NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Aggregate Sampling Manual

Materials and Tests Unit
Field Operations Section

Aggregate Sampling Manual
(Roadway Assurance Samples)

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North Carolina Department of Transportation
Materials and Tests Unit - Field Operations Section

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Section 1 - Purpose

The purpose of this training manual is to explain techniques for obtaining roadway aggregate base material samples (i.e., Aggregate Base Course – ABC, Cement Treated Base Course – CTBC, etc). The Department currently has two aggregate acceptance methods and project funding determines which method applies. The Roadway Assurance (RA) sample method is for federally funded projects while the Roadway Informational (RI) sample method is for state funded projects. Both methods require the Department to obtain and test aggregate samples to verify the material does not exceed specification criteria. Personnel obtaining either RA or RI sample(s) must have a valid ABC Sampling Certification. Personnel with a valid ABC Sampling certification and are actively obtaining Roadway Acceptance (RA) samples must be assessed once per year. Personnel obtaining RI samples only are not required to be assessed since these samples are for informational purposes.

Under the current Aggregate Quality Control/Quality Assurance (QC/QA) Program, aggregate producer representatives certified by the Department obtain Quality Control (QC) samples at the quarry and Department representatives from Materials and Tests obtain Quality Assurance (QA) and Verification (V) samples at the quarry. This sampling and testing process is performed prior to the material being loaded and delivered to a project. Sampling under this Program is discussed in the QC/QA Sampling and Testing Certification Course. Aggregate producers can also take Roadway Quality Control (RC) samples from the roadway for their internal use, that is, to obtain additional information concerning quality. Due to safety concerns an aggregate producer must obtain permission from the Resident Engineer prior to visiting a construction project. Additional details regarding the QC/QA Program can be obtained from the *QC/QA Program Manual* produced by the Materials and Tests Unit.

Resident Engineers can review the Aggregate Producer's QC test results by accessing the Q.A.P. database in HiCAMS. However, the Quality Assurance Engineer monitors QC test results and will notify the Resident Engineer if a sample exceeds specification requirements. Due to the importance of aggregate materials, Department representatives should study the following items as it relates to any aggregate utilized on a project.

- *NCDOT Standard Specifications for Roads and Structures (Standard Specifications)*
- *Aggregate Sampling Manual*
- Plans
- Project Special Provisions
- *NCDOT Construction Manual*

Section 2 – Importance of Proper Sampling

A sample is defined as a "portion, piece, or segment that is representative of a whole". Therefore, it is important that the procedure(s) used to obtain this small portion not compromise the requirement that it be a representation of the larger portion.

There are penalties associated with non-conformity with the *Standard Specifications*. For material that has been placed on a roadway, non-conformity can result in a rejection of the material. Improper sampling (that is, when the portion obtained did not represent the larger portion) has repercussions that can be costly. Therefore, following proper sampling procedures cannot be overemphasized.

Section 3 – Aggregate Materials

Definitions and uses

Several aggregate based products are available and may be used during construction. The most common products are as follows:

- **Aggregate Base Course (ABC) -** When ABC is placed on the roadway as part of the pavement structure it is defined in the *Standard Specifications* as "a base composed of an approved aggregate material hauled to the road, placed on the road, mixed, compacted, and shaped to conform to the lines, grades, depths, and typical sections shown in the plans or established by the Engineer".
- **Stabilizer Aggregate (S.A.)** – aggregate material used to stabilize subgrade soils, usually a two to three-inch thick layer of ABC is added and mechanically mixed with the soil
- **Cement Treated Base Course (CTBC)** – is ABC with the addition of cement and is generally placed on the roadway as part of the pavement structure.
- **Select Material Class IV** – coarse aggregate material meeting gradation requirements of ABC (refer to Appendix C Table 1005-1).
- **Incidental Stone Base -** is "a graded stone material used for driveways, temporary maintenance of traffic, adjacent to mailboxes, beneath traffic islands, median covers, and at any other locations that are not part of any base course on which pavement is to be placed".

The following table lists aggregate products, if a project acceptance sample is required, and related section(s) to reference in the *Standard Specifications*.

Aggregate Product	Sample Required	Related Section(s) of the *Standard Specifications*
Aggregate Base Course (ABC)	Yes	Section 520, Section 1005, Section 1006, Section 1010
Stabilizer Aggregate (SA)	Yes	Section 510, Section 1005, Section 1006, Section 1008
Cement Treated Base Course (CTBC)	Yes	Section 540, Section 1005, Section 1006, Section 1010-2
Select Material Class IV	Optional	Section 1016, Section 1010
Incidental Stone Base	No*	Section 545

* When ABC or any other aggregate product is used as Incidental Stone Base as defined in Section 545 of the *Standard Specifications*, sampling or testing is NOT required.

Types of ABC

There are two types of ABC depending on how and when the material is sampled and tested under the QC/QA Program. These are: *Type A ABC* and *Type B ABC*. Type A ABC is sampled by the aggregate producer from an aggregate production pile. Type B ABC is sampled by the aggregate producer from an "approved" stockpile, which has specific permissible dimensions in terms of layer thickness, tonnage per layer, etc. Approved stockpiles have tighter quality control processes and procedures while being constructed when compared to a production pile. Production piles (Type A ABC) at a quarry may have material being added at one end of the pile while material is simultaneously being shipped from the other end. For an approved stockpile (Type B ABC), the material is continuously added until the specified pile is completed, sampled, tested, and approved by the Central Laboratory Engineer. Once approval is granted, no additional material can be added and shipment to the project can begin.

Section 4 – Importance of Placement Operation

Segregation and degradation have detrimental effects on aggregate base material. When not properly addressed these issues can become significant enough to turn ABC from a well-graded material which would yield satisfactory performance into a material that is difficult to compact and would not perform as desired under pavement loading. Aggregate Producers have quality control measures and procedures in place to help control the quality of base material reducing segregation and degradation. However, improper loading, placement, or manipulation by the Contractor can segregate base material. Therefore, Contractors must follow best practices to reduce issues with segregation or degradation. Some best practice procedures include.

- Place base material at or near optimum moisture content
- Use a mechanical spreader box to avoid tailgate placement of material
- Once base material is placed on the grade, avoid excessive material manipulation
- Seal or compact the layer within 48 hours after placement

The material should be placed at or near optimum moisture content to reduce segregation. A mechanical spreader also reduces segregation and helps to control the depth of material placed. Generally, the depth of base material compacts to approximately 2/3^{rds} of the original loose layer thickness. For example, if plans specify an 8-inch compacted layer of ABC then approximately an 11 to 12-inch loose layer should be placed. Ideally, the level of base material within the spreader box should not be allowed to drop below the 1/3rd depth of the box. Once material within the box drops to the 1/3rd level, advancement should stop, and the next truck allowed to back into position to begin discharging material. The placement operation should proceed in a smooth manner with the rear truck tires staying in contact with the spreader box as material is discharged. The spreader box should push the truck down the grade as base material slides into the box. Avoid over filling the box resulting in spillage or dumping in front of the box since material dumped in this manner will likely segregate. Avoid using the tailgate method of placing material since tailgating increases segregation. Obtain RA or RI samples prior to manipulation such as rough grading or surface sealing with a roller. Project personnel should monitor placement operations ensuring safety procedures are followed and that material is placed in a manner following best practices. If questionable practices are observed that may affect the base material in a detrimental manner, document and notify the Resident Engineer.

Section 5 – Roadway Assurance (RA) Sampling

Whether Type A ABC or Type B ABC is delivered to a project, it has presumably been tested by the producer (QC) and by the Department (QA) for conformity with specifications. Again, the purpose of obtaining roadway aggregate samples is to ensure the quality of material placed on the roadway has remained the same as when originally tested at the quarry under the QC/QA Program. The sampling procedure to be used depends on how the product will be used at the project. As required by the *Standard Specifications*, aggregate material is placed on the roadway using a mechanical spreader. If, due to unusual circumstances, a mechanical spreader cannot be used, follow the applicable items (i.e., lot size, sample size, etc.) discussed in this section of the manual; however, utilize the sampling procedures described in Appendix E. If a contractor elects to obtain aggregate from two or more quarries, care must be taken to keep each quarry's material separated for acceptance purposes (i.e., gradation, density, etc). For example, material represented in a sampling lot must be from one quarry. If you are unsure of any aspects regarding aggregate sampling contact the Field Operations Group for assistance (919) 329-4170.

Aggregate Base Course (ABC)

When sampling ABC from the roadway, a NCDOT approved sampling ring must be used. The sampling ring "isolates" the sample site from the rest of the roadway reducing segregation from fall in material. The specifications for this ring and the standard sampling procedures to be followed are given in Appendix A. Sample(s) should be obtained prior to any compaction or manipulation of the material. As stated in the *Standard Specifications* Sub-article 520-7, ABC shall be machined and compacted

"within 48 hours after beginning placement of the base". No more than five days of ABC placement shall occur without a sample. No RA samples are required if a project utilizes less than 2,500 total tons of ABC (falls under small quantity as stated in Minimum Sampling Guide). Random numbers are used to locate sampling sites to prevent biased sampling. However, samples should not be located within 2 feet of the edge of spread. During aggregate placement operations, the edges are normally segregated and therefore, not representative of the material. The procedure for using random numbers is described in Appendix B of this manual. If the specifications require two layers of ABC to be placed, "close-out" the sampling lot of the first layer prior to placement of the second layer.

Each sample requires a minimum of 70 pounds dry (two full sample bags usually more the 70 pounds) to be processed.

For sampling and acceptance purposes, a lot will be 2,500 tons or a fraction thereof.

For each lot of aggregate placed on the road, one (1) sample will be taken at a random location on the road prior to compaction. The LL, PI, and gradation results of this sample will be used to determine acceptability of the lot.

Liquid Limit/Plasticity Index (LL/PI) - Material passing the No. 40 sieve shall not have Liquid Limit or Plasticity Index values exceeding specification limits listed in Table 1005-1 of the *Aggregate Sampling Manual*. The lot will be rejected if any individual test result indicates values exceeding these limits.

Gradation - For the lot to be acceptable, gradation test results shall meet the requirements shown in Column C of Table 1005-1. The lot will be rejected if a gradation test result exceeds the limits of Column C of Table 1005-1.

Sampling ABC used for stabilization - "Stabilizer Aggregate - SA"

To obtain a representative sample, Stabilizer Aggregate is sampled while it is in the spreader box prior to spreading and mixing. Each test will require a RA sample weighing at least 70 pounds dry to be processed. The guidelines for determining the lot size are given below and are the same as described for roadway sampling.

For sampling and acceptance purposes, a lot will be 2,500 tons or a fraction thereof.

For each lot of aggregate delivered to the project, one (1) sample will be taken at a random interval. The LL, PI, and gradation results of this sample will be used to determine the acceptability of the lot. Sample(s) must be obtained prior to spreading the material to the 2 to 3-inch thickness on the roadway. No more than five days of stabilizer aggregate placement shall occur without a sample. Random numbers are used to determine sampling tonnage to prevent biased sampling. The procedure for using random numbers is described in Appendix B.
When a dump truck loads material in a spreader box, a conical pile of material is typically formed. In sampling stabilizer aggregate, the upper half of this conical pile is

struck off and the required sample obtained using a sampling ring (see Appendix A) from the exposed flat surface.

