Validation Report

Ohio, SPS-1

Task Order 9, CLIN 2
May 10 through May 12, 2005

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1 Executive Summary

A visit was made to the Ohio SPS-1 beginning on May 10 and continuing through May 12, 2005 for the purposes of conducting a validation of the WIM system located on US Route 23 at milepost 19.7. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This site meets all LTPP loading precision requirements except speed, which is not considered sufficient to disqualify the site as having research quality loading data.

The classification algorithm is currently not providing research quality classification information.

The site is instrumented with Mettler-Toledo load cell sensors and WIM controller.

The validation used the following trucks:

1) 3S2 with a tractor having air suspension and standard rear tandem trailer having air suspension, loaded to 76,800 lbs.
2) 3S2 with a tractor having air suspension and trailer having a standard two leaf spring suspension, loaded to 52,020 lbs.

The validation speeds ranged from 44 to 59 miles per hour. The pavement temperatures ranged from 57.5 to 102.5 degrees Fahrenheit.

Table 1-1 Post-Validation results – 390100 – 12-May-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	1.4%±5.7%	Pass
Tandem axles	±15 percent	3.9%±8.3%	Pass
Gross vehicle weights	±10 percent	3.5%±6.0%	Pass
Speed	±1 mph [2 km/hr]	**0.9±1.0 mph**	**Fail**
Axle spacing	± 0.5 ft [150 mm]	0.0±0.2 ft	Pass

The pavement condition was sub-optimal for conducting a performance evaluation (as noted in the original assessment report and the last validation visit reports). In the field, significant truck bouncing was observed at the transition from asphalt to concrete pavement approximately 165 feet prior to the WIM scale area. Profiling data supported this observation and indicated high index values throughout the WIM scale area, specifically the most critical area from 300 feet prior to the scale area to 100 feet after the scale area. In this case this roughness did not appear to impact on equipment performance.

This site meets the overall classification requirement of less than two percent unclassified. However, it does not meet the less than two percent trucks misclassified criteria.

Most vehicles that were misclassified were Class 3s, 4s and 5s that were being misidentified within the category of light single unit vehicles, i.e. 3s classified as 4s and 5s, 4s being classified as 5s, and 5s being classified as 3s and 4s. This misclassification failure is not considered significant under the proposed modification to the definition of research quality classification data (by the Traffic ETG) that includes only heavy vehicles (Class 6 and above).

Weight estimations by the WIM equipment installed at this site appears to be affected by pavement temperatures above 95 degrees Fahrenheit, indicating a possible overcompensation by a temperature compensation function of the equipment. This problem was identified during the pre-calibration process, however; following the calibration adjustments the impact of pavement temperature on GVW was not noticeable.

MACTEC field personnel worked with the agency representative to compute all factor adjustments. The agency representative made all equipment changes. This is consistent with our experience in other jurisdictions and our previous visits to this site.

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, and the field validation procedures do not include verification of that information.

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%	97.7%	Pass
GVW	± 10%	95.3%	Pass

2 Corrective Actions Recommended

The system's classification algorithms should be augmented with weight parameters to correct the problem of small Class 5 vehicles being classified as Class 3s and 4s and vice versa.

The temperature compensation function of the equipment should be reviewed by the agency and vendor to ensure that the equipment is not overcompensating for temperatures above 95 degrees Fahrenheit.

The backup of the water being drained from the sensors originally identified during the November, 2003 assessment was reevaluated. The condition described at that time remains. Although there appears to be adequate room for a significant amount of water, if the drainage pipe was to back up and become frozen, the scale pit will begin to fill eventually keeping the scale from operating properly.

3 Post Calibration Analysis

This final analysis is based on test runs conducted May 11, 2005 during the early evening hours and May 12, 2005 during the morning hours at test site 390100 on US Route 23. This SPS-1 site is at milepost 19.7 on the southbound, right hand lane of a divided four-lane facility. No auto-calibration was used during test runs. The two trucks used for initial calibration and for the subsequent testing included:

1. 3S2 with a tractor having air suspension and standard rear tandem trailer having air suspension, loaded to 76,800 lbs.(Golden Truck B)
2. 3S2 with a tractor having air suspension and trailer having a standard two leaf spring suspension, loaded to 52,020 lbs. (Class 9)

These trucks made a total of 43 passes over the WIM scale at speeds ranging from approximately 44 to 59 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 57 to 103 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are reflected in Table 3-1.

Table 3-1 Post-Validation Results - 390100 – 12-May-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	1.4%±5.7%	Pass
Tandem axles	±15 percent	3.9%±8.3%	Pass
Gross vehicle weights	±10 percent	3.5%±6.0%	Pass
Speed	±1 mph [2 km/hr]	**0.9±1.0 mph**	**Fail**
Axle spacing	± 0.5 ft [150 mm]	0.0±0.2 ft	Pass

As shown in Table 3-1 this site meets all LTPP WIM precision requirements except for speed measurement which is not considered sufficient to disqualify the site as having research quality loading data.

The test runs were conducted primarily during the early evening hours on May 11 and morning hours on May 12, resulting in two groups of pavement temperatures at the two extremes of the temperature range. The runs were also conducted at various speeds to determine the effects of that variable on the performance of the WIM scale. To investigate both effects, the dataset was split into three speed groups and two temperature groups. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the desired distribution of speed and temperature combinations was not achieved for this set of validation runs. Although the desired speed range was achieved, due to unseasonably low temperatures on May 12, temperatures to bridge the gap between the lower and upper temperature groups were not observed.

The speed groups were divided as follows: Low speed - 42-47 mph, Medium speed - 48-52 mph and High speed 53+ mph. The two temperature groups were created by splitting the runs between those at 55 to 80 degrees Fahrenheit for Low temperature and 81 to 105 degrees Fahrenheit for High temperature.

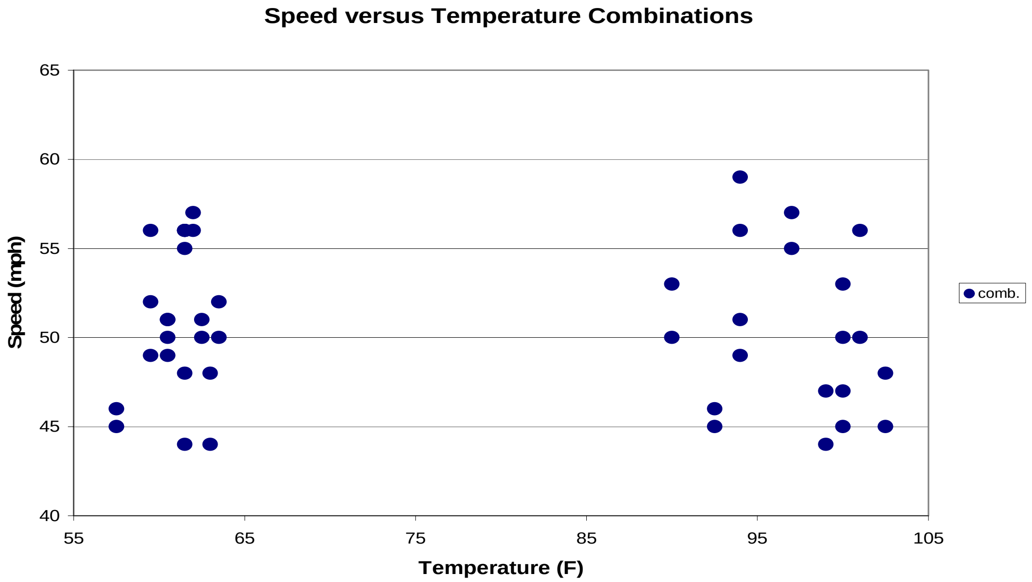


Figure 3-1 Post-Validation Speed-Temperature Distribution – 390100 – 12-May-2005

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 that the GVW error estimate of the WIM equipment decreased as the speed of the test trucks increased. The scatter of the percent error also decreased as the speeds increased. As the speed limit at this location is 55 mph and the 85th percentile speed is 60 mph, this trend does not merit adjustments to the equipment.

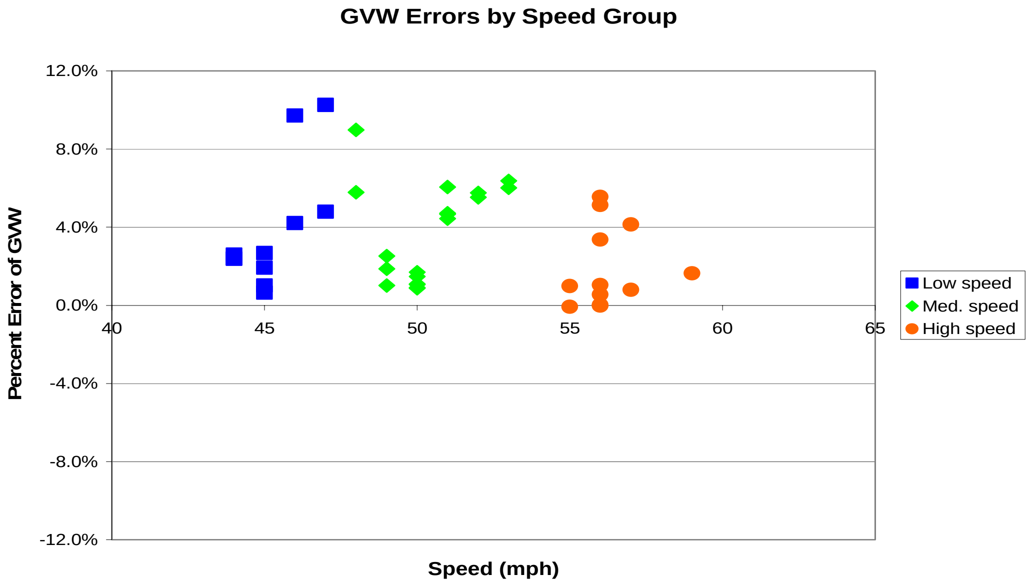


Figure 3-2 Post-validation GVW Percent Error vs. Speed – 390100 –12-May-2005

Figure 3-3 shows the relationship between temperature and GVW percentage error. The graph illustrates that there does not appear to be a relationship between GVW error and pavement temperature.

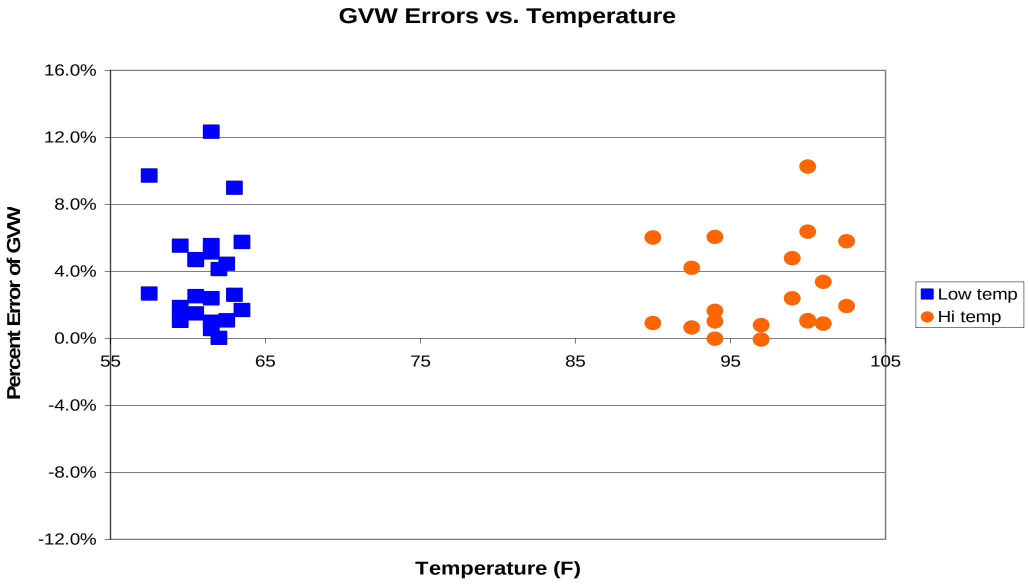


Figure 3-3 Post-Validation GVW Percent Error vs. Temperature – 390100 – 12-May-2005

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 spacing 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.

Axle spacing errors appear to be consistent throughout the test truck speed range and are limited to maximums of about 2.4 inches (0.2 feet). Vehicle speeds appear to have no effect on the error of measured axle spacing.

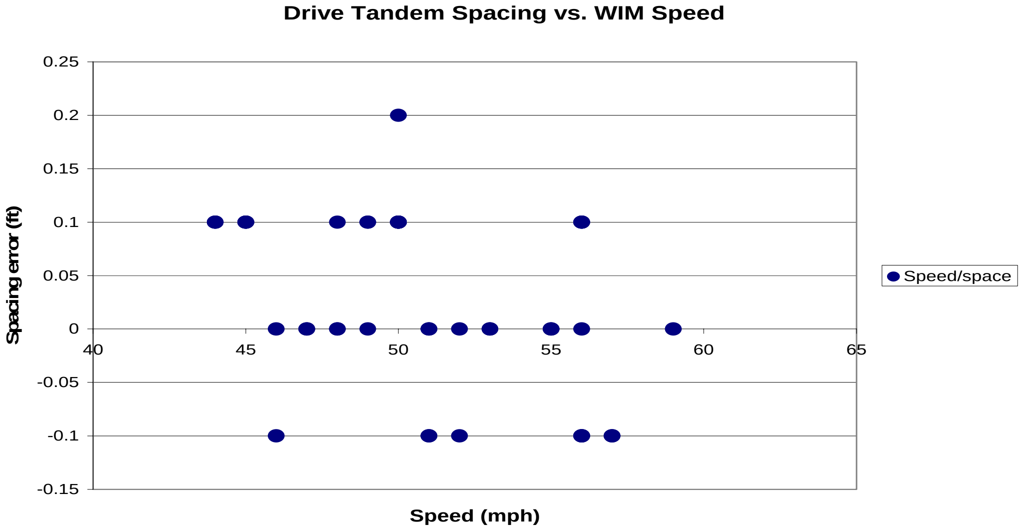


Figure 3-4 Post-Validation Spacing vs. Speed - 390100 – 12-May-2005

3.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 55 to 80 degrees Fahrenheit for Low temperature and 81 to 105 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 390100 –12-May-2005

Element	**95% Limit**	**Low Temperature 55-80 °F**	**High Temperature 81-105 °F**
Single axles	±20 %	2.4%±5.5%	0.2%±5.4%
Tandem axles	±15 %	4.2%±8.3%	3.5%±8.6%
GVW	±10 %	3.9%±6.5%	3.0±5.8%
Axle spacing	± 0.5 ft	0.0±0.2 ft	0.0±0.2 ft

The unseasonably low temperatures during the morning hours of May 12 did not allow the pavement temperature to increase enough to bridge the gap between the low temperatures and the high temperatures. As a result, there is no “medium” temperature range group in Table 3-2. Although these “medium” temperatures were not achieved during the test runs, results from the test truck runs over the wide range of pavement temperatures indicated very small changes in mean and variability errors.

Figure 3-5 shows the distribution of GVW errors versus temperature by truck. It appears that the GVW of both trucks was overestimated. The Class 9 truck (diamonds) was overestimated by more than the Golden Truck B GVW (squares). The consistency of GVW results for the Class 9 and the Golden Truck indicates a lack of a relationship between the GVW mean error and the pavement temperature.

