

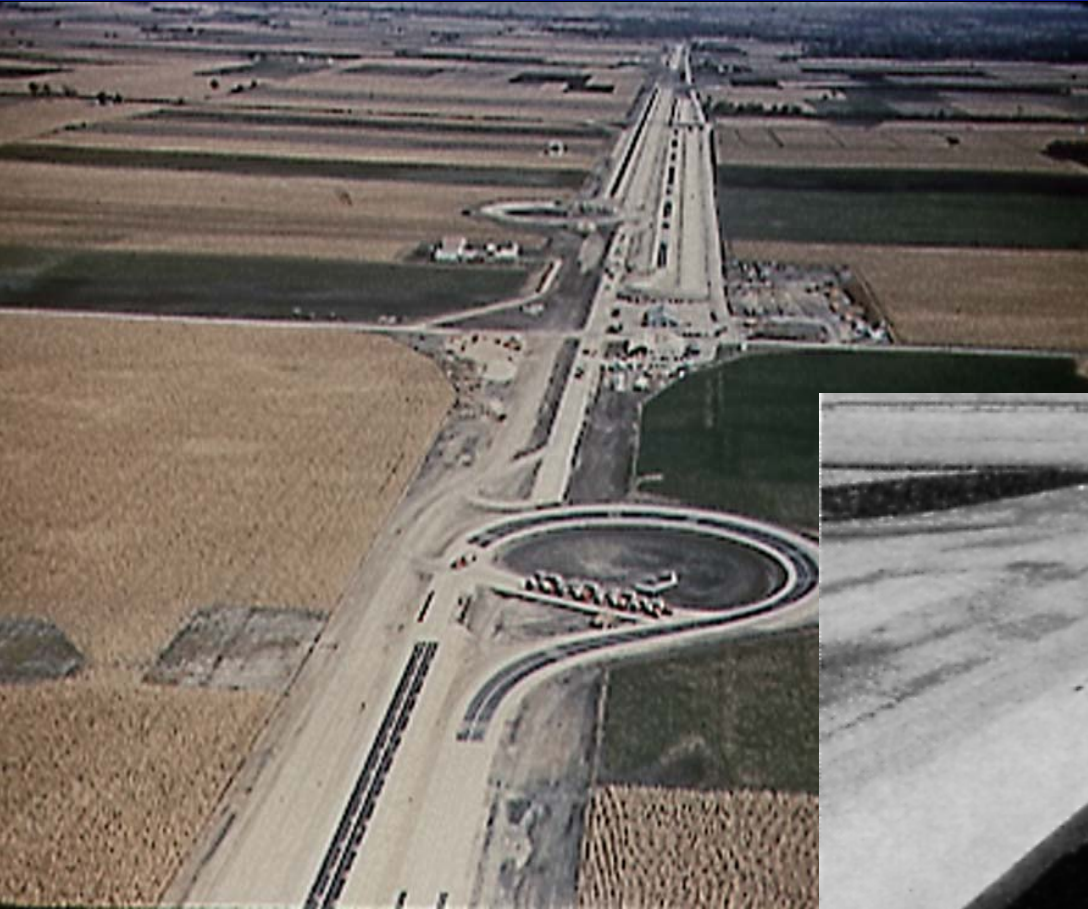
Quality Assurance

“The Rest of the Story”

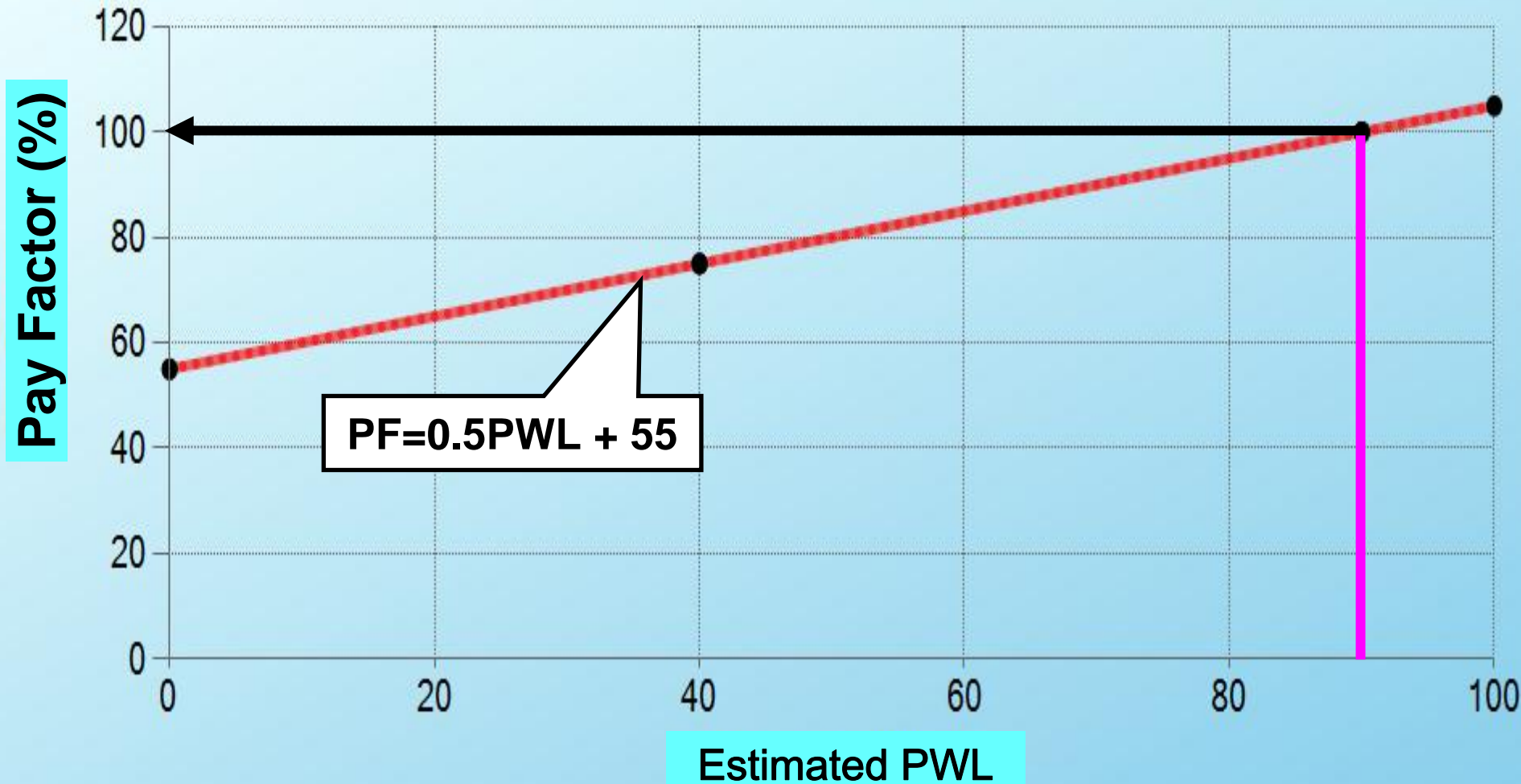
Dennis Dvorak
FHWA Resource Center
Olympia Fields, IL

