

HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
QUALITY ASSURANCE MANUAL
FOR
MATERIALS

OCTOBER 2001

MATERIALS TESTING AND RESEARCH BRANCH
2530 LIKELIKE HIGHWAY
HONOLULU, HAWAII 96819

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I. INTRODUCTION

The Materials Quality Assurance (MQA) Program represents the Hawaii Department of Transportation (HDOT), Highways Division's (HWY) recognition of its responsibility and commitment to ensure that materials incorporated into highway construction projects conform substantially to requirements of the plans and specifications, including approved changes. The Materials Testing and Research Branch (MTRB) Quality Assurance Manager will manage the MQA Program. The Quality Assurance Officers are responsible to implement the Materials Quality Assurance Program within their Districts and Counties. The MQA Program is composed of the following: Laboratory Qualification Program, Personnel Qualification Program, Materials Acceptance Program, and Independent Assurance Program. Refer to Appendix 1 for flow diagram showing the interrelationship of the different programs.

The following procedures and guidelines are provided to ensure the quality of materials for all State Highway construction projects, and County Federal-aid projects on the National Highway System, according to Title 23, Code of Federal Regulations, part 637, subpart B, Quality Assurance Procedure for Construction.

II. DEFINITIONS

Central Laboratory (CL). Hawaii Department of Transportation, Highways Division, Materials Testing and Research Branch (MTRB) at 2530 Likelike Highway, Honolulu, Hawaii, 96819.

Construction Materials Laboratory (CML). Contractor or Commercial Testing Laboratory qualified to perform sampling and testing.

Engineer. The Administrator of the Highways Division or the Director or Chief Engineer responsible for County roads, acting directly or through a duly authorized representative.

Laboratory Technician. Personnel qualified in one or more of the Aggregate, Asphalt, Concrete, or Soils modules, performing laboratory testing for qualified laboratory.

Materials Engineer. Materials Testing and Research Engineer of the Highways Division, 2530 Likelike Highway.

Proficiency samples. Homogeneous samples produced and distributed by the Central Laboratory for testing by two or more laboratories. Test results are compared to ensure that laboratories are obtaining results within acceptable limits.

Qualified laboratories. Laboratories meeting requirements defined in the Laboratory Qualification Program.

Qualified sampling and testing personnel. Personnel meeting requirements defined in the Personnel Qualification Program.

Quality Assurance. All planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality.

Quality Assurance Manager. Materials Engineer or his designated representative to manage the Materials Quality Assurance program within the Highways Division.

Quality Assurance Officer. District or County Engineer or their designated representative responsible for administering the Materials Quality Assurance program within the District or County.

Quality Control. All Contractor/Vendor operational techniques and activities performed or conducted to fulfill contract requirements.

Random sample. Sample drawn from a lot in which each increment in the lot has an equal probability of being chosen.

Split sample. Two or more equal parts from a homogeneous sample.

Verification Sampling and Testing. Sampling and testing done by the Engineer to validate product quality when Contractor sampling and testing are used in the Materials Acceptance Program.

III. LABORATORY QUALIFICATION PROGRAM

- A. Purpose.** This program provides uniform, statewide procedures for ensuring that laboratory facilities and equipment are capable of performing materials sampling and testing in accordance with methods used in the Materials Quality Assurance Program. The Materials Testing and Research Branch (MTRB), accredited under the AASHTO Accreditation Program, is responsible for overseeing the statewide Laboratory Qualification Program.
- B. Scope.** Laboratories that perform sampling and testing and furnish test data for use in the Materials Quality Assurance Program shall be qualified. This includes but is not limited to the following:
1. Commercial laboratories;
 2. Contractor laboratories;
 3. County laboratories;
 4. State District laboratories.
- C. Qualification Procedures.**
1. To qualify State District Laboratories, the MTRB will do the following:
 - a. Verify that current editions of references used to perform tests are available.
 - b. Document that laboratories have required equipment to perform tests.
 - c. Verify that a list or record of all laboratory equipment requiring calibration/verification is maintained.
 - d. Check that calibration/verification records for each piece of equipment include the following:
 - (1) Description of equipment;
 - (2) Identification of individual(s) performing work;
 - (3) Frequency of calibration, date of calibration, and date of last calibration;

- (4) Identification of calibration or verification procedure used;
 - (5) Identification of any calibration/verification device or traceable standards used;
 - (6) Results of work performed;
 - (7) Procedure used to identify non-compliant equipment.
 - e. Verify that sampling and testing personnel are qualified according to Section IV — Personnel Qualification Program.
 - 2. Laboratories other than State District Laboratories shall be qualified by verification of the following:
 - a. Laboratories shall be accredited for applicable test methods by AASHTO Accreditation Program or comparable accreditation program approved by FHWA.
 - b. Sampling and testing personnel shall be qualified according to Section IV — Personnel Qualification Program.
 - 3. In addition, equipment may be subject to calibration, verification, or inspection by the MTRB.
 - 4. Calibration standards and laboratory equipment calibration frequencies shall be as specified in the applicable test methods for which the equipment is intended to be used. Calibration/verification is required whenever a laboratory or equipment is moved. Qualification of a laboratory shall be valid for three years, after which time the laboratory shall be requalified.
 - 5. Any equipment in a qualified laboratory failing to meet specified equipment requirements for a specific test method shall be identified as such and shall not be used for that test method.
- D. Disqualification.** A laboratory that does not maintain qualification requirements is subject to disqualification. Test results from disqualified laboratories shall not be used in the Materials Quality Assurance Program.

- E. Documentation Maintenance.** The MTRB will be responsible for maintaining documentation on all laboratories that it qualifies. Qualified laboratories shall be responsible for maintaining equipment calibration/verification records.
- F. Disputes.** Disputes concerning calibration and verification of equipment will be resolved by the MTRB Materials Engineer, who will have final authority.

IV. PERSONNEL QUALIFICATION PROGRAM

A. Purpose. This program provides uniform, statewide procedures for ensuring personnel are capable of performing materials sampling and testing in accordance with methods used in the Materials Quality Assurance (MQA) Program. The Materials Testing and Research Branch (MTRB) is responsible for administering the statewide Personnel Qualification Program to qualify personnel performing sampling and testing used in the MQA Program.

B. Scope.

1. All personnel (laboratory and field) performing material sampling and testing in any of the modules listed below, shall be qualified in the respective sampling and testing procedures:

	<u>Modules</u>	<u>Test Methods</u>
a.	Aggregate	AASHTO: T2, T11, T27, T176, and T248
b.	Asphalt	AASHTO: T40, T166, T168, T209, T255, and T275 WAQTC: TM6
c.	Concrete	AASHTO: T22, T23, T97, T119, T121, T141, T152, and T231 ASTM: C1064
d.	Soil	AASHTO: T87, T89, T90, T99, T180, and T265 HDOT: TM5
e.	Field Sampling and Testing	AASHTO: T2, T23, T40, T119, T141, and T168 ASTM: C1064 HDOT: TM1 and TM3

2. Sampling and testing personnel will be qualified for a maximum period of five years, based on successful completion of a written examination and a performance examination. Personnel must reapply for qualification after five years.

3. The following personnel (evaluator/examiner) may qualify an individual to perform sampling and testing on materials by administering the required written and performance examinations:
 - a. MTRB personnel authorized by the Materials Testing and Research Engineer.
 - b. State or consultant personnel authorized by the Materials Testing and Research Engineer.
 4. MTRB will schedule qualification examinations (written and performance) at least two times a year. A schedule will be posted on the DOT Highways web site (<http://www.state.hi.us/dot/highways>).
 5. To apply for the examinations, an individual shall submit completed copy of Hawaii Transportation Personnel Qualification Program Registration Form (HDOT-TPQP-1) and Transportation Personnel Qualification Program Rights and Responsibilities Agreement (HDOT-TPQP-2) to MTRB Quality Assurance Manager at 2530 Likelike Highway, Honolulu, Hawaii 96819. (See Appendix 2 for form and agreement). Program may require a registration fee.
 6. Individuals qualified by Western Alliance for Quality Transportation Construction (WAQTC), American Concrete Institute (ACI) for concrete, or other independent sources acceptable to the Materials Testing and Research Engineer shall be exempted from the MTRB qualification procedure for the applicable module. However, notification in writing, of such qualification, shall be made to the Quality Assurance Manager, who will verify and approve such qualification and maintain a record of qualified individuals.
- C. Qualification Procedures.** To qualify, an individual shall pass a written examination and a performance examination of all the applicable test methods in that module.
1. Written examination.
 - a. Examination will require detailed knowledge of the test method procedures and basic reading comprehension. Examination will be a closed-book exam. Calculations may be required for some questions. Examination will be administered within a specified time frame by an evaluator authorized by the Materials Testing and Research Engineer.

