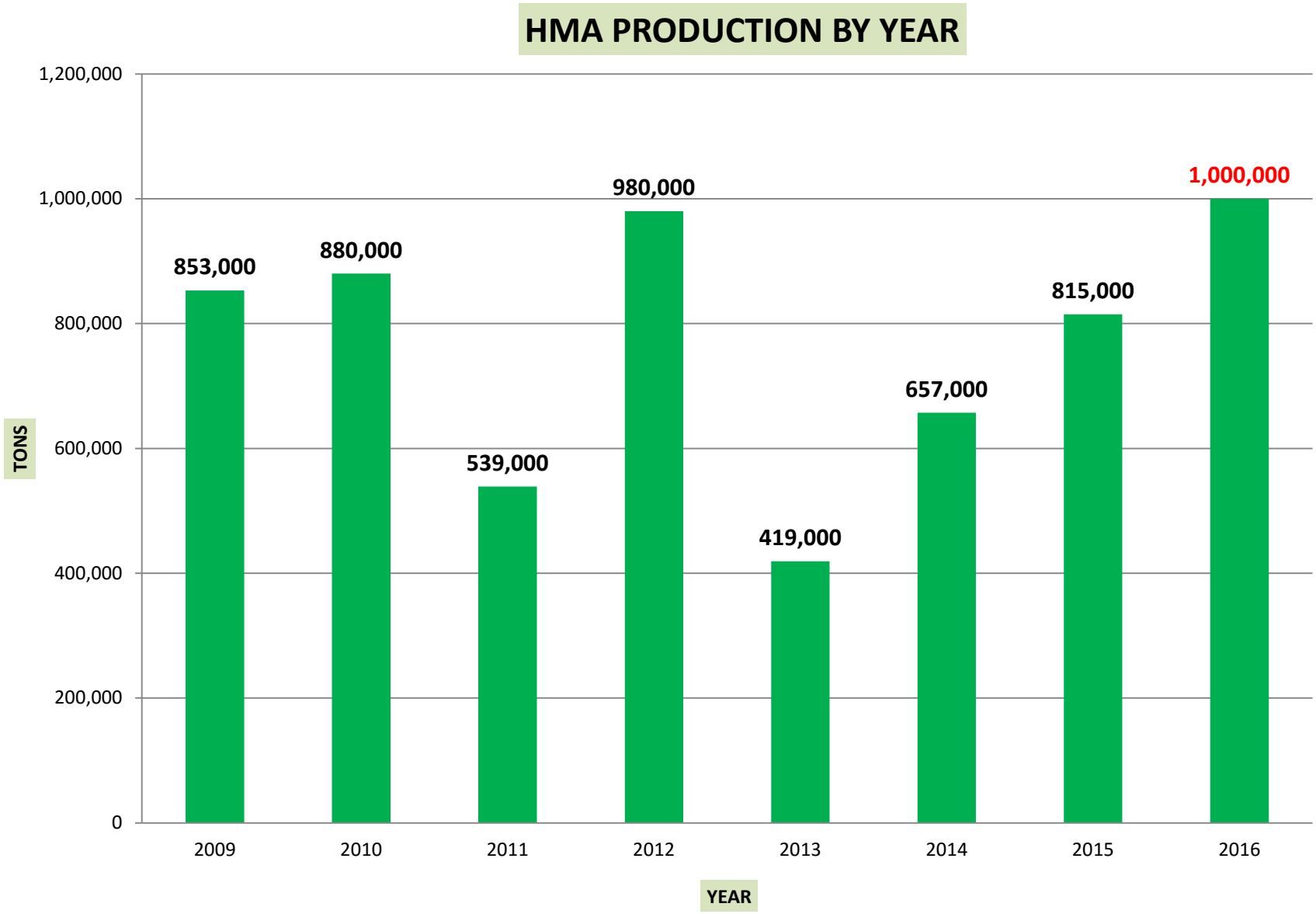
PAPA Technical Meetings - 2017


HMA PRODUCTION BY YEAR
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
TONS
853,000
880,000
539,000
980,000
419,000
657,000
815,000
1,000,000
2009
2010
2011
2012
2013
2014
2015
2016
YEAR

