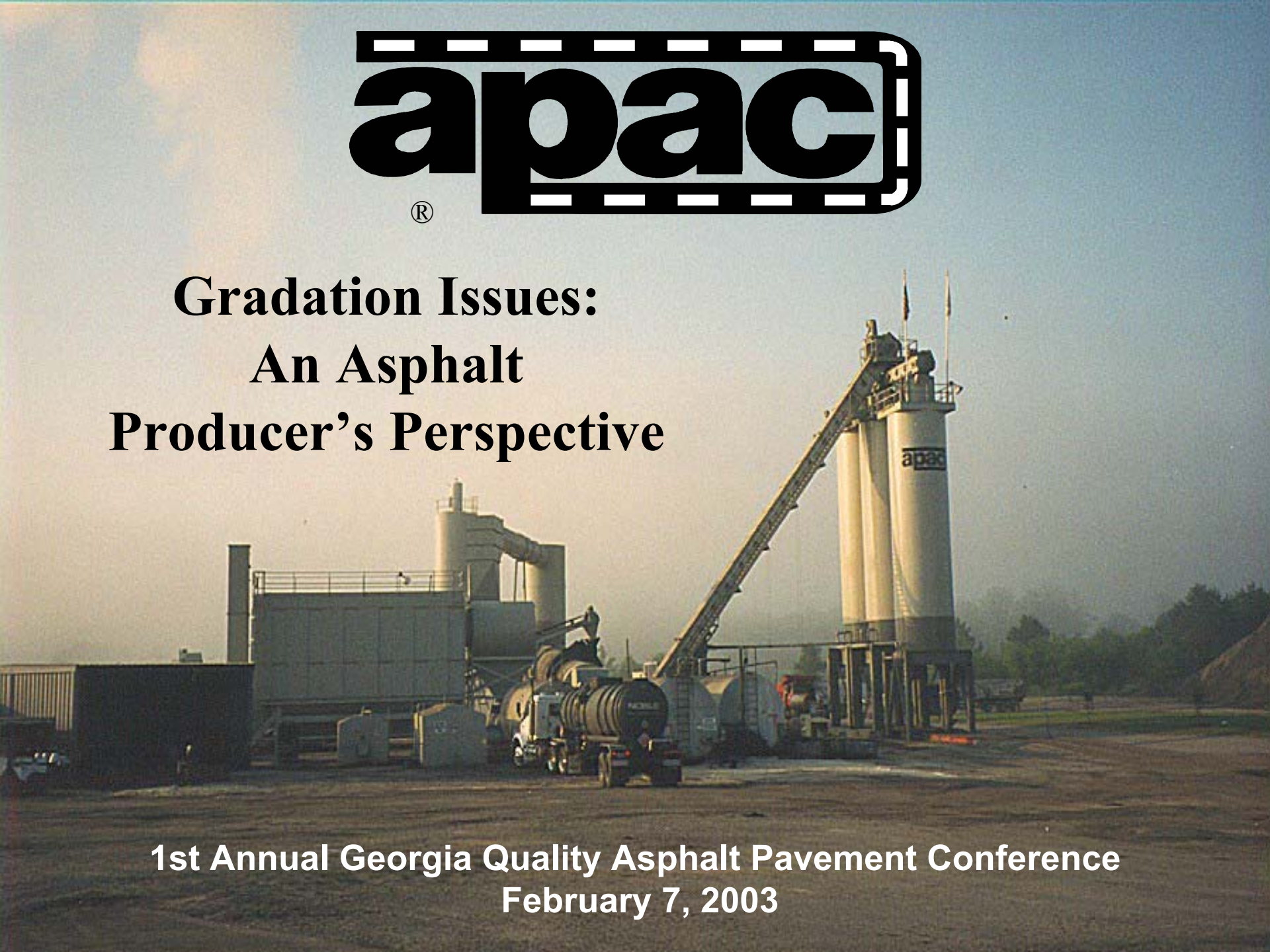
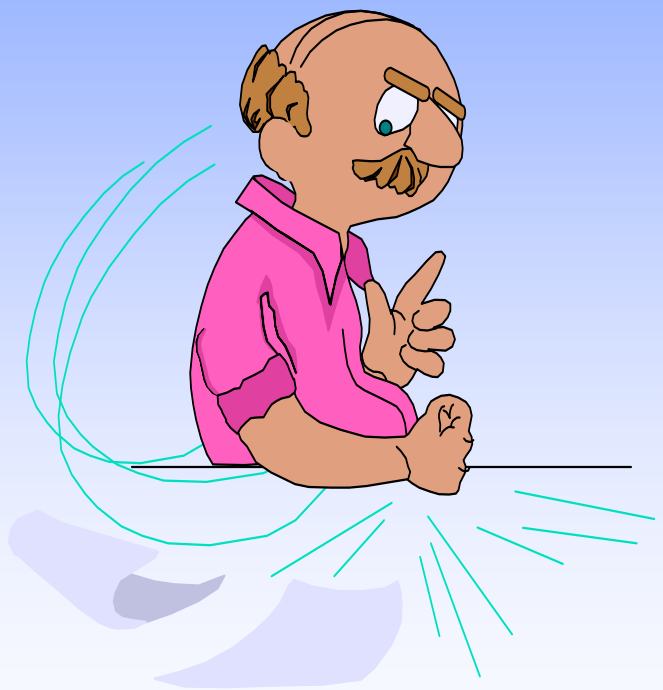


