

Quality Assurance Program (QAP) Manual for Use by the City of Victorville

This manual provides quality assurance guidelines for materials used in local projects. Projects not on the NHS nor SHS shall follow these requirements.



Note: Quality Assurance Programs should be reviewed and updated every five years or more frequently.

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Quality Assurance Program (QAP) Manual

for Use by Local Agencies

1.0 INTRODUCTION

A Quality Assurance Program (QAP) consists of an Acceptance Program and an Independent Assurance (IA) Program that will provide assurance that the materials and workmanship incorporated into a construction project are in conformance with the contract specifications. A QAP should be updated as needed, and at least once every five years.

When transportation projects are constructed on the National Highway System (NHS), it is required by federal regulations that each State Transportation Department (STD) has a QAP that meets federal requirements.

There are no federal QAP regulations for local agency administered Federal-aid projects off the NHS. However, to ensure that a local agency is a good steward of public funds and to ensure that the materials and workmanship incorporated in a construction project are in conformance with the contract specifications, the use of a QAP is essential. Consequently, Caltrans has included the requirement in the Local Assistance Procedures Manual that every local agency receiving funds for a Federal-aid transportation project must have a QAP. This manual provides guidelines that local agencies can use to develop a QAP for all Federal-aid projects off the State Highway System (SHS) which would include agency transportation projects off the NHS and the essential connecting roads on the NHS that are off the SHS.

2.0 STATE AND LOCAL AGENCY PROJECTS ON THE NHS

When local agencies need assistance concerning Federal-aid projects on the SHS, they are encouraged to contact their Caltrans District Local Assistance Engineer (DLAE) for guidance.

2.1 THE NATIONAL HIGHWAY SYSTEM (NHS)

In California, the NHS consists of approximately 7,500 miles of roadways on the SHS, all roadways on the Interstate System, and 120 miles of essential connecting (city or county) roads off the SHS. For the locations of California roadways on the NHS, refer to the following website: <http://www.fhwa.dot.gov/planning/nhs/index.html>

2.2 CODE OF FEDERAL REGULATIONS TITLE 23, PART 637 FOR PROJECTS ON THE NHS

The Code of Federal Regulations (Title 23, Section 637.205), defines the general policy for quality assurance programs on the NHS. It reads: "Each State Transportation Department (STD) shall develop a quality assurance program which will assure that the materials and workmanship incorporated into each Federal-aid highway construction project on the NHS are in conformity with the requirements of the approved plans and specifications, including approved changes." Appendix A contains the entire text of Part 637, including the "Guide Letter of Certification by State Engineer" required for transportation projects on the NHS.

2.3 QAP REQUIREMENTS FOR PROJECTS ON THE SHS

In California, the STD (Caltrans) has determined that California test (CT) methods will be used to meet the QAP requirements.

2.3.1 QAP DOCUMENTS

These QAP documents are to be used:

- The California Department of Transportation (Caltrans) Construction Manual
- The Caltrans Independent Assurance (IA) Manual

The Caltrans Construction Manual provides the frequency of acceptance testing and outlines the acceptance testing program. The Caltrans IA Manual details the Caltrans Independent Assurance program to be followed that has been approved by FHWA.

These manuals are available at the following websites:

http://www.dot.ca.gov/hq/construc/manual2001/chapter6/chp6_1.pdf

<http://www.dot.ca.gov/hq/esc/Translab/IAPMasterList/2005%20IA%20Manual.pdf>

2.3.2 PLANS AND SPECIFICATIONS

Caltrans and local agency projects on the SHS are required to use Caltrans approved plans and specifications.

2.3.3 TEST METHODS

On Caltrans and local agency projects on the SHS, CT methods are required to be followed. All CT methods are available at the following website:

<http://www.dot.ca.gov/hq/esc/ctms/index.html>

2.4 TRANSPORTATION PROJECTS ON THE NHS, BUT OFF THE SHS

2.4.1 QAP DOCUMENTS

For projects on the NHS but off the SHS, federal requirements mandate a QAP. The local agency may adopt the information contained in this manual for their QAP as outlined in Section 3, or follow the Caltrans QAP documents outlined in Section 2.3. The QAP in Section 3 consists of:

- An acceptance testing program
- An independent assurance program

An example of a simple QAP that can be used by a local agency is shown in Appendix Y.