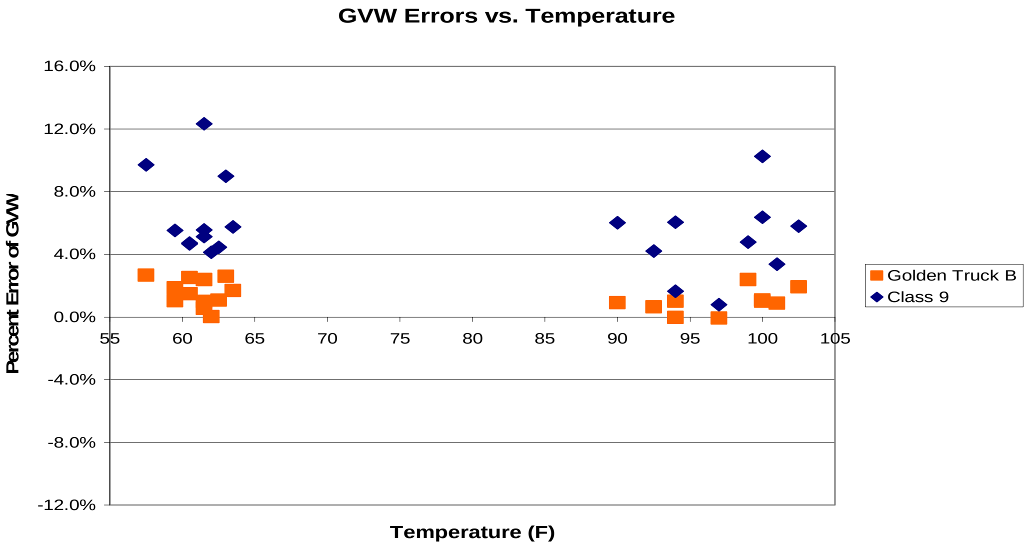


Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 390100 – 12-May-2005

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 utilize auto-calibration.

The figure illustrates a general overestimation of steering axle weights by this WIM equipment at the lower temperatures. At higher temperatures the WIM equipment appears to estimate the steering axle weight reasonably well.

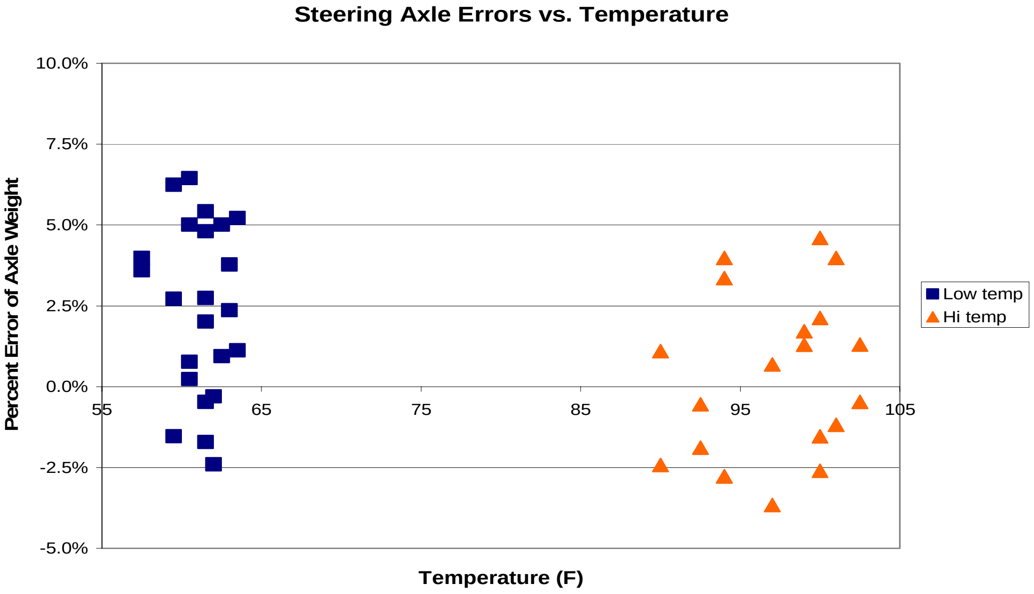


Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group - 390100 –12-May-2005

3.2 Speed-based Analysis

The speed groups were divided as follows: Low speed - 42-47 mph, Medium speed - 48-54 mph and High speed 55+ mph.

Table 3-3 Post-Validation Results by Speed Bin – 390100 – 12-May-2005

Element	**95% Limit**	**Low Speed 42-47 mph**	**Medium Speed 48-54 mph**	**High Speed 55+ mph**
Single axles	+20 %	1.1%±4.8%	2.3%±6.1%	0.3%±6.4%
Tandem axles	+15 %	4.5%±8.9%	4.3%±8.9%	2.2%±7.2%
GVW	+10 %	3.9%±7.2%	4.2%±6.5%	1.9%±4.5%
Axle spacing	+ 0.5 ft	0.2±0.2 ft	0.0±0.2 ft	0.0±0.2 ft

From the table it appears that this WIM equipment at this site generally overestimates all weights with a slight decrease in the overestimation at the higher speeds. The effect of speed on the variability of the weight errors is nearly negligible with only a slight decrease in GVW error variability at the higher speeds.

Figure 3-7 illustrates the tendency of the WIM equipment to produce a smaller mean error and reduce the scatter of the error as the speed of the test trucks increased. This tendency is more prevalent with the Class 9 truck (diamonds), which was the partially loaded vehicle, than the Golden Truck B (squares).

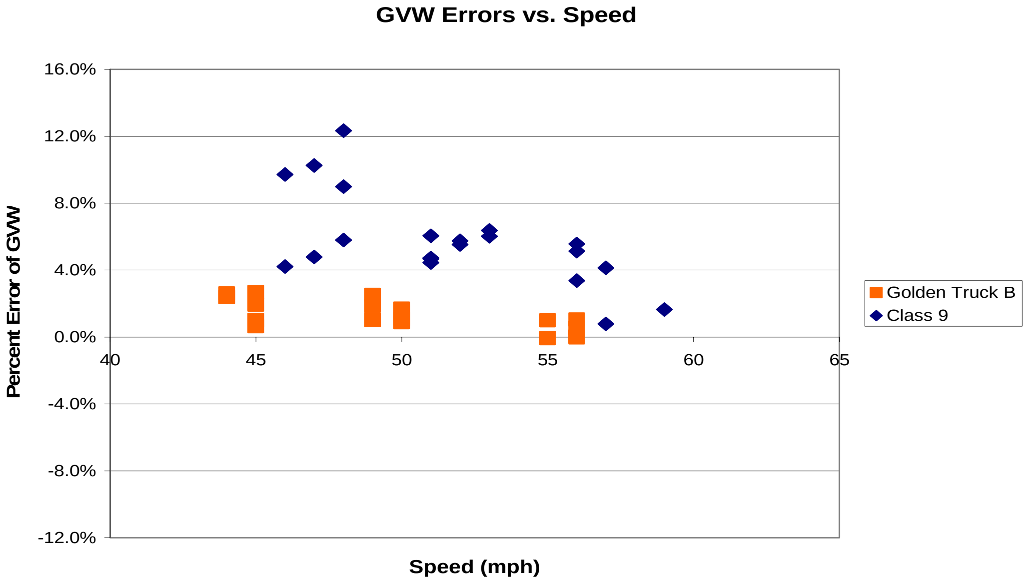


Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 390100 –12-May-2005

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 utilize auto-calibration. This figure illustrates that there is almost no relationship between steering axle error and speed.

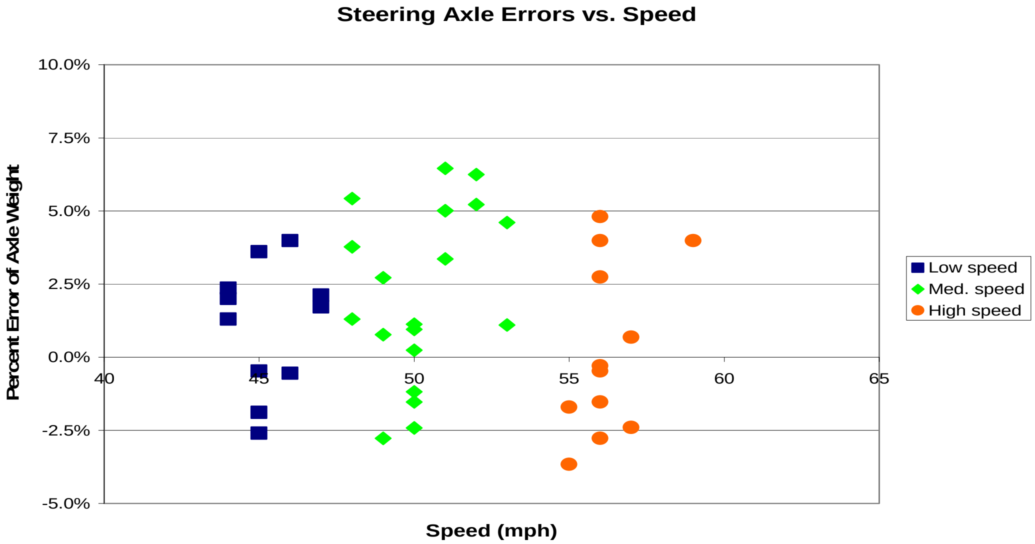


Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group- 390100 –12-May-2005

3.3 Classification Validation

The agency uses the FHWA 13 bin classification scheme.

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

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 3-4 has the classification error rates by class. The overall misclassification rate is 18.2% and is driven solely by light single unit vehicles.

Table 3-4 Truck Misclassification Percentages for 390100 - 12-May-2005

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	80%	5	80%	6	0.0%
7	Unknown				
8	0.0%	9	0.0%	10	Unknown
11	Unknown	12	Unknown	13	Unknown

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 reported above 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 3-5 Truck Classification Mean Differences for 390100 - 12-May-2005

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	100.0	5	40.0	6	0.0
7	N/A				
8	0.0	9	0.0	10	N/A
11	N/A	12	N/A	13	N/A

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

Truck Classes 4 and 5 are regularly misclassified as each other and as Class 3s at this site. During the verification of the algorithm it was discovered that the classification of the vehicles did not appear to consistently follow the algorithm settings in the equipment. Further investigation of this problem will be conducted by the agency.

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, and the field validation procedures did not include verification of that information.

Table 3-6 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	97.7%	Pass
GVW	± 10%	95.3%	Pass

4 Pavement Discussion

The site was successfully calibrated and validated in spite of the pavement smoothness issues indicating the longitudinal profile would most likely interfere with successful data collection.

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

4.1 Profile analysis

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

Profile data was collected at this SPS WIM location by Stantec, Inc. on May 4, 2005 and 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. These ranges are shown in Table 4-1. When all of the values are below the lower thresholds, it is presumed unlikely that pavement smoothness will significantly influence sensor output. When one or more values exceed an upper threshold there is a reasonable expectation that the pavement smoothness will influence the outcome of the validation. When all values are below the upper threshold but not all below the lower threshold, the pavement smoothness may or may not influence the validation outcome.

Table 4-1 Thresholds for WIM Index Values

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

Table 4-2 shows the computed index values for all 11 profiler passes for this WIM site. The average values over the passes in each path were also calculated when three or more passes were completed. These are shown in the right most column of the table. Values below the index lower limits are presented in *italics*. Values above the upper limits are in **bold**.

Table 4-2 WIM Index Values - 390100 –04-May-2005

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Pass 5	Ave.
Center	LWP	LRI (m/km)	1.175	1.222	1.202	1.177	1.216	1.198
		SRI (m/km)	1.367	1.063	1.117	1.053	1.065	1.133
		Peak LRI (m/km)	**2.155**	1.989	**2.176**	2.032	**2.108**	2.092
		Peak SRI (m/km)	1.399	1.373	1.522	1.506	1.514	1.463
	RWP	LRI (m/km)	0.772	0.885	0.983	0.882	1.028	0.910
		SRI (m/km)	1.212	1.303	1.527	1.458	1.458	1.392
		Peak LRI (m/km)	**2.507**	**2.420**	**2.474**	**2.427**	**2.427**	**2.451**
		Peak SRI (m/km)	1.319	1.598	1.769	1.721	1.650	1.611
Left Shift	LWP	LRI (m/km)	1.193	1.208	1.293			1.231
		SRI (m/km)	1.372	1.455	1.492			1.440
		Peak LRI (m/km)	**2.264**	**2.239**	2.009			**2.171**
		Peak SRI (m/km)	1.496	1.642	1.590			1.576
	RWP	LRI (m/km)	1.030	1.041	1.041			1.037
		SRI (m/km)	1.568	1.465	1.268			1.434

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Ave.**
		Peak LRI (m/km)	1.731	1.772	1.572			1.692
		Peak SRI (m/km)	1.927	1.688	1.367			1.661
Right Shift	LWP	LRI (m/km)	1.178	1.136	1.185			1.166
		SRI (m/km)	1.410	1.403	1.367			1.393
		Peak LRI (m/km)	1.712	1.901	1.854			1.822
		Peak SRI (m/km)	1.481	1.459	1.481			1.474
	RWP	LRI (m/km)	0.909	0.908	0.948			0.922
		SRI (m/km)	1.334	1.285	1.421			1.347
		Peak LRI (m/km)	**3.926**	**3.834**	**3.785**			**3.848**
		Peak SRI (m/km)	1.460	1.456	1.482			1.466

From Table 4-2 it can be seen that all of the indices except some of the Peak LRI indices computed from the profiles are between the upper and lower threshold values. Thirteen out of twenty-two Peak LRI index values are above the upper threshold limits and the rest are between the upper and lower thresholds. 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. Based on the profile data analysis, the Ohio SPS-1 WIM site does not meet the requirements for WIM site locations. No remedial action is currently suggested, since this site has met the performance criteria for loading.

It should be noted that the existing pavement is tined portland cement concrete. This tining makes it highly unlikely that the resulting profile index values will be below the performance threshold (the lower index limit).

Table 4-3 shows the computed index values for the prior site validation. Although the computations were done with an earlier version of the software, the difference in LRI and SRI values between the two software versions was found to be less than 3 percent. All of the values computed for the prior visit were between the upper and lower threshold values.

Table 4-3 WIM Index values (Alpha version) - 390100 – 04 February-2004

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Ave.**
Center	LWP	LRI (m/km)	1.147	1.134	1.196	1.101	1.066	1.129
		SRI (m/km)	1.235	1.216	1.169	1.150	1.180	1.190
	RWP	LRI (m/km)	0.963	0.930	0.900	0.973	0.903	0.934
		SRI (m/km)	1.533	1.573	1.403	1.479	1.402	1.478
Left Shift	LWP	LRI (m/km)	1.131	1.404	1.122			1.219
		SRI (m/km)	1.327	1.720	1.390			1.479
	RWP	LRI (m/km)	0.886	0.900	0.896			0.894
		SRI (m/km)	1.395	1.224	1.467			1.362
Right Shift	LWP	LRI (m/km)	1.079	1.105	1.211			1.132
		SRI (m/km)	1.527	1.536	1.480			1.514
	RWP	LRI (m/km)	0.984	0.924	0.895			0.934
		SRI (m/km)	1.461	1.460	1.305			1.409

Table 4-4 provides a comparison of the average index values between this validation and the prior site validation are presented. A close examination of the profile data from both validations indicated that data collection at this visit and the previous visit were performed in the same location. The differences observed between the two sets of index values are likely to be caused by the data collection vehicle not following exactly the same path as it moves across the site.

Table 4-4 Average index value comparison

Profiler Passes			**Ave. (2004)**	**Ave. (2005)**	**Change (%)**
Center	LWP	LRI (m/km)	1.129	1.198	6%
		SRI (m/km)	1.190	1.133	-5%
	RWP	LRI (m/km)	0.934	0.910	-3%
		SRI (m/km)	1.478	1.392	-6%
Left Shift	LWP	LRI (m/km)	1.219	1.231	1%
		SRI (m/km)	1.479	1.440	-3%
	RWP	LRI (m/km)	0.894	1.037	16%
		SRI (m/km)	1.362	1.434	5%
Right Shift	LWP	LRI (m/km)	1.132	1.166	3%
		SRI (m/km)	1.514	1.393	-8%
	RWP	LRI (m/km)	0.934	0.922	-1%
		SRI (m/km)	1.409	1.347	-4%

Several observations can be drawn from the table:

1. The LRI and SRI index values from both validations are within similar ranges and are between the upper and lower thresholds.
2. Except one LRI index and one SRI index, the changes of all index values are less than 6%. The changes are not significant considering the 3% differences between the different software versions used.
3. The average LRI value at the right wheel path of the left shift profiling increased by 16%.
4. The average SRI index value at the left wheel path of the right shift profiling decreased by 8%.

