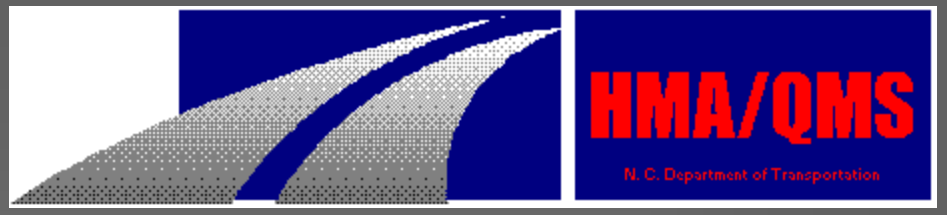


Limited Production

What is Limited Production?

- The production, placement and compaction of a sufficient quantity of mix to construct only a 300’ control strip plus 100’ of pavement adjacent to each end of the control strip.

- When proceeding on limited production, the 500 ft. will be considered a lot and will be accepted based on the average of the 5 cores in that control strip.

- When is Limited Production required?

  - After 2 consecutive failing lots (per mix type) excluding lots representing an individual resurfacing map or portion thereof
  - After 3 consecutive failing lots, with each lot representing an individual resurfacing map or portion thereof
  - 2 consecutive failing control strips

- What is a Failing Lot?

  – One for which the lot average fails

- Contractor shall proceed on limited production until:

-satisfactory density results are attained,

- or -

- two control strips have been attempted without achieving passing density results

Still not achieving density?

- Production of the asphalt mix shall cease until such time as the cause of the failing density test results can be determined

- Except: The Engineer may grant approval for the Contractor to produce a different mix design of the same type mix if QC and QA test results indicate the failing densities may be attributed to a mix problem.

<u>This will be determined by the QA Supervisor.</u>

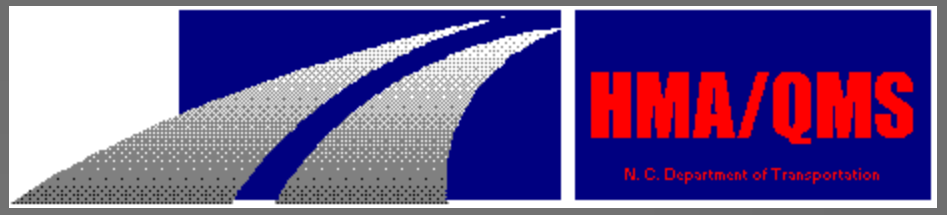
- Failure by Contractor to operate under the limited production procedures?

  - Mix for the failing lots associated with being on limited production, or all mix produced after the required stop point, is considered unacceptable

  and….

  – shall be removed and replaced with material which complies with the specifications, unless otherwise approved by the Engineer

- Should the Contractor elect to produce a different mix design of the same mix type, all previous mix in question not tested with the correlated target will be based on the calculated target unless the Contractor elects to cut cores.



QUALITY ASSURANCE OF DENSITY

Quality Assurance of Density . . .

… is a process of sampling and/or testing the Contractor's product, and monitoring his operations to confirm that the Quality Control results are adequate and accurate. The Department shall provide a certified gauge operator for this purpose.

F.H.W.A.

23 Code of Federal Regulations (CFR) 637B states the following:

"Quality control sampling and testing results may be used as part of the acceptance decision provided that:

(A) The sampling and testing has been performed by qualified laboratories and qualified sampling and testing personnel

(B) The quality of the material has been validated by the verification testing and sampling. The verification shall be performed on samples that are taken independently of the quality control samples."

Quality Assurance testing shall be accomplished in the following ways:

1. Re-testing randomly selected Quality Control nuclear or non-nuclear test sections at a frequency equal to or greater than **5 %** of the required QC gauge testing frequency; ("**QA**" test – same test sites as QC)

2. Periodically observing tests performed by the Contractor

3. Conducting Verification testing (“**V**” test) on nuclear or non-nuclear test sections at different randomly locations within the same QC test sections, at a frequency of at least **10 %** of the QC sampling and testing frequency

4. Periodically directing the recalculation of random numbers for the QC density gauge test locations. The original QC test locations may be tested by the QA operator and evaluated as a (“**V**”) verification test

5. Periodically requiring the Contractor to retest marked test site(s) in the presence of a certified QA gauge operator

6. Witnessing the daily quality control nuclear gauge Standard Count procedure

7. Witnessing the Pavetracker 2701B Reference Reading

8. (If testing with a Pavetracker) Requesting QC gauge operator to take a density reading on the Pavetracker Reference Block to verify the device is measuring within tolerance

9. Witnessing the PQI Test Block procedure;

10. Verifying the PQI Test Block results are within tolerance

11. Retesting 100 % of all nuclear or non-nuclear control strip cores

12. Any combination of items 1 – 11 listed

When performing QA and Verification testing do not perform “QA” and “V” tests in the same Test Section!

