Illinois Asphalt Pavement Association
March 12, 2012 (aka 5-days before St. Patrick’s Day)

SURVIVING STATISTICALLY BASED SPECIFICATIONS
In order to be successful an organization must concentrate on the eight key elements:

<table>
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<tr>
<th>Ethics</th>
<th>Integrity</th>
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<td>Trust</td>
<td>Training</td>
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<td>Teamwork</td>
<td>Leadership</td>
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<td>Recognition</td>
<td>Communication</td>
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### Surviving Statistically Based Specs.

[Click Here to Start]

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[Final Challenge]
Answer: $300

Rethink, retool, and refine ways we do business; Part One.
Question: $300
What was asked of industry (IAPA membership) by the Illinois Department of Transportation in the 1990’s?
Partnering and consensus decision making by IAPA membership, IDOT, and FHWA during QC / QA program development.
Question: $200

What was needed to obtain program credibility?
Answer: $300

- Lake Land College; prime.
- Numerous association, contractor, and consultant firms; sub-consultant.
Who was tasked with training and certifying HMA scientists long term throughout Illinois with continuous IDOT and IAPA guidance?
Mean (average), spread (low to high), standard deviation (S: Spread), quality index, and PWL.

\[ S = \sqrt{\frac{n \cdot \sum (x)^2 - (\sum x)^2}{n \cdot (n - 1)}} \]
What are statistical measures used in determining the precision and accuracy of continuous production of HMA?

(FHWA and IDOT use these to define road materials ‘fitness for use’.)
Roman Ondák’s room of heights

- Room 1, 29.9.2010
- Room 2, 29.9.2010

- Rhodendron, 7.9.2010
  - Marianne, 10.10.2010
  - Ilya, 12.9.2010
  - Suzanne, 16.9.2010

- Lotte, 17.10.2010

- Jonke, 17.10.2010
- Kira, 25.9.2010
- Jak, 25.9.2010

- Lora, 19.9.2010

- Stas, 19.9.2010
  - Nora, 2.10.2010

- Feia, 25.9.2010
- Laniel 2.10.2010
Roman Ondák’s room of heights
Roman Ondák’s room of heights
Roman Ondák’s room of heights
5’ 4.3” and 5’ 9.9”
Mean (Average) of 100 AC tests

Mean = Sum / Total Count
= 599.85 / 100
= 6.00
Estimate of Population Improves with Increasing Number of Samples

Asphalt Content (%)
The standard deviation (S: Spread) is a statistic that tells you how tightly all the various examples are clustered around the mean in a set of data.
What is your firm's capability of producing within quality limits consistently?

How well can you identify, quantify, and solve production variances?
Contractors are capable of and shall receive 100% pay for achieving 90 PWL on an ongoing basis.
Normal Distributions with Different Means and Std. Dev.
QC – Mean & Spread Relationship

"Typical" $S_n$

"Smaller" $S_n$

90 PWL

75 PWL

90 PWL
Skew

Normal: Skew = 0
Hold a pre-pave meeting
Left (negative) skew
Materials (Mix Designs & QC)
Machinery (Production and Placement Equipment)
Methods (Construction Techniques)
Recommended Action Items
1% moisture = 10% Fuel

↓ moisture = ↑ Quality
Aggregate Gradation

Going in...
How worn flights affect temperatures

NEW FLIGHTS

OLD WORN FLIGHTS
Do not chase the data
Audit the system
$G_{mm}$ variability ($T^3$)
Infrared Photo
(End Dump Mix Behind Paver)
Consider hopper retrofit
Longitudinal Segregation
Kick-Back paddles
Auger ‘hold’ point

My mother always told me, ‘The devil is in the details.’
Bearing / hanger
Density testing
End of truckload segregation

86%

94%

88%

Surviving Statistically Based Specs.

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$200 $200 $200 $200 $200

$300 $300 $300 $300 $300

$400 $400 $400 $400 $400

$500 $500 $500 $500 $500

Final Challenge
Think outside the box, cross-train personnel, and perpetuate contractor ingenuity.
<table>
<thead>
<tr>
<th>Problem</th>
<th>Frequency</th>
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<tr>
<td>Varying AC content.</td>
<td>1/1</td>
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<tr>
<td>Low in-place density.</td>
<td>1/2</td>
</tr>
<tr>
<td>High minus #200.</td>
<td>1/1</td>
</tr>
<tr>
<td>Segregation.</td>
<td>1/1</td>
</tr>
<tr>
<td>Compromised ride.</td>
<td>1/1</td>
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</tbody>
</table>

- 1/1 (Meet with Ryan)
- 1/2 (Watch Jt.)
- 1/1 (Design issue)
- 1/1 (Training)
- 1/1 (Spoke with Pat)
Pareto chart of HMA problems as reported

- Lack of Action when Var. exists
- Aggregate Var.
- Testing Error
- Misinterpreting Spec's.
- Plant
Maximizing your PWL

- Asphalt Mix Design
- QC and Production
- Construction Methods

Corporate QC Director
New Way of Thinking

- “Tweaking” mixtures leads to low PWL.
- PWL effects all aspects of operations – everyone is involved with QC – materials, estimating, production, management.
Final Challenge

Organizational Realities

Individual Realities

Quality Management Realities
Questions?

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