INTERNATIONAL ROAD DYNAMICS INC.

LTPP WIM DATA COLLECTION SYSTEMS

INSTALLATION AND CALIBRATION FOR WISCONSIN SPS-1 LTPP ID 550100

OCTOBER 23, 2007

CLIN 2004A TASK ORDER # 15

CONTRACT NO. DTFH61-05-D-00001

U.S. Department of Transportation
Federal Highway Administration

LONG TERM Pavement PERFORMANCE

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 1

2.0 POINT OF CONTACTS 2

3.0 SHEET 16 – SITE CALIBRATION SUMMARY 3
3.1.1 iSINC Site Calibration Factors & Site Parameters 5

4.0 WIM SITE INVENTORY 6
4.1.1 Site Map 8
4.1.2 Pictures, WIM Site 9
4.1.3 Pictures, Installation 10
4.1.4 Ste Layout 12
4.1.5 WIM Cabinet Concrete Pedestal 13
4.1.6 Electrical Readings 14

5.0 WIM CALIBRATION 15
5.1.1 Test Truck #1 Information 15
5.1.2 Pictures, Test Truck 1 16
5.1.3 Test Truck #2 Information 18
5.1.4 Pictures, Test Truck 2 19

6.0 TEST TRUCK CALIBRATION RECORDS 21
6.1.1 Validation Runs 21
6.1.2 Test Trucks Error Calculations 22
6.1.3 Overall Performance 23
6.1.4 Weight Graphs 24
6.1.5 Temperature Influence Graphs 25

1.0 EXECUTIVE SUMMARY

This report details the installation and calibration of the Wisconsin SPS-1 Weigh-in-Motion (WIM) on SH29, Mile Post 189.8. The site is located approximately 1.4 miles upstream from the start of SPS-1 Test Section 5550114, 15 miles east of Wausau in Marathon County

The WIM site is instrumented with IRD's iSINC (Intelligent Sensor Interface Network Controller) WIM Electronics and IRD Bending Plate Sensors. The LTPP lane is in the west bound driving lane it's instrumented with two inductive loops and 2 Bending Plate sensors. The WIM system uses a landline modem for communication and power is provided by 120 Volt A.C. service. The WIM Controller cabinet is located on the shoulder north of the west bound lanes.

The WIM equipment installation began on June 19, 2007 and was completed on June 20, 2007. The site power and phone service was established on September 24, 2007. The site was calibrated on October 23, 2007 using two class 9 vehicles.

The calibration results demonstrate the WIM system meets the LTPP performance requirements for weight and axle spacing as detailed in the *Data Collection Guide for SPS WIM Sites*.

2.0 POINT OF CONTACTS

Debbie Walker (COTR)
FHWA LTPP
ph: (202) 493-3068
email: deborah.walker@fhwa.dot.gov

Basel Abukhater (RSC)
Stantec
ph: (716) 632-0804

Lorenzo Casanova (Division Representative)
FHWA
ph: (804) 775-3362

State of Wisconsin DOT
Laura Fenley Ph: (608) 246-5455

Bruce Myers
International Road Dynamics (Phase 2 Contractor)
ph: (717) 264-2077
email: bruce.myers@irdinc.com

Greg Guite
Elite Carriers (calibration trucks)
ph: (715) 849-4000

3.0 SHEET 16 – SITE CALIBRATION SUMMARY

SITE CALIBRATION INFORMATION

1. DATE OF CALIBRATION (MONTH/DAY/YEAR): **October 23, 2007**

2. TYPE OF EQUIPMENT CALIBRATED:
   - ☒ WIM
   - ☐ CLASSIFIER
   - ☐ BOTH

3. REASON FOR CALIBRATION
   - ☐ REGULARLY SCHEDULED SITE VISIT
   - ☐ RESEARCH
   - ☐ EQUIPMENT REPLACEMENT
   - ☐ TRAINING
   - ☐ DATA TRIGGERED SYSTEM REVISION
   - ☒ NEW EQUIPMENT INSTALLATION
   - ☐ OTHER (SPECIFY) _____

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

5. EQUIPMENT MANUFACTURER: **International Road Dynamics Inc.**

WIM SYSTEM CALIBRATION SPECIFICS

6. CALIBRATION TECHNIQUE USED:
   - ☐ TRAFFIC STREAM:
     - NUMBER OF TRUCKS _____
     - ☐ STATIC SCALE
   - ☒ TEST TRUCKS:
     - NUMBER OF TEST TRUCKS **2**
     - PASSES PER TRUCK **21**

TRUCK#	TYPE	SUSPENSION
1	**9**	**1 & 2**
2	**9**	**1 & 2**
3	**X**	**X**
4	**X**	**X**
5	**X**	**X**

TYPE PER FHWA 13 BIN SYSTEM
SUSPENSION TYPES:
1 – AIR
2 – LEAF SPRING
3 – OTHER

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)

GVW MEAN DIFFERENCE	**.9 %**	STANDARD DEVIATION	**2.3%**
SINGLE AXLE MEAN DIFFERENCE	**-2.8%**	STANDARD DEVIATION	**2.6%**
DOUBLE AXLES MEAN DIFFERENCE	**2.1%**	STANDARD DEVIATION	**4.3%**

8. NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED: **3**

9. DEFINE THE SPEED RANGES USED (MPH): **45 - 55, 55 – 65, 65 - 70**

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) **See following sheets**

11. IS AUTO-CALIBRATION USED AT THIS SITE? ☐
    IF USED, LIST AND DEFINE AUTO-CALIBRATION VALUE _____

CLASSIFIER TEST SPECIFICS

12. METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
    - ☐ VIDEO
    - ☒ MANUAL
    - ☐ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT:
    - TIME
    - NUMBER OF VEHICLES
    - NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:

FHWA CLASS 2	100**%**
FHWA CLASS 3	100**%**
FHWA CLASS 4&5	100**%**
FHWA CLASS 8	100**%**
FHWA CLASS 9	100**%**
FHWA CLASS 12	**%**
"UNCLASSIFIED" VEHICLES:	**%**

15. PICTURES: _____

16. NOTES:
    _____

PERSON LEADING CALIBRATION EFFORT: **Bruce Myers**
CONTACT INFORMATION: **717-264-2077**

3.1.1 iSINC SITE CALIBRATION FACTORS & SITE PARAMETERS

Wisconsin LTPP Current As of Date: October 23, 2007

Calibration Parameters >							
Select Lane		1					
Select Axle Sensor		1					
Threshold		60					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	80	88	96	105	112
		Calib Factor	3296	3381	3516	3315	3262
Select Lane		1					
Select Axle Sensor		2					
Threshold		60					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	80	88	96	105	112
		Calib Factor	3476	3566	3708	3497	3441
Site Parameters >							
Lane Name			1				
Lane State			ENABLED				
Upstream Loop >		Loop State	ENABLED				
		Module UID	9				
		Channel Num	0				
		Polarity Active	LOW				
		Width (cm)	250				
Downstream Loop >		Loop State	ENABLED				
		Module UID	9				
		Channel Num	1				
		Polarity Active	LOW				
		Width (cm)	250				
		Distance(cm)	720				
Axle Sensors >		Select Axle	1				
		Axle State	ENABLED				
		Module UID	5				
		Channel Num	0				
		Polarity Active	HIGH				
		Type	PAT BP				
		Distance(cm)	270				
		Temp State	ENABLED				
		Temp Module UID	5				
		Temp Channel Num	0				
Axle Sensors >		Select Axle	2				
		Axle State	ENABLED				
		Module UID	5				
		Channel Num	1				
		Polarity Active	HIGH				
		Type	PAT BP				
		Distance(cm)	640				
		Temp State	ENABLED				
		Temp Module UID	5				
		Temp Channel Num	0				
Processing >	MaxTimeout(ms)		3000				
	Dynamic Comp(%)		103				
	Sig Wt Diff(%)		40				
	Min Axle Wt(kg)		1360				
	Veh Rec Mode		Split				
	Axle Sensor Width(cm)		50				
	Axl Sep(cm)		372				
Axle Snsor Debounce >	Type	PAT BP					
	On (ticks)	25					
	Off (ticks)	5					
DIOM Debounce	Loop On (ticks)	40					
	Loop Off (ticks)	40					
	Ovrhgt on (ticks)	40					
	Ovrhgt off (ticks)	0					
	Axle On (ticks)	40					
	Axle Off (ticks)	40					
Utilities	WCU Update TGM	Y					
	WCU UID	3					
	WCU SBM UID	2					

4.0 WIM SITE INVENTORY

1. ROUTE SH-29 MILEPOST:189.8 LTPP DIRECTION: N S E **W**

2. SITE DESCRIPTION
   GRADE: <.1%
   ☐ Sag vertical
   Nearest SPS section downstream of the site: 550114
   Distance from sensor to nearest downstream SPS Section: 1.4 miles

3. LANE CONFIGURATION
   Number of lanes in LTPP direction: 2 lanes
   Lane width: 12 ft.
   ☐ Median painted
   ☐ Median physical barrier
   ☒ Median grass
   ☐ Median none
   ☐ Shoulder curb and gutter
   ☒ Shoulder paved AC
   ☐ Shoulder paved PCC
   ☐ Shoulder unpaved
   Shoulder width: 10 ft.

4. PAVEMENT TYPE: PCC

5. CONDITION: (Surface distresses by type / severity within WIM section)
   Good

6. SENSOR SEQUENCE: Loop – Bending Plate – Bending Plate - Loop

7. PAVEMENT REPLACEMENT AND/OR GRINDING:
   Straightedge check: Performed _____ Result: ☒ Pass / ☐ Marginal / ☐ Unsatisfactory
   Short wave check: Performed _____ Result: ☒ Pass / ☐ Marginal / ☐ Unsatisfactory
   Long wave check: Performed _____ Result: ☒ Pass / ☐ Marginal / ☐ Unsatisfactory

8. ANY EFFECTS FROM RAMPS OR LANE TRANSITIONS:
   ☒ Driveway within 300m upstream, distance: _____
   ☐ Intersection/driveway within 300m downstream, distance: _____
   ☐ LTPP lane used for passing by vehicles traveling in south bound lane

9. DRAINAGE:
   ☐ Open to ground
   ☒ Pipe to culvert or ditch
   ☐ None
   ☐ French drain

10. CABINET LOCATION:
    - ☒ Same side of road as LTPP lane
    - ☐ Median
    - ☐ Behind guard rail

    Distance from edge of travel lane to cabinet: 44 ft
    Distance from sensors: 44 ft
    Type: 336
    Access controlled by: ☐ LTPP / ☒ State / ☐ Joint
    Primary contact: Laura Fenley
    Alternate contact:

11. POWER:
    Power type: ☐ Overhead / ☒ Underground / ☐ Solar
    Distance from cabinet to drop: 5 ft
    Service provider: N/A.