Control Strip (QA items) . . .

- NCDOT representative must monitor construction of the Control Strip

- Unless directed by the Engineer, no separate Control Strip is required

- QA gauge operator is to conduct gauge readings at each core as previously described

- Randomly taking QA comparison core(s) next to the QC Control Strip core(s)

- If the QA Operator can not determine a target density by taking 10 nuclear gauge readings from the Control Strip, a calculated target density can be used as the target

  Formula -

  62.4 pcf x Gmm = XXX.X pcf

- Non-nuclear gauges MUST be correlated to perform density acceptance testing

- QA Operator will use Form 514 QC/QA to determine target density
- The target density will be determined by dividing the average gauge density by the average percent compaction of the 5 core samples

- The QA Control Strip shall have the same number as the QC Control Strip number with the addition of the suffix **QA**

For example:

Contractor (1st Control Strip) labeled **- 1QC**

Department labeled **- 1QA**

QA Test Section Procedures . . .

- Each test section is to be divided into 5 equal segments and 1 nuclear gauge reading or 5 non-nuclear gauge readings are to be taken from each segment

- Location of gauge readings may be random
  "**V**" Test Section (**10 %** of QC test sections)
  or at the QC's test locations
  "**QA**" Test Section (**5 %** of QC test sections)

- Density readings will be tabulated on Form M&T 515 QA
- If testing with a non-nuclear gauge the average of the 5 readings will be recorded for each test site
- Results will be recorded in percent compaction
- QA test sections will have the same number as the QC test section number with the addition of a suffix at the end to designate Verification (V) or QA (QA) test

For example:

For a days production the QC Operator completes test sections:

8 QC, 9 QC, 10 QC, 11 QC and 12 QC

The QA Operator performs Quality Assurance testing at QC test sections: **8 QC 10 QC** and **11 QC**

QA numbering is as follows –

8 V (randomly located test sites)

10 QA (QC located test sites)

11 V (randomly located test sites)

QA density verification testing. . .

Verification testing is an integral part of the Department's quality assurance process. It is independent testing performed by the QA personnel to help assure the asphalt mat is adequately compacted. It is very important that all personnel involved with the QMS density testing procedures on asphalt pavements are knowledgeable of these requirements and guidelines. Should these test results vary considerably from the QC results, or fall below the minimum specification acceptance limit, further testing may be directed by the Department which then could be used as part of the acceptance process.

- Acceptable Limits of Precision between QC and QA test section averages are:

  +/- 2.0 %

- If the test section averages are outside the Limits of Precision or the QA test section results are below the minimum requirements the Engineer will investigate to determine the reason

Dispute Resolution Procedures

- QA will immediately notify QC
- Both will jointly perform a Field Confirmation of Gauges
  - Verify gauge parameters are correct for each device
  - Correct discrepancy prior to proceeding
- QA will randomly select a test site
  - QC and QA will take density readings within same footprint
  - QC should observe QA testing and QA should observe QC testing
  - Follow appropriate testing procedures

- If test results are not within 2.0%, QA should contact Soils Laboratory to request a Detailed Investigation

- If test results are within 2.0%, QA and QC must retest test section(s) in question using appropriate procedures

Dispute Resolution Procedures – **V**erification Test Section

- QC while being observed by QA, will retest QA Verification Test Sites
- QA while being observed by QC, will retest QC Test Sites
- Retest density results are to be recorded in the "Comments" space provided on the test report
- If average of QC retest results exceed 2.0% of QA original test results **and / or . . .**
- If average of QA retest results exceed 2.0% of QC original test results . . .