In general, the results from both validations are similar and no significant improvement or deterioration of the pavement smoothness can be observed since the last time profile data was collected. As a result, the suggested recommendations from both validations are consistent.

4.2 Distress survey and any applicable photos

The pavement is in a good condition except for the faulting at the transition of asphalt concrete pavement to cement concrete pavement 165 feet prior to the sensors. The trucks movement was slightly affected by the faulting. However, the trucks appear to stabilize before touching the sensors.

Figure 4-1 - Photo of the Asphalt to PCC transition - 390100 - 12-May-2005

4.3 Vehicle-pavement interaction discussion

The trucks were bouncing due to the faulting at the transition of asphalt concrete pavement to the portland cement concrete pavement 165 feet prior to the sensors. However, the trucks movement appears to stabilize before touching the sensors. The truck speed was not reduced as they approached or exited the sensor area. Most of the trucks traveled along the wheel path. The truck tires appear to be fully touching the sensors.

5 Equipment Discussion

The traffic monitoring equipment at this location includes Mettler-Toledo load cell sensors and WIM controller. These sensors are installed in a staggered configuration in a 500 foot concrete pavement section. The roadway outside this short section is asphalt.

Since the last validation in April 2004 and before this validation the vendor performed static load tests and made adjustments to the operating parameters. The vendor also installed a calibration routine within the software to assist in the calibration of the system. These adjustments and improvements appear to have improved the linearity of the weights.

The ghost axle problem that was observed during the pervious validation visit in April 2004 appears to have been eliminated.

5.1 Pre-Validation Diagnostics

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

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

The backup of the water being drained from the sensors identified during the assessment and later validations was re-evaluated. The conditions described in those reports remain unchanged.

Calibration factors for the WIM equipment at this site have undergone minor changes since our last validation visit in April 2004. Compensation factors for weight are automatically calculated based on a comparison between the static weight of the test trucks and the mean weight reported by the WIM equipment. The compensation factor is identified as the “multiplier” for each test truck. Typically, there is a multiplier for a light truck, a partially loaded truck and a heavy truck, but these may be changed by the agency at their discretion.

5.2 Calibration Process

The equipment required 1 iteration of the calibration process between the initial 42 runs and the final 43 runs.

5.2.1 Calibration Iteration 1

The results of the 42 pre-calibration runs performed by the three test trucks produced an average combined GVW error of approximately -1.4% ± 10.0%. The partially loaded truck produced an average error of -0.456% while the fully loaded trucks combined to produce a mean error of -2.343%. Based on these errors the medium weight and heavy weight truck multipliers, which are used to compensate for non-linear bias output, were adjusted. The medium weight multiplier was increased by 0.456% from 0.9240720616 to .928305133 and the heavy multiplier was increased from 0.888171581 to 0.909485341. The precision of the values is reported as they were displayed by the equipment.

The first set of 12 iterations performed by the test trucks produced a mean error of +2.7% ± 4.6%. Based on the decrease of the deviation of the weight error to within the acceptable range, it was determined that no further adjustments were required and 31 more runs were performed by the test trucks to meet the 40 post-calibration run requirement.

Table 5-1 Calibration Iteration 1 Results - 390100 – 11-May-2005 (beginning 2:20 PM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	0.3%±5.0%	Pass
Tandem axles	±15 percent	3.2%±8.5%	Pass
Gross vehicle weights	±10 percent	2.7%±4.6%	Pass
Vehicle speed	±1 mph [2 km/hr]	**0.9±1.0 mph**	**Fail**
Axle spacing length	± 0.5 ft [150 mm]	0.1±0.2 ft	Pass

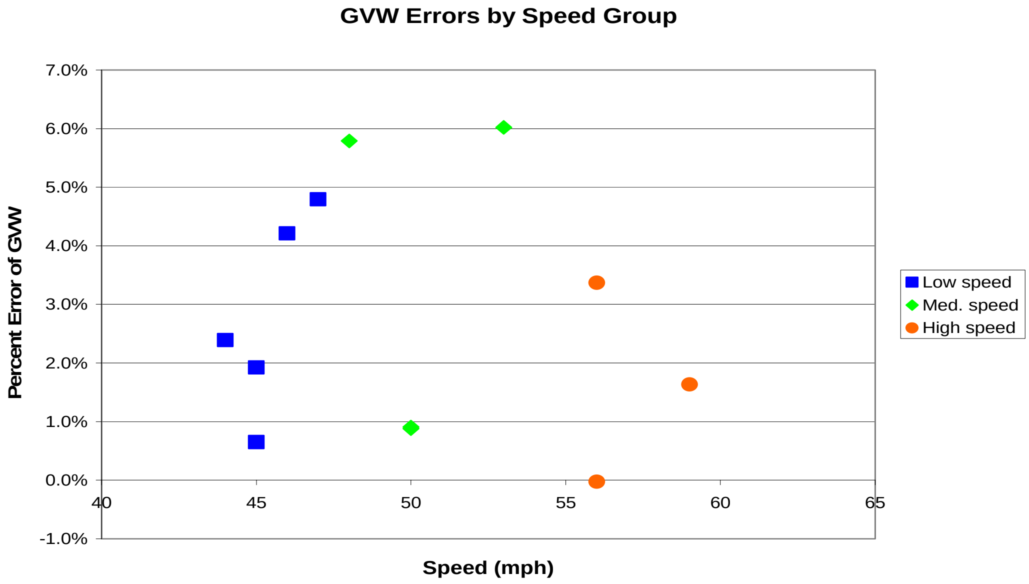


Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group - 390100 –11-May-2005 (beginning 2:20 PM)

5.3 Summary of Traffic Sheet 16s

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

Table 5-2 Classification Validation History - 390100

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other (1)	Other (2)	
2/4/2004	No. of Trucks	1	0	-29 (Class 5)		1
4/14/2004	No. of Trucks	0	0	33 (Class 7)		0
4/15/2004	No. of Trucks	1	0	-33 (Class 5)		0
5/10/2005	No. of Trucks	0	0			0
5/12/2005	No. of Trucks	0	0			0

Table 5-3 has the information found in TRF_CALIBRATION_WIM for site visits and Sheet 16s submitted prior to this validation as well as the information for the current visit. None of the intervening site adjustments has been documented on a sheet 16 according to currently available information.

Table 5-3 Weight Validation History - 390100

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
2/3/2004	Test Trucks	4.4 (4.4)	-4.5 (1.8)	8.3 (7.6)
2/4/2004	Test Trucks	1.8 (5.5)	-6.6 (2.2)	5.3 (9.9)
4/14/2004	Test Trucks	4.0 (4.7)	-1.8 (2.7)	8.3 (6.8)
4/15/2004	Test Trucks	1.8 (4.7)	-4.8 (2.3)	6.7 (7.2)
5/11/2005	Test Trucks	-1.3 (5.0)	-3.2 (5.8)	-0.9 (5.9)
5/12/2005	Test Trucks	3.5 (3.0)	1.4 (2.8)	3.9 (4.2)

5.4 Projected Maintenance/Replacement Requirements

The system algorithm needs to be reviewed to correct the problem associated with the misclassification of Class 3, 4, and 5 vehicles.

The pavement condition (smoothness) needs to be monitored and the fault at the transition from the AC to PCC pavements needs to be repaired.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted May 10 during the mid afternoon to early evening hours and May 11 during the mid-morning hours at test site 390100 on US route 23. This SPS-1 site is at milepost 19.7 on the southbound, right hand lane of a divided four-lane facility. No auto-calibration was used during test runs. The three trucks used for initial calibration and for the subsequent testing included:

1. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and air suspension loaded to 75,540 lbs. (Golden Truck A)
2. 5-axle tractor semi-trailer combination with a tractor having air suspension and trailer with standard rear tandem and leaf spring suspension loaded to 52,020 lbs. (Class 9)
3. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and air suspension loaded to 76,800 lbs. (Golden Truck B)

Golden Truck A and Class 9 were used during the initial day of testing on May 10, 2005. On day two, Golden Truck B was substituted for Golden Truck A because Golden Truck A could no longer be provided by the vendor. Golden Truck B was similar in weight and dimensions to Golden Truck A and was deemed an acceptable substitute by the field leader and state representative.

For the initial validation Golden Truck A, Class 9 and Golden Truck B made a total of 9, 22 and 11 passes respectively over the WIM scale at speeds ranging from approximately 44 to 59 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 79 to 103 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 6-1.

This site met all LTPP precision requirements except for GVW and speed measurements.

Table 6-1 Pre-Validation Results - 390100 – 11-May-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	-3.2%±12.0%	Pass
Tandem axles	±15 percent	-0.9%±11.5%	Pass
Gross vehicle weights	±10 percent	**-1.3%±10.1%**	**Fail**
Vehicle speed	±1 mph [2 km/hr]	**0.9±1.0 mph**	**Fail**
Axle spacing length	± 0.5 ft [150 mm]	0.0±0.2 ft	Pass

The test runs were conducted primarily during the afternoon hours on May 10 and the morning hours on May 11, resulting in a reasonably wide range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and three temperature groups. 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 achieved for this set of validation runs.

The speed groups were divided as follows: Low speed - 42-47 mph, Medium speed - 48-54 mph and High speed 55+ mph. The three temperature groups were created by splitting the runs between those at 76 to 86 degrees Fahrenheit for Low temperature, 87 to 95 degrees Fahrenheit for Medium temperature and 96 to 103 degrees Fahrenheit for High temperature.

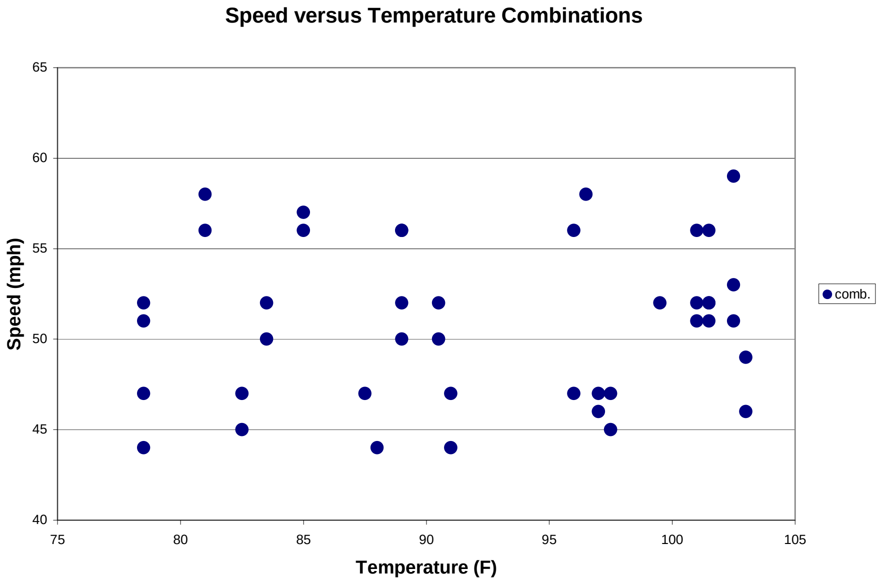


Figure 6-1 Pre-Validation Speed-Temperature Distribution – 390100 – 11-May-2005

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

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. The estimation of GVW by the WIM equipment appears to decrease slightly from a slight overestimation at lower speeds to a modest underestimation at higher speeds.

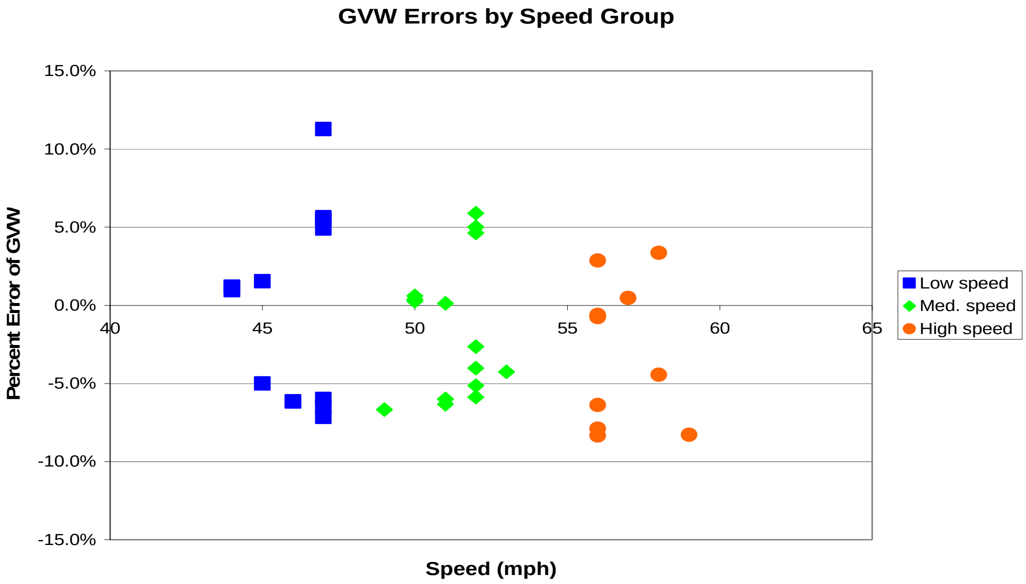


Figure 6-2 Pre-validation GVW Percent Error vs. Speed – 390100 –11-May-2005

Figure 6-3 shows the relationship between temperature and GVW percentage error. There is a notable transition from an overestimation at the low and medium speeds to an underestimation of GVW at the higher temperatures. This could possibly be attributed to the WIM equipment's temperature compensation function that may be introduced into the weight estimation at approximately 95 degrees Fahrenheit. Details on the actual temperature compensation process are not currently available. Scatter of GVW error does not appear to be affected by pavement temperature.

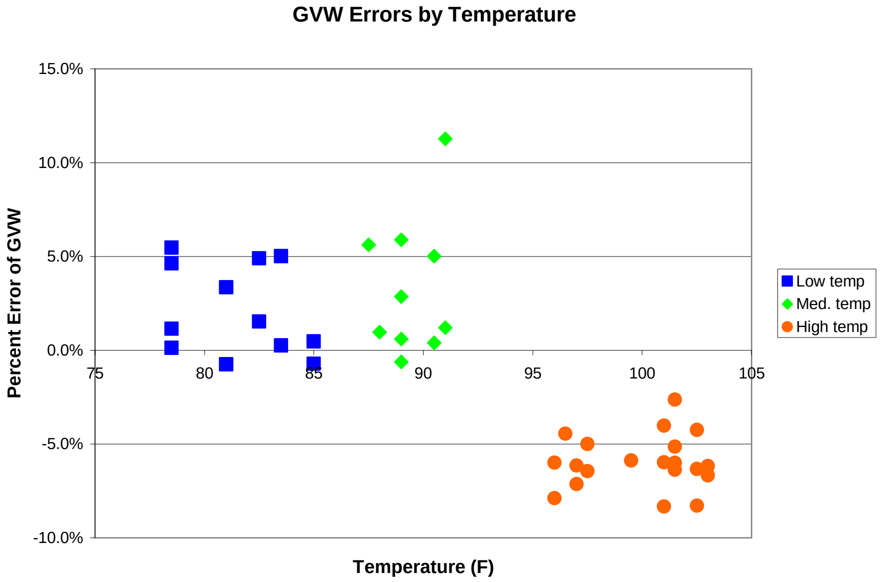


Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature - 390100 –11-May-2005

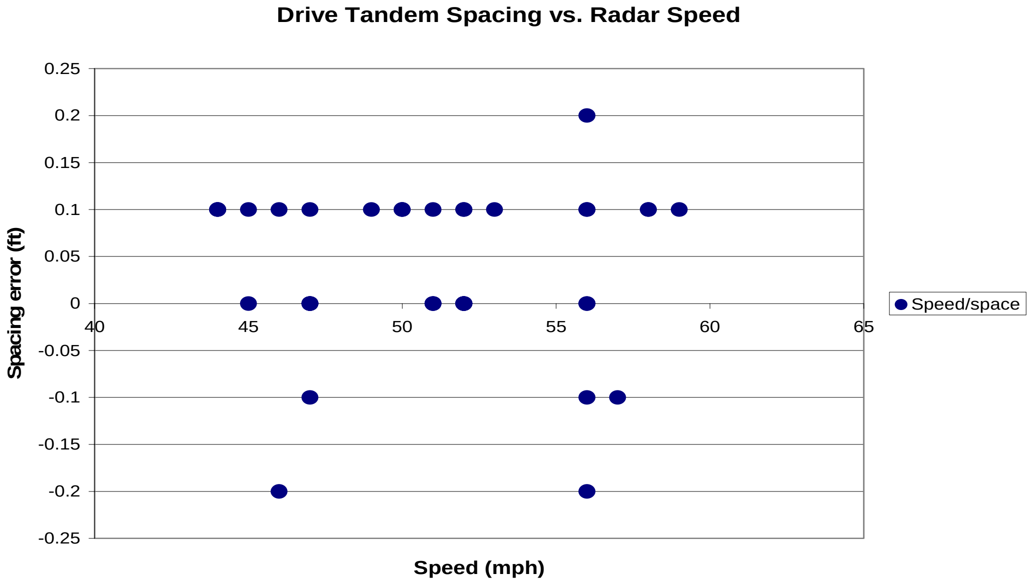


Figure 6-4 Pre-Validation Spacing vs. Speed - 390100 – 11-May-2005

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 spacing 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. This figure indicates that there is little or no effect from speed on the ability of the WIM equipment to measure axle spacing.

