

Louisiana's Quality Assurance –
Percent Within Limits Approach

SEAUPG
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Louisiana Specifications

- 1973 -QC/QA based on a variation known specification
 - ♦ contractor designed mixes
 - ♦ plant control based on a mean
 - ♦ 4 marshall /2 gradation/ lot
- 1992
 - ♦ Increased nominal maximum aggregate size to 19 and 25mm
 - ♦ Limited natural sands to 25%

Louisiana Specifications

- 1994
 - ♦ Added elastic polymers to asphalt cement: (forced duct ratio and elastic recovery)

Louisiana Specifications

1994: Added Material Transfer Vehicle



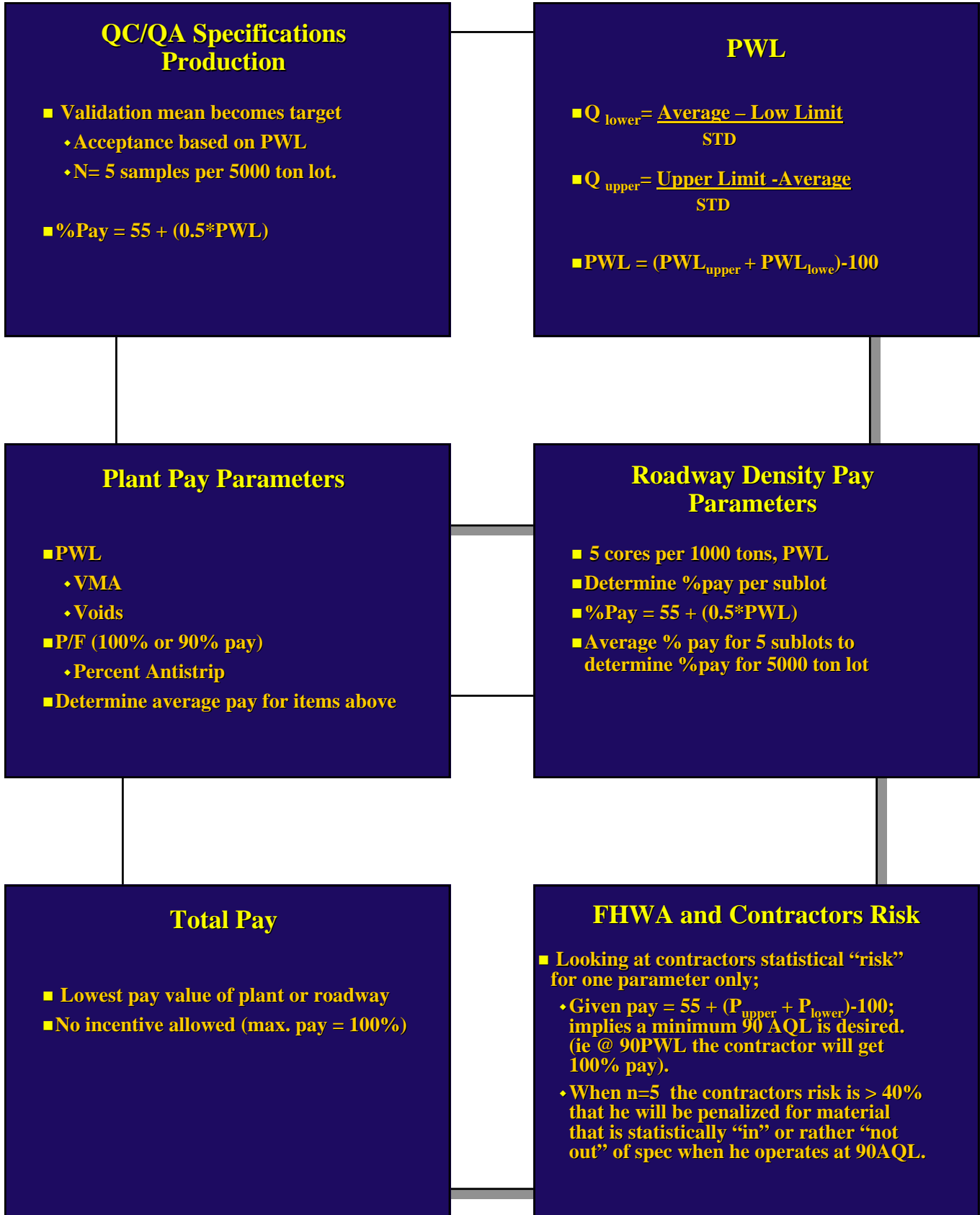
1994

1997 Superpave Specifications

- Used this opportunity to introduce Gmm into the specifications.
- Recognized limits of QA based on mean
- Modeled after NCHRP 9-7
Percent Within Limits approach