12. TELEPHONE:
    Telephone type: ☐ Overhead / ☒ Underground / ☒ Cell
    Distance from cabinet to drop: 5 ft
    Phone # : (715) 454-6865

13. SYSTEM:
    Software: iSINC
    Version:
    Connection: ☒ RS232 / ☐ Parallel port / ☐ USB / ☐ Other

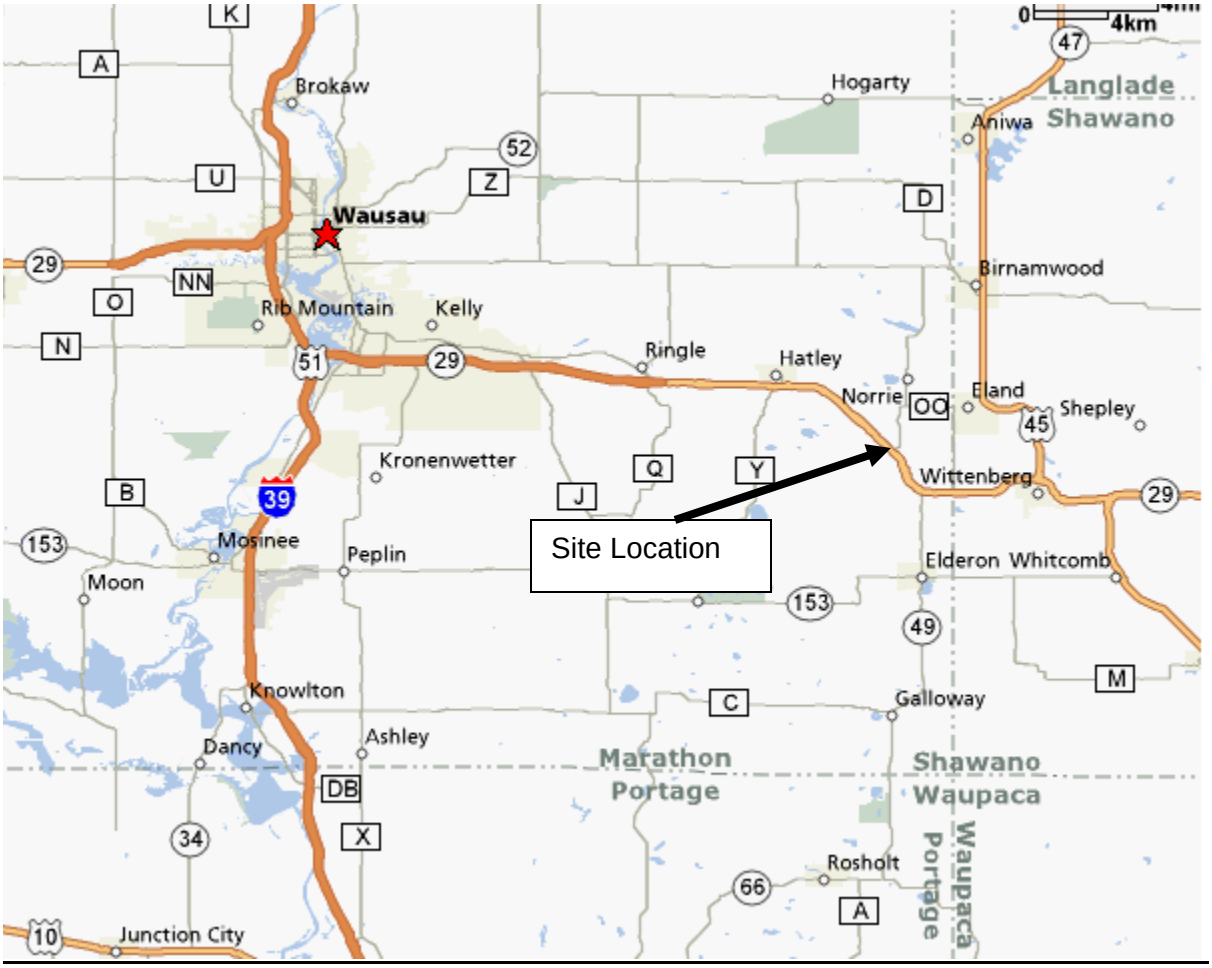
14. TEST TRUCK CYCLE:
    Turnaround time: 10 minutes
    Turnaround distance: 6.4 miles

