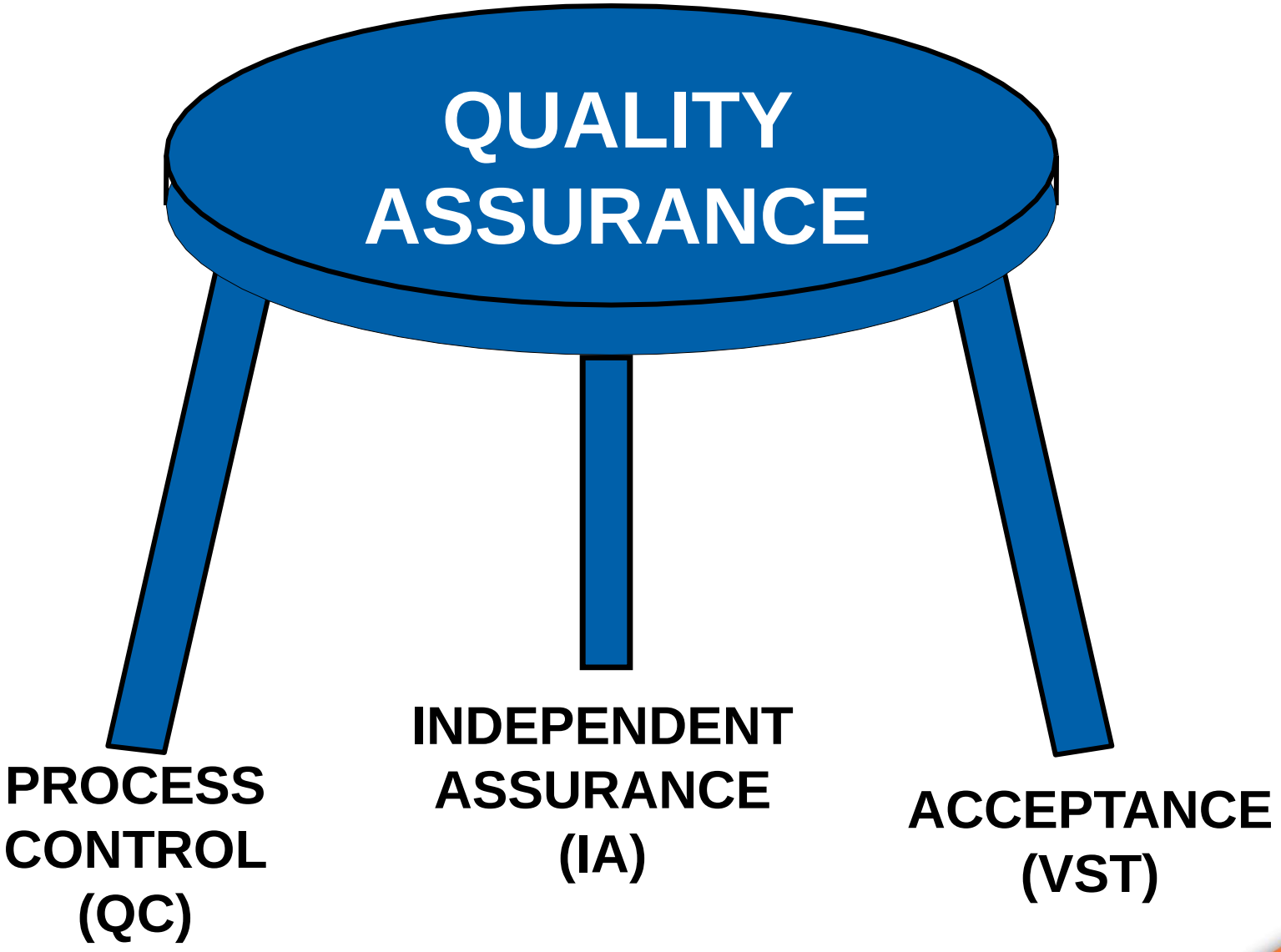
Asphalt Quality Assurance Program

W.R. Bailey, P.E.

Asphalt Regional Meetings


QUALITY ASSURANCE
PROCESS CONTROL (QC)
INDEPENDENT ASSURANCE (IA)
ACCEPTANCE (VST)

Asphalt QA Program

- **Contractor – Performs QC**
- **VDOT – Performs IA & VST**
  - **Asphalt Certification schools for contractors, inspectors and testing personnel.**
    - **Plant Certification**
    - **Field Certification**

Quality Control (QC)

- All activities performed to control the quality of the asphalt mixture during production and placement to fulfill the contractor requirements.
- Section 211
  - Mix Design
  - Contractor provides QC testing
- Section 315
  - Mix Placement
  - Contractor provides Field Control - Equipment
  - Density Testing

Independent Assurance (IA)

- **Activities that are an unbiased and an independent evaluation of all Operations, sampling and testing procedures, and equipment used in the acceptance program.**

- **VDOT provides IA during production and placement**
  - **Inspection – observations**
  - **Split sample tests**
  - **Evaluations of Technicians**

- **AASHTO Materials Reference Laboratory**

Verification Sampling and Testing (VST)

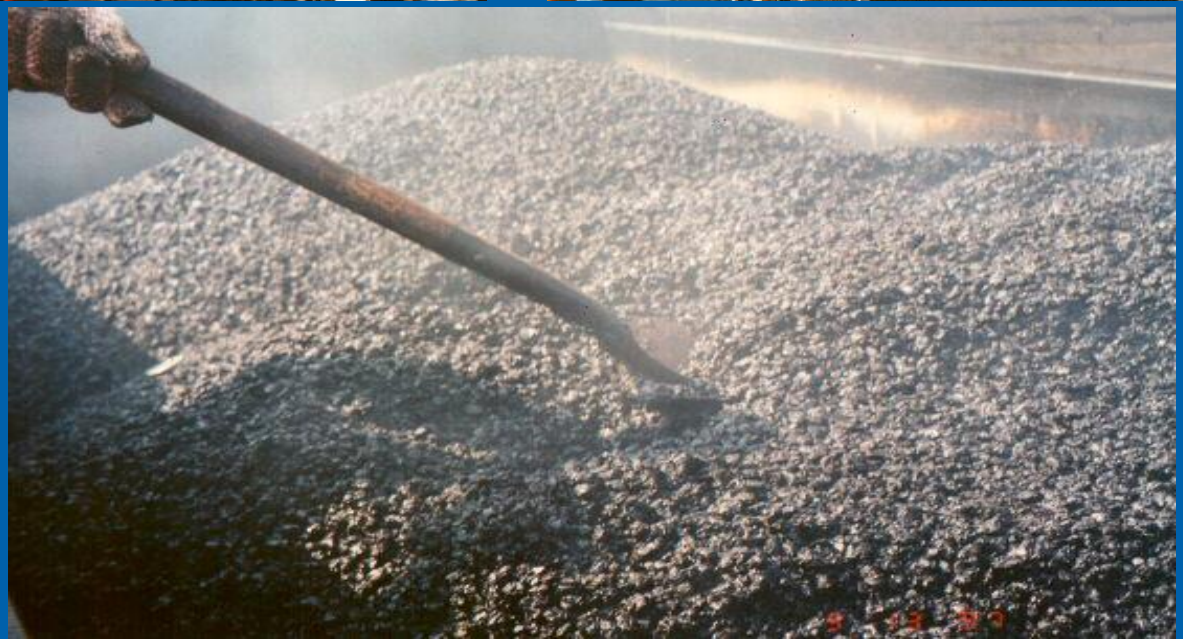
- Validate the quality of the product
  - Performed by VDOT
- VST should determine if the material is acceptable per specification.
- VDOT uses split samples plus a statistical process of examining Contractor QC test data to verify the accuracy of sampling and testing used in the acceptance decision.
  - Plant
- VDOT uses independent samples
  - Field

Mix Design Approval Process

- Contractor submits mix design laboratory data and forms to VDOT for initial approval.
- Limited production - contractor can produce up to 500 tons or one day's production. Gyratory samples taken and analyzed by both VDOT and Contractor for compliance with Specification requirements and conformance to submitted mix design.
- Full production approval granted after a successful limited production trial.