5. Notification of each individual's successful or unsuccessful completion of the qualification requirements will be mailed by the MTRB.
 6. Qualified personnel are subject to the requirements of the Independent Assurance Program.
- D. Documentation.** The MTRB will be responsible for maintaining documentation of all individuals qualified under its authority who perform required sampling and testing for acceptance of materials. Quality Assurance Officer shall also maintain a list of qualified individuals performing sampling and testing on projects under their supervision. Documentation retention will be for the life of the qualification.
- E. Suspension and Revocation of Qualification.**
1. The Materials Testing and Research Engineer may revoke qualification issued by the MTRB at any time for just cause. A notice of revocation will be sent to the individual, in writing, along with the individual's right to appeal revocation. Revocation is effective on receipt of notice by the individual. Reasons for qualification revocation or suspension are negligence or abuse of responsibilities. A Qualification Revocation Committee appointed by the Materials Testing and Research Engineer will review all appeals and recommend its findings to the Materials Testing and Research Engineer. The decision of the Material Testing and Research Engineer will be final.
 2. Negligence is defined as unintentional deviation from approved procedures, which may or may not cause erroneous results. Penalties for negligence are the following:
 - a. First offense of negligence will result in a letter of reprimand being sent to both the employee and the employer.
 - b. Second offense will result in a 30-day suspension of qualification.
 - c. Third offense will result in a 180-day suspension of qualification.
 - d. Fourth offense will result in permanent revocation of qualification.

3. Abuse is defined as intentional deviation from approved procedures. First offense for a finding of abuse will result in a penalty ranging from a one-year suspension to permanent revocation of an individual's qualification. Any subsequent finding of abuse will result in permanent ineligibility for any future type of (MTRB) qualification.
 4. Revocations or suspensions for abuse or negligence, in one module, will be considered revocation or suspension in all modules held by the individual.
 5. If warranted, the Materials Testing and Research Engineer may deviate from the above penalties.
- F. Rights and Responsibilities.** Qualification carries inherent rights and responsibilities. These rights include being exclusively sanctioned to perform sampling, testing, and reporting of test results for the Material Quality Assurance Program. These responsibilities include performing and reporting tests, with accuracy and precision expected of the qualified individual, according to required test procedures. The qualified individual shall also be aware that both State and Federal laws may govern construction projects, including Title 18, United States Code, Section 1020, that in brief, states that anyone making falsifications on Federal-aid projects "shall be fined not more than \$10,000 or imprisoned not more than five years, or both."

V. MATERIALS ACCEPTANCE PROGRAM

- A. Purpose.** This program provides uniform, statewide procedures for sampling, testing, and inspection to ensure that the quality of materials incorporated into the project is in conformance with the plans and specifications.
- B. Scope.** The program applies to all State Department of Transportation Highway projects, and County Federal-aid projects on the National Highway System. All testing laboratories and sampling and testing personnel under this program shall be qualified according to the Laboratory and Personnel Qualification Programs and subject to the requirements of the IA Program. In order to avoid an appearance of a conflict of interest, any qualified laboratory, other than CL, shall perform only one of the following types of testing on the same project: Contractor sampling and testing, Verification sampling and testing, Dispute Resolution sampling and testing, or IA sampling and testing. The Sampling and Testing Guide for Acceptance and Verification (Appendix 3) identifies the material, lot size, frequency, and location in the construction or production operation at which sampling is done, and the specific attributes tested that reflect the quality of the finished product.
- C. Acceptance Sampling and Testing.** The State's Materials Acceptance Program will be managed by the Quality Assurance Manager. District and County Quality Assurance Officers shall be responsible for implementing the Materials Acceptance Program within their Districts and Counties. The Quality Assurance Officer shall be responsible for ensuring that only sampling and testing by qualified personnel and laboratories are used in the Materials Acceptance Program. Materials acceptance sampling and testing within a project may be accomplished by either one or both of the following methods:
1. Acceptance Sampling and Testing by District or County personnel or their designated agents.
 - a. Oahu District (HWY-O) Quality Assurance Officer shall be responsible for acceptance sampling and testing requirements. All sampling and field testing will be performed by HWY-O or by a designated agent. Field samples obtained for laboratory testing shall be sent to Materials Testing and Research Branch (MTRB) or to a qualified laboratory.
 - b. Designated Quality Assurance Officers for Hawaii, Kauai, and Maui Districts, and all Counties shall be responsible for

- acceptance sampling and testing requirements within their respective jurisdictions. When laboratory testing cannot be performed by the District or County, samples may be sent to MTRB or to a qualified laboratory for required testing.
- c. Samples shall be selected by the random selection method according to ASTM D 3665, Random Sampling of Construction Materials.
 - d. Location and frequency at which acceptance sampling and testing are to be accomplished shall conform to the Sampling and Testing Guide for Acceptance and Verification (Appendix 3).
 - e. Samples, test data, and certificates of compliance shall be submitted to MTRB with the white sample card (Form MTRB JC-1 or JC-1a — Appendix 2). MTRB will review all project data to ensure that materials incorporated in the construction work conform to approved plans and specifications.
2. Acceptance Sampling and Testing by Contractor with Verification by District or County, or their designated agents. This method is permitted when specified in the contract specification.
- a. Contractor Sampling and Testing.
 - (1) Project specifications shall specify minimum quantity of tests required for Contractor Sampling and Testing. Except as otherwise specified, minimum sampling and testing shall be in accordance with the requirements shown on the Sampling and Testing Guide for Acceptance and Verification (Appendix 3). Sampling location shall be as indicated on the Sampling and Testing Guide for Acceptance and Verification.
 - (2) Project specifications shall require the Contractor to designate a Quality Control (CQC) Manager, who shall be responsible for managing, controlling, and documenting all activities to ensure material compliance with the contract plans and specifications.
 - (3) Project specifications shall require the Contractor to prepare and submit a Quality Control Plan for projects over \$1,000,000.

- (4) Samples shall be selected by the random sampling method according to ASTM D 3665, Random Sampling of Construction Materials.
 - (5) The Project Engineer shall transmit the Contractor's test results with the yellow sample card (Form MTRB CJC-2 or CJC-2a — Appendix 2) to MTRB through the District Quality Assurance Officer.
- b.** Verification Sampling and Testing.
- (1) To validate product quality, Verification Sampling and Testing shall be performed by qualified sampling and testing personnel employed by the State or County or its designated agent, excluding qualified sampling and testing personnel employed by the Contractor. When Contractor and State or County test results differ by more than the allowable standards established by MTRB, dispute resolution procedures shall be followed.
 - (2) Frequency of Verification Sampling and Testing shall be a minimum of 10 percent of the Contractor Sampling and Testing requirements. Frequency may be increased by the State or the County based on a history of dissimilar test results between Contractor and Verification testing.
 - (3) Verification samples shall be random samples (ASTM D 3665) taken at the same general location of the Contractor's sample.
 - (4) Verification samples or test data shall be transmitted with the blue sample card (Form MTRB VJC-3 or VJC-3a — Appendix 2) to MTRB through the District Quality Assurance Officer.
- c.** Dispute Resolution Procedures. Conflicts between the Engineer and the Contractor, resulting from discrepancies in testing or non-test-related material quality disputes, shall be resolved by using the steps outlined below. Non-test-related disputes may include such items as segregation, workmanship, flushing, open joints, non-uniform mats, and other issues. If mutually agreed to by the disputed parties, other forms of resolution may be used. Any deviations from the following procedures shall be agreed to in writing.

(1) Case I: Test Related Disputes:

(a) Step I: Project Investigation.

Personnel responsible for the Contractor Sampling and Testing and Verification Sampling and Testing shall review sampling procedures, testing procedures, testing equipment, and computations. The intent of this investigation is to ensure that proper procedures are followed, equipment used is properly calibrated and functioning, and computational errors are ruled out. If problems are found, corrective action shall be taken.

If Step I does not resolve conflict, procedures in Step II shall be followed.

(b) Step II: Third Party Investigation.

Third party shall be the MTRB or a non-Highways Division laboratory designated by the Engineer. The MTRB shall be viewed as an “unbiased” third party, although technically not totally independent. The designated non-Highways Division laboratory shall be accredited in the applicable test by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by Federal Highway Administration (FHWA), with testing personnel qualified under the Personnel Qualification Program. The non-Highways Division laboratory third party shall not, in any way, be involved in the Contractor Sampling and Testing, Verification Sampling and Testing, or IA Sampling and Testing on the disputed project.

Designated third party shall examine the following:

- (i)** Past similar/dissimilar comparisons for the disputed item to identify any particular trends.

- (ii) Results of the project-level investigation.
- (iii) Results of the Independent Assurance Program.

A sample shall be split among the Contractor, Engineer, and third party to compare test results. Third party may perform additional verification testing, at the project-level investigation, as necessary.

Results obtained from split samples or new samples and verification testing shall be evaluated to decide whether initial test results obtained by the Contractor or the Engineer more accurately represent the particular material property. Third party shall submit a written report describing dispute, all subsequent actions, and final recommendation.

