

# SECTION 403 Q&A

(revised 05-03-07)

## INTRODUCTION

This document was developed, and will be maintained, to clarify the intent of the specifications, reduce conflict in the QC/QA environment and improve uniformity of contract administration across the state.

This is not a contract document and cannot be enforced as such. The Resident Engineer always has the latitude to react in an appropriate way to job specific circumstances, but decisions should be consistent with the underlying intent of guiding specifications and policies.

For this discussion, QC refers to the contractor's representative performing Quality Control testing. QA refers to MoDOT's representative performing Quality Assurance testing.

## QUESTIONS AND ANSWERS

#1

***Can I direct a routine QC loose-mix sample to an area on the roadway that appears to have a mix problem?***

It is critical that routine tests, as defined in the contractor's QC plan, be at random locations. It is critical because any manipulation of the random numbers introduces bias. Keep in mind that the QC test results are used to statistically define a population of data. Bias causes inaccuracy in that statistical calculation.

#2

***Am I restricted to testing only the locations where the random samples fall?***

No. QA can take a sample anywhere, at any time if there is concern about a problem area, but this should be treated as an "extra" sample. These "extra" samples are used to determine if problem areas are acceptable, or to help define limits of a problem.

#3

***Can I direct my random QA test an area on the roadway that looks like it may a quality problem?***

No. The QA test that will be used for comparison to QC should be taken at a random location unless adjusted for a specific reason. For example, a test should not be taken in the middle of a busy intersection because that would be contrary to public interest. Also, Section 403.23.7.1.4 allows samples to be separated by a minimum of 200 tons.

Remember, bias causes problems with our statistics and is not in the interest of either MoDOT or the contractor.

#4

***Didn't you tell me earlier that QA could test anywhere any time?***

Yes. The test frequencies listed in the specifications are minimums. QA always has the option to take additional tests. The random QA sample is used for comparison to QC and determines whether QC tests adequately define the characteristics of the entire lot. The "additional" QA test is used only to determine if an isolated area has a problem, or to help define the limits of a problem.

#5

***Does it matter how I choose my random numbers?***

The best way to generate random numbers is to use the spreadsheet, because that eliminates any question of bias. The latest version of the spreadsheet can be found on the MODOT web page under business/contractor\_resources/forms – Materials Related.

A random number chart is okay, but be sure to choose random number pairs either row by row, or column by column. In other words, don't jump around on the chart, because that can introduce unintentional bias. Random number generators on a calculator are satisfactory as long as the selections aren't intentionally biased.

When using any method other than the spreadsheet to generate random numbers for roadway density cores, the pairs should be recorded once at the beginning of the lot and provided to QC at the completion of the lot. This will assure transparency of the random number selection process.

#6

***When should I give the random numbers to QC?***

This issue has caused a great deal of conflict statewide. To restore confidence in the process, the following procedures will be used:

Random numbers will be generated in advance, by lot, and a printout of those numbers will be sealed in an envelope. At least one lot should be prepared in advance and kept in a secure location in the field laboratory. The QA inspector will also keep a copy in his possession. Random numbers will be given to QC between 100 and 150 tons in advance of the test. The intent is to give QC enough time to get any ongoing tests to a stopping point and to get out to the roadway in time. This should not give the plant operator enough time to adjust production and work any resulting change through the silo. When the sampling for a lot is completed, the envelope for that lot will be opened to demonstrate that the random numbers were not manipulated during production.

Random numbers for density cores should also be generated in advance. They can be provided to QC when rolling is complete.

QC and QA need to work together in good faith to make this process run smoothly. Occasionally random tests will fall close together. If QC is at a critical point in a test when the next random number comes up, QA should make an adjustment. QA should be aware that this policy creates some real challenges for QC and use appropriate judgment. There should be less conflict because both sides have their cards on the table.