When the gradation test results for a lot exceed any of the limits shown in Column C of Table 1005-1, the lot will be rejected. The rejected lot will be considered for acceptance only after corrective material has been furnished, placed, and mixed with the in-place aggregate to an acceptable gradation.

Sampling ABC used for Cement-Treated Base Course (CTBC)

When Plant-Mixed CTBC is manufactured, cement is added and mixed with ABC in a pugmill. Sampling of the ABC must be done before cement is added. Sampling ABC prior to entering a pugmill is normally obtained from the conveyor belt however, if unusual circumstances or safety considerations prevent this method contact Materials and Tests for guidance. If the contractor elects to manufacture Roadway-Mixed CTBC, Roadway Acceptance samples can be obtained using the same procedures as described for sampling roadway ABC.

When sampling from a conveyor belt the following equipment is needed: flat-tip shovel, brush, 5-gallon bucket, scoop, sample bags, and sample cards (M&T Form 1).

Random numbers are used to determine the tonnage at which the sample is to be taken (see Appendix B). To obtain a sample, the conveyor belt is stopped at the appropriate tonnage and a flat-tip shovel is used to isolate about an 18-inch section. Using a scoop, the material in that isolated section is placed into a 5-gallon bucket and later transferred to bags. It is important that all the material in that isolated section be removed, including the fines that can be removed with a brush.

For sampling and acceptance purposes, a lot will be 2,500 tons or a fraction thereof.

For each lot of aggregate placed on the road, one (1) sample will be taken at random from the pugmill conveyor belt or roadway prior to the cement being added. The LL, PI, and gradation results will be used to determine the acceptability of the lot.

Liquid Limit/Plasticity Index LL/PI - Material passing the No. 40 sieve shall not have Liquid Limit or Plasticity Index values exceeding specification limits listed in Table 1005-1 of the *Aggregate Sampling Manual*. The lot will be rejected if any individual test result indicates values exceeding these limits.

Gradation - For the lot to be acceptable, the test results shall meet the gradation requirements shown in Column C of Table 1005-1. The lot will be rejected if a gradation test result exceeds the limits of Column C of Table 1005-1.

Select Material Class IV

Obtaining RA samples of Select Material Class IV is optional and sound engineering judgment should be followed when determining to sample. Select Material Class IV must meet the same specification requirements as ABC (refer to Appendix C Table 1005-1 in this manual).

When sampling Class IV from the roadway, a NCDOT approved sampling ring is used. The sampling ring "isolates" the sample site from the rest of the roadway reducing segregation from fall in material. When Class IV material is placed using a mechanical spreader box, follow specifications for the sampling ring and sampling provided in Appendix A. If a mechanical spreader is not used for material placement, follow sampling procedures described in Appendix E. Sample(s) should be obtained prior to any compaction, mixing, or manipulation of the material. Random numbers are used to locate sampling sites to prevent biased sampling. The procedure for using random numbers is described in Appendix B of this manual.

Each sample will require a RA sample weighing a minimum of 70 pounds dry (two full sample bags) to be processed.

For sampling and acceptance purposes, a lot will be 2,500 tons or a fraction thereof.

For each lot of aggregate placed on the road, one (1) sample will be taken at a random location on the road prior to compaction. The LL, PI, and gradation results of this sample will be used to determine the acceptability of the lot.

Liquid Limit/Plasticity Index (LL/PI) - Material passing the No. 40 sieve shall not have Liquid Limit or Plasticity Index values exceeding specification limits listed in Table 1005-1 of the *Aggregate Sampling Manual*. The lot will be rejected if an individual test result indicates values exceeding these limits.

Gradation - For the lot to be acceptable, gradation test results shall meet the requirements shown in Column C of Table 1005-1. If lot will be rejected if a gradation test result exceeds the limits of Column C of Table 1005-1.

RA Sample Identification and Numbering

Correct sample identification is just as important as using proper sampling procedures when obtaining a sample. Without proper tracking, test data will not be incorporated into the acceptance process. If a sample is lost, the effort exerted while obtaining the sample is for nothing and, ultimately, the project may have a sample shortage when it is certified or audited.

Samples are given a "RA" designation followed by the sample number. For example, the first 2,500-ton sampling lot on a given project will be represented by a sample labeled RA-1. The second 2,500-ton sampling lot would be labeled RA-2, followed by RA-3, RA-4, etc. Numbering will start with "1" and will run consecutively for the entire project. Each product that is sampled will have its own series of numbers. For example, if CTBC and ABC are being placed on the same project, each material will have its own consecutive numbering series beginning with "RA-1".

One sample card is completed for each sample bag and one duplicate is completed for project files. When completing the represented quantity (***Rep. Qty:**) line on the sample card, enter the total amount of material represented by the sample. For example, if sample RA-4 represents a fraction lot of 1,525 tons then record "1,525" tons on each

card. Place completed cards in a plastic bag (to protect the card) and then place each card in the corresponding sample bag.

Figure 1 shows an example of a completed sample card for a RA sample.

The actual sampling site and the beginning and ending stations for each sampling lot should be recorded to ensure the section can be identified if a check sample is required.

For each sample complete the required information in the ABC Sample Field Logbook. Refer to Appendix F for an example of the notebook.

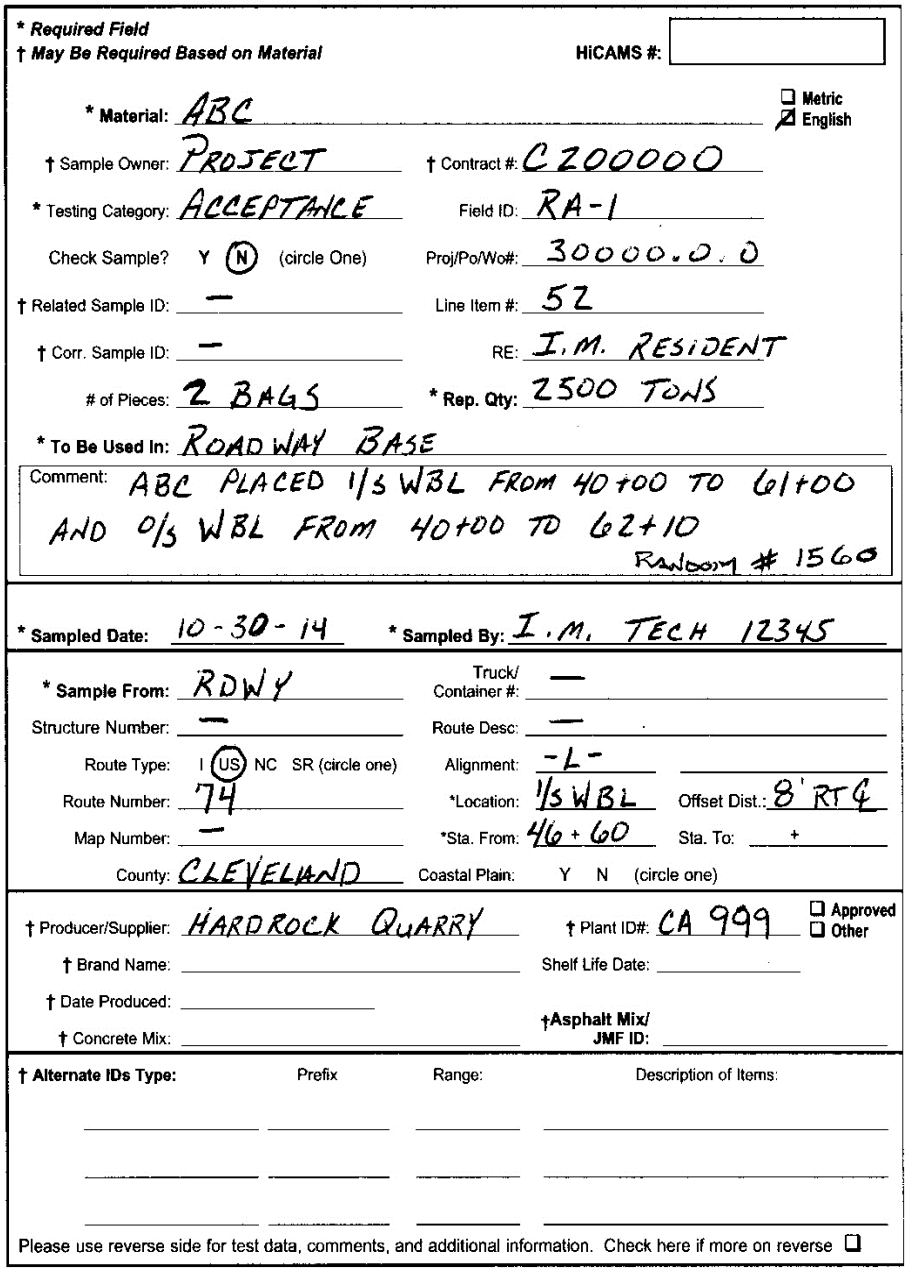


Figure 1 - Information Required on RA Sample I.D. Card

Section 6 – Roadway Informational (RI) Sampling

Since this method is a new approach, project personnel should hold a meeting prior to aggregate placement to cover details of the process with the Contractor, Aggregate Producer, and Department inspection staff. The current ABC Roadway Sampling Program, as it applies to State Funded projects will be as outlined below:

I. Roadway Informational (RI) Samples from the Project

1) RI Samples will be taken by project personnel from each of the first 3 placement days of base course materials (in lieu of Roadway Assurance (RA) samples). One sample per day, for the first 3 days, selected randomly from the anticipated length of pull for the day's operation.

2) If any of the initial 3 samples are found to exceed specifications, a roadway investigation will be conducted by the Materials and Tests Unit. If the results of that investigation confirm material to be outside of specifications, additional RI samples may be required for subsequent placement days, such that 3 consecutive passing samples are obtained.

3) Once three consecutive placement day (RI) samples have been tested and shown to meet specifications, project personnel should continue to monitor for *"Changes in Operations"* as described below when determining if optional RI sampling is necessary.

4) If project personnel elect to take an optional RI sample, sample in accordance with the *Aggregate Sampling Manual* and:
   a) Notify the Resident Engineer and the Technical Trainer Supervisor. The Technical Trainer Supervisor will notify a representative of the Aggregate Producer.
   b) If the sample exceeds specification limits, follow the check sample process described in items 2-3 above.

II. <u>Quality Control (QC) Samples from the Quarry</u>

1) If QC results from the facility indicate that material is outside of specifications, the QC Technician shall immediately take a check sample in accordance with the check sample procedures outlined in the *Aggregate QC/QA Manual*. If that sample meets specifications, document the cause of the original out of specification results.

   If the first QC check sample is found to exceed specifications, the Producer shall notify the Aggregate QC/QA Engineer. Following an investigation, and any necessary corrections made to the aggregate material in question, a second QC check sample will need to be obtained and split in the presence of a Materials and Tests representative (half tested by the Aggregate Producer/half tested by the Materials and Tests Unit).

