Promoting Quality in Workmanship

(West Virginia Specifications)

South Eastern States Pavement Conference
Charleston, WV
October 25, 2018

Specification Areas

- Field Technician Program
- PWL
- Warranty
- Smoothness Specification

ASPHALT FIELD AND COMPACTION TECHNICIAN

SUMMARY

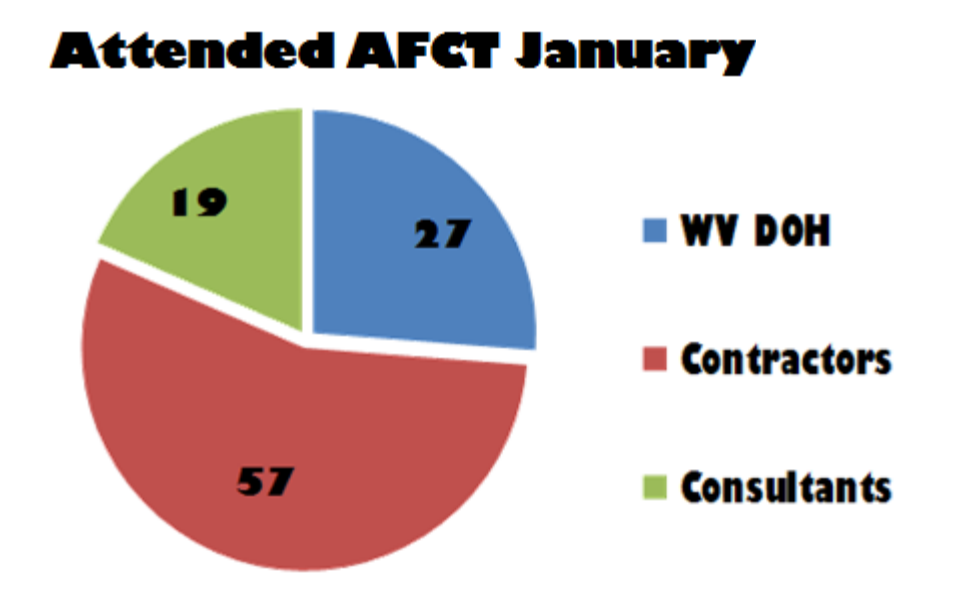
- Each paving crew needs an AFCT
- AFCT must be Contractor's employee
- Recertification every 2 years
- Written test and practical

ASPHALT FIELD AND COMPACTION TECHNICIAN

- 401.6.1-Quality Control Testing (Continued)

  The Contractor shall maintain necessary equipment and qualified personnel including at least one certified Asphalt Field and Compaction Technician at each project during paving operations. Additionally, a certified Asphalt Field and Compaction Technician with certification to perform nuclear density testing of asphalt pavements shall perform all testing necessary to assure compaction of the asphalt meets specification requirements. Compaction Technicians may serve as Asphalt Field and Compaction Technicians for asphalt compaction testing until December 31, 2017.

CHANGES TO THE PROGRAM



Class Stats:

103 Attendees

98% Passing rate

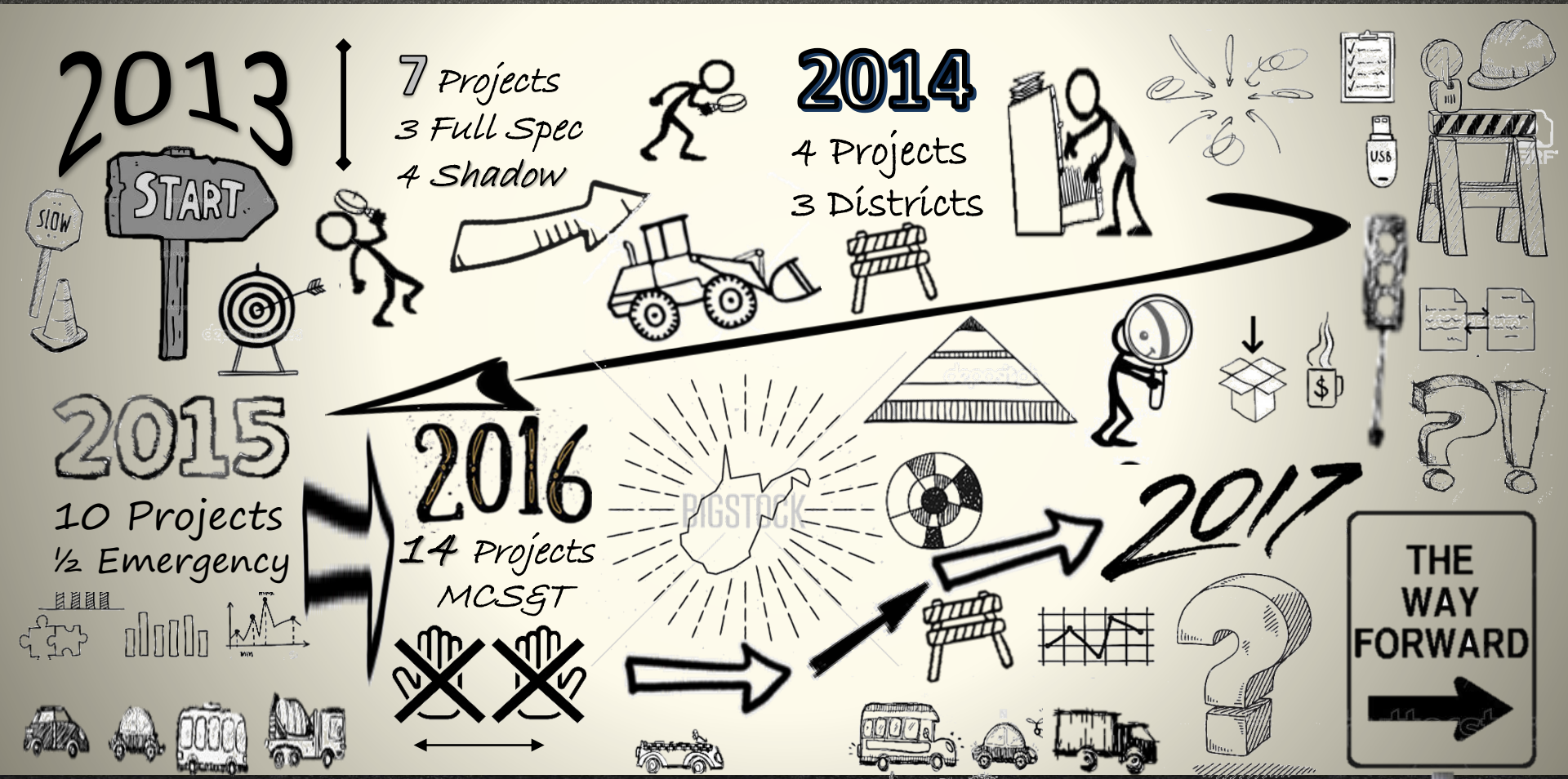
PWL

Percent Within Limits

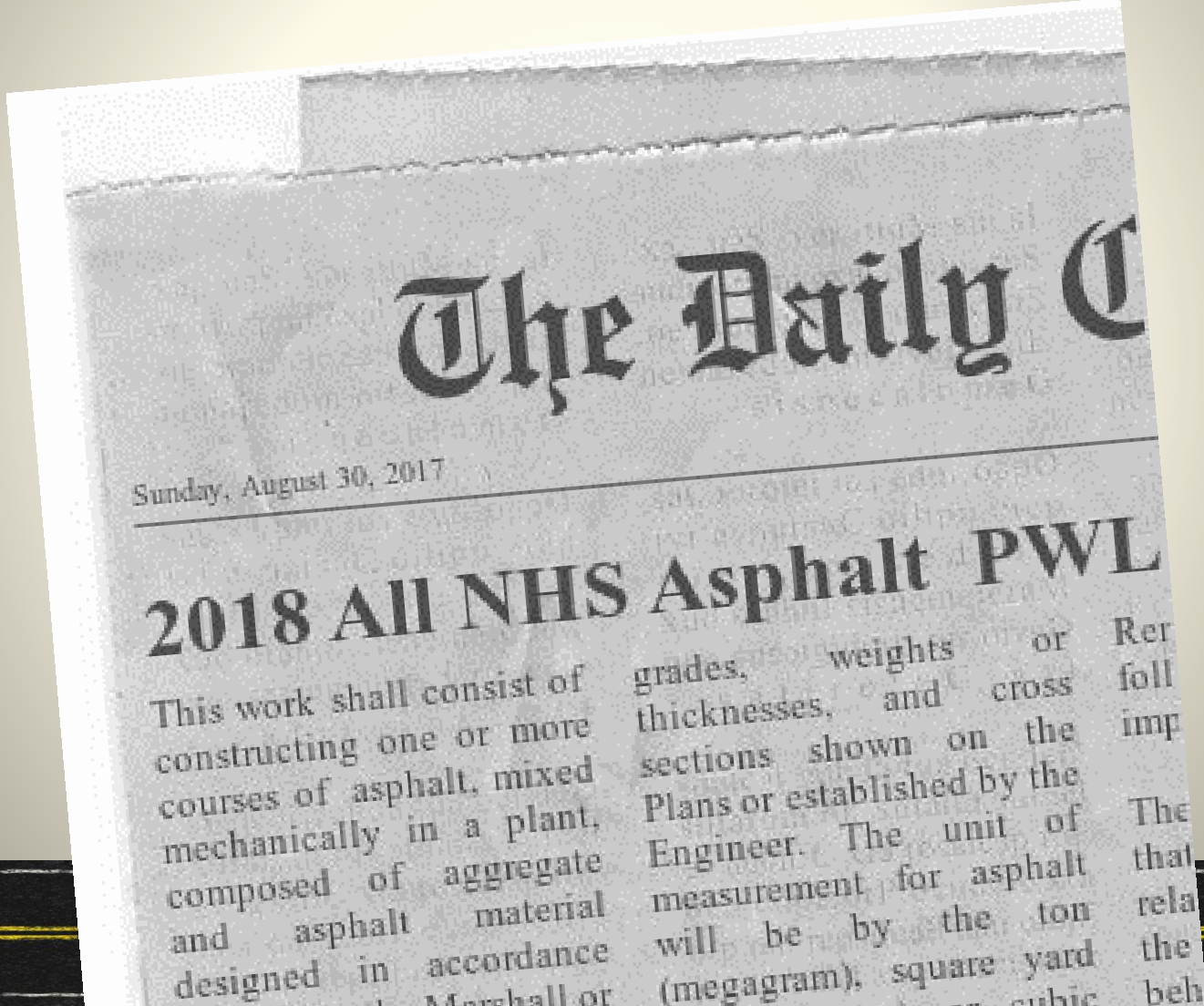
PWL
CAPITAL INC.

PWL
LONG LIVE YOUR MONEY

History of PWL in WV



History of PWL in WV



The Daily C

Sunday, August 30, 2017

2018 All NHS Asphalt PWL

This work shall consist of constructing one or more courses of asphalt, mixed mechanically in a plant, composed of aggregate and asphalt material designed in accordance

grades, weights or thicknesses, and cross sections shown on the Plans or established by the Engineer. The unit of measurement for asphalt will be by the ton (megagram), square yard

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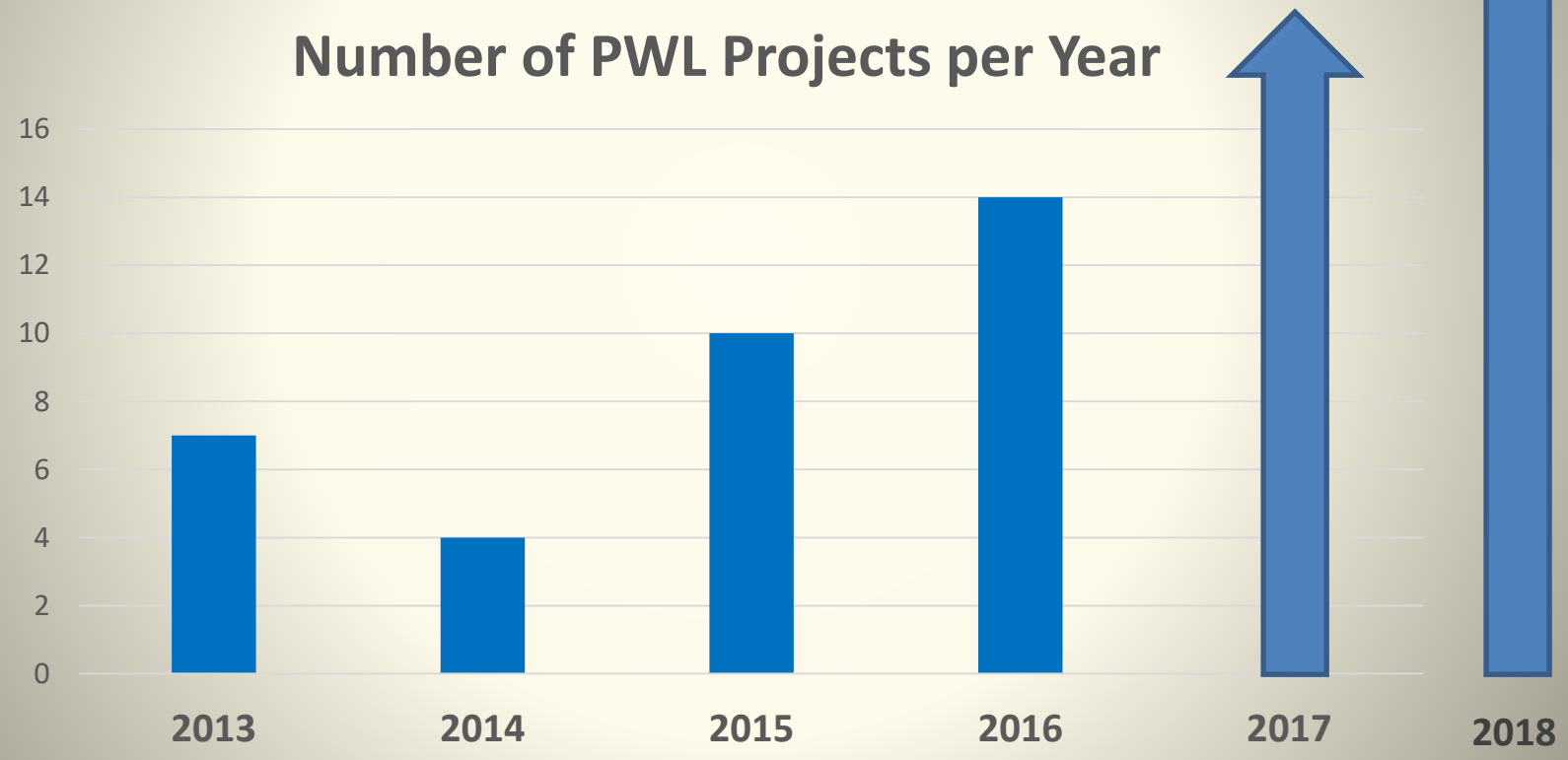
History of PWL in WV



West Virginia PWL Calculations

Understanding PWL Calculations

1. Determine the Mean
2. Establish the Standard Deviation
3. Calculate the Upper and Lower Quality Index

$$Q_u = \frac{USL - \overline{X}}{s} \qquad Q_L = \frac{\overline{X} - LSL}{s}$$

$$\overline{X} = \frac{\sum X}{n} \qquad s = \sqrt{\frac{\sum (X - \overline{X})^2}{n - 1}}$$

Understanding PWL Calculations

4. Enter Table 1 in MP 401.13.50
5. Use the upper and lower quality level to calculate Percent Within Limits

$$PWL = (P_u + P_L) - 100$$

Do I have to do the MATH..?!

T-432
Rev. 8-15-2014

T-432 NHPP-0050(338)D SL12

WEST VIRGINIA DIVISION OF HIGHWAYS
Summarization of Lot Test Sample Data

Project Number	NHPP-0050(338)D	*T-400 #*	1394715
Source	Clarksburg Asphalt	*Source Code*	CAC1.01.400 (C287A)
Material Type	SP 9.5MM SKID	*Material Code*	402.002.016
Lot Number	SL12	*AC Target*	6.2
		Verified Date	

ASPHALT	Target	SL12 - M1	SL12 - M2	SL12 - M3	SL12 - M4	SL12 - M5	SL12 - M6	SL12 - M7	Average	Standard Deviation
Tech		SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU		
Oven		1	1	2	1	1	2	1		
Oven Correction		0.52	0.52	0.53	0.52	0.52	0.53	0.52		
AC % (NCAT)	6.2	**6.23**	**5.93**	**5.76**	**6.44**	**6.03**	**6.36**	**6.28**	**6.15**	0.26
AC % (Math)		6.19	5.93	5.75	6.47	6.52	6.31	6.31	6.21	0.28
Difference		0.04	0.00	0.01	-0.03	-0.49	0.05	-0.03		