#7

***The contractor is sampling mix directly out of the trucks and using the results to adjust the plant. Is that okay?***

Yes, but the samples should be marked as such if they are tested in the field laboratory. The contractor has the option of doing extra testing. These “self-tests” or “truck tests” are used to see how the mix is doing between random tests. Only the random QC tests are used to calculate pay.

#8

***Can't the “self tests” be used to tweak the plant in advance of the random test?***

Not if the random test locations are given 100 to 150 tons in advance as outlined earlier. There would be no way to complete a test and adjust the plant in time.

#9

***The contractor doesn't want to give me the results of the “self-tests.” Can I insist on getting them?***

There is no reason to demand “self-test” results. If the random testing is being done correctly, the results will accurately define general production characteristics. If there is reason to be concerned about an isolated area, take an extra QA test.

#10

***Can “self-test” results be used to determine removal limits?***

Section 403.23.7.3 of the GCM reads as follows: “*QC self-test results may be used to help define the limits of removal as long as the self-test(s) are well documented*”.

A self-test will be considered well documented if the following minimum criteria are met:

1. The puck is available and is clearly labeled
2. The gyratory printout is made available
3. The printout from the AC test is made available

The resident engineer has the option to determine removal limits based on puck height, provided that the self-test data is consistent with previous production.

#11

***There are test specimens in the field laboratory that I can't identify. I can't be there all the time to witness all the testing. How do I know that the correct samples are used to determine payment?***

There is no legitimate reason for unidentified samples to be in the Field laboratory. The QA inspector should insist that all test specimens in the field laboratory be marked as soon as they are cool enough. The identifying mark should be permanent, unique, and indicate what the sample is.

#12

***My QA sample does not compare favorably with QC. QC says my testing is in error. Now what do I do?***

QA and QC should be given the opportunity to witness each other's sampling and testing. Doing so will head off a lot of conflict.

Copies of all test methods should be readily available in the field laboratory. Testing procedure must follow an approved test method. If either party has an issue with the other's test procedure, an objection should be raised at that time. By doing this promptly, the issue can be resolved while it is still possible to re-create the test. If a decision is made to test a retained sample, the test should be run jointly so that testing procedure is taken off the table as a variable.

Section 403.23.7.1.1.2 of the GCM reads as follows: *"If the comparison is not favorable, the first step is to review both QC and QA test results to see if there is any noticeable error. If no errors are found, testing of the retained samples may be performed. Judgment must be used in determining which retained sample(s) to test. When testing a retained sample, the entire suite of tests (%AC,  $V_a$ , and VMA) should be performed to verify the validity of the original test results. If the test results of the retained sample confirm the original test results, the original test results are used to determine the PWL. If the test results of the retained sample verify that the original test results were incorrect, the test results of the retained sample are used to determine the PWL."*

#13

***We have checked everything and it turns out that QA and QC test results are both valid. The results are still unfavorable. What does the contractor get paid?***

Section 403.23.7.1.1.2 of the GCM reads as follows: *"If the QC and QA test results have been determined to be valid and the comparison is still unfavorable, the test results from the random, independent QA sample will be included in the PWL calculation. The QA test results of QC retained samples or the test results from any additional QA samples will not be used in the PWL calculation. As an example, lot 3 has been completed and consists of 4 sublots. A favorable comparison was not obtained but*

*it was determined that the QC and QA test results are valid. Therefore, the PWL calculation will include the QC test results from all 4 of the sublots and the test results of the random, independent QA sample (n = 5)."*

*When the random QA test results are included in the PWL calculation, all volumetric properties ( %AC, VMA & V<sub>A</sub>) for that sample will be used, even if only one of the three properties has an unfavorable comparison. There should not be an unfavorable comparison of density because QA randomly re-tests one of the QC cores.*

#14

***The plant is running smoothly, I have confidence in QC's testing and our comparisons are favorable. Do I need to continue running so many QA tests?***

Section 403.19.3 of the GCM reads as follows: *"The minimum sampling and testing requirements for both QC and QA, as shown in the table in Standard Specification Section 403.19.3, have been modified as a result of the QC/QA Process Team. The guidelines set forth in this document should be followed."*

The following table illustrates the differences. The frequency of testing of QC splits can be reduced when QC and QA become confident with each other's sampling and testing procedures.