2016 – LOT Testing Summary

- Total Lots – 844 / 48 Failures
  (894,019 tons)

- 100% payment – 796 (94.4%)
- 99.2% payment – 2 (.2%)
- 97% payment – 22 (2.6%)
- 94% payment – 2 (.2%)

- Defective Lots - 22 (2.6%)

  – 17 Lots Removed and Replaced – (14,701 tons)

  – 5 Lots L.I.P. @ 50% payment (4,120 tons)

Yearly HMA LOT Payment %

	2014	**2015**	**2016**
# OF LOTS Tested	602	779	844
LOTS @ 100% PAY	**88%**	**90%**	**94%**
DEFECTIVE LOTS %	**4.3%**	**3.8%**	**2.6%**

2016 - Failures by Item

- High AC – 0
- Low AC – 2
- High #200 – 0
- Low #200 – 0
- High Air voids – 37
- Low Air voids – 18
- Low Density – 10

2016 – Roadway Density Results

- 9.5mm – 95.0
- 12.5mm – 94.4
- 19mm – 94.7
- 25mm – 94.8
- RB25mm 95.6

- ***OVERALL AVERAGE – 94.7***

Spec Changes for 2018

- ***Changes to CS 409 for 2018 projects:***
  - ***Design*** VMA will be + 0.5% on ALL mixes
  - CA and FA gravity & absorption values will be averaged with Bulletin 14 values or - third party results if it's not listed in B14.
  - Eliminated PG 64-28
  - New Bituminous QC plan template
  - Clear direction of (***small quantities)*** required testing
  - Tack Coat Material

PTC Materials Staff

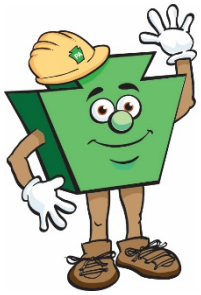
- East - (300 - 358 / A-20 – A-130)
  - **Steve Havrilla** – shavrill@paturnpike.com

- Central – (146 - 300)
  - **Brian Wible** – bwible@paturnpike.com

- West – (0 - 146)
  - **Chris Forry** - cforry@paturnpike.com

- Materials Lab (MP 113.8)
  - **Brian Paroda** – bparoda@paturnpike.com

Bituminous Mix Design Verification



Pennsylvania Turnpike - 2017 PAPA Regional Technical Meetings

Pennsylvania Turnpike Commission's Materials Laboratory

2017 PAPA Technical Conference

Despatch
CAUTION
HOT
CAUTION
HOT

DURASTILL
USA

Despatch

CAPTIVE-AIRE
Despatch

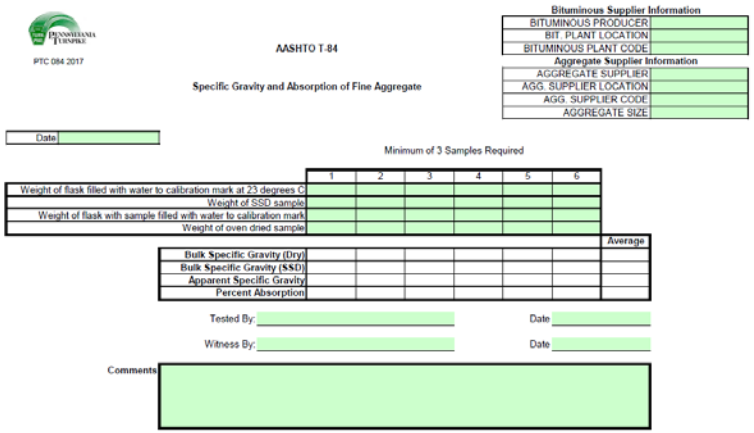
CAPTIVEAIRE
EXIT
CAPTIVEAIRE
Despatch
LANE

Bituminous Mix Design Verification

1. **Requirements?**

- Bulletin 27; Appendix J (PTC Revision 2017)

  I. Completed T84 and T85 worksheets



PTC 084 2017

AASHTO T-84

Specific Gravity and Absorption of Fine Aggregate

Bituminous Supplier Information	
BITUMINOUS PRODUCER	
BIT. PLANT LOCATION	
BITUMINOUS PLANT CODE	