GRADATION	Target	SL12 - M1	SL12 - M2	SL12 - M3	SL12 - M4	SL12 - M5	SL12 - M6	SL12 - M7	Average	Standard Deviation
2 in (50 mm)										
1 1/2 in (37.5 mm)										
1 in (25 mm)										
3/4 in (19 mm)		100	100	100	100	100	100	100	100	0
% Passing 1/2 in (12.5 mm)	100	100	100	100	100	100	100	100	100	0
3/8 in (9.5 mm)	96	96	96	96	95	94	96	94	95.2857	0.95
No. 4 (4.75 mm)	60	59	59	58	59	58	63	57	59	1.91
No. 8 (2.36 mm)	38	37	37	36	37	36	39	35	36.7143	1.25
No. 16 (1.18 mm)	24	22	22	22	22	21	23	21	21.8571	0.69
No. 30 (600 µm)	15	14	13	14	14	13	15	13	13.7143	0.76
No. 50 (300 µm)	9	9	9	9	10	9	10	9	9.28571	0.49
No. 200 (75 µm)	**5.1**	**5.6**	**4.9**	**5.5**	**5.9**	**5.2**	6.2	5.1	5.48571	0.46
Weight Check	0.20	0.03	0.02	0.04	-0.01	0.04	0.09	0.06		

DENSITY CORES	Target	SL12 - DT1	SL12 - DT2	SL12 - DT3	SL12 - DT4	SL12 - DT5	SL12 - DT6	SL12 - DT7	Average	Standard Deviation
Tech		SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU		
Thickness (Density)	2	2.15		2.23	2.06	1.82	1.80	2.24	2.05	0.2
DENSITY		**93.45**		**87.14**	**90.99**	**92.64**	**92.60**	**93.82**	**91.77**	2.47

BOND CORES	Target	SL12 - BT1	SL12 - BT2	SL12 - BT3	SL12 - BT4	SL12 - BT5	SL12 - BT6	SL12 - BT7	Average	Standard Deviation
Tech		SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU	SJ/CDU		
Thickness (Bond)		2.36	2.17	2.19	2.02	2.05	1.77	2.00	2.05	0.19
Bond Strength PSI	100	**90.83**	**79.56**	**75.57**	**87.19**	**66.80**	**163.12**	**0.00**	**80.44**	47.73

Core Density PWL	55	Core Density Pay Factor	65.00%
Asphalt Content PWL	92	Asphalt Content Pay Factor	100.00%
Passing #200 PWL	100	Passing #200 Pay Factor	102.00%

Lift	**Lot Payment**	**83.00%**
Surface	**Thickness Pay Deduction**	**Full Pay**
	Bond Strength Pay Adjustment	

Before Construction

- Pre Paving Meeting
- Paving Plan
- Lot Layout
- Sampling Plan

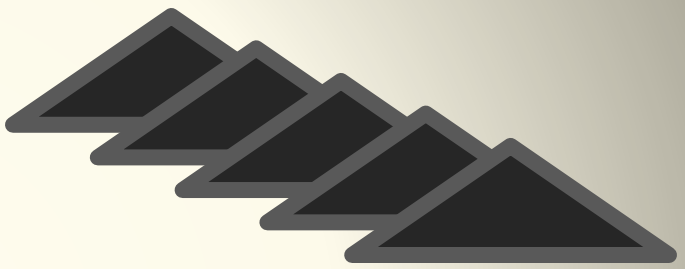
Laying Out Paving Plan

Additionally the following Materials Procedures (MP) for Square Yard Paving may be obtained by contacting the Materials Control, Soil and Testing (MCS&T) Division:

a.	MP 401.02.31	QC & Acceptance
b.	MP 401.07.20	Sampling Loose Asphalt Pavement Mixtures
c.	MP 401.07.21	Sampling Compacted Asphalt
d.	MP 401.07.22	Thickness of Asphalt Concrete Using Cores
e.	MP 401.07.23	Bond Strength
f.	MP 401.07.24	Pavement Macrotexture
g.	MP 401.07.25	Evaluation of Asphalt Pavements
h.	MP 401.13.50	Determination of PWL

Laying Out Paving Plan

- Remember Lot Sizes
  - *2500 tons per lot*
  - *500 ton sublots*



- Determine square yards per lot / sublot
- Cover square yards to square feet
- Divide square feet by the pull width

Linear Feet Per SubLot

Laying Out Paving Plan

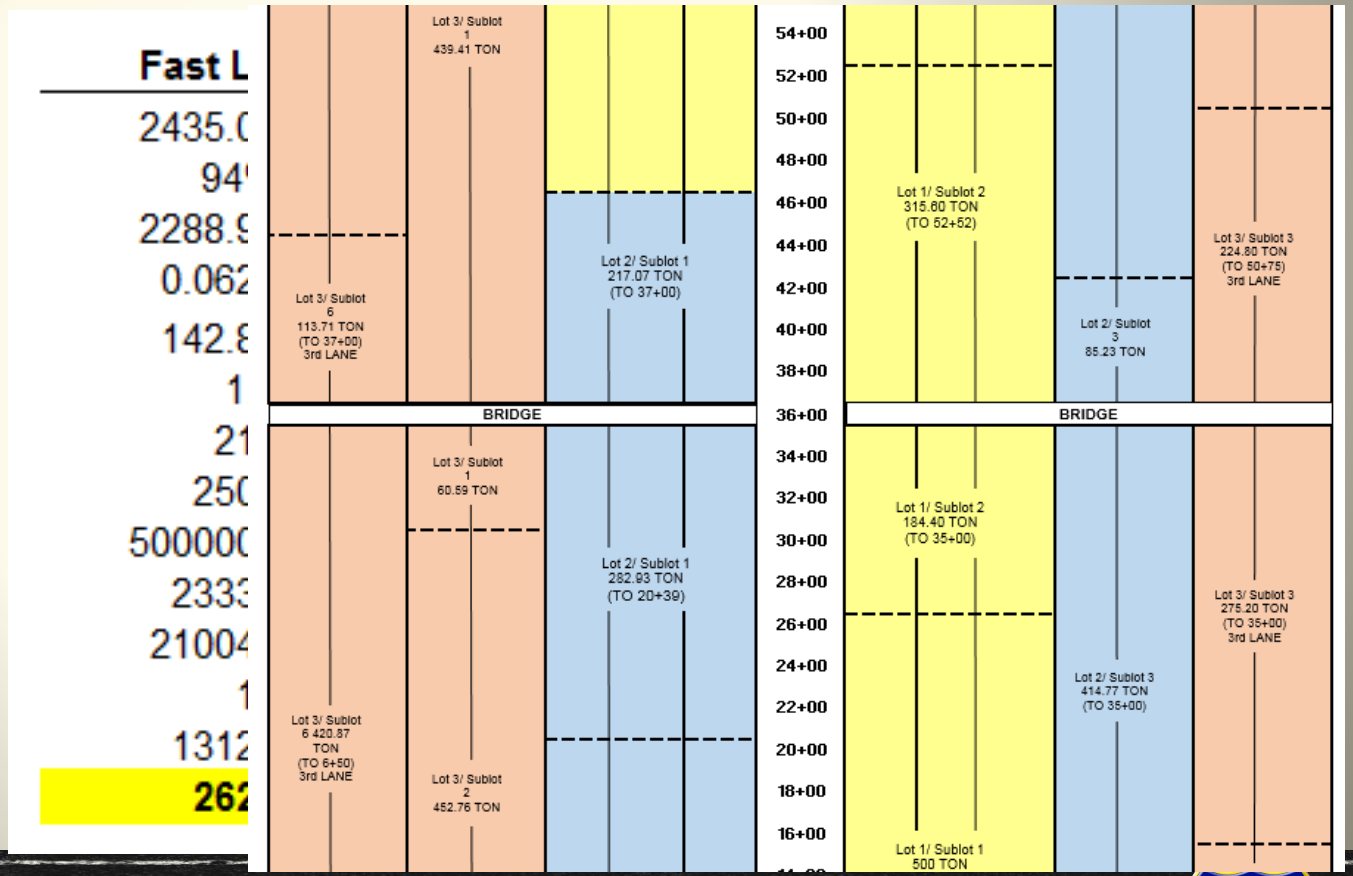
- Remember Lot Sizes
  - *2500 tons p*
  - *500 ton sub*
- Determine / sublot
- Cover squa et
- Divide squa idth

