4	5.9	4.5
4	5	10	6	15	51	35	6262	10	55.5	74.5	60.4	0	5.7	5.1	6.8	6.5	19.9	6.9	6.1	4.4	3.7	5.2	30.7	5	4.5	4			
4	5	10	6	16	0	34	6335	10	80.6	57	72.8	14	5.4	5.2	8.7	8.6	12	8.5	8.8	4.3	9.3	8.1	31.2	9.2	8.6	4.3			
4	5	10	6	16	1	15	6345	11	74.9	63.6	70.7	2	5.4	5.6	6.9	5.3	13.5	7.1	5.8	4.7	6.1	7.1	32.2	6	6.8	4.2	6.4	6.4	4.2
4	5	10	6	16	1	21	6347	10	53.2	75.3	70.7	0	5.6	5.5	6.8	6.6	20.5	6.7	6.2	4.2	2.6	3.4	30.8	4.3	5.5	4.2			
4	5	10	6	16	10	22	6436	10	77.8	56.6	52.7	10	5.2	4.9	8.7	8.5	12.2	8.5	8.4	4.2	8.5	7.6	30.9	8.9	8.5	4.2			
4	5	10	6	16	10	34	6439	11	76.5	63.4	50.5	2	5.9	5.1	6.7	7.3	14	7.2	7.3	4.3	6.6	5.8	32.3	6.6	5.9	4	5.9	6.2	4.3
4	5	10	6	16	10	38	6440	10	56.2	75.4	50.5	0	5.3	5.4	6.7	6	20	7	6.5	4.7	4.4	4.2	30.3	5.4	5.3	4.3			
4	5	10	6	16	30	3	6678	10	79.1	57	72.8	10	5.4	4.8	9	8.6	12	8.6	8.9	4.3	7.8	7.8	31.2	9.3	8.9	3.8			
4	5	10	6	16	30	13	6679	11	74.5	62.7	70.7	2	5.4	5.6	6.9	5.4	13.5	6.5	6.6	4.7	6.5	6.8	32.2	6.5	6.5	4.2	6.1	5.8	4.2
4	5	10	6	16	30	19	6682	10	56.2	75.7	70.7	0	5.2	5.4	6.1	6.5	20.1	7.4	6.2	4.2	3.8	4.9	30.8	4.8	5.8	4.2			
4	5	10	6	16	39	13	6760	10	77.9	56.9	53.8	10	5.3	4.8	8.5	8.4	12.1	8.5	8.6	4.3	8.6	8.1	31.3	8.7	8.3	4.3			
4	5	10	6	16	39	23	6762	10	56.7	75.1	49.5	0	5.3	5.5	6.9	6.2	20.2	6.7	6.5	4.2	4.3	4	30.7	5.6	5.7	4.2			
4	5	10	6	16	47	52	6856	10	78.1	57.3	63.5	10	4.9	4.8	8.7	8.7	12.1	8.5	7.9	4.2	9.1	8	31.4	8.8	8.7	4.2			
4	5	10	6	16	48	7	6861	10	54.8	73.8	59	0	5.3	5.1	6.1	6.1	19.8	6.2	6.4	4.3	3.9	5.2	30	5.7	4.7	4.3			
4	5	10	6	16	57	15	6956	10	76.8	57.6	53.8	0	5.3	4.6	8.6	8.3	12.1	8.4	8.5	4.6	8.3	7.7	31.6	8.8	8.4	3.9			
4	5	10	6	16	57	26	6960	10	55.3	74.4	49.5	0	5.6	5.2	6.6	6.3	19.9	6.6	6.2	4.2	4.2	4.1	30.4	5.4	5.1	4.2			
4	5	10	6	17	21	29	7171	10	56.6	74.8	68.8	0	5.1	5.5	6.1	6.8	20	6.1	5.9	4.5	5	5.2	30	4.9	5.8	4.5			
4	5	10	6	17	55	11	7444	10	76.9	57.3	63.5	10	5.1	4.6	8.2	8.3	11.7	7.9	8.8	4.6	8.8	8.5	31.4	8.4	8.4	3.8			
4	5	10	6	17	55	36	7445	10	57.1	67.7	57.6	16	5.4	5.4	6	6	19	6.6	6.6	4.2	5.2	5.2	29.3	5.2	5.2	3.8			
4	5	10	6	18	5	59	7527	10	77.6	56.8	63.5	10	5.2	4.9	8.3	8.7	12.1	8	8.3	4.6	8.7	8.5	31.4	8.7	8.3	4.2			
4	5	10	6	18	6	2	7528	10	54.9	74.4	65.2	0	5.1	5.5	6.1	6.4	19.8	6.2	6.1	4.3	3.5	5.4	30.5	5.6	5.1	3.9			
4	5	10	6	18	13	29	7578	10	77.2	55.6	51.6	0	4.9	4.7	8.3	8.6	11.9	8.5	8.4	4.1	8.4	8.1	31	8.7	8.7	4.1			