North Central Asphalt User Producer Group Meeting
January 10-11, 2007

AASHTO Road Test

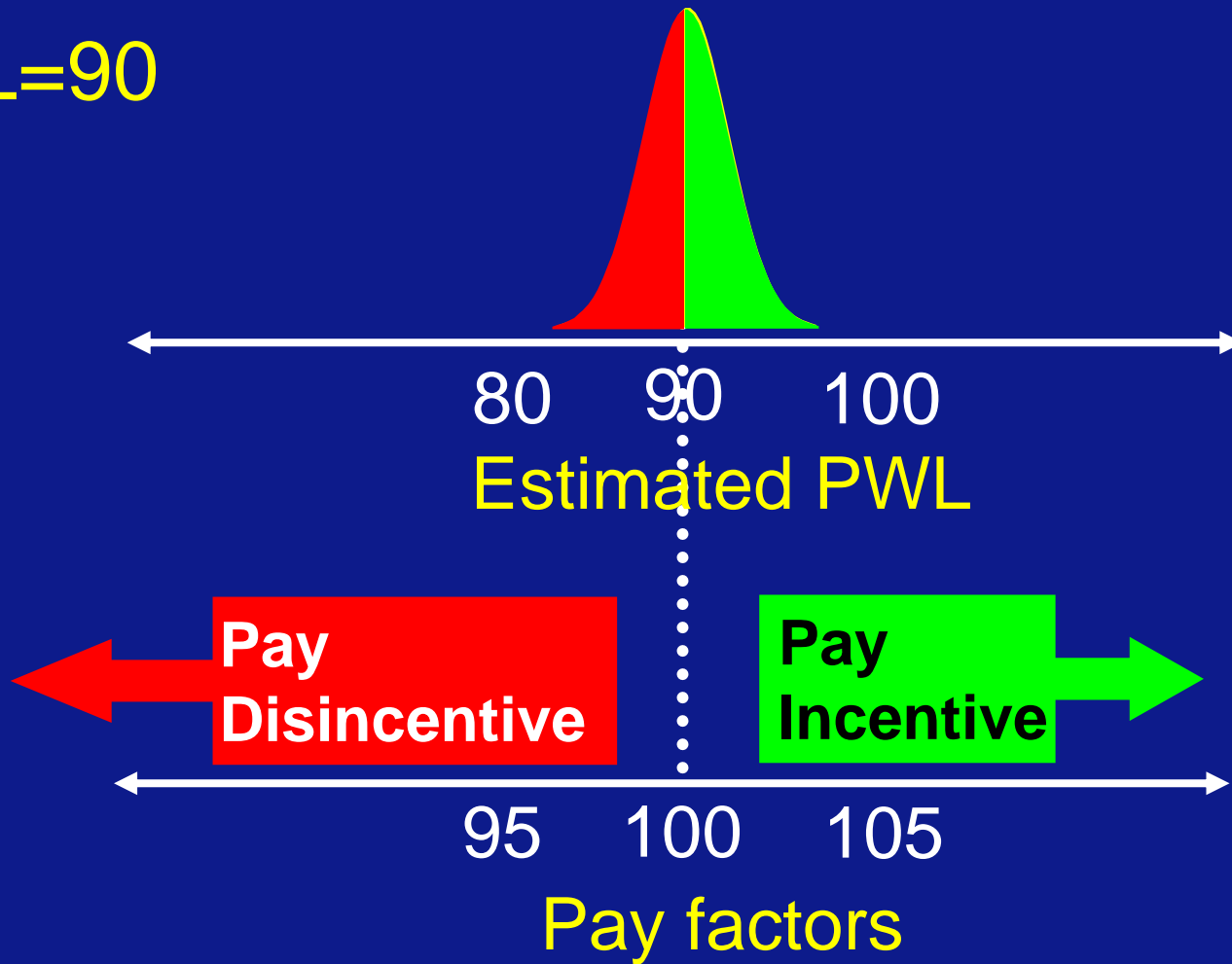


Payment Plan with 5% Incentive

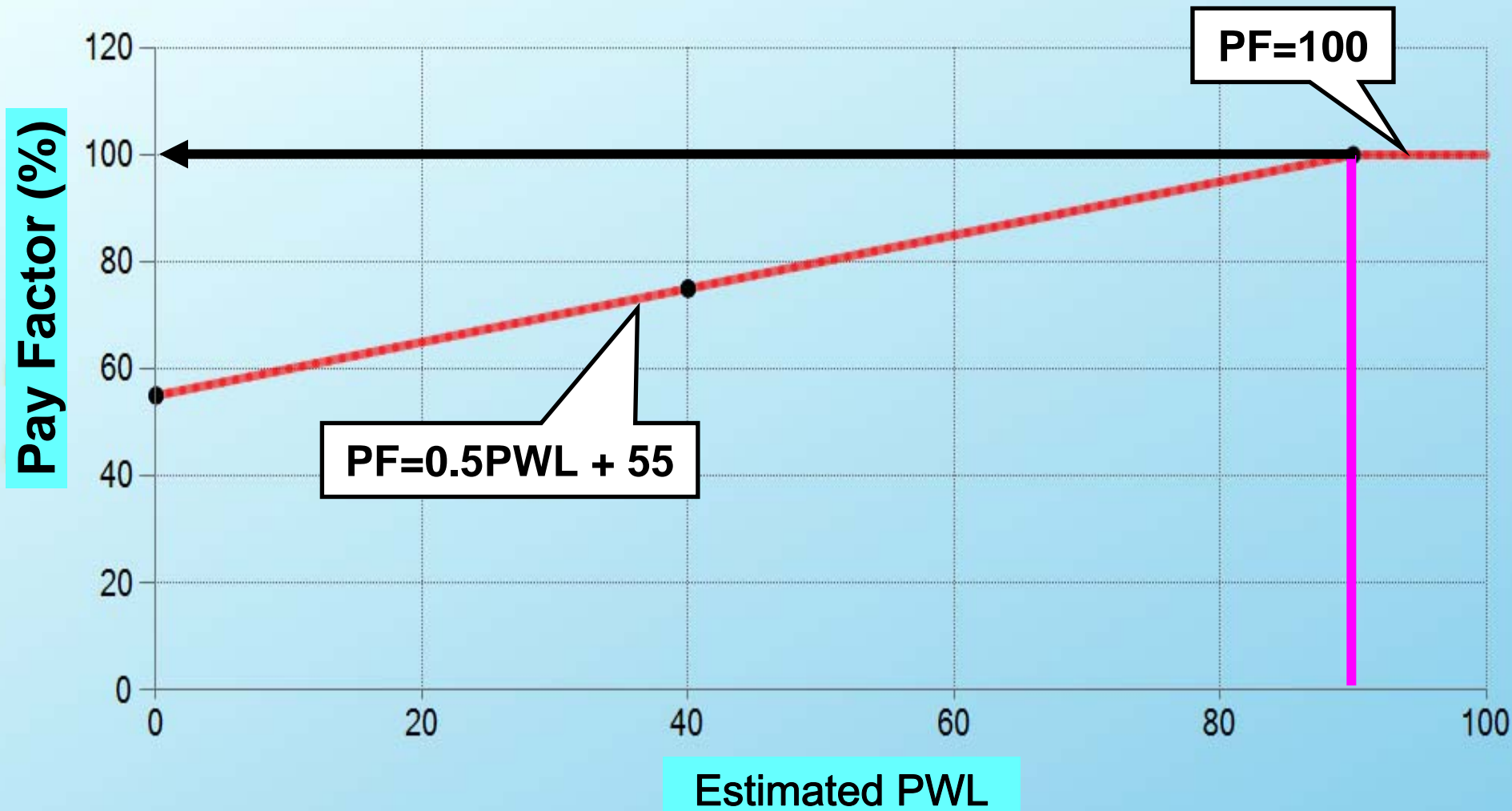


Payment Plan with Incentive

AQL=90

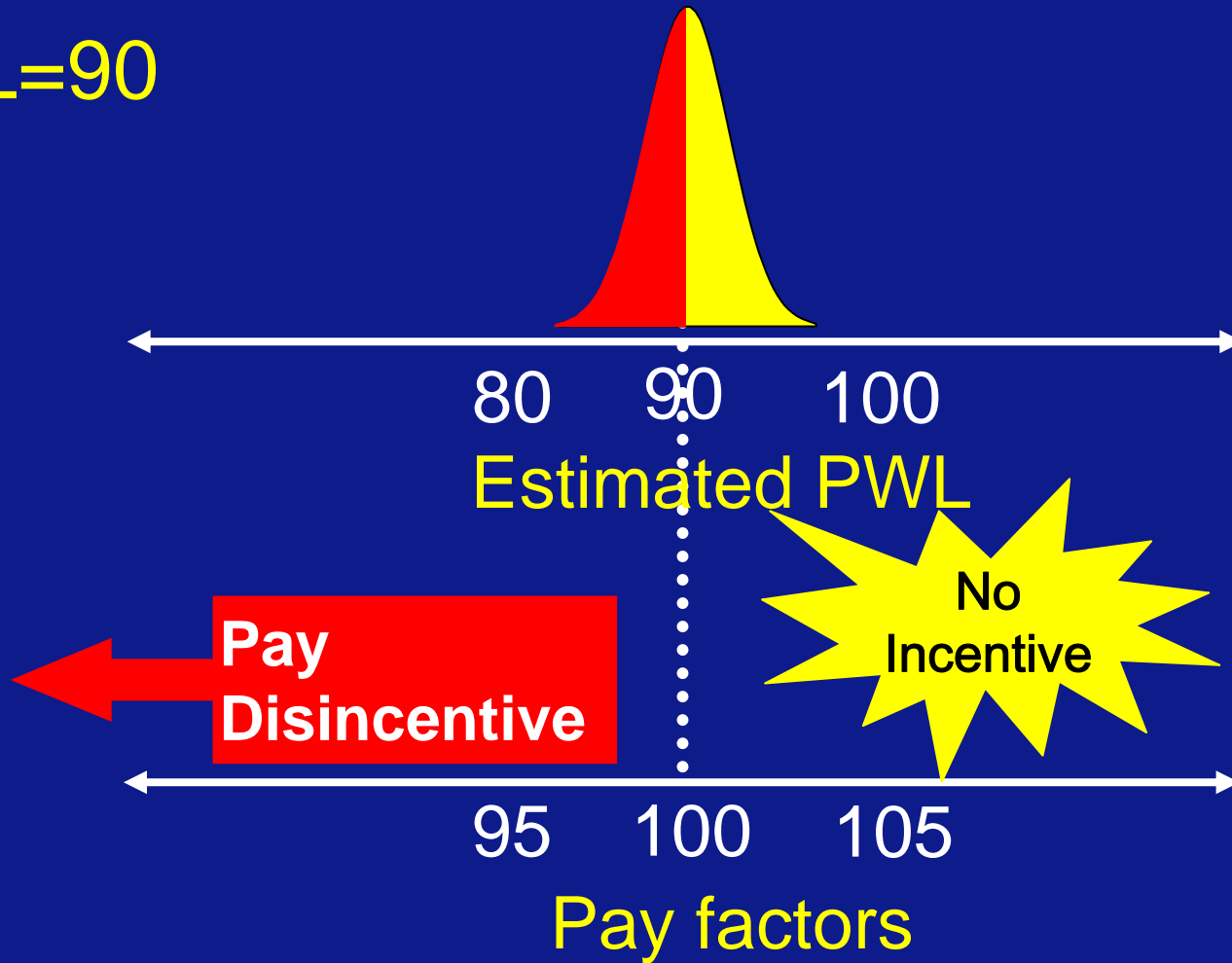


Payment Plan without Incentive



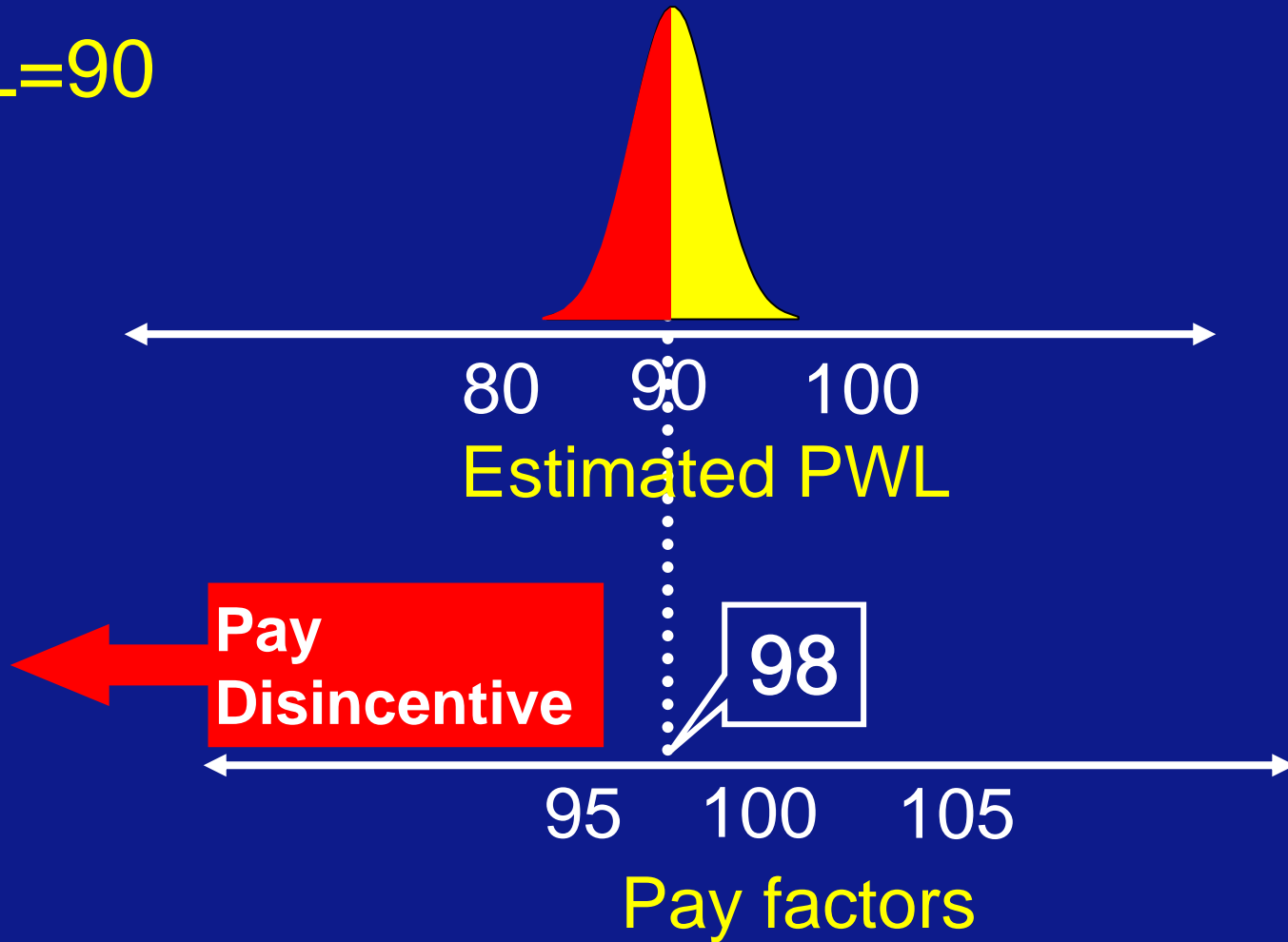
Payment Plan without Incentive

AQL=90



Payment Plan without Incentive

AQL=90





Overview

- Background
- Where we have been ...
- Where we are now ...
- Current Resources
- Where we are going ...
 - Short term
 - Long term



Background

Why is Quality Assurance Important?

Approximately 50% of construction costs are spent on the PURCHASE of materials.



Background

- Acceptance procedures
 - Once material is in place ... it stays in place
 - Only industry paying for marginally acceptable material



Where We Have Been ...