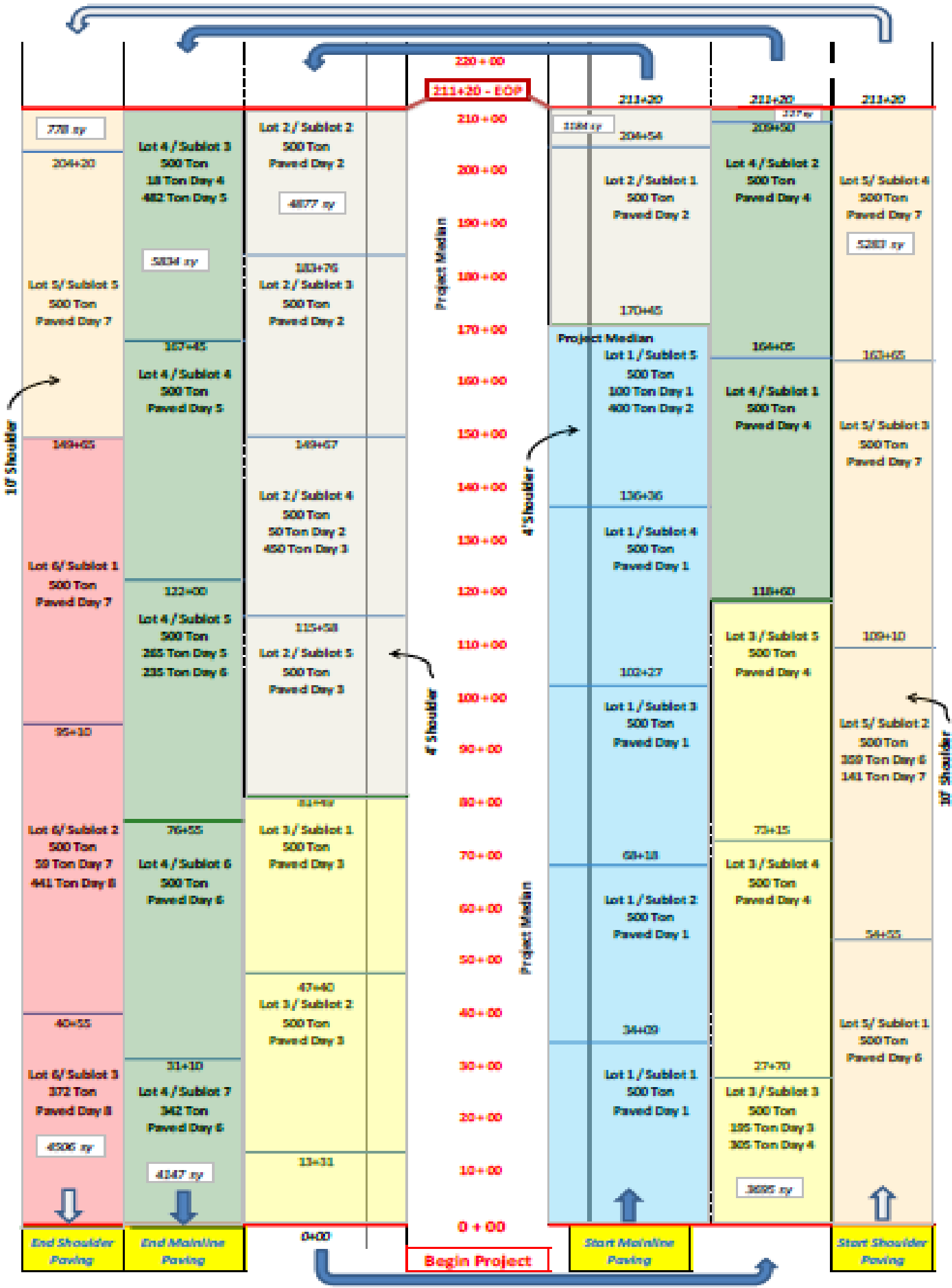
Fast Lane and Shoulder	
2435.00	kg/m^3
94%	Passing Density
2288.90	Target Density
0.0624	English Conversion
142.83	lb/ft^3
1.5	SY Conversion
214	lbs/sy
2500	TN/Lot
5000000	Lbs/Lot
23338	SY/Lot
210044	SF/Lot
16	Ft. Lane Width
13128	Ft./Lot
2626	**Ft./Sublot**

ot

Laying Out Paving Plan

Linear Feet Per SubLot




220+00
211+20 - EOP
210+00
200+00
190+00
180+00
170+00
160+00
150+00
140+00
130+00
120+00
110+00
100+00
90+00
80+00
70+00
60+00
50+00
40+00
30+00
20+00
10+00
0 + 00
Project Median
4' Shoulder
10' Shoulder
778 sy
204+20
Lot 5/ Sublot 5
500 Ton
Paved Day 7
149+05
Lot 6/ Sublot 1
500 Ton
Paved Day 7
95+10
Lot 6/ Sublot 2
500 Ton
59 Ton Day 7
441 Ton Day 8
40+55
Lot 6/ Sublot 3
372 Ton
Paved Day 8
4526 sy
End Shoulder Paving
Lot 4 / Sublot 3
500 Ton
18 Ton Day 4
482 Ton Day 5
5834 sy
167+45
Lot 4 / Sublot 4
500 Ton
Paved Day 5
122+00
Lot 4 / Sublot 5
500 Ton
265 Ton Day 5
235 Ton Day 6
76+55
Lot 4 / Sublot 6
500 Ton
Paved Day 6
31+10
Lot 4 / Sublot 7
342 Ton
Paved Day 6
4247 sy
End Mainline Paving
Lot 2 / Sublot 2
500 Ton
Paved Day 2
4877 sy
183+76
Lot 2 / Sublot 3
500 Ton
Paved Day 2
149+67
Lot 2 / Sublot 4
500 Ton
50 Ton Day 2
450 Ton Day 3
115+58
Lot 2 / Sublot 5
500 Ton
Paved Day 3
81+49
Lot 3 / Sublot 1
500 Ton
Paved Day 3
47+40
Lot 3 / Sublot 2
500 Ton
Paved Day 3
13+31
0+00
Begin Project
1184 sy
204+58
Lot 2 / Sublot 1
500 Ton
Paved Day 2
170+45
Project Median
Lot 1 / Sublot 5
500 Ton
100 Ton Day 1
400 Ton Day 2
136+36
Lot 1 / Sublot 4
500 Ton
Paved Day 1
102+27
Lot 1 / Sublot 3
500 Ton
Paved Day 1
68+18
Lot 1 / Sublot 2
500 Ton
Paved Day 1
34+09
Lot 1 / Sublot 1
500 Ton
Paved Day 1
Start Mainline Paving
227 sy
204+50
Lot 4 / Sublot 2
500 Ton
Paved Day 4
164+05
Lot 4 / Sublot 1
500 Ton
Paved Day 4
118+60
Lot 3 / Sublot 5
500 Ton
Paved Day 4
73+15
Lot 3 / Sublot 4
500 Ton
Paved Day 4
27+70
Lot 3 / Sublot 3
500 Ton
195 Ton Day 3
305 Ton Day 4
3695 sy
Lot 5/ Sublot 4
500 Ton
Paved Day 7
5283 sy
163+65
Lot 5/ Sublot 3
500 Ton
Paved Day 7
109+10
Lot 5/ Sublot 2
500 Ton
359 Ton Day 6
141 Ton Day 7
54+55
Lot 5/ Sublot 1
500 Ton
Paved Day 6
Start Shoulder Paving
211+20
211+20
211+20

Laying out Sampling Plan

- Lots are established
- Generate sample locations
- How do we select the locations?

