North Carolina Department of Transportation

Materials and Tests Unit

QMS Density Gauge
Segment 1 of 4

Core Control Density Training

Latest Specifications -

Superpave HMA/QMS Manual (2014)

NCDOT Standard Specifications for Roads and Structures - Section 609 (latest edition)

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Density Gauge Training

Latest Density Gauge Operator's Manual
Revised Date – **October 16, 2013**

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REFERENCE MATERIAL FOR THIS SCHOOL

- **Density Gauge Operator's Manual**

Note: Page Numbers located in the upper right hand corner of each slide; reference the page numbers in the manual.

Density Gauges

Nuclear and Non-nuclear


TROXLER
4640-B
THIN LAYER DENSITY GAUGE


PAVEMENT QUALITY INDICATOR
MODEL 301
Asphalt Density Gauge
ON
OFF
1
4
7
CAL
Trans Tech
TRANSTECH SYSTEMS, INC.
1-800-724-6306
www.transtechsys.com


PaveTracker™ Plus
TROXLER


TROXLER

Establish Gauge Parameters
- Nuclear Gauges -

Turn gauge on and set gauge testing parameters . . .

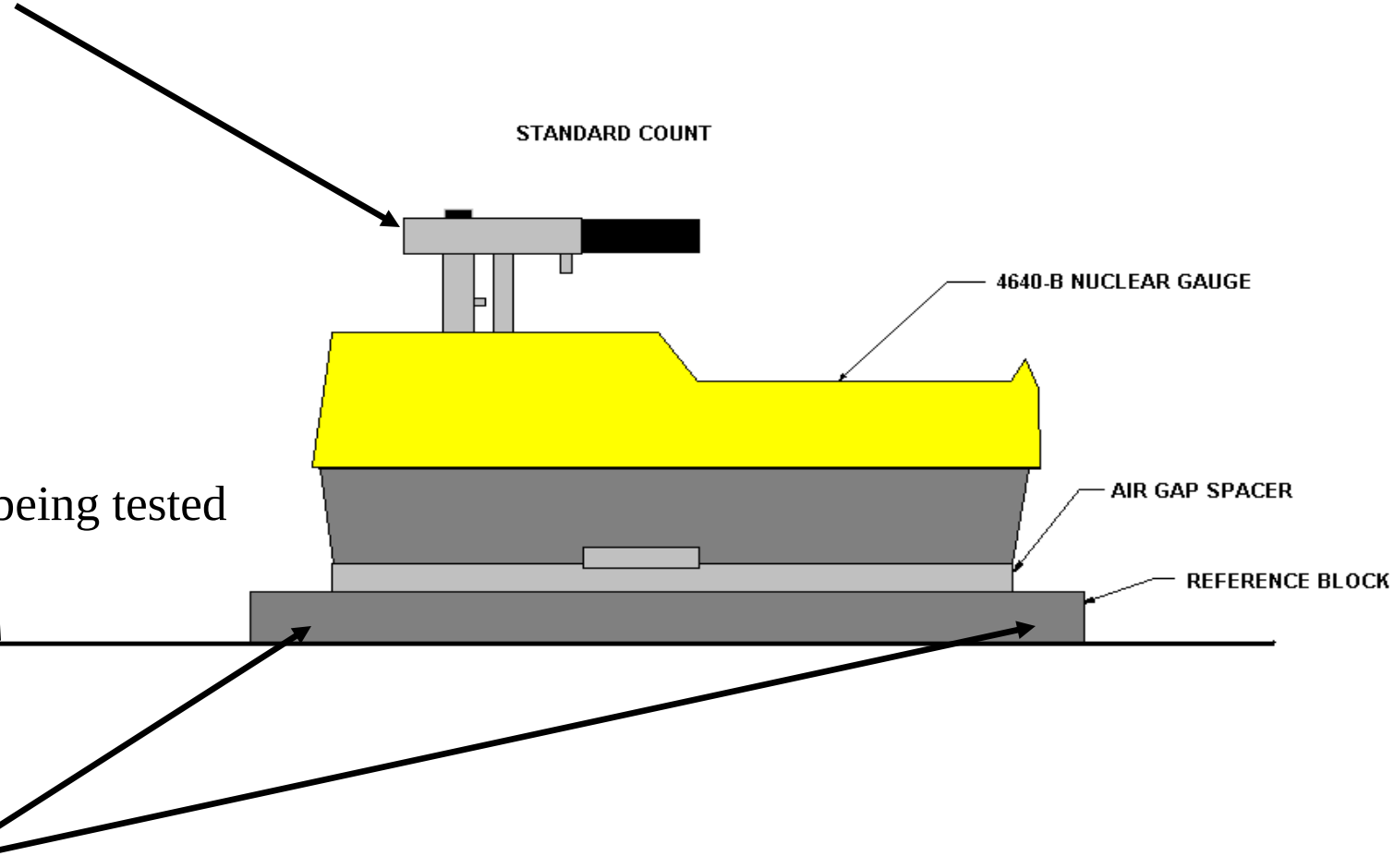
- Select proper **Unit** of Measurement (US or metric)
- **“Count Time” -** Conduct all nuclear gauge measurements with a **1-minute Count Time**
- 3450 gauge – Select Measurement Mode (always “Thin-Layer” for QMS testing)
- Enter measurement Thickness (3450 & 4640-B)
- Enter appropriate Target Density
- Create project file to “Store” density measurements
- ALLOW TEN MINUTE WARM-UP TIME