If this investigation shows that the Engineer's tests are correct, the Contractor shall pay for the cost of the third party investigation. Similarly, if the investigation shows that the Contractor's tests are correct, the Engineer will pay the cost of the third party investigation.

(2) Case II: Non-Test Related Disputes:

(a) Step I: Project Investigation.

The Contractor and the Engineer will jointly quantify the dispute (e.g., the area of segregation, etc.), its severity, and impact on facility performance. When testing is required to assist in dispute resolution, all parties shall agree to the sampling and testing plan, testing agency, and disposition of these findings before starting.

If Step I does not resolve dispute to the satisfaction of all parties within a previously agreed time, procedures in Step II shall be followed.

(b) Step II: Third Party Investigation.

Resolution shall be arbitrated by an unbiased third party designated by the Engineer. Third party shall submit a written report describing dispute, all subsequent required actions, and final recommendation.

When disputes are resolved by an unbiased third party, the Engineer and the Contractor shall share cost of third party investigation. Conclusions and recommendations made by any unbiased third party shall be binding.

- D. Submittals.** Acceptance, Contractor, and Verification Test data, and any Dispute Resolution reports shall be submitted to MTRB. MTRB will review all project test data to ensure that materials incorporated in construction work conform to approved plans and specifications. Based on this information, MTRB will issue a materials certification to FHWA for each construction project that is subject to FHWA construction oversight activities (see Section VII).

VI. INDEPENDENT ASSURANCE PROGRAM

- A. Purpose.** This program provides uniform, statewide procedures to ensure personnel qualified under the Personnel Qualification Program remain capable of performing sampling and testing correctly, and to ensure equipment is checked and calibrated.
- B. Scope.** The program applies to all State Department of Transportation Highway projects and County Federal-aid projects on the National Highway System. This program evaluates samplers, testers, and testing equipment in the modules listed in the Personnel Qualification Program. Central Laboratory (CL) personnel and test equipment are exempt from the Independent Assurance (IA) Program.
- C. Responsibility.** The CL will administer the IA Program. Within the Highways Division, the District Engineer or designated representative shall be the Quality Assurance Officer, who shall be responsible for coordinating the IA activities with the CL and administering these activities within the District and County.
1. The District Quality Assurance Officer shall be responsible for maintaining competency of qualified personnel, calibrating and verifying field laboratory testing equipment, and resolving any deficiencies noted by the IA evaluations. The District Quality Assurance Officer shall also be responsible for consultants, Construction Materials Laboratories (CMLs), and other agencies performing sampling and testing for the District highway projects and County Federal-aid projects on the National Highway System. The District Quality Assurance Officer may require the County to provide a Quality Assurance Officer. However, all coordination with the CL, including County projects, shall be done through the District Quality Assurance Officer.
 2. CL personnel or CL's designated agents that act as IA inspectors, coordinators, evaluators, and reference testers will herein be referred to as "IA inspector". CL equipment or designated agents' equipment will be used as IA reference equipment when split sampling or split-sample testing is performed.
- D. Frequency of Evaluation.**
1. Qualified laboratory technicians from the State District laboratories will be evaluated annually on four modules (Aggregate, Asphalt, Concrete, and Soil) in the Personnel Qualification Program.

Laboratory testing equipment will be evaluated not less than once every three years.

2. Laboratory technicians working for CMLs, who are qualified under each of the Asphalt, Concrete, Soil, and Aggregate modules, and CML testing equipment shall be evaluated by an approved accreditation agency at a frequency established by that agency. However, MTRB Engineer may, at his discretion, conduct unscheduled site visits or require split-sample testing.
3. Personnel qualified in the Field Sampling and Testing module of the Personnel Qualification Program will be evaluated annually. The actual number of personnel to be evaluated annually will be determined by the MTRB Engineer at the beginning of each calendar year, but will not be less than 10 percent of the qualified personnel. Field testing equipment will be evaluated not less than once every three years.
4. Individuals qualified by independent sources acceptable under the Personnel Qualification Program, such as the WAQTC and ACI, who are not evaluated by an accreditation agency approved under the Laboratory Qualification Program, will be included in the pool of personnel qualified in the Field Sampling and Testing module and evaluated for the test methods used for material acceptance.

E. Method of Evaluation.

1. Sampling Personnel. Sampling personnel will be evaluated by observation.
2. Testing Personnel. Testing personnel will be evaluated by one or more of the following:
 - a. Observation.
 - b. Split-sample testing by personnel and IA inspector.
3. Testing equipment. Testing equipment covered under AASHTO R-18 will be evaluated by using one or more of the following:
 - a. Review of calibration and verification records;
 - b. Split-sample testing using equipment being evaluated and IA reference equipment;

- F. Evaluation Procedures.** The IA evaluation will focus on sampling and testing procedures routinely performed by the personnel to be evaluated. For example, the IA inspector may evaluate personnel who perform sampling and testing only at project sites, only on the test method section that covers sampling and testing at project sites. Materials used in IA evaluations are not required to be project specific. IA test results shall not be used to verify specification compliance on construction projects. Therefore, IA tests shall not be used for acceptance. Evaluation procedures are described as follows:
1. Evaluation by Observation.
 - a. Personnel evaluation of qualified laboratory technicians from the State District laboratories will be coordinated by the MTRB.
 - b. Observation of personnel qualified in the Field Sampling and Testing module will be performed at an appropriate location, determined by the IA inspector upon discussion with the Quality Assurance Officer or Project Engineer. The IA inspector will consider availability of materials, location of personnel, and impact to construction testing when determining the appropriate site. Sites may include a test site prepared by the District for the purpose of this evaluation.
 - c. The IA inspector, using a checklist, will observe the person performing the sampling or testing procedure and will note any deficiencies during the demonstration. After the demonstration is completed, the IA inspector will discuss with the person those deficiencies observed during the demonstration.
 - d. The IA inspector will summarize results of the IA evaluation and report any deficiencies to the Quality Assurance Officer. When deficiencies are reported, the Quality Assurance Officer shall follow procedures of Subsection VI.G — Procedures When Deficiencies Are Reported.
 2. Evaluation by Split Sample.
 - a. Split samples may be used to evaluate personnel and testing equipment.
 - b. A material sample will be split into two equal portions, with one portion to be used by the tester and the other portion to be used by the IA inspector.

- c.** IA samples shall be placed in a container or sample bag, which shall be sealed to prevent tampering. Samples shall be submitted with a green sample card (Form MTRB IA-1 — Appendix 2). Each IA container and sample bag shall be labeled and identified as an “IA” sample. The identification shall also include a tag with the following information:

 - (1)** IA sample number and source of the sample;
 - (2)** Date of split sample;
 - (3)** Address where each split sample was sent;
 - (4)** Name of the tester.
 - d.** The tester shall perform required test and submit test results to the IA inspector within two working days. Test data shall be submitted with a green sample card (Form MTRB IA-1 — Appendix 2).
 - e.** The tester’s results will be compared to the results of the IA inspector. Difference will be subject to the standards established by the CL. The IA inspector will summarize results of the IA evaluation and report any deficiencies to the Quality Assurance Officer. When deficiencies are reported, the Quality Assurance Officer shall follow the procedures of Subsection VI.G — Procedures When Deficiencies Are Reported.
- 3.** Evaluation by Calibration and Verification.
- a.** Calibration and Verification checks shall be made to ensure equipment covered in AASHTO R-18 is within the specified tolerances. Each piece of equipment shall be checked at the specified frequency and clearly marked with an identification number.
 - b.** The Quality Assurance Officer shall have a program to ensure equipment verification and calibration are done at the required frequency. Records of test equipment verification and calibration shall be kept on file.
 - c.** The IA inspector will review equipment records and may, at his discretion, inspect any equipment for conformance.

- d. The IA inspector will summarize results of the IA evaluation and report any deficiencies to the Quality Assurance Officer. When deficiencies are reported, the Quality Assurance Officer shall follow the procedures of Subsection VI.G — Procedures When Deficiencies Are Reported.

G. Procedures When Deficiencies Are Reported. The Quality Assurance Officer shall use one of the following procedures, as appropriate:

- 1. Procedures to Follow When Deficiencies Are Reported for Evaluation by Observation.
 - a. Discuss each procedural deficiency with the tester and review the proper procedure.
 - b. Observe the technician perform the test properly.
 - c. Prepare memorandum of record summarizing corrective action taken.
 - d. Submit memorandum of record to the CL.
- 2. Procedures to Follow When Deficiencies Are Reported for Poor Results from Split Samples.
 - a. Determine if the data reported were correctly entered.
 - b. Determine if the test results obtained were properly transferred to the submitted data sheet.
 - c. Determine if all calculations leading to the test results obtained were correct.
 - d. Determine if equipment conformed to specifications.
 - e. Determine if proper test procedures were followed.
 - f. Take corrective action to repair or replace defective equipment, or review proper procedures with the tester.
 - g. Prepare memorandum of record summarizing investigation results, identifying cause of deficiencies, and describing any corrective action taken.