4	5	10	6	18	13	29	7578	10	77.2	55.6	51.6	0	4.9	4.7	8.3	8.6	11.9	8.5	8.4	4.1	8.4	8.1	31	8.7	8.7	4.1
4	5	10	6	18	13	36	7579	10	56.2	74.1	49.5	0	5.3	5.1	6.9	6.1	19.9	7	6.5	4.6	4.2	4.5	30	5.7	4.9	4.2
4	5	10	6	18	22	36	7674	10	77	56.4	63.5	10	5.3	4.7	8.1	8.7	12.1	8.1	8.1	4.6	8.6	8.2	31.4	8.6	8.6	4.2
4	5	10	6	18	22	43	7675	10	55.2	74.6	59	0	5.6	4.8	6.5	6.4	19.8	6.4	6.2	4.3	4.1	5.6	30.3	4.7	4.8	4.3

Sheet 21	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records of	* DATE 05/10/2006

Rev. 08/31/2001

LANE 4 POST VALIDATION 5/10/06

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
140	51				5194								77.3					
	48				5198								76.5					
					~~5195~~	5204							57.2					
141.5	60				5325													
					5327													
	56				5330													
137.5					5421								79.0					
	67				5422								75.5					
	66				5424								59.2					
134.5	50				~~[illegible]~~	5512												
	48				5515													
	47				5516													
132	60				6162	52	5.2/4.8	8.6/8.5	8.6/8.4	8.6/7.9	8.7/8.5		77.7	11.8	4.5	30.9	4.2	
	59				6164	50	5.9/5.5	6.7/7.5	7.5/7.2	6.7/5.9	6.0/6.2	6.2/6.1	77.5	14.0	4.3	32.3	4.3	4.3
	57				6166	49	5.2/5.3	6.8/6.0	6.8/5.8	4.5/4.6	5.5/5.2		55.7	20.2	4.2	30.4	4.2	
2					6251									12.1	4.2	31.4	4.2	
					6260	61	5.8/5.1	6.4/6.6	6.8/7.2	6.5/6.2	6.4/6.2	6.4/5.9	75.7	13.9	4.5	32.3	4.1	4.5
					6262	60	5.7/5.1	6.8/6.5	6.9/6.1	3.7/5.2	5.0/4.5		55.5	19.9	4.4	30.7	4.0	
127.5					6335													
					6345													
					6347													
123.5	50				6436	5.2/4.9	8.7/8.5	8.5/8.4	8.5/7.6	8.9/8.5			77.8	12.2	4.2	30.9	4.2	
	47				6439	5.9/5.1	6.7/7.3	7.2/7.3	6.6/5.8	6.4/5.9	5.9/6.2		76.5					
	48				6440								56.1					

Recorded by ____________ Checked by ____________

4 5662

Sheet 21	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records of	* DATE 05/10/2006

Rev. 08/31/2001

LANE 4 POST-VALIDATION 5/10/06

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
119.5	63 58 58				from bottom 7674 7675													
	70 67 67				6678 6679 6682													
108	51 47 62				6760 6762 6856													
	~~62~~ 58				~~6859~~ 6861 6956 ?													
	47 56				6960 7171													
35					7444 7445	63 57												
	60 58				7527 7528													
					7578 7579													

Recorded by ______________ Checked by ______________

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

STATE: Texas

SHRP ID: 480100

Photo 1 – TO_13_48_2.60_0100_Truck_1_Tractor.JPG

Photo 2 – TO_13_48_2.60_0100_Truck_1_Tractor_Suspension.JPG

Photo 3 – TO_13_48_2.60_0100_Truck_1_Trailer_Suspension.JPG

Photo 4 – TO_13_48_2.60_0100_Truck_2_Load.JPG

Photo 5 – TO_13_48_2.60_0100_Truck_2_Tractor.JPG

Photo 6 – TO_13_48_2.60_0100_Truck_2_Tractor_Suspension.JPG

Photo 7 – TO_13_48_2.60_0100_Truck_2_Trailer_Suspension.JPG

Photo 8 – TO_13_48_2.60_0100_Truck_2_Trailer_Suspension_2.JPG

Photo 9 – TO_13_48_2.60_0100_Truck_3_Load.JPG

Photo 10 – TO_13_48_2.60_0100__Truck_3_Tractor.JPG

Photo 11 – TO_13_48_2.60_0100_Truck_3_Tractor_Suspension.JPG

Photo 12 – TO_13_48_2.60_0100_Truck_3_Trailer_Suspension.JPG