# Gradation Issues: An Asphalt Producer's Perspective

1st Annual Georgia Quality Asphalt Pavement Conference
February 7, 2003

# HMA Producer “Wish” List



- Customer Focus (Communication)
- “Cleaner” Fines
- More Product Options (Fractionation)
- Lower Variability

# Objectives

- Performance Expectations
- Production Expectations
- Greater Flexibility and Control


apac™

# “Cleaner” Fines

**What’s up with that?!?!**

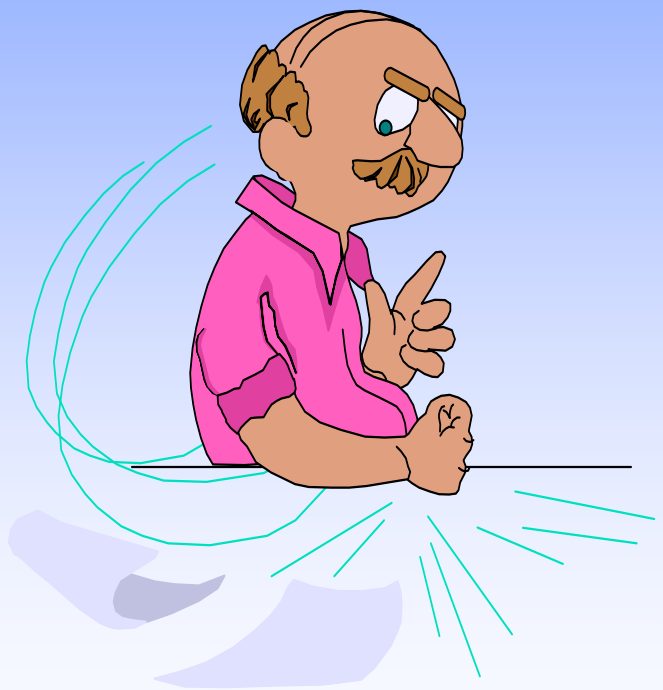
# Fractionation

"5, 6, 7, 8, 9"

# GDT Table 800.1 & ASTM D 448 Std. Sizes of Aggregate

| Size No. | Percent Passing (by weight) Each Laboratory Sieve | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 in. | 3/4 in. | 1/2 in. | 3/8 in. | No. 4 | No. 8 | No. 16 | No. 50 | No. 100 |
| 6 | 100 | 90 - 100 | 20 - 55 | 0 - 15 | 0 - 5 | - | - | - | - |
| 67 | 100 | 90 - 100 | - | 20 - 55 | 0 - 10 | 0 - 5 | - | - | - |
| 68 | 100 | 90 - 100 | - | 30 - 65 | 5 - 25 | 0 - 10 | 0 - 5 | - | - |
| 7 | - | 100 | 90 - 100 | 40 - 70 | 0 - 15 | 0 - 5 | - | - | - |
| 78 | - | 100 | 90 - 100 | 40 - 75 | 5 - 25 | 0 - 10 | 0 - 5 | - | - |
| 8 | - | - | 100 | 85 - 100 | 10 - 40 | 0 - 10 | 0 - 5 | - | - |
| 89 | - | - | 100 | 90 - 100 | 20 - 55 | 5 - 30 | 0 - 10 | 0 - 5 | - |
| 9 | - | - | - | 100 | 85 - 100 | 10 - 40 | 0 - 10 | 0 - 5 | 5 - 25 |
| 10 | - | - | - | 100 | 85 - 100 | - | - | - | 10 - 30 |