2.4.2 PLANS AND SPECIFICATIONS

For local agencies with Federal-aid projects on the NHS, but off the SHS, approved plans and specifications shall be one of the following:

- Plans and specifications based upon a nationally-recognized standard (i.e., AASHTO, ASTM, etc.)
- Caltrans Standard Plans and Specifications
- Greenbook Standard Plans and Specifications

2.4.3 TEST METHODS

To receive Federal-aid funding for local agency administered projects off the SHS but on the NHS, local agencies are required to use test methods based upon a national standard or CT methods. Examples of national standards include:

- American Society for Testing and Materials (ASTM)
- American Association of State Highway and Transportation Officials (AASHTO)

It is beneficial if local agencies decide which testing standards are best suited for transportation projects in their geographical area. Local agencies should consider selecting the testing standards predominantly used by the professional groups in their geographical area. A list of testing standards is located in Appendix C.

2.5 CALTRANS INDEPENDENT ASSURANCE PROGRAM

Per the Caltrans IA Manual, IA services are provided by Caltrans IA staff for all locally-administered projects on the NHS or SHS, when CT methods are used. It should be noted that Caltrans will not perform IA services for these projects when ASTM or AASHTO standards are used to test the construction materials. When CT methods are used for local agency administered projects on the SHS or NHS, typical IA services performed by Caltrans include:

- Qualifying samplers and testers
- Accrediting laboratories
- Providing equipment calibration verification

3.0 LOCAL AGENCY TRANSPORTATION PROJECTS OFF THE NHS

For local agency Federal-aid transportation projects off the NHS, a QAP is required by the Caltrans Local Assistance Procedures Manual and is recommended by FHWA. The local agency has flexibility on how to develop and implement their QAP. It is recommended that ASTM standards, AASHTO standards, the Greenbook and/or Caltrans standards be used for the local agency's QAP.

3.1 DEVELOPING A QAP USING CT METHODS

- Caltrans QAP - Local agencies may use the Caltrans QAP documents outlined previously in Section 2.3.
- QAP Developed by the Local Agency - Chapter 16 of the Local Assistance Procedures Manual and this manual provide QAP guidelines using CT methods that will assist local agencies in developing a QAP for projects off the NHS. An example of a simple QAP that can be used by a local agency is shown in Appendix Y.
- When local agencies use CT methods, and construct one or more projects on the SHS or NHS each year, Caltrans is required to provide IA services for those local agency projects. After the samplers and testers are qualified and laboratories are accredited by Caltrans, they can then be used on other local agency projects while the accreditation and qualifications are still valid.
- If the local agency does not have a current project on the SHS or NHS, the local agency must make its own arrangements for IA services.

3.2 RECOMMENDED GUIDELINES FOR DEVELOPING A QAP

For local agencies that do not use the Caltrans QAP documents outlined previously in Section 2.3, it is recommended that they develop their own QAP that includes as a minimum:

- a) Acceptance Testing - sampling and testing to determine the degree of compliance with contract requirements. This includes:
- b) Testing Frequency Tables - construction sampling and acceptance testing should be outlined in a frequency table. An example of a frequency table is shown in Appendix D.
- c) Qualifying testing laboratories and acceptance samplers and testers through nationally acceptable certifications.
- d) A testing laboratory tied to a nationally known proficiency (or correlation) testing program or the Caltrans Reference Sample Program. Proficiency testing programs are explained in Appendix B.

- e) Thorough acceptance testing documentation. This is explained in detail in Section 4. “Maintaining Acceptance Testing Records and Materials Documentation.”
- **Independent Assurance Program** - procedures to verify that acceptance testing is being performed correctly by qualified testers and laboratories. **These include, but are not limited to only on NHS or SHS projects:**
 - a) Verifying that equipment used for acceptance testing is properly calibrated and in good working condition. Records of equipment calibrations should be kept with the equipment.
 - b) Witnessing sampling and testing by the acceptance tester.
 - c) A written procedure for dispute resolution.
- **Testing of Manufactured materials** - procedures for inspecting, accepting and testing manufactured and prefabricated materials either by source inspection, job inspection, or certificate of compliance.
- **QAP approval** - The QAP shall be approved by the Public Works Director. A non-registered Public Works Director must delegate the approval to a staff engineer if such individual is appropriately registered. If no registered staff engineer is available, the delegation can be made to a registered consultant engineer retained by the agency. Copies of the QAP shall be kept on file for review; one copy shall be submitted to the Caltrans District Local Assistance Engineer.