- Method type specs
- 1956-1960 AASHO Test Road
 - Recognition of Material variability
- 1960s Blatnik Investigations
 - Federal regulation on sampling and testing
- 1970's Experimentation with QA specifications
- 1980's Implementation of QA specifications
- 1990's Use of contractor test results for acceptance



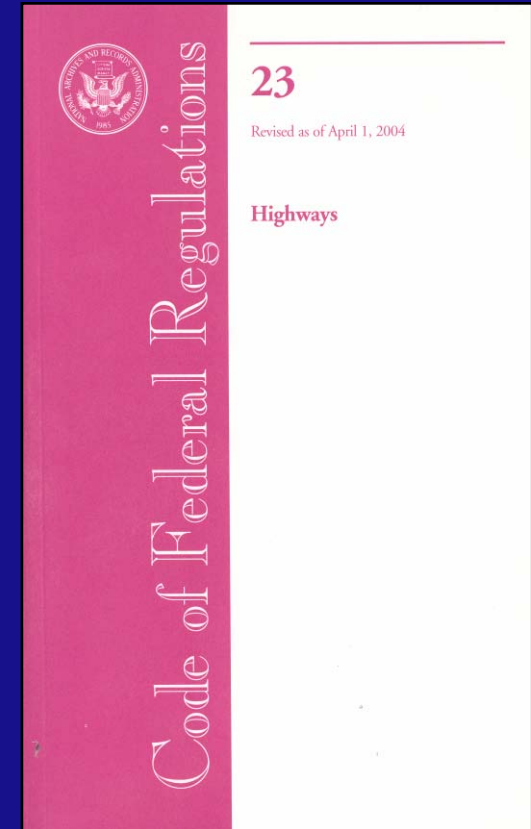
Where We Are Now ...

- Quality Assurance Specifications
 - Percent Within Limits Specifications
- Design Build
- Short Term Warranty/Guarantee



Where We Are Now ...

- POLICY (23CFR 637.205(a)) – “Each SHA shall develop a quality assurance program ... The program must meet the criteria in 637.207 and be approved by the FHWA.”