	Minimum by Spec	Early in project	Later in project
Random QA	1/day	1/lot	1/lot
QC Split	1/week	1/day	On days when there is no random QA

***What about the frequency of dry-back. Can we cut back if the results are consistent?***

The construction manual will be edited to contain the following language: *"When required by specification, the dry-back method should be performed on all samples taken in the first lot of mix produced. If the G<sub>mm</sub> and the dry-back G<sub>mm</sub> of a sample are within 0.002 of each other in all sublots of the first lot, the dry-back may be reduced to once per lot."*

#15

***What constitutes a favorable comparison when running a QC split?***

G<sub>mm</sub> should be within 0.005, G<sub>mb</sub> should be within 0.010, and AC within 0.1%. If variances are larger both QA and QC should scrutinize sampling and testing procedures to identify the cause of the difference.

Isn't that a pretty tight comparison range for G<sub>mb</sub>?

Yes, but for two technicians in the same lab it is attainable. If there are comparison problems, the retests should be run together to ascertain the cause of the discrepancy.

#16

***I observe extra density core holes in the mat that I can't account for. Should I be concerned?***

The roadway inspector should assure chain-of-custody of all density cores. The preferred procedure is for a MoDOT inspector to take possession of the cores as soon as they are cut, and deliver them directly to QA at the plant. This needs to be done promptly so that testing of the density cores can proceed without delay. When specific job circumstances make this procedure impractical, the roadway inspector may dry the core with a paper towel and mark the side using a permanent felt-tipped marker. The identifying mark should be unique and readily identifiable when the sample arrives at the plant. A signature, along with lot and subplot, is one example of an identifying mark.

The QA density cores should be selected from among the random QC cores.

#17

***Can I take the joint density cores at the same longitudinal location as the random mat density samples or should I use a separate random number?***

Either way is acceptable to MoDOT. If QC prefers one method over the other, then they should be accommodated.

#18

***Due to stage construction, less than 4 sublots in a particular lot have an unconfined joint. Should the deduction for low unconfined joint density apply to the entire lot?***

No. The deduction should only apply to those sublots which have an unconfined joint density sample. The spreadsheet has been modified to assist with this determination.

#19

***What is this QC/QA project checklist that I'm hearing about?***

A checklist was developed for QC and QA to run through before work begins. It is intended to reduce conflict by working out the day to day details of how to conduct business in advance of all the pressures of production. The industry/MoDOT task force developed an acceptable checklist but any other that accomplishes the same thing is acceptable.

One of the key elements of any checklist is to clearly define a conflict escalation procedure. Far too many conflicts lay unresolved for too long. Conflicts that QC and QA cannot resolve between themselves should be promptly escalated.

#20

***I have a disagreement with QC that we can't resolve. What do I do now?***

The vast majority of issues between QC and QA can be resolved by consulting the QC Plan, the Test Method or the contract documents. If a dispute cannot be resolved within a few hours of taking these initial steps, it should be escalated.

Time frames and escalation levels (including the names of the individuals) should be discussed when going through the checklist. Unresolved issues lead to an atmosphere of mistrust in the QC/QA environment.

Decisions should always be timely and made at the lowest **appropriate** level.

#21

***Do the Specifications require that the QC lab be located at the asphalt plant?***

No. The contractor is required to provide an appropriately equipped QC laboratory. The contractor is also required to provide office space at the asphalt plant for the QA inspector to work on records and reports. Usually these 2 requirements are met with one structure, but not always. The intent of the specification will be met if the QA inspector is provided with suitable facilities at the plant, but the lab is located offsite at a location appropriate to the work under progress. For example, the contractor may elect to place the laboratory at a location between the jobsite and the plant.