# HMA Producer “Wish” List



- Customer Focus (Communication)
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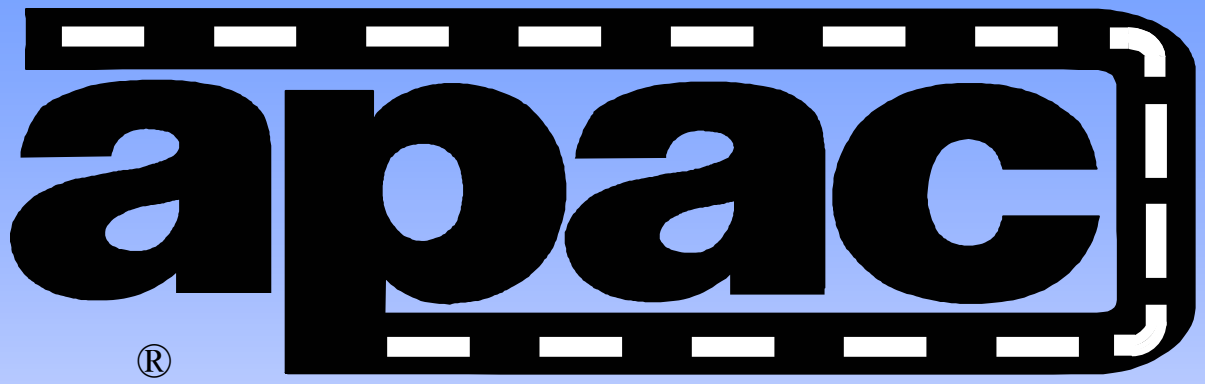
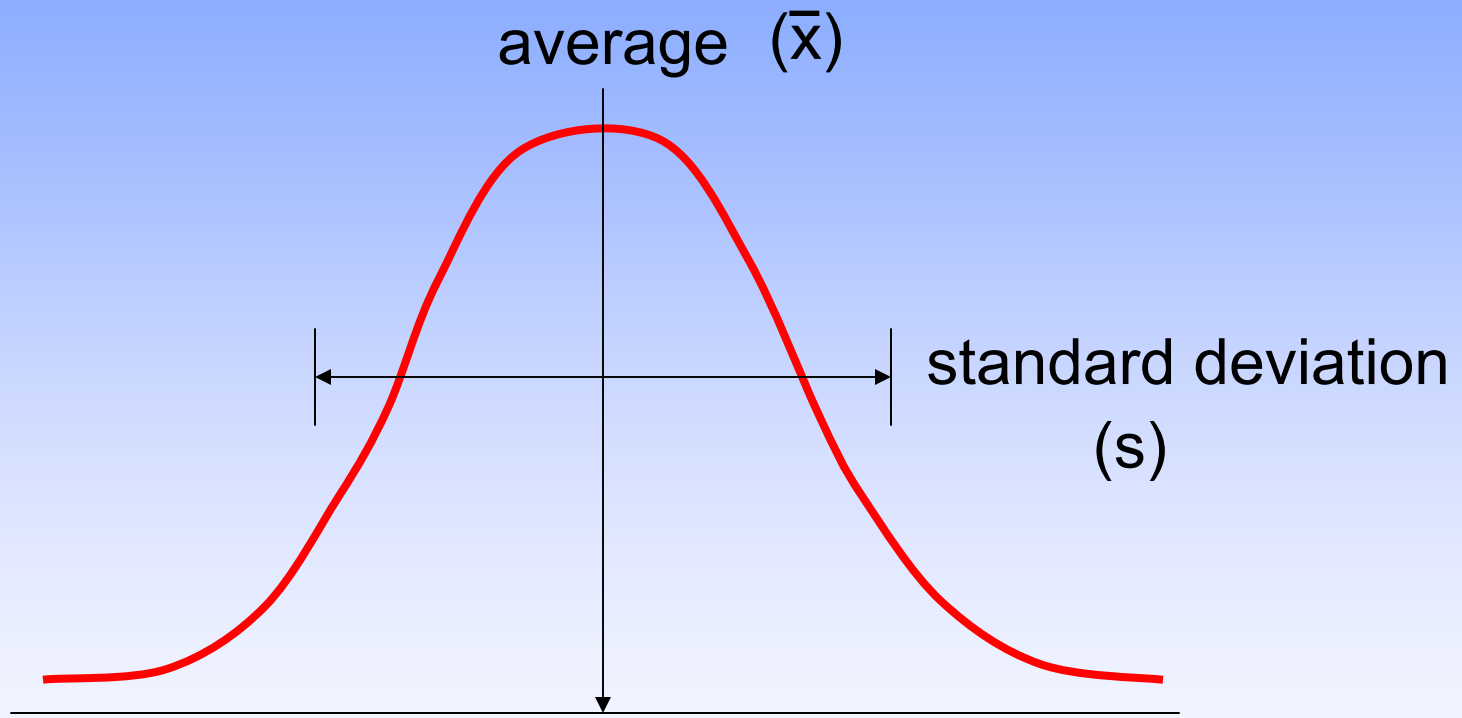



# Statistics & Sources of Variability

# Why is understanding variability important?

- Variations affect the penalties and bonuses for the mixtures.
- Understanding of variability gives us insight as to how it can be reduced.
- Reducing variability allows us to improve the consistency and quality of our pavements.
- However, only inasmuch....

