

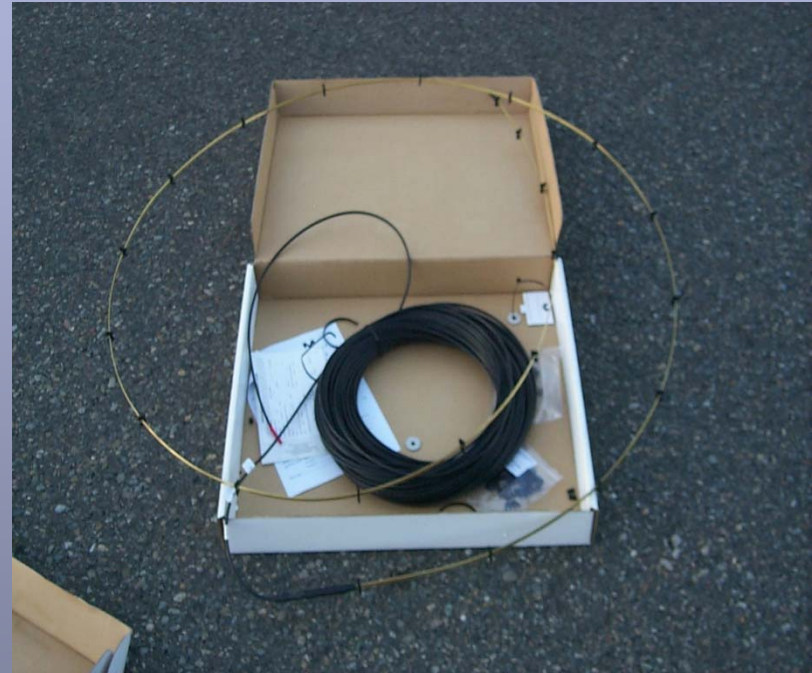
Best Practices for the Installation of Brass Linguini (BL) Piezos

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Hoang Nguyen



Why BL Sensors

- COST
- Installation time
- Ease of installation
- Accuracy of sensors
- Did we mention cost?



Keys to a successful WIM

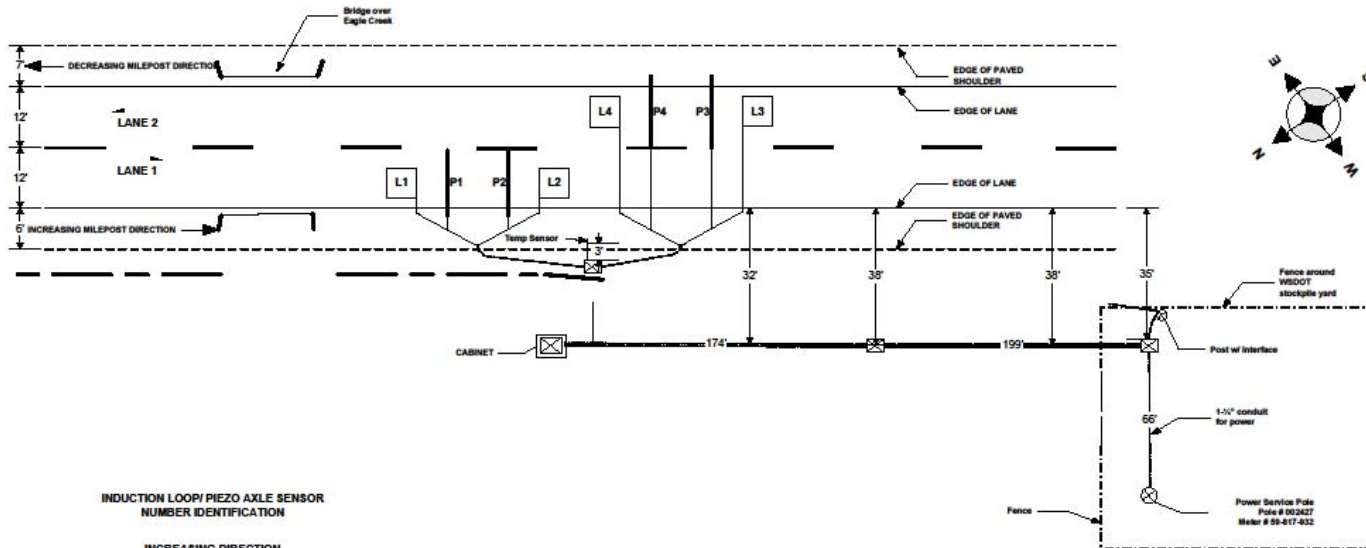
1. Who is responsible for installing the sensors
2. Getting the sensor installed to work accurately.
3. Software changes from default settings
4. Calibration
5. Maintenance