If the first QC check sample exceeds specifications, the Aggregate QC/QA Engineer will notify project personnel, who should immediately take a Roadway Informational (RI) Sample.

a) If the RI test results are within the limits of Column C of Table 1005-1 of the *Aggregate Sampling Manual*, proceed with placement operations.
b) If the RI test results fall outside of Column C specifications, follow procedures listed in Section I. 2-3.

2) If the second QC check sample is out of specifications, or if no test results have been reported within 3 workdays of the first check sample results, shipment of the material in question from the aggregate facility shall stop.

3) If shipment from the Aggregate Producer has been halted, refer to *Aggregate QC/QA Manual* for resuming shipment of base materials (3 consecutive passing QC samples).

****Additional information concerning the check sampling process at the quarry can be found in the "Aggregate QC/QA Manual" Section III. A. Bullet Point 6.**

III. Changes in Operations

1) If project personnel observe consecutive loads of material that do not appear consistent with the material previously tested (i.e., material is suddenly very coarse), additional RI samples may be requested. If RI samples are requested by the Department, the process outlined in Section I.4 above shall be followed.
2) If one or more of the following conditions occur, 3 new consecutive passing samples, as described in Section I. will be required:

- Change in the quarry supplying project base material
- Base material placement operations cease for periods of 60 days or more.

IV. RI Sample Numbering and Identification Procedure

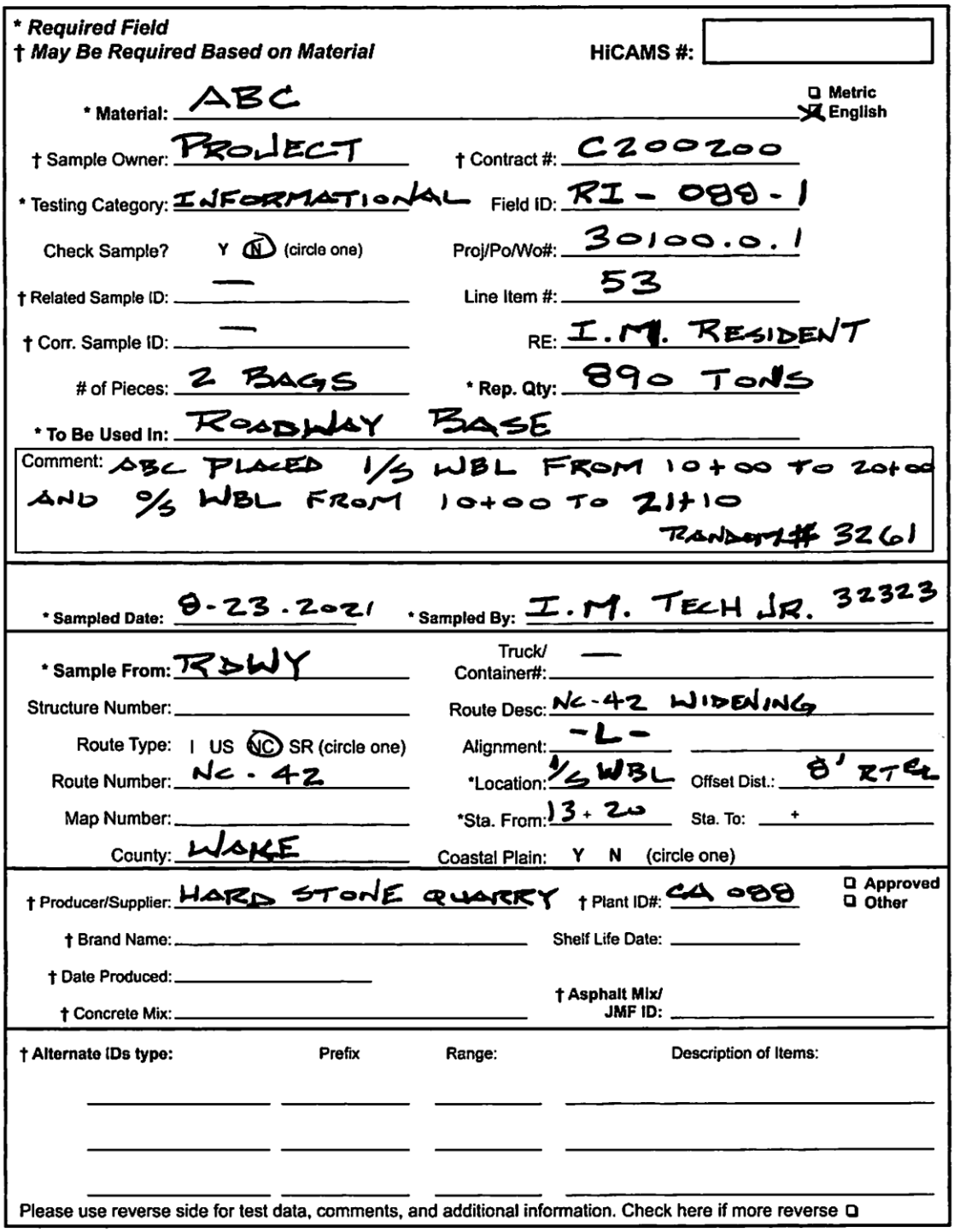
Numbering of Roadway Informational Samples shall follow the following guidelines:

RI-000-X

Where: RI = Roadway Informational Sample
000 = The Facility ID Number of the Aggregate Facility suppling base materials
X = The Number of RI Samples that have been collected from the indicated Supplier

Example:
First three RI samples from an aggregate supplier with the Facility ID, CA79 would be:
1) RI-079-1
2) RI-079-2
3) RI-079-3

Figure 2 shows an example of a complete Roadway Informational (RI) sample card.



* Required Field
† May Be Required Based on Material

HiCAMS #:

* Material: ABC ☐ Metric ☒ English

† Sample Owner: PROJECT † Contract #: C200200

* Testing Category: INFORMATIONAL Field ID: RI - 088 - 1

Check Sample? Y (N) (circle one) Proj/Po/Wo#: 30100.0.1

† Related Sample ID: — Line Item #: 53

† Corr. Sample ID: — RE: I.M. RESIDENT

# of Pieces: 2 BAGS * Rep. Qty: 890 TONS

* To Be Used In: ROADWAY BASE

Comment: ABC PLACED 1/S WBL FROM 10+00 TO 20+00 AND 0/S WBL FROM 10+00 TO 21+10
RANDOM # 3261

* Sampled Date: 8-23-2021 * Sampled By: I.M. TECH JR. 32323

* Sample From: RDWY Truck/ Container#: —

Structure Number: Route Desc: NC-42 WIDENING

Route Type: I US (NC) SR (circle one) Alignment: -L-

Route Number: NC - 42 *Location: 1/S WBL Offset Dist.: 8' RTE

Map Number: *Sta. From: 13 + 20 Sta. To: +

County: WAKE Coastal Plain: Y N (circle one)

† Producer/Supplier: HARD STONE QUARRY † Plant ID#: CA 088 ☐ Approved ☐ Other

† Brand Name: Shelf Life Date:

† Date Produced:

† Concrete Mix: † Asphalt Mix/ JMF ID:

† Alternate IDs type:	Prefix	Range:	Description of Items:

Please use reverse side for test data, comments, and additional information. Check here if more reverse ☐

Figure 2 - Information Required on RI Sample I.D. Card

Section 7 – Check Samples

RA Check Sample (ABC) – The Area Construction Engineer and appropriate representative from the aggregate producer should be notified prior to taking a check sample. Check sample(s) will be taken by a representative of Materials and Tests (M&T) with assistance from project personnel. The M&T representative will investigate and compile a report documenting the results. Additional guidance regarding the investigation process is provided in Appendix H and Appendix I of this manual. When obtaining check samples, the following steps are to be taken:

1) If approved by the M&T representative, perform additional sampling of the lot. The procedure for this additional sampling consists of obtaining another sample within 5 feet of the original sample.

2) If check sample test results for the lot are within the limits of Table 1005-1 Column C for LL/PI, and gradation, the lot will be considered acceptable.

3) When the test results for a lot exceed gradation limits, and the lot cannot be corrected by the addition of aggregate, or when the gradation of a corrected lot exceed limits of Table 1005-1, Column B, or the LL or PI exceed limits of Table 1005-1 Column B, the lot will be rejected and shall be removed and replaced at no additional cost to the Department unless otherwise approved by the Engineer. Correction of a lot when LL or PI results exceed *Standard Specifications* will not be permitted.

4) When test results for a RA sampling lot exceed specification limits and the results indicate the material can be corrected by the addition of aggregate, the Engineer may allow the material to be corrected provided there is no additional cost to the Department for furnishing, adding, re-mixing, re-shaping, and re-compacting of the added material. The method of correcting the lot shall be approved both by the Area Construction Engineer and the Central Laboratory Engineer.

5) Project personnel will obtain one randomly located sample from the corrected RA sampling lot. When the LL/PI or gradation of a corrected lot exceeds limits of Table 1005-1, Column B, the material will be removed and replaced at no additional cost to the Department in accordance with the requirements of Article 520-6 of the *Standard Specifications*

RA Check Sample (CTBC) – CTBC check samples will be taken by a M&T representative with assistance from project personnel in accordance with procedures listed below if cement has not been added. The M&T representative will investigate and compile a report documenting the results. The Area Construction Engineer and appropriate representative from the aggregate producer should be notified prior to taking the check sample. Additional guidance regarding the investigation process is provided in Appendix H and Appendix I of this manual.

1) Perform additional sampling of the lot. The procedure for this additional sampling consists of obtaining another sample within 5 feet of the original sample.

2) When the test results for a lot are within the limits for LL/PI and gradation of Column C of Table 1005-1, the lot will be considered acceptable.

3) When the test results for a lot exceed specification limits for gradation, and the lot cannot be corrected by the addition of aggregate or when the gradation of a corrected lot exceeds any of the limits of Table 1005-1, Column B, or the LL or PI of the sample exceed the limits of Table 1005-1 Column B, the lot will be rejected and shall be removed and replaced at no additional cost to the Department unless otherwise approved by the Engineer. Correction of a lot when LL or PI exceeds specifications will not be permitted.

4) When test results for a lot exceed specification limits shown above and the test results indicate the material can be corrected by the addition of aggregate, the Engineer may allow the material to be corrected provided there is no additional cost to the Department for furnishing, adding, re-mixing, re-shaping, and re-compacting of the added material. The method of correcting lots exceed specifications shall be approved both by the Area Construction Engineer and the Central Laboratory Engineer.

5) Project personnel will obtain a randomly located sample from the corrected lot. When the LL/PI or gradation of a corrected lot exceeds any of the limits of Table 1005-1 Column B, the material will be removed and replaced at no additional cost to the Department in accordance with the requirements of Sub-article 520-6 of the *Standard Specifications*.

Additional information regarding check samples can be found in Appendix H and Appendix I.

RA Check Sample (Select Material Class IV) - Due to various applications and methods of placement obtaining check samples for Select Material Class IV may or may not be possible. Therefore, when a sample fails for Class IV material it will be evaluated on a case-by-case basis. If a check sample can be taken the same procedures used for obtaining ABC check samples will apply.

RI Check Sample – Follow applicable procedures described in Section 6, Appendix H, and Appendix I.