Asphalt Plant Quality Control

Random Truck Sampling



Sample Splitting

Asphalt Plant QA

VDOT uses the Contractor's test data (QC) in the acceptance of plant produced Asphalt mixtures

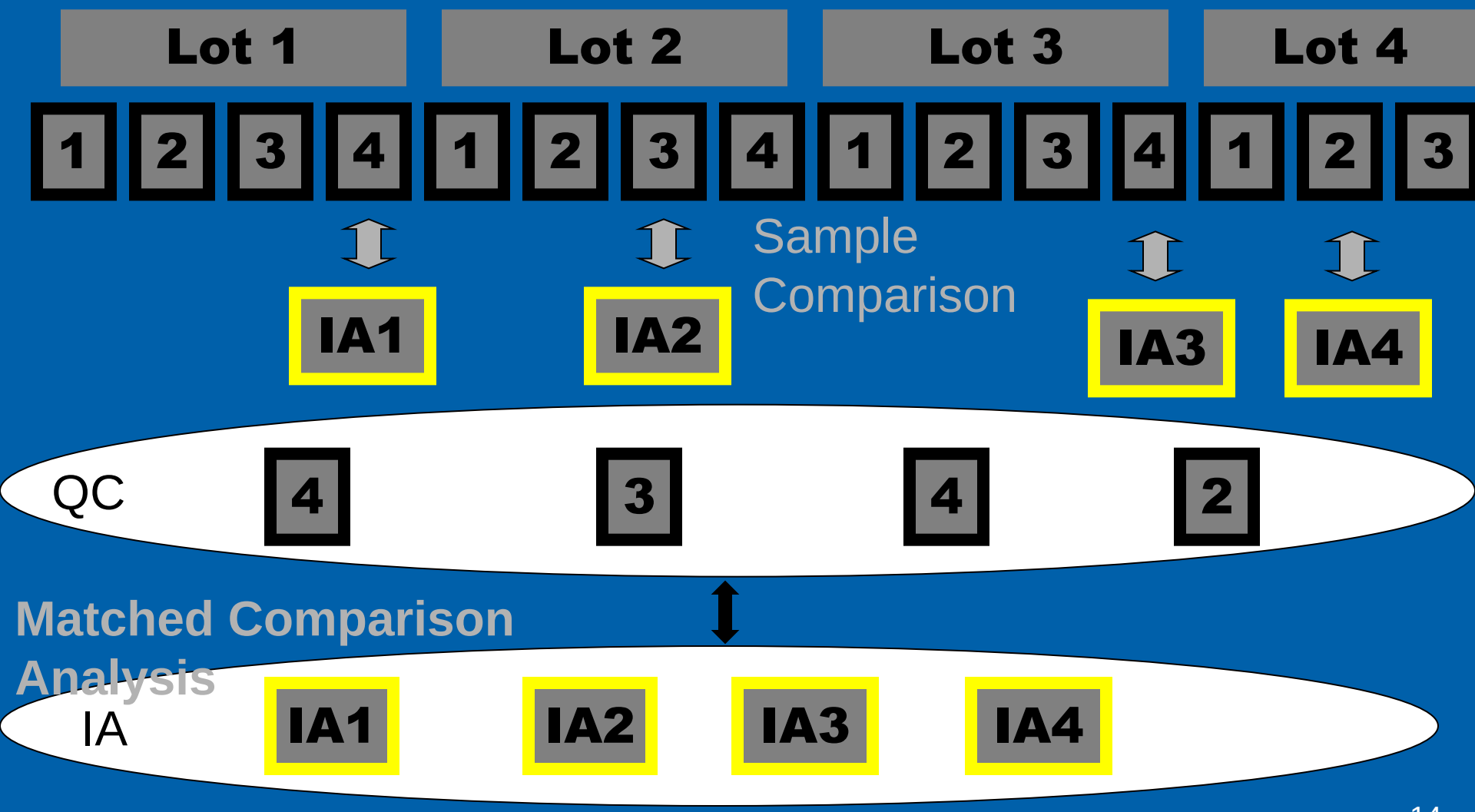
Producer Samples and Tests (QC)

- **Perform Gradation and Asphalt Content testing randomly every 500 tons**
- **Temperature Measurements 1st and 5th load then at least once an hour**
- **Volumetric SUPERPAVE tests every 1,000 tons**
  - **Air Voids (VTM)**
  - **Voids in Mineral Aggregate (VMA)**
  - **Voids filled with Asphalt (VFA)**
  - **Rice test – Maximum Specific Gravity (G_{mm})**

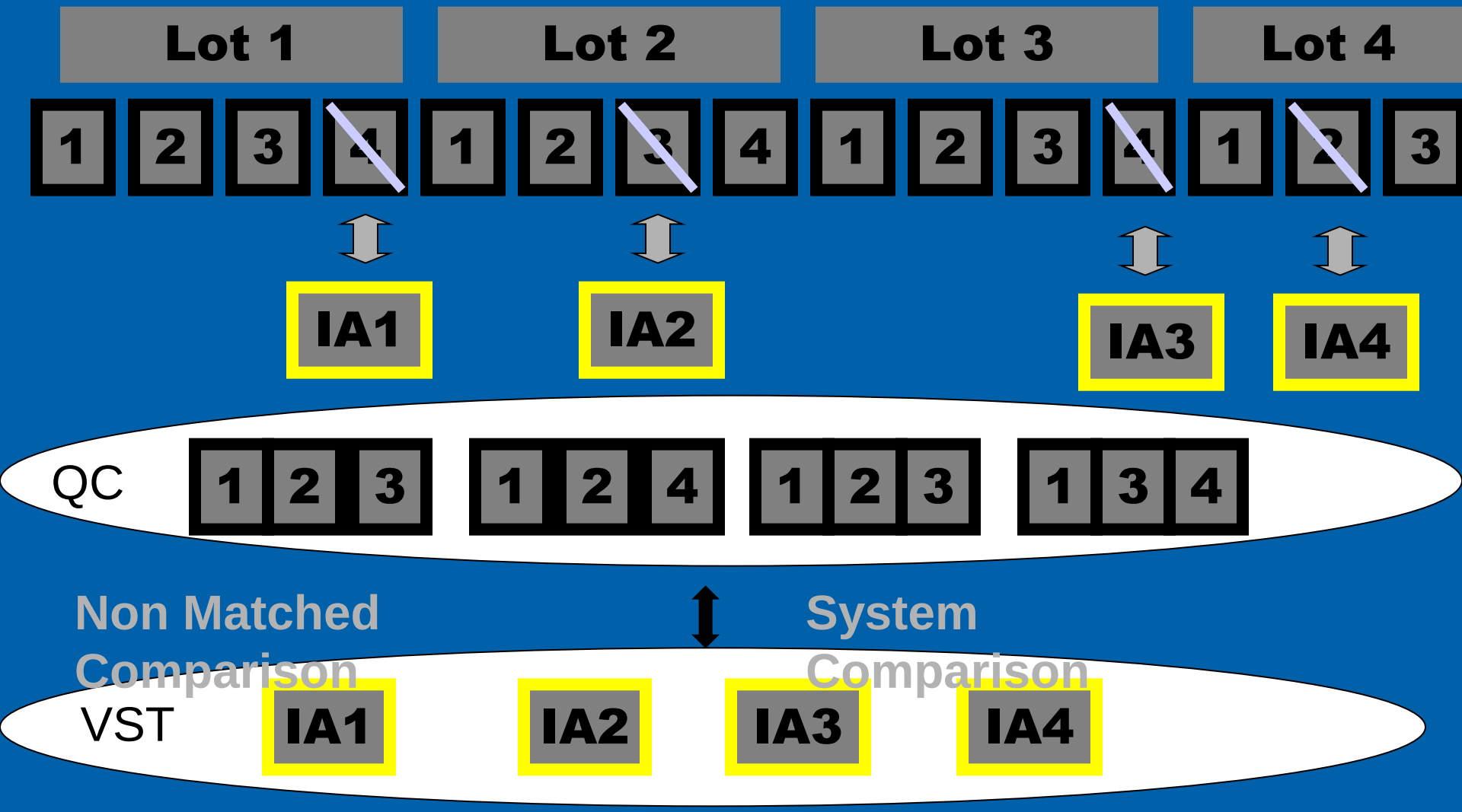
VDOT Responsibilities, Samples and Tests