15. PICTURES: See following pages, Site Map, WIM Site, Site layout drawings

16. NOTES:

COMPLETED BY: **Bruce Myers**
CONTACT INFORMATION: **717-264-2077**

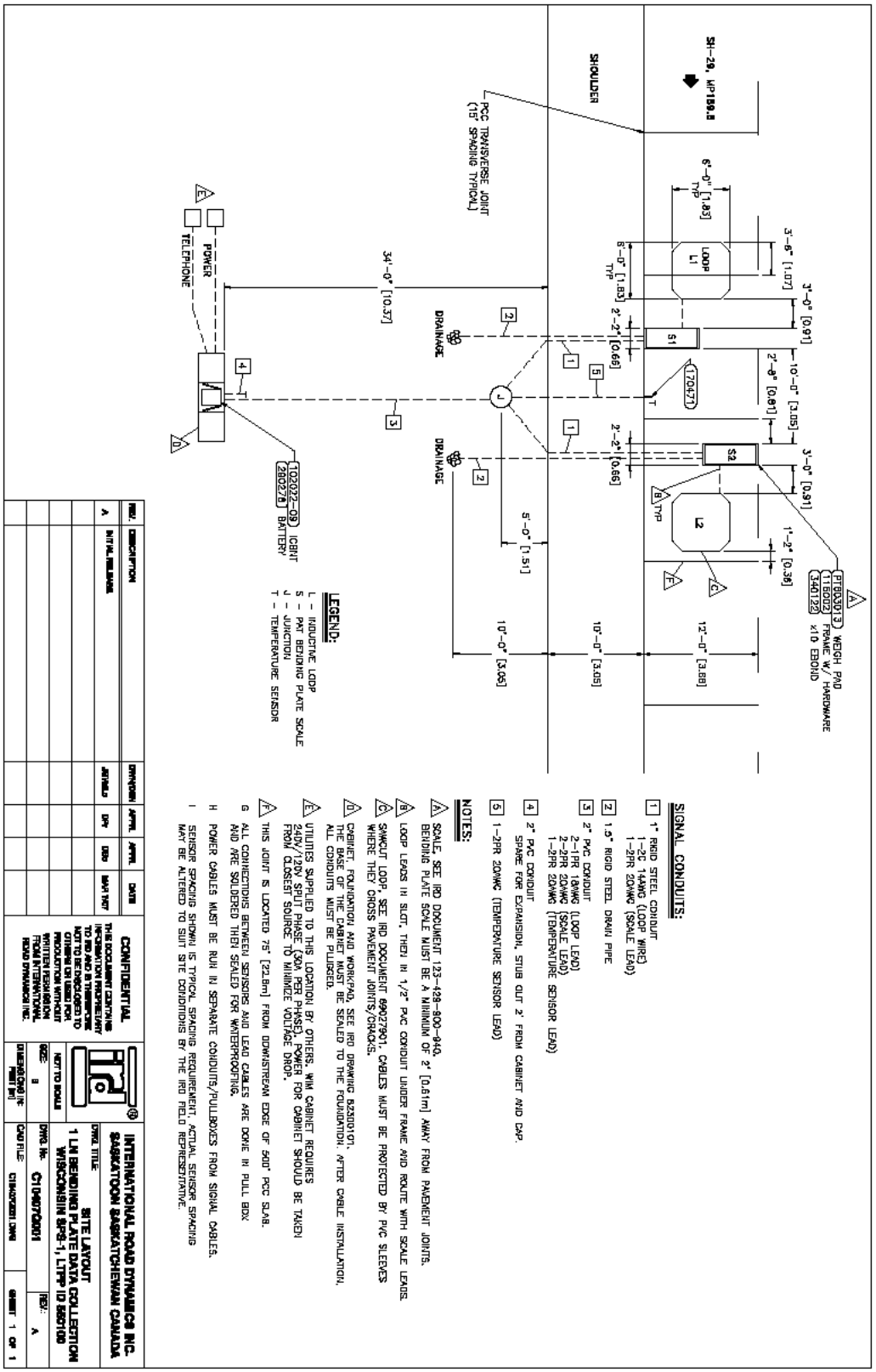
4.1.1 SITE MAP


Site Location
Wausau
Brokaw
Hogarty
Aniwa
Langlade
Shawano
Birnamwood
Rib Mountain
Kelly
Ringle
Hatley
Norrie
Eland
Shepley
Wittenberg
Kronenwetter
Mosinee
Peplin
Moon
Elderon
Whitcomb
Galloway
Knowlton
Ashley
Dancy
Marathon
Portage
Shawano
Waupaca
Rosholt
Junction City
0
4km