6.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 76 to 86 degrees Fahrenheit for Low temperature, 87 to 95 degrees Fahrenheit for Medium temperature and 96 to 103 degrees Fahrenheit for High temperature.

Table 6-2 Pre-Validation Results by Temperature Bin - 390100 –11-May-2005

Element	95% Limit	Low Temperature 76-86°F	Med. Temperature 87-95 °F	High Temperature 96-103 °F
Single axles	±20 %	2.0%±5.6%	1.6%±5.5%	-8.7%±6.0%
Tandem axles	±15 %	2.4%±7.8%	3.9%±9.8%	-5.2%±7.6%
GVW	±10 %	2.3%±5.3%	3.5%±8.3%	-5.8%±3.0%
Axle spacing	± 0.5 ft	0.1±0.2 ft	0.0±0.2 ft	0.0±0.2 ft

Pavement temperatures above 95 degrees Fahrenheit appear to have a pronounced effect on the ability of the WIM equipment to estimate vehicle weight. Weight mean and variability error appear to be fairly consistent from low to medium temperatures but appear to be affected by temperatures above 95 degrees Fahrenheit. This could be caused by the introduction of a temperature compensation function of the WIM equipment.

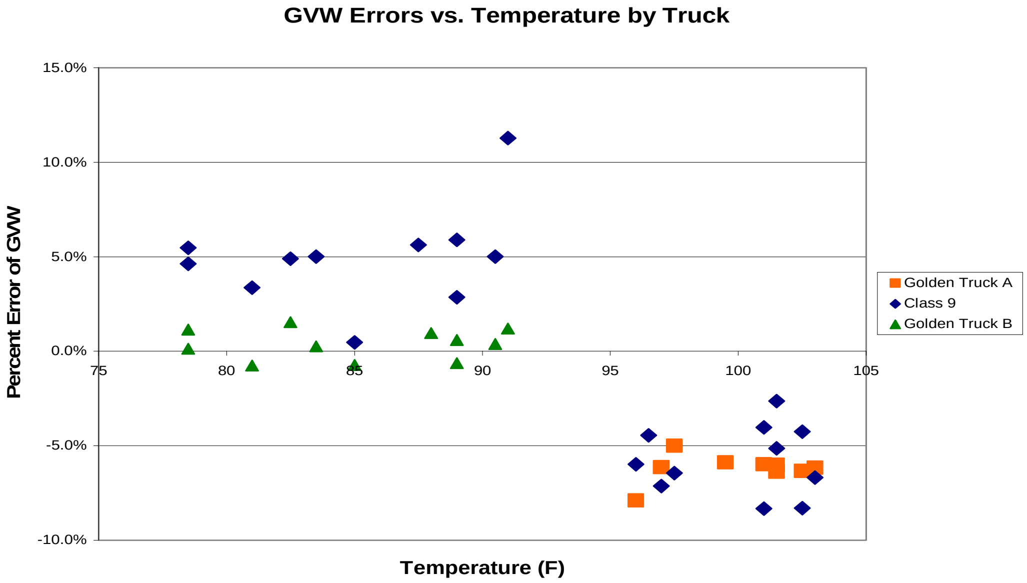


Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 390100 –11-May-2005

Figure 6-5 shows the distribution of GVW errors versus temperature by truck. From this figure, it can be seen that the equipment consistently underestimates the GWV when the temperatures are above 95 degrees. The WIM equipment appears to overestimate the GVW of the Class 9 (diamonds) at the low and medium temperatures, while estimating the GVW of Golden Truck B (triangles) fairly accurately at those temperatures. During the high temperature test truck runs, which were conducted the day prior to the low and medium truck runs, the GVW for both the Class 9 (diamonds) and Golden Truck A (squares) were distinctly underestimated.

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 calibration. This site does not use auto-calibration. As can easily be seen in Figure 6-6 and Figure 6-7, the effect of temperatures above 95 degrees affects the estimation of the steering axles and axle groups in the same manner as GVW. Steering axle weights abruptly transition from an overestimation at low and medium temperatures to an underestimation. A similar trend is illustrated for tandem axle weights

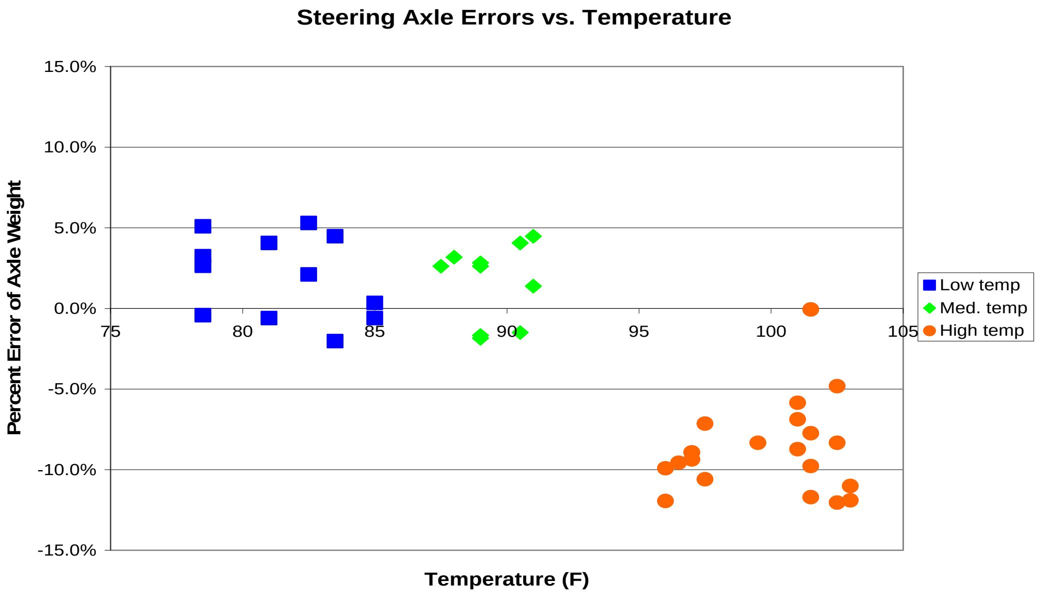


Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group - 390100 –11-May-2005

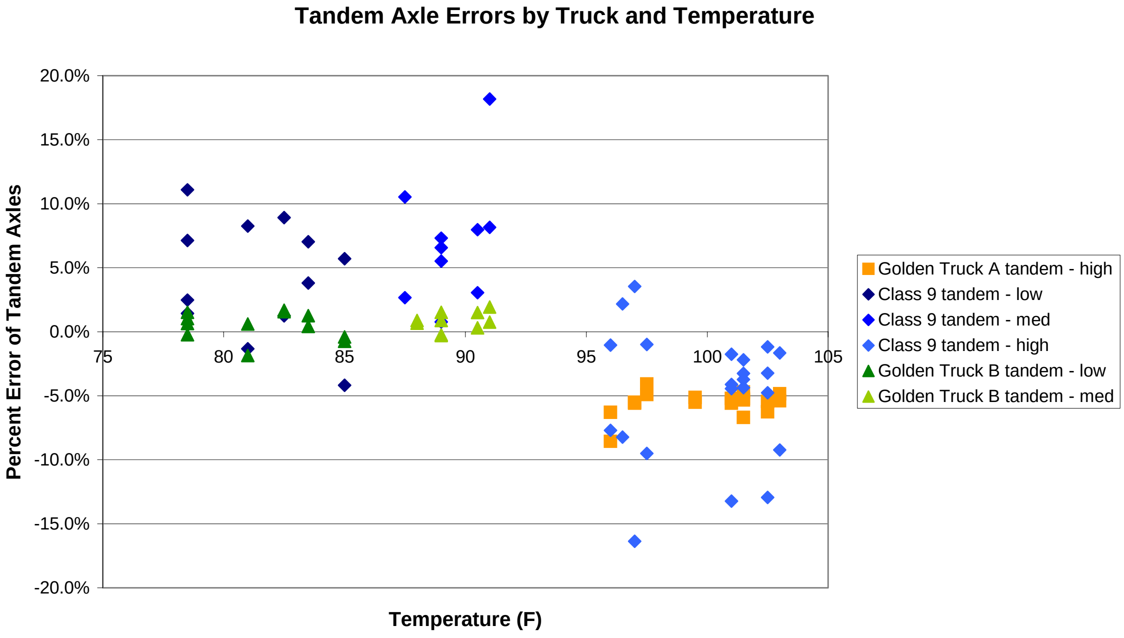


Figure 6-7 Pre-Validation Tandem Axle Errors vs. Temperature by Truck and Temperature - 390100 - 11-May-2005

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed - 42-47 mph, Medium speed - 48-54 mph and High speed 55+ mph.

Table 6-3 Pre-Validation Results by Speed Bin - 390100 –11-May-2005

Element	95% Limit	Low Speed 42-47 mph	Medium Speed 48-54 mph	High Speed 55+ mph
Single axles	+20 %	-2.5%±14.9%	-3.9%±12.8%	-3.0%±10.8%
Tandem axles	+15 %	0.3%±14.3%	-0.7%±9.5%	-2.6%±11.6%
GVW	+10 %	-0.1%±12.7%	-1.3%±9.7%	-2.6%±9.9%
Speed	+1 mph	0.9±1.0 mph	0.9±1.0 mph	0.9±1.0 mph
Axle spacing	+ 0.5 ft	0.2±0.2 ft	0.0±0.1 ft	0.0±0.3 ft

It appears from Table 6-3 that for the truck population as a whole there is little change in mean error over the course of the speed ranges; however the variability of GVW error and the size of the underestimation appear to decrease as the truck speeds increase.

As shown in Figure 6-8, changes in speed have different effects on the estimation of GVW by the equipment for each test truck. GVW for Golden Truck A (squares) appears to be consistently underestimated at all speeds. For the Class 9 test truck (diamonds), the GVW appears to trend downward over the course of the speed range, but the scatter of the error is much larger for this truck than the other two especially at the lower speeds. For Golden Truck B (triangles), the GVW estimated fairly representative over the course of the speed range. Scatter in GVW error for Golden Truck B and the Class 9 are negligible over the speed range.

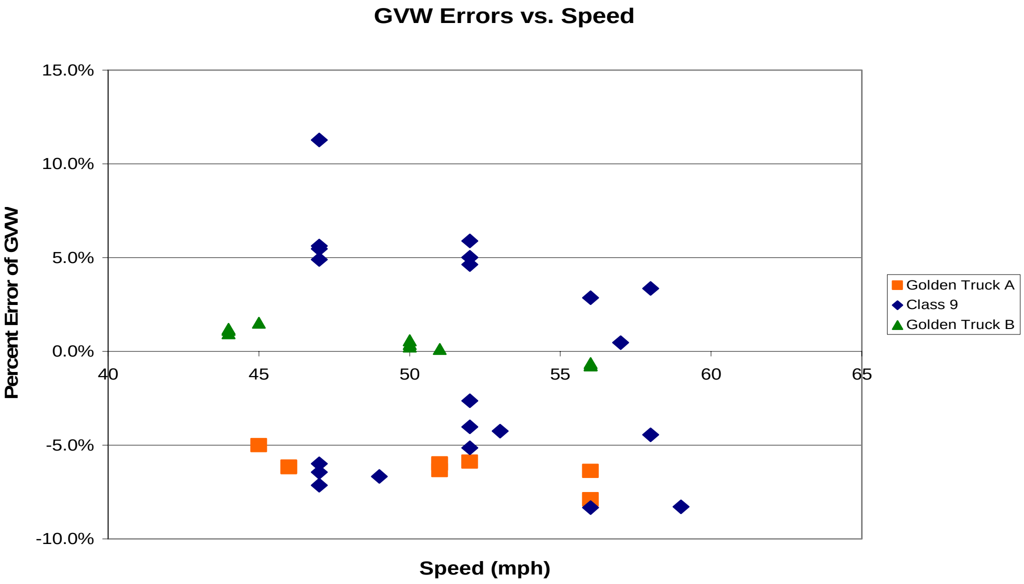


Figure 6-8 Pre-Validation GVW Percent Error vs. Speed Group - 390100 –11-May-2005

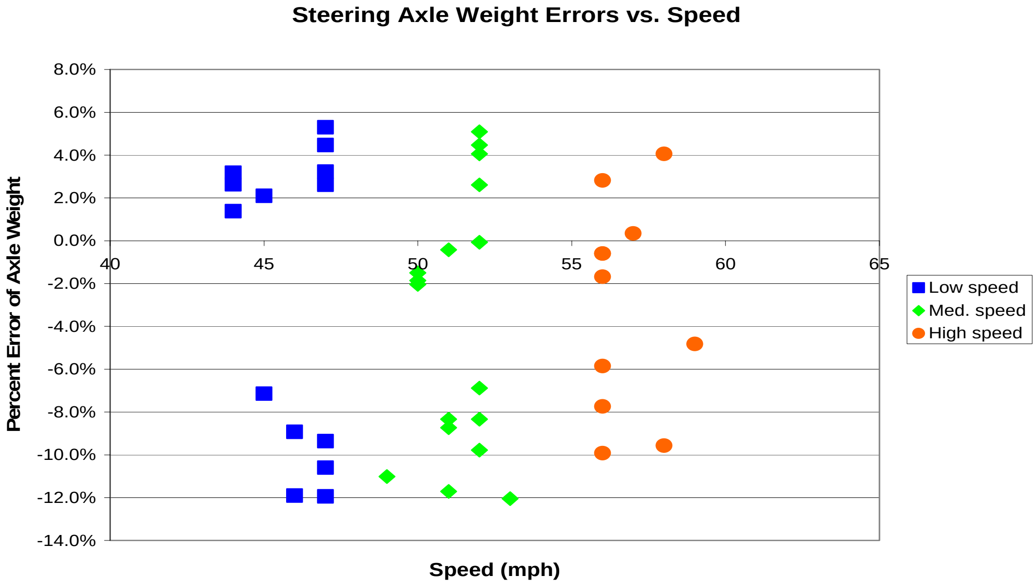


Figure 6-9 Pre-Validation Steering Axle Percent Error vs. Speed Group - 390100 –11-May-2005

Figure 6-9 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. From the figure it can be seen that speed generally does not have an effect on Steering Axle Weight error. Scatter of error is slightly less at higher speeds when compared to the low and medium speeds.

6.3 Classification Validation

The agency uses the FHWA 13-bin classification scheme.

A sample of 100 vehicles was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on a 100 percent sample it was determined that there are 0 percent unknown vehicles and 0 percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 6-4 has the classification error rates by class. The overall misclassification rate is 17.8% driven by misclassification among single unit vehicles.