Check Sample Identification and Numbering

Check sample(s) for either RA or RI samples will be taken by a Materials and Tests representative and may be taken before correction. Check samples are labeled the same as the original sample with the addition of an alphabetical designation. For example, if a check sample is taken representing sample “RA-1” then the check sample will be labeled RA-1A. If a check sample is taken for “RI-079-1” it will be labeled as RI-079-1A. In the event the Contractor elects to correct a RA lot, the Resident Engineer’s personnel will re-sample the lot and use the next suffix to designate the sample (i.e., RA-1B). The same guidelines for obtaining and submitting samples are to be followed.

Section 8 – Ethics / Falsification

Ethics has the following definitions when referenced in a dictionary:

1. *A principle of right or good behavior*
2. *A system of moral principles or values*
3. *The study of general nature of morals and the specific moral choices an individual makes in relating to others*
4. *The rules or standards of conduct governing the members of a profession*

To maintain trust of the public, the Department has implemented an Ethics Policy and the latest version is posted at the following webpage:

https://inside.ncdot.gov/Employees/HRDocumentLibrary/HR%20Manual/13%20Miscellaneous/Ethics%20Policy.pdf

The entire Ethics Policy should be reviewed, and these policies apply to Department personnel as well as contract/consultant staff completing work as a representative of the Department. Ethics policy regarding falsification is as follows:

Falsification

North Carolina State Law G.S. Chapter 136 Roads and Highways
13.2 Falsifying highway inspection reports

(a) Any person who knowingly falsifies any inspection report or test report required by the Department of Transportation in connection with the construction of highways shall be guilty of a Class H Felony.
(b) Any person who directs a subordinate under his direct or indirect supervision to falsify an inspection report or test report required by the Department of Transportation in connection with the construction of highways shall be guilty of a Class H Felony.

Punishment for a Class H Felony can result in up to 10 years in jail, up to $10,000.00 in fines or both.

Federal Law Title 18-Crimes and Criminal Procedure
Part I – Crimes
Chapter 47 – Fraud and False Statements
Section 1020. Highway Projects

Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity of the work performed or to be performed, or the costs thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction of any highway or related project submitted for approval to the Secretary of Transportation; or Whoever knowingly

makes any false statement, false representation, false report, or false claim with respect to furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to a material fact in any statement, certificate, or report submitted pursuant to the provisions of the Federal-Aid Road Act approved July 11, 1916 (39 Stat. 355), as amended and supplemented,
Shall by fined under this title $10,000.00 or imprisoned not more than five years, or both.

Falsification of Records is defined as the changing or misrepresentation of Data or Tests. Falsification also includes the destruction of alteration of records.

Appendix A

ABC Sampling Using Steel Sampling Ring

Equipment

Steel sampling ring (12-inch outside diameter, 9-inch deep)
Scoop/Large spoon
Small pick
Sample bags (in good condition)
Wooden mallet
Sample card
Plastic bags (for sample cards)
Plastic ties

Procedure

The following procedure is for taking a sample when the material is placed using a mechanical spreader box. 70 pounds of material will require a minimum of 2 full M&T sampling bags. The sample is to be obtained on the loose lift (prior to any compaction, manipulation, or sealing) and should not be within 2 feet of the edge of a spread. If the sampling site looks unusually segregated when visually compared with the surrounding material, do not sample in the segregated area. Move the ring out of the segregated area and obtain the sample. Document your decision and actions in the Field Logbook including location of the segregated area. If you continue to notice segregated areas, investigate to determine the cause. If you have any questions regarding this issue, contact your local M&T representative.

1. Place sample ring on flat surface of material to be sampled.
2. Use the pick to carefully loosen material. Remove the material within the ring using a scoop or spoon. Place material in the sample bag.
3. Lower the ring as material is removed. This can be accomplished by lightly tapping the top of the ring with a wooden mallet. Remove all material down to the full depth of the layer.
4. If two full bags have been obtained after the ring reaches the bottom of the layer, go to step 6. If not, move the ring over such that the new position of the ring overlaps with the previous position (see Figure A.1). The technician should exercise judgment on whether there is sufficient material within the ring's new position so that the two-bag minimum will be attained.
5. Repeat steps 2 to 4.
6. Fill out a sample card for each bag of material.
7. Place each sample card into a plastic bag for protection.
8. A sample card must be placed in each bag of material.
9. Enter sample details into HiCAMS
10. Deliver sample(s) to Materials and Tests within **48 hours** of obtaining samples.

This is a top view of the ring. The solid circle shows the location of the sampling ring. The dashed circle is an example of an acceptable new location for obtaining additional material. Note that the two locations must overlap.

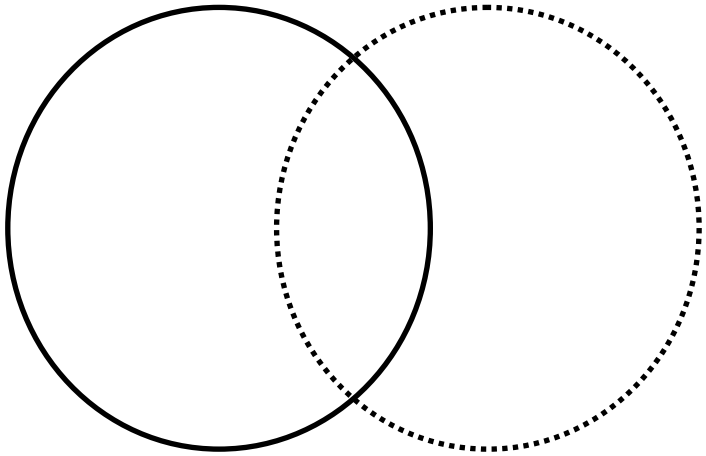


Figure A.1 - Moving the Sampling Ring

Appendix B

Random number calculation examples

The purpose of using random numbers in taking samples is to ensure that sampling is unbiased. It prevents the preferential selection of a sample location based on some form of bias, such as sample appearance, etc.

Use the random numbers provided in Appendix K of this manual. Record the random numbers used for calculating the sample location on the "Comment" box on the sample card and in the "Remarks" column in the ABC Field Logbook (Appendix G). To ensure that the numbers obtained from these tables are truly random, a consistent pattern must be used in extracting numbers from the tables. Once a pattern is established, it shall be used for the duration of the project.

When obtaining RA samples, the random numbers are used to calculate the tonnage and width across roadway at which a sample is to be taken. When obtaining RI samples, random numbers are used to calculate the sample site location from within the total length and width of the daily coverage area.

Example 1: First RA sample of ABC used in roadway (assume 12 foot lay-down width).

a) Random numbers are as follows:

	0
1	8121
2	4185
3	7423
4	9153
5	1617

b) Lot size = 2,500 tons

c) The sample is to be taken at

2,500 tons x 0.81 = **2,025 tons**

12 ft x 0.21 = **2.5 or 3 feet from either edge**

d) Once a random number(s) is used, strikethrough the number

Example 1 (continued): Second RA sample used in roadway (assume 12 foot lay-down width)

a) Random numbers are as follows:

	0
1	~~8121~~
2	4185
3	7423
4	9153
5	1617

b) Lot size = 2,500 tons
c) The sample is to be taken at
2,500 tons x 0.41 = 1,025 tons
1,025 tons + 2,500 tons = **3,525 tons**
12 ft x 0.85 = **10 feet**
d) Once a random number(s) is used strikethrough the number
e) Repeat these procedures for the remaining sampling lots

Example 2: Stabilizer Aggregate (RA Sample) sampled from spreader box (no need to calculate random location for the width, sample from within spreader box)

a) Random numbers are as follows:

	0
1	~~8121~~
2	~~4185~~
3	7423
4	9153
5	1617

b) Lot size = 1,255 tons
c) The sample is to be taken at
1,255 tons x 0.74 = **928.7 or 929 tons**

Example 3: Select Material Class IV (placed without spreader box, refer to sampling procedures listed in Appendix E)

a) Random numbers are as follows:

	0
1	~~8121~~
2	~~4185~~
3	~~74~~23
4	9153
5	1617

b) Lot size 2,500 tons

c) The sample is to be taken from the center of the pile at:

2,500 tons x 0.23 = **575 tons**

d) Once a random number(s) is used, strikethrough the number

Example 4: RA Samples from a project utilizing a total of 3,500 tons (ABC placed with spreader box 12-foot width). This process stratifies the sampling locations to obtain better representation of the material being delivered. This process should be followed when a project uses less than 5,000 tons.

a) Minimum of two samples required, therefore divide the 3,500 tons into two equal lots:

3,500 tons / 2 = **1,750-ton sampling lots**

b) Utilize proper sampling procedures (refer to Appendix A)

c) Randomly locate one sampling site from each 1,750-ton sampling lot

d) Random numbers are as follows:

	0
1	~~8121~~
2	~~4185~~
3	~~7423~~
4	9153
5	1617

e) The first sample is to be taken:

1,750 tons x 0.91 = 1592.5 or **1,593 tons**

12 ft x 0.53 = 6.36 or **6 feet from edge**

f) The second sample is to be taken:

1,750 tons x 0.16 = 280 tons

280 tons + 1750 tons = **2,030 tons**

12 ft x 0.17 = 2.04 or **2 feet from edge**

g) Once a random number is used, strikethrough the number.

Example 5: RI Sample from first day's placement of ABC. A total of 1,160 tons of ABC from Hardrock Quarry was placed. Use random numbers to determine location of the sample site. Assume coverage area for the day begins at Station10+50, ends at Station 21+70, and is 36 feet in width.

a) Random numbers are as follows:

	0
1	~~8121~~
2	~~4185~~
3	~~7423~~
4	9153
5	1617

b) Determine length of coverage area
   2170 – 1050 = 1120 feet

c) Calculate sampling site
   Length -
   1120 feet x .91 = 1019.2 or 1019 feet
   (Begin Sta) 1050 + 1019 = 2069 or **Station 20+69**
   Width (offset) -
   36 feet x .53 = 19.08 or **19 feet**

d) Strike through random numbers once used

Appendix C

Aggregate Specification Table

Table 1005-1

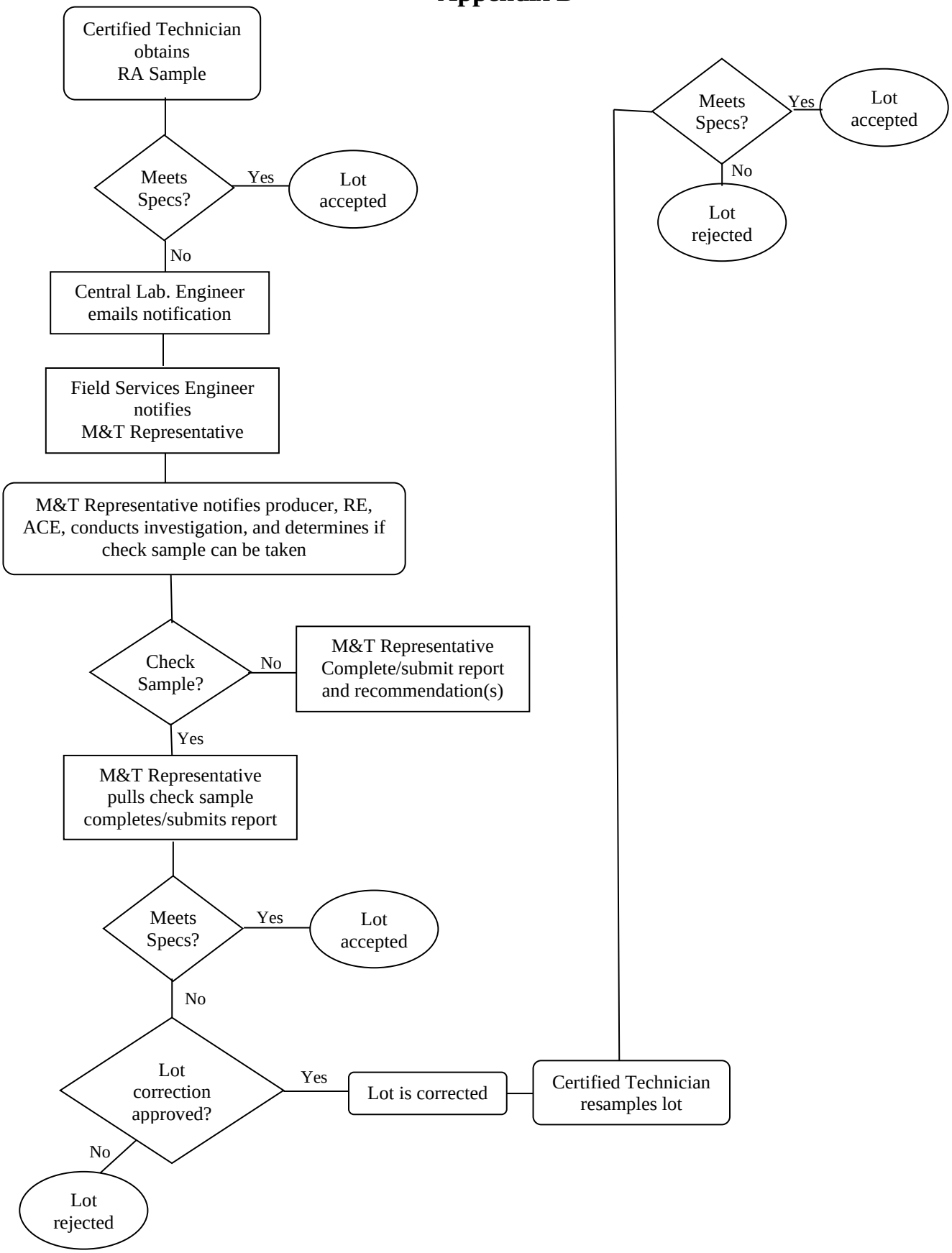
Base Course – ABC, CTBC, and Select Material Class IV
Gradation Acceptance Ranges, Liquid Limit (L.L), and Plasticity Index (P.I.)

Column A (Sieve Size)	Column B % Passing (QC/QA Sample Specs)	Column C % Passing (RA/RI Sample Specs)	Column D (Penalty Points)
1-1/2”	100	98-100	1
1”	75-97	72-100	1
½”	55-80	51-83	1
#4	35-55	35-60	3
#10	25-45	20-50	2
#40	14-30	10-34	3
#200	4-12	3-13	5
* Material Passing No. 10 Sieve (Soil Mortar)			
#40@	40-84	36-84	2
#200@	11-35	10-36	2
Material Passing No. 40 Sieve			
L. L.	0-30	0-30	-
P. I.	0-4	0-4	-

Table 1010-1

*Soil Mortar specification requirements (#40@ and 200@) apply if P.I. is greater than 4. If the P.I. exceeds 6, material shall be rejected**.** P.I. cannot exceed 4 for CTBC.

Appendix D


Certified Technician obtains RA Sample
Meets Specs?
Yes
Lot accepted
No
Central Lab. Engineer emails notification
Field Services Engineer notifies M&T Representative
M&T Representative notifies producer, RE, ACE, conducts investigation, and determines if check sample can be taken
Check Sample?
No
M&T Representative Complete/submit report and recommendation(s)
Yes
M&T Representative pulls check sample completes/submits report
Meets Specs?
Yes
Lot accepted
No
Lot correction approved?
Yes
Lot is corrected
Certified Technician resamples lot
No
Lot rejected
Meets Specs?
Yes
Lot accepted
No
Lot rejected

Appendix E

Sampling procedures when a mechanical spreader is not used

If aggregate is placed without a mechanical spreader, segregation will occur as the material is "tailgated" or spread on the grade. Once material is spread in this manner it may not represent what was delivered. Therefore, when sampling in this manner, the following procedures will apply:

Equipment

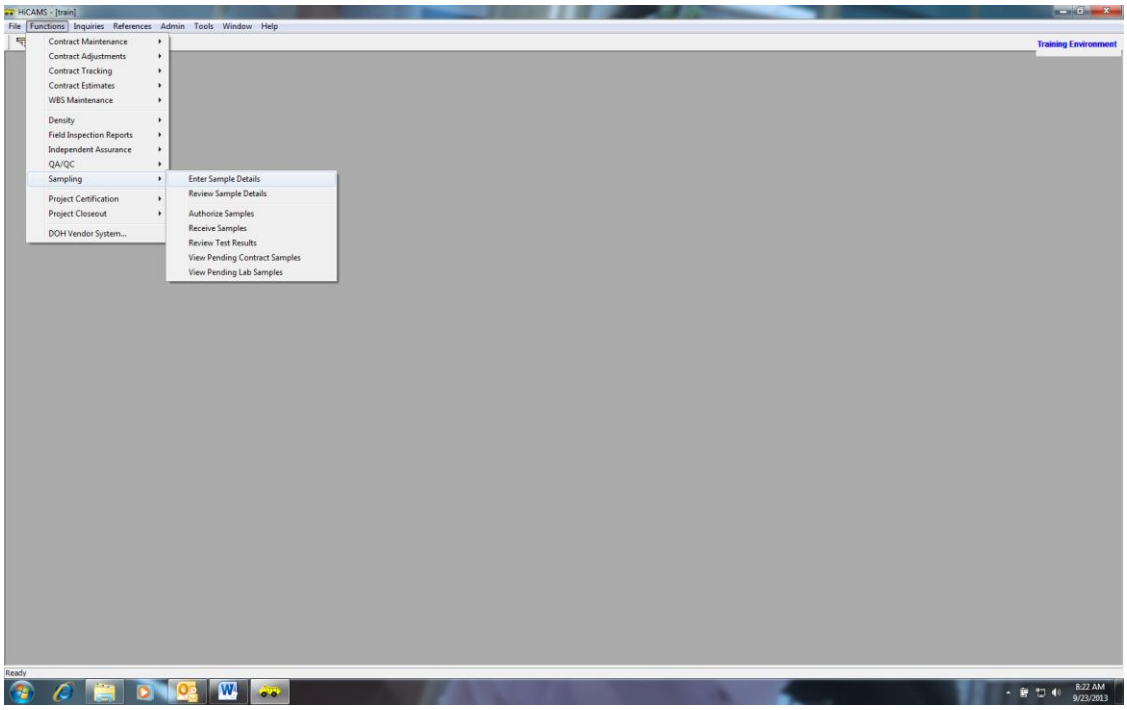
Steel sampling ring (12-inch outside diameter, 9-inch deep)
Scoop/Large spoon
Small pick
Shovel (not used to take the sample)
Sample bags (in good condition)
Wooden mallet
Sample card
Plastic bags (for sample cards)
Plastic ties

1. Use random numbers as described in Appendix B to determine the sampling tonnage.
2. When a truck dumps material, a conical shaped pile is usually formed.
3. Using the blade of a motor grader, dozer, or if necessary, a shovel, strike off the top half of the pile.
4. Place the NCDOT approved sampling ring in the middle of the pile.
5. Use the pick (if necessary) to loosen material from within the ring and use a scoop or spoon to place the material from within the ring into the sample bag.
6. Lower the ring as material is removed. This can be accomplished by lightly tapping the top of the ring with a wooden mallet (never tap top of ring with a metal object).
7. Obtain two full bags of material (approximately 70 pounds).
8. Fill out a sample card for each bag.
9. Place each sample card in a plastic bag.
10. Place a sample card in each bag.
11. Seal top of bag.
12. Enter sample details into HiCAMS.
13. Deliver samples to Materials and Tests within **48 hours** of obtaining the sample.

