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| Title: Random Number Table-Based Random Sampling Requirements | | |

1.0 PURPOSE:

The purpose of this procedure is to describe the methods of determining random unit, random quantity, or random location by using the Random Number Table method for the sampling and testing requirements required by Contract Documents.

2.0 RESPONSIBILITIES:

- 2.1 Sampling and Testing Technicians – are responsible to select random numbers and determine random locations for sampling and testing.
- 2.2 OV Testing Technicians – are responsible for using a two-step process to stratify the estimated total production units and determine the location within the limits of a stratified random production unit to perform sampling and testing, when contractor performed testing results are used in NTTA’s Acceptance Decision. (Ref: CRV-02-A2 for examples).

3.0 SCOPE/APPLICABILITY:

This procedure applies to NTTA construction projects, laboratories, and personnel performing sampling and testing to be considered in the NTTA Acceptance Decision when the use of Random Number Table method for random sampling and testing is directed in writing by NTTA or specified in the project specific sampling procedures.

4.0 REFERENCES:

- [TxDOT Manual of Testing Procedures](#)
- Contract Documents
- [NTTA Construction Manual, Appendix C, Guide Schedule of Sampling and Testing](#)
- [CRV-02-A1](#) Random Number Tables
- [CRV-02-A2](#) Examples of Selecting Random Locations for OV Samples and Tests

5.0 DEFINITIONS & ACRONYMS:

- 5.1 Acceptance Decision – NTTA’s decision to accept the work based on the results and effective implementation of the Quality Assurance Program approved for the project.
- 5.2 Acceptance Program – all factors that comprise the NTTA’s program to determine quality of the product as specified in the contract requirements.
- 5.3 Contract Documents – documents related to a specific project by contract between the NTTA and a Contractor or Design-Build entity.
- 5.4 Contractor – legal entity entering into an agreement/contract with NTTA through the Design-Bid-Build or Design-Build project delivery methods.

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- 5.5 Independent Assurance Program – all activities that are included in an unbiased and independent evaluation program for all the sampling and testing procedures, personnel, and equipment used as part of the Acceptance Decision.
- 5.6 Owner Verification (OV) – inspections, observations, auditing, sampling, testing and other activities performed by the NTTA, or performed on behalf of NTTA, to validate the quality of the work.
- 5.7 Owner Verification Program – document established to define the OV processes and procedures to be implemented by the Owner, as part of the Quality Assurance Program.
- 5.8 Project Tests – the tests listed in the NTTA Construction Manual, Appendix C, Guide Schedule of Sampling and Testing. These tests are described in the table(s) listed there-in for the “Material or Product” indicating the “Test For” using the “Test Number”, at the “Location or Time of Sampling”, at the “Frequency of Sampling” as listed therein and includes any specific tests required to be performed as prescribed within specifications as part of the Contract Documents.
- 5.9 Quality Assurance Program (QAP) – the program for quality management and control of the Project and Work, as described in the Contract Documents.
- 5.10 Quality Control Program (QCP) – program detailing the Contractor’s internal systematic processes, procedures, and documentation for delivery of quality control and ensure that the Work is delivered in accordance with the Contract Documents.
- 5.11 **Random Samples** - Random samples are defined as those samples either selected and documented through the method defined within a project specific sampling procedure, or selected by applying randomness by avoiding patterned sampling routines, as defined in the NTTA Construction Manual, Appendix C, Guide Schedule of Sampling and Testing. Random samples also include those samples selected when the next planned random sample is not feasible or practical, i.e. in the case when the use of a random number table selects a sample that does not materialize within the days production and the closest feasible or practical sample must be selected instead.

6.0 PROCEDURE:

6.1 Random Determination

6.1.1 Select Random Numbers

- A) Use only the random number tables provided in CRV-02-A1 in the random selection process.
- B) Randomly select a table and then randomly select a block in the table.