- **Inspect Plant equipment and lab for compliance with specifications – IA**
- **Split sample tests for gradation and Asphalt Content are used for system wide IA and VST purposes**
- **Volumetrics SUPERPAVE tests used for verification purposes.**
  - **Air Voids (VTM)**
  - **Voids in Mineral Aggregate (VMA)**
  - **Voids filled with Asphalt (VFA)**
  - **Rice test – Maximum Specific Gravity (G_{mm})**

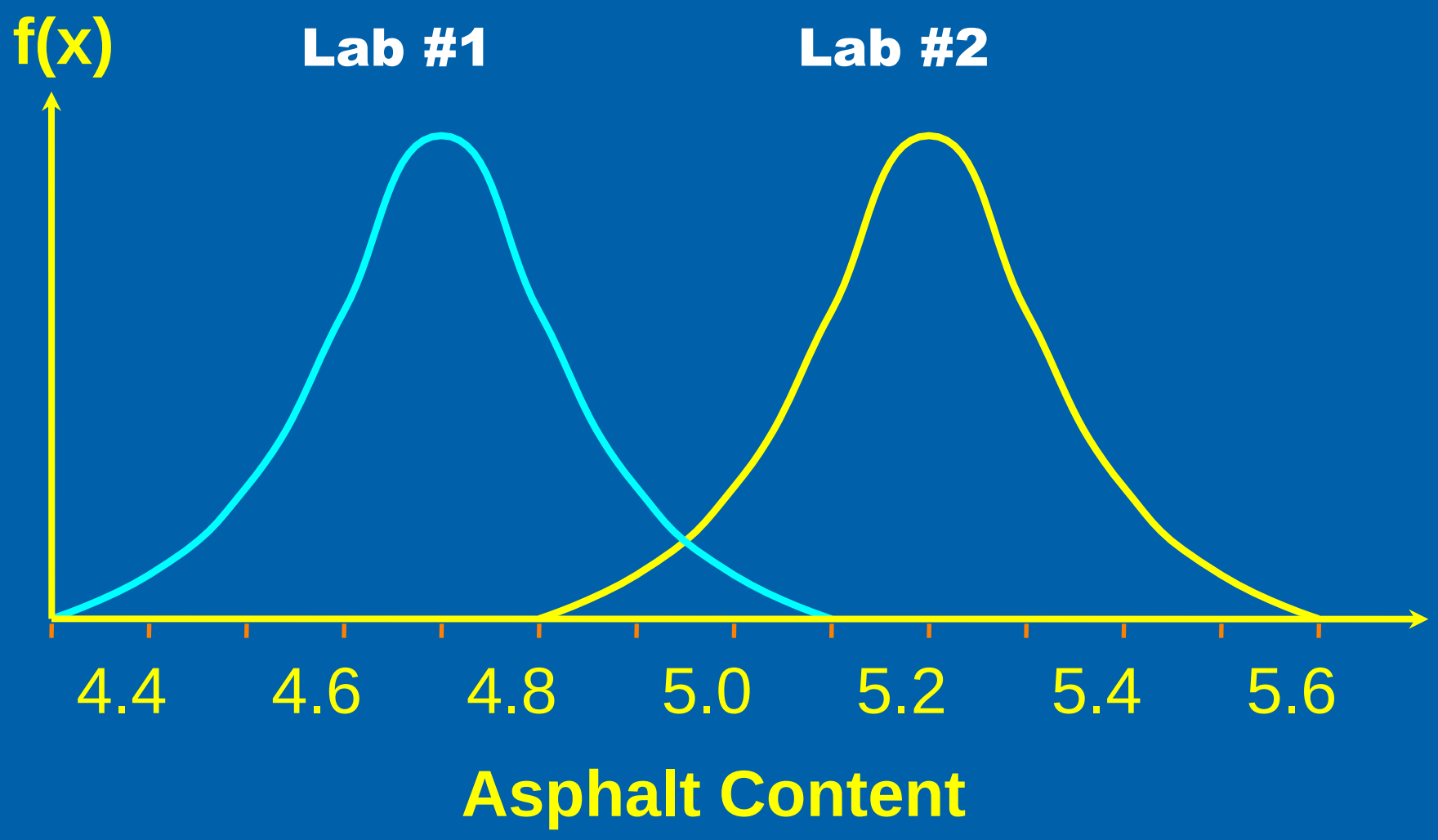
Independent Assurance



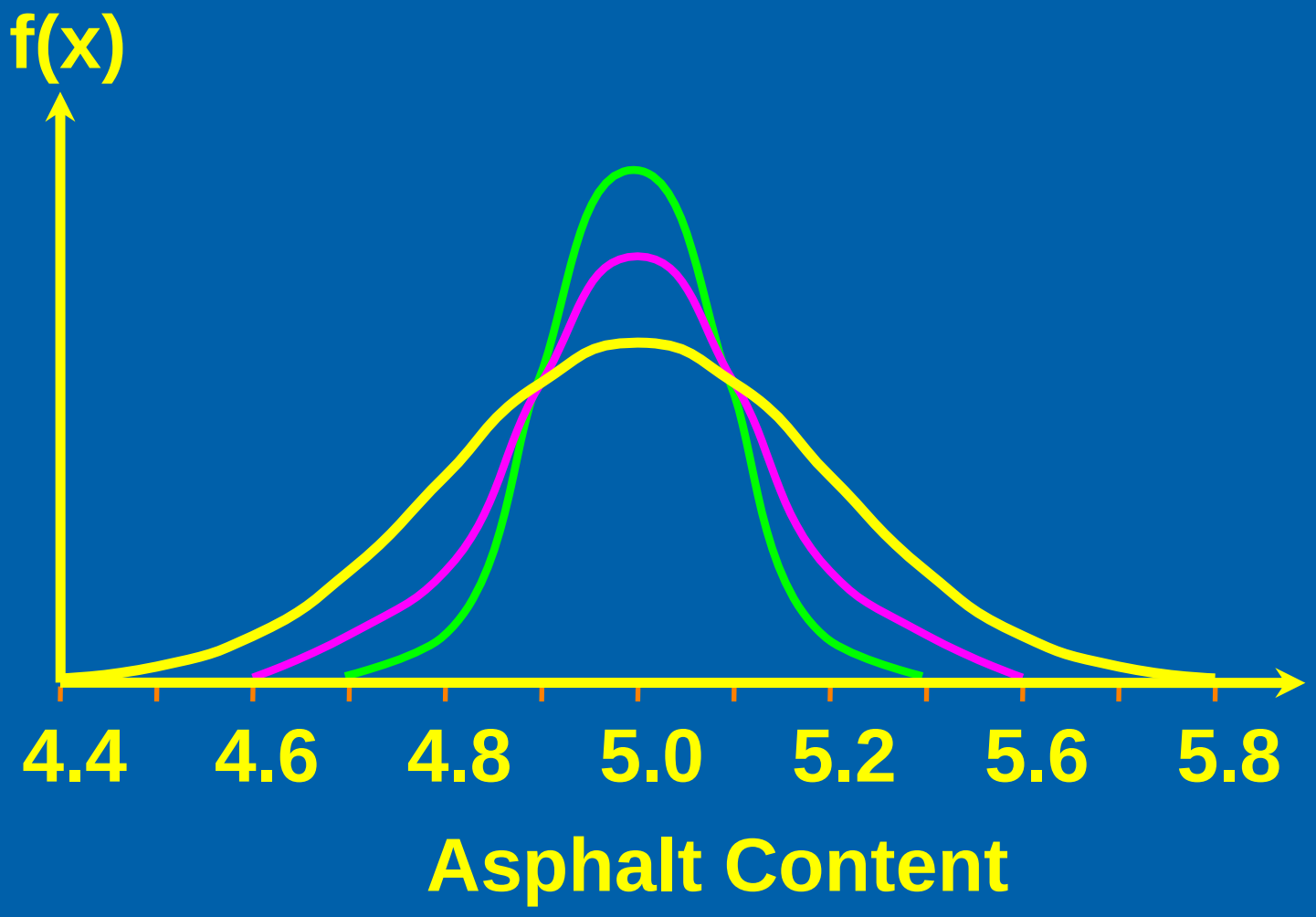
VST


Lot 1
Lot 2
Lot 3
Lot 4
1 2 3 4
1 2 3 4
1 2 3 4
1 2 3
IA1
IA2
IA3
IA4
QC
1 2 3
1 2 4
1 2 3
1 3 4
Non Matched Comparison
System Comparison
VST
IA1
IA2
IA3
IA4