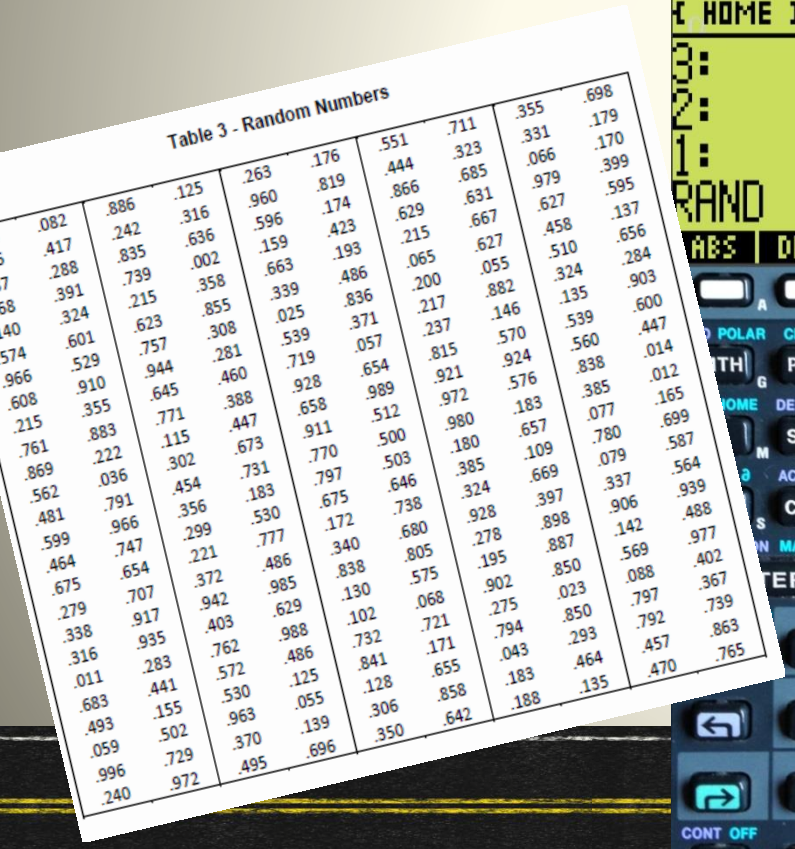
RANDOM NUMBERS

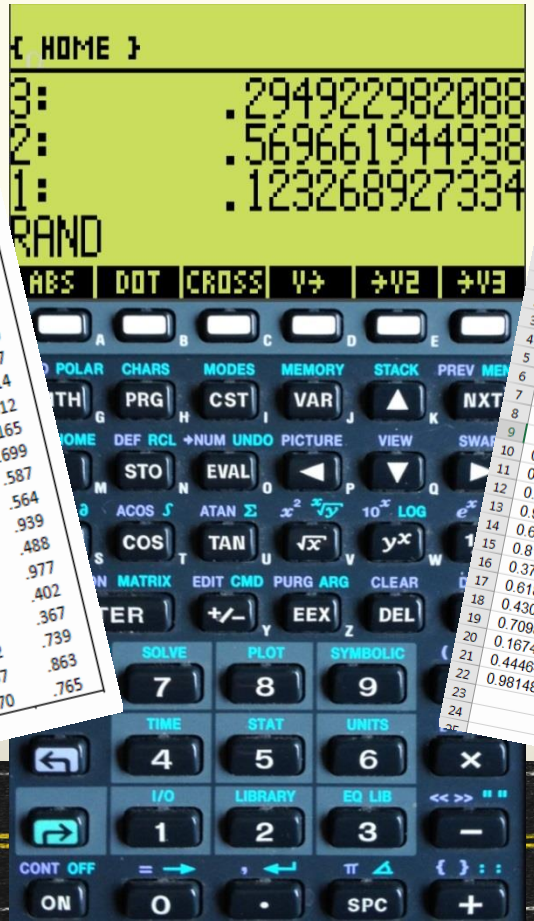
Laying out Sampling Plan

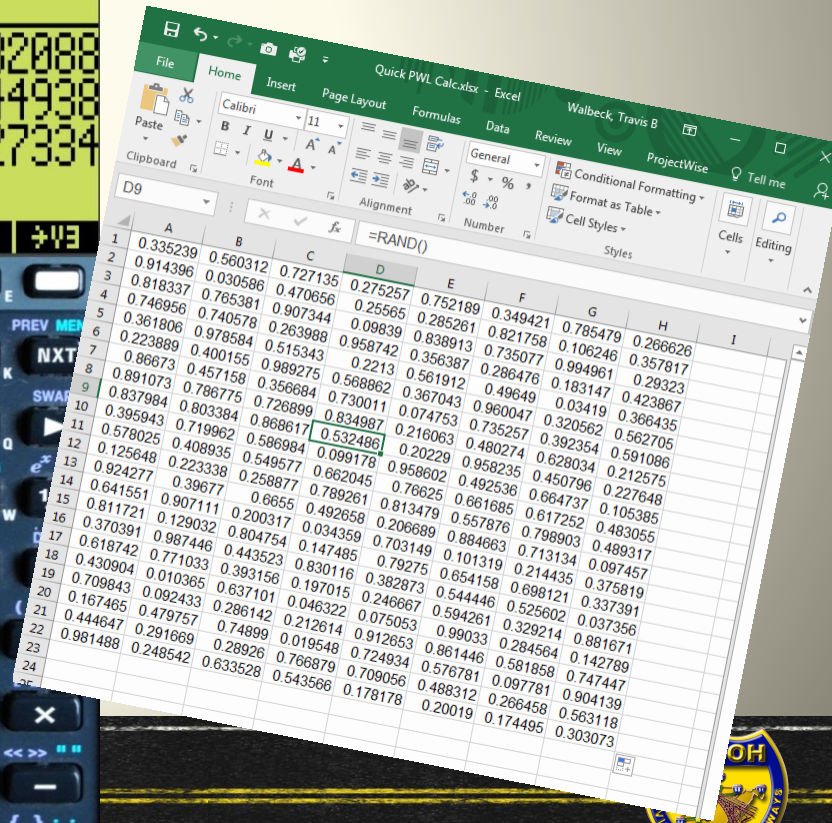
- Where do we get Random Numbers?

Laying out Sampling Plan

- Where do we get Random Numbers?

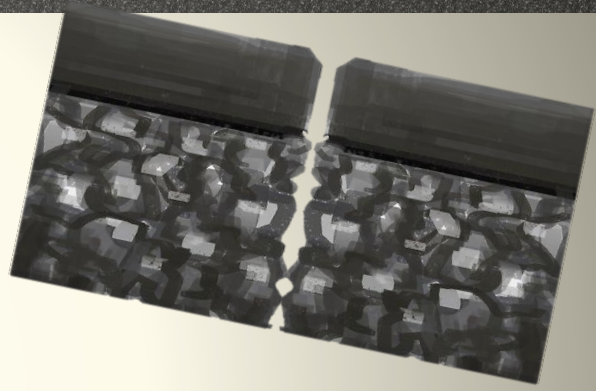






Layout Joint Lots

- 10,000 ft of joint
- 2,000 ft SubLots
- Core centered on the joint



2,000 ft	Starting STA →	89+20 ft
x 0.8514 ←	Random Number	+ 1703 ft
1703 ft	Sample STA →	106+23 ft

Questions on layout

PWL FAQs and Key Points

- Consistancy
- 24 hour Test Results
- Sister Samples
- Field Samples v Plant Samples
- Verification
- Calibration Samples
- ReCalibration of Oven

Contractor's Keys to Success

- Stick to paving plan
- Consistency
- Don't make big adjustments
- Consistency
- Best Practices in the Field and Plant
- Consistency

WEST VIRGINIA
9 YEAR WARRANTY

QUICK INTRO

- Special Provision Bundle

February 25, 2015

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 490

NINE YEAR PAVEMENT PERFORMANCE CRITERIA

NOTE: THIS SPECIAL PROVISION SHALL ONLY APPLY TO THE MAINLINE PAVEMENT FROM STATION 2359+00 TO STATION 2514+98 NORTHBOUND AND FROM STATION 2359+00 TO STATION 2516+77 SOUTHBOUND, MILEPOST 40.43 TO 43.39.

490.1 – DESCRIPTION:

The pavement performance period shall consist of satisfying the performance criteria requirements of the work contained in the appendices. This special provision establishes the common terms and definitions applied to the pavement requiring warranted work. The pavement performance criteria assure and protect the Division from specific defects found in the pavement.

490.1.1 – Definitions

- **Initial Acceptance Date of Initial Construction Work** - The date when the warranted work is completed and is continuously open to traffic. This shall be the date of initial acceptance and constitutes the start date for the performance criteria period. For divided highways, there may be more than one acceptance date of warranted work for a project.

- **Warranty Lane(s)** - The portion of the pavement considered warranted work. Each of the following shall be considered a separate warranty lane.

  - Each individual mainline lane and adjacent shoulder

  - The sum of all ramp lanes and the associated acceleration/deceleration lanes

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QUICK INTRO

- Contractor uses the processes of their choice
  - Anything in DDs or
  - Approved procedure (Other States Specs)

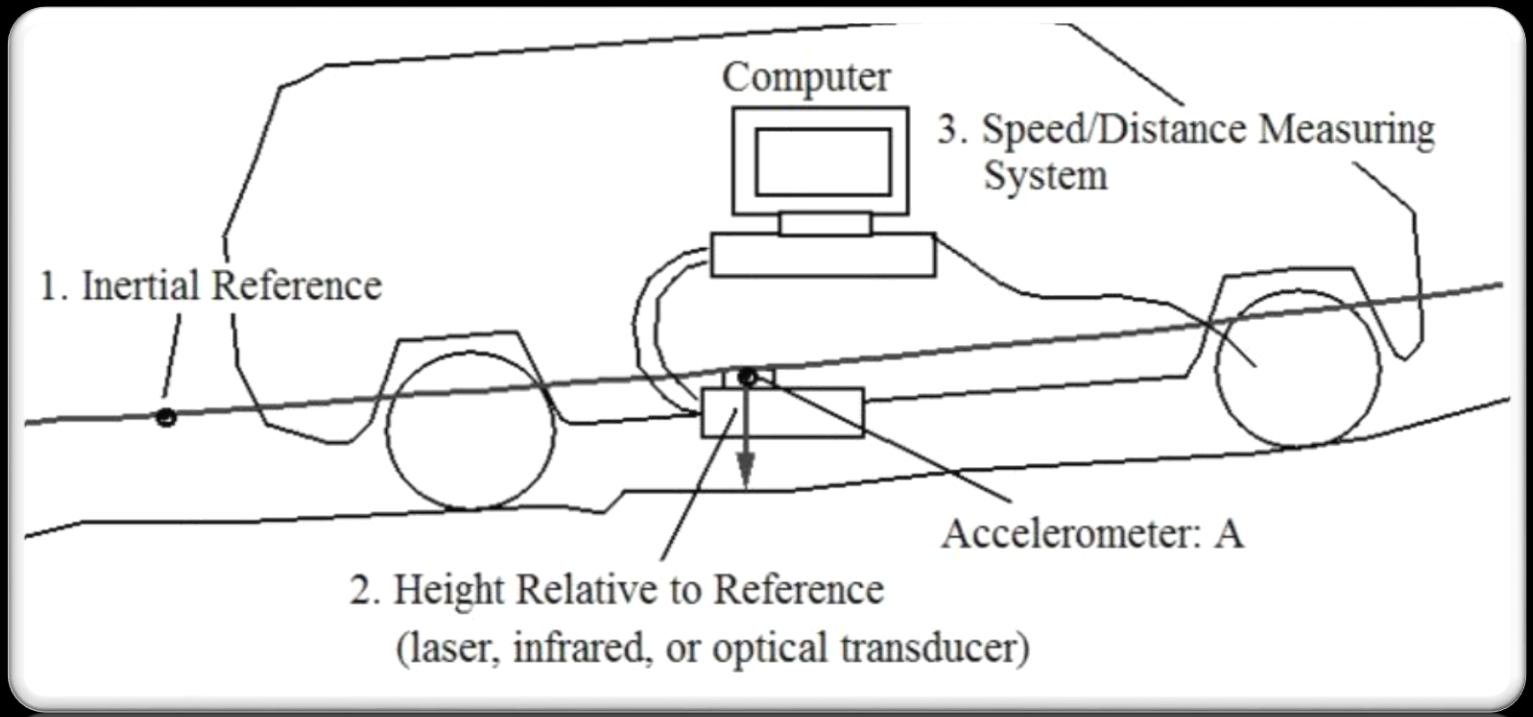
- Contractor maintains road, must meet certain criteria *every* year for 9 years
  - Smoothness / Roughness – IRI
  - Pavement Surface Rating (PSR)
  - Threshold Limits