Aggregate Supplier Information	
AGGREGATE SUPPLIER	
AGG. SUPPLIER LOCATION	
AGG. SUPPLIER CODE	
AGGREGATE SIZE	

Date

Minimum of 3 Samples Required

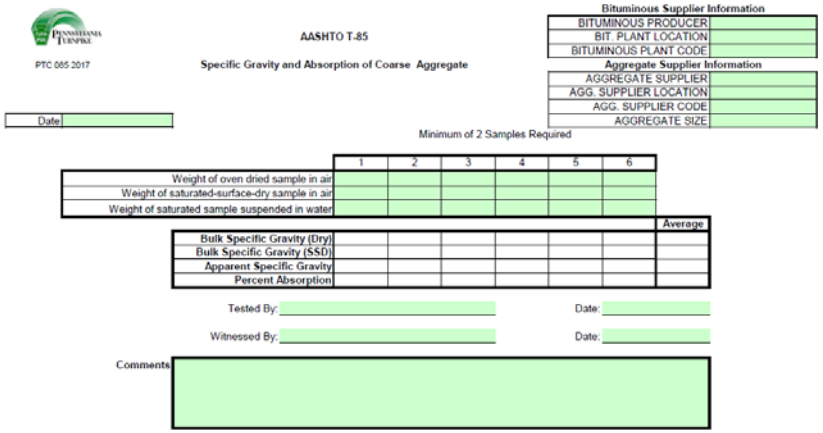
	1	2	3	4	5	6
Weight of flask filled with water to calibration mark at 23 degrees C						
Weight of SSD sample						
Weight of flask with sample filled with water to calibration mark						
Weight of oven dried sample						

	Average
Bulk Specific Gravity (Dry)	
Bulk Specific Gravity (SSD)	
Apparent Specific Gravity	
Percent Absorption	

Tested By: Date

Witness By: Date

Comments



PTC 085 2017

AASHTO T-85

Specific Gravity and Absorption of Coarse Aggregate

Bituminous Supplier Information	
BITUMINOUS PRODUCER	
BIT. PLANT LOCATION	
BITUMINOUS PLANT CODE	

Aggregate Supplier Information	
AGGREGATE SUPPLIER	
AGG. SUPPLIER LOCATION	
AGG. SUPPLIER CODE	
AGGREGATE SIZE	

Date

Minimum of 2 Samples Required

	1	2	3	4	5	6
Weight of oven dried sample in air						
Weight of saturated-surface-dry sample in air						
Weight of saturated sample suspended in water						

	Average
Bulk Specific Gravity (Dry)	
Bulk Specific Gravity (SSD)	
Apparent Specific Gravity	
Percent Absorption	

Tested By: Date:

Witnessed By: Date:

Comments

Bituminous Mix Design Verification

1. **Requirements?**

- Bulletin 27; Appendix J (PTC Revision 2017)

    I. *Completed T84 and T85 worksheets*

    II. *Aggregate split samples (including RAP)*

    III. *Minimum of (2) Gmm & (2) Gmb specimens @ Design Va*

    IV. *Completed Bit-DEL Design Software*

Bituminous Mix Design Verification

2. What's new for *2018*

Bulletin 27, Appendix J; **TABLE J-3**

Tolerances Sigma Limits (d2s)		
	Gmm	Gmb
1/2" & greater	± 3%	± 6%
#100 thru 3/8"		± 4%
#200	± 1.0%	± 2.0%
AC	± 0.4%	± 0.4%
Gmm	± 0.012	
Va	± 0.6	
VMA	± 0.6	
VFA	± 4	

Tolerance table for Design Verifications

Bituminous Mix Design Verification

1. (2014 – 2016) Re-tested JMF Gmm and Gmb specimens from 26 different producers

2. Compared the PTC values to the Producer's original values

3. Statistically analyzed the data by comparing the differences to:

    a) The overall central tendencies (statistical means)

    b) The population standard deviation

4. Established Bulletin 27, Appendix J; Table J-3

Bituminous Mix Design Verification

- In order to obtain good comparisons between the PTC test results and the Producer's test results, specimen masses should be as close as possible to the original masses.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Gmm

within **0.7g**

PTC Gmm Dry Masses vs Original Dry Masses		
Mat. Class	Mean	Std. Dev.
9.5 mm	1.7g	5.2g
12.5 mm	0.8g	5.4g
19 mm	0.1g	10.0g
25 mm	0.9g	6.9g

Gmb

within **1.8g**

PTC Gmb Dry Masses vs Original Dry Masses		
Mat. Class	Mean	Std. Dev.
9.5 mm	3.4g	4.0g
12.5 mm	1.3g	6.8g
19 mm	2.4g	4.1g
25 mm	1.8g	5.5g

Bituminous Mix Design Verification

- Established central tendencies between the PTC's results and the Producer's results.