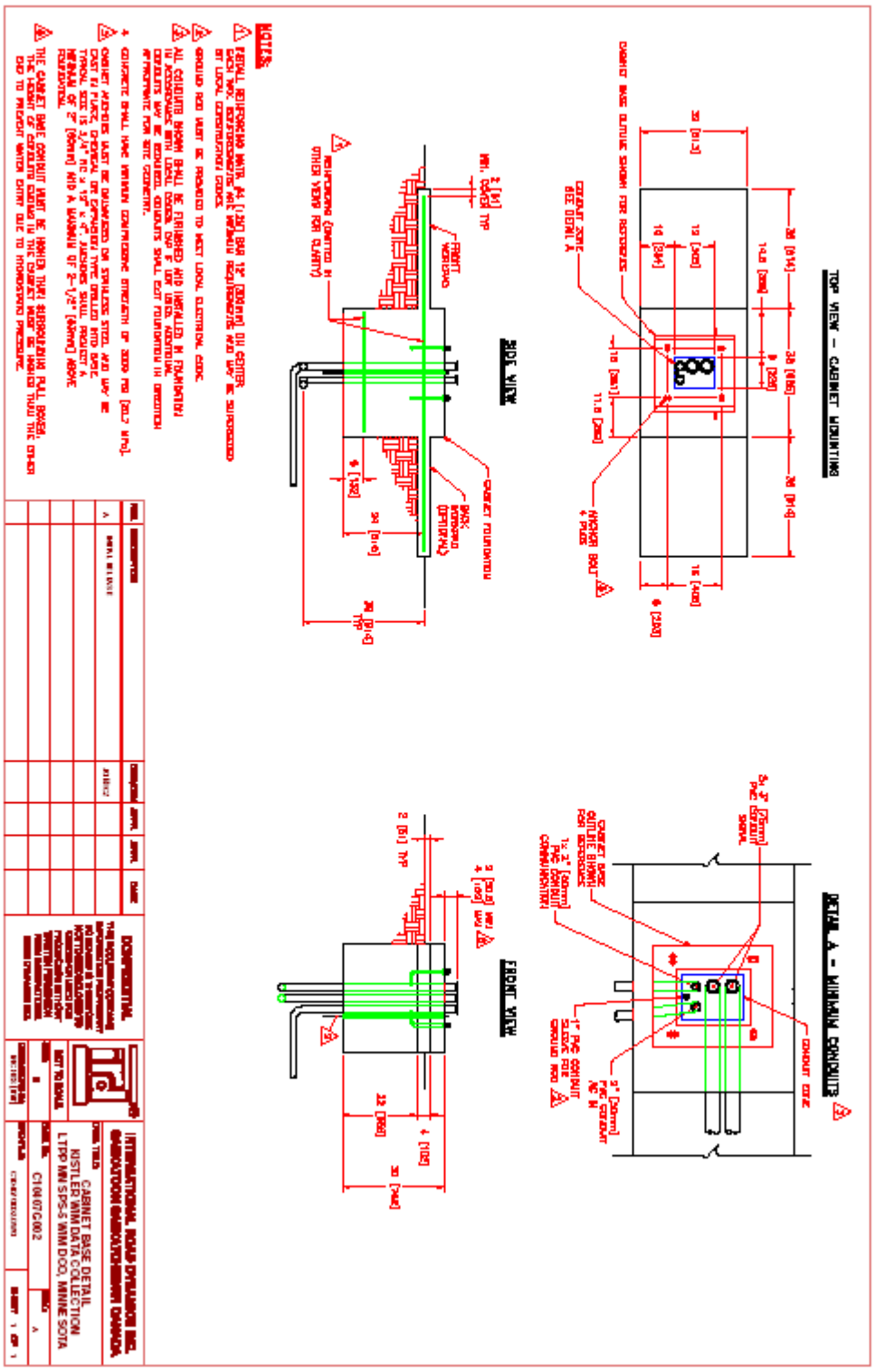
4.1.2 PICTURES, WIM SITE

4.1.3 PICTURES, INSTALLATION

4.1.4 STE LAYOUT



4.1.5 WIM CABINET CONCRETE PEDESTAL



4.1.6 ELECTRICAL READINGS

International Road Dynamics Inc.

Site Service Sheet

Clear

System Type: iSINC/PAT BP

Date: 10/23/2007 **State:** Wisconsin **Location:** SH 29 Mile Post 189.8
Job #: 10407Q **Site #:** SPS-1 **LTPP ID:** 550100

Loops	Lane - 1		Lane -		Lane -		Lane -	
	Lead	Trail	Lead	Trail	Lead	Trail	Lead	Trail
Resistance	.9 ohm	.9 ohm						
Leakage	inf.	inf						
Inductance								
Frequency	N/A	N/A						

Weighpads	Lane - 1		Lane -		Lane -		Lane -	
	Lead	Trail	Lead	Trail	Lead	Trail	Lead	Trail
Supply	979 ohm	979 ohm						
Signal	842 ohm	842 ohm						
Shield	inf.	inf.						
Zero Pt	0.3 mV	0.2mV						
Serial #								

Piezos	Lane -		Lane -		Lane -		Lane -	
Amplitude								
Capacitance								
Resistance								

System

A/C Service	120 VAC
Power Supply	13.6 VDC
Solar Panel	N/A
Back-Up	13.6 VDC
System Input	N/A
Modem Power	
Phone off hook	8.5 VDC
Phone on hook	48. VDC

Temp Sensor

White to Blue	2.7K ohm

Technician: Bruce Myers **Date:** 10/23/2007

5.0 WIM CALIBRATION

5.1.1 TEST TRUCK #1 INFORMATION

DATE OF CALIBRATION: **October 23, 2007**

1. TEST TRUCK NUMBER: 1 2. FHWA CLASS: 9 3. Number of axles: 5

Axle	Empty Truck Axle Weights (lb)	4. Pre-Test Loaded Axle Weights (lb)	5. Post-Test Loaded Axle Weights (lb)	6. Measured Directly or Calculated
A		11860		D
B		30660		D (B&C combined)
C				
D		17900		D (D&E combined)
E				

7. CALCULATIONS:

Empty Truck Gross Weight (lb)	Pre-Test Loaded Gross Weight (lb)	Post-Test Loaded Gross Weight (lb)	Pre to Post Difference (lb)
	60420		60420

8. TRACTOR CAB STYLE: ☐ Cab over engine / ☒ Conventional ☒ With sleeper

9. TRACTOR MANUFACTURER:
   Make: Peter Built
   Model:

10. TRAILER LOAD DESCRIPTION: Paper

11. TRAILER TARE WEIGHT (lb): _____

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	17.1'
B-C	4.3'
C-D	34.7’
D-E	4.2’

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +1.5 ft

SUSPENSSION:

Axle	17. Tire Size	18. Suspension description (leaf, air, # of leaves, taper or flat leaf, etc.)
A	11R24.5	Leaf spring – two leaves
B	11R24.5	air
C	11R24.5	air
D	11R24.5	air
E	11R24.5	air

5.1.2 PICTURES, TEST TRUCK 1


10/23/2007


10/23/2007

5.1.3 TEST TRUCK #2 INFORMATION

DATE OF CALIBRATION: **October 23, 2007**

1. TEST TRUCK NUMBER: 2 2. FHWA CLASS: 9 3. Number of axles: 5

Axle	Empty Truck Axle Weights (lb)	4. Pre-Test Loaded Axle Weights (lb)	5. Post-Test Loaded Axle Weights (lb)	6. Measured Directly or Calculated
A		11940		D
B		33100		D (B&C combined)
C				
D		31620		D (D&E combined)
E				

7. CALCULATIONS:

Empty Truck Gross Weight (lb)	Pre-Test Loaded Gross Weight (lb)	Post-Test Loaded Gross Weight (lb)	Pre to Post Difference (lb)
	76660		76660

8. TRACTOR CAB STYLE: ☐ Cab over engine / ☒ Conventional ☒ With sleeper

9. TRACTOR MANUFACTURER:
   Make: Freightliner
   Model:

10. TRAILER LOAD DESCRIPTION: Paper

11. TRAILER TARE WEIGHT (lb): _____

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	17.1’
B-C	4.4’
C-D	35.1’
D-E	4.1’

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +1.5 ft

SUSPENSSION:

Axle	17. Tire Size	18. Suspension description (leaf, air, # of leaves, taper or flat leaf, etc.)
A	11R24.5	Leaf spring – two leaves
B	11R24.5	air
C	11R24.5	air
D	11R24.5	air
E	11R24.5	air

5.1.4 PICTURES, TEST TRUCK 2


10/23/2007


10/23/2007

6.0 TEST TRUCK CALIBRATION RECORDS

6.1.1 VALIDATION RUNS

International Road Dynamics Inc.

