

# INTRODUCTION

## CONSTRUCTION

### General

These sampling schedules are arranged in accordance with section numbers of the *1992 Standard Specifications for Roads and Bridges*.

Sampling of materials shall be in accordance with this manual unless otherwise specified by project specifications. This manual is not to be used for the purpose of determining permissible material uses. Sampling for Specialty Items is to be performed in accordance with the applicable parts of these schedules, unless otherwise specified by contract requirements. Any questions concerning the sampling of any material are to be directed to the District Laboratory Engineer. Final authority is vested in the DOTD Materials Engineer Administrator.

These schedules delineate the Quality Assurance Program for construction materials. These requirements include Qualified Products Lists (QPL's), certifications and visual inspection, in addition to sampling. The Department reserves the right to randomly or otherwise inspect, test, and make final acceptance of all material after delivery to the project. Visual inspection at the work site or point of delivery shall be conducted on all materials, regardless of whether previously approved or not.

Sampling and testing requirements for materials or processes specified in Supplemental Specifications or Special Provisions are not included in this manual. The requirements for such materials or processes will be included in the Supplemental Specifications or in the Special Provisions. If no sampling or testing requirements are published, sampling and testing will be as directed by the DOTD Materials Engineer Administrator.

## II. Sampling Schedules

The sampling schedules are arranged in chart form by page heading. Each chart is divided into ten major vertical columns. The schedules provide sampling and testing information for construction materials when the item number and specific material are known. At times, for certain materials, it will be necessary to reference between schedules to obtain correct information.

- A. Page Heading: The Section Number and Name from the *Standard Specifications* form the Page Heading. Page Headings are arranged in numerical order by Section number, just as in the *Standard Specifications*. The user can identify the correct schedule by the Item Number. (e.g., Item No. 301(01) would be found under Section 301, Class I Base Course.)
- B. Material: The Material Column is an alphabetical index to all materials listed in the *Materials Sampling Manual* for construction. The Material Column is divided into two subcolumns.
  1. Left Subcolumn: Contains a broad group of closely related materials, listed alphabetically by section number to assist the user in locating a specific material (e.g., Asphaltic Material).
  2. Right Subcolumn: Contains an alphabetical listing of individual materials included in the group listed in the left column (e.g., Curing Membrane).

The right Materials Subcolumn may also contain information other than a specified material. Examples of such alternate information are Thickness, Width located under Mixture on Roadway. These entries are used to describe the type of testing conducted on a material. This example reflects the need to conduct depth and width measurements on the compacted mixture on the roadway. When there is no entry in the right subcolumn, the information given applies to the material listed in the left subcolumn.

**Note 1:** *The Page Heading and Material column will lead the user to the appropriate horizontal information line for a specific material. This information delineates responsibility and minimal testing required by the department's Quality Assurance Program.*

C. Reference/Tested By: The column titled Reference/Tested By is a dual purpose column listing the authorization and responsibility for each test.

1. Reference: The numerical listing(s) under this heading for each material is the Standard Specification reference (e.g., 301.16(a)). More than one listing is shown when multiple specification references exist. If a standard plan is referenced, it will be listed with the abbreviation "Std. Pl." and then the standard plan number.

2. Tested By:

a. The entry beneath the reference denotes the entity responsible for testing the sample authorized under Reference, (e.g., Proj. Engr.).

b. Abbreviations used are:

Const. Fab. Insp.	=	Construction Fabrication Inspection Unit
Dist. Lab	=	District Laboratory
Mat. Lab	=	Materials & Testing Section Laboratory
Mfr.	=	Manufacturer
Proj. Engr.	=	Project Engineer

D. Purpose

1. The Purpose Column defines the reason for which the sample is taken and tested (e.g., Acceptance).

2. Terms used are:

Quality Control	-	Sampling, testing and inspection by the contractor for the purpose of making adjustments in field construction operations such as mixing, proportioning, temperature control, moisture content, density, etc. at a rate sufficient to ensure that the work conforms to contract requirements or specifications.
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(Verif.)

Verification

Sampling and testing for the purpose of verifying that correct and accurate procedures and equipment are being used and of ascertaining that materials used are of the same quality as the previously tested materials. Verification samples are not considered on a "pass/fail" basis

for construction purposes and therefore, are not intended to determine the usability of the material on the project.

(Accept.)  
Acceptance

Determination of conformance to contract requirements or specifications. This may include sampling and testing, certification, visual inspection, qualified products, or any combination. Most products listed on the Qualified Products List require additional sampling to determine the acceptability of the material. Regardless of the acceptance method, all materials may require sampling, if they are regarded to be questionable through visual inspection. No material shall be incorporated into the work prior to completion or receipt of the designated acceptance documentation. Acceptance samples are considered on a "pass/fail" basis, therefore, if failing results are indicated by testing of these samples, positive actions should be taken to insure that no failing materials are incorporated into the work.