Standard Count

Compensates for source decay and must be . . .

- Performed daily
- Performed at project site on the material being tested
- Performed a minimum of **10 feet** from large objects and **33 feet** from another radioactive source
- Refer to Appendix I in the manual for Best Practice Procedures for taking a Standard Count

Source Rod must be in the Safe Position!



Material being tested

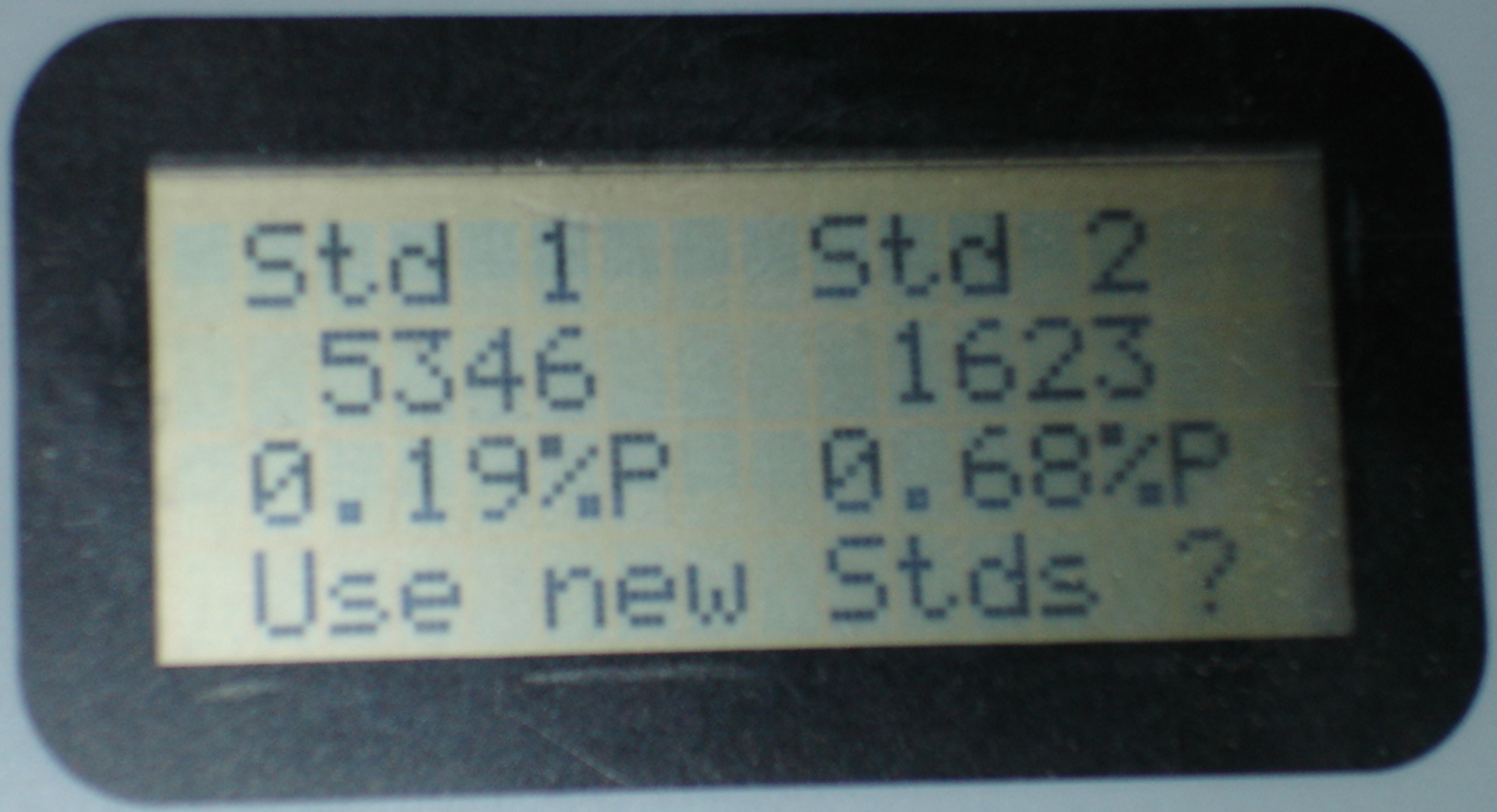
Ensure the surface is dry, flat and the Reference Block does not rock