- QA should contact Soils Laboratory to request a Detailed Investigation

- If QC and QA retest confirms original test results . . .
  - It indicates possible density non-uniformity across the mat
  - QA should notify Engineer and work with QC to determine cause
  - If determined that underlying layer is cause QA should document on density form 515 QA
  - Where visibly evident take photos of existing roadway
  - Continue normal paving and testing operations

- If underlying layer is not suspect . . .
- Contractor may take corrective
- If area in question is re-rolled, both QC and QA must re-test the area
- If Contractor does not re-roll area, acceptance will be based on QC test results

- QA will perform a second Verification Test Section
  - If Limits of Precision are exceeded, QA should notify QC and contact Soils Laboratory to request a Detailed Investigation

Dispute Resolution Procedures – **QA** Test Section

- QC while being observed by QA, will retest Test Sites
- QA while being observed by QC, will retest Test Sites
- If average of retest are within Limits of Precision, replace original test results with retest results
- If average of retest are not within Limits of Precision, QA should contact the Soils Laboratory to request a Detailed Investigation

Detailed Investigation

A 3 member committee will review the issue and determine if the Contractor will be required to switch to core method of density acceptance until the issue is resolved (Construction Unit will send notification)

- If the potential for pavement failure is present the Engineer may suspend production while investigation is in progress

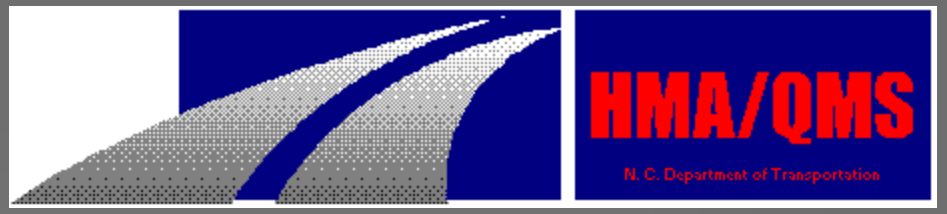
  (108-7 Standard Specifications)

- If additional tests are required, these tests will be performed jointly by the Contractor's QC and Department's QA personnel

  (108-7 Standard Specifications)

- If the reason for the difference cannot be determined payment will be based on 105-3 of Standard Specifications

- If the reason is determined to be an error or other discrepancy in the QC test results, the applicable QA results will used for acceptance



Acceptance of Density

Acceptance of Density….

- Accepted on a lot by lot basis
  - A lot is generally defined as 1 day's production of a given JMF…..***EXCEPT*:**

    As an exception, separate lots will be established when the following occurs:

1) Portions of JMF placed on a given day in both "New" and "Other" construction categories as defined below. A lot will be established for the portion of the pavement in the "New" construction category and a separate lot for the portion of pavement in the "Other" construction category.

2) Pavement being placed on multiple resurfacing maps, unless otherwise approved prior to paving. A lot will be established for each individual resurfacing map or portion thereof, unless otherwise approved.

3) Pavement is being placed simultaneously by multiple crews. A lot will be established for the pavement placed by each crew.

4) Pavement is being placed for intersections.

5) Portions of the JMF placed in different layers.

6) Control strip is placed during limited production.

New Construction Category

MUST MEET ALL 3 of the following :

1) Pavement must be placed on **NEW**:
   - Aggregate Base
   - Soil Base

   } **must be compacted to a specified density**

   - Asphalt mix layer (excluding wedging/leveling)

2) Pavement must be within a designated final traffic travel lane.

3) Pavement must be 4’ or wider.

Exception to New Construction

When a layer of mix is placed on an **unprimed** aggregate base, the layer will be evaluated in the “Other” Construction Category

Acceptance of Density….

- Accepted on a lot by lot basis
  - A lot is generally defined as 1 day's production of a given JMF…..***EXCEPT*:**

Separate lots will be established for :

- New Construction Category
- Other Construction Category
- Individual Map Sections

Other Construction

- All Pavement Not Meeting Requirements for “New Construction”

Acceptance of Density….

- Accepted on a lot by lot basis
  - A lot is generally defined as 1 day's production of a given JMF…..***EXCEPT*:**

Separate lots will be established for :

- New Construction Category
- Other Construction Category
  - Individual Map Sections