Comparison Reports



Comparison Reports

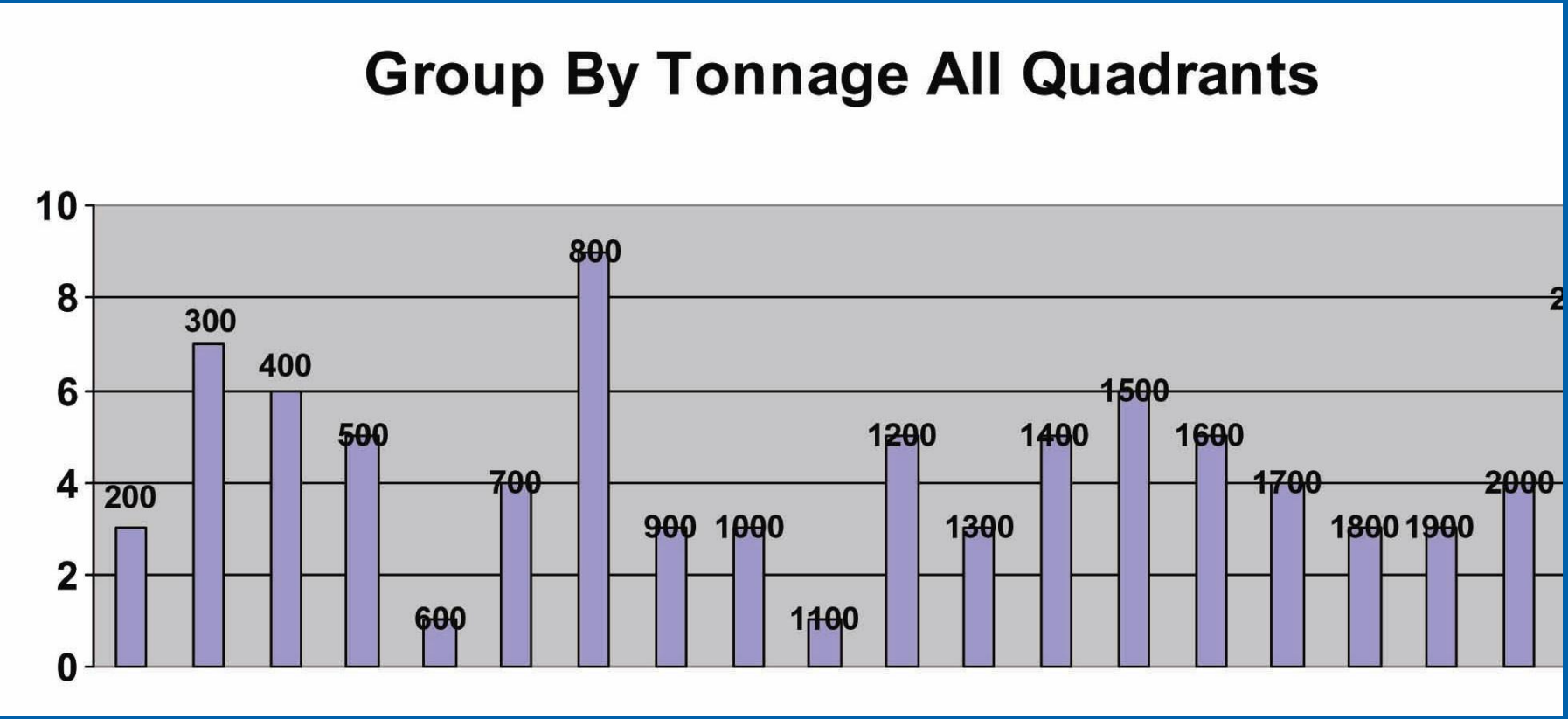


Asphalt MITS - PLAID Reports

- Statistical Tests are performed on both Split Comparison and IA Samples.
- Any non comparison must be investigated, resolved and documented.

Assessment of Random Samples

Is this random?



Summary – Asphalt Plant QA

- Statistics is the tool that VDOT uses to verify the quality of asphalt mixtures.

Asphalt Field Quality Assurance

Contractor Field QC Testing

- Depth Checks
- Cross Slope
- Straight Edge Transverse Joints
- QC Density testing either by Thin Lift Nuclear gauge or through cores/plugs
  - Joint Density
- Test and Test frequency will be determined by Road & Bridge Specifications, Special Provisions or as directed by the Engineer
- Cut plugs for VST at direction of Materials QA technician.

VDOT Project Staff Responsibilities IA

- Verifies Paving equipment meets specifications
- Verifies materials being used are from approved sources
- Take Temperature measurements of AC at least every hour
- Verifies that contractor personnel are performing QC operations correctly
- Verifies Density testing being performed
  - Joint Density


218.0
°F
MAX 219

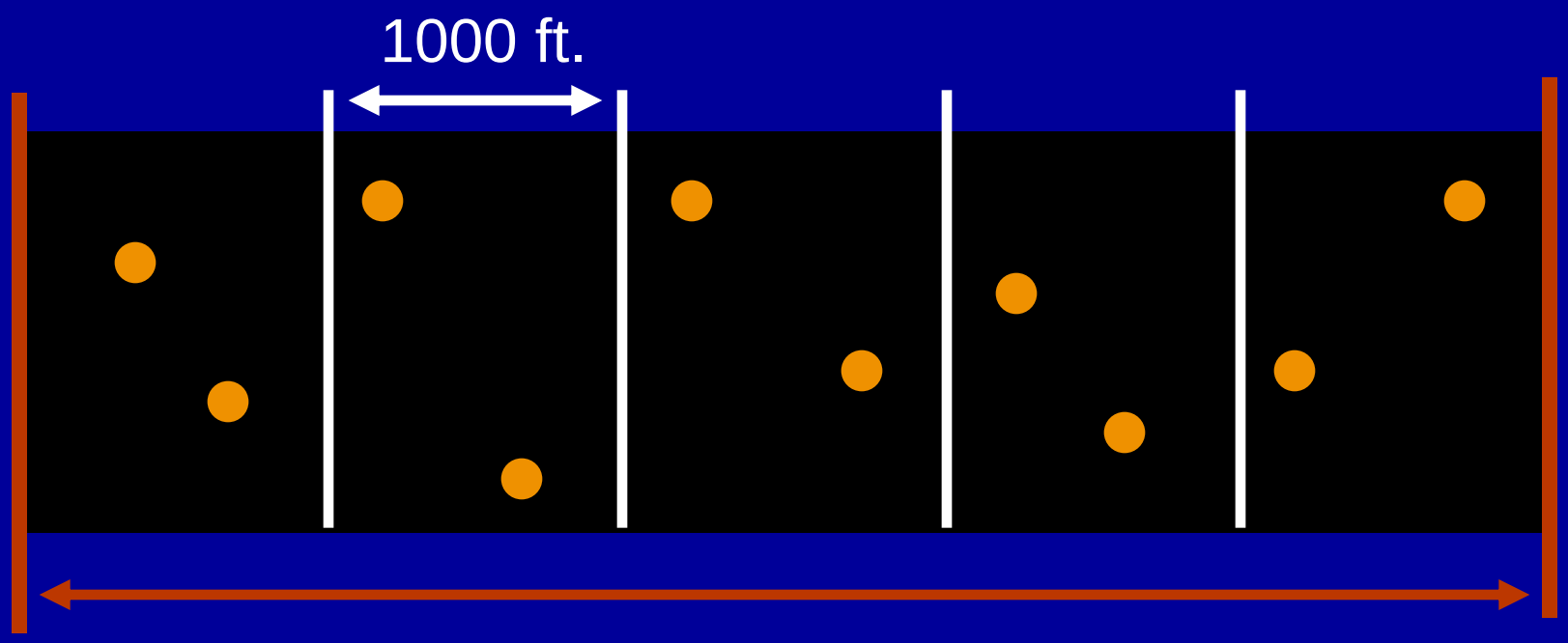
VDOT/Materials VST and IA

- Perform VST testing on plugs
- IA testing
  - Verify method of random selection
  - Marking of test locations
  - Observe QC testing at control strip
  - Observe test sections.
  - Obtain samples of cores from control strip to reweigh in laboratory.
- Depth Control tests