Standard Count Tolerance Limits – 4640-B

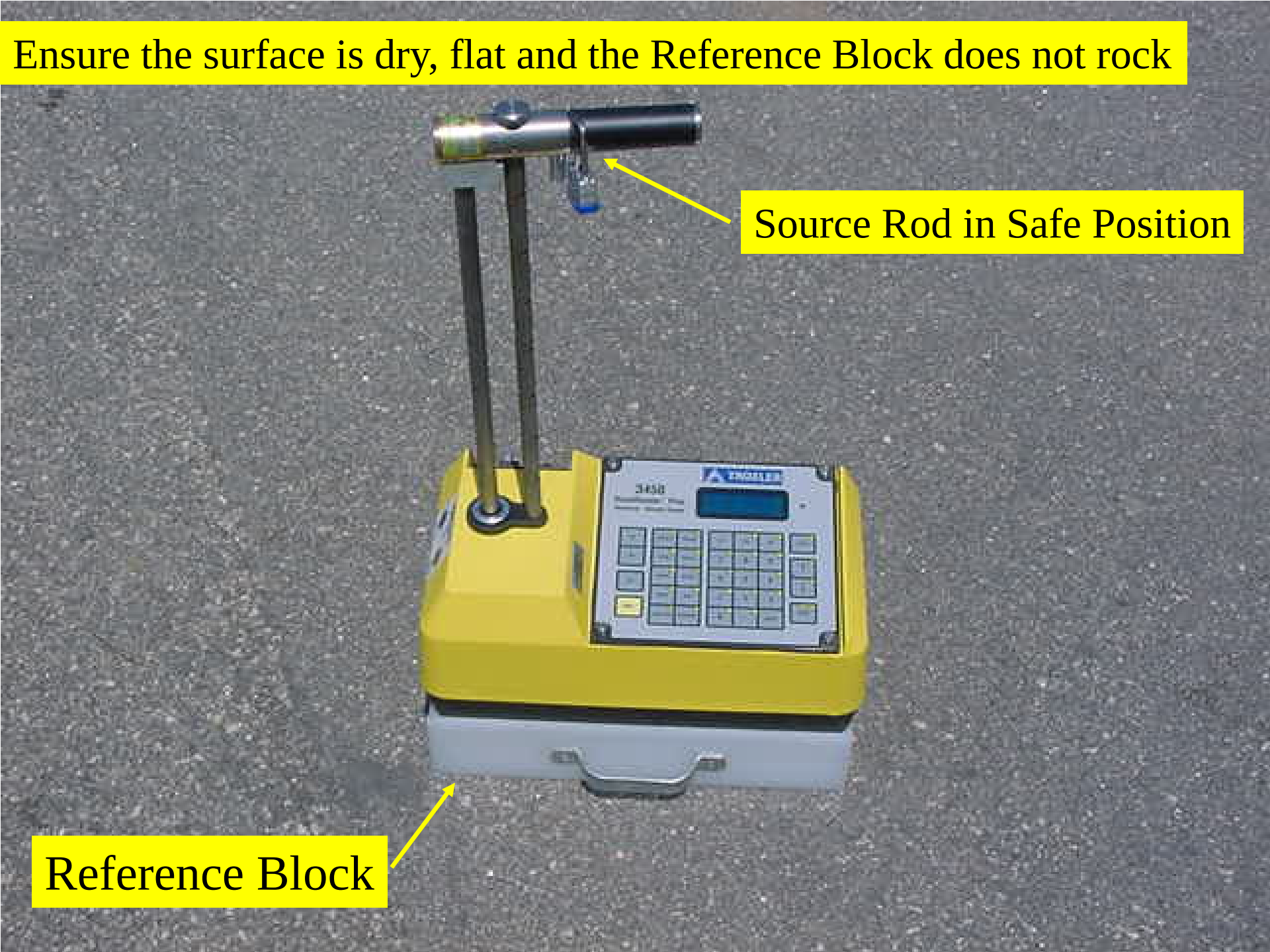
The new Standard Count is compared to the average of the last four Standard Counts in memory:
"Multi-Standard Mode"