Design

Sampling and testing for the purpose of design. Results of these samples provide contractor and Department personnel with numerical data that is used to determine various factors that facilitate the construction of different phases of a project. This may include sampling and testing of soils for cement content and moisture density relationships, asphaltic concrete aggregates for specific gravities, as well as, contractor sampling used in the design process for asphaltic and portland cement concrete

(IA) Independent  
Assurance

Sampling and testing for the purpose of making an independent random check on the reliability of results obtained in acceptance sampling and testing. IA testing is performed on projects with federal participation administered by the FHWA. IA results do not independently form a basis for determining the acceptability of materials and construction work, but supplement acceptance results in accomplishing such determinations.

(Prelim. Source  
Approval)  
Preliminary Source  
Approval

Preliminary test representing a specified quantity of material sampled at the source by the supplier or the Department. This is performed for quality assurance acceptance and/or to provide reference data for comparison with subsequent verification or acceptance by a certificate of delivery.

**Note 2:** *Preliminary Source Approval is not normally performed by the Project Engineer.*

- E. **Sampled By/Method:** This is a dual purpose column which lists the responsibility for each sample and the sampling method to be used.
1. **Sampled By:** The first entry in this column denotes the entity responsible for sampling the material as authorized under Reference. The same abbreviations listed for Tested By are to be used (e.g., Dist. Lab).
  2. **Method:** This column specifies the sampling procedure from Part III of this manual to be used to obtain a representative sample (e.g., S 101).
  3. A reference to a Test Procedure (TR) may be included in this column in lieu of a sampling method. When this occurs, the sampling technique is included in the test procedure, not in a sampling method. (e.g., TR 401 - Information pertinent to selecting a representative test site is included in the test procedure.)
- F. **Minimum Frequency:** This column establishes the minimum number of representative sites or samples which are to be selected to represent a quantity of specified material under the Quality Assurance Program. Since these are the **minimum** requirements, the entity referenced under the Sampled By/Method column may require additional sampling to establish that a material meets the Department's criteria (e.g., 1/1000 yd<sup>3</sup>).
- G. **Minimum Quantity/Container:** This dual purpose column establishes the size of the sample and the container in which it is placed and transported.
1. **Minimum Quantity:** The first entry in this column for each material specifies the minimum amount of material necessary for testing (e.g., 1 gal). When the term item appears in this column, sample the required number of every item used for that material. For example, with the Material heading Hardware, "2 of each item" could mean 2 bolts, 2 screws, 2 nuts and 2 washers are to be submitted as the sample.
  2. **Container:** The next entry establishes the container used to hold and protect the sample until the material is tested (e.g., friction top can).

**Note 3:** *There may be no entries in this column if no physical sample is to be taken (e.g., density test). There may be only one entry, a combination of quantity and container (e.g., one full sample sack).*

- H. **Cert./Distr.:** This dual purpose column designates the type and number of certification documents required and who is to receive and distribute them. Entries are listed only when a certification is required by the Department.

Required certificates for other materials may accompany shipments or be furnished by the contractor or supplier, but all required certifications (and/or Department test reports) are to be approved and reported prior to material use.

- 1 Certificates: The first entry is a code which signifies the type of certificate required (e.g., CA). The listing of certificates below defines the party responsible for generation of the certificate and any additional necessary information which must appear. See the *1992 Standard Specifications* Subsection 106.04 for further details. Regardless of an approved certificate, sampling and testing may still be required if the material is questionable upon delivery or if required in the "Minimum Frequency Column."

The abbreviations and definitions of certificates are as follows:

- CA** = Certificate of Analysis - Certificate from the manufacturer or supplier of actual test results of the material properties. (This also includes "mill test reports". Properties listed shall include those material and represented in a clear format. Certificates of Analysis shall be signed by an authorized representative of the manufacturer or supplier. The certificate shall be furnished with each lot of material delivered to the work. The lot number shall be clearly identified on the certificate.
- CC** = Certificate of Compliance - Certificate from the manufacturer or supplier stating that the material complies with the required specifications. The applicable specification shall be specifically referenced on the certificate. Certificates of Compliance shall be furnished with each lot of material delivered to the work. The lot number shall be clearly identified on the certificate.
- CD** = Certificate of Delivery - A document for the manufacturer or supplier listing particular materials shipped. A valid DOTD issued laboratory number representing actual test results conforming to specifications shall be included on the certificate with the exception of cement and lime. The certificate of delivery shall be documented on a Department approved form for the particular material shipped (see "procedures" section of this manual for examples of proper forms). Certificates of Delivery shall be signed by an authorized representative of the manufacturer or supplier. It may contain statements concerning the materials compliance with specifications. (This includes "Certificates of Release.") A Certificate of Delivery shall be furnished with each shipment of material delivered to the work.