Asphalt Density
Virginia Test Method
VTM-76

- **Stratified Random Locations - QC**
  - Control Strip
  - Test Sections
- **Cores for Control Strips - IA**
  - 6 cores for new mixes
    - 2 cores per site
  - 2 cores

STRATIFIED RANDOM LOCATIONS

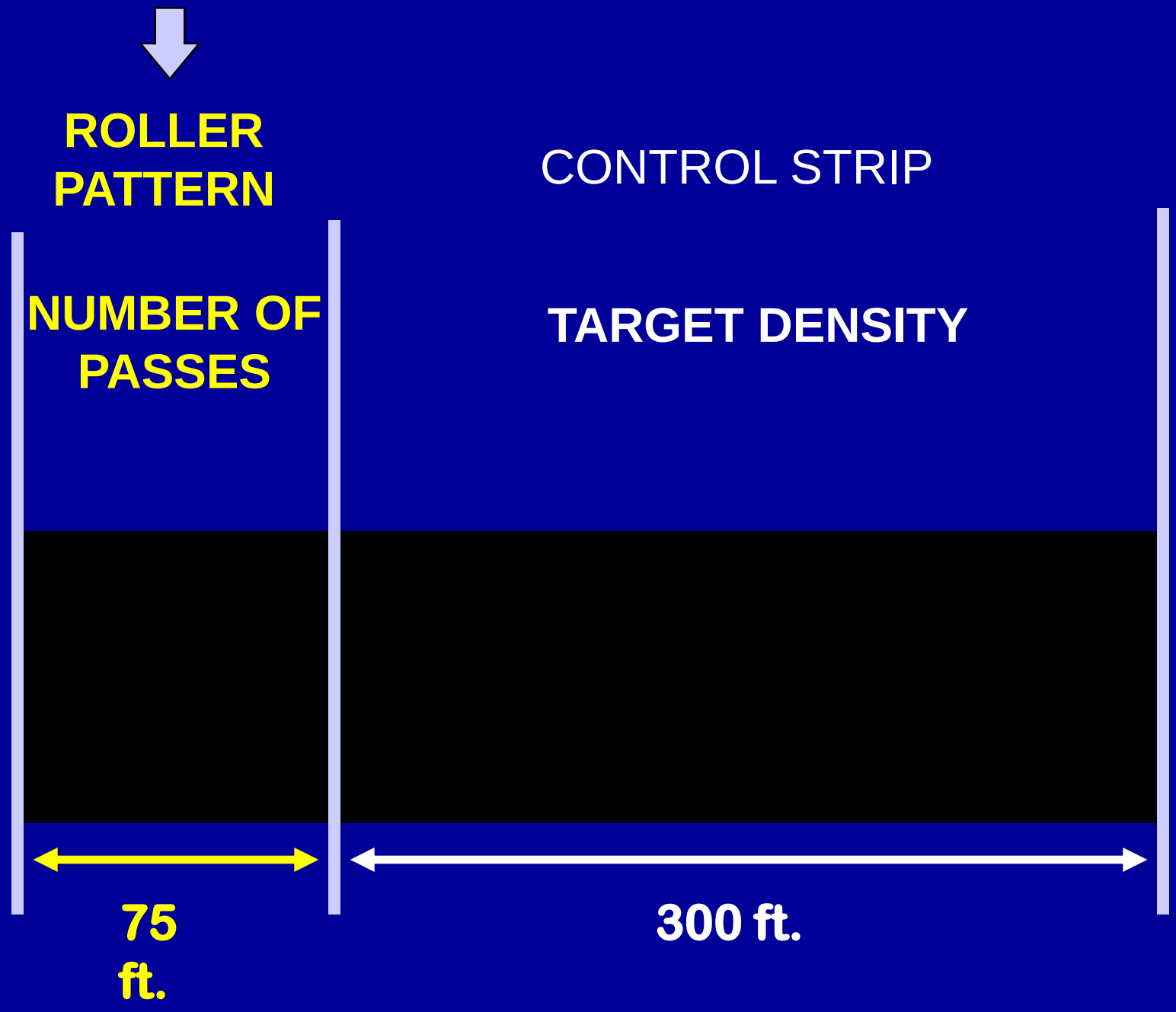


5000 FEET

1000 FOOT SECTIONS

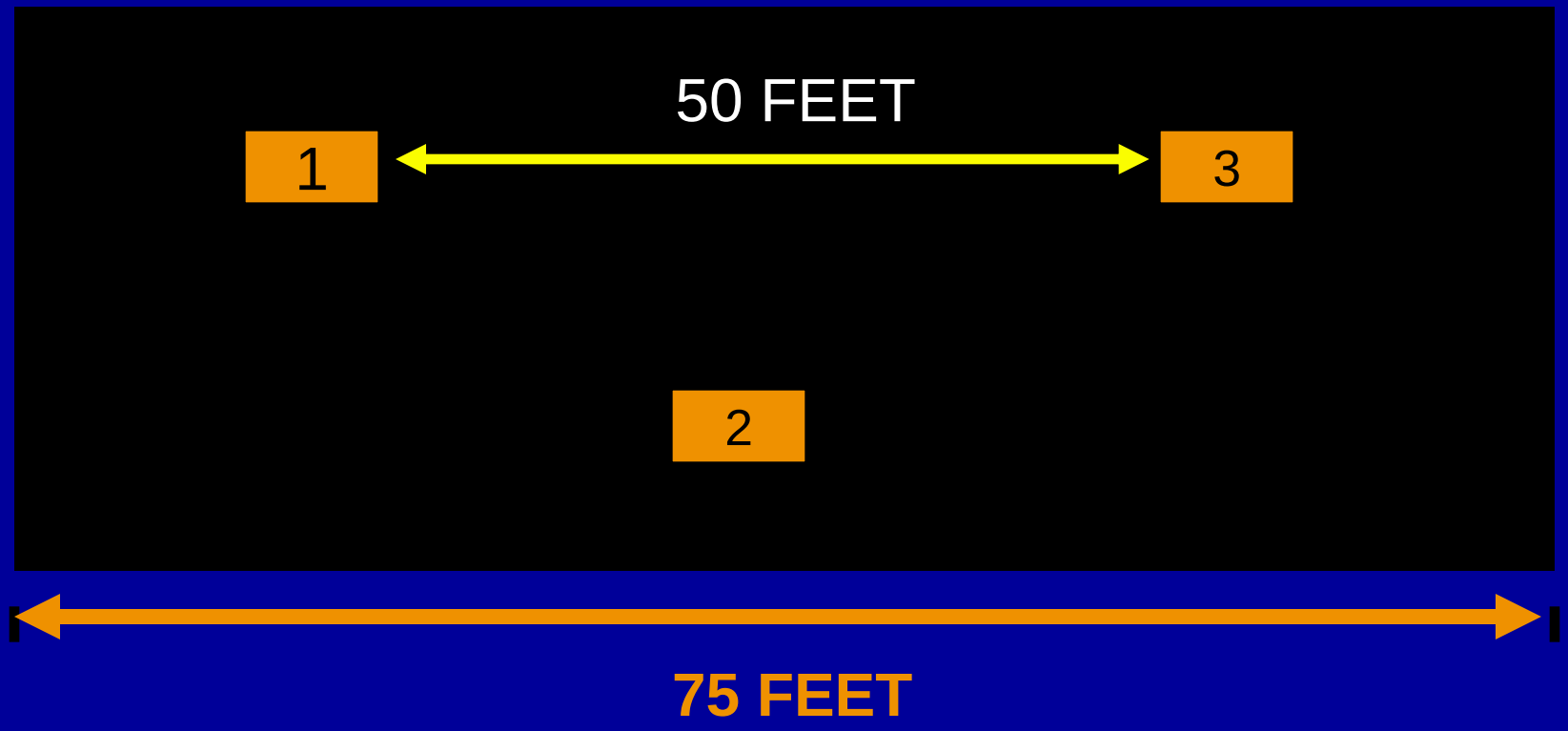
TEST SECTION


CAT
CAT


ROLLER PATTERN
CONTROL STRIP
NUMBER OF PASSES
TARGET DENSITY
75 ft.
300 ft.