QC/QA
Design and Validation

- Contractor submits design JMF
- 1000 ton Validation, 5 sample
- 90 PWL min.
 - ♦ 3-5 Voids, min. VMA, 2.36mm (+/-3%), 75um (+/- 0.7%) , Gmm (+/- 0.015), max. $N_{initial}$, and 98 % min. N_{final} .
- All tests performed at contractors plant (single operator, DOTD)



Plant Data

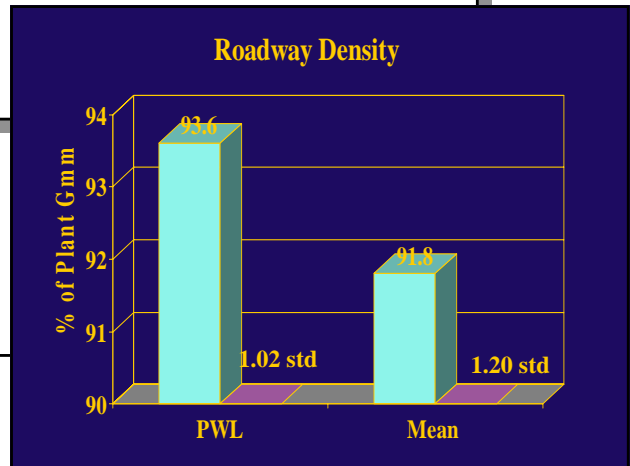
	Avg.	STD	PWL	Spec	Tolerance
Gmm	2.480	0.006	92.5		.015
Gmb	2.414	0.009	92.3		.022
Gmbest	2.387	0.020	N/A		N/A
Ninitial	86.0	0.549	97.4	89max	
Nfinal	97.4	0.400	92.4	98max	

Plant Data (con't)

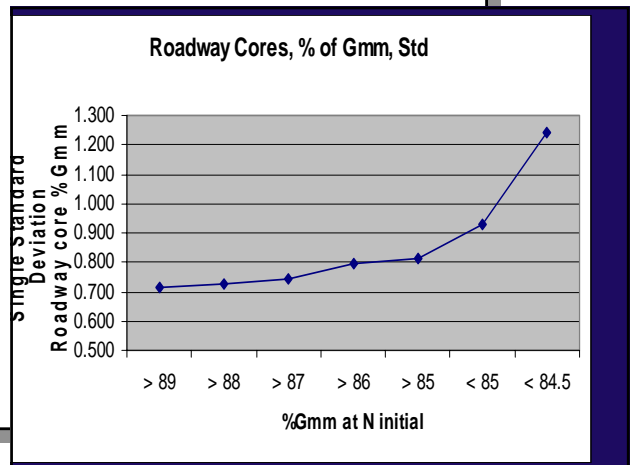
	Avg.	STD	PWL	Spec	Tolerance
Voids	4.07	0.35	94.7	3-5	
VMA	13.5	0.342	93.7	12 or 13 min.	
2.36mm	25	1.029	95.1		3
75um	4.6	0.242	93.8		0.7