PERFORMANCE CRITERIA

- Smoothness / Roughness – International Roughness Index (IRI)
  - Incentive/Disincentive - <65 / >81
- Pavement Surface Rating (PSR)
  - Incentive/Disincentive - Sliding Scale : 80
- Threshold Limits
  - Warranted Work, NOT optional!
- General Observations

IRI

- Scanned with our van



PSR

- Pavement Survey

- Measure, rate, and quantify distresses, rutting
- 0.1 mile roadway segments
- Two per mile, STA 0.4 – 0.5, Random

GENERAL OBSERVATIONS

- Anything of note on the entire length of roadway
  - Longitudinal Cracks
  - Transverse Cracks
  - Segregation
- Other small gouges, scratches, etc

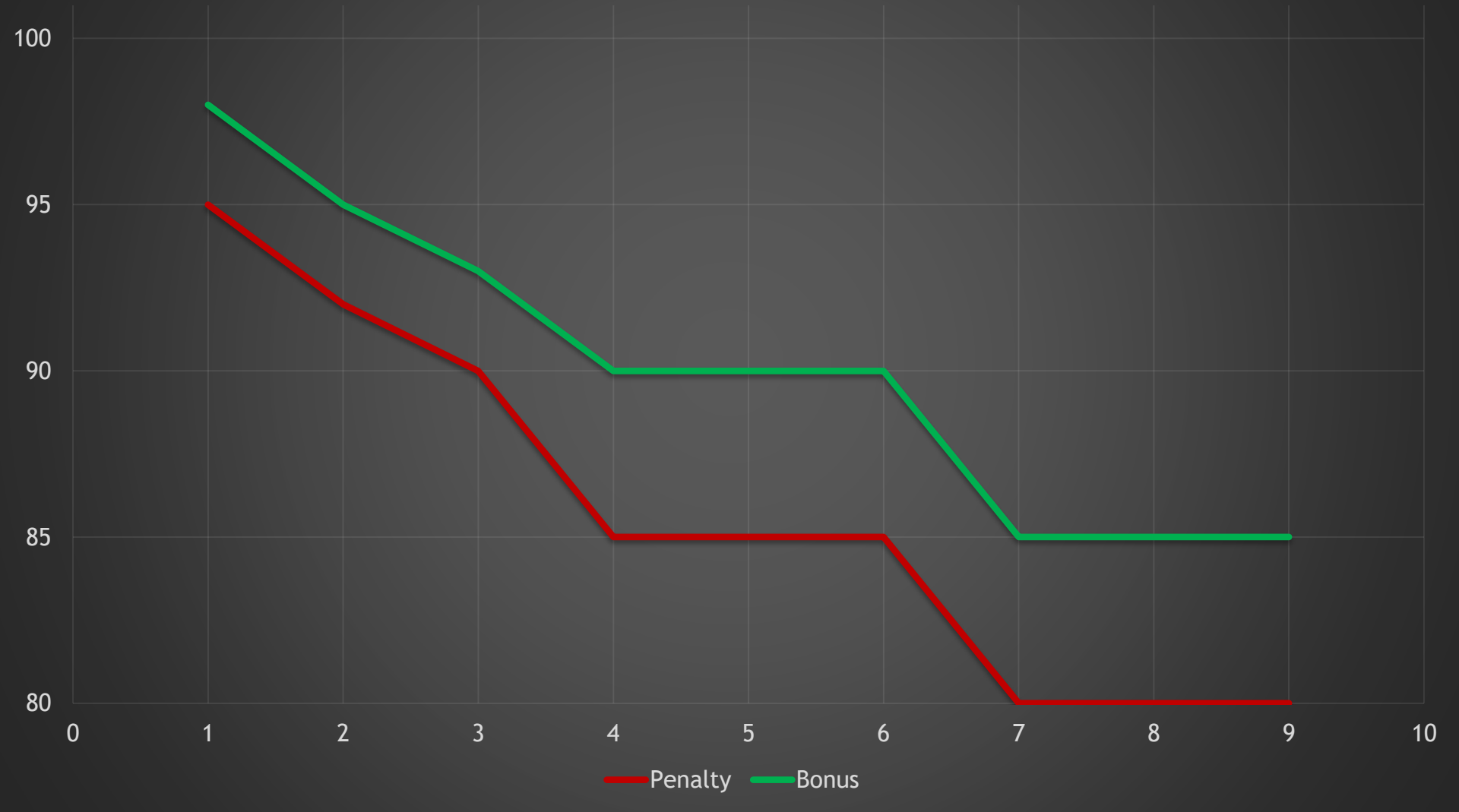
OTHER MAJOR POINTS

- Lane Rental (set dollar amount)
  - per Lane per Mile per Day
  - Contractor bids the number of days needed
  - After exceeding days bid, contractor pays Division the rental fee
- Idea is to promote quality work upfront
  - *"Get in, get out, stay out"*
- Document *Everything*
  - MCS&T
  - District Personnel
  - Contractor