TROXLER
4640-B
THIN LAYER DENSITY GAUGE

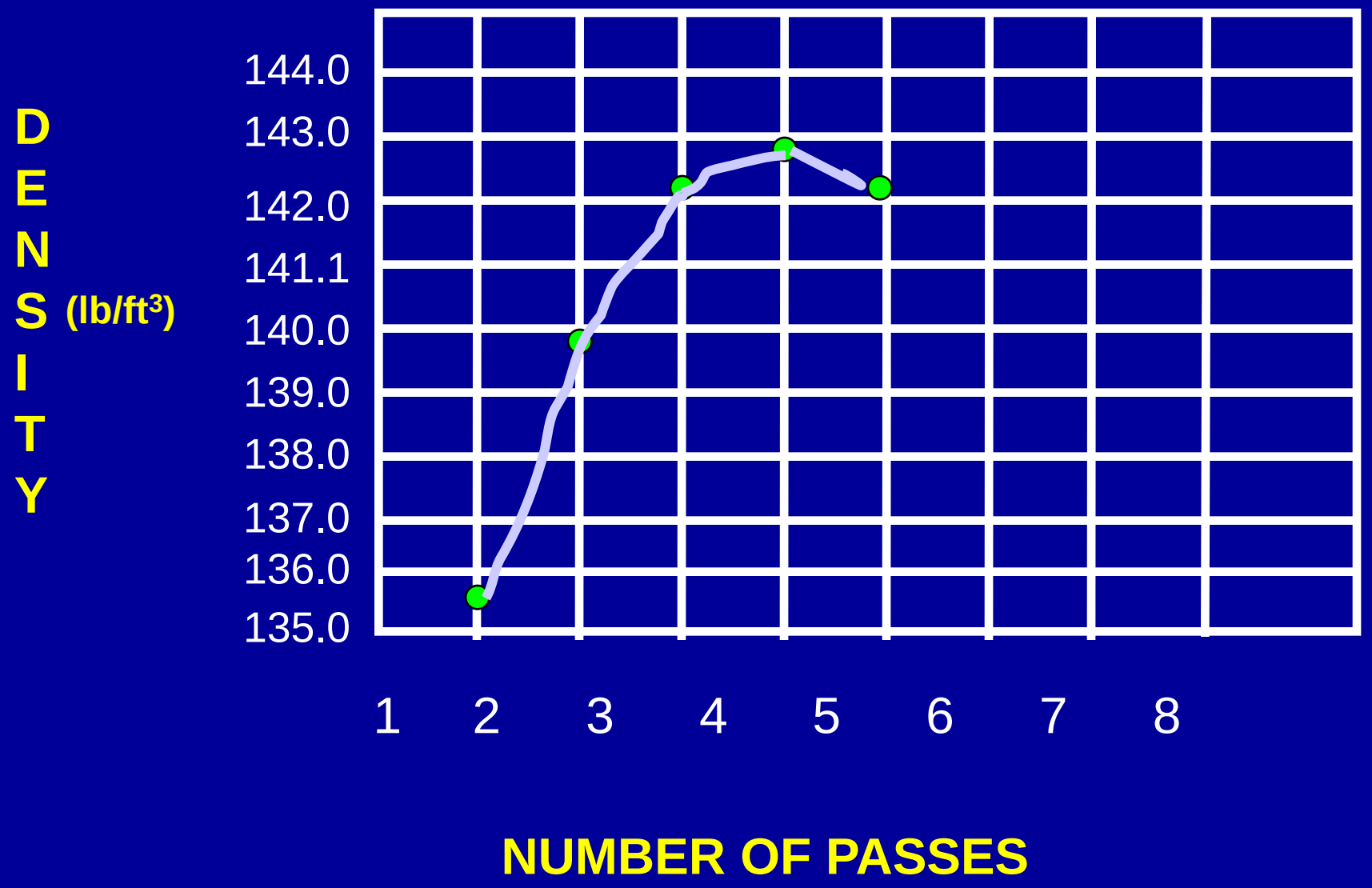
TEST THREE LOCATIONS



MARK TEST LOCATIONS

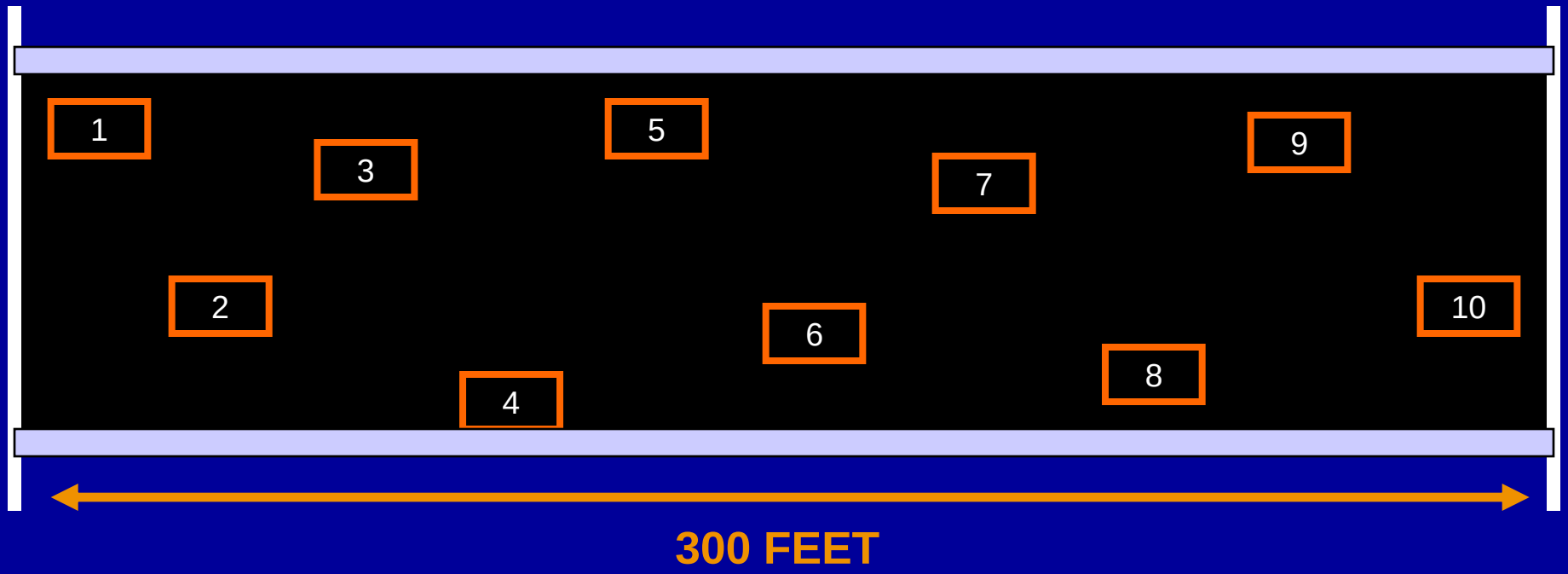
ORIENT GAUGE IN SAME DIRECTION

DENSITY vs NUMBER OF PASSES




VTM-76

CONTROL STRIP



TAKE READINGS AT LEAST 1 FOOT FROM EDGE OF PAVEMENT

Using 5 roller passes

Core locations are marked for cutting.