MAINTAINING ACCEPTANCE TESTING RECORDS AND MATERIALS DOCUMENTATION

Local agencies shall maintain accurate acceptance testing records during the construction of their Federal-aid projects. It is the responsibility of the Resident Engineer to keep all acceptance testing records current. After the completion of each transportation project, all materials records should be stored at a convenient location, with easy access, for a minimum of three years after final project voucher.

To assist the Resident Engineer, a check list of acceptance sampling and testing items is shown in Appendix E. During an FHWA or Caltrans process review, the Resident Engineer is usually asked to present the following items:

- Local Agency Quality Assurance Program
- A log summary of acceptance tests (Appendix H)
- Individual acceptance test records (Appendix G)
- Certificates of Compliance (Appendix J.1, J.2)
- Documentation of Qualified Testing Personnel and Testing Laboratories
- Materials Certification signed at the completion of the project (Appendix K)

See Appendix F for a list of the construction materials accepted by a Certificate of Compliance. Appendices G, H, J.1, J.2 and K are examples of acceptance testing records that should be maintained by the Resident Engineer.

4.1 ACCEPTANCE TESTING DOCUMENTATION FOR LOCAL AGENCIES WITHOUT MATERIALS TESTING LABORATORIES

Many local agencies cannot justify the cost of having a fully functional materials testing laboratory to perform their acceptance tests. In these cases, a local agency's only option is to "contract-out" all sampling and testing services. These types of activities are usually contracted to a consultant within the geographical area. Some consultant laboratories may already be qualified by Caltrans or other professional organizations (i.e., AASHTO, Asphalt Institute, American Concrete Institute, National Institute of Certification of Engineering Technologies, etc.). Whenever possible, consultant laboratories with these types of qualifications should be considered.

Throughout the construction of a project, it is important that a local agency employee frequently check with the consultant to ensure that all elements of the required acceptance sampling and testing are being performed. All test records for specification compliance should be accurately compiled using examples in this manual and they should be regularly presented to a local agency employee for review and acceptance.

Prior to construction, a representative from the local agency should present the consultant with a copy of the local agency's approved QAP. It is the responsibility of the consultant to forward all test records (and final documents) to the Resident Engineer each day and to the local agency within one week of completing testing.

Should a local agency need to confirm the certifications and/or qualifications of their consultant's samplers, testers, and/or laboratory; or to verify the accuracy of the consultant's test results, the local agency should use a second qualified consultant. Differences between the construction contractor's test results and the local agency consultant's test results of the same materials, if significant, can also require sampling, and laboratory testing by a third independent qualified material's consultant.

4.2 ACCEPTANCE TESTING DOCUMENTATION FOR LOCAL AGENCIES WITH MATERIALS TESTING LABORATORIES

Local agencies that perform acceptance testing using their own facilities and trained staff should perform the sampling and testing per an approved QAP. The acceptance samplers and testers should also use documentation similar to that shown in Appendices G, H, J.1, J.2 and K. Personnel may not have dual roles; namely, being an acceptance sampler and tester and concurrently performing IA duties. This is a conflict of interest and is not allowed.

5.1 ISSUING CERTIFICATES OF PROFICIENCY FOR ACCEPTANCE SAMPLERS AND TESTERS

The consultants are on an approved pre-qualified list maintained by the finance department and the agency has the right to pick a consultant from that list and act as the agency's sampler and tester to perform work for the local agency.

The Certificate of Proficiency should include the following items:

- The printed full name of the acceptance sampler and/or tester
- The company and address of the qualified sampler and/or tester
- A list of the test methods the sampler and/or tester is qualified to perform
- The re-qualification date (month and year) for each test
- The date the certificate is issued

Prior to sampling and testing on a local agency transportation project, provide the Resident Engineer with a copy of the Certificate of Proficiency for each sampler and tester on the project. See Appendix Q for an example of a Certificate of Proficiency.