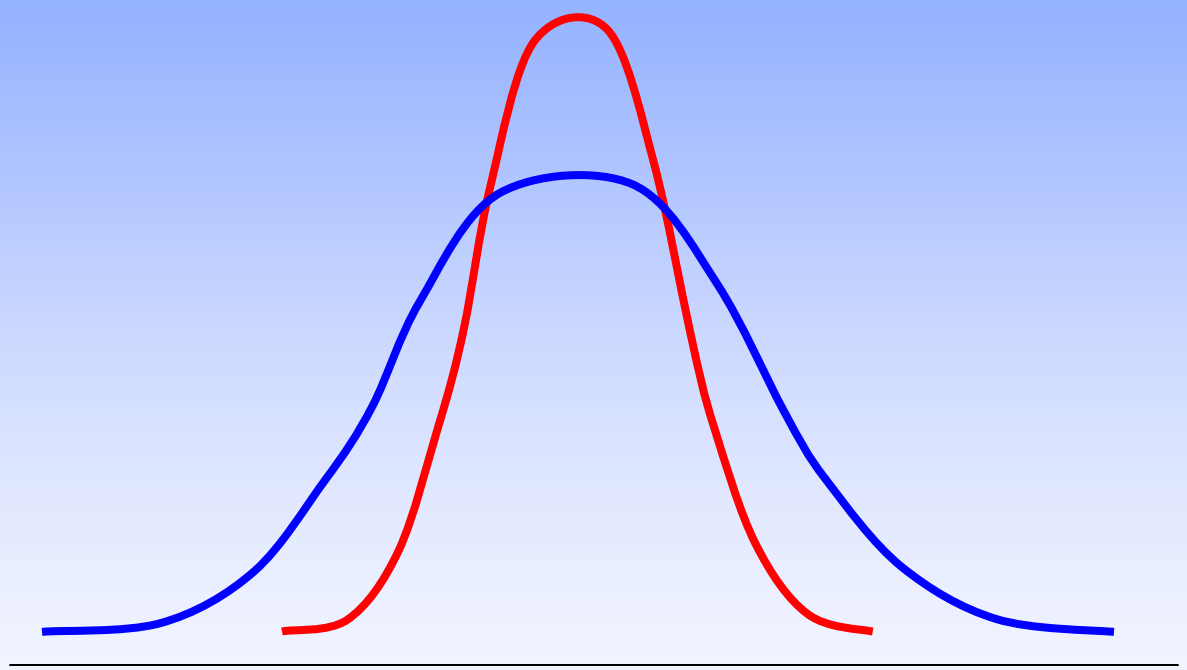
# Statistics: FYI




4.27

Standard deviation is a measure of the “spread of the data” or the variability that exists in the data.