System 1 (shallow readings)	**+/- 1.0 %**
System 2 (deep readings)	**+/- 1.2%**

Once the Count is complete the results will be displayed
If the Standard Count passes the tolerances, press “Yes”



4640-B


Ensure the surface is dry, flat and the Reference Block does not rock
Source Rod in Safe Position
Reference Block

Standard Count Tolerance Limits – 3450

The new Standard Count is compared to the average of the last four Standard Counts in memory: "Multi-Standard Mode"

DS 1 (shallow readings)	**+/- 1.0 %**
DS 2 (deep readings)	**+/- 1.0 %**
MS (moisture)	**+/- 2.0 %**

3450 only - Calibration of Depth Strip must occur after completion of Standard Count!!!

When placing a Control Strip, calculate the **Allowable Standard Count Range** (Standard Count must pass)

- Determined on day Control Strip is placed and tested
- A maximum and minimum range is calculated for System 1 (+/- 1.0 %) and System 2 (+/- 1.2 %)
- Range is used until the next Control Strip is performed (process is repeated)

STANDARD COUNTS

DENSITY

5346 System 1 (pass)

1623 System 2 (pass)

Allowable Standard Count Range

____	+ 1.0 %	System 1	- 1.0 %	____
____	+ 1.2 %	System 2	- 1.2 %	____

STANDARD COUNTS

DENSITY

5346 System 1 (pass)

1623 System 2 (pass)

Allowable Standard Count Range

5399	+ 1.0 %	System 1	- 1.0 %	5292
1642	+ 1.2 %	System 2	- 1.2 %	1604

Establish Gauge Parameters
- Non-Nuclear Gauges -

Turn **PQI** on and set testing parameters . . .

- Perform Test Block Procedure - verify and record
  (record on the Control Strip and Test Section forms)
- Select pavement type
- Select proper **Unit** of Measurement (US or metric)
- Enter lift thickness
- Verify date and time are correct
- Enter appropriate Target Density (“MTD”)
- Select the “Average” Mode (averages 5 readings)

Turn **Pavetracker** on and set testing parameters . . .

- Select proper **Unit** of Measurement (US or metric)
- Verify date and time are correct
- Take a Reference Reading and verify results
- Create project file to store measurements
- Select the Mode – “Average” (average 5 readings)
- Enter appropriate Target Density

Density Measurement

Test Site Preparation / Gauge Positioning

Nuclear Gauges and Non-Nuclear Gauges

Site preparation/gauge positioning procedures . . .

- Remove loose material from test site
- If moisture is noticeable allow the surface to dry or dry with an absorbent cloth (non-nuclear device)
- Keep the gauge parallel with the paving operation
- Ensure the bottom of the gauge is clean
- Seat the gauge on the asphalt and ensure the device does not “rock”
- PQI Relative Water Value must not exceed **5**

- PQI Relative Water Value must remain constant **(differences should remain within 1 %)**