Getting Started: Site Selection

- Road conditions-hills or road grade, bumpy
- Obstructions-power lines, side roads
- Traffic Patterns –passing, shoulder driving



TDO site layout Drawing

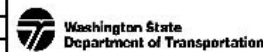


**INDUCTION LOOP/PIEZO AXLE SENSOR
NUMBER IDENTIFICATION**

INCREASING DIRECTION
Lane 1 – (drive lane) = Loop L1, Piezo P1, Piezo P2, Loop L2

DECREASING DIRECTION
Lane 2 – (drive lane) = Loop L3, Piezo P3, Piezo P4, Loop L4

Layout drawn by: Kelly Haeger	Pavement type: ASPHALT	Counter type: IRD 1068	Site number: P18
Checked by: ???	Power: FULLTIME	Counter Serial #: 0306-8282	Site Location SR 101 mp: 324.70
Date drawing completed: 7-29-2009	Original install date: 12-30-1991	Modem type: ZOOM	Site name: LILLIWAUP
Last drawing update: 7-29-2009	Last complete reinstall date: 7-29-2009	Modem serial #: 00C2-0495	Site Region: OLYMPIC



Hardware installation

- Getting the sensors glued to the road!



Who does the Work?

- Contractor
- State Forces
- Neighbor down the street

Or.....

Billy Bob's WIM installs and street Lettering, Inc.



Straight edge



Cutting piezo slot







Piezo Sanding





Software changes

- 40 temperature bins instead of IRD default 30 bins, 2 degree increments
- 3 speed bins instead of IRD default 1
- Modified Class Scheme to eliminate class 9 trucks with front axle weigh less than 8kips or more than 13kips to be included in the auto-calibration process

WA Modified Temp Curve				IRD Default Temp Curve			
BIN#	C	F	FACTORS	BIN#	C	FACTORS	
0	-50	-55	2700	0	-50	720	
1	-18	0	2610	1	-45	720	
2	-16	4	2520	2	-40	720	
3	-14	7	2430	3	-35	720	
4	-12	11	2340	4	-30	720	
5	-10	14	2260	5	-25	720	
6	-8	18	2180	6	-20	720	
7	-6	22	2100	7	-15	720	
8	-4	25	2020	8	-10	740	
9	-2	29	1940	9	-5	760	
10	0	32	1870	10	0	800	
11	2	35	1800	11	5	840	
12	4	39	1730	12	10	880	
13	6	42	1660	13	15	920	
14	8	46	1590	14	20	960	
15	10	50	1540	15	25	1000	
16	12	53	1490	16	30	1040	
17	14	57	1440	17	35	1080	
18	16	60	1390	18	40	1120	
19	18	64	1340	19	45	1160	
20	20	68	1300	20	50	1180	
21	22	71	1260	21	55	1200	
22	24	75	1220	22	60	1200	
23	26	78	1180	23	65	1200	
24	28	82	1140	24	70	1200	
25	30	86	1120	25	75	1200	
26	32	89	1100	26	80	1200	
27	34	93	1080	27	85	1200	
28	36	96	1060	28	90	1200	
29	38	100	1040	29	95	1200	
30	40	104	1030				
31	42	107	1020				
32	44	111	1010				
33	46	114	1000				
34	48	118	990				
35	50	122	985				
36	52	125	980				
37	56	132	975				
38	60	140	970				
39	64	147	965				

Speed bins



Eliminate unwanted vehicles for
auto-cal

Calibration

- Auto-cal
- Dynamic compensation factor
- Population mean

PASS #: 1		PASS #: 2		PASS #: 3		PASS #: 4		PASS #: 5		Wait for 5 passes to get New Calibration Factors		
Veh. ID#:		Veh. ID#:		Veh. ID#:		Veh. ID#:		Veh. ID#:		CF1	0.193 Enter present calibration factor for first sensor	
Length:		Length:		Length:		Length:		Length:		CF2	0.182 Enter present calibration factor for second sensor	
Speed:		Speed:		Speed:		Speed:		Speed:		Avg GVW 1	0.00 Average GVW for 5 runs from first sensor	
AXLE	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Avg GVW 2	0.00 Average GVW for 5 runs from second sensor
1											New CF1	##### Note WIM Channel
2											New CF2	##### Note WIM Channel
3												
4												
5												
GVW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