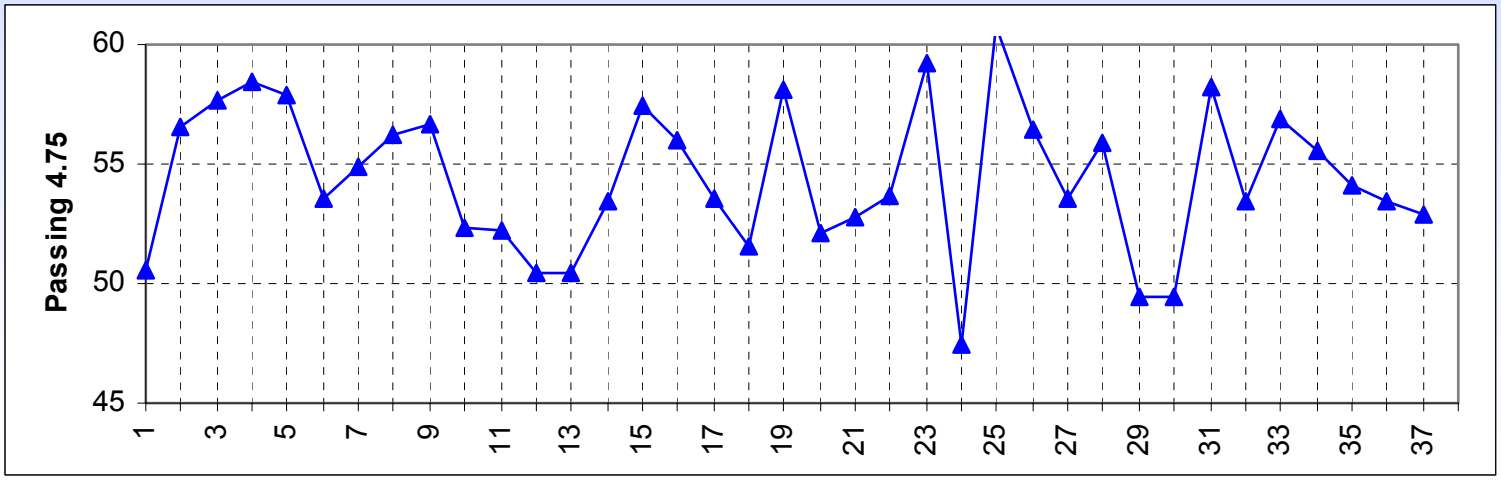
# Standard Deviation



These two normal distributions share the same average, but have different standard deviations. The blue distribution has more variability.

# Sources of Variability in Test Results

1. Sampling variability
2. Testing variability
3. **Materials variability**
4. Construction variability



# Materials Variability

- Fluctuations in gradation, asphalt content, temperature, aggregate specific gravities, etc.

- Materials variability can be caused by:
  - inconsistent plant operation
  - poor plant calibration
  - poor plant maintenance
  - poor loader operation
  - poor quality control practices
  - inconsistent raw materials

# A Word About Variability

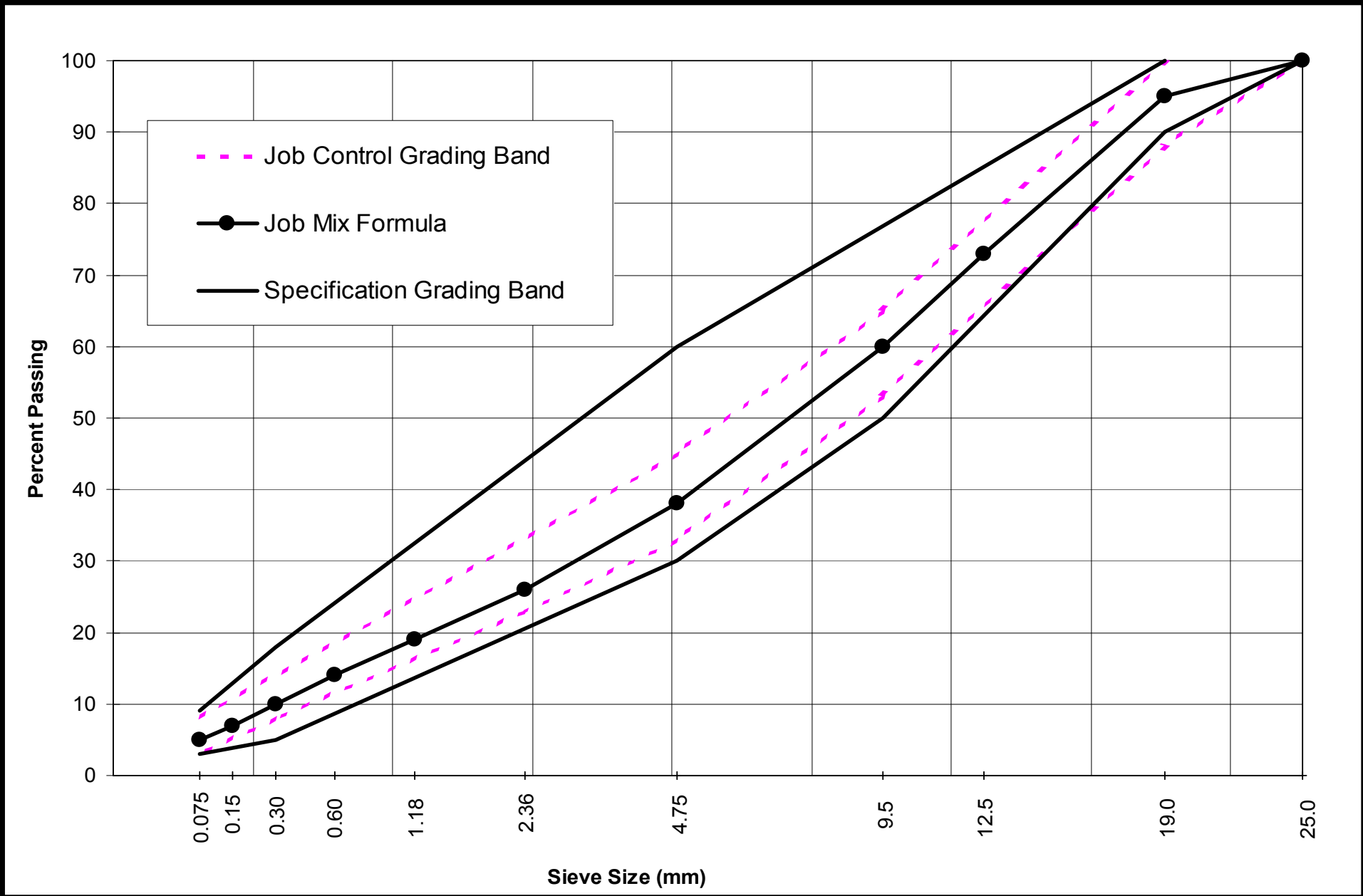
- ***Material*** variability affects ***HMA*** variability - aggregate production specifications are typically wider than HMA specifications.