Table 6-4 Truck Misclassification Percentages for 390100 - 11-May-2005

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	75%	5	60%	6	50%
7	N/A				
8	0.0%	9	0.0%	10	0.0%
11	N/A	12	N/A	13	N/A

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

Table 6-5 Truck Classification Mean Differences for 390100 - 11-May-2005

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	300.0	5	-60.0	6	-50.0
7	N/A				
8	0.0	9	0.0	10	0.0
11	N/A	12	N/A	13	N/A

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

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, and the field validation procedures did not include verification of that information. Table 6-6 shows the results using ASTM processes.

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

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	97.6%	Pass
GVW	± 10%	97.6%	Pass

7 Data Availability and Quality

As of May 12, 2005 this site does not have at least 5 years of research quality data. Research quality data is defined to be at least 210 days in a year of data of known calibration meeting LTPP's precision requirements.

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

The amount and coverage for the site is shown in Table 7-1. The value for months is a measure of the seasonal variation in the data. The indicator of coverage indicates whether day of week variation has been accounted for on an annual basis. As can be seen from the table only 2003 does not have a sufficient quantity to be considered complete years of data. In the absence of previously gathered validation information for those years it can be seen that at least five 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 390100 –12-May-2005

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
1998	261	11	Complete Week	273	11	Complete Week
2000	291	11	Complete Week	322	12	Complete Week
2001	283	11	Complete Week	289	11	Complete Week
2003	27	4	Complete Week	41	9	Complete Week

Post-validation data is not yet available to provide information on the expected GVW characteristics, vehicle classification distributions or speed distributions for use in future data review. The RSC will need to create the comparison characteristics.

8 Data Sheets

The following is a listing of data sheets and photographs incorporated in Appendix A. Appendix A follows after the Sheet 16 information at the very end of the report.

Sheet 19 – Truck 1 – 3S2 loaded air suspension (4 pages)
Sheet 19 – Truck 2 – 3S2 partially loaded leaf spring suspension (8 pages)
Sheet 19 – Truck 3 – 3S2 loaded air suspension (4 pages)

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

Sheet 20 – Speed and Classification verification – post-validation (2 pages)

Sheet 21 – Pre-validation (7 pages)
Sheet 21 – Calibration Iteration 1 – (2 pages)
Sheet 21 – Post-validation (4 pages)

Calibration Iteration 1 Worksheets – (1 page)

Test Truck Photographs – (7 pages)

9 Updated Handout Guide and Sheet 17

A copy of the post-visit handout has been included following page 30. It includes a current Sheet 17 with all applicable maps and updated 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.

11 Traffic Sheet 16(s)

Sheet 16s for the pre-validation and post-validation conditions are attached following the current Sheet 18 information.

POST-VISIT HANDOUT GUIDE FOR SPS WIM FIELD VALIDATION

STATE: Ohio

SHRP ID: 0100

Figures

1. General Information

SITE ID: *390100*

LOCATION: *US 23 SB (Mile Post: 19.7) near Delaware*

VISIT DATE: *Beginning May 10th, 2005*

VISIT TYPE**:** *Validation*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Steven Jessberger, 614-752-4057, steven.jessberger@dot.state.oh.us*

Roger Green, 614-995-5993, roger.green@dot.state.oh.us

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

FHWA Division Office Liaison: *Bob McQuiston, 614-280-6848, bob.mcquiston@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *No Briefing Requested*

ONSITE PERIOD: *May 10th through May 12th, 2005*

TRUCK ROUTE CHECK: *Completed (See Truck Route)*

4. Site Location/ Directions

NEAREST AIRPORT: *Port Columbus International Airport, Columbus, OH*

DIRECTIONS TO THE SITE: *7.6 miles North of SR 37*

MEETING LOCATION: *On site*

WIM SITE LOCATION: *US 23 (Milepost 19.7)*

WIM SITE LOCATION MAP:*See Figure 4.1*

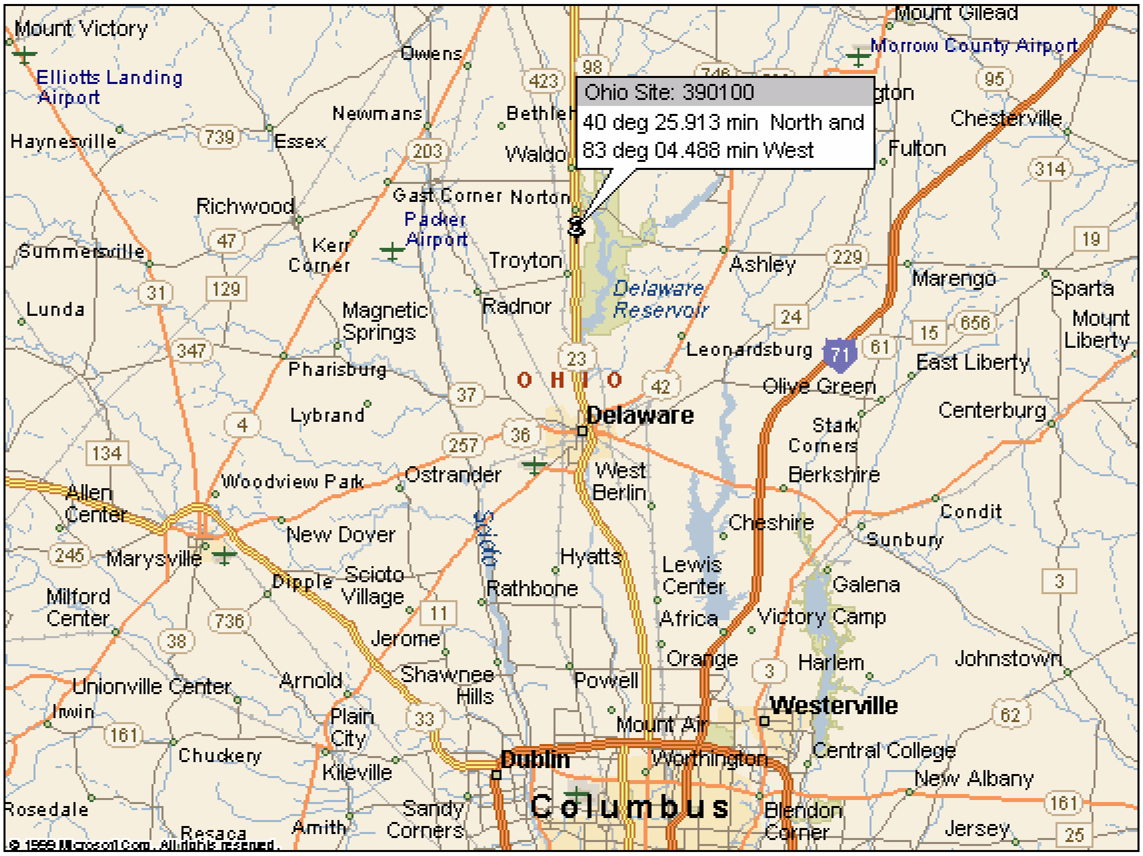


Figure 4-1 - Section 390100 near Delaware, Ohio

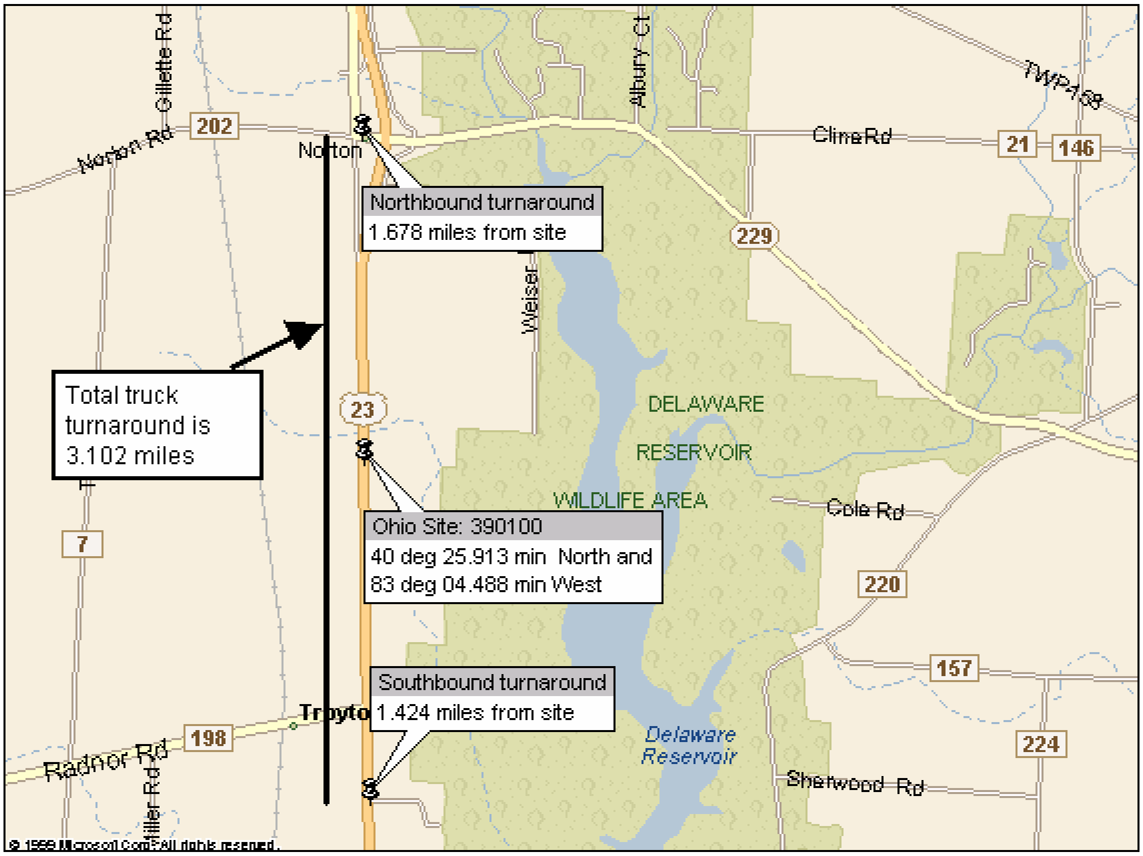
5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *I-71 Milepost 129, Hours: 7:00 a.m.-3:00 p.m. and 8:00 p.m.-4:00 a.m. Contact: Don Brane (740) 965-3105. CAT Scales at Pilot Travel, I-71 at Exit 131, Sunbury, OH.*

TRUCK ROUTE:

- *Northbound Turnaround –1.678 miles from site at SR 229 (40^0 26.035' North and 83^0 04. 363' West)*
- *Southbound Turnaround –1.424 miles from site at Irwin Road (40^0 23. 356' North and 83^0 04.459' West)*



Northbound turnaround
1.678 miles from site

Total truck turnaround is 3.102 miles

Ohio Site: 390100
40 deg 25.913 min North and
83 deg 04.488 min West

Southbound turnaround
1.424 miles from site

Figure 5-1 - Truck Turnaround Map at 390100

6. Sheet 17 – Ohio (390100)

1.* ROUTE ___US 23____MILEPOST ___19.7_LTPP DIRECTION - N [✓ S] E W

2.* WIM SITE DESCRIPTION - Grade ____<1____ % Sag vertical Y / [✓ N]
Nearest SPS section upstream of the site _0__ _1__ _6__ _1__
Distance from sensor to nearest upstream SPS Section ___ _3__ _1__ _2__ ft

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

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

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

Shoulder width _1_ _0__ ft

4.* PAVEMENT TYPE ___________Cement Concrete______________

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _11-12-03_Photo_Filename_ TO_1_39_6A_0100_Downstream_11_12_03.jpg _
Date _11-12-03_Photo_Filename_ TO_1_39_6A_0100_Upstream_11_12_03.jpg ___

6. * SENSOR SEQUENCE ___________Loop-Load Cell-Staggered in wheel path__

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 _2_ _5_ ft

Distance from system __9__5__ ft

TYPE _____ 3B______________________

CABINET ACCESS controlled by LTPP / [✓ STATE] / JOINT ?

Contact - name and phone number ___Steven Jessberger 614-752-4057

Alternate - name and phone number Dave Gardner 614-752-5740

11. * POWER

Distance to cabinet from drop ___ _1__ _0__ ft [✓ Overhead] / underground / solar / AC in cabinet?

Service provider __Amer. Elec. Power______Phone number __________

12. * TELEPHONE

Distance to cabinet from drop _6__ _5__ _0__ ft Overhead / [✓ under ground] / cell?

Service provider ____Verizon__ Phone Number ______________________

13.* SYSTEM (software & version no.)- ___________Mettler - Toledo_____

Computer connection – [✓ RS232] / Parallel port / USB / Other _______________

14. * TEST TRUCK TURNAROUND time __10_____ minutes DISTANCE _6.2__ mi.

15. PHOTOS FILENAME

Power source ________________________

Phone source _ TO_1_39_6A_0100_Phone_Pedestal_11_12_03.jpg _

Cabinet exterior _ TO_9_39_2.49_0100_Cabinet_Exterior_05_10_05.jpg _

Cabinet interior _ TO_9_39_2.49_0100_Cabinet_Interior_05_10_05.jpg _

Weight sensors _ TO_9_39_2.49_0100_Leading_WIM_Sensor_05_10_05.jpg _

Classification sensors _ TO_9_39_2.49_0100_Trailing_WIM_Sensor_05_10_05.jpg _

Other sensors __ TO_9_39_2.49_0100_Loop_Sensor_05_10_05.jpg _

Description ________________________________

Downstream direction at sensors on LTPP lane

TO_1_39_6A_0100_Downstream_11_12_03.jpg _____________________

Upstream direction at sensors on LTPP lane

TO_1_39_6A_0100_Upstream_11_12_03.jpg _____________________

COMMENTS ____
___________GPS Coordinates of site: 40^0 25. 913' North and 83^0 04.488' West______
____

Amenities__5.5_miles_south_of_site____
__________Food_-Wendy's & McDonalds_______________________________________
__________Gas_-_Citgo, Sunoco, mini-mart____________________________________
__________Miscelleaneous_-_84 Lumber______________________________________
__________Hotel_-_Travel Lodge ____
____
__________10.0_miles south of site____
__________Food_-_Damon's, Wendy's, Taco Bell, Kroger's______________________
__________Hotel_-_Super 8, Ameri Host_______________________________________
__________Miscellaneous_- Banks, Wal-Mart, Sears Hardware____________________
____
__________ Types of Trucks: Two Class 9s_________________________________
____

_____Weight Ranges: Truck 1 – 72,000 to 80,000 legal limit on gross and axles, air suspension; Truck 2 – partially loaded to approximately 50,000 lbs no suspension requirements;____
____
____
____

Speeds to be run: 45 to 55 mph (Posted Speed Limit is 55 mph) __________
__________Corrective actions recommended: Adjustments to the drainage culvert, ____ ___ Controller classification firmware should be updated to facilitate the use of weights in the classification process. ____
____
____
____
____
____
____
____
____
____