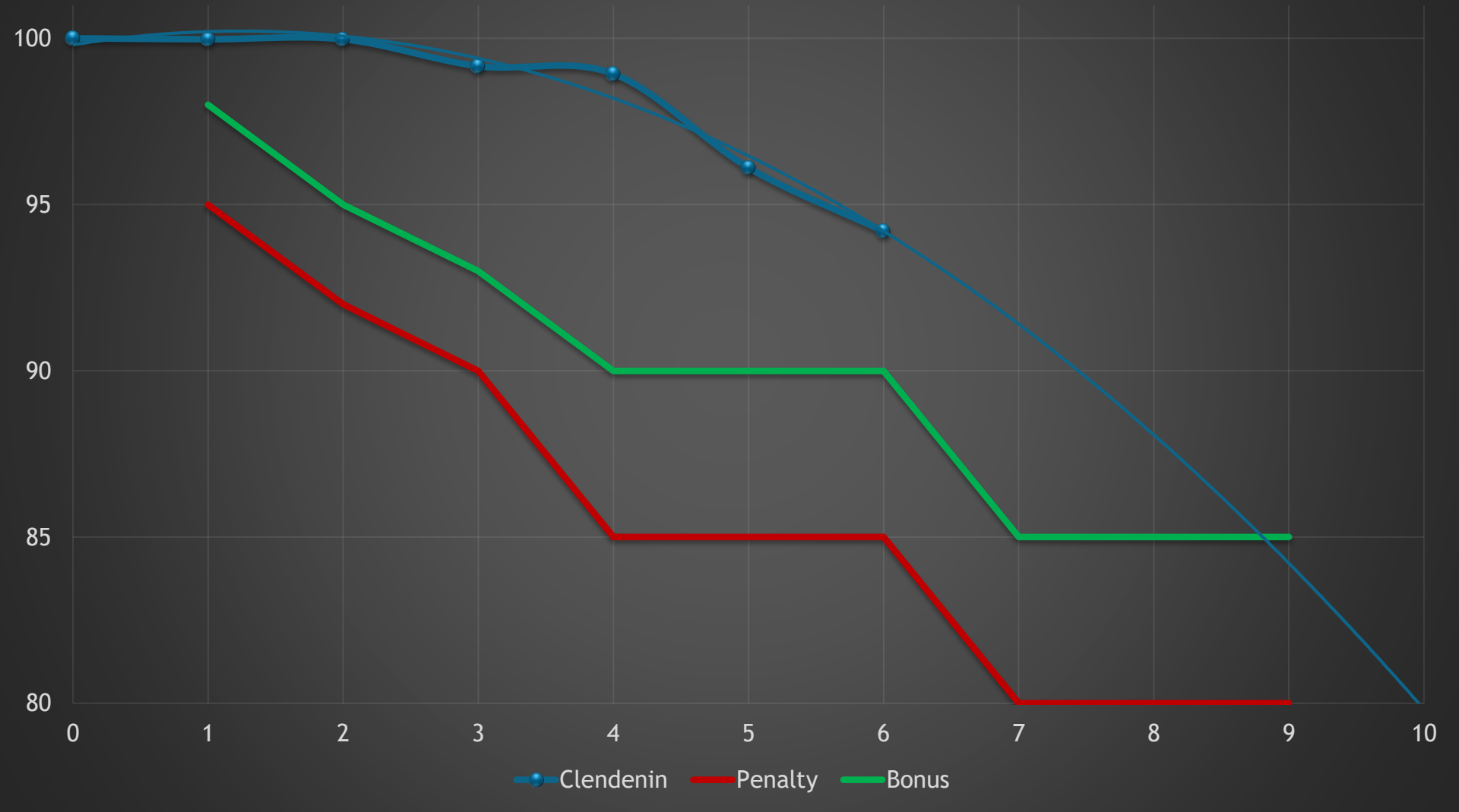
BONUS AND PENALTY

- Rated each year
  - IRI
    - <65 Bonus
    - >81 Penalty
  - PSR
    - >98-85 Bonus
    - <95-80 Penalty
- Year Nine
  - IRI
  - PSR