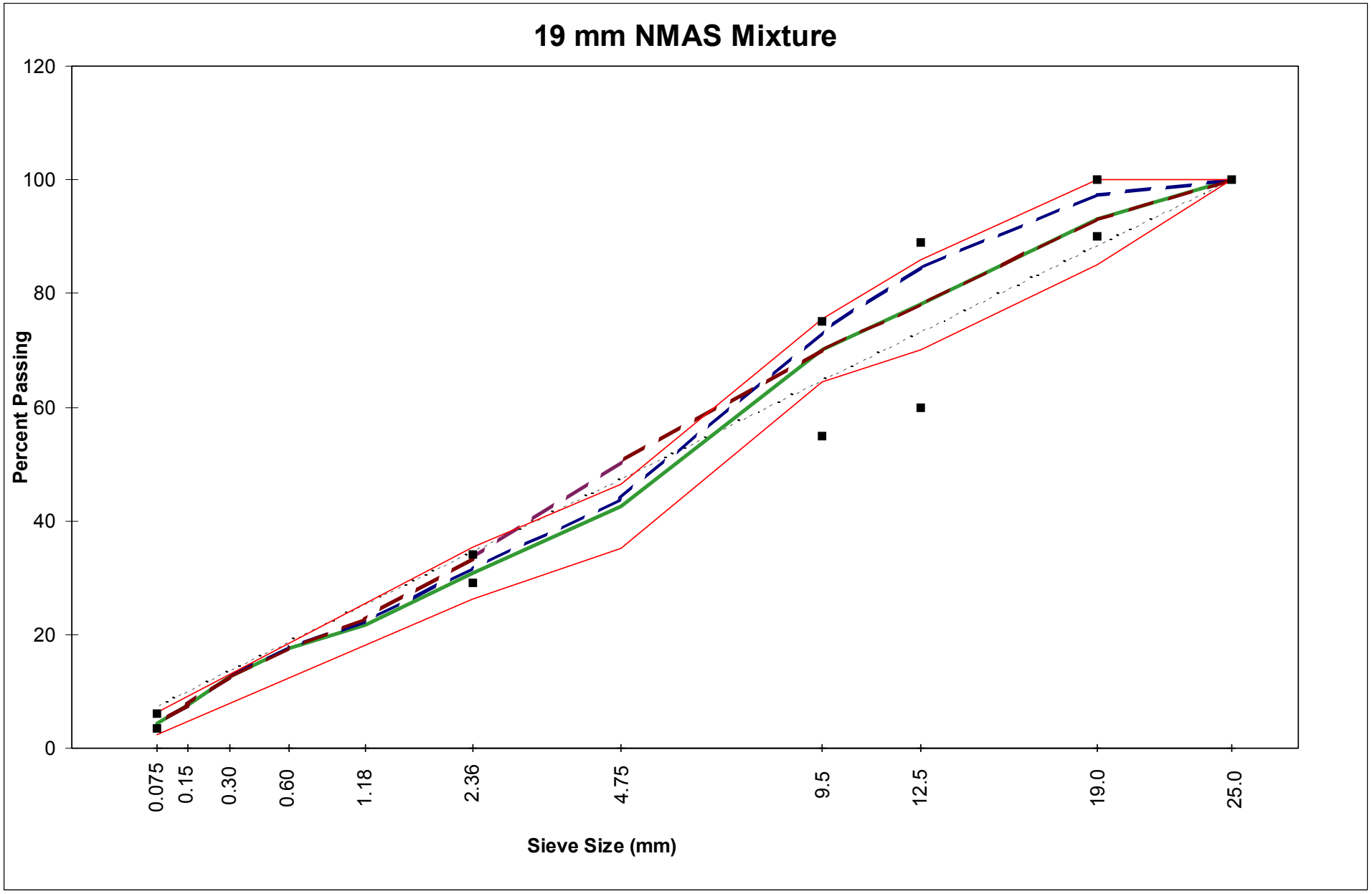
- “Specifications” ≠ “Tolerances”