COMPLETED BY ____Dean J. Wolf____________________________

PHONE ___301-210-5105_______DATE COMPLETED _0_ 5_ /_1_ 0_ / _2_ 0_ 0_ 5_

Sketch of equipment layout

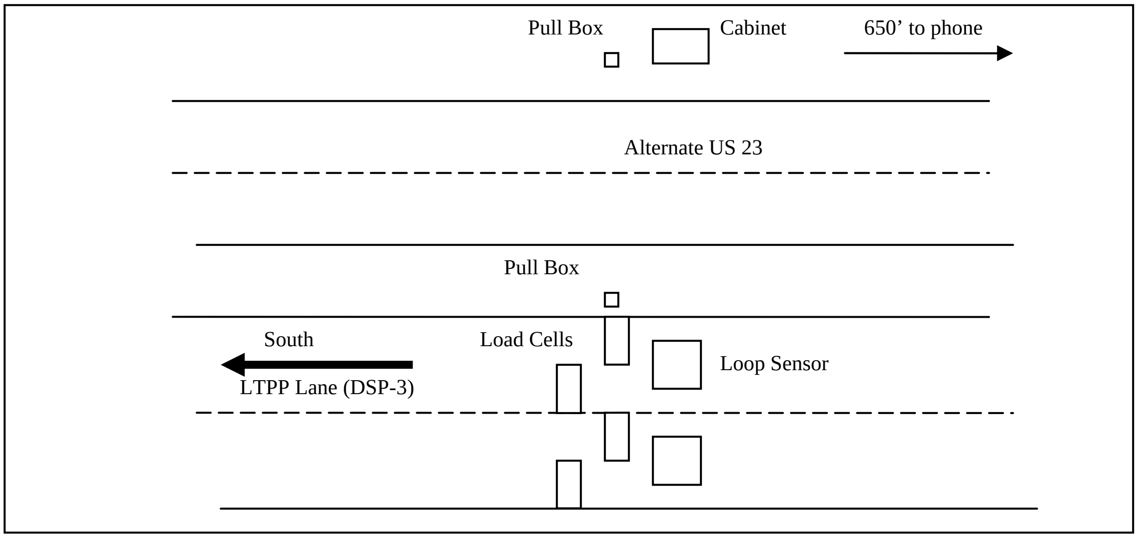
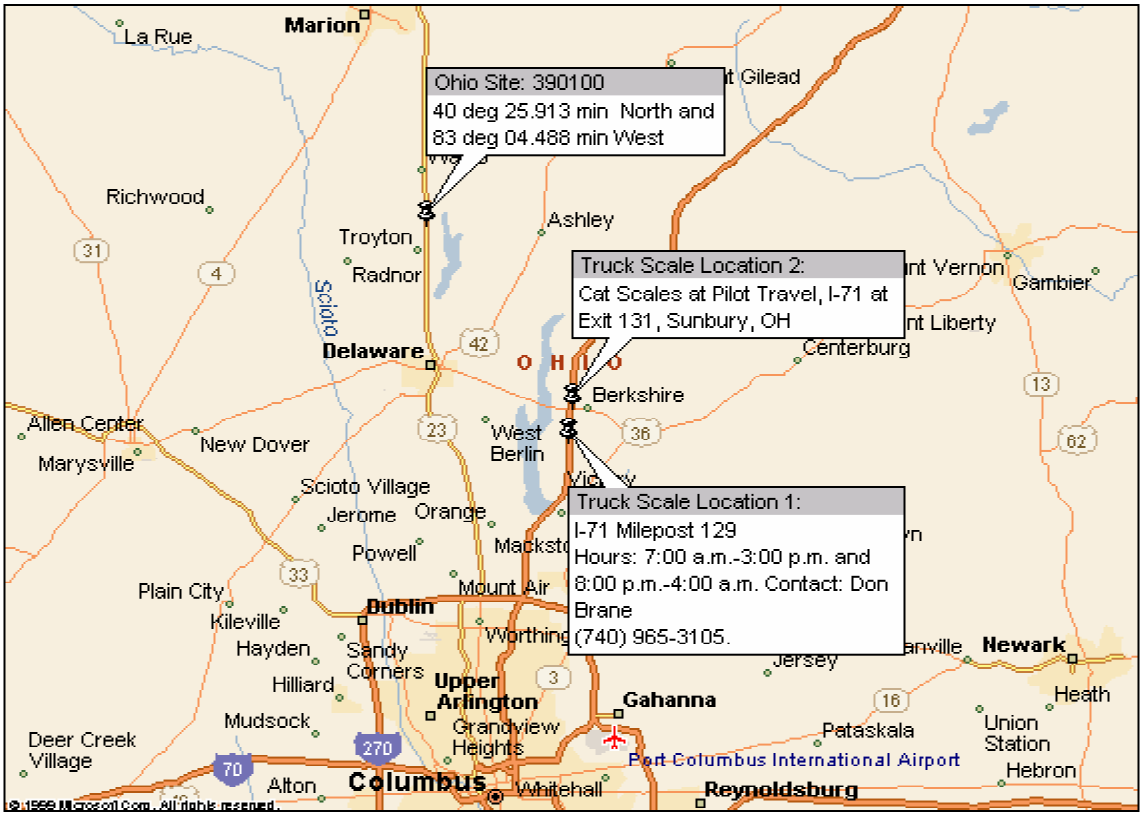


Figure 6-1 – Sketch of Equipment Layout

Site Map


Ohio Site: 390100
40 deg 25.913 min North and
83 deg 04.488 min West

Truck Scale Location 2:
Cat Scales at Pilot Travel, I-71 at
Exit 131, Sunbury, OH

Truck Scale Location 1:
I-71 Milepost 129
Hours: 7:00 a.m.-3:00 p.m. and
8:00 p.m.-4:00 a.m. Contact: Don
Brane
(740) 965-3105.

Figure 6-2 - Site Map at 390100 in Ohio

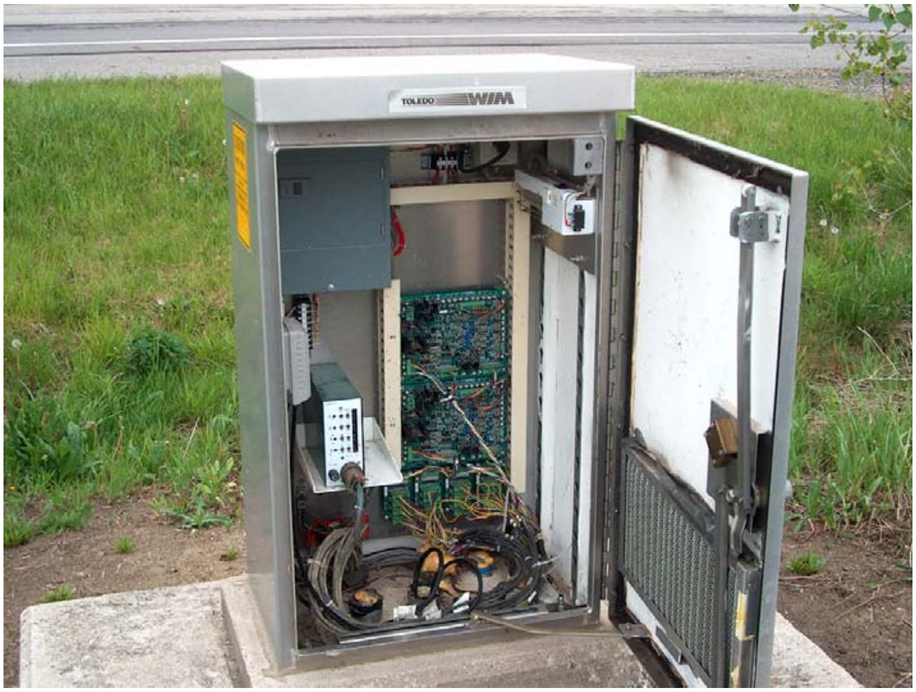
TO_1_39_6A_0100_Downstream_11_12_03.jpg

TO_1_39_6A_0100_Upstream_11_12_03.jpg

TO_9_2.49_0100_Asphalt_to_PCC_Transition_05_10_05.jpg

TO_1_39_6A_0100_Phone_Pedestal_11_12_03.jpg

TO_9_39_2.49_0100_Cabinet_Exterior_05_10_05.jpg



TO_9_39_2.49_0100_Cabinet_Interior_05_10_05.jpg

TO_9_39_2.49_0100_Leading_WIM_Sensor_05_10_05.jpg

TO_9_39_2.49_0100_Trailing_WIM_Sensor_05_10_05.jpg

TO_9_39_2.49_0100_Loop_Sensor_05_10_05.jpg

SHEET 18	STATE CODE [_39]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0100 _]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) __05_ / __10_ / __ 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 [_39]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0100 _]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) __05_ / __10_ / __ 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 _14____ ☒ days ☐ weeks

b. Notice for straightedge and grinding check - __14__ ☒ 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 – ___________________________

SHEET 18	STATE CODE [_39]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0100 _]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) __05_ / __10_ / __ 2005_ __

Rev. 05/25/04

e. Test Vehicles
    i. Trucks –
        1st – Air suspension 3S2 ☐ State ☒ LTPP
        2nd – ____3S2________ ☐ State ☒ LTPP
        3rd – ________________ ☐ State ☐ LTPP
        4th – ________________ ☐ State ☐ LTPP
    ii. Loads – ☐ State ☒ LTPP
    iii. Drivers – ☐ State ☒ LTPP

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

____

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 – ____
    b. Reports – ____
    c. Other – ____
    d. Special Conditions – ____

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

        Name: _ Steven Jessberger_ Phone: __614-752-4057_________

        Agency: ____Ohio DOT_____________________________

SHEET 18	STATE CODE [_39]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0100 _]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) __05_ / __10_ / __ 2005_ __

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b. Maintenance (equipment) –

Name: _____Steven Jessberger_ Phone: __614-752-4057___

Agency: ______Ohio DOT___________________________

c. Data Processing and Pre-Visit Data –

Name: _____Steven Jessberger_ Phone: __614-752-4057___

Agency: ______Ohio DOT___________________________

d. Construction schedule and verification –

Name: ________________________ Phone: _________________

Agency: ____

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

Name: ________________________ Phone: _________________

Agency: ____

f. Traffic Control –

Name: ________________________ Phone: _________________

Agency: ____

g. Enforcement Coordination –

Name: ________________________ Phone: _________________

Agency: ____

h. Nearest Static Scale

Name: __CAT Scale_____________ Location:_I-71 exit 133____

Phone: ____

SHEET 16
LTPP MONITORED TRAFFIC DATA
SITE CALIBRATION SUMMARY

*STATE ASSIGNED ID [__0_7_2_1_]
*STATE CODE [_3_9_]
*SHRP SECTION ID [_0_1_0_0__]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_5_ / _1_1_ / _2_0_0_5 __]

2. * TYPE OF EQUIPMENT CALIBRATED __ WIM __ CLASSIFIER _X_ 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
____ BARE FLAT PIEZO
__X_ LOAD CELLS
__X_ INDUCTANCE LOOPS
____ BENDING PLATES
____ QUARTZ PIEZO
____ CAPACITANCE PADS
____ OTHER (SPECIFY) ____

5. EQUIPMENT MANUFACTURER ______Mettler-Toledo____

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

__1_4 __ 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	___9____	____2_____________
3	___9____	____2_____________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ ___-_1_ . 3_ STANDARD DEVIATION __ _5 . 0_
DYNAMIC AND STATIC SINGLE AXLES ___ ___-_3 . 2_ STANDARD DEVIATION __ _5 . 9_
DYNAMIC AND STATIC DOUBLE AXLES ___ ___-_0_ . 9_ STANDARD DEVIATION __ _5 . 8_

8. ___3____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____40-47, 48-52, 53+ ______ ______ ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) _light truck = .941416662; medium truck = .928389036; heavy truck = .909484754___

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ __0_._0__
*** FHWA CLASS 8 ____ __0_._0__
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ __0_ . _0__

PERSON LEADING CALIBRATION EFFORT: ___Dean J. Wolf______________________________________
CONTACT INFORMATION: _MACTEC Engineering and Consulting 301-210-5105________ rev. November 9, 1999

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__0_7_2_1_] *STATE CODE [_3_9_] *SHRP SECTION ID [_0_1_0_0__]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_5_ / _1_2_ / _2_0_0_5 __]

2. * TYPE OF EQUIPMENT CALIBRATED __ WIM __ CLASSIFIER _X_ BOTH

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

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

5. EQUIPMENT MANUFACTURER ______Mettler-Toledo____

WIM SYSTEM CALIBRATION SPECIFICS**

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

__ __ __ NUMBER OF TRUCKS COMPARED

__2__ __ NUMBER OF TEST TRUCKS USED

__2_1 __ 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	___9____	____2______________
3	________	___________________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ ___ _3_ . 5_ STANDARD DEVIATION __ _3 . 0_
DYNAMIC AND STATIC SINGLE AXLES ___ ___ _1 . 4_ STANDARD DEVIATION __ _2 . 8_
DYNAMIC AND STATIC DOUBLE AXLES ___ ___ _3_ . 9_ STANDARD DEVIATION __ _4 . 2_

8. ___3____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____40-47, 48-52, 53+ ______ ______ ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) _light truck = .941416662; medium truck = .928389036; heavy truck = .909484754___

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ __0_._0__
*** FHWA CLASS 8 ____ __0_._0__
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ __0_ . _0__

PERSON LEADING CALIBRATION EFFORT: ___Dean J. Wolf____
CONTACT INFORMATION: _MACTEC Engineering and Consulting 301-210-5105________ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK # 1	* DATE 05/10/05

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PART I.

truck # 158

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

day 1 only

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		10180	9980	[✓ D] / C
B		16620	16590	D / [✓ C]
C		16620	16590	D / [✓ C]
D		16060	16070	D / [✓ C]
E		16060	16070	D / [✓ C]
F				D / C

GVW (same units as axles)

7. a) Empty GVW unk

*b) Average Pre-Test Loaded weight 75540

*c) Post Test Loaded Weight 75300

*d) Difference Post Test – Pre-test -240

GEOMETRY

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

9. a) * Make: ~~Great~~ Freightliner b) * Model: century

10.* Trailer Load Distribution Description:

Pallets loaded evenly along trailer

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

b). Trailer Tare Weight (units): unk

Sheet 19	* STATE_CODE	39
LTPP Traffic Data	* SPS PROJECT ID	0100/ 0200
*CALIBRATION TEST TRUCK # 1	* DATE	05/10/05

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

A to B 17' 1" B to C 4' 3" C to D 37' 3"

D to E 4' 1" E to F ____

Wheelbased (measured A to last) ____ Computed 62.8

13. *Kingpin Offset From Axle B (units) +1.75 (____)
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295/75R22.5	Full Spring leaf 2 leaves
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 39
LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK # 1	* DATE 05/10/05

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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 39
LTPP Traffic Data	* SPS PROJECT ID 0100 / 0200
*CALIBRATION TEST TRUCK # 1	* DATE 05/10/05

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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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10,180	16620	16620	16060	16060		75540
2	10,200	16610	16610	16060	16060		75540
3	10,160	16630	16630	16060	16060		75540
Average	10,180	16620	16620	16060	16060		75540

Table 6. Raw data – Axle scales –

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

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9980	16590	16590	16070	16070		75300
2							75300
3							75300
Average	9980	16590	16590	16070	16070		75300

Measured By SW

Verified By DJW

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 0200
*CALIBRATION TEST TRUCK # 2	* DATE 05/10/05

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days 1+2

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		9760	9620	[✓ D] / C
B		10620	10576	D / [✓ C]
C		10620	10570	D / [✓ C]
D		10510	10510	D / [✓ C]
E		10510	10510	D / [✓ C]
F				D / C

GVW (same units as axles)

7. a) Empty GVW UNK

*b) Average Pre-Test Loaded weight 52010

*c) Post Test Loaded Weight 51780

*d) Difference Post Test – Pre-test - 30

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / [✓ Conventional]

b) * Sleeper Cab? Y / [✓ N]

9. a) * Make: FREIGHTliner b) * Model: FLD 120

10.* Trailer Load Distribution Description:

Pallet loaded with Sand bags along trailer

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

b). Trailer Tare Weight (units): Unk

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 0100/ 0200
*CALIBRATION TEST TRUCK #2	* DATE 05/10/05

Rev. 08/31/01

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

A to B 12'8"

B to C 4'2.5"

C to D 34'1"

D to E 4'1"

E to F

Wheelbased (measured A to last)

Computed 55.2

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

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295/75R22.5	Spring leaf, 2 Full leaves
B	"	AIR
C	"	"
D	"	leaf spring, 3 tapper leaves
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	39
LTPP Traffic Data	* SPS PROJECT ID	0100/0200
*CALIBRATION TEST TRUCK #2	* DATE	05/10/05

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.											