PTC vs Producer Results <u>Statistical Mean</u>	
Gmm	0.003
Air Voids	-0.01
VMA	-0.08
VFA	-0.01
#200	0.1
AC%	0.1

9.5mm <u>Mean</u>	12.5mm <u>Mean</u>	19mm <u>Mean</u>	25mm <u>Mean</u>
0.004	0.003	0.003	0.003
0.00	-0.01	-0.03	0.02
-0.10	-0.09	-0.09	-0.05
-0.01	0.00	0.00	-0.02
0.2	0.1	0.1	0.1
0.2	0.1	0.2	0.1

Bituminous Mix Design Verification

- When comparing all of the data to the central tendencies, some significant differences were observed.

PTC vs Producer Results Statistical Mean	
Gmm	0.003
Air Voids	-0.01
VMA	-0.08
VFA	-0.01
#200	0.1
AC%	0.1

Greatest Overall Differences	
-0.032	10x
1.4	100x
-1.2	10x
-9.0	100x
1.9	10x
-1.0	10x

Bituminous Mix Design Verification

- Determined that the significant values were not specific to one material classification.

PTC vs Producer Results Statistical Mean	
Gmm	0.003
Air Voids	-0.01
VMA	-0.08
VFA	-0.01
#200	0.1
AC%	0.1

9.5mm	12.5mm	19mm	25mm
0.029	0.020	0.029	-0.032
0.6	-0.8	1.4	-0.6
-1.2	-0.9	1.1	0.6
3	5	-9	4
1.0	1.6	1.9	-1.2
0.5	-1.0	1.0	0.4