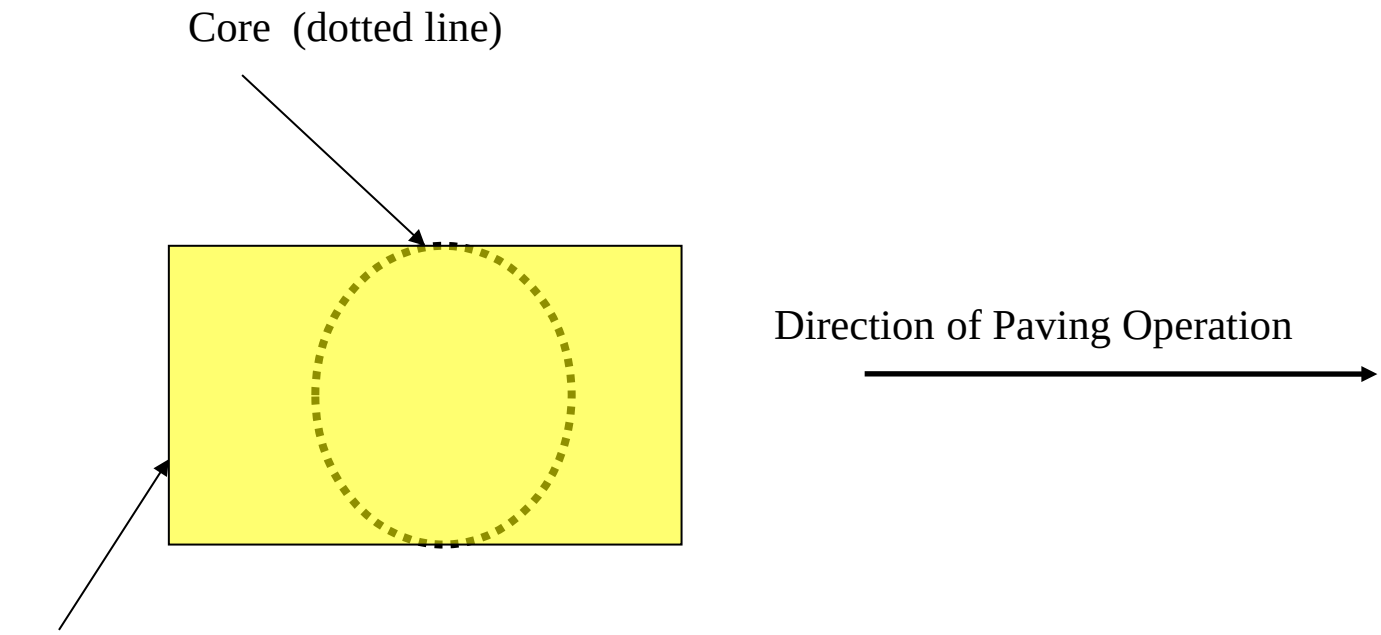
Measurement on Core site . . .