Axle Spacings		Axle Spacings		Axle Spacings		Axle Spacings		Axle Spacings	
1-2		1-2		1-2		1-2		1-2	
2-3		2-3		2-3		2-3		2-3	
3-4		3-4		3-4		3-4		3-4	
4-5		4-5		4-5		4-5		4-5	

PASS #: 6		PASS #: 7		PASS #: 8		PASS #: 9		PASS #: 10		
Veh. ID#:		Veh. ID#:		Veh. ID#:		Veh. ID#:		Veh. ID#:		
Length:		Length:		Length:		Length:		Length:		
Speed:		Speed:		Speed:		Speed:		Speed:		
AXLE	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
1										
2										
3										
4										
5										
GVW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Axle Spacings		Axle Spacings		Axle Spacings		Axle Spacings		Axle Spacings	
1-2		1-2		1-2		1-2		1-2	
2-3		2-3		2-3		2-3		2-3	
3-4		3-4		3-4		3-4		3-4	
4-5		4-5		4-5		4-5		4-5	

Maintenance



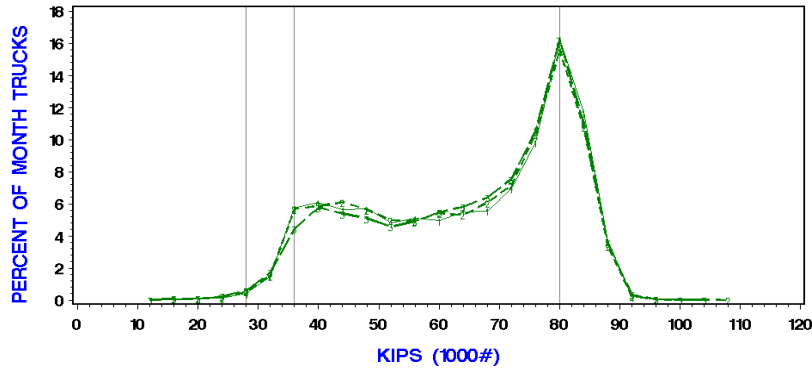


Ooops!