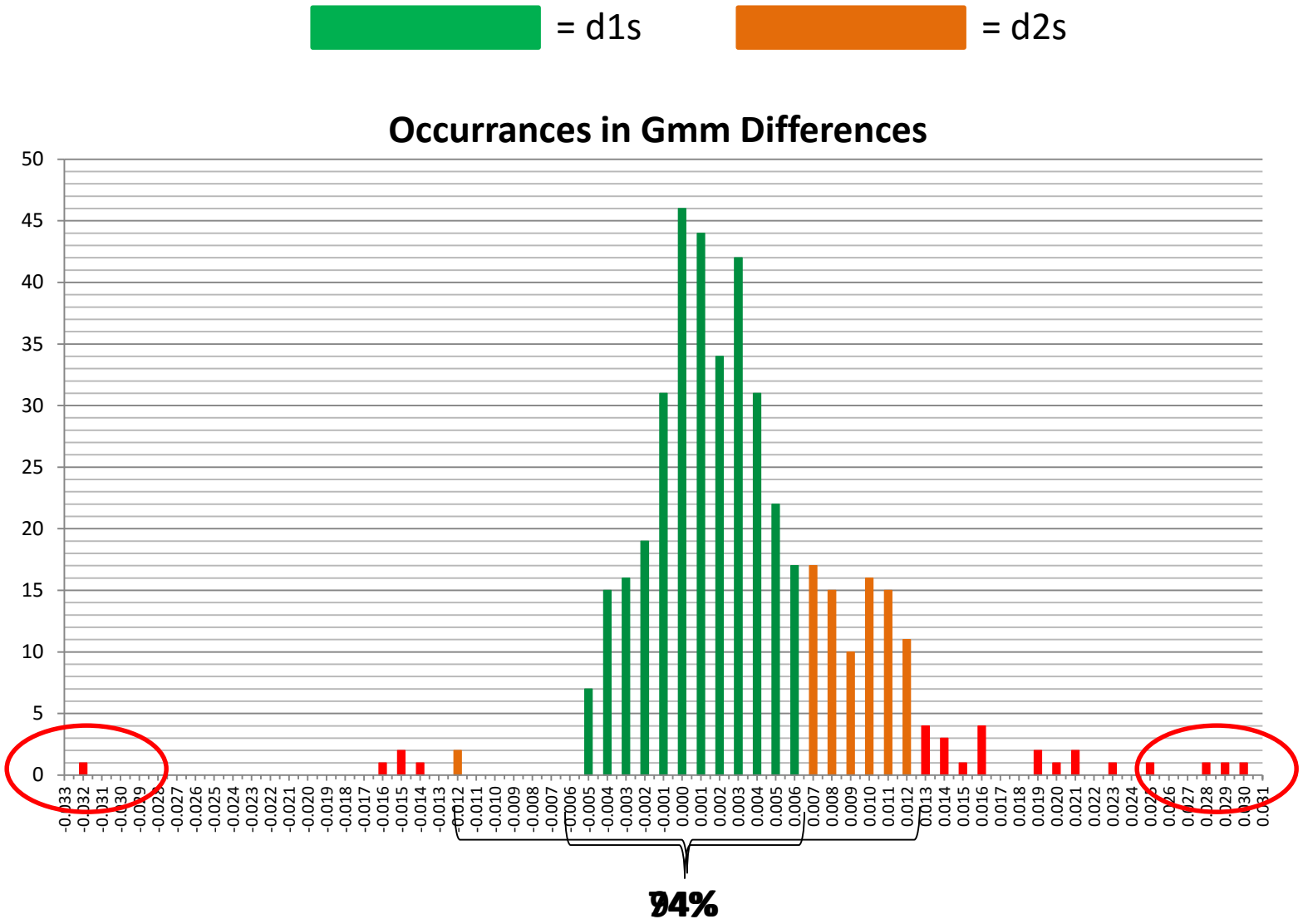
Bituminous Mix Design Verification

- Established the standard deviations of the population then re-examined the significant differences.