- Use procedures as previously stated

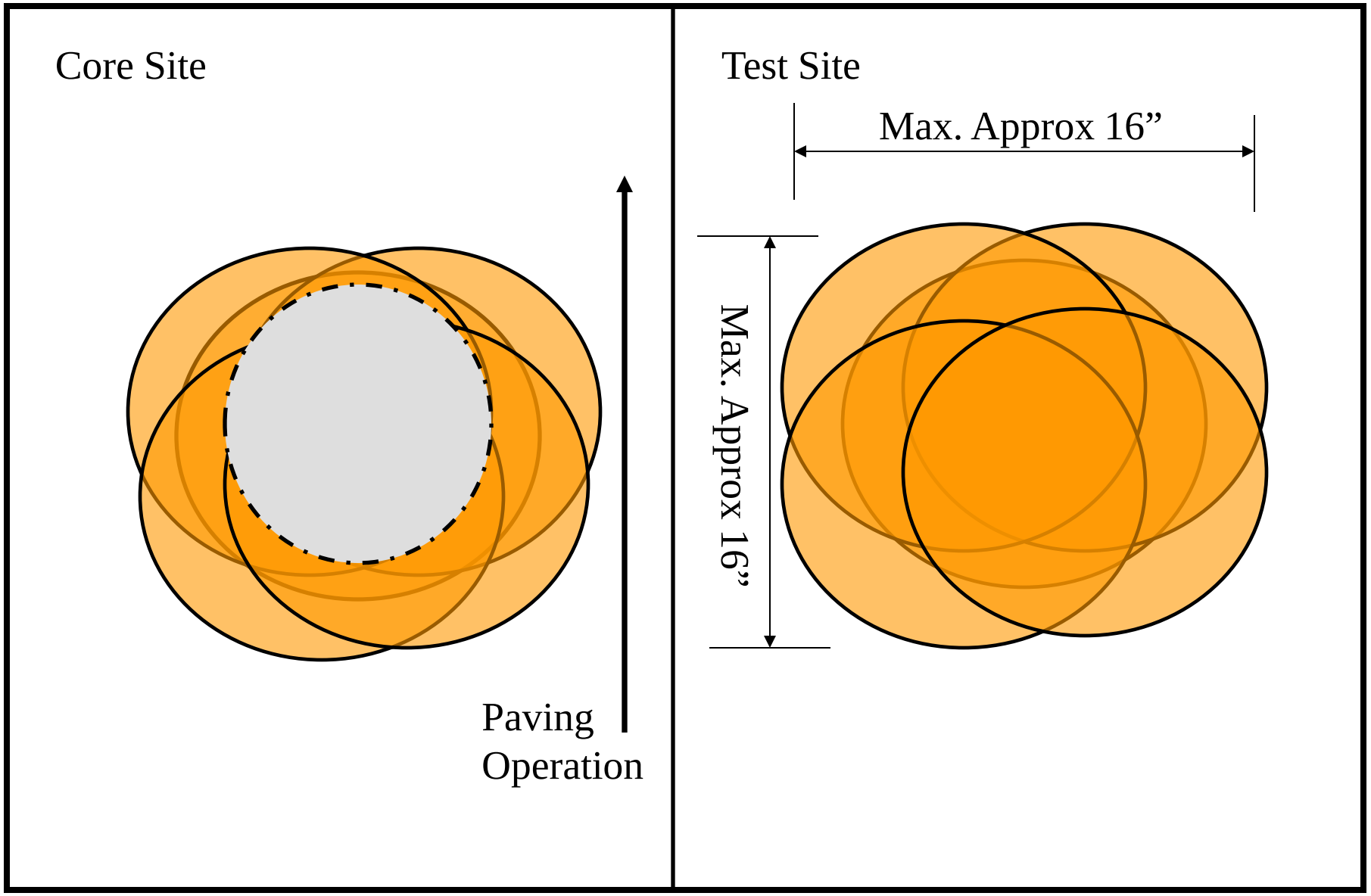
- Except, when taking measurements at core site the gauge may be moved a maximum of 12 inches from core location to level the device however, the core must be cut from the center of the measurement “footprint”

Nuclear Density Measurement on Core Site (4640-B or 3450)