Quality Assurance Program

- Acceptance Program

- State's Verification Testing

- Inspection

- May use Contractor test results

- Dispute resolution

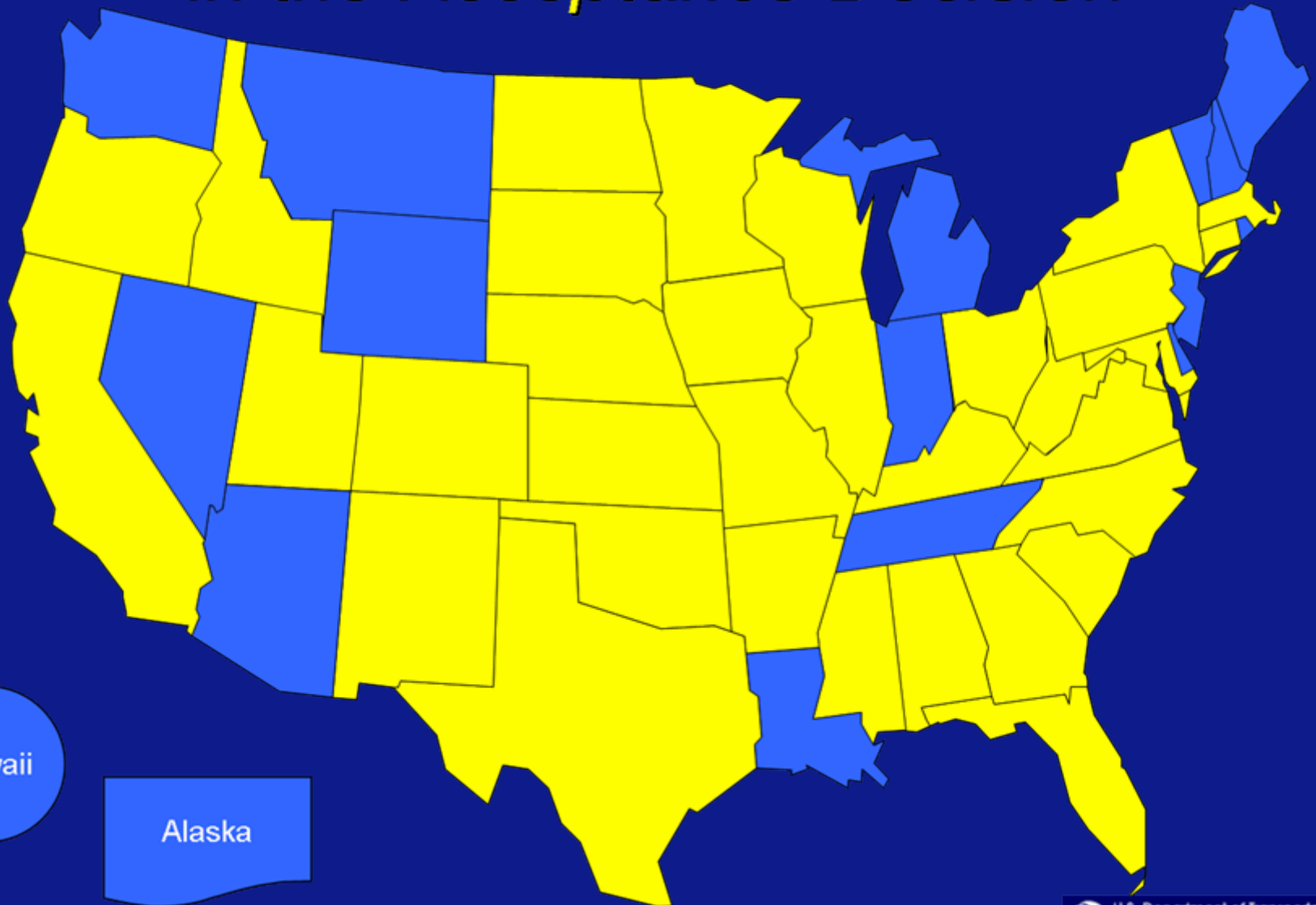
- Qualified Technicians

- Accredited / Qualified Labs

- Independent Assurance Program

- Materials Certification

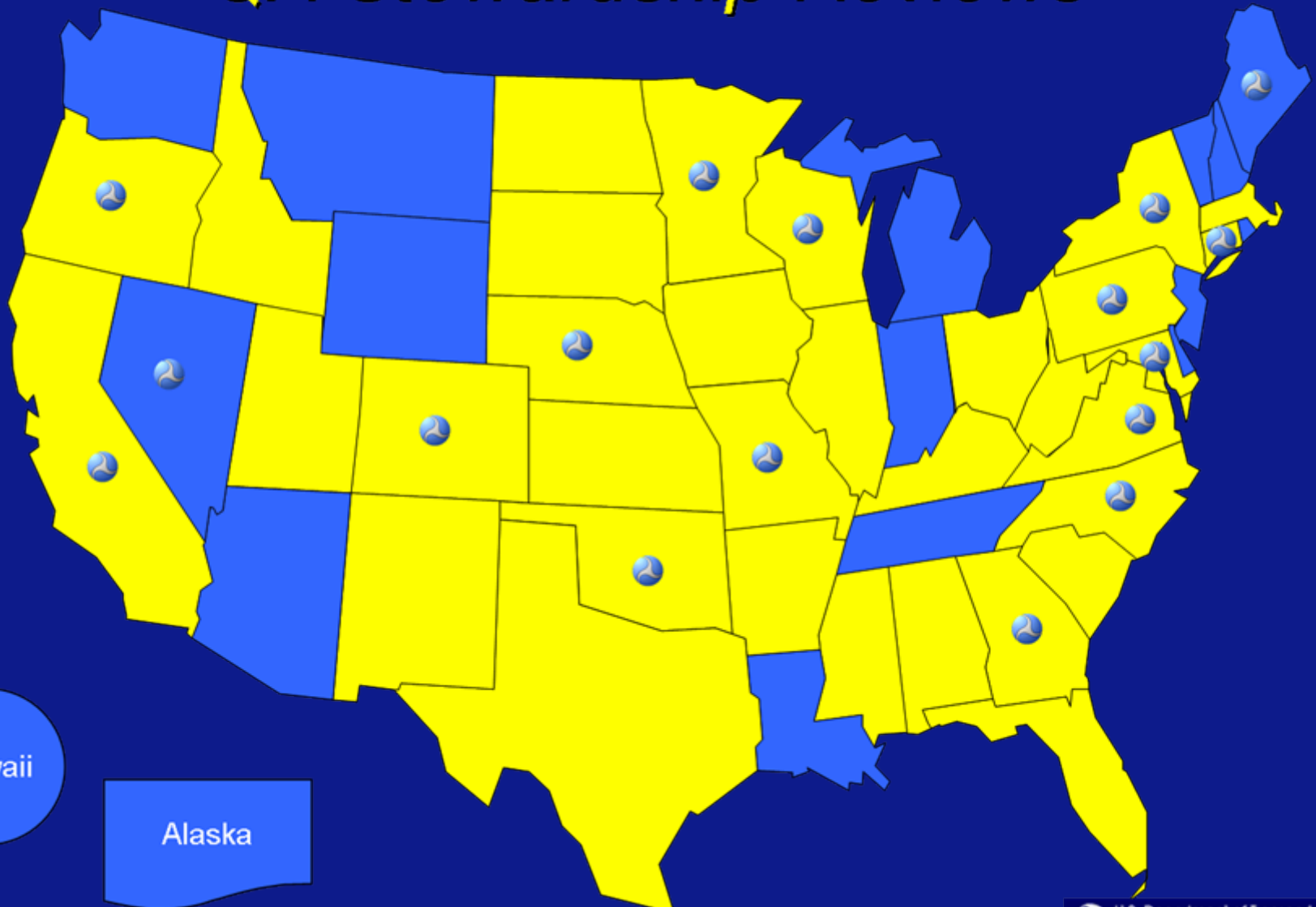
33 States using Contractor Test Results in the Acceptance Decision



Hawaii

Alaska

17 States Reviewed as part of QA Stewardship Reviews



Hawaii

Alaska

Scope

- Interviews

- DOT Headquarters, Region/District, and Project Field Offices

- Review

- DOT implementation strategies, policy and procedures, and office records

- Visit

- Construction projects to assess field procedures and practices



Where We Are Now ...

- Not enough State personnel
- Not enough State Verification Testing
- Reluctance to spend money on construction engineering – not even for consultants
- Increasing volume of projects/workload
- No electronic materials testing data



Where We Are Now ...

- Ineffective validation procedures
 - ❑ no independent samples
 - ❑ no statistical comparison
 - ❑ number of samples for comparison
 - ❑ control of Contractor supplied data
 - ❑ security of samples
 - ❑ Control of random sampling location
 - ❑ Retest provisions



Common Types of OIG Fraud Cases

- ❑ Bid rigging & collusion
- ❑ Materials overcharging
- ❑ Time overcharging