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- C) After selecting the block, use the top left number in the block as the first random number. If a pair of random numbers is needed, select the adjacent number immediately below within the block. Mark through the number(s) that has been selected.
- D) Proceed down the left column for additional numbers and proceed to the top of the adjacent column to the right when the bottom of the left column within the block is reached. When the bottom of the column on the right is reached for the block, proceed to the top left in the block immediately below. Continue selection of the random numbers from top to bottom and left to right within each block and column of blocks. When the last number in the block on the bottom right is selected, proceed to the top block on the upper left in the table.
- E) When reaching the starting block and all numbers have been selected and marked in the random selection process, select a new table and a starting block in accordance with 6.1.1 B) and repeat the procedure.
- F) If the random location results in a location that a sample is not allowed, then the random number shall be discarded and the next random number in sequence shall be used. Note on field test or Sample Identification Form reason for discarding the initial random number(s) – such as joints, obstructions, edge of pavement, etc.
- G) In the instances where the selection of a random number from the table produces a Random Location as defined in Section 6.1.2, that does not materialize within the days production, the closest feasible or practical sample must be selected instead. This sample is considered random and must be noted on the field test or Sample Identification Form along with a description of the reasoning used to discard the initial random sample.
- H) Record random number(s) on the sampling or field testing form.

6.1.2 Determine Random Locations

A) Per Length

1. Identify the length from which a random location is required.
2. Select a random number in accordance with 6.1.1.
3. Multiply the length by the random number.
4. The resulting number is the random distance.
5. Add the random distance to the beginning of the length to determine the random location.

B) Per Area

1. Identify the area from which a random location is required.
2. Select a pair of random numbers in accordance with 6.1.1. From a fixed corner, use the first number for the longitudinal location and the second number for the transverse direction.
3. Determine the longitudinal length in accordance with 6.1.2. A)
4. Multiply the transverse width by the 2nd random number.
5. The resulting numbers represent the random location.

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C) Per Unit

1. Identify the number of units from which a random unit is required and label these units numerically beginning with 1 and increasing until all units have a different number.
2. Select a random number in accordance with 6.1.1.
3. Multiply the number of units by the random number.
4. Round up the resulting number to the next whole number to determine the random unit.

D) Per Quantity

1. Identify the quantity from which a random quantity is required.
2. Select a random number in accordance with 6.1.1.
3. Multiply the quantity by the random number.
4. The resulting number is the random quantity to be sampled.
5. The sample is obtained from the truck containing the random quantity.

E) Per Target Area

1. Determine the area from which a random location is required to the nearest 1 yd².
2. Divide the area by 100 and round down to the nearest whole number. The resulting number will be the number of segments within the area that are available for sampling.
3. Divide the area by the number of sample segments to determine the sample segment size to the nearest yd².
4. Select a random number as indicated above.
5. Multiply the number of sample segments by the random number and round to the nearest whole number. The resulting number represents the random target area. The sample will be taken from material placed within the random target area.
6. Divide the sample segment size by the width of the area and round to the nearest 0.1 ft. length. The resulting number is the length of the random target area.
7. Multiply the random target area by the length of the random target area and round to the nearest whole foot. The resulting number will be the distance to the beginning of the random target area as measured from the start of the area to be sampled.

6.2 Owner Verification Random Determination - use a two-step process to stratify the estimated total production units and determine the location within the limits of a stratified random production unit to perform sampling and testing. (Ref: CRV-02-A2 for examples)

6.2.1 Select a stratified random production unit (quantity, distance, area, etc.)

- A) Identify and stratify the total production units to be sampled or tested.
- B) Select a random number as described above and apply to the stratified production unit, please see definition of random sample.

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6.2.2 Select a random location within the stratified random production unit

- A) Select a random number(s) and apply to the limits within the stratified random production unit selected following Section 6.1.2 to determine the random sample or test location, please see definition of random sample.

7.0 REGULATORY REQUIREMENTS:

- [Code of Federal Regulations 23 CFR 637\(B\)](#)
- [FHWA Technical Advisory T6120.3](#)

8.0 RELATED BOARD POLICY:

N/A

9.0 COMPONENT DOCUMENTS:

N/A

10.0 FLOWCHART:

N/A

11.0 REVISION HISTORY:

| Revision | Revised by | Date Issued | DRN# | Reason for Revision |
|----------|--------------|-------------|-----------------------|--|
| 0 | John Roberts | 12/11/2009 | 10067 | Original Issue |
| 1 | Frank Yuan | 08/30/2010 | 10232 | Added definition of random samples and note for applicability to sections 6.2.1 and 6.2.2, and added bullet G to section 6.1.1 |