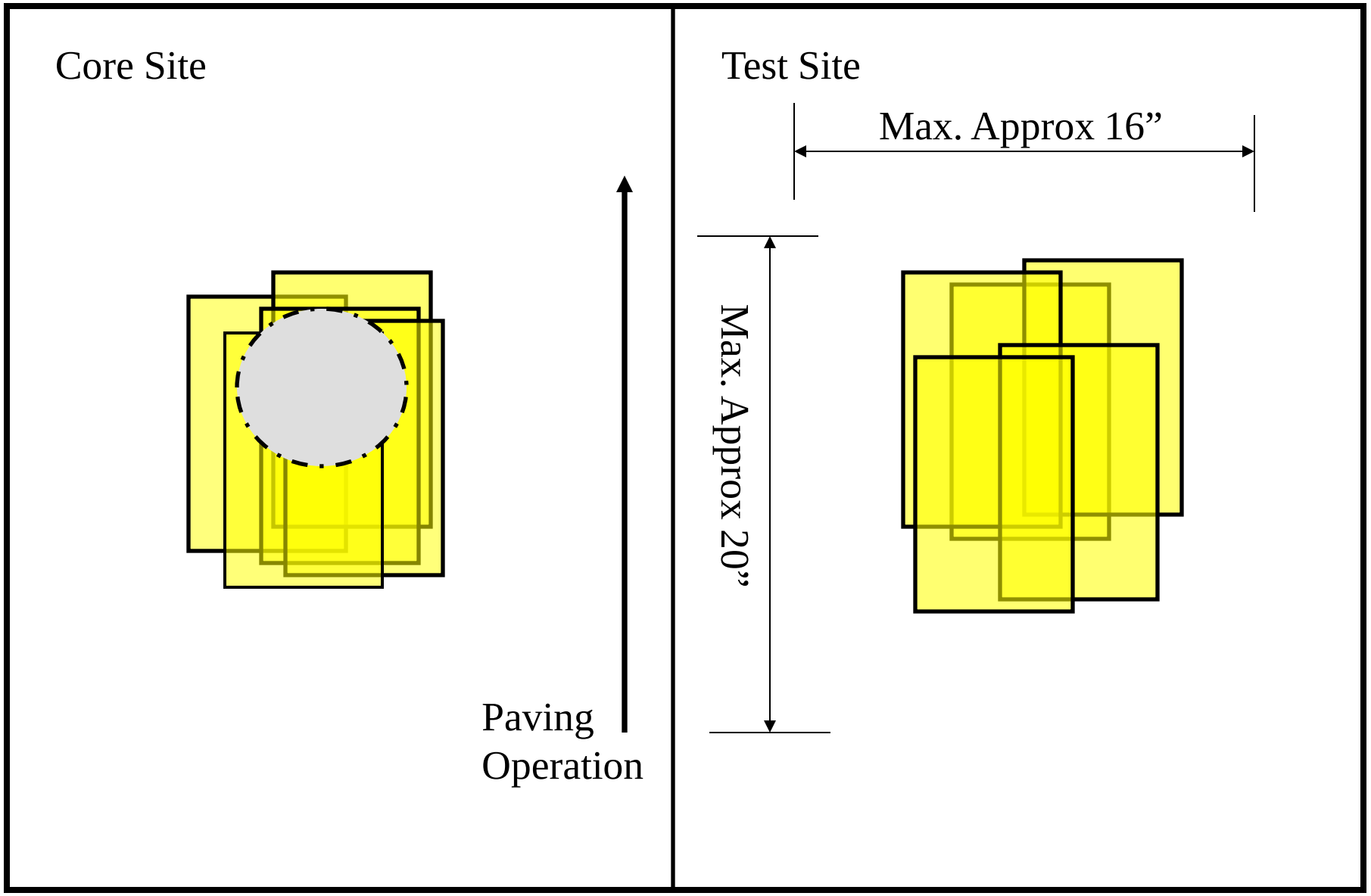
Test Pattern for a Core Site within a Control Strip



Test Pattern for PQI – Core Site and Test Site



Test Pattern for Pavetracker– Core Site and Test Site



Taking a measurement . . .

- Do not touch non-nuclear devices when taking a measurement

- When taking a measurement with a 4640-B, the source rod handle MUST be resting on the stop pin

- When taking a measurement with a 3450, the source rod handle MUST be in the Backscatter position (first notch)

To ensure understanding, please complete the following questions.

You must score 80% or better to complete the on-line portion of this training course.

When testing with a non-nuclear device, how many measurement(s) are taken at each test site?

- A) One measurement
- B) Two measurements
- C) Three measurements
- D) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

When testing with a PQI device the Relative Water Value must not exceed _____.

- A) 3
- B) 4
- C) 5
- D) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

When placing a gauge on the pavement for taking a density reading, the gauge must be placed _____ with the paving operation?

- A) Parallel
- B) Perpendicular
- C) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

Nuclear density measurements must be taken with a _____ Count Time.

- A) 15 second
- B) 1 minute
- C) 2 minute
- D) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

What is the minimum distance between two nuclear gauges when taking a density measurement or Standard Count?

- A) 10 feet
- B) 15 feet
- C) 33 feet
- D) 50 feet

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

When taking a Standard Count, what position must the source rod be in?

- A) Safe Position
- B) Backscatter Position
- C) Resting on the stop pin
- D) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

How long should a nuclear gauge "warm-up" prior to taking a Standard Count or density measurement?

- A) No warm-up time is needed
- B) At least 5 minutes
- C) At least 10 minutes
- D) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

When taking a measurement with a 4640-B nuclear gauge, the source rod must be resting on the stop pin.

- A) True
- B) False

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

Quiz

Questions Correct	{correct-questions}
Total Questions	{total-questions}
Accuracy	{percent}
Number of Quiz Attempts	{total-attempts}

Question Feedback/Review Information Will Appear Here

Continue

Congratulations!

You have now completed course:
QMS Density Gauge Online Course - Segment 1

Please click the following link and fill out the form to receive credit for completing this course.

Acknowledgement Form