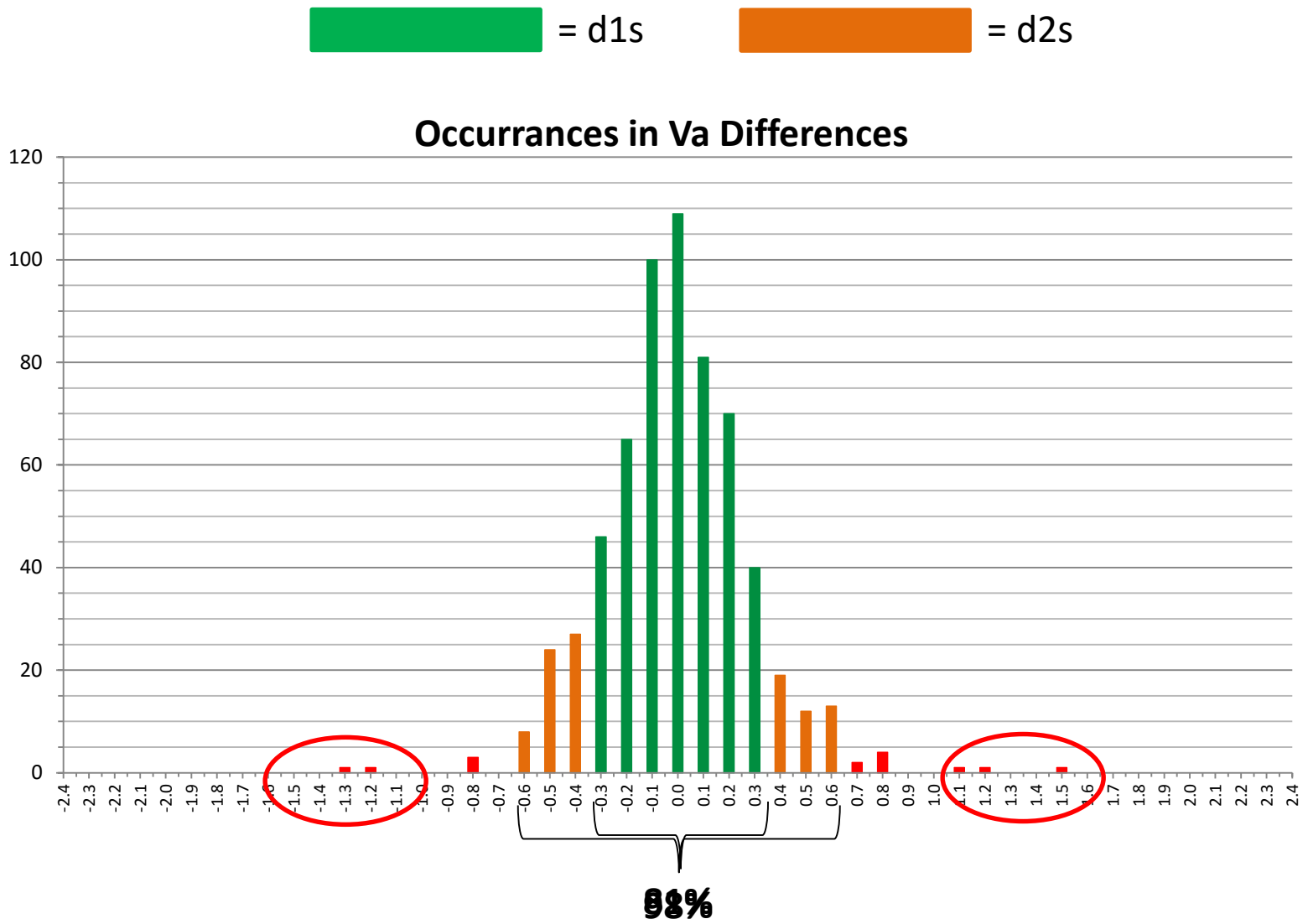
PTC vs Producer Results Standard Deviation	
Gmm	0.006
Air Voids	0.29
VMA	0.29
VFA	1.86
#200	0.43
AC%	0.18