- ❑ Product substitution
- ❑ Minority-owned business fraud
- ❑ Quality-control testing fraud
- ❑ Kickbacks
- ❑ Bribery



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Materials Overcharging

Definition

Contractor *misrepresents* how much construction material was used on the job and then charges for more material than was used to *increase job profit*.

Fraud

The Paper Trail

Asphalt Production Report

DATE: [REDACTED] PLANT START: 10:00 PLANT STOP: 11:00 TOTAL PLANT HOURS: 11

JOB NO.	JOB NAME	MIX	TOTAL TONS
0069	Golf Road	2.5UR	4660.850
0069	Golf Road	2.5UR	787.95
0069	Golf Road	2.5UR	1389.52

Asphalt Shipped

MIX FORMULA TYPE	ASPHALT CONTENT	TONS PRODUCED
2.5% RBN	3.3	500
4.0% RBN	2.6	110
1.5% Sum	4.6	790
2.5 Sum	5.8	290

4310

CUST. NO.	CUSTOMER NAME	MIX TYPE	OFFICE USE	CASH/CHECK REC'D	TOTAL TONS
04501	Two W's	SUR			46.60
06850	OLYMPIC	SUR			201.22
07200	Phoenicia	RBN			680.03
04670	J.C. Blacktop	SUR			529.98

Private Jobs

TOTAL CASH REC'D: 5,692.78

COMMENTS: Auto Shop
0069 Golf Sur 4/23/93 [Signature]

Plant production report shows 1,380 tons more asphalt shipped than produced on this day

Quality-Control Testing Fraud

Definition

Contractor *misrepresents* QC test results to falsely earn contract incentives or avoid contract disincentives, or to avoid production shutdown or required removal of deficient material in order to *limit costs* or *increase profits*.