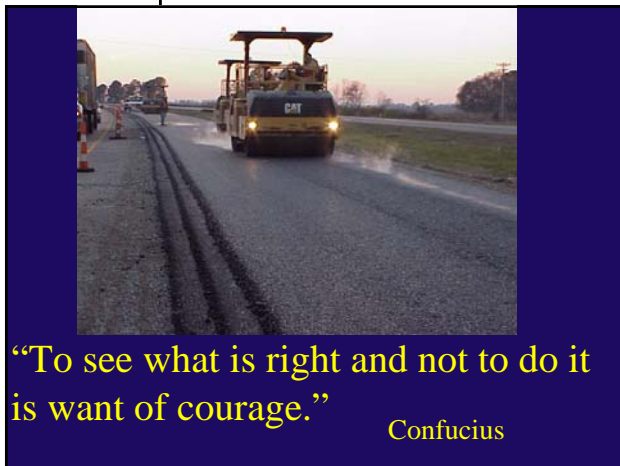
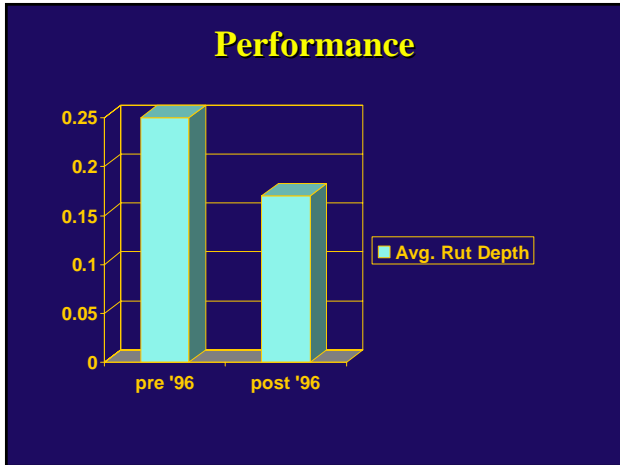
Plant Data (Con't)

	Avg.	STD	PWL	Spec	Tolerance
VFA	69.8	2.35		65-75	
%AC	4.33	0.19	100		0.4
4.75mm	36	1.64	90.2		4
Slope	8.6	0.33	27	4	0.4



- ### Actual Pay
- Given 3 years of actual data
 - Contractor pay for asphalt averaged 98.4%
 - This indicates that most of the time, the contractor produced at a higher than 90 AQL.





- ### 2005 Specifications
- Reduced Air Void Design from 4% to 3.5%
 - Based plant pay solely on Air voids, n = 5
 - Stepped pay schedule
 - Total pay based on average of Roadway Density, n = 15, Smoothness and Plant Pay, incentive

VOIDS PAY

% PAY	103	100	98	90	80	50
PWL	100	88-99	71-87	51-70	21-50	<21

3.5	3.8	4.0	3.8	3.6
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For N=5, PWL = 100, 103% Pay

DENSITY PAY

% PAY	105	100	98	90	80	50
PWL	98-100	89-97	79-88	61-78	31-60	<31

95.0	94.8	94.3	92.9	95.1
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For N=15, PWL = 100, 105% Pay

15 CORES USED TO COMPUTE PAY!

ROADWAY SMOOTHNESS

IRI SPECS
IMPLEMENTED
JULY 2004



Category

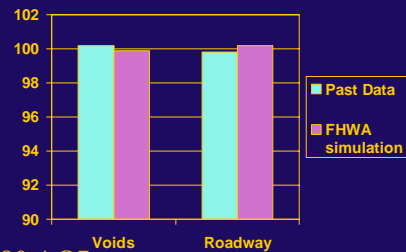
- | | |
|---|--|
| A | Multi-Lift New Construction,
Overlays of More than two Lifts
All Interstates |
| B | One or Two Lift Overlays Over Cold Planed
Surfaces, Two-Lift Overlays Over Existing
Surfaces |
| C | Single-Lift Overlays Over Existing Surfaces |

SURFACE TOLERANCE PAY

TABLE 502-7A,
Inches per mile

	103%	100%	90%	80%	50% or remove
A	<55	<65	65-75	NA	>75
B	<65	<75	75-89	NA	>89
C	<75	<85	85-95	>95- 110	>110

Estimated Pay w/ stepped scale



@ 90 AQL

Voids = 35% Risk Roadway = 30% Risk

Conclusion

- Because of the PWL specification, “contractors have invested more in plant quality personnel and with these personnel, they have become more aware of their production variability and performance”
- DOTD and contractors should understand the inherent “risks” in PWL specifications