9.5mm	**12.5mm**	**19mm**	**25mm**
0.029	0.020	0.029	-0.032
0.6	-0.8	1.4	-0.6
-1.2	-0.9	1.1	0.6
3	5	-9	4
1.0	1.6	1.9	-1.2
0.5	-1.0	1.0	0.4

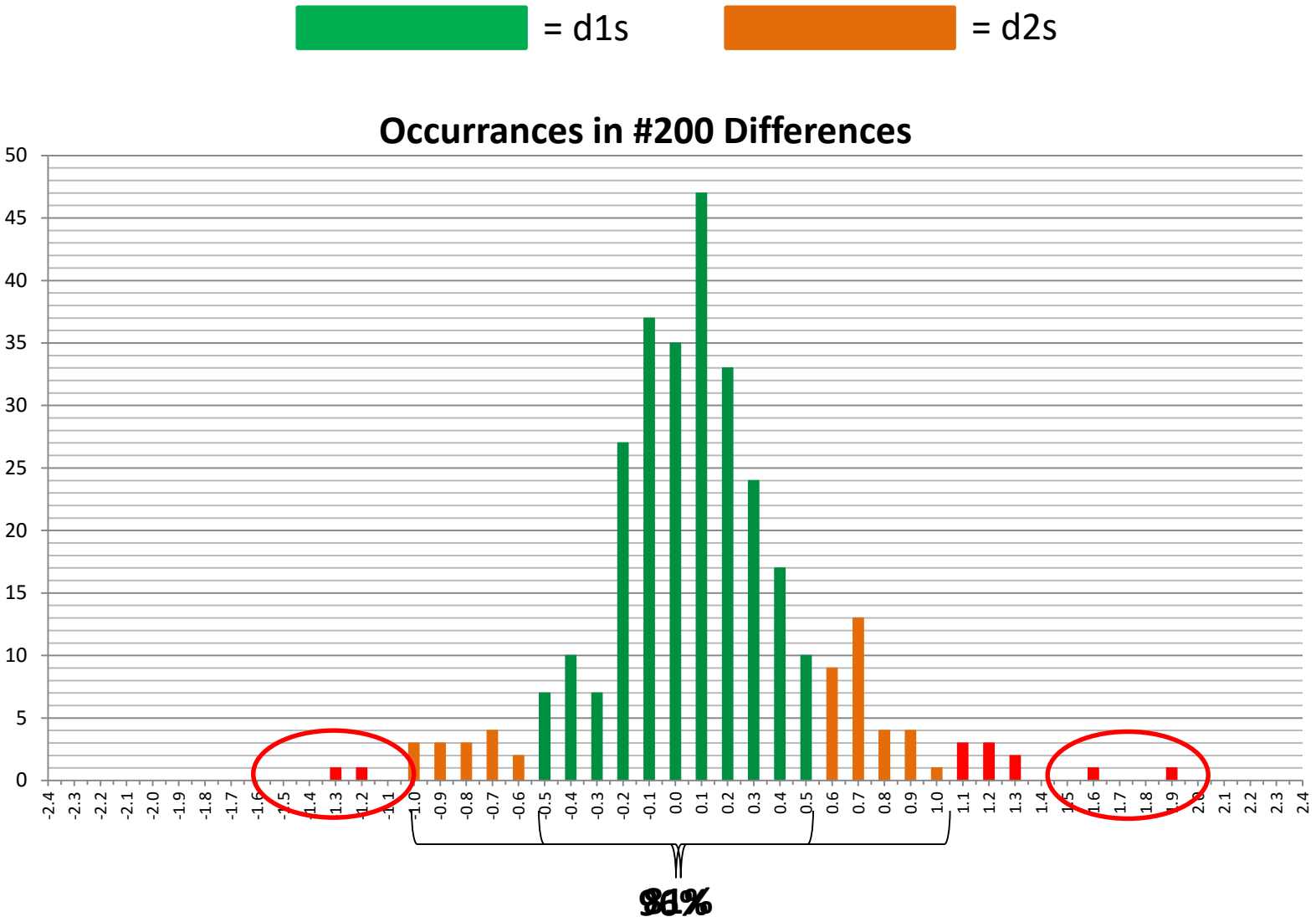
Bituminous Mix Design Verification



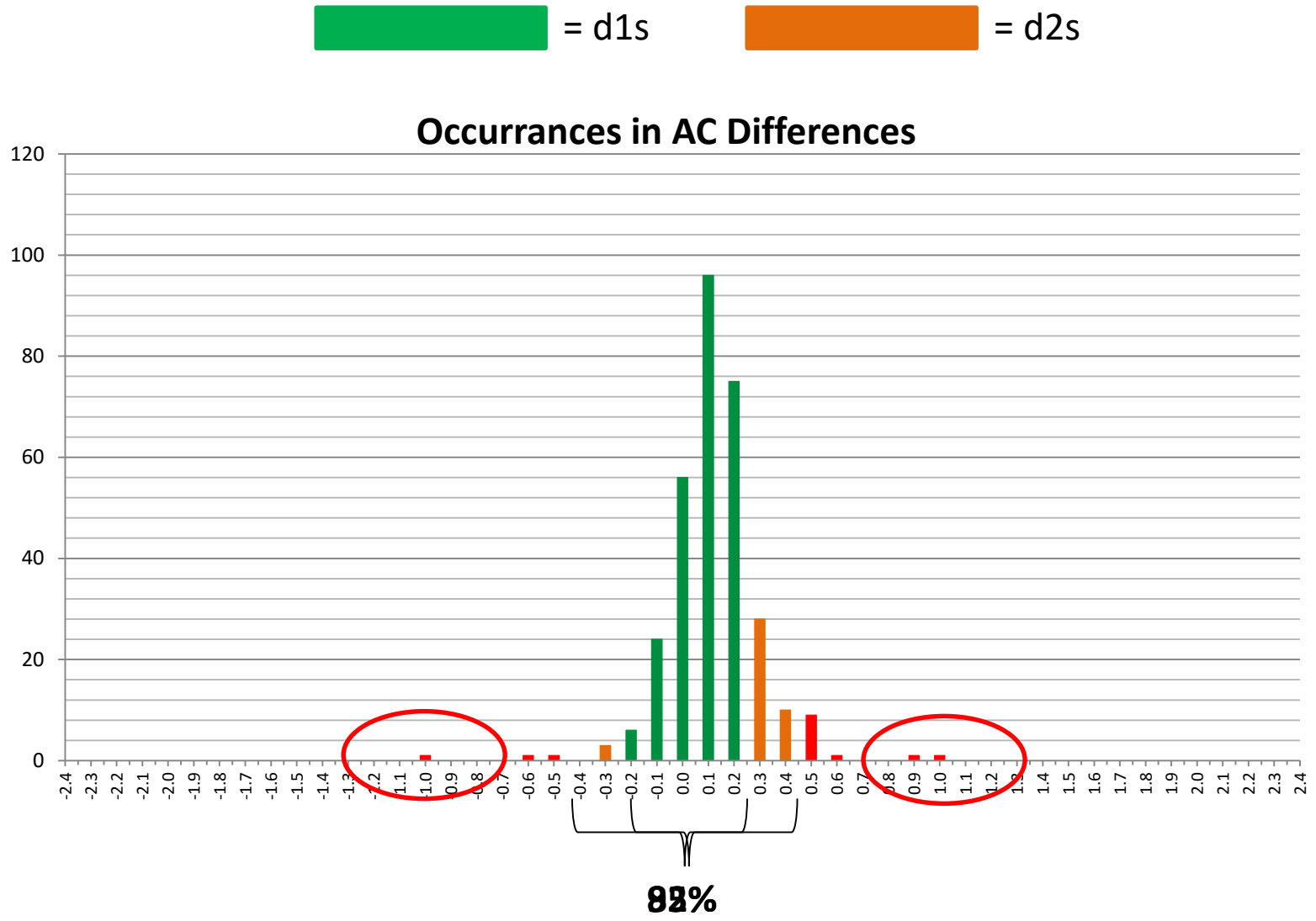
Bituminous Mix Design Verification



Bituminous Mix Design Verification



Bituminous Mix Design Verification



Bituminous Mix Design Verification

1. Significant differences in values?
2. We know…
    a) Reliable data; Masses were close to original providing good, comparable mass/volume ratios
    b) Abnormalities were not material class specific
    c) Overall population indicated minimal variability
3. Compare individual producer results with Table J-3

Tolerances Sigma Limits (d2s)		
	Gmm	Gmb
1/2" & greater	± 3%	± 6%
#100 thru 3/8"		± 4%