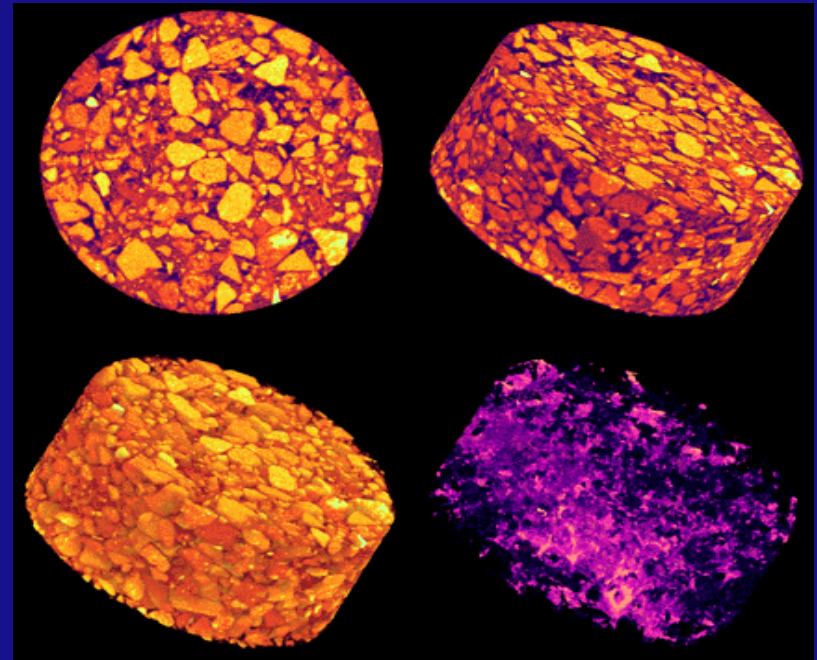
Example

After distracting the state inspector, an asphalt-paving crew foreman discarded road cores from random QC locations designated by the inspector and replaced them with “test cores” known to qualify for density-incentive payments under the contract.

Quality-Control Testing Fraud

Sample Indicators

- ❑ Contractor employees regularly contrive to take or label QC samples away from inspector oversight
- ❑ Contractor insists on transporting QC samples from the construction site to the lab
- ❑ Contractor does not maintain QC samples for later Quality-Assurance (QA) testing
- ❑ Contractor challenges results, or attempts to intimidate Quality Assurance inspectors obtaining conflicting results





Resources

- NHI Course 134042: Materials Control and Acceptance - Quality Assurance
- FHWA Basic PWL Workshop
- 2003-2005 Summary Report for QA Stewardship Review
- www.fhwa.dot.gov/pavement/materials/stewardreview2006.cfm



Where We Are Going ...

Short Term

- Reduce Risks
 - ▣ Lots not restricted to a single day
 - ▣ More State Verification Testing as compared to Contractor Testing
 - ▣ Statistically Proper Validation Procedures
- SPECRISK and PWL-Pay Programs
- Specification Development Course
- Database Workshop



Why Electronic Databases

- Need information to develop and modify specifications
- Materials inputs into M-E Pavement Design Guide
- Tie to Pavement Management System



Examples of Paper Documents

Project Number AC-NH-7-002(054)077		Contractor Mayo Const.		Date 7-19-06	Time 1:30 am
Test Number 10	Lot Number 10	Daily Tons		Total Tons	
Station 4245+80		Lane Rt. Shoulder		LR 1st.	

FIELD PLUGS

PLUG NO.	WEIGHT IN AIR (A)	WEIGHT IN WATER (B)	WEIGHT SAT. SURF (C)	VOLUME C-B = D (D)	BULK SP. GR. $\frac{A}{D} = \frac{E}{D}$
10-A	4904.8	2848.2	4906.7	2058.5	2.383
10-B	4924.7	2858.2	4927.6	2069.4	2.380

AVERAGE BULK SP. GR. (F) = 2.382
DENSITY (F x 62.4) PCF 148.6

MAXIMUM MIX DENSITY

FLASK NUMBER	1	2	
G. SAMPLE CONTAINER & SOLUTION:	4234.9	3983.7	
H. CONTAINER & SOLUTION:	3633.4	3382.2	
I. SAMPLE IN SOLUTION (G-H)	601.5	601.5	
J. SAMPLE IN AIR	1012.4	1010.1	
K. VOLUME OF VOIDLESS MIX (J-I)	410.9	408.6	
L. MEAS. MAX. SPEC GRAVITY (J/K)	2.464	2.472	2.468
M. MAX. THEOR. DENSITY (62.4 X L)			154.0

PERCENT AIR VOIDS
% AIR VOIDS = $\frac{L-F}{L} \times 100 = \left(\frac{2.468 - 2.382}{2.468} \right) 100 = 3.5$ % AIR VOIDS

AGGREGATE BLEND PROPORTIONS		AC CONTENT: <u>5.7</u>
<u>28</u>	<u>5/8 Rock</u>	NOTES Changed from 6.0% to 5.7%.
<u>15</u>	<u>CD</u>	
<u>24</u>	<u>ASCF</u>	
<u>33</u>	<u>NF</u>	