# GDT Table 800.1 & ASTM D 448 Std. Sizes of Aggregate

| Size No. | Percent Passing (by weight) Each Laboratory Sieve | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 in. | 3/4 in. | 1/2 in. | 3/8 in. | No. 4 | No. 8 | No. 16 | No. 50 | No. 100 |
| 6 | 100 | 90 - 100 | 20 - 55 | 0 - 15 | 0 - 5 | - | - | - | - |
| 67 | 100 | 90 - 100 | - | 20 - 55 | 0 - 10 | 0 - 5 | - | - | - |
| 68 | 100 | 90 - 100 | - | 30 - 65 | 5 - 25 | 0 - 10 | 0 - 5 | - | - |
| 7 | - | 100 | 90 - 100 | 40 - 70 | 0 - 15 | 0 - 5 | - | - | - |
| 78 | - | 100 | 90 - 100 | 40 - 75 | 5 - 25 | 0 - 10 | 0 - 5 | - | - |
| 8 | - | - | 100 | 85 - 100 | 10 - 40 | 0 - 10 | 0 - 5 | - | - |
| 89 | - | - | 100 | 90 - 100 | 20 - 55 | 5 - 30 | 0 - 10 | 0 - 5 | - |
| 9 | - | - | - | 100 | 85 - 100 | 10 - 40 | 0 - 10 | 0 - 5 | 5 - 25 |
| 10 | - | - | - | 100 | 85 - 100 | - | - | - | 10 - 30 |

| Table 2.05 Typical Composition of Hot Mix Asphalt | | | | | |
|---|---|---|---|---|---|
| Sieve Size | Mix Designation and Nominal Maximum Size of Aggregate | | | | |
| | 37.5 mm (1 1/2 in) | 25.0 mm (1 in) | 19.0 mm (3/4 in) | 12.5 mm (1/2 in) | 9.5 mm (3/8 in) |
| | Total Percent Passing (by Weight) | | | | |
| 50 mm (2 in.) | 100 | - | - | - | - |
| 37.5 mm (1 1/2 in.) | 90 to 100 | 100 | - | - | - |
| 25.0 mm (1 in.) | - | 90 to 100 | 100 | - | - |
| 19.0 mm (3/4 in.) | 56 to 80 | - | 90 to 100 | 100 | - |
| 12.5 mm (1/2 in.) | - | 56 to 80 | - | 90 to 100 | 100 |
| 9.5 mm (3/8 in.) | - | - | 56 to 80 | - | 90 to 100 |
| 4.75 mm (No. 4) | 23 to 53 | 29 to 59 | 35 to 65 | 44 to 74 | 55 to 85 |
| 2.36 mm (No. 8) | 15 to 41 | 19 to 45 | 23 to 49 | 28 to 58 | 32 to 67 |
| 1.18 mm (No. 16) | - | - | - | - | - |
| 0.60 mm (No. 30) | - | - | - | - | - |
| 0.30 mm (N0. 50) | 4 to 16 | 5 to 17 | 5 to 19 | 5 to 21 | 7 to 23 |
| 0.15 mm (No. 100) | - | - | - | - | - |
| 0.75 mm (No. 200) | 0 to 5 | 1 to 7 | 2 to 8 | 2 to 10 | 2 to 10 |
| Asphalt Binder, Weight Percent of Total Mixture | 3 to 8 | 3 to 9 | 4 to 10 | 4 to 11 | 5 to 12 |
| | Suggested Coarse Aggregate Sizes | | | | |
| | 4 and 67 or 4 and 68 | 5 and 7 or 57 | 67 or 68 or 6 and 8 | 7 or 78 | 8 |


Job Control Grading Band
Job Mix Formula
Specification Grading Band
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
0.075
0.15
0.30
0.60
1.18
2.36
4.75
9.5
12.5
19.0
25.0
Sieve Size (mm)