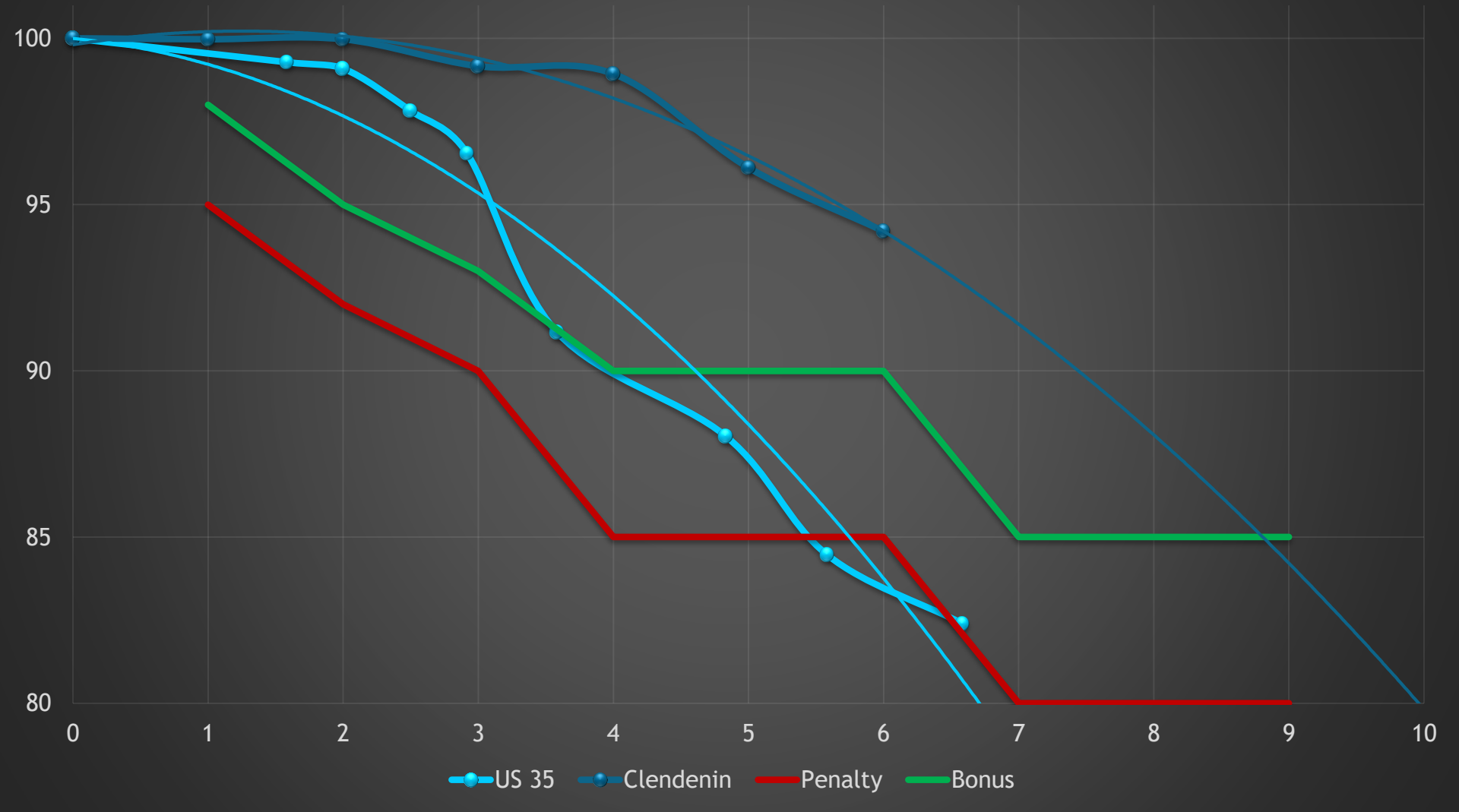
Warranty



Warranty



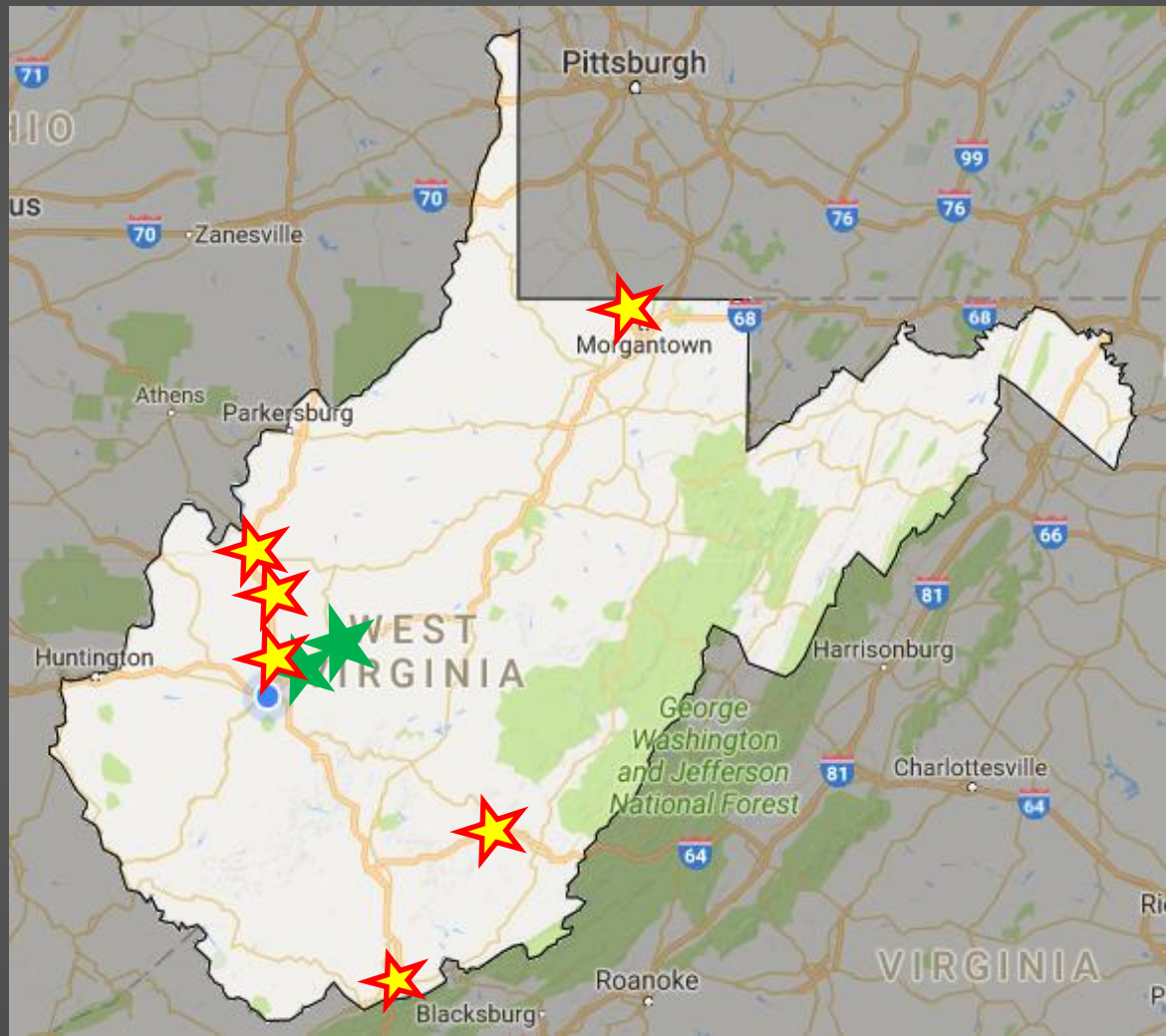
Warranty vs nonWarranty



Projects

6 – Warranty

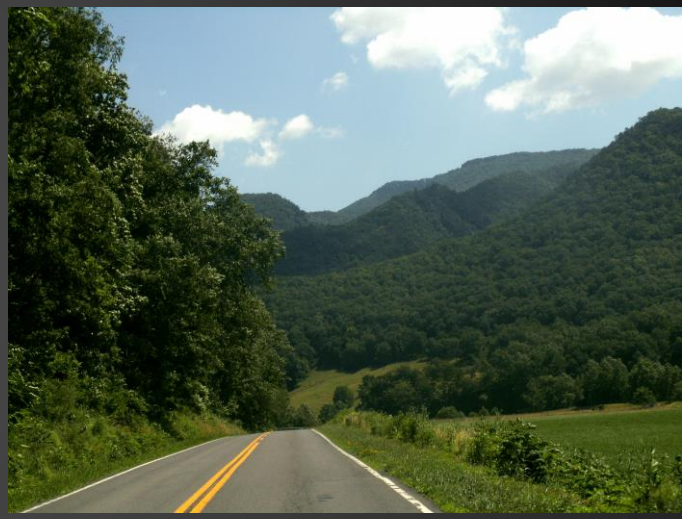
2 – Ex Warranty



WHAT YOU NEED TO KNOW: SPECIFICATION 720

OVERVIEW OF SECTION 720

- Updated Certification process for both Operator and Equipment
- Two Classifications of roads:
  - NHS: QC Testing Required
    - Similar Price adjustments as SP 720
  - Non-NHS: QC Testing not Required
    - Price adjustments based on % improvement
- Minimum Length of project: 0.2 miles



NHS ROUTE SCHEDULES

- Schedule 1: 4 inches or More
- Schedule 2: 4 inches < 3 inches
- Schedule 3: 2 inches < 1 inch

TABLE 720.5.2
Schedule 1 NHS Pavement Projects

IRI for each 0.1-mile section (in/mi)	Price Adjustment ($)
30.0 or Less	+600
30.1 to 60.0	-20(IRI) + 1,200
60.1 to 65.0	0
65.1 to 95.0	-20(IRI) + 1,300
95.1 or Greater	Corrective Action Required

TABLE 720.5.3
Schedule 2 NHS Pavement Projects

IRI for each 0.1-mile section (in/mi)	Price Adjustment ($)
46.0 or Less	+600
46.1 to 76.0	-20(IRI) + 1,520
76.1 to 80.0	0
80.1 to 120.0	1,200 - 15(IRI)
120.1 or Greater	-600

TABLE 720.5.4
Schedule 3 NHS Pavement Projects

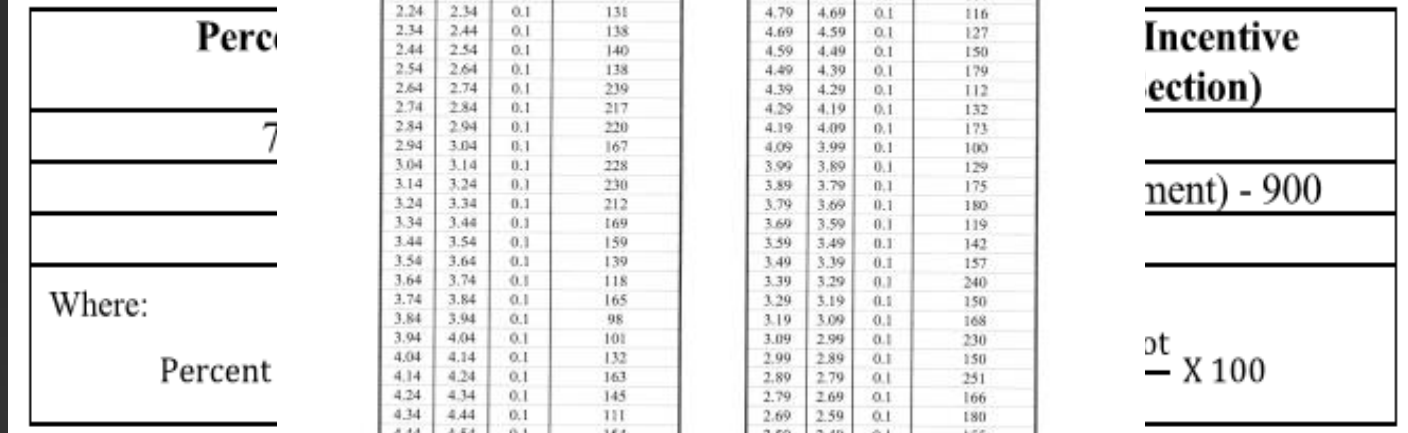
IRI for each 0.1-mile section (in/mi)	Price Adjustment ($)
46.0 or Less	+300
46.1 to 76.0	-10(IRI) + 760
76.1 or Greater	0

NON-NHS ROUTES

- Based on Percent Improvement
- Non-NHS Criteria:
  - >.2 miles
  - 16 feet or wider
  - 1 in. or more of new pavement
  - ADT of 100 or more
- No negative price adjustments
- Bonus if…..

  50% Improvement + < 170 IRI

NON-N NTIVES



Pre PS&E Smoothness Data

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Contract ID:	1729614	District:	5
MCS&T Test Date:	1/29/2018	Route:	CR 11
Est. PS&E Date:		Project Length:	3.014 mi.
Project Name:	Ed Welsh Rd - Shirleys Lane		

Northbound Lane

BMP	EMP	Legth (mi.)	Average IRI (in/mi.)
2.04	2.14	0.1	126
2.14	2.24	0.1	155
2.24	2.34	0.1	131
2.34	2.44	0.1	138
2.44	2.54	0.1	140
2.54	2.64	0.1	138
2.64	2.74	0.1	239
2.74	2.84	0.1	217
2.84	2.94	0.1	220
2.94	3.04	0.1	167
3.04	3.14	0.1	228
3.14	3.24	0.1	230
3.24	3.34	0.1	212
3.34	3.44	0.1	169
3.44	3.54	0.1	159
3.54	3.64	0.1	139
3.64	3.74	0.1	118
3.74	3.84	0.1	165
3.84	3.94	0.1	98
3.94	4.04	0.1	101
4.04	4.14	0.1	132
4.14	4.24	0.1	163
4.24	4.34	0.1	145
4.34	4.44	0.1	111
4.44	4.54	0.1	154
4.54	4.64	0.1	199
4.64	4.74	0.1	90
4.74	4.84	0.1	103
4.84	4.94	0.1	129
4.94	4.99	0.05	278

Southbound Lane

BMP	EMP	Legth (mi.)	Average IRI (in/mi.)
4.99	4.89	0.1	234
4.89	4.79	0.1	117
4.79	4.69	0.1	116
4.69	4.59	0.1	127
4.59	4.49	0.1	150
4.49	4.39	0.1	179
4.39	4.29	0.1	112
4.29	4.19	0.1	132
4.19	4.09	0.1	173
4.09	3.99	0.1	100
3.99	3.89	0.1	129
3.89	3.79	0.1	175
3.79	3.69	0.1	180
3.69	3.59	0.1	119
3.59	3.49	0.1	142
3.49	3.39	0.1	157
3.39	3.29	0.1	240
3.29	3.19	0.1	150
3.19	3.09	0.1	168
3.09	2.99	0.1	230
2.99	2.89	0.1	150
2.89	2.79	0.1	251
2.79	2.69	0.1	166
2.69	2.59	0.1	180
2.59	2.49	0.1	155
2.49	2.39	0.1	66
2.39	2.29	0.1	140
2.29	2.19	0.1	92
2.19	2.09	0.1	129
2.09	2.04	0.06	85

Data was collected using the Division's High Speed Inertial Profiler

Travis Walbeck, PE
Pavement Engineer

Joseph Caudill
Highway Engineer Trainee

Specification Areas

- Field Technician Program
- PWL
- Warranty
- Smoothness Specification

QUESTIONS