2. Distribution: This second entry directs the user to information concerning the codes outlining the responsibility for approval and documentation (e.g., 3).

Codes for distribution are as follows:

Code

- |   |  |
|---|--|
| 1 | Project Engineer receives one legible copy, reviews, approves and files for documentation.   |
| 2 | Project Engineer receives two legible copies and sends one to the Construction Fabrication Inspection Unit for review and approval. Project Engineer receives approved copy for documentation.                         |
| 3 | Project Engineer receives two legible copies and sends one to the Materials and Testing Section for review and approval. Project Engineer receives approved copy for documentation.                                    |
| 4 | Construction Fabrication Inspection Unit receives one legible copy, reviews and approves. Project Engineer receives approved copy for documentation.   |
| 5 | Materials and Testing Section receives one legible copy, reviews and approves. Project Engineer receives approved copy for documentation.  |
| 6 | Construction Fabrication Inspection Unit receives one legible copy, reviews, approves and files for documentation.   |
| 7 | Materials and Testing Section receives one legible copy, reviews, approves and files for documentation.  |
| 8 | Project Engineer receives on legible copy, approves and submits to District laboratory Engineer attached to sample identification. District Laboratory Engineer reviews and files for documentation with test results. |
| 9 | Hot mix plant receives on legible copy and files for documentation:  |

Typical Handling Time - This column approximates the time in working days for the complete processing of a sample including transportation, testing and documentation. This time can be affected by sample load, transportation etc.

J. Small Quantities Rule - This column, when filled, defines a quantity of material. If less than this quantity of material is used on the project the material does not require sampling unless questionable. If no quantity is defined the material does require sampling.

K. Remarks: This column contains important information which extends the notation under individual columns. Some common types of information found in Remarks are:

1. Clarification of whether a test is required (e.g., Visual inspection by Proj. Engr. Sample only if questionable. Visual inspection is classified as a test. A sample is taken if the material fails the visual inspection.).
2. Reference to other parts of the manual (e.g., See Section 601 of this manual.).
3. Clarification of the quantity of material to be represented by a sample (e.g., Not to represent more than 50 tons.).
4. Establishment of an exception to normal sampling procedures or frequency.
5. Other terms commonly used in the Remarks column include:
  - a. EDSM - *Engineering Directives and Standards Manual*.
  - b. Qualified Products List (QPL) - Lists which are maintained by the Department's Materials and Testing Section for products which require field or detailed evaluation for which time constraints would delay projects. Source approval sampling, lab testing and field evaluation requirements are included in each QPL qualification procedure.  
 Qualification of a product is not blanket approval for its use, since qualified products are subject to certification and/or acceptance or verification testing as shown in the following schedules.
  - c. Random or Randomly - Samples shall be obtained following a random selection process (i.e., without aim or reason, depending entirely on chance alone), and Random Number Tables may be used if desirable; however, use of the Random Number Tables will not be required unless specified.
  - d. Random Number Tables - Tables of random numbers used to assure the selection of unbiased samples. Such tables are shown in sampling procedure S 605.
  - e. Shipment - When the term "shipment" is used, it indicates similar material from one source which arrives at the destination in one load.
  - f. Visual Inspection - Visual inspection at the work site or point of delivery shall be conducted on all materials, regardless of whether previously approved or not. However, the term "visual inspection" also has another meaning in regard to material acceptance. There are certain materials that under certain circumstances may be accepted at the work site or point of delivery on the basis of visual inspection and will not require a Department test report. In each case these circumstances will be outlined in the Remarks column. Visual inspection may denote checks for specific specification requirements.
  - g. Quality Assurance Manuals (QA manuals) - The Department's policy and procedure manuals.

### III. Quality Assurance

The concept of quality assurance refers to the combined effort of the contractor through quality control and the Department through inspection and acceptance to produce a transportation project that will provide the public with a durable product exhibiting a high level of performance. To this end, a system of inspection by qualified personnel,

both Department and contractor, and statistically based sampling and testing has been established. To ensure that the quality assurance concept functions properly, it is critical that the contractor's quality control and the Department's inspection process be a cooperative, coordinated effort. When any part of the process fails, the contractor's risk for payment adjustments and the Department's risk of accepting substandard work increases. The increase of these risks caused by a failure on the part of either the contractor or the Department is unacceptable.