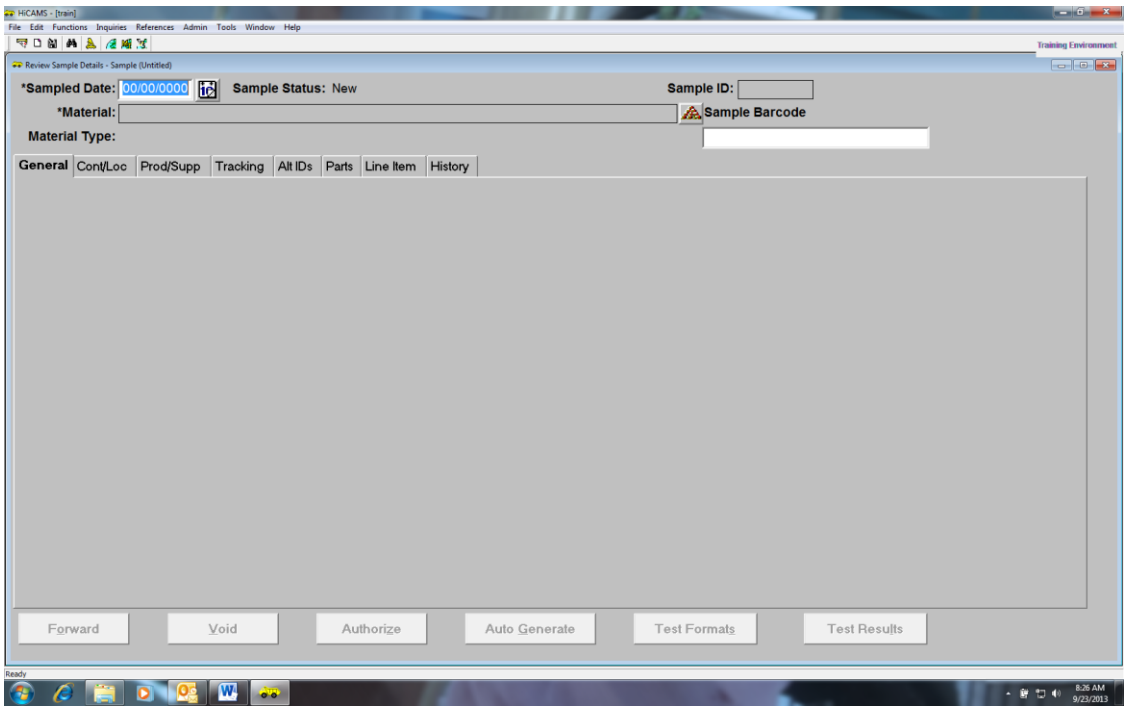
Appendix F

Procedures for entering samples into HiCAMs

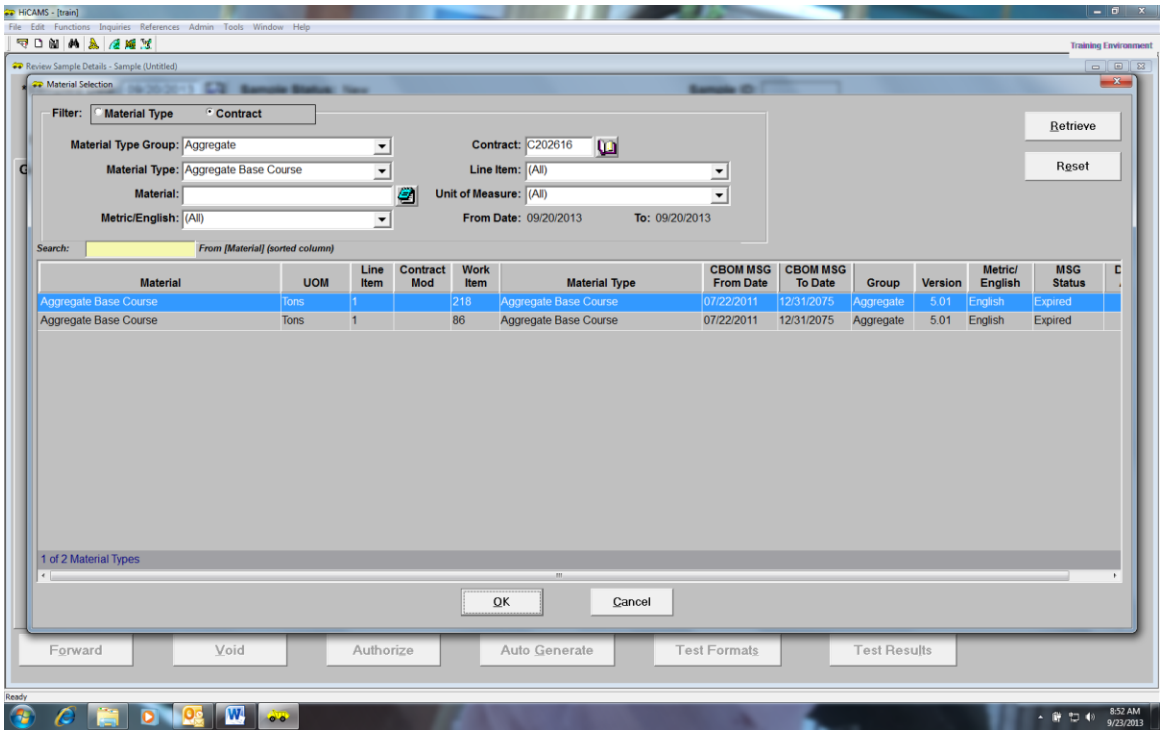
Select “Functions”; then “Sampling”; then “Enter Sample Details”



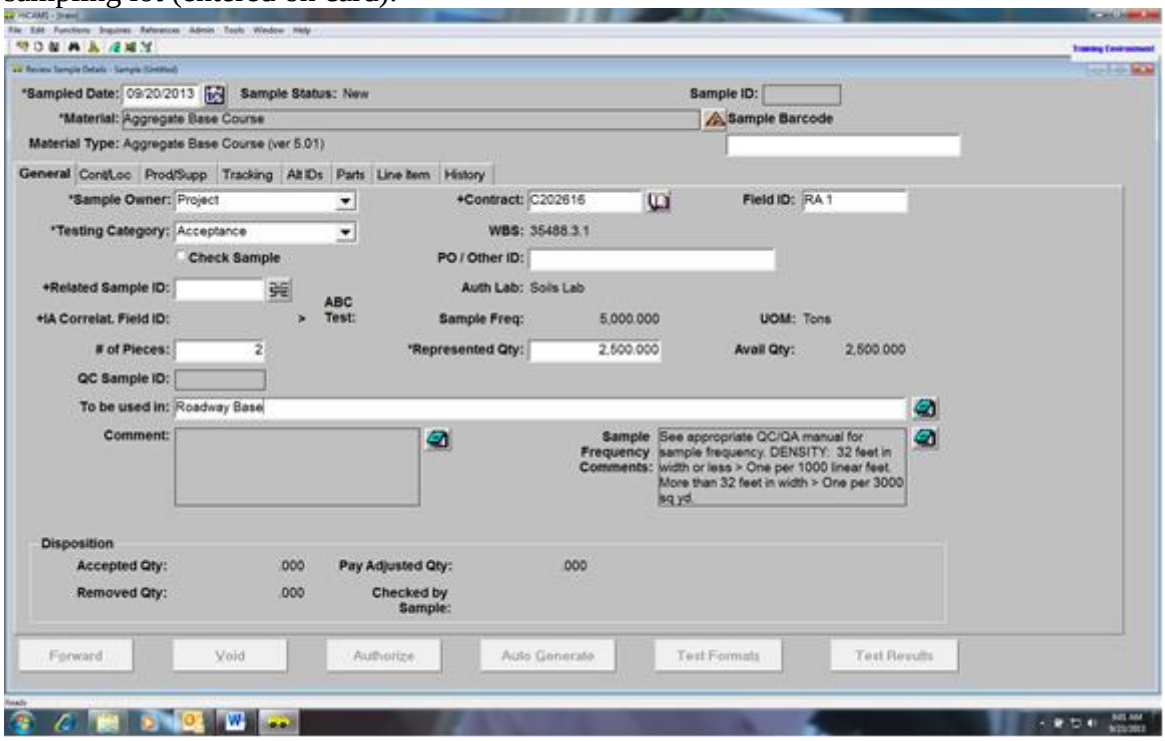
Enter the “Sampled Date”



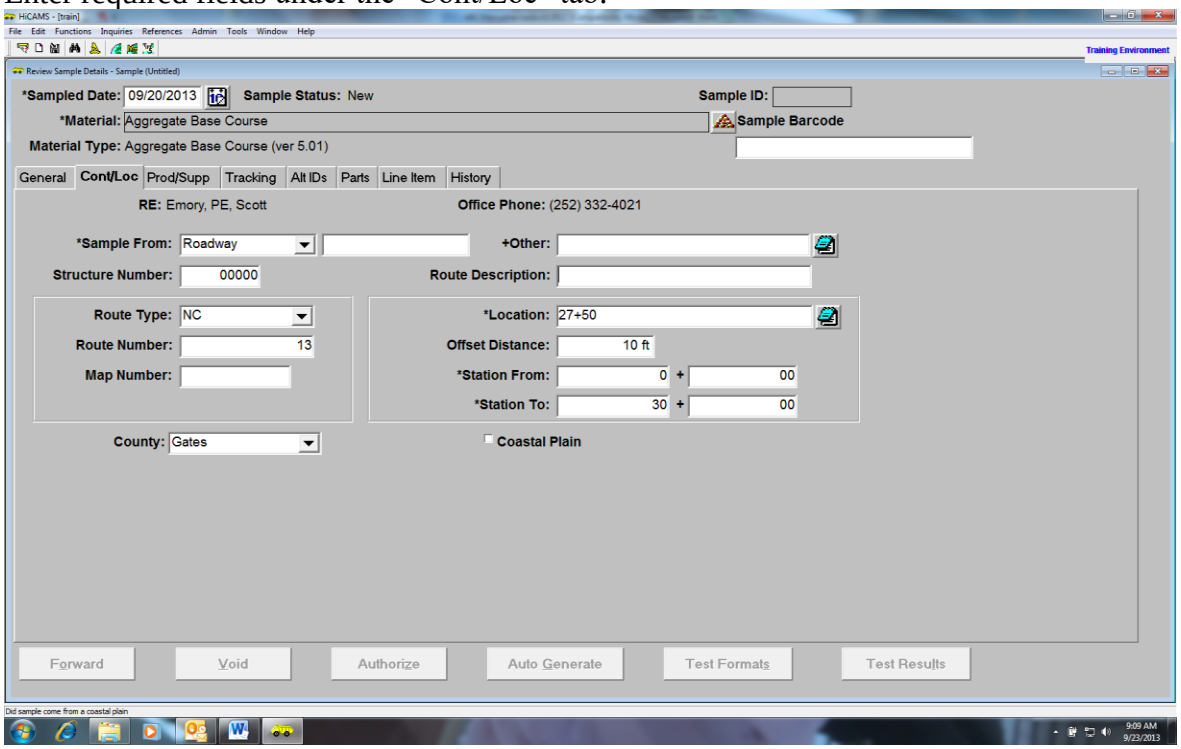
Enter “Contract” and select “Material Type” = “Aggregate Base Course”. Highlight appropriate item the aggregate material is being used in.



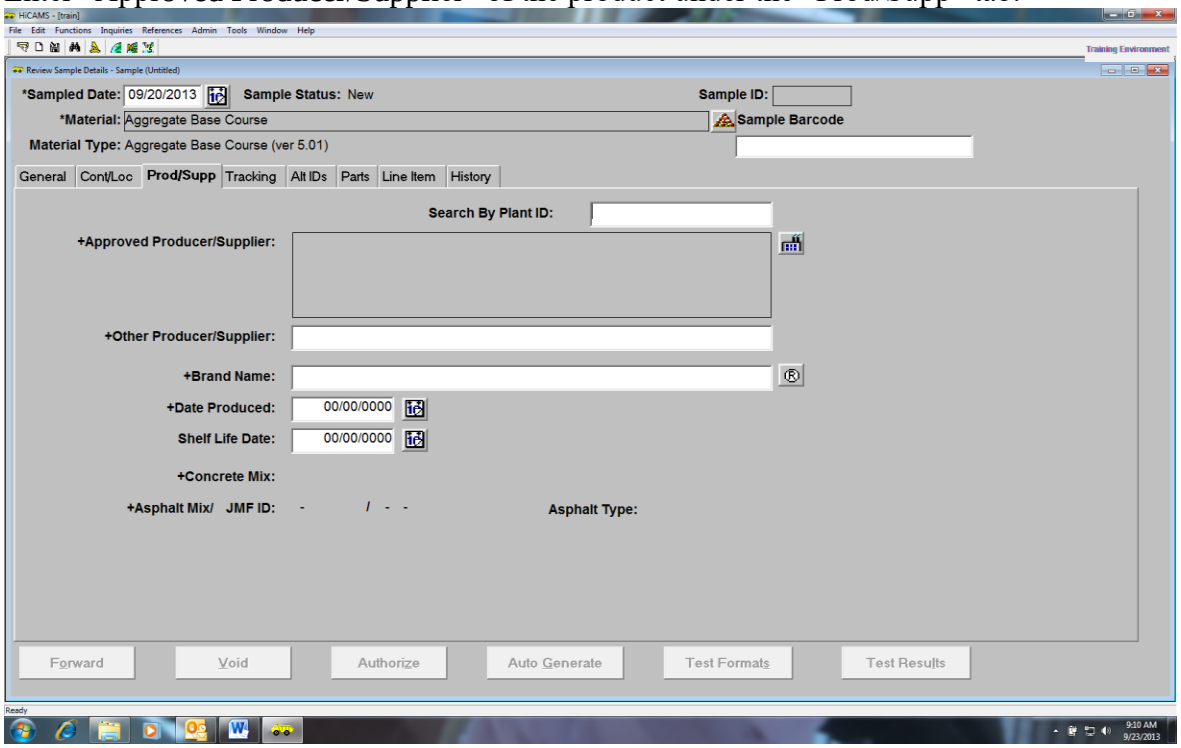
Enter required fields under the “General” tab. The “**Sampling Freq**:” should be 2,500 and the “**Represented Qty**:” should equal the amount of material represented in the sampling lot (entered on card).