VII. LETTER OF MATERIALS CERTIFICATION

- A. Purpose.** A letter of materials certification is issued to attest that materials incorporated in the project conform substantially to requirements of the approved plans and specifications, including approved changes.
- B. Scope.** A letter of materials certification will be submitted to the Federal Highways Administrator for each project subject to FHWA construction oversight activities.
- C. Procedure.**
1. Project Engineer.
 - a. The Project Engineer shall review all project records, such as sampling and testing reports, material certificates, and certified test results, to ensure that materials incorporated into the project were in conformance with the approved plans and specifications. Records for material items listed in the Project Proposal Schedule shall have been substantially documented and submitted to the MTRB during the project construction.
 - b. The Project Engineer shall request a letter of materials certification using Form MTRB MC — Appendix 2, Materials Certification Documentation. All applicable sections of this form shall be properly completed. Materials tracking summaries utilized by the project may be submitted to expedite procedure for the letter of materials certification.
 2. Materials Testing and Research Branch.
 - a. The MTRB will review the project documents on file at the MTRB. When deficiencies are noted, the project engineer will be contacted for a resolution.
 - b. The MTRB Engineer will prepare and submit a letter of materials certification to the FHWA upon a satisfactory review.

APPENDIX 1

Flow Diagram

MATERIALS QUALITY ASSURANCE PROGRAM

Program Includes:

1. MTRB accredited by AAP
2. All laboratories qualified
3. All personnel qualified

Mandatory

Mandatory

MATERIALS ACCEPTANCE PROGRAM

Program includes:

1. Frequency Guide
2. Random Sample Locations
3. Materials Quality Attributes
4. Validation through the IAP

INDEPENDENT ASSURANCE PROGRAM

Use IAST frequency based on time

Evaluate equipment by:
1. Calibration/Verification records
2. Split Samples

Evaluate personnel by:
1. Split Samples
2. Observation

Submit Annual Report to FHWA

Acceptance Sampling & Testing by District or County Personnel or their Designated Agents?

No

Yes

Apply S&T and IAST Criteria

Acceptance Sampling and Testing by Contractor with Verification by District or County Personnel or their Designated Agents

- Program includes:
1. Contractor Quality Control S&T validated by independent State and County Verification S&T
 2. Dispute Resolution System

Issue Project Materials Certification to FHWA

Abbreviations:

MTRB = Material Testing and Research Branch

AAP = AASHTO Accreditation Program

IAP = Independent Assurance Program

S&T = Sampling and Testing

IAST = Independent Assurance Sampling and Testing

FLOW DIAGRAM

APPENDIX 2

Forms

Hawaii Transportation Personnel Qualification Program Registration
Transportation Personnel Qualification Program
Instructions for Completing Transmittals for Acceptance, Contract and Verification Sampling and Testing
Transmittal for Contractor Sampling and Testing
Sample Card and Concrete Strength Test Report (MTRB CJC-2a)
Transmittal for Independent Assurance Sampling and Testing
Transmittal for Materials Acceptance
Sample Card and Concrete Strength Test Report (MTRB JC-1a)
Materials Certification Documentation
Transmittal for Verification Sampling and Testing
Sample Card and Concrete Strength Test Report (MTRB VJC-3a)

HAWAII TRANSPORTATION PERSONNEL QUALIFICATION PROGRAM REGISTRATION FORM

Name: Position/Title:	Employer:
Home Address:	Employer's Address:
Home Phone #:	Employer's Phone #:
E-mail Address:	Current ACI or Other Qualification #: (Submit copies if applicable)

Check one: Original Qualification Renewal of Qualification

Mailing address to be used: Home Employer

Desired Qualifications (select only one qualification area per registration form)	
<input type="checkbox"/> Aggregate Module	Examination Fee _____
<input type="checkbox"/> Asphalt Module	_____
<input type="checkbox"/> Concrete Module	_____
<input type="checkbox"/> Soil Module	_____
<input type="checkbox"/> Field Sampling and Testing Module	_____

Examination date and location

First Choice		Second Choice	
Date	Location	Date	Location

Personnel seeking qualification in one of the designated qualification modules should consult the Material Testing and Research Branch for qualification criteria, policies, requirements and general information. The person's full name and qualification information will be recorded upon successful completion of the qualification requirements.

<input type="checkbox"/> Passed Qualification Date: _____	<input type="checkbox"/> Failed Qualification Date: _____
_____ Materials Testing and Research Engineer	

TRANSPORTATION PERSONNEL QUALIFICATION PROGRAM (TPQP)

Qualification carries inherent rights and responsibilities. These rights include being exclusively sanctioned along with others so qualified by TPQP to perform sampling, testing, and reporting of test results for quality control and quality assurance programs. These responsibilities include performing and reporting tests with the accuracy and precision expected of the individual in accordance with the required test procedures. By signing this document the individual agrees to abide by all of the terms of the TPQP and as set forth by the contracting agency.

Finding of negligence or abuse of these rights and responsibilities will be penalized upon recommendation by the Technical Task Group Committee. Penalties, as described herein, may be assessed for abuse or negligence. Negligence is defined as unintentional deviations from approved procedures which may or may not cause erroneous results. The first finding of negligence will result in a letter of reprimand being sent to both the employee and the employer, the second will result in a thirty (30) day suspension of qualification, the third in a one hundred eighty (180) day of suspension of qualification, and the fourth offense will result in permanent revocation of qualification. Abuse is defined as intentional deviation from approved procedures. The first finding of abuse will result in a one (1) year suspension to permanent revocation of an individual's qualification. Any subsequent finding of abuse will result in permanent revocation of qualification. Revocation or suspension in one qualification area will be considered a revocation or suspension of all qualification areas held by the individual. Permanent revocation of qualification will result in that person being ineligible for any TPQP qualification. The penalties are guidelines and the Technical Task Group Committee may impose harsher penalties if warranted for findings of abuse or negligence.

RIGHTS AND RESPONSIBILITIES AGREEMENT

This document affirms that _____ hereinafter
(*print name*)
the applicant, desires to be qualified by the Transportation Personnel Qualification Program (TPQP) in
_____ module.
(*name of module desired*)

The applicant should also be aware that both State and Federal laws may govern construction projects, including Title 18, United State Code, Section 1020, that in brief states that anyone making falsifications on Federal-aid projects,

“Shall be fined not more than \$10,000 or imprisoned not more than five years, or both.”

I, _____, have read, understand, and agree to abide by the rights,
(*print name*)

responsibilities, and penalties associated with receipt of this qualification.

Signature

Date

**INSTRUCTIONS FOR COMPLETING TRANSMITTALS FOR ACCEPTANCE,
CONTRACTOR AND VERIFICATION SAMPLING AND TESTING
(Forms MTRB JC-1, MTRB CJC-2, and MTRB VJC-3)**

Item Description

- 1 Sample number assigned by the Project Engineer. First number is the transmittal number; second group of letters represent a code; the third number is the transmittal under that code. Use the following recommended codes:

EM	Excavation & Embankment	CAG	Concrete Aggregates
IB	Import Borrow	CA	Concrete Class "A"
AB	Aggregate Base Course	CB	Concrete Class "B"
ASB	Aggregate Subbase Course	CC	Concrete Class "C"
SF	Structural Fill	CD	Concrete Class "D"
TB	Trench Backfill	CP	Paving Concrete
BC	Bed Course for Pipes	RS	Reinforcing Steel
FM	Filter Material	PM	Pavement Marking Materials
AC	Asphalt Concrete	WC	Weekly Compaction Report
ACB	Asphalt Concrete Base	M	Miscellaneous (Includes material certifications)
ACA	Asphalt Concrete Aggregates		

Project number and date transmittal submitted are self explanatory.

- 2 Project Title.
- 3 Name exact material or item being submitted for testing or review. Do not list material not included with this transmittal. Indicate "Certificate of Compliance for (name of item)" for the item being submitted. (Be sure the Certificate of Compliance is specific as to what is being certified. It should not list items not in the project.)
- 4 Manufacturer or Brand of the material being submitted.
- 5 Source of supplier of the material being submitted.
- 6 Name of person who sampled the material and date of sample (if applicable).
- 7 Where sampled: jobsite; (name) of quarry; etc. as applicable. Quantity represented: __tons; __C.Y.; __each; etc. as applicable for each sample.
- 8 Where or what the material will be used in.
- 9 Specific section or subsection, plan sheet number, or change order number where the referenced material is specified and the quality requirements are indicated.
- 10 Payment item number (i.e., Item 206.7200).
- 11 Any other data required to clearly identify the material, test requirement and where it is required in the contract document.
- 12 Any notes as applicable (i.e., alternate use of the material, number of sample bags, and how shipped).
- 13 Any remarks regarding sampling difficulties, field conditions that may affect samples, how samples taken, etc.
- 14 Note whether project engineer has "accepted", "rejected" or "accepted subject to" test results or conditions contractor needs to meet.
- 15 Location and date sample/test data/certifications sent.
- 16 Name and signature of person submitting transmittal.
- 17 Phone number where the person can be contacted especially when test data does not meet specifications, and District or County office where test data or review comments should be sent to.