FHWA VERIFICATION

Static Test Vehicle Measurements

ID				GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1				60.4	11.9	30.7	17.9	17.1	4.3	34.7	4.2
2				76.7	11.9	33.1	31.6	17.1	4.4	35.1	4.1

b

Dynamic Test Vehicle Measurements

ID	V#	Speed	Temp	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	10732	47	49	60.4	11.6	30.8	18.0	17.0	4.4	34.7	4.1
2	10733	49	49	77.3	11.7	33.4	32.2	17.1	4.2	35.0	4.0
2	10771	58	49	74.8	11.2	32.1	31.4	17.1	4.3	35.1	4.0
1	10796	70	50	58.4	11.1	28.8	18.6	17.0	4.4	34.6	4.1
2	10797	67	50	78.2	11.6	34.4	32.3	17.1	4.2	35.0	4.0
1	10826	48	50	60.0	11.3	30.6	18.2	17.0	4.4	34.7	4.1
2	10827	47	50	77.4	11.8	33.4	32.2	17.2	4.4	35.2	4.0
1	10853	64	50	63.5	11.4	31.9	20.1	17.0	4.4	34.6	4.0
2	10854	63	50	75.5	11.7	30.8	32.9	17.1	4.2	35.1	4.0
1	10875	70	52	61.4	10.7	31.2	19.5	17.0	4.4	34.7	4.1
2	10876	67	52	77.8	11.5	33.9	32.5	17.1	4.2	35.1	4.1
1	10908	49	54	60.4	11.6	30.6	18.2	17.0	4.4	34.8	4.1
2	10909	48	54	77.6	11.7	33.6	32.2	17.1	4.2	35.2	4.0
1	10944	63	54	63.6	11.5	32.1	20.0	17.0	4.4	34.5	4.1
2	10945	63	54	75.8	11.8	31.0	33.1	17.1	4.2	35.2	4.0
2	10969	67	55	78.5	11.7	34.2	32.5	17.0	4.2	35.0	4.1
1	10999	54	55	62.2	11.5	31.4	19.4	17.0	4.3	34.7	4.1
2	11000	51	55	79.4	12.0	34.6	33.0	17.1	4.2	35.1	4.0
1	11017	70	55	60.6	11.0	30.6	19.1	17.0	4.4	34.7	4.1
2	11018	67	55	74.8	11.5	30.9	32.3	17.1	4.2	35.2	4.1
1	11044	51	56	61.7	11.8	31.4	18.4	17.0	4.4	34.6	4.1
2	11045	50	56	77.4	11.9	33.8	31.8	17.1	4.2	35.1	4.0
1	11284	64	54	62.6	11.5	32.0	19.1	17.0	4.4	34.7	4.1
2	11285	63	54	76.7	12.0	31.2	33.4	17.1	4.2	35.2	4.0
1	11316	70	54	59.7	11.1	29.7	19.0	17.0	4.4	34.7	4.1
2	11317	67	54	76.9	11.4	33.2	32.3	17.2	4.3	35.3	4.0
1	11349	54	54	62.3	11.4	30.8	20.0	17.0	4.4	34.6	4.1
2	11350	53	54	78.7	11.9	34.3	32.6	17.1	4.2	35.2	4.0
1	11371	64	54	62.6	11.5	31.1	20.1	17.0	4.4	34.7	4.1
2	11372	62	54	77.8	11.9	32.9	33.1	17.2	4.2	35.2	4.0
1	11405	70	54	59.2	11.0	29.4	18.6	17.0	4.4	34.7	4.1
2	11406	67	54	77.8	11.6	33.5	32.8	17.1	4.2	35.1	4.0
1	11443	54	54	61.5	12.0	30.8	18.7	17.0	4.3	34.6	4.1
2	11444	54	54	78.4	11.9	34.2	32.4	17.1	4.3	35.2	4.0
2	11479	64	55	77.6	12.0	32.7	32.9	17.1	4.2	35.2	4.1
1	11505	70	56	62.8	11.5	31.4	19.8	17.0	4.4	34.6	4.1
2	11507	67	56	74.0	11.8	30.2	32.0	17.0	4.2	35.0	4.0
2	11542	58	56	74.1	11.5	31.0	31.4	17.1	4.3	35.1	4.0