#### **Resampling and Retesting Procedure**

Material will be resampled and retested when the original material is changed by reworking the original material or by adding new material when permitted by specifications to the original material and reworking. The resampled material will be used for determining the material's conformance to contract requirements or specifications.

At the discretion of the engineer, when a sample is determined not to be representative, **whether passing or failing**, a new sample shall be taken from the same material and area as the original sample. This sample will be used for determining the material's conformance to contract requirements or specifications.

Resampling and retesting will not be conducted to avoid a payment adjustment for failing results unless there is a defective sample.

#### **V. Sampling and Testing for Source Approval**

The sampling and testing requirements for source approval will be listed in each QPL qualification procedure.

#### **Sampling and Testing for Informational Purposes Only**

Samples submitted to the Department's laboratory may be tested for "Informational Purposes Only" at the discretion of the engineer. The test report will not indicate pass or fail and the wording "For Informational Purposes Only" will be placed on the report. The test report shall not be used for quality control or acceptance purposes.

#### **Updating Test Reports**

- A. Updating test reports for disposition of failing tests: When the engineer receives an exception report for a failing test, the engineer is to describe the disposition of the failing material directly on the exception report, sign and date the disposition in accordance with EDSM III.5.1.2. and forward the report to the district laboratory for MATT System entry. When a test report generated by the Materials and Testing Section must be updated at a district laboratory, the district laboratory will route a computer message to the Materials Engineer Administrator stating the project number, material code, lab number and remarks updated.
- B. Updating test report due to incorrect data submitted on sample ID form: When MATT System updates are necessary due to incorrect information on the MATT System form, the engineer must completely prepare a new MATT System form with the same sample ID number with the correct information. The engineer will then send the new form to the district laboratory with a signed, completed Request to Transfer/Update Test Report form. A district laboratory representative authorized



to update MATT System data will update the MATT System and sign the Request to Transfer/Update Test Report form as the person who updated the MATT System data. The original MATT System form will be retrieved from the district laboratory files and the new MATT System form with the Request to Transfer/Update Test Report form will be attached to it and all documents refiled. When a test report generated by the Materials and Testing Section must be updated, the new MATT System form and the Request to Transfer/Update Test Report form will be forwarded by the district laboratory to the unit at the Materials and Testing Section responsible for testing the affected sample.

#### **VIII. Transfer of Test Results and Quantities from Project to Project**

It is the policy of DOTD that test results not be routinely transferred between projects. Whenever possible, material is to be sampled on individual projects; however, when special conditions necessitate transferring test results from one project to another, a new MATT System form with a new sample ID number and a Request to Transfer/Update Test Report form signed by the engineers for both projects must be submitted to the laboratory which tested the transferred material. The engineer on the receiving project will verify and note the source identity (lot, batch, etc.) and quantity of material delivered to the receiving project, then sign the Request to Transfer/Update Test Report form, requesting the transfer. The engineer on the originating project will verify that there is surplus material available for transfer and will then sign the Request to Transfer/Update Test Report form and forward it to the District Lab Engineer or laboratory unit at the Materials and Testing Section which tested the original sample. The Laboratory will verify that the original test results meet the contract requirements for the receiving project. The Laboratory will approve the transfer and place a statement in the Remarks field that the test results were transferred from S.P. # \_\_\_\_ - \_\_\_\_ - \_\_\_\_\_. The original test report must be updated to reflect a reduction in quantity for the amount transferred. After the transfer has been approved, a laboratory representative authorized to update MATT System data will transfer and update the test results and sign the Request to Transfer/Update Test Report form as the person who updated the MATT System data. The original MATT System form will be retrieved from the laboratory files and the new MATT System form, with the Request to Transfer/Update Test Report form, will be attached and all documents refiled.

#### **IX TESTING PRIORITIES**

The following represents a general prioritization schedule used by the District Laboratories and the Materials & Testing Section:

1. Check sample or resamples
2. Acceptance samples
3. Design samples
4. Preliminary Source Approval sample for acceptance
5. Verification sample
6. Independent assurance
7. Preliminary source Approval to provide reference data.(QPL, NPE, etc.)

Samples of material with the same priority are tested in the order received. The Laboratory Engineer may override the above to accommodate unusual circumstances and improve efficiency. To assist in prioritization, the Project Engineer may check the urgent box and indicate the "date needed" on the sample envelope; however, the availability of results are not guaranteed by that date. In order to handle prioritization efficiently and fairly, samples should be labeled urgent only in critical situations.