TRANSMITTAL FOR CONTRACTOR SAMPLING & TESTING

Sample No. CJC..... Project No. Date.....

Project.....

Sample of.....

Manufacturer or Brand.....

Source of Supply.....

Sampled by..... Date Sampled.....

Where sampled..... Quantity represented.....

Material is proposed for use in.....

Determine suitability under:

Spec. Section/Plan Sheet No.....

Payment Item No.....

Comments:.....

Report any pertinent facts below: If a field test is made, report results below.

Remarks.....

Note whether material is accepted, rejected, or accepted subject to conditions.....

Shipped to..... Date.....

Submitted by..... Signature.....

Agency..... Phone Number.....

SAMPLE CARD AND CONCRETE STRENGTH TEST REPORT

Sample No. CJC _____ Date _____ 19 _____

Project No. _____ Charge Code _____ Work Order _____

Project _____

Sampled By _____ Date & Time Sampled _____

Concrete Supplier _____ Plant Location _____

Truck No. _____ Time Concrete Left Plant _____

Quantity Of Water Added On Jobsite (gal/cy) _____ Slump (C143/T119) _____

Type Of Concrete _____ Nominal Aggregate Size _____ Cement Factor (100 lbs/cy) _____

Admixture _____

Unit Of Concrete Sampled _____ Quantity Of Concrete Represented _____







Concrete is Being Used In _____

Remarks _____

Signed _____

FOR CENTRAL LABORATORY USE ONLY

ID No.	Test Age (Days)	Test Date	Weight (gms)	Density (lbs/ft ³)	Diameter (in)	Area (in ²)	Max. Load (lbs)	Strength (psi)	Frac. Type	Tested By	Remarks
A											
B											
C											
D											
E											
F											
G											
H											
I											

<p style="text-align: center;">TEST METHOD</p> <p>_____ C39/T22 _____ C78/T97</p> <p>Other: _____</p> <p>_____</p> <p>_____</p>	<p>FRACTURE TYPE</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">1 </div> <div style="text-align: center;">2 </div> <div style="text-align: center;">3 </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;">4 </div> <div style="text-align: center;">5 </div> <div style="text-align: center;">6 </div> </div>	<p>Sample Received By & Date: _____</p> <p>Condition Of Sample: _____</p> <p>_____</p> <p style="text-align: right;">Physical Testing Engineer</p>
--	---	--

Remarks: _____

Quality Assurance Engineer

TRANSMITTAL FOR INDEPENDENT ASSURANCE SAMPLING & TESTING

Sample No. IA..... Project No. Date.....

Project.....

Sample of.....

Manufacturer or Brand.....

Source of Supply.....

Sampled by..... Date sampled.....

Where sampled.....

Material is proposed for use in.....

Sampling and Testing Observations on District, County or Contractor Personnel: ()

For Split Sample Testing by the District, County or Contractor: ()

Name of tester.....

Equipment used in the testing.....

Date sample tested.....

Report test results below or attach worksheets:

Remarks.....

Shipped to..... Date.....

Submitted by (Project Engineer).....Signature.....

Agency.....Phone Number.....

TRANSMITTAL FOR MATERIALS ACCEPTANCE

Sample No. JC..... Project No. Date.....

Project.....

Sample of.....

Manufacturer or Brand

Source of Supply.....

Sampled by..... Date sampled.....

Where sampled.....Quantity represented.....

Material is proposed for use in.....

Determine suitability under:

Spec. Section/Plan Sheet No.....

Payment Item No.....

Comments:.....

Report any pertinent facts below. If a field test is made, report results below.

Remarks.....

Note whether material is accepted, rejected, or accepted subject to conditions.....

Shipped to.....Date.....

Submitted by.....Signature.....

Agency.....Phone Number.....

SAMPLE CARD AND CONCRETE STRENGTH TEST REPORT

Sample No. JC _____ Date _____ 19 _____

Project No. _____ Charge Code _____ Work Order _____

Project _____

Sampled By _____ Date & Time Sampled _____

Concrete Supplier _____ Plant Location _____

Truck No. _____ Time Concrete Left Plant _____

Quantity Of Water Added On Jobsite (gal/cy) _____ Slump (C143/T119) _____

Type Of Concrete _____ Nominal Aggregate Size _____ Cement Factor (100 lbs/cy) _____

Admixture _____

Unit Of Concrete Sampled _____ Quantity Of Concrete Represented _____







Concrete is Being Used In _____

Remarks _____

Signed _____

FOR CENTRAL LABORATORY USE ONLY

ID No.	Test Age (Days)	Test Date	Weight (gms)	Density (lbs/ft ³)	Diameter (in)	Area (in ²)	Max. Load (lbs)	Strength (psi)	Frac. Type	Tested By	Remarks
A											
B											
C											
D											
E											
F											
G											
H											
I											

<p style="text-align: center;">TEST METHOD</p> <p>_____ C39/T22 _____ C78/T97</p> <p>Other: _____</p> <p>_____</p> <p>_____</p>	<p style="text-align: center;">FRACTURE TYPE</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">1 </div> <div style="text-align: center;">2 </div> <div style="text-align: center;">3 </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;">4 </div> <div style="text-align: center;">5 </div> <div style="text-align: center;">6 </div> </div>	<p>Sample Received By & Date: _____</p> <p>Condition Of Sample: _____</p> <p>_____</p> <p style="text-align: right;">Physical Testing Engineer</p>
--	---	--

Remarks: _____

Quality Assurance Engineer

MATERIALS CERTIFICATION DOCUMENTATION

MTRB MC

To: MATERIALS TESTING & RESEARCH BRANCH

Date: _____

From: Agency: _____

Name of Requestor: _____

Subject: **MATERIALS CERTIFICATION REQUEST**

Project No.: _____

Project: _____

1. Material Manufacturer/Supplier (Source) Inspections:

Material	Inspected (Yes/No)	Inspecting Personnel Other Than State Highways	Location of Reports	Comments/Remarks
A. Asphalt Concrete				
B. Asphalt Concrete Base				
C. Recycle Asphalt				
D. Concrete (PCC)				
E. Metal Pipes				
F. Concrete Pipes				
G. Precast Members				
H.				

2. Information on Pay Proposal Items

A. Sampling & Testing For Small Quantities:

Item No.	Material	Quantity	Comments/Remarks

B. Documented Visual Inspection:

Item No.	Material	Quantity	Comments/Remarks

C. Materials Supplied by Other Agencies

Item No.	Material & Name of Agency	Quantity	Comments/Remarks

D. Contract Change Orders (CCO) – Revise Quantity of Materials Only:

Item No.	Material	Project Quantity	CCO No.	Revised Amount (+) or (-)

_____ Signature

_____ Telephone No.

 For Materials Testing & Research Branch Use Only

Status of Deficiencies:

Suspense File Cleared _____ Yes No

If no, indicate:

Item No.	Material	Date Notified	Action Taken

Materials Certification Issued to FHWA: Yes No

Date: _____

TRANSMITTAL FOR VERIFICATION SAMPLING & TESTING

Sample No. VJC..... Project No. Date.....

Project.....

Sample of.....

Manufacturer or Brand.....

Source of Supply.....

Sampled by..... Date sampled.....

Where sampled..... Quantity represented.....

Material is proposed for use in.....

Determine suitability under:

Spec. Section/Plan Sheet No.....

Payment Item No.....

Comments:.....

Report any pertinent facts below. If a field test is made, report results below.

Remarks.....

Note whether material is accepted, rejected, or accepted subject to conditions.....

Shipped to..... Date.....

Submitted by..... Signature.....

Agency..... Phone Number.....