Date:	2007/10/23
Technician:	Bruce Myers
Location:	Wisconsin LTPP

6.1.2 TEST TRUCKS ERROR CALCULATIONS

Truck	V#	Speed	Temp	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	10732	47	49	0.0%	-2.5%	0.3%	0.6%	-0.1	0.1	0.0	-0.1
2	10733	49	49	0.8%	-1.7%	0.9%	1.9%	0.0	-0.2	-0.1	-0.1
2	10771	58	49	-2.5%	-5.9%	-3.0%	-0.6%	0.0	-0.1	0.0	-0.1
1	10796	70	50	-3.3%	-6.7%	-6.2%	3.9%	-0.1	0.1	-0.1	-0.1
2	10797	67	50	2.0%	-2.5%	3.9%	2.2%	0.0	-0.2	-0.1	-0.1
1	10826	48	50	-0.7%	-5.0%	-0.3%	1.7%	-0.1	0.1	0.0	-0.1
2	10827	47	50	0.9%	-0.8%	0.9%	1.9%	0.1	0.0	0.1	-0.1
1	10853	64	50	5.1%	-4.2%	3.9%	12.3%	-0.1	0.1	-0.1	-0.2
2	10854	63	50	-1.6%	-1.7%	-6.9%	4.1%	0.0	-0.2	0.0	-0.1
1	10875	70	52	1.7%	10.1%	1.6%	8.9%	-0.1	0.1	0.0	-0.1
2	10876	67	52	1.4%	-3.4%	2.4%	2.8%	0.0	-0.2	0.0	0.0
1	10908	49	54	0.0%	-2.5%	-0.3%	1.7%	-0.1	0.1	0.1	-0.1
2	10909	48	54	1.2%	-1.7%	1.5%	1.9%	0.0	-0.2	0.1	-0.1
1	10944	63	54	5.3%	-3.4%	4.6%	11.7%	-0.1	0.1	-0.2	-0.1
2	10945	63	54	-1.2%	-0.8%	-6.3%	4.7%	0.0	-0.2	0.1	-0.1
2	10969	67	55	2.3%	-1.7%	3.3%	2.8%	-0.1	-0.2	-0.1	0.0
1	10999	54	55	3.0%	-3.4%	2.3%	8.4%	-0.1	0.0	0.0	-0.1
2	11000	51	55	3.5%	0.8%	4.5%	4.4%	0.0	-0.2	0.0	-0.1
1	11017	70	55	0.3%	-7.6%	-0.3%	6.7%	-0.1	0.1	0.0	-0.1
2	11018	67	55	-2.5%	-3.4%	-6.6%	2.2%	0.0	-0.2	0.1	0.0
1	11044	51	56	2.2%	-0.8%	2.3%	2.8%	-0.1	0.1	-0.1	-0.1
2	11045	50	56	0.9%	0.0%	2.1%	0.6%	0.0	-0.2	0.0	-0.1
1	11284	64	54	3.6%	-3.4%	4.2%	6.7%	-0.1	0.1	0.0	-0.1
2	11285	63	54	0.0%	0.8%	-5.7%	5.7%	0.0	-0.2	0.1	-0.1
1	11316	70	54	-1.2%	-6.7%	-3.3%	6.1%	-0.1	0.1	0.0	-0.1
2	11317	67	54	0.3%	-4.2%	0.3%	2.2%	0.1	-0.1	0.2	-0.1
1	11349	54	54	3.1%	-4.2%	0.3%	11.7%	-0.1	0.1	-0.1	-0.1
2	11350	53	54	2.6%	0.0%	3.6%	3.2%	0.0	-0.2	0.1	-0.1
1	11371	64	54	3.6%	-3.4%	1.3%	12.3%	-0.1	0.1	0.0	-0.1
2	11372	62	54	1.4%	0.0%	-0.6%	4.7%	0.1	-0.2	0.1	-0.1
1	11405	70	54	-2.0%	-7.6%	-4.2%	3.9%	-0.1	0.1	0.0	-0.1
2	11406	67	54	1.4%	-2.5%	1.2%	3.8%	0.0	-0.2	0.0	-0.1
1	11443	54	54	1.8%	0.8%	0.3%	4.5%	-0.1	0.0	-0.1	-0.1
2	11444	54	54	2.2%	0.0%	3.3%	2.5%	0.0	-0.1	0.1	-0.1
2	11479	64	55	1.2%	0.8%	-1.2%	4.1%	0.0	-0.2	0.1	0.0
1	11505	70	56	4.0%	-3.4%	2.3%	10.6%	-0.1	0.1	-0.1	-0.1
2	11507	67	56	-3.5%	-0.8%	-8.8%	1.3%	-0.1	-0.2	-0.1	-0.1
2	11542	58	56	-3.4%	-3.4%	-6.3%	-0.6%	0.0	-0.1	0.0	-0.1

6.1.3 OVERALL PERFORMANCE

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Specifications					
Confidence	95%	Speed range low	45	to	55
	(1.96)	Speed range medium	55	to	65
Gross vehicle weight	10%	Speed range high	65	to	76
Tandem group weight	15%	Temperature range low	45	to	50
Single axle weight	20%	Temperature range medium	50	to	54
Axle spacings	0.5	Temperature range high	54	to	60

Overall					
Characteristic	Error	StdDev	Specification	Calculated	Pass/Fail
Gross vehicle weight	0.9%	2.3%	10%	5.4%	pass
Tandem group weight	2.1%	4.3%	15%	10.6%	pass
Single axle weight	-2.8%	2.6%	20%	8.0%	pass
Axle spacings	0.0	0.1	0.5	0.2	pass

Speed range 45 to 55 (14 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	1.5%	1.3%	10%	4.2%
Tandem group weight	2.5%	2.6%	15%	7.6%
Single axle weight	-1.5%	1.8%	20%	7.7%
Axle spacings	0.0	0.1	0.5	0.2

Speed range 55 to 65 (11 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	1.1%	3.1%	10%	7.3%
Tandem group weight	2.2%	5.8%	15%	13.9%
Single axle weight	-2.2%	2.2%	20%	6.7%
Axle spacings	0.0	0.1	0.5	0.2

Speed range 65 to 76 (12 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.4%	2.2%	10%	4.9%
Tandem group weight	1.9%	4.4%	15%	10.6%
Single axle weight	-4.5%	2.8%	20%	10.2%
Axle spacings	-0.1	0.1	0.5	0.2

Temperature range 45 to 50 (9 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.1%	2.5%	10%	5.2%
Tandem group weight	1.2%	4.2%	15%	9.6%
Single axle weight	-3.5%	2.1%	20%	7.7%