N

Cores are cut …

VTM-76

...and carefully removed

VTM-76


igloo

MINIMUM DENSITY REQUIREMENT

(Bulk Specific Gravity / Max Specific Gravity) * 100

(Table III-3)

TABLE III-3 Density Requirements

Mixture Type	Min. Control Strip Density (%)
SM-9.5A, 12.5A	92.5
SM-9.5D, 12.5D	92.2
SM-9.5E, 12.5E	92.2
IM-19.0A	92.2
IM-19.0D	92.0
BM-25.0	92.2

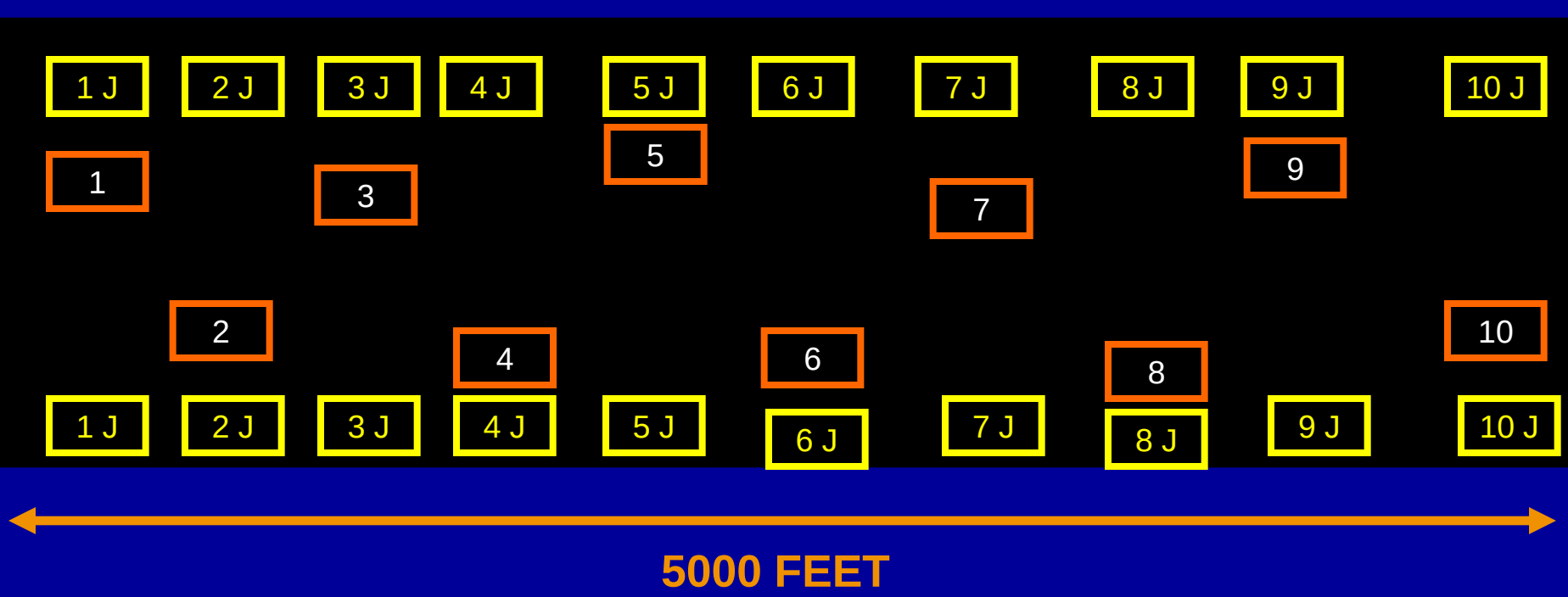
Note: The control strip density requirement is the percentage of theoretical maximum density at the job-mix formula as determined by Superpave Mix Design.

Nuclear Gauge

Calibrated

Same gauge used at Control Strip

QC Density Test Section

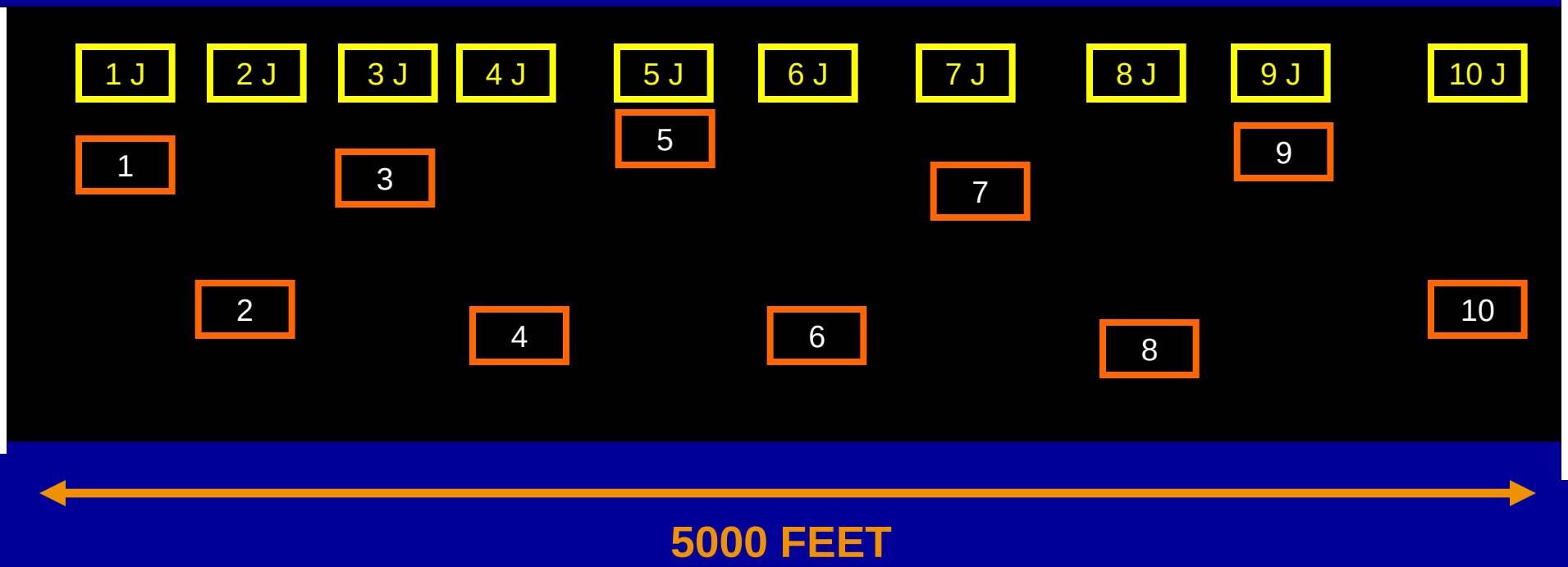


TAKE READINGS AT LEAST 1 FOOT FROM EDGE OF PAVEMENT

Average of 10 readings (98 – 102% of control strip)