SAMPLE CARD AND CONCRETE STRENGTH TEST REPORT

Sample No. VJC _____ Date _____ 19 _____

Project No. _____ Charge Code _____ Work Order _____

Project _____

Sampled By _____ Date & Time Sampled _____

Concrete Supplier _____ Plant Location _____

Truck No. _____ Time Concrete Left Plant _____

Quantity Of Water Added On Jobsite (gal/cy) _____ Slump (C143/T119) _____

Type Of Concrete _____ Nominal Aggregate Size _____ Cement Factor (100 lbs/cy) _____

Admixture _____

Unit Of Concrete Sampled _____ Quantity Of Concrete Represented _____







Concrete is Being Used In _____

Remarks _____

Signed _____

FOR CENTRAL LABORATORY USE ONLY

ID No.	Test Age (Days)	Test Date	Weight (gms)	Density (lbs/ft ³)	Diameter (in)	Area (in ²)	Max. Load (lbs)	Strength (psi)	Frac. Type	Tested By	Remarks
A											
B											
C											
D											
E											
F											
G											
H											
I											

<p style="text-align: center;">TEST METHOD</p> <p>_____ C39/T22 _____ C78/T97</p> <p>Other: _____</p> <p>_____</p> <p>_____</p>	<p>FRACTURE TYPE</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">1 </div> <div style="text-align: center;">2 </div> <div style="text-align: center;">3 </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;">4 </div> <div style="text-align: center;">5 </div> <div style="text-align: center;">6 </div> </div>	<p>Sample Received By & Date: _____</p> <p>Condition Of Sample: _____</p> <p>_____</p> <p style="text-align: right;">Physical Testing Engineer</p>
--	---	--

Remarks: _____

Quality Assurance Engineer

APPENDIX 3

Sampling and Testing Guide for Acceptance and Verification

SAMPLING AND TESTING GUIDE FOR ACCEPTANCE AND VERIFICATION

MATERIALS/TESTS	ITEM NO. (See Note 5)	ACCEPTANCE OR CONTRACTOR SAMPLING & TESTING	SAMPLING & TESTING FOR SMALL QUANTITIES	VERIFICATION SAMPLING & TESTING (N/A FOR SMALL QUANTITIES) (See Note 4)	SAMPLE LOCATION	SAMPLE SIZE	REMARKS
01. CONCRETE (PAVEMENT, STRUCTURAL AND MISCELLANEOUS)							
A. Cement (See Note 1)	701	Certificate of Compliance. Check samples of 1 for approximately every 5,000 yd ³ of concrete placed and as required for control	If concrete is used for incidental construction, Certificate of Compliance	N/A	Weigh hopper or in the feed line immediately in advance of the hopper	30 lbs.	
B. Aggregate (See Note 1)	703.01						
(1) Fine & Coarse Aggregate	703.02						
(a) Gradation		1 for approximately every 2 weeks or 500 yd ³ of concrete placed and as required for control	(See Note 2)	1 per 10 acceptance tests	(See Note 3)	50 lbs. (C.A.) 10 lbs. (F.A.)	
(b) Specific Gravity		When aggregate changed or as required for source information	N/A	N/A	(See Note 3)	10 lbs. (C.A.) 5 lbs. (F.A.)	
(c) Moisture		As required for information	N/A	N/A	(See Note 3)	5 lbs. (C.A.)	
(2) Coarse Aggregate							
(a) Clay Lumps and Friable Particles; L.A. Abrasion; and Flat and Elongated Pieces		When aggregate changed or at least once a year	N/A	N/A	(See Note 3)	200 lbs.	
(3) Fine Aggregate							
(a) Sand Equivalent		If required, 1 for approximately every 2 weeks or 3,000 yd ³ of concrete placed or as required for control	(See Note 2)	When required, 1 per 5,000 yd ³	(See Note 3)	2 lbs.	
(b) Clay Lumps and Friable Particles; Organic Impurities; and L.A. Abrasion on Parent Material for Manufactured Fines Only		When aggregate changed or at least once a year or 1 per project	N/A	1 per project	(See Note 3)	50 lbs.	
(c) Complete		When new source is proposed for use or when aggregate changed	N/A	N/A	Stockpile / (See Note 3)	200 lbs. (C.A.) 100 lbs. (F.A.)	

MATERIALS/TESTS	ITEM NO. (See Note 5)	ACCEPTANCE OR CONTRACTOR SAMPLING & TESTING	SAMPLING & TESTING FOR SMALL QUANTITIES	VERIFICATION SAMPLING & TESTING (N/A FOR SMALL QUANTITIES) (See Note 4)	SAMPLE LOCATION	SAMPLE SIZE	REMARKS
01. CONCRETE (PAVEMENT, STRUCTURAL AND MISCELLANEOUS) CONT'D							
C. Water (See Note 1)	712.01	1 per source. (Obviously suitable source as drinking water requires no sampling)	N/A	N/A	At point of use	3 gals. - Use glass or plastic jugs w/ lined sealed lids	
D. Admixture	711	When admixture is initially used in state work, Certificate of Compliance with test results	If previously used in other state work, Certificate of Compliance	N/A			
E. Concrete Mixture - Pavements	411						
(1) Compressive Strength (28 days, 7 days), when required by Central Laboratory	601	1 set for approximately 300 yd ³ of concrete placed for concrete specified by class; 1 set for each 150 yd ³ and fractional thereof placed on any day or as required for acceptance for concrete specified by strength	1 set per day of pour	1 per project	At point concrete deposited in the work	1 set of 2 - 6"x12" cylinders for each test age	
(2) Flexural Strength		1 set per half day or as required for control	1 set per half day of pour or as required for control	1 per project	At point concrete deposited in the work	1 set of 2 - 6"x6"x 21" beams for each test age	
(3) Yield, Cement Factor, and Unit Weight (See Note 1)		As necessary to assure accuracy of mix design or as necessary for control. When yield test used for payment, 1 per project		When yield test used for payment, 1 per project	At point concrete deposited in the work	Approximately 1 ft ³	
(4) Slump Test		When test specimen are fabricated or when consistency or uniformity is questionable	When test specimen are fabricated or when consistency or uniformity is questionable	1 per project (Observation)	At point concrete deposited in the work		
(5) Entrained Air		When entrained air is specified, 1 approximately every 300 yd ³ or as necessary for control or as required for control.	N/A	When entrained air is specified, 1 per project	At point concrete deposited in the work		

MATERIALS/TESTS	ITEM NO. (See Note 5)	ACCEPTANCE OR CONTRACTOR SAMPLING & TESTING	SAMPLING & TESTING FOR SMALL QUANTITIES	VERIFICATION SAMPLING & TESTING (N/A FOR SMALL QUANTITIES) (See Note 4)	SAMPLE LOCATION	SAMPLE SIZE	REMARKS
01. CONCRETE (PAVEMENT, STRUCTURAL AND MISCELLANEOUS) CONT'D							
F. Concrete Mixture - Bridges & Major Structures (R.C.B., P.C.C., Arch Culverts, & Retaining Walls)	504 503 601						
(1) Compressive Strength (28 days, 7 days)		1 set for approximately 300 yd ³ of concrete placed for concrete specified by class; 1 set for each 150 yd ³ and fractional thereof placed on any day or as required for acceptance for concrete specified by strength	1 set per day of pour	1 per project	At point concrete deposited in the work	1 set of 2 - 6"x12" cylinders for each test age	
(2) Yield, Cement Factor, and Unit Weight (See Note 1)	504 503 601	As necessary to assure accuracy of mix design or as necessary for control. When yield test used for payment, 1 per project	N/A	When yield test used for payment, 1 per project	At point concrete deposited in the work	Approximately 1 ft ³	
(3) Slump Test		When test specimen fabricated or when consistency or uniformity is questionable	When test specimen are fabricated or when consistency or uniformity is questionable	1 per project (Observation)	At point concrete deposited in the work		
(4) Entrained Air		If entrained air is specified, 1 approximately every 300 yd ³ or as necessary for control or as required for control	N/A	When entrained air is specified, 1 per project	At point concrete deposited in the work.		
G. Concrete Mixture - Miscellaneous Concrete (Concrete for Incidental Construction)	601 604 607 608						
(1) Compressive Strength (28 days, 7 days)	609 610 621 622 623 640	1 set for each day when volume exceeds 25 yd ³ or as required for acceptance for concrete specified by strength	If concrete is less than 25 yd ³ , 1 per accumulative 100 yd ³ . None if total days run less than 25 yd ³	1 per project. When total days run less than 25 yd ³ , none	At point concrete deposited in the work	1 set of 2 - 6"x12" cylinders for each test age	
(2) Yield, Cement Factor, and Unit Weight (See Note 1)		As necessary to assure accuracy of mix design or as necessary for control	N/A	If yield test used for payment, one (1) per project	At point concrete deposited in the work	Approximately 1 ft ³	