#200	± 1.0%	± 2.0%
AC	± 0.4%	± 0.4%
Gmm	± 0.012	
Va	± 0.6	
VMA	± 0.6	
VFA	± 4	

Bituminous Mix Design Verification

Bulletin 27, Appendix J; **TABLE J-3**

Tolerances Sigma Limits (d2s)		
	Gmm	Gmb
1/2" & greater	± 3%	± 6%
#100 thru 3/8"		± 4%
#200	± 1.0%	± 2.0%
AC	± 0.4%	± 0.4%
Gmm	± 0.012	
Va	± 0.6	
VMA	± 0.6	
VFA	± 4	

4 Producers Constitute:

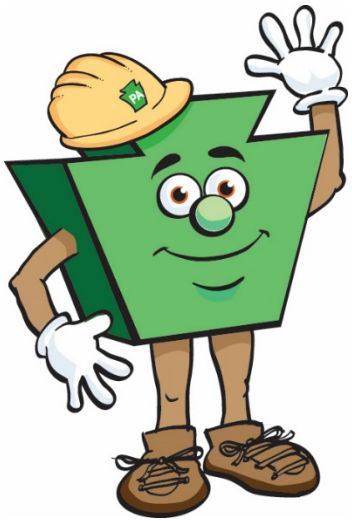
12% of all designs verified

48% of all **FAILURES !!!**

Producer	Fail Rate	Failures	Designs
A	0%	0	40
B	0%	0	18
C	0%	0	14
D	0%	0	4
E	0%	0	3
F	0%	0	2
G	0%	0	14
H	0%	0	12
I	6%	1	18
J	6%	2	35
K	7%	1	14
L	8%	1	12
M	9%	2	23
N	11%	2	19
O	13%	2	15
P	14%	1	7
Q	17%	1	6
R	18%	3	17
S	20%	2	10
T	29%	2	7
U	33%	2	6
V	38%	3	8
W	56%	5	9
X	56%	5	9
Y	75%	3	4
Z	88%	7	8

TEAMWORK

Overcoming differences to work towards a common goal.



Thank You!