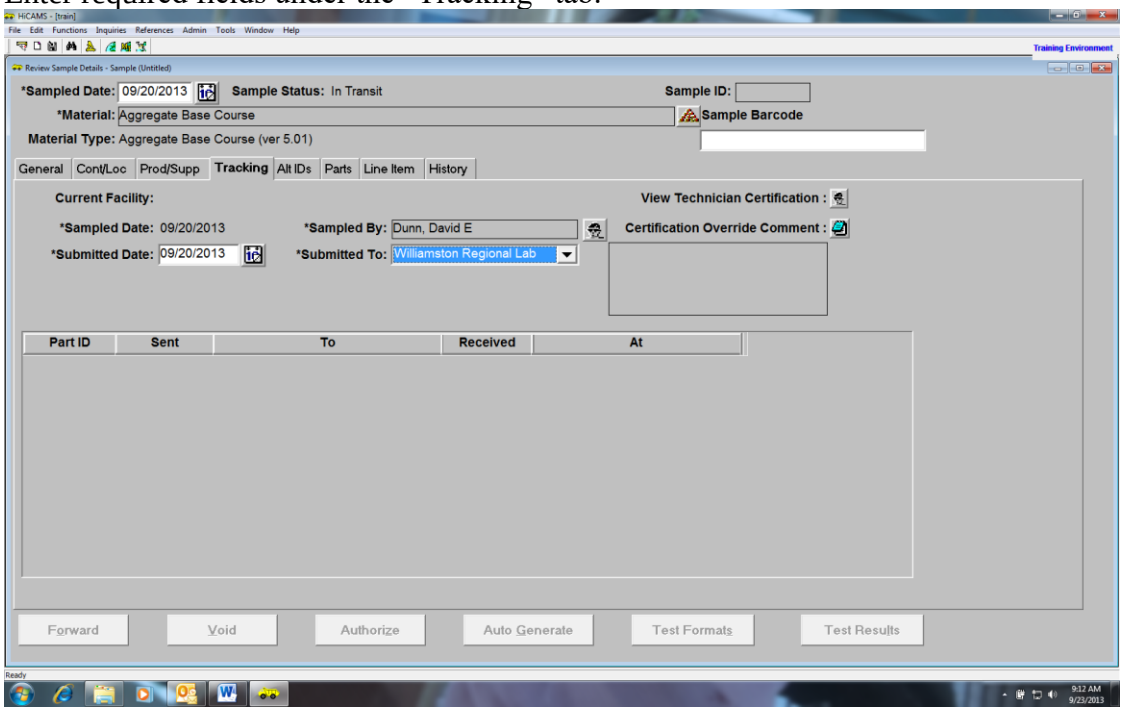
Enter required fields under the “Cont/Loc” tab.



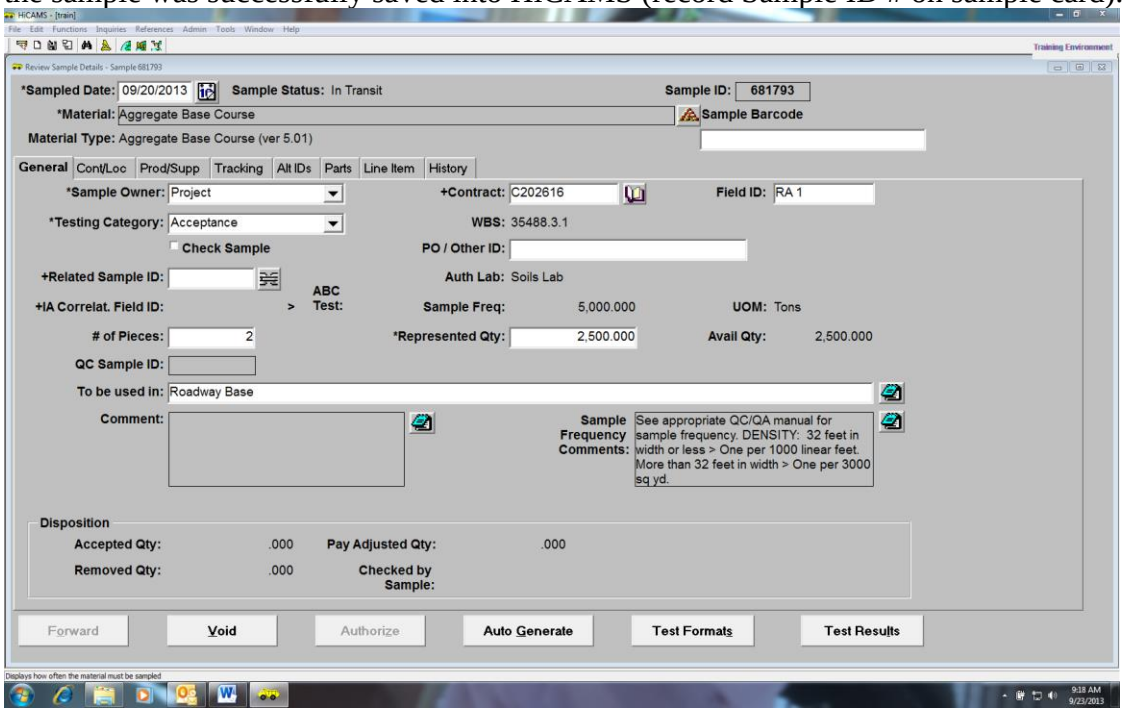
Enter “Approved Producer/Supplier” of the product under the “Prod/Supp” tab.



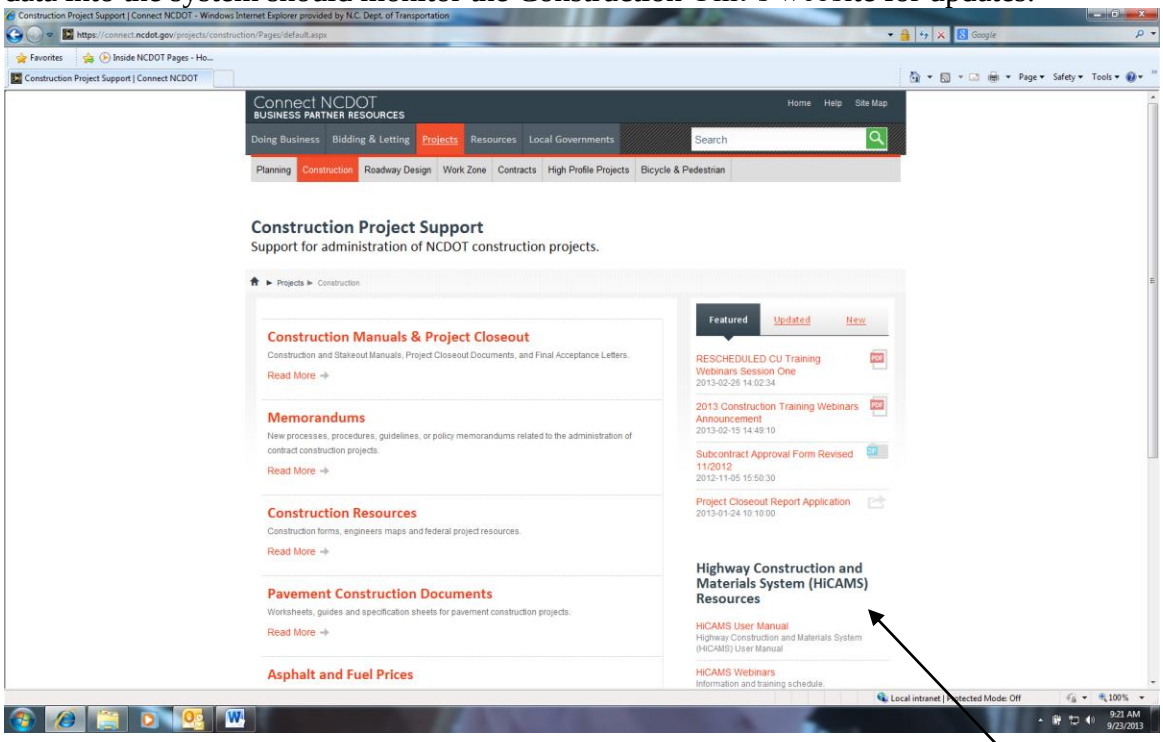
Enter required fields under the “Tracking” tab.



For RI samples select “Informational” as the Testing Category. If a RA sample is entered select “Acceptance” as the Testing Category. If all required information has been entered, pick the “Save” function. The system will prompt you if any required field(s) has not been entered. A “Sample ID:” will be displayed if all information is entered and the sample was successfully saved into HiCAMS (record Sample ID # on sample card).



Since the HiCAMs database is changed periodically, personnel responsible for entering data into the system should monitor the Construction Unit's website for updates.



Information regarding HiCAMS can be accessed at this website.

Appendix G

Refer to figure below for an example of a maintaining an ABC Field Log

LC 32 Aggregate Base Course				Roadway Assurance (RA) Sample Book								Sample Frequency	- 1 Sample per 2,500 Tons or fraction thereof - No more than 5 days of ABC placement without a sample - Samples may be taken more often to ensure minimum samples are obtained, or as deemed necessary by the RE
			Distance	Random	Daily	Cumulative	Represented						
Sample #	Alignment	Station	From C/L	Number	Total	Total	Quantity	Result	Date	Initials	Remarks		
					895.04	895.04			9/12/2009				
					763.66	1658.7			9/23/2009				
					37.58	1696.28			9/26/2009				
RA - 1	-L-	13+35	28.8 Rt	7316	579.77	2276.05	2276.05	Pass	10/10/2009	BYO			
RA - 2	-Y1-	15+23	2.0 Rt	3204	604.24	2880.29	604.24	Fail	12/12/2009	BYO	RE requested sample due to failure to use spreader box		
					1030.99	3911.28			10/16/2009				
RA - 2A	-Y1-	15+23	6.6 Rt	2392	----	----	----	Pass	10/18/2009	DOP	Check Sample Passed (Taken by M&T)		
					100.11	4011.39			10/19/2009				
					284.05	4295.44			10/20/2009				
RA - 3	-L-	22+54	43.2 Rt	2976	1084.85	5380.29	2500	Pass	10/23/2009	BYO	Today's quantity (1438.99) split between RA-3 and RA-4		
					354.14	5734.43			10/23/2009				
					310.56	6044.99			10/24/2009				
					1133.28	7178.27			10/25/2009				
					18.91	7197.18			10/27/2009				
					75.39	7272.57			10/28/2009				
RA - 4	-L-	12+34	44.2 Lt	4820	82.52	7355.09	1974.8	Pass	11/2/2009	BYO	Sample taken due to 5 days of placement		
					370.74	7725.83			11/15/2009				
					194.08	7919.91			11/16/2009				
RA - 5	-L-	15+94	40.12 Lt	3937	1309.89	9229.8	1874.71	Fail	11/17/2009	BYO			
RA - 5A	-L-	15+94	41.62 Lt	2930	----	----	----	Fail	11/23/2009	DOP	Check Sample Failed (Taken by M&T) Removed & Replaced		
					911.82	10,141.62			12/12/2009				
					19.53	10161.15			12/14/2009				
RA - 6	-L-	19+32	47.0 Lt	3203	1192.21	11353.36	2129.58	Pass	3/22/2010	FRH			
					743.63	12096.99			3/29/2010				
					292.33	12389.32			3/30/2010				
RA - 7	-L-	21+10	33.4 Lt	3465	678.8	13068.12	1714.76	Pass	4/1/2010	FRH			
RA - 8	-L-	25+37	29.8 Rt	3920	2301.4	15369.52	2301.4	Pass	4/15/2010	BYO			
RA - 9		31+98	31.5 Rt	3827	2500	17869.52	2500	Pass	4/16/2010	KLM	Today's quantity (3019.93) split between RA-9 & RA-10		
					519.93	18389.45			4/16/2010				
RA - 10		35+21	42.3 Rt	9372	1913.33	20302.78	2433.26	Pass	4/17/2010	KLM			