Robert J. [Signature]
Inspector's Signature



Examples of Electronic Files

YEAR	2004	Asphalt Pavement Analyzer Data												Cycles	Temp.	Deformation, mm				Tensile Strength Ratio, %						86
SAMPLE ID		DATE / LOCATION			MIX VOLUMETRICS AND PROPERTIES										GRADATION (Percent Passing)											
Sample	Lab # Field #	Received	Sampled	Station	Stability (lbs)	Flow	Rise (Gmm)	Density @Ndes	Density @Nmax	%Voids @Mini	%Voids @Ndes	%Voids @Nmax	% Binder	% VMA	% VFA	% FAA	3/4"	1/2"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 60	No. 200	
EBM	55 (MHC 612084)	3/5/04	3/5/04				2.428	2.314	2.338	11.8	4.7	3.7	5.11	14.9	68.4	45.7	99.1	95.1	87.7	71.2	44.0	35.4	17.7	10.8	4.5	
Contractor							2.422	2.336	2.360	10.6	3.6	2.6	5.19	14.2	74.8	45.1	100.0	94.6	89.9	73.6	46.0	30.7	19.1	11.8	5.2	
1	122	6/8/04	6/3/04				2.428	2.319	2.341	12.2	4.5	3.6	5.00	14.7	69.3	44.8	100.0	93.0	88.6	79.1	50.2	30.3	19.1	11.8	5.1	
Contractor	TS-1		6/3/04	BURN	OFF	FAA	2.428	2.318	2.342	11.5	4.5	3.5	4.91	14.6	69.0	44.9	100.0	92.5	87.1	73.9	44.2	28.8	18.6	11.7	5.2	
2	125	6/10/04	6/7/04				2.441	2.339	2.363	11.8	4.2	3.2	4.95	13.9	69.9		100.0	96.7	91.7	79.3	51.0	45.9	32.2	21.2	5.5	
Contractor	TS-2		6/7/04				2.439	2.348	2.372	11.2	3.7	2.7	4.89	13.5	72.1		100.0	94.4	89.0	79.1	50.0	32.5	21.4	14.0	5.9	
3	126	6/10/04	6/9/04				2.430	2.364	2.383	10.5	2.7	2.0	4.95	13.0	79.0		100.0	94.3	90.1	76.8	49.9	43.6	31.1	20.3	5.7	
Contractor	TS-3		6/9/04				2.437	2.363	2.388	10.3	3.0	2.0	5.01	13.0	76.7		100.0	94.8	90.4	79.2	50.7	32.3	21.2	13.9	6.2	
4	127	6/10/04	6/9/04				2.436	2.331	2.353	12.0	4.3	3.4	4.90	14.2	69.3		100.0	95.2	92.3	81.2	52.0	32.2	20.8	13.2	5.6	
Contractor	TS-4		6/9/04				2.437	2.330	2.354	11.6	4.4	3.4	4.94	14.2	68.9		100.0	97.0	86.0	82.9	52.9	33.5	21.7	14.0	6.1	
5	128	6/10/04	6/9/04				2.419	2.305	2.329	12.2	4.7	3.7	4.73	14.9	68.5	44.8	100.0	96.3	93.4	81.8	54.2	33.6	21.7	13.7	5.4	
Contractor	1-1		6/9/04	BURN	OFF	FAA	2.434	2.320	2.346	11.7	4.7	3.6	4.82	14.4	67.5	44.8	100.0	95.0	92.7	85.2	54.4	34.7	22.5	14.5	6.2	
6	137	6/14/04	6/9/04				2.430	2.347	2.369	11.0	3.4	2.5	4.76	13.4	74.4		100.0	94.5	89.5	78.6	50.5	32.1	21.0	13.5	5.7	
Contractor	1-2		6/9/04				2.440	2.349	2.374	10.8	3.7	2.7	4.65	13.2	71.8		100.0	92.7	86.5	78.0	50.4	32.6	21.4	14.0	4.9	
7	138	6/14/04	6/10/04				2.434	2.346	2.370	11.3	3.6	2.6	4.85	13.6	73.2		100.0	93.3	89.4	77.3	50.0	30.7	19.8	12.5	5.1	
Contractor	1-3		6/10/04				2.438	2.342	2.368	11.1	4.0	2.9	4.85	13.6	71.0		100.0	93.7	89.8	79.2	50.1	31.7	20.6	13.3	5.9	
8	139	6/14/04	6/10/04				2.428	2.343	2.367	11.2	3.5	2.5	4.89	13.7	74.5		100.0	93.3	89.0	74.7	47.3	29.3	19.0	12.2	5.1	
Contractor	1-4	PRDD	PUCKS	TSR-78			2.439	2.390	2.377	10.9	3.6	2.5	4.89	13.4	72.8		100.0	94.7	90.3	77.4	48.7	31.0	20.2	13.2	5.7	
9	140	6/14/04	6/10/04				2.427	2.338	2.364	11.5	3.7	2.6	5.13	14.1	73.9		100.0	96.9	90.7	78.5	49.9	30.9	20.0	12.7	5.2	
Contractor	1-5		6/10/04				2.426	2.340	2.366	11.0	3.6	2.5	5.26	14.1	74.7		100.0	96.7	94.3	83.1	53.1	33.4	21.4	13.9	6.0	
10	147	6/15/04	6/10/04				2.422	2.354	2.373	10.6	2.8	2.0	5.10	13.5	79.4	46.0	99.2	94.0	89.4	76.8	49.8	31.1	20.3	12.9	5.2	
Contractor	2-1		6/10/04				2.428	2.348	2.373	10.7	3.3	2.3	5.06	13.6	75.9	46.0	100.0	95.0	89.7	78.8	50.1	32.2	21.2	13.8	6.2	
11	170	6/18/04	6/18/04				2.415	2.346	2.368	10.8	2.9	1.9	5.47	14.1	79.7		100.0	97.2	91.3	82.2	53.5	33.1	21.1	13.4	5.5	
Contractor	2-4		6/18/04				2.420	2.340	2.370	10.5	3.0	2.0	5.20	13.0	79.1		100.0	96.0	90.0	80.0	50.0	30.0	20.0	13.0	5.0	



Evolution...



QA Specs

Performance Specs

*Design Build
Warrant Maintain*





Advanced Quality Systems (AQS) Implementation Team

- Headquarters Offices
- Resource Center
- Division Offices



Where We Are Going ...

Long Term

- Domestic Scan of other industries
- Move toward Quality Management Systems by all contractors and suppliers
 - Beyond ISO 9000 – sector specific requirement
 - Aerospace – AS9100
 - Automotive – ISO/TS16949
- Quality Based Selection and Procurement
- Design Build Warrant Maintain



Design Build Warrant Maintain *- The Final QA?*

- Long Term Warranty

- Performance based contract
- Guarantees product integrity
- Contractor responsible for repair of defects or replacement

- Warranty Period

- Pre specified for repair defects



... and beyond!

- Cannot continue on same path of regulate and enforce
- Cannot continue to police contractors trying to catch them in the act
 - System needed to match contractor's priorities in-line with agency's
 - Quality and long term performance