Individual Map Sections

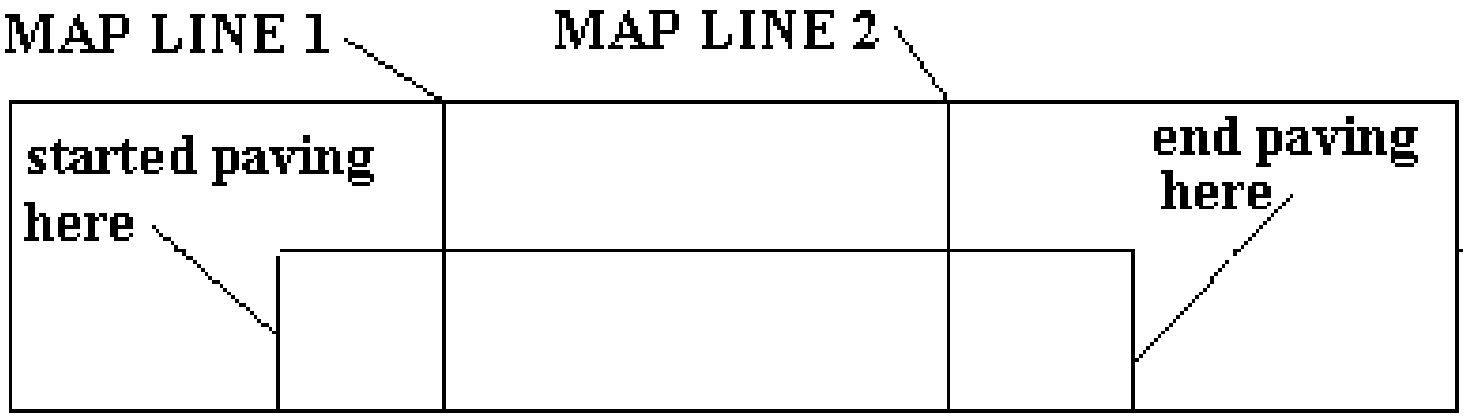
Different map sections may be combined if requested by the Contractor and approved by the Engineer prior to starting project

Senario...

- If a paving crew crosses 2 map lines today, what is the maximum and minimum number of lots for that day?

Min. 1

Max. 3



“New”or “Other” Construction?

Original Paving of Final Surface on Travel Lanes of I-40?

1) Asphalt placed on a new base or new asphalt layer -- YES

2) Within a designated travel lane which will be the final traffic pattern-- YES

3) 4’ or wider -- YES

“NEW” Construction (All 3 are YES)

“New” or “Other” Construction?

Final surface of a 10’ wide paved shoulder placed on new B 25.0B mix ?

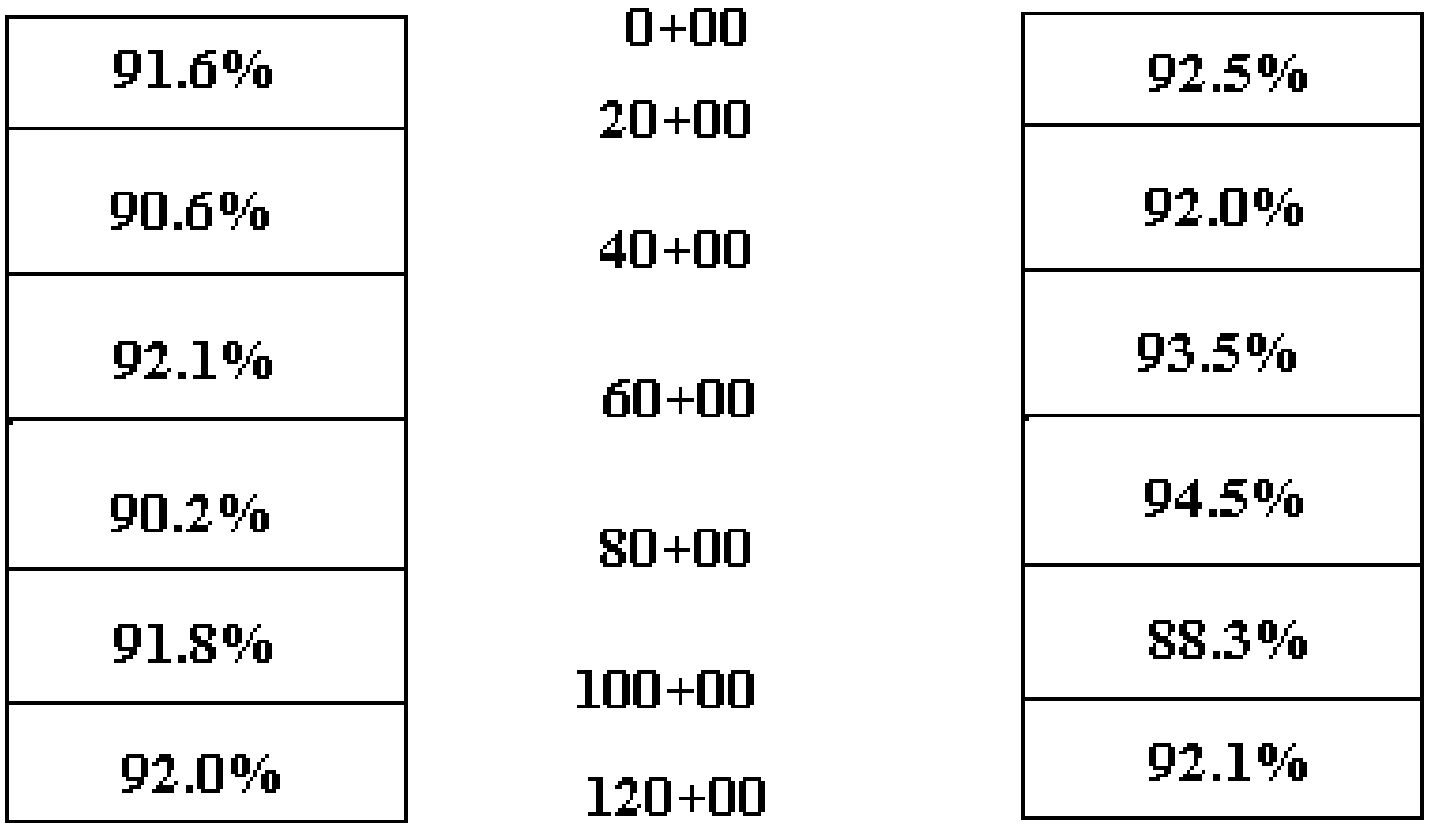
1) Asphalt placed on a new base or new asphalt layer -- YES
2) Within a designated travel lane which will be the final traffic pattern-- NO
3) 4’ or wider -- YES