MATERIALS/TESTS	ITEM NO. (See Note 5)	ACCEPTANCE OR CONTRACTOR SAMPLING & TESTING	SAMPLING & TESTING FOR SMALL QUANTITIES	VERIFICATION SAMPLING & TESTING (N/A FOR SMALL QUANTITIES) (See Note 4)	SAMPLE LOCATION	SAMPLE SIZE	REMARKS
01. CONCRETE (PAVEMENT, STRUCTURAL AND MISCELLANEOUS) CONT'D							
(3) Slump Test		When test specimen are fabricated or when consistency or uniformity is questionable	N/A	1 per project (Observation)	At point concrete deposited in the work		
(4) Entrained Air		When entrained air is specified, 1 approximately every 300 yd ³ or as required for control	N/A	When entrained air is specified, 1 per project	At point concrete deposited in the work		
02. CEMENT TREATED PERMEABLE BASE	309						
A. Cement (See Note 1)	701	Accepted by manufacturer's or supplier's Certificate of Compliance supplemented with check testing. Check sample for approximately every 5,000 yd ³ of concrete placed and as required for control	N/A	N/A	Weigh hopper or in the feed line immediately in advance of the hopper.	30 lbs.	
B. Aggregate (See Note 1)	703.02	1 per day or as required for control	N/A	1 per 10 acceptance tests	(See Note 3)	250 lbs.	
03. ASPHALT CONCRETE	401						
A. Asphalt Cement	702.01	1 per approximately every 7,500 tons of asphaltic concrete	If less than 500 gals. per project, Certificate of Compliance with test results	1 per project minimum	Plant line	2 qts.	
B. Aggregate	703.09						
(1) Gradation		1 per approximately every 500 tons of asphaltic concrete	If less than 150 tons per project, visual inspection	1 per 10 acceptance tests. 1 per project minimum	Plant conveyor belt	10 lbs.	
(2) Sand Equivalent		1 per approximately every 2,500 tons of asphaltic concrete	If less than 150 tons per project, none	1 per 10 acceptance tests. 1 per project minimum	Plant conveyor belt	10 lbs.	
(3) Los Angeles Abrasion, Stripping, K Factor, Flat & Elongated Pieces		1 per year per source, minimum	N/A	1 per year per source	Plant conveyor belt	40 lbs.	

MATERIALS/TESTS	ITEM NO. (See Note 5)	ACCEPTANCE OR CONTRACTOR SAMPLING & TESTING	SAMPLING & TESTING FOR SMALL QUANTITIES	VERIFICATION SAMPLING & TESTING (N/A FOR SMALL QUANTITIES) (See Note 4)	SAMPLE LOCATION	SAMPLE SIZE	REMARKS
03. ASPHALT CONCRETE CONT'D							
(4) Complete Aggregate Test		When new source is proposed for use or when aggregate changed	N/A	When new source is proposed for use or when aggregate changed	Plant conveyor belt/ stockpile	200 lbs.	
C. Uncompacted AC Mixture For Specific Gravity	401	1 per approximately every 500 tons of asphaltic concrete	If less than 150 tons per project, none.	1 per 10 acceptance tests. 1 per project minimum	Jobsite - From paver at auger	5 lbs.	
D. Uncompacted AC Mixture For Asphalt Content & Design Check		1 per approximately every 7,500 tons of asphaltic concrete	If less than 150 tons per project, none	1 per project minimum	Plant - Off truck bed	15 lbs.	
E. Compacted AC Cores		1 per approximately every 3,000 yd ² of surface area paved per day, minimum 3 per day	If less than 150 tons per project, none.	1 per 10 acceptance tests. 1 per project minimum	Jobsite - Pavement	4 in. diameter cores	
04. PLANT MIX GLASSPHALT CONCRETE BASE COURSE	312	Same as Asphalt Concrete					
05. ASPHALT TREATED PERMEABLE BASE	311						
A. Asphalt Cement	702.01	1 per approximately every 7,500 tons of asphalt treated permeable base	If less than 500 gals. per project, Certificate of Compliance with test results	1 per project minimum	Plant line	2 qts.	
B. Aggregate	703.09						
(1) Gradation	311.03	1 per approximately every 3,000 tons of asphalt treated permeable base	If less than 250 tons per project, visual inspection	1 per 10 acceptance tests. 1 per project minimum	Plant conveyor belt	50 lbs.	
06. PRIME COAT	408 702.03	1 per approximately every 10,000 gals.	If less than 500 gals. per project, Certificate of Compliance with test results	1 per project minimum	Jobsite - Distributor truck	1 gal.	
07. TACK COAT	407 702.04	1 per approximately every 10,000 gals.	If less than 500 gals. per project, Certificate of Compliance with test results	1 per project minimum	Supplier's Plant - Storage tank before dilution	1 gal.	

MATERIALS/TESTS	ITEM NO. (See Note 5)	ACCEPTANCE OR CONTRACTOR SAMPLING & TESTING	SAMPLING & TESTING FOR SMALL QUANTITIES	VERIFICATION SAMPLING & TESTING (N/A FOR SMALL QUANTITIES) (See Note 4)	SAMPLE LOCATION	SAMPLE SIZE	REMARKS
08. BITUMINOUS SEALS	404, 409						
A. Asphalt Cement, Liquid Asphalt, and Asphalt Emulsion	702.01 702.03 702.04	1 per approximately every 10,000 gals.	If less than 500 gals. per project, Certificate of Compliance with test results	1 per project minimum	AC - Plant line LA - Distributor Tank Truck Emulsion - Supplier's plant storage tank	AC - 2 qts. LA - 1 gal. Emulsion - 1 gal.	
B. Aggregate	703.09 703.11						
(1) Gradation, L.A. Abrasion, Stripping and Flat & Elongated Pieces		1 prior to use and as required for information and/or acceptance	If less than 250 tons per project, visual inspection.	1 per project minimum	Plant conveyor belt	50 lbs.	
09. CUT SUBGRADE	203						
A. Gradation, Sand Equivalent, Proctor	203	1 per soil type	If less than 2500 ft ² , Certificate of Compliance	1 per project	Jobsite - On roadbed	250 lbs	
B. Compaction		1 per soil type per lift per 500 lin. ft. per lane	If less than 2500 ft ² , visual inspection	1 Visual inspection per project	Jobsite - On roadbed	N/A	
10. EMBANKMENT FILLS & IMPORT BORROW	203						
A. Gradation, Sand Equivalent, Proctor	203	1 per soil type	If less than 2500 ft ² , Certificate of Compliance	1 per project	Jobsite - On roadbed	250 lbs	
B. Compaction Below 2.5 ft.		1per lift per 2,000 yd ³	If less than 3,000 yd ³ , visual inspection	N/A	Jobsite - On roadbed	N/A	
C. Compaction Above 2.5 ft.		1per lift per 500 lin. ft. per lane	If less than 500 lin. ft. per lane, visual inspection	1 Visual inspection per project	Jobsite - On roadbed	N/A	

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11. STRUCTURAL BACKFILL	206						
A. Gradation, Sand Equivalent, Proctor	703.20	1 per 1,500 yd ³ per type	If less than 250 yd ³ of type B backfill, Certificate of Compliance. N/A for Type A backfill	1 per 10 tests, but not less than 1	Jobsite - On roadbed	250 lbs.	
B. Compaction	206	1 per lift per 500 ft ²	If less than 500 ft ² , per use for type B backfill, none. N/A for type A backfill	1 Visual inspection per project	Jobsite - On roadbed	N/A	
12. TRENCH BACKFILL (INCLUDING BED COURSE)	206						
A. Gradation, Sand Equivalent, Proctor, Resistivity & pH as Required	703.21	1 per 1,500 yd ³ per type	If less than 100 yd ³ traffic area, or if less than 250 yd ³ non-traffic area, Certificate of Compliance	1 per 10 tests, but not less than 1	Jobsite - On roadbed	250 lbs.	
B. Compaction	206	1 per lift per 300 lin. ft	1 per traffic crossing per lift. If less than 300 lin. ft. for other areas, visual inspection	Visual inspection	Jobsite - On roadbed	N/A	
13. AGGREGATE BASE COURSE	304						
A. L.A. Abrasion, Plasticity Index, Flat & Elongated Pieces, Crushed Particles	703.06	1 per material source	If less than 250 yd ³ per project, Certificate of Compliance	N/A	Jobsite - On roadbed	100 lbs.	
B. Gradation, Sand Equivalent, Proctor	703.06	1 per 1,500 yd ³ per material type but not less than 1	If less than 250 yd ³ per project, Certificate of Compliance	1 per 10 tests, but not less than 1	Jobsite - On roadbed	250 lbs.	
C. Compaction	304	1 per lift per 1,000 ft ²	If less than 1,000 yd ² per project, visual inspection	Visual inspection	Jobsite - On roadbed	N/A	

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14. AGGREGATE SUBBASE	305						
A. Plasticity Index Gradation, Sand Equivalent, Proctor	703.17	1 per 1,500 yd ³ , but not less than 1	If less than 250 yd ³ per project, Certificate of Compliance	1 per 10 tests, but not less than 1	Jobsite - On roadbed	250 lbs.	
B. Compaction	305	1 per lift per 1,000 ft ²	If less than 1,000 yd ² per lift per project, visual inspection	Visual inspection	Jobsite - On roadbed	N/A	
15. UNTREATED PERMEABLE BASE	306						
A. Prime Coat For Permeable Base Course	420.02	1 per approximately 10,000 gals. (See Note 1)	If less than 500 gals. per project, Certificate of Compliance	N/A	Storage tank before dilution	1 gal.	
B. Coarse Aggregate and Filler	703.04						
(1) Gradation, L.A. Abrasion, Flat & Elongated Pieces		1 per material source	If less than 500 tons per project, Certificate of Compliance	N/A	Jobsite - On roadbed	150 lbs.	
(2) Gradation		1 per 3,000 tons per material type	If less than 500 tons per project, Certificate of Compliance	1 per 10 tests, but not less than 1	Jobsite - On roadbed	60 lbs.	
16. PAVING FABRIC	412						
A. Asphalt Cement	702.01	1 per approximately 10,000 tons of AC (See note 1)	If less than 500 gals. per project, Certificate of Compliance with test results	1 per project minimum	Plant line	2 qts.	
B. Paving Fabric	716.04	Certificate of Compliance and Certified test results	N/A	N/A			