Density Readings 4 or 6 inches from the Joint

QC Density Test Section

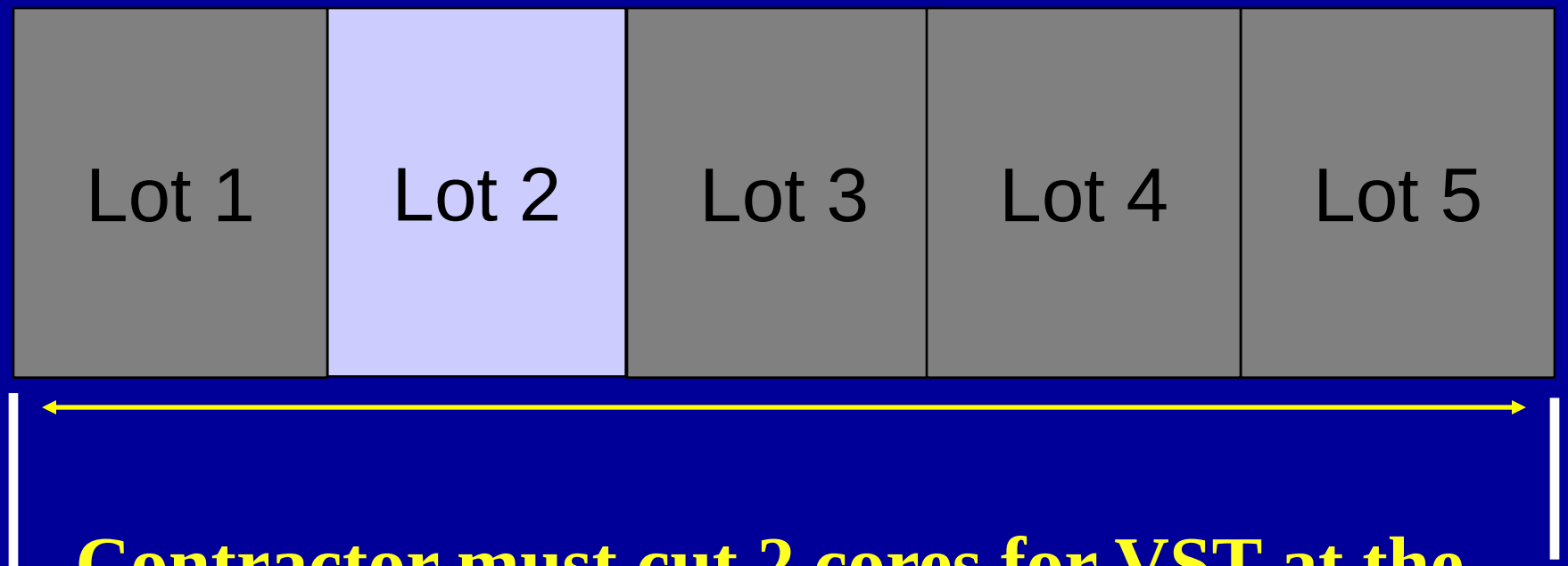


TAKE READINGS AT LEAST 1 FOOT FROM EDGE OF PAVEMENT

Average of 10 readings (98 – 102% of control strip)

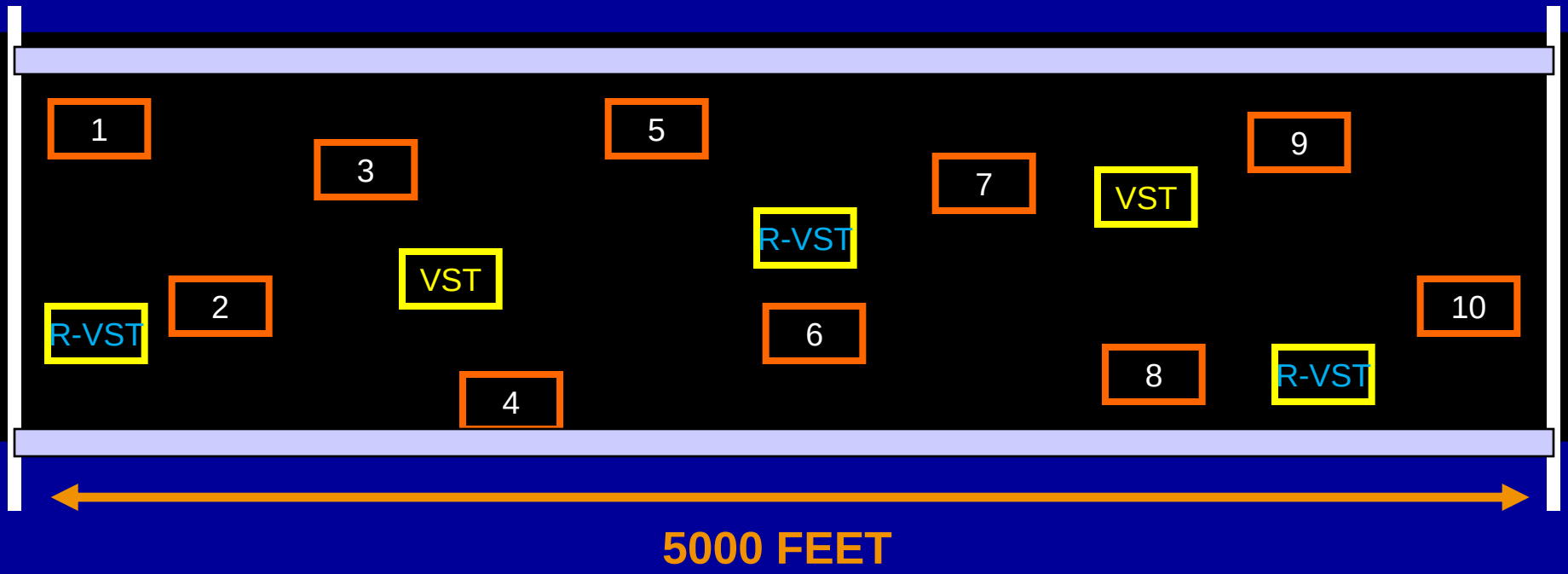
Density Readings 4 or 6 inches from the Joint

Select one Test Section for VST



Contractor must cut 2 cores for VST at the direction of VDOT

VST Density Test Section

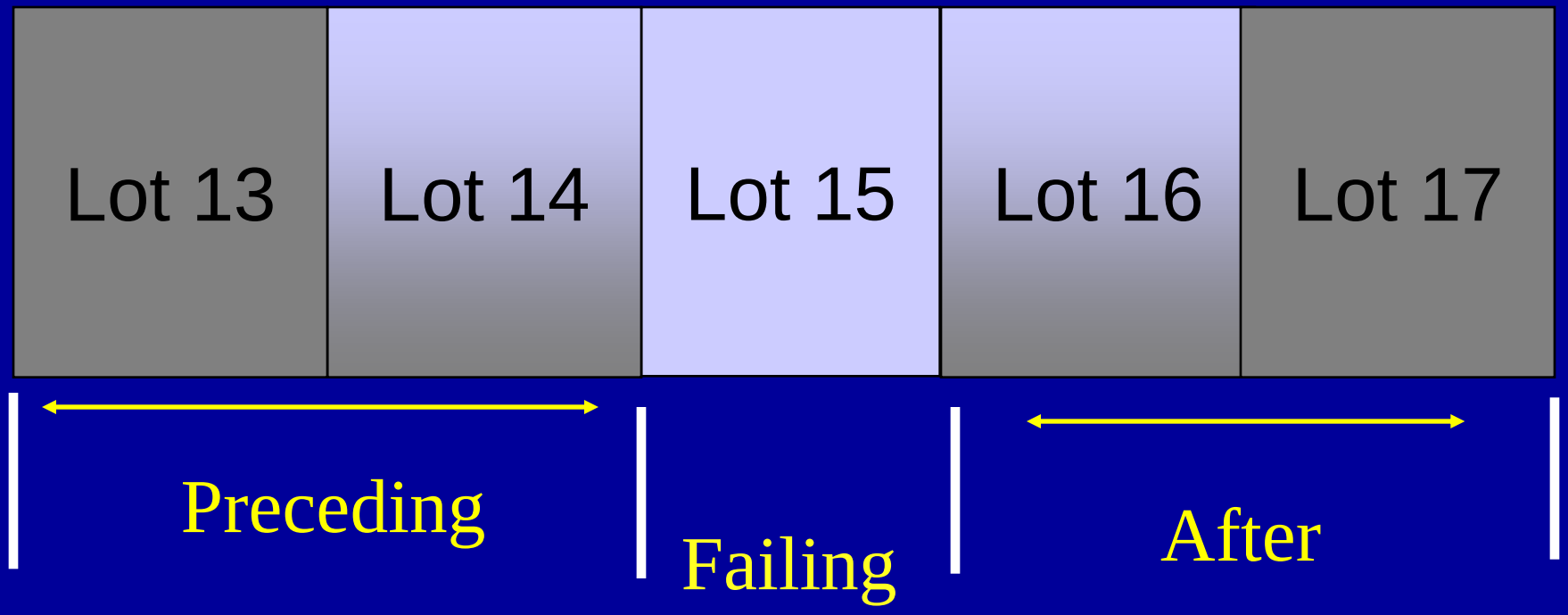


CUT 2 CORES

Referee Procedure - Cut 3 more Cores

use average of all 5 for final decision

Determine Limits



Asphalt Quality Assurance Program

W.R. Bailey, P.E.

Asphalt Regional Meetings