19 mm NMAS Mixture
120
100
80
60
40
20
0
Percent Passing
0.075
0.15
0.30
0.60
1.18
2.36
4.75
9.5
12.5
19.0
25.0
Sieve Size (mm)

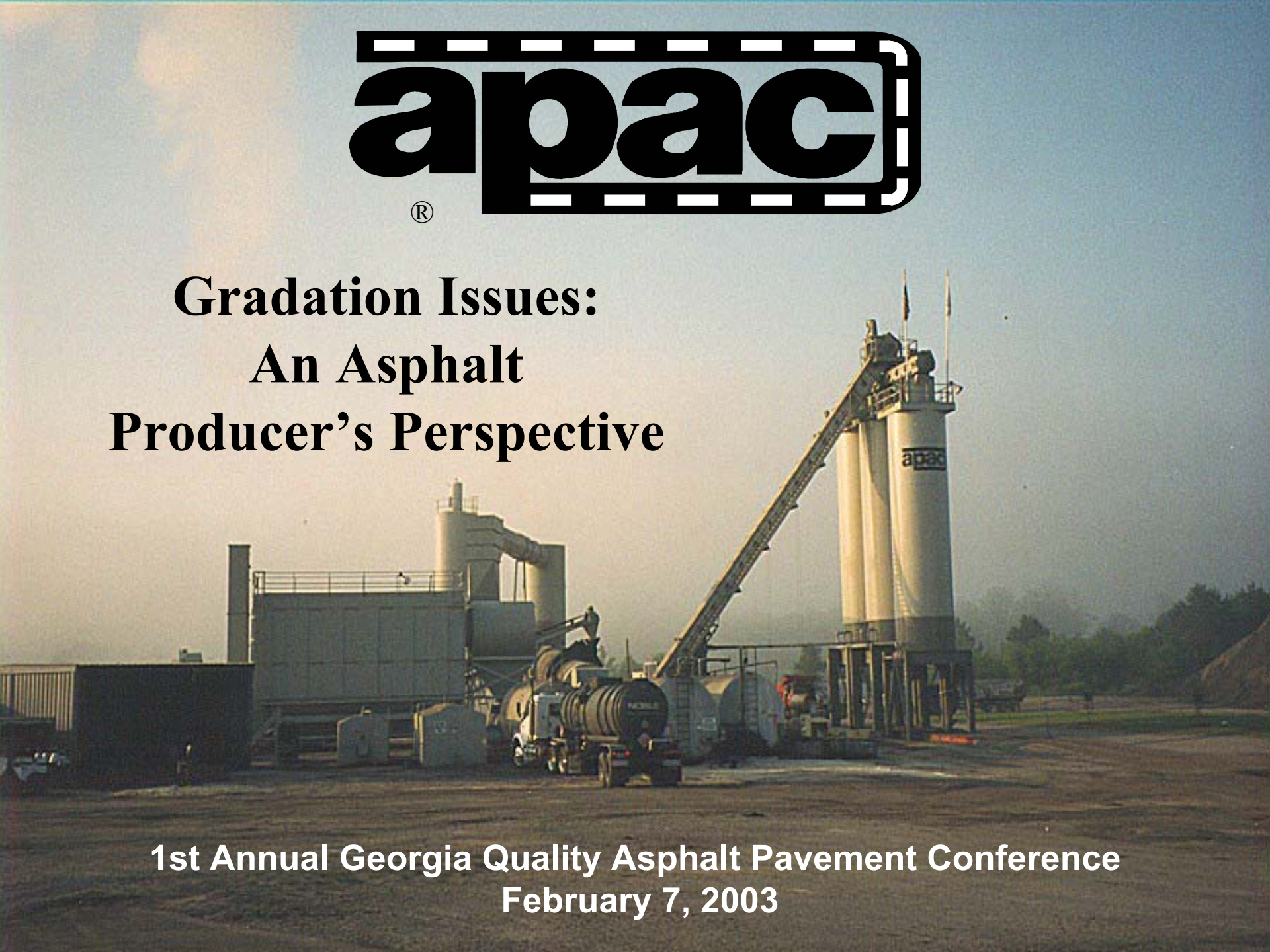
# Summary

- Performance Expectations
- Production Expectations
- Customer Focus (Communication)
- “Cleaner” Fines
- More Product Options (Fractionation)
- Lower Variability

# Keys to Success

- Change, “We must Change to Succeed”
- Positive Attitude
- Teamwork
- Creation of a Performance Based Culture

- **Consistency**
- **Communication**



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