Notes
> Random number when days production is less than 2500 should be based on estimated days production for day which sample is taken
> Represented quantity should be 2500 tons or quantity represented since last sample
> Check samples must be taken by M&T Independent Assurance Technician

LC 32 Aggregate Base Course

Roadway Assurance (RA) Sample Book

Sample Frequency
- 1 Sample per 2,500 Tons or fraction thereof
- No more than 5 days of ABC placement without a sample
- Samples may be taken more often to ensure minimum samples are obtained, or as deemed necessary by the RE

Sample #	Alignment	Station	Distance From C/L	Random Number	Daily Total	Cumulative Total	Represented Quantity	Result	Date	Initials	Remarks

Notes

> Random number when days production is less than 2500 should be based on estimated days production for day which sample is taken

> Represented quantity should be 2500 tons or quantity represented since last sample

> Check samples must be taken by M&T Independent Assurance Technician

Appendix H

Procedures for Failing Roadway Samples

1. As soon as test results are available, the Central Laboratory Engineer will notify the Resident Engineer's office by email of the failure, with corresponding HiCAMS information, and arranging for an investigation to be conducted by Materials and Tests (M&T). The State Materials Engineer, State Construction Engineer, applicable Area Construction Engineer, Quality Assurance Engineer, Field Services Engineer, and aggregate producer's representative will be copied on the email to the Resident Engineer.

2. The Quality Assurance Engineer will immediately process and provide a QC and QA data summary (see #3) to the Field Services Engineer and the aggregate producer for reference. This data will be incorporated into a report with the findings of the M&T representative (see #4).

3. The QC/QA summary will contain analysis of any trends in the test results obtained from the production site based on the 20 QC samples obtained prior to the time of placement and the Department's corresponding verification of those results. If necessary, the review will include data from a larger time frame in order to provide meaningful information. All data used in compiling the summary should be included with the field investigation report.

4. The M&T representative will be notified with information regarding the failing sample(s) and will contact the Resident Engineer's office, aggregate producer, and Area Construction Engineer to schedule an investigation and, depending on results of the investigation, obtain a check sample in accordance with the *Aggregate Sampling Manual*.

5. All observations (sample location, visible segregation, coarseness vs. fineness, proper sampling procedure, proper placement procedures, etc.) will be noted and combined with the QC/QA summary in a report with the results of any check sample attached. This report will be sent from the Field Service Engineer to the Area Construction Engineer.

Appendix I

Investigation Procedures for M&T Representative (RA Sample)

1. The Central Laboratory Engineer notifies the Field Services Engineer that a roadway sample has failed.

2. The Field Services Engineer notifies the appropriate Materials and Tests (M&T) representative to perform an investigation and, if possible, obtain a check sample.

3. The M&T representative contacts the Resident Engineer for the project, Area Construction Engineer, and representative from the quarry supplying the ABC to schedule an investigation. If investigation determines the original sample was taken following proper procedures and the existing material has not been excessively manipulated, a check sample should be obtained within 5 feet of the original sample location. The Department has the right to sample beyond the 5-foot original sample location if any conditions listed in items 6 and/or 8 are present or any other extenuating circumstances that may influence the sample.

4. Quarry personnel may take an informational only check sample adjacent to the Department's check sample

5. Prior to obtaining a check sample, review the previous 20 QC and corresponding QA test sample results tested prior to the failing RA sample to determine if any trends or irregularities exist. Note any issues on the investigation report.

6. As part of the investigation, the M&T representative meets with the ABC sampling technician to discuss and confirm that he or she is certified to take ABC samples and that the proper sampling procedures were followed while obtaining the original sample. Items reviewed include:

    - using random numbers to determine sample location
    - staying 2 feet away from edges of spread when sampling
    - using the ABC steel sampling ring
    - sampling completely through to the next layer of material
    - making sure the quantity of the sample meets the minimum 65 lbs. dry weight requirement
    - was mechanical spreader utilized or were sampling procedures described in Appendix E used
    - could sample have been taken on a seam where 2 lanes get blended-together potentially leading to segregation
    - noting any observations from the ABC sampling technician or other project inspectors that may be pertinent to the investigation

7. After consideration of the above information, a check sample may be taken in accordance with the current version of the *Aggregate Sampling Manual*.

8. Other considerations for not obtaining a check sample include the following conditions:
    - it is impossible to sample within 5 feet of the original sample due to location (material covered, in a taper, unknown location of original sample)
    - the "dump and push method" was used
    - material represented by the original sample has been excessively manipulated (i.e., pushed or bladed, additional material added, etc.)
    - tailgated material was not sampled using the alternate method in accordance with Appendix E of the *Aggregate Sampling Manual*

9. If the investigation determines the original RA sample was not obtained following proper procedures or taken by a non-certified technician, the M&T representative will recommend voiding the original sample. Depending on material placement or manipulation following placement, the area in question may be re-sampled following proper procedures by a certified representative from the field office. Though not required, the M&T representative may be present during the resampling process to perform an assessment of sampling procedures. If the original sample is to be voided, the Resident Engineer or Area Construction Engineer should contact Materials and Tests to request voiding the sample.

If either the re-sampling or check sampling process is not an option, the Resident Engineer may evaluate the intended use of the product, results of the investigation, and use engineering judgement to determine acceptance. As part of the evaluation process the Engineer may also obtain additional aggregate samples for information only, review density results, increase density testing to ensure area has acceptable density, and/or perform in-situ performance testing such as DCP or FWD to determine if the area in question will perform as intended. The Materials and Tests – Data Collection and Investigations Group can assist with performing the in-situ performance testing while the Materials and Tests - Pavement Design Group can assist with interpreting data. Possible actions taken by the Resident Engineer include but are not limited to accepting the material under 105-3 of the *Standard Specifications* as reasonably close to conformity.

Investigation Procedures for M&T Representative (RI Sample)

1. The Central Laboratory Engineer notifies the Field Services Engineer that a roadway sample has failed.

2. The Field Services Engineer notifies the appropriate Materials and Tests (M&T) representative to perform an investigation and, if possible, obtain a check sample.

3. The M&T representative contacts the Resident Engineer for the project, Area Construction Engineer, and representative from the quarry supplying the ABC to schedule an investigation. If investigation determines the original sample was taken following proper procedures and the existing material has not been excessively manipulated, a check sample should be obtained within 5 feet of the original sample location. The Department has the right to sample beyond the 5-foot original sample location if any conditions listed in items 6 and/or 8 are present or any other extenuating circumstances that may influence the sample.

4. Quarry personnel may take an informational only check sample adjacent to the Department's check sample

5. Prior to obtaining a check sample, review the previous 20 QC and corresponding QA test sample results tested prior to the failing RA sample to determine if any trends or irregularities exist. Note any issues on the investigation report.

6. As part of the investigation, the M&T representative meets with the ABC sampling technician to discuss and confirm that he or she is certified to take ABC samples and that the proper sampling procedures were followed while obtaining the original sample. Items
reviewed include:

    - using random numbers to determine sample location
    - staying 2 feet away from edges of spread when sampling
    - using the ABC steel sampling ring
    - sampling completely through to the next layer of material
    - making sure the quantity of the sample meets the minimum 65 lbs. dry weight requirement
    - was mechanical spreader utilized
    - could the sample have been taken on a seam where 2 lanes get blended-together potentially leading to segregation
    - noting any observations from the ABC sampling technician or other project inspectors that may be pertinent to the investigation

7. After consideration of the above information, a check sample may be taken in accordance with the current version of the *Aggregate Sampling Manual*.

8. Other considerations for possibly not obtaining a check sample include the following conditions:
    - it is impossible to sample within 5 feet of the original sample due to location (material covered, in a taper, unknown location of original sample)
    - the "dump and push method" was used
    - material represented by the original sample has been excessively manipulated (i.e., pushed or bladed, additional material added, etc.)
    - tailgated material was not sampled using the alternate method in accordance with Appendix E of the *Aggregate Sampling Manual*

9. If the investigation determines the original RI sample was not obtained following proper procedures or by a non-certified technician, the M&T representative will recommend voiding the original sample. Depending on material placement or manipulation following placement, the area in question may be re-sampled following proper procedures by a certified representative from the field office. Though not required, the M&T representative may be present during the resampling process to ensure proper sampling procedures are followed. If the original sample is to be voided, the Resident Engineer or Area Construction Engineer should contact Materials and Tests to request voiding the sample.

Appendix J – Random Numbers

ASTM D-3665

	0	1	2	3	4	5	6	7	8	9
1	8121	3695	7367	7390	8568	9550	3107	3589	8240	3059
2	4185	5885	0699	3204	5610	3896	1692	2695	3354	9693
3	7423	7796	3747	8271	6052	8188	7913	4975	2525	3610
4	9153	3997	4351	5758	1611	0736	9949	9995	0791	5927
5	1617	6057	8761	8397	9092	0148	6552	7139	1588	0437
6	8760	3170	1224	4708	0815	7609	6584	4617	7047	6426
7	3588	2066	9567	9292	0174	4935	8792	5666	4876	7563
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266	2555	7714	6454	8424	2953	4083	5523	2402	5565	4877
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381	1747	7440	8716	6254	0012	6060	5348	7185	5750	4662
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459	7800	5776	7489	6166	9933	7387	1823	5741	7063	9422
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465	6968	6542	4931	0323	0554	8831	8249	0884	9401	6952
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495	9895	7280	6024	4505	0338	0706	8514	0659	5178	4059
496	3081	0287	4712	5215	7088	7707	0787	7815	7176	7655
497	2725	3254	8246	4645	9448	7622	0063	9307	9870	2843
498	7315	0408	0976	3714	3932	9194	6425	6438	0639	0028
499	5270	0138	2015	7250	0504	5008	2431	8394	1859	7517
500	6729	4405	0043	5901	9227	5824	5584	1345	9856	2515

References

ASTM Manual, D-3665 Standard Practice for Random Sampling of Construction Materials, Volume 04.03.