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*CALIBRATION TEST TRUCK # 2	* DATE	5/10/05

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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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9760	10620	10620	10500	10500		52000
2	9760	10600	10600	10520	10520		52000
3	9740	10640	10640	10510	10510		52040
Average	9760	10620	10620	10510	10510		52010
1st day post	9660	10550	10550	10530	10530		51820

Table 6. Raw data – Axle scales – 2nd day pretest

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9760	10620	10620	10520	10520		52040
2	9740	10630	10630	10510	10510		52020
3	9720	10640	10640	10500	10500		52000
Average	9740	10630	10630	10510	10510		52020
2nd day post	9620	10570	10570	10510	10510		51780

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9860	10620	10620	10540	10540		52180
2	9860	10620	10620	10520	10520		52140
3	9820	10620	10620	10540	10540		52140
Average		10620	10620	10540	10540		52150

Measured By ______________________ Verified By ______________________

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK # 2	* DATE 5/11/05

Rev. 08/31/01

days 2&3

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		9740	9690	[✓ D] / C
B		10630	10610	D / [✓ C]
C		10630	10610	D / [✓ C]
D		10510	10510	D / [✓ C]
E		10510	10510	D / [✓ C]
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight ~~51780~~ 52020

*c) Post Test Loaded Weight 51920

*d) Difference Post Test – Pre-test -100

GEOMETRY

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

9. a) * Make: FREIGHTLINER　　b) * Model: FLD 120

10.* Trailer Load Distribution Description:

PALLETS LOADED WITH SAND BAGS EVENLY ALONG TRAILER

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

b). Trailer Tare Weight (units): UNK

Sheet 19	* STATE_CODE 39
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*CALIBRATION TEST TRUCK # 2	* DATE 5/11/05

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

A to B 12.8 ✓ B to C 4.2 ✓ C to D 34.1 ✓

D to E 4.1 ✓ E to F ______

Wheelbased (measured A to last) ______ Computed 55.2 ✓

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

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295/75R22.5	leaf spring, 2 full leaves
B	"	AIR
C	"	"
D	"	leaf spring, 3 tapered leaves
E	"	"
F	/	

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

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*CALIBRATION TEST TRUCK # 2	* DATE 5/12/05

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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.											

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LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK #1	* DATE 5/1[illegible]/05

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9760	10620	10620	10520	10520		52040
2	9740	10630	10630	10510	10510		52020
3	9720	10640	10640	10500	10500		52000
Average	9740	10630	10630	10510	10510		52020

day 2 post 9620 10570 10570 10510 10510 51780

Table 6. Raw data – Axle scales – pre day 3

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9860	10620	10620	10540	10540		52180
2	9860	10620	10620	10520	10520		52140
3	9820	10620	10620	10540	10540		52140
Average	9850	10620	10620	1053	10530		52150

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9680	10600	10600	10520	10520		51920
2	9640	10640	10640	10500	10500		51920
3	9740	10590	10590	10500	10500		51920
Average	9690	10610	10610	10510	10510		51920

Measured By DAW

Verified By ____________________

TRUCK 3

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK # 3	* DATE 5/11/05

Rev. 08/31/01

PART I.

days 2+3

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		11150		D / C
B		16750		D / C
C		16750		D / C
D		16080		D / C
E		16080		D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW unk

*b) Average Pre-Test Loaded weight 76800

*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: Classics XL

10.* Trailer Load Distribution Description:

Pallet loaded along trailer

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

b). Trailer Tare Weight (units): unk

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LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK #3	* DATE 5/11/05

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

A to B ~~4' 1"~~ 20.1'

B to C ~~36' 10"~~ 4.3'

C to D ~~4' 3"~~ 36.8'

D to E ~~20'~~ 4.1"

E to F ____________

Wheelbased (measured A to last) ____________ Computed 65.3

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

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	275/80R24.5	Full spring leaf 2 leaves
B	285/75R24.5	AIR
C	275/80R24.5	"
D	295/75R22.5	"
E	"	"
F		

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

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LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK #3	* DATE 5/11/05

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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.											

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LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK #3	* DATE 5/11/05

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530
3)1600

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11160	16750	16750	16080	16080		76820
2	11160	16740	16740	16080	16080		76800
3	11140	16750	16750	16070	16070		76780
Average	11150	16750	16750	16080	16080		76800
day 2 post	11100	16650	16650	16080	16080		76560

Table 6. Raw data – Axle scales – day 3 pretest

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11660	16910	16910	16070	16070		77620
2	11580	16900	16900	16070	16070		77520
3	11560	16890	16890	16060	16060		77460
Average		16900	16900	16070	16070		77530

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

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

Measured By SW

Verified By DJW

Sheet 20	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 1 of* 2	* DATE 05 / 10 / 05

Rev. 08/31/2001….

pre-calibration

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
65	3	9220	63	3	57	4	9578	57	6 dump
60	9	9240	60	9	69	3	9588	63	2 10.6 3.5
58	9	9250	56	9	62	3	9597	61	3
67	3	9255	66	3	65	3	9602	64	3
57	9	9267	57	9	57	9	9633	55	9
56	3	9271	56	2 9.7	63	3	9665	63	3 ~~9~~
58	4	9274	57	5	60	4	9669	59	5 19.3
59	9	9283	59	9	~~65~~ 57	~~2~~ 9	~~9674~~ 9658	56	~~3~~ 9
55	9	9290	55	9	62	9	9701	62	9
60	9	9321	60	9	63	2	9712	62	3 12.6
60	8	9334	58	8	59	3	9721	58	3
72	3	9366	72	3	58	9	9735	58	9
61	9	9382	60	9	61	3	9752	61	2 9.1
56	5	9418	58	5	64	9	9769	63	9
62	9	9450	60	9	61	3	9777	61	2
58	9	9457	57	9	49	6	9793	48	6
57	9	9475	57	9	56	3	9803	56	5 11.4
62	~~2~~ 3	9490	62	~~2~~ 3	50	9	9842	50	9
53	3	9501	52	2	52	9	9843	51	9
65	9	9512	63	9	62	5	9848	60	5
60	9	9522	59	9	60	10	9886	58	10
60	9	9532	60	9	56	9	9905	56	9
60	3	9538	59	2 9.4 3.74	67	3	9912	63	2 9.0
60	9	9559	59	9	61	3	9916	60	3
60	3	9566	59	~~3~~ 2 9.5 3.8	56	9	9927	55	9

1 2 4
o oo oooo

Recorded by JJW Direction 5 Lane 4 Time from 12:31 to 1:05

Sheet 20	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 2 of* 2	* DATE 05/10/2005

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
62	9	9941	62	9	63	9	10609	61	9
54	9	9952	53	9	51	8	10622	49	8
62	9	9955	61	9	62	9	10631	61	9
55	5	9969	54	5	59	9	10639	57	9
56	4	10006	56	4 bus	63	9	10647	62	9
58	9	10013	57	9	56	3	10654	55	3
52	3	10401	52	2 car	60	8	10656	59	8
59	9	10415	58	9	60	3	10675	59	3
57	4	10430	56	5	64	3	10694	64	3
63	9	10440	62	9	61	9	10701	58	9
55	9	10443	55	9	57	4	10702	57	4
65	3	10447	65	3	59	3	10728	58	2
54	3	10468	54	2	63	9	10737	61	9
57	9	10473	55	9	57	8	10742	56	8
55	5	10477	55	5	61	9	10780	61	9
65	3	10495	66	2	60	3	10758	59	3
54	9	10504	56	9	63	4	10773	61	5
62	4	10526	59	5	51	9	10782	50	9
54	9	10539	53	9	66	3	10787	66	2
60	9	10549	59	9	61	2	10792	61	2
59	9	10552	58	9	59	9	10813	58	9
56	9	10569	56	9	61	3	10821	60	2
68	3	10581	66	3	66	3	10834	64	2 9.1
58	9	10587	58	9	56	9	10837	57	9
62	9	10601	59	9	62	3	10844	62	2

Recorded by DJW Direction 5 Lane 4 Time from 1:06 to ________

Sheet 20
LTPP Traffic Data
Speed and Classification Checks * 1 of* 2
Rev. 08/31/2001….

* STATE_CODE 39
*SPS PROJECT_ID 0100
* DATE 05/12/2005

post calibration

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
60	3	12997	60	3	58	9	369	58	9
60	9	12003	60	9	60	9	374	59	9
64	3	12014	63	3	58	9	392	57	9
65	3	12026	65	~~10~~ 3	62	9	401	61	9
57 ~~67~~	3	12033	57	3	54	9	417	54	9
57	5	12036	58	5	63	3	419	61	2
62	9	12083	60	9	75	3	427	73	2
60	9	12098	60	9	57	8	437	57	8
60	9	12102	59	9	78	3	451	77	3
62	9	12125	62	9	59	6	457	59	6
54	9	12137	54	9	64	3	470	63	5
58	9	168	58	9	65	3	509	63	3
59	3	184	57	2	59	9	516	57	9
60	3	197	60	2	60	9	520	60	9
64	3	213	63	2	60	9	528	59	9
65	9	227	63	9	59	3	543	59	3
65	3	246	64	3	63	3	555	61	2
58	9	259	58	9	62	3	565	61	2
64	3	267	62	2	64	3	576	64	3
60	3	275	58	2	59	9	590	59	9
61	5	320	61	5	63	6	594	62	6
61	8	323	60	8	55	9	602	55	9
62	3	328	62	2	59	9	636	59	9
60	3	339	58	3	60	4	653	59	~~6~~ 5
63	9	366	62	9	58	9	659	59	9

Recorded by DJW
Direction S
Lane 4
Time from 2:20 to 2:50

Sheet 20	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 2 of* 2	* DATE 05/12/2005

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WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
61	9	697	61	9	62	3	13004	61	3
57	3	708	56	2	72	3	019	67	3
74	3	720	71	3	59	8	027	58	8
54	9	733	54	9	65	3	040	64	2
56	3	745	55	2	59	8	060	59	8
60	9	756	60	9	80	5	075	71	3 -
62	3	772	62	3	59	4	078	58	5
62	9	777	62	9	56	9	096	54	9
58	9	787	57	9	57	9	106	57	9
59	6	813	59	~~9~~ 6	64	9	113	62	9
57	2	822	55	3	60	9	114	58	9
59	9	829	57	9	59	~~4~~ 5	120	58	4
67	3	834	65	2	69	3	130	63	3
66	9	848	64	9	62	9	150	60	9
60	9	857	59	9	66	3	159	65	3
63	9	859	61	9	60	4	160	59	5
65	3	867	63	2	63	3	181	61	3
71	3	887	69	3	85	5	182	67	3 -
65	3	900	65	2 -	67	4	192	66	5
55	5	928	55	3 -	63	9	204	62	9
62	9	936	61	9	59	9	219	59	9
57	8	954	55	8	62	9	229	62	9
73	3	962	71	3	60	5	242	59	3 -
61	9	969	60	9	60	9	254	58	9
67	3	981	64	3	60	8	270	59	8

Recorded by DJW Direction S Lane 4 Time from 2:51 to ________

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 1 of 1	* DATE 05/10/2005

Rev. 08/31/2001

1st 40 RUNS (42 TOTAL)

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
~~98.5~~		~~1~~	~~1~~		~~12105~~	~~47~~												
~~98.5~~		~~1~~	~~2~~	~~2:48~~	~~12311~~	~~57~~	~~6820~~	~~7800~~ ~~7840~~	~~73~~									
~~98.5~~		~~2~~	~~1~~	~~2:48~~	~~12330~~	~~46~~	~~4660~~ ~~4380~~	~~4980~~ ~~5900~~	~~4800~~	~~4900~~ ~~5040~~			~~46800~~	~~13.2~~	~~4.3~~	~~34.5~~	~~4.1~~	
101.5		1	1	2:55	12500	56	4980 4320	7800 8120	8160 7360	7620 7360	7800 7200		70720	17.4	4.3	38.5	4.1	
101.5		2	1	3:05	12750	52	4460 4280	5500 4700	5840 4460	5500 4360	4900 5340		49340	13.4	4.4	35.5	4.1	
102.5		1	2	3:10	12960	51	4920 4320	7920 7780	8140 7560	7840 7160	8040 7060		70760	17.5	4.3	38.7	4.1	
102.5		2	2	3:11	12948	53	4500 4020	5500 4800	6160 4480	5200 4900	4480 5760		49800	13.7	4.4	35.7	4.1	
~~102.5~~		~~1~~	~~5~~	~~3:19~~	~~13161~~	~~56~~	~~4480~~ ~~4340~~	~~7860~~ ~~7440~~	~~8840~~ ~~7520~~	~~7340~~ ~~7360~~	~~7780~~							

Recorded by ______________________ Checked by ______________________

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 7	* DATE 05/10/2005

Rev. 08/31/2001

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
102.5		2	3	3:20	13177	59	4720 4500	5300 4900	5760 4220	5040 4020	4740 4500		47700	13.6	4.4	36.3	4.2	
~~101~~		~~1~~	~~3~~	~~3:28~~	~~13409~~	~~56~~	~~4840 4320~~	~~7980 7800~~					~~70680~~	~~17.4~~	~~4.3~~	~~38.1~~	~~4.1~~	
101		2	4	3:29	13434	56	4620 4500	4960 5180	5520 4660	4560 4360	4680 4640		47680	13.1	4.1	34.7	4.1	
97		1	3	3:35	13640	46	4980 4200	7880 7720	8160 7580	7940 7260	7960 7200		70900	17.7	4.1	37.1	4.1	
97		2	5	3:36	13654	47	4420 4360	5320 5700	6060 4560	4400 4760	4200 4220		4830	13.4	4.3	34.9	4.1	
101.5		1	4	3:44	13891	51	4880 4020	7940 7760	8160 7620	7720 7740	8520 7140		71000	17.4	4.3	38.3	4.1	
101.5		2	6	3:46	13975	52	4480 5200	5420 5200	5320 4460	5360 4700	5160 5340		50640	13.4	4.3	35.4	4.1	
99.5		1	5	3:54	14250	52	5160 4080	8100 7480	8500 7300	8020 7380	8120 6960		71100	13.7	4.3	38.9	4.1	

Recorded by ____________________ Checked by ____________________

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 3 of 9	* DATE 05/10/2005

Rev. 08/31/2001

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
99.5		~~2~~	~~8~~	~~3:56~~	~~14557~~													
103		1	~~10~~ 6	4:01	14510	46	5020 3860	8000 7600	8360 7640	7700 7280	8220 7200		70680	17.6	4.4	38.7	4.2	
103		2	7	4:04	14582	49	4440 4180	5340 4900	5920 4680	4700 4920	4160 5300		48540	13.5	4.4	35.2	4.2	
101		1	~~11~~ 7	4:10	14767	51	4860 4340	7760 7960	8040 7600	7980 7280	7960 7240		71020	17.3	4.3	38.5	4.1	
101		2	18	4:11	14826	52	4620 4400	5150 5020	5580 4500	5360 4760	5060 5480		49920	13.3	4.4	35.3	4.1	
97.5		1	~~12~~ 8	4:17	15029	45	5220 4140	7820 7840	8440 7460	7920 7300	8100 7500		71760	17.3	4.3	38.2	4.1	
97.5		2	9	4:19	15092	47	4540 4120	5280 4960	6040 4700	4500 5120	4320 5040		68660	13.4	4.4	34.7	4.1	
~~94.5~~		~~1~~	~~17~~ 9	~~4:27~~	~~15360~~	~~51~~	~~5040 4060~~	~~7940 7660~~	~~8120 7460~~	~~7420 7~~			~~70680~~					

Recorded by ______________ Checked by ______________

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 4 of 8	* DATE 05/10/2005

Rev. 08/31/2001

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
96.5		2	10	4:22	15371	58	4360 4400	5460 5120	5800 5880	4430 4620	5080 5160		49700	13.7	4.4	35.9	4.1	
96		1	14 9	4:36	15660	56	4820 4260	7760 7940	7840 7580	7200 7520	7500 7160		6958	17.3	4.3	38.0	4.1	
96		2	18	4:38	15751	47	4380 4140	5440 4760	6100 4660	4640 5320	4200 5240		48900	13.4	4.3	34.8	4.1	

Recorded by ____________________ Checked by ____________________

South Page 1
6

Sheet 21	* STATE_CODE	31
LTPP Traffic Data	*SPS PROJECT_ID	0100
WIM System Test Truck Records ~~5 of 7~~ 1 of 3	* DATE	05/11/05

Rev. 08/31/2001

FIRST 40 RUNS (DAY 2)