A

DISTRIBUTION OF GROSS WEIGHT
5-AXLE SEMIS BY STATION DIRECTION
 STA=P7C NAME=RITZVI DIR= 1 LANE= 1 YY=2010

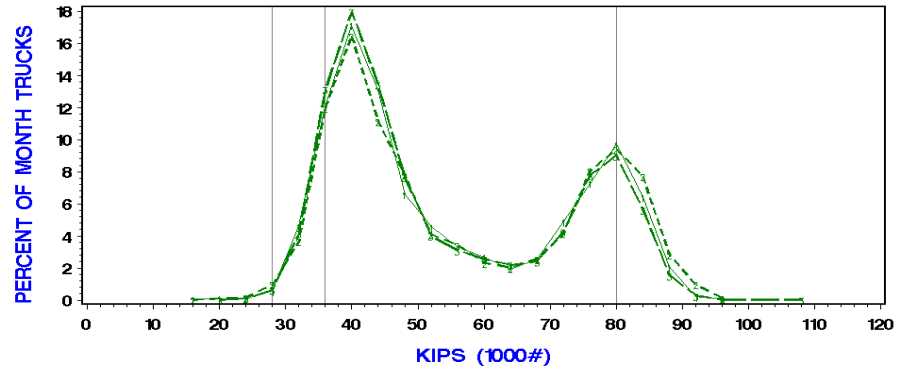


LEGEND: 1-3= JAN-MAR 4-6= APR-JUN 7-9= JUL-SEP O,N,D= OCT,NOV,DEC

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B

DISTRIBUTION OF GROSS WEIGHT
5-AXLE SEMIS BY STATION DIRECTION
 STA=B02 NAME=BRADY_ DIR= 3 LANE= 1 YY= 2010

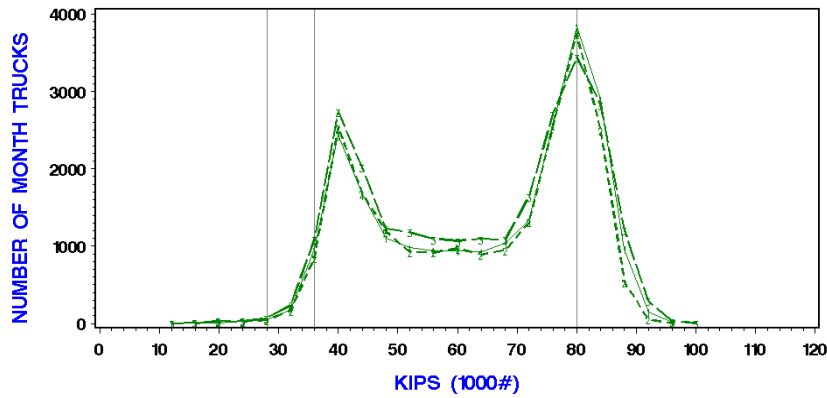


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C

DISTRIBUTION OF GROSS WEIGHT
5-AXLE SEMIS BY STATION DIRECTION
 STA= P09 NAME=PLYMOU DIR= 3 LANE= 1 YY= 2010

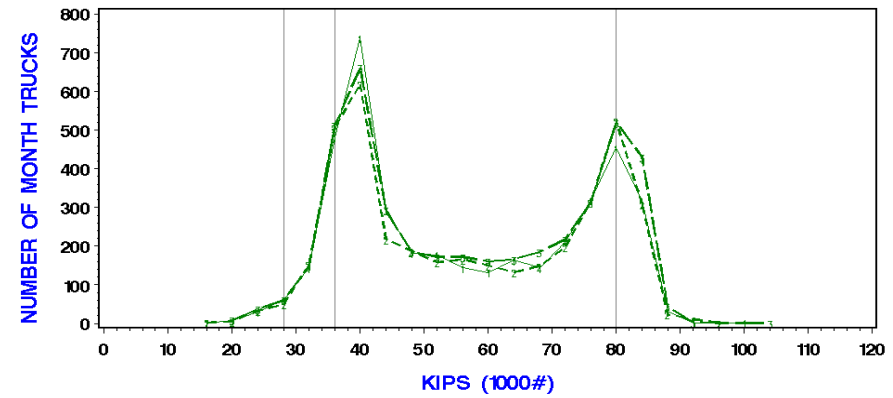


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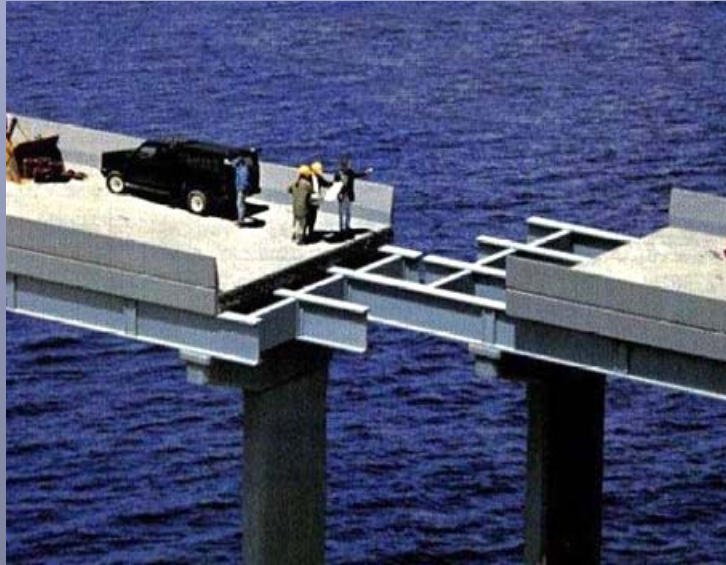
DISTRIBUTION OF GROSS WEIGHT
5-AXLE SEMIS BY STATION DIRECTION
 STA= P17 NAME=PROSSE DIR= 5 LANE= 1 YY= 2010



LEGEND: 1-3= JAN-MAR 4-6= APR-JUN 7-9= JUL-SEP O,N,D= OCT,NOV,DEC

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Planning is everything!



Road work forever!!



Questions?