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17. UNDERDRAINS	605						
A. Perforated/Unperforated Pipe	706.12	Certificate of Compliance	N/A	N/A			
B. Permeable Separator	716.03	Certificate of Compliance	N/A	N/A			
C. Crushed Rock							
(1) Gradation, L.A. Abrasion	605 703.04	1 per 3,000 tons	If less than 500 tons per project, Certificate of Compliance	1 per project	Jobsite - On roadbed	150 lbs.	
18. CURING COMPOUND	411, 503 711.01	Certificate of Compliance	N/A				
19. JOINT FILLER	411, 503 705.01	Certificate of Compliance	N/A	1 per project		1 ft. x 2 ft.	
20. JOINT SEALER	411, 503 705.04	Certificate of Compliance	N/A				
21. WATERPROOFING ASPHALT	503, 705.06	Certificate of Compliance	N/A				
22. WATERPROOFING PRIMER	503, 705.06	Certificate of Compliance	N/A				
23. ASPHALT SATURATED FABRIC	503, 705.06	Certificate of Compliance	N/A				
24. TRAFFIC PAINT	629 708.06	From approved product list and 1 per batch	If less than 25 gallons per project, Certificate of Compliance with test results		Jobsite	2 qts.	
25. RUBBER STOP	503, 705.07	Certificate of Compliance	N/A				
26. METAL GUARDRAIL	606 710.04	Certificate of Compliance and Certified test results	N/A	N/A	N/A	N/A	
27. GUARDRAIL HARDWARE	710.08	Certificate of Compliance and Certified test results	N/A	N/A	N/A	N/A	
28. BRIDGE RAILINGS AND POST	507 710.09, 710.10	Certificate of Compliance and Certified test results	N/A	N/A			
29. NEOPRENE BEARING PAD	503 712.09	Certificate of Compliance and Certified test results	N/A	N/A			

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30. VITRIFIED CLAY PIPE	625, 706.08	Certificate of Compliance	N/A	N/A			
31. REINFORCED CONCRETE GUARDRAIL POST	606 710.06	Certificate of Compliance and Certified test results	N/A	N/A			
32. PAVEMENT MARKERS	629 712.40	Certificate of Compliance with Certified test results and 1 sample per batch	If less than 1,000 markers per project, Certificate of Compliance with Certified test results	1 for every 10,000 or less or 1 per batch	Jobsite or source	10 for non-reflective markers and 6 for reflective markers	
33. PAVEMENT MARKER EPOXY	629, 712.41	Certificate of Compliance	N/A	N/A			
34. PAVEMENT MARKER BITUMINOUS ADHESIVE	629 712.41	1 per lot	If less than 1000 markers per project, Certificate of Compliance with test results	1 per project minimum		1/2 box per lot	
35. PLASTIC CONDUIT	622, 625 706.09, 712.27	Certificate of Compliance and Certified test results	N/A	N/A			
36. RIGID STEEL CONDUIT	622 712.27	Certificate of Compliance and Certified test results	N/A	N/A			
37. SEED	618, 641	Certificate of Compliance					
38. ELECTRICAL CONDUCTOR	622, 712.34	Certificate of Compliance					
39. GEOSYNTHETICS	412, 605 648, 716	Certificate of Compliance	N/A				
40. THERMOPLASTIC	629, 712.55	Certificate of Compliance	N/A				
41. PAVEMENT MARKING TAPE	629, 712.53	Certificate of Compliance	N/A				
42. WOVEN FENCE	607 710.02	Certificate of Compliance and Certified test results	N/A	N/A	N/A	N/A	
43. TOPSOIL	617 712.17	1 sample per type	If less than 1,000 ft ² , visual inspection	N/A	Jobsite	50 lbs.	
44. PRESERVATIVES FOR TIMBER	502, 714.02	Certificate of Compliance					

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45. CONCRETE PIPE	603 706.02 706.17	1 joint length for approximately every 50 joint lengths for 3 edge bearing load test. Inspected at plant and released by Central laboratory	If less than 100 lin. ft. per project, Certificate of Compliance		Strength tests usually performed at plant		1 D-load per every 50 pieces
46. CORRUGATED METAL PIPE	603 707.02 707.03	Visual, accepted by manufacturer's or supplier's Certificate of Compliance. Inspected at plant and released by Central Laboratory		N/A	At fabrication point or at time of use		
47. REINFORCING STEEL	504 602 610 709.01	Sample each size for each brand and additional samples as necessary. Approved together with fabricator's certified analysis	If less than 200 lbs. per project, Certificate of Compliance		Jobsite or source	3 specimen 36" long	
48. WIRE MESH REINFORCEMENT	602 709.01	Each 10 tons or fraction thereof	If less than 200 lbs. per project, Certificate of Compliance		Jobsite	3 feet x 3 feet	
49. WIRE ROPE OR CABLE	709.02	Certificate of Compliance with Certified test results and 1 sample per type per lot	1 set per project	1 set per project	Jobsite	2 strands 4-1/2 ft. long	
50. STRUCTURAL PLATE ARCHES		Certificate of Compliance		N/A	Jobsite		
51. PRE-STRESSED STRANDS	504 709.03	Certificate of Compliance with Certified test results and 1 sample per type per lot	1 set per project	1 set per project	Jobsite	2 strands 4-1/2 ft. long	
52. STEEL PRODUCTS	602.02	Certificate of Compliance and Certified test results	N/A	N/A			
53. BARB WIRE	607, 710.01	Certificate of Compliance	N/A	N/A			
54. BOLTS & HARDWARE	713.01 713.03 713.04	Certificate of Compliance and Certified test results	N/A	N/A			
55. BRICK	704	Certificate of Compliance	N/A	N/A			

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57. CHAIN LINK FENCE	607 710.03						
A. Fabric		Certificate of Compliance with Certified test results and 1 sample per lot or per project	If less than 200 ft ² per project, Certificate of Compliance with Certified test results	1 sample per project or 1 sample per lot	Jobsite	3 ft. length, full height	
B. Posts		Certificate of Compliance with Certified test results and 1 sample per lot or per project	If less than 30 lin. ft. per project, Certificate of Compliance with Certified test results	1 sample per project or 1 sample per lot	Jobsite	12 inch length each end	
C. Tension Wire		Certificate of Compliance with Certified test results and 1 sample per lot or per project	If less than 100 lin. ft. per project, Certificate of Compliance with Certified test results	1 per sample per project or 1 sample per lot	Jobsite	3 ft. length	
D. Tie Wire		Certificate of Compliance with Certified Test results and 1 sample per lot or per project	If less than 25 lbs. per project, Certificate of Compliance with Certified test results	1 sample per project or 1 sample per lot	Jobsite	3 ft. length	
E. Fittings		Certificate of Compliance with Certified test results	N/A	N/A	N/A	N/A	

- Note 1: Not required if the same source is being used on other projects and test is being made. Not necessary to duplicate the test for the sake of the record. The actual test results may be used anywhere they are applicable. (Established Source with Acceptable Quality Control/System Basis)
- Note 2: When gradation is being determined by a qualified plant technician at the plant, the guide schedule for gradation and sand equivalent as sampled by the plant inspector may be reduced to approximately 1/5. However, the schedule should be supplemented with the contractor's quality control results.
- Note 3: One of the following locations listed in order of preference: (a) Belt from weigh hopper to central or transit mixer; (b) Belt which feeds batch plant bins immediately preceding the weigh hopper, (c) Discharge gate of weigh hopper, (d) Discharge gates of bins feeding the weigh hopper at the batch plant. The location and method of sampling are to be determined and agreed upon by the Engineer and the Contractor. Once selected, the location and method of sampling are not to be changed during the life of the project, or so long as there is no change in Plant's configuration or operation.
- Note 4: When the Contractor's tests results are to be verified on a comparative basis as part of the overall acceptance program, the verification testing should be done at a frequency of not less than 10 percent of the frequency for Contractor's sampling and testing in the approved quality assurance plan or a minimum of 5 samples, which is the minimum number required to perform statistical evaluation. As Contractor demonstrates consistency of performance or test results are statistically similar, the Engineer may modify the sampling and testing requirements as shown below.
- Note 5: Item Nos. shown are the common references encountered in most construction projects. For unusual items, consult the Materials Testing & Research Branch.