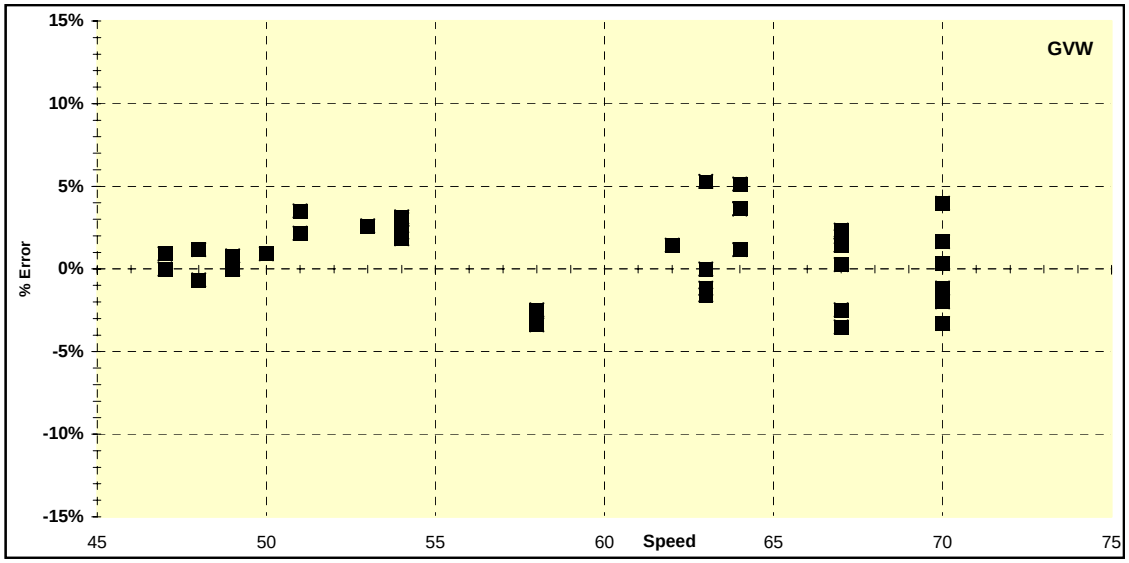
Temperature range 50 to 54 (18 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	1.4%	1.9%	10%	5.2%
Tandem group weight	2.9%	4.3%	15%	11.4%
Single axle weight	-2.9%	3.0%	20%	8.9%

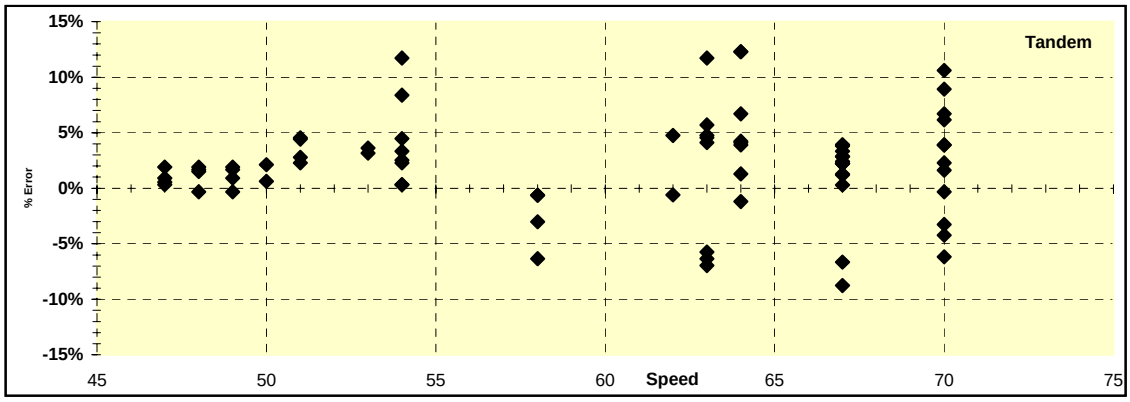
Temperature range 54 to 60 (11 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.7%	2.7%	10%	6.2%
Tandem group weight	1.7%	4.6%	15%	10.9%
Single axle weight	-2.1%	2.5%	20%	7.1%

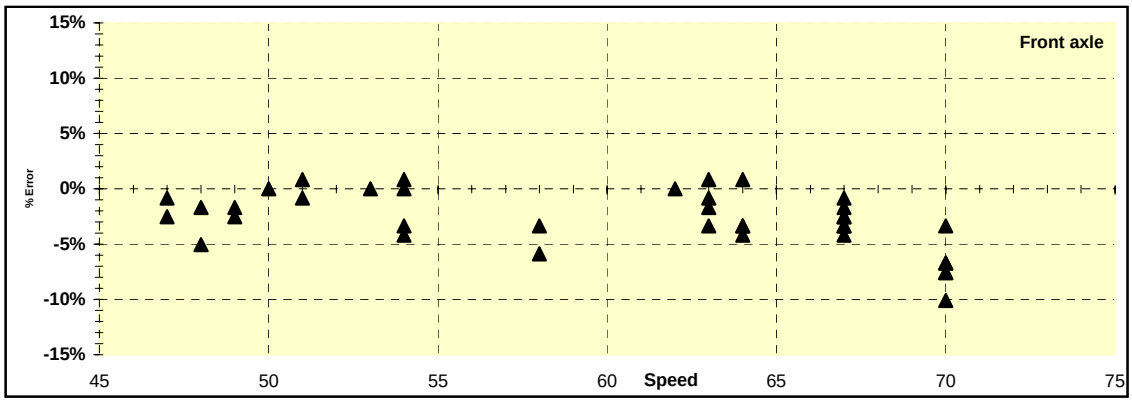
6.1.4 WEIGHT GRAPHS

International Road Dynamics Inc.

FHWA VERIFICATION







6.1.5 TEMPERATURE INFLUENCE GRAPHS

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