#22

***My random QA test results indicate that the subplot that it fell within should be removed. The random QC results are above the removal limit. The comparison for the entire lot is favorable. What should I do?***

Section 403.23.7.3 of the GCM reads as follows: *“If the QA test results fall below the removal limits for density and/or air voids, the mix should stay in place if a favorable comparison has been obtained with the QC test results. Again, a favorable comparison signifies that the QC test results adequately define the characteristics of the lot and are, therefore, acceptable. If the QA test results fall below the removal limits and a favorable comparison has not been obtained, dispute resolution should be initiated to determine whether or not the mix should stay in place.”*

#23

***Can the TSR sample be taken at the asphalt plant?***

Yes, the test method allows that. Since it is easier to take a larger sample at the plant, the QA sample should be at least 125 pounds. This will provide the Central Laboratory with enough material to determine all mix properties. The inspector should write the Mix

Number and sample ID on the box. TSR samples need not be taken at random locations but can be taken when it is convenient to production.

#24

***It seems to take an awfully long time getting results from my counterpart. Within what time-frame should I expect results?***

Section 403.17.1.1 of the Standard Specifications requires QC to provide all **raw** data to the engineer no later than the beginning of the day following the test. Raw data, of course, is subject to revision.

Section 403.23.7.1 requires QA to make the QLA no more than 24 hours after receipt of the contractor's test results.

These are guidelines that should be adhered to unless there is a compelling reason to do otherwise. If problems are persistent they should be escalated quickly for resolution. In general, it is a good practice to provide PWL calculations to the contractor for work that is paid for on each estimate.

#25

***In a small quantity situation is it necessary to remove and replace Mixture that is out of the specification limits by only a small amount?***

The following guidance will be added to the construction manual under section 403.19.3.2.1 – Small Quantities: “The resident engineer should use engineering judgment when mixture placed under this section fails to meet specifications. If the laboratory compacted air voids are less than 2.5%, or the roadway density is less than 90.0% or more than 98%, the material should be removed and replaced. If asphalt content is above or below the target value by more than 0.3%, or if the roadway density is less than 91.5%, the mixture may be allowed to remain in place with an appropriate deduction. Mixture that is out of specification by a minor amount may be left in place with no deduction”

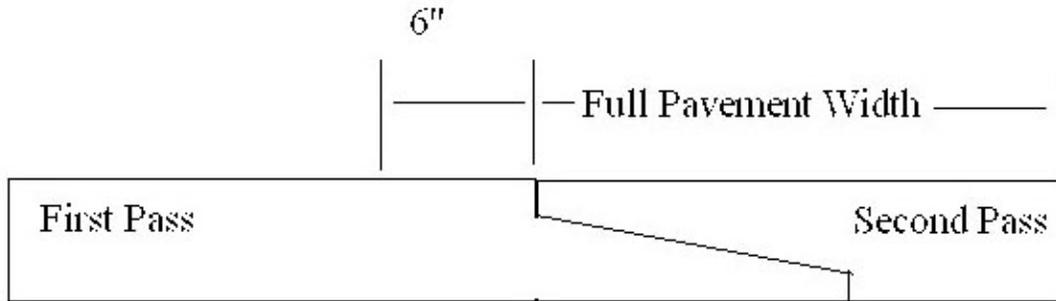
***The small quantity deduction is more punitive than if PWL were calculated. Is it an option to use PWL to calculate the deduction on a small quantity project?***

Yes, if the contractor has it spelled out in the quality control plan.

# 26

*The contractor is using something called a notched-wedge to construct the longitudinal joint. Where is the unconfined joint density measured?*

The Notched-Wedge is marketed by a company called, Trans Tech. There are similar products on the market as well, but in general they look like the sketch below:



Unconfined joint density should be measured on the first pass in the 6 inches adjacent to the vertical notch (if the contractor is taking 6 inch density cores the location should be adjusted as necessary to avoid the vertical face of the notch.) On the second pass, the entire width of the lane is fair game for random density testing, including the entire wedge section.