“OTHER” Construction (All 3 must be YES)

Acceptance of Density….

- A failing lot for density acceptance is:
  - A lot in which the lot average of all test sections fails to meet the minimum specification requirement.
  - Failing lots are subject to reduction in pay or removal

    In addition , any lot or portion of a lot that is obviously unacceptable will be rejected for use in the work.



Avg density 91.4%

Avg density 92.2%

Lot passes

Lot fails due to failing to achieve min. density

Last one….

- If a Contractor milled 3” off the 12’ travel lanes on a project, then placed I 19.0B on the milled surface, then placed a final layer of S 12.5B , what categories are there for lot determinations?

I 19.0B - Other

S 12.5B - New

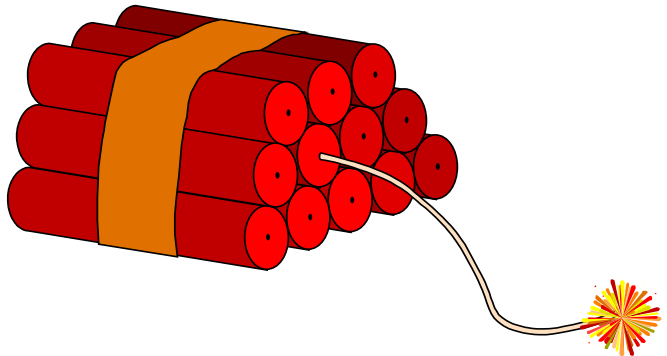
Maintaining Records . . .

- Copies of all QC Forms are to be maintained for for 3 years after completion of the form

- Copies of all QA Forms are to be maintained as described in the Construction Manual (R-204)

FALSIFICATION!!

Falsifying documents or test results will result in revocation of QMS certification and possible criminal charges by State and/or Federal Authorities.



To ensure understanding, please complete the following questions.

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

The Limit of Precision between the QC and QA density gauges are _____?

- A) 2.0%
- B) 2.5%
- C) 5.0%
- D) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

As part of quality assurance the QA gauge operator must perform at least _____ Verification testing of the total QC test sections.

- A) 2.0%
- B) 5.0%
- C) 10.0%
- D) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

As part of quality assurance the QA gauge operator must perform at least _____ QA testing of the total QC test sections.

- A) 2.0%
- B) 5.0%
- C) 10.0%
- D) None of the above

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

The Contractor should proceed on limited production after two consecutive failing control strips.

- A) True
- B) False

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

When placing mix while on limited production, the 500 foot material placed will be considered a lot.

- A) True
- B) False

Correct - Click anywhere to continue

Incorrect - Click anywhere to continue

You must answer the question before continuing

Submit

Clear

Copies of all QC Forms should be kept for _____ after the form is completed.

- A) 6 months
- B) 1 year
- C) 2 years
- D) 3 years

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 4

This is the last segment of the QMS Density Gauge Online Course, you are now able to take the final proctored exam after selecting the following link and filling out the form to receive credit for completing this course.

Acknowledgement Form