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
~~78.5~~		~~2~~	~~12~~	~~9:19~~ 0k24	~~6223~~	~~47~~	5000 5000	5720 5740	6540 5540	4980 5900	4740 5700		54860	~~13.3~~	~~4.3~~	~~34.7~~	~~4.1~~	
78.5		3	1	9:22	6780	44	5760 5660	8900 8000	8500 8460	7500 8720	7580 8560		77680	20.6	4.3	37.4	4.1	
78.5		2	13	9:34	7081	52	5120 5060	5600 5720	5920 5460	5220 5340	4740 6240		57420	13.3	4.3	34.9	4.1	
78.5		3	2	9:29	7187	51	5160 5320	8900 8060	8380 8400	7600 8600	7700 8180		76900	20.3	4.3	37	4.0	
81		2	14	9:52	7486	58	5120 4960	5800 5560	5860 5420	4980 5120	4900 5740		53760	13.5	4.4	35	4	
81		3	3	9:54	7554	56	5580 5480	8180 8200	8220 8400	7180 8460	7480 8440		76220	20.8	4.4	37.5	4.1	
82.5		2	15	10:07	7860	47	5200 5000	5740 5720	6220 5400	4980 5900	4660 5720		54560	13.1	4.3	34.6	4.1	
82.5		3	4	10:09	7938	45	5760 5600	8860 8120	8480 8460	7680 8700	7620 8700		77980	20.6	4.3	37.2	4	

Recorded by ____________________ Checked by ____________________

South

Page 2

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records ~~6 of 7~~ 2 of 3	* DATE 05/11/2005

Rev. 08/31/2001

~~Last 40 runs~~ FIRST 40 RUNS (DAY 2)

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
83.5		2	16	10:22	8221	52	5020 5100	5760 5820	6000 5100	5100 5600	5300 5820		54620	13.3	4.1	34.6	4.1	
83.5		3	5	10:24	8272	50	5520 5380	8680 7940	8460 8460	7840 8600	7760 8360		77000	20.5	4.3	37.1	4.0	
85		2	17	10:35	8525	57	4780 4940	5380 6020	5700 5300	4640 5240	4700 5560		52260	13.1	4.2	34.4	4	
85		3	6	10:39	8606	56	5560 5500	8560 8180	8080 8440	7400 8520	7800 8120		76260	20.6	4.3	37.1	4.1	
87.5		2	18	10:49	8833	47	5120 4820	5660 5840	6460 5480	4820 6060	4700 6000		54940	13.3	4.3	34.7	4.1	
87.5		3.	7	10:53	8910	44	5900 5580	8840 7980	8460 8340	7560 8500	7880 8500		77540	20.3	4.3	37.0	4.0	
90.5		2	19	11:05	9171	52	4960 5120	5500 5660	5920 5600	5120 5460	5120 5940		54620	13.3	4.3	34.6	4.1	
90.5		3	8	11:08	9240	50	5580 5380	8540 8040	8400 6520	7600 6720	7820 8500		77100	20.6	4.3	37.6	4.0	

Recorded by ______________________ Checked by ______________________

south

page 3

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records ~~7 of 7~~ 3 of 3	* DATE 05/11/2005

Rev. 08/31/2001

FIRST 40 RUNS (DAY 2)

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
89		2	20	11:21	9542	56	4880 5080	5400 5860	5800 5280	6980 5400	5360 5440		53500	13.1	4.2	34.5	4.0	
89		3	9	11:23	9598	56	5440 5500	8580 8280	8100 8360	7520 8440	7500 8600		76320	20.5	4.3	37.3	4.0	
91		2	21	11:36	9887	47	5080 5040	5500 5720	6340 5360	5680 6620	6000 6540		57880	13.1	4.2	34.2	4.1	
91		3	10	11:37	9917	44	5760 5520	8880 8080	8620 8460	7620 8460	7780 8520		77720	20.6	4.3	37.6	4.1	
89		2	22	11:50	10213	52	4940 5000	5600 5860	5880 5400	5560 5540	5280 6020		55080	13.3	4.3	34.4	4.0	
89		3	11	11:52	10258	50	5780 5140	8960 8080	8460 8400	7800 8680	7800 8360		77260	20.6	4.3	37.5	4.0	
			truck	1 -	9 22													
			truck	2 -														
			truck	3 -	11 42													

Recorded by ____________________ Checked by ____________________

First Calibration Runs (12) Sears

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 1 of 2	* DATE 05 / 11 / 03

Rev. 08/31/2001

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
92.5		1	1	2:20	12725	45	5720 5360	9180 7980	8600 8460	7780 8200	7800 8440		77520	20.7	4.3	37.7	4.1	
92.5		2	1	2:24	12839	46	4880 4780	5820 6500	6520 5340	4860 5920	4620 5920		57160	13.2	4.3	34.4	4.1	
90		1	2	2:35	13128	50	5820 5200	9040 7860	8660 8480	7620 8780	7840 8420		77720	20.7	4.3	37.5	4.0	
90		2	2	2:39	13211	53	5120 4700	5960 5840	6480 6260	5580 5160	5240 5760		55100	13.3	4.3	35.1	4.1	
94		1	3	2:51	13546	56	5660 5320	8860 8260	8320 8460	7500 8600	7860 8160		77000	20.7	4.3	37.3	4.1	
94		2	3	2:53	13620	59	5060 5040	5640 5740	6080 5520	4560 4240	5720 5820		52820	13.4	4.3	34.8	4.1	
99		1	4	3:05	13961	44	5780 5660	9180 8040	8620 8600	7920 8440	7720 8320		[illegible]	20.5	4.3	37.3	4.1	
99		2	4	3:08	14039	47	4980 4900	6020 5620	6140 5400	4960 5740	4560 5960		[illegible]	13.4	4.3	35.7	4.1	

Recorded by ______________________ Checked by ______________________

First Calibration Runs south

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 2	* DATE 25 / 11 / 05

Rev. 08/31/2001

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
101		1	5	3:20	14371	50	5760 5400	9040 7920	8660 8400	7660 8740	7800 8320		77700	20.7	4.4	37.6	4.1	
101		2	5	3:22	14445	56	4940 5160	5280 6000	5820 5100	5280 5380	5080 5650		53720	13.3	4.2	344	4.0	
102.5		1	6	3:33	14796	45	5700 5540	9180 8060	8720 8540	7680 8680	7840 8560		78500	20.6	4.3	37.2	4.1	
102.5		2	6	3:36	14869	48	5040 4800	6040 5660	6520 5540	5020 5460	4900 6000		54980	13.6	4.3	35.2	4.1	
		truck truck	1 - 6 2 - 6															
			12															

Recorded by ______________ Checked by ______________

Final calibration Runs

Sheet 21	* STATE_CODE 39 39
LTPP Traffic Data	*SPS PROJECT_ID 0100 01 00
WIM System Test Truck Records 1 of 1	* DATE 05/11/2005

Rev. 08/31/2001

ADDITIONAL RUNS (31) day 2

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
100		1	7	3:49	15381	50	5660 5460	8960 8060	8640 8540	7800 8380	7980 8380		77860	20.5	4.3	37.0	4.0	
100		2	7	3:53	15490	53	5120 5040	5640 5840	6080 5340	5380 5600	5100 6140		55280	13.3	4.3	34.7	4.0	
97		1	8	4:04	15885	55	5100 5780	8400 8740	7700 8720	7260 9160	7340 8160		776960	20.2	4.2	36.3	3.9	
97		2	8	4:08	16029	52	4720 5060	5320 6100	5780 5560	4420 5540	4940 5340		52080	13.3	4.2	34.1	4.0	
100		1	9	4:20	16422	45	5520 5480	8720 8300	[illegible]80 8580	[illegible] 8620	[illegible] 8660		77800	20.3	4.3	37.0	4.0	
100		2	9	4:22	16487	47	4980 4940	5480 5820	6240 5660	5320 6540	5840 6480		57300	13.3	4.3	34.5	4.1	
94		1	10	4:35	16931	49	5400 5580	8620 8240	8340 8660	7620 9020	7500 8820		77800	20.2	4.2	36.5	3.9	
94		2	10	4:36	16990	51	4940 5100	5320 6220	5640 5800	5120 5740	4660 6580		55120	13.1	4.2	33.8	4.0	

Recorded by ______________ Checked by ______________

South

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 1 of 3	* DATE 05/12/2005

Rev. 08/31/2001

final runs

day 3

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
57.5		1	11	8:56	6034	45	5780 5920	8660 8400	8500 8900	7620 8800	7500 9000		79080	20.4	4.3	37.0	4.0	
57.5		2	11	9:02	6197	46	5140 4960	5500 5920	6060 6000	4900 6680	5860 6000		57020	13.1	4.2	34.1	4.0	
59.5		1	12	9:15	6530	49	5640 5960	8680 8440	8440 8760	7560 8600	7860 8540		78460	20.5	4.3	36.6	4.0	
59.5		2	12	9:18	6623	52	5040 5280	5460 6280	5620 5800	4620 6360	5620 6340		54840	13.1	4.2	33.9	4.0	
62		1	13	9:31	6947	56	5420 5840	8200 8620	7980 8720	7060 8760	7500 8740		77040	20.4	4.2	36.7	4.0	
63		1	14	9:45	7273	44	5720 5840	8720 8560	8500 8840	7540 8700	7880 8720		79020	20.2	4.3	37.0	4.0	
63		2	13	9:53	7432	48	5000 5080	5520 5940	6100 5620	5280 6540	4540 7020		56640	13.2	4.3	34.4	4.1	
62.5		1	15	10:05	7644	50	5640 5760	8780 8480	8400 8700	7320 8640	7380 8740		77840	20.5	4.3	37.1	4.1	

Recorded by ______________ Checked by ______________

South

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 3	* DATE 05 /12 /2005

Rev. 08/31/2001

Final Runs

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
62.5		2	14	10:07	7683	51	4980 5220	5440 6120	5580 5920	4700 5700	4340 6280		54280	13.1	4.2	34.1	4.0	
59.5		1	16	10:19	7931	56	5480 5640	8760 8520	8200 8700	7580 8840	7460 8840		77820	20.4	4.3	36.7	4.0	
59.5		2	15	10:28	7840	57	4680 4800	5540 6240	5540 5620	4500 6280	4700 6220		54120	13.1	4.2	33.9	4.0	
61.5		1	17	10:40	8064	44	5720 5800	8860 8420	8540 8760	7460 8820	7600 8880		78860	20.4	4.3	37	4.1	
61.5		2	16	10:43	8145	48	5060 5180	5600 5820	6220 5540	5340 6000	6060 6560		58380	13.1	4.3	33.5	4.1	
60.5		1	18	10:54	7818	49	5600 5780	8800 8480	8360 8720	7920 8760	8120 8420		78960	20.3	4.3	36.6	4.0	
60.5		2	17	10:58	7900	51	5080 5260	5580 6040	5580 5760	4600 5760	4600 6140		54600	20.2	4.3	34.0	4.0	
61.8		1	19	11:10	8178	55	5580 5520	5480 5560	8200 8660	7640 8620	7820 8600		77780	20.2	4.2	36.7	4.0	

Recorded by ____________ Checked by ____________

South

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 3 of 3	* DATE 05/12/2005

Rev. 08/31/2001

Final Runs

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
61.5		2	18	11:14	8271	56	4980 5000	5520 6060	5680 5620	5000 5820	4680 6280		54640	13.1	4.2	34.2	4.1	
63.5		1	20	11:26	8538	50	5880 5540	8880 8420	8440 8700	7120 8800	7660 8880		78320	20.5	4.3	37.1	4.0	
63.5		2	19	11:31	8662	52	5080 5140	5480 6180	5760 5840	4780 5760	4740 6200		54960	13.3	4.3	34.2	4.0	
61.5		1	21	11:43	8959	56	5520 5720	8480 8440	8140 8680	7260 8800	7680 8720		77440	20.6	4.3	37.3	4.1	
61.5		2	20	11:47	9043	56	4920 5260	5040 6460	5620 5520	5060 6180	4140 6660		54860	12.9	4.2	33.9	4.0	
60.5		1	22	11:59	9322	50	5560 5760	8580 8480	8380 8720	7380 8980	7780 8540		78160	20.5	4.3	37.0	4.0	
60.5		2	21	12:02	9392	51	5100 5100	5400 6140	5680 5680	4840 5760	4480 6240		54420	13.2	4.3	34.2	4.0	
						31												

Recorded by ______________________ Checked by ______________________

390100 calibration worksheet (DSt-3)

starting parameters

multiplier

1	.941416662
2	.921172453
3	.888171801

errors

truck 1/3 - 2.343 (heavy - multiplier 3)

2 - -.0456 (medium - multiplier 2)

calculations .941416662 - no adjustment

.921172453 × 1.00456 = .9283890369981

.888171801 × 1.02343 = .9094847548025

ending parameters

multiplier

1	.941416662
2	.9283890369981
3	.9094847548025

TEST TRUCK PHOTOGRAPHS

STATE: Ohio

SHRP ID: 0100

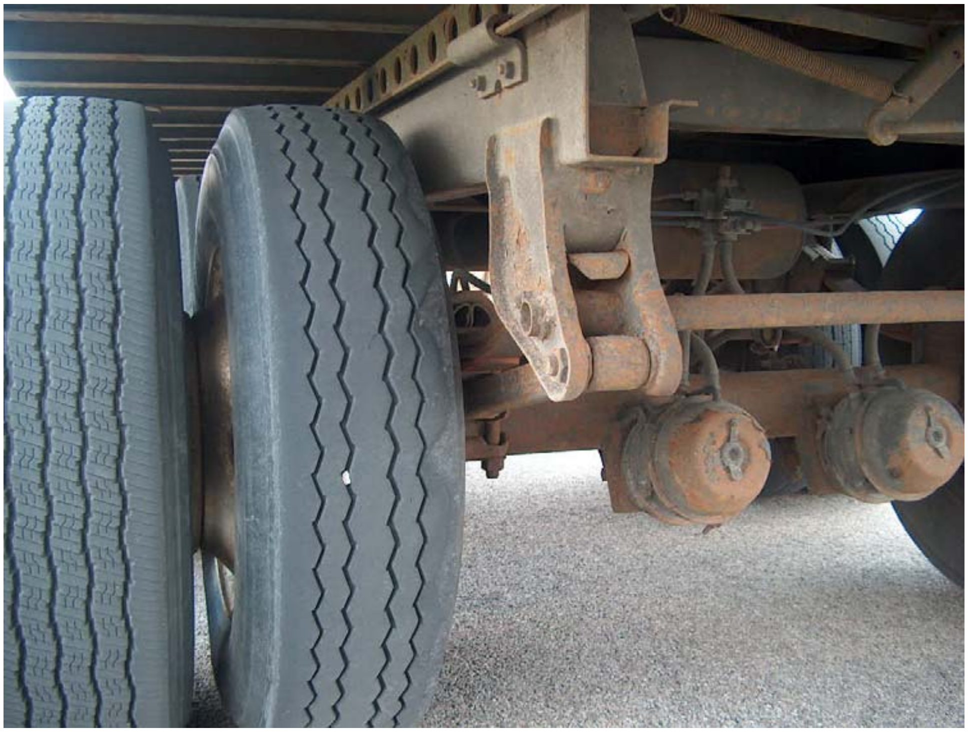
TO_9_39_2.49_0100_Truck_1_Tractor.JPG

TO_9_39_2.49_0100_Truck_1_Tractor_Suspension.JPG

TO_9_39_2.49_0100_Truck_1_Trailer.JPG

TO_9_39_2.49_0100_Truck_1_Trailer_Suspension.JPG

TO_9_39_2.49_0100_Truck_2_Tractor.JPG



TO_9_39_2.49_0100_Truck_2_Tractor_Suspension.JPG

TO_9_39_2.49_0100_Truck_2_Trailer.JPG

TO_9_39_2.49_0100_Truck_2_Trailer_Suspension.JPG

TO_9_39_2.49_0100_Truck_3_Tractor.JPG

TO_9_39_2.49_0100_Truck_3_Tractor_Suspension.JPG

TO_9_39_2.49_0100_Truck_3_Trailer.JPG

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