5.2 ISSUING LABORATORY ACCREDITATION CERTIFICATES

At least once during each calendar year, the IA person should review each materials testing laboratory that performs work for the local agency to verify the laboratory has the following:

- A current copy of the local agency's QAP (signed and dated by a city or county engineer).
- A current copy of all test methods used by the local agency.
- Proper test equipment (with firmly attached calibration stickers dated within 12 months of the current date), supporting calibration records and round-robin test results (from an accredited laboratory tied to AMRL, CCRL or Caltrans' RSP).
- Current Certificates of Proficiency for all samplers and/or testers expected to be on the project.

The Laboratory Accreditation Certificate should include the printed name and address of the laboratory, the accreditation date, a list of the tests the laboratory is accredited to perform and the full name of the IA person, and a statement that all of the above requirements have been met. A certificate of compliance from the laboratory showing certification from a nationally accepted organization will be acceptable.

See Appendix S for an example of a Laboratory Accreditation Certificate for a materials testing laboratory.

5.8 MAINTAINING ACCURATE RECORDS

It is the responsibility of the local agency's Resident Engineer to create, and maintain accurate records for all acceptance materials testing performed on local agency construction projects. Per CFR Title 49, Section 18.42, a local agency using federal funds for a transportation project must maintain pertinent construction records for three years subsequent to final project voucher reimbursement or through the period of litigation, whichever is later. A complete set of Resident Engineer records should include the following:

- A log summary of the acceptance tests taken on the project
- Copies of all tester qualification and lab certifications
- All acceptance tests taken on the project
- Copies of Certificates of Compliance
- Records of pre-manufactured materials (collection of release tags)
- Materials certificate (signed by the Resident Engineer at the completion of the project)

- A copy of the approved QAP with the date of approval

(See Appendices G, H, J.1, J.2, K, P, Q, S, T, U, V.I, V.2, and W for examples of these records.)

FHWA/CALTRANS PROCESS REVIEWS

FHWA and/or Caltrans process review teams randomly visit California local agencies to examine their materials records on selected Federal-aid construction projects. During a FHWA or Caltrans process review, the Resident Engineer may only have five to seven days to retrieve all their project files and review the materials testing elements on their project. Under these conditions, it is imperative that all materials records for each construction project are accurate, well organized and stored in an easily retrievable place.

The process review team may typically ask several questions pertaining to the quality assurance process. They are especially interested in examining the written documentation collected during the construction of the project, to verify that proper amounts of sampling and testing were performed in accordance with the local agency's QAP and determine if all failed tests were resolved.

From project plans, quantities of materials used, and the local agency's QAP frequency tables, it is relatively easy to determine the minimum number of acceptance tests that are required on the project. In the past, California local agencies have not always had the proper number of acceptance tests and other required items in their project files. It should be noted that the role of the review team is to examine all areas of the local agency's QAP and observe whether or not the local agency has done what is required. Their main objectives are to assist state and local agencies with their control of materials and encourage them to fully document all required materials records as noted in their QAP. This manual is intended to help local agencies fulfill material testing and record requirements on their Federal-aid projects and to help ensure both state and federal compliance with future Caltrans or FHWA process reviews. See Appendix X for commonly asked questions during a Caltrans or FHWA process review.

Appendix A - Code of Federal Regulations that Govern Transportation Quality Assurance Programs - 23 CFR 637

- Chapter 1 - Federal Highway Administration, Department of Transportation
- Title 23 Code of Federal Regulations (CFR) - Highways
- Part 637 - Construction Inspection and Approval

Caltrans Editorial Comment: Currently, there are no Code of Federal Regulations (CFR) pertaining to Quality Assurance Program requirements for local agency Federal-aid projects off the NHS. However, for local agencies that have projects on the NHS, the provisions of 23 CFR 637 which includes "Subpart B - Quality Assurance Procedures for Construction" apply.

Title 23 CFR 637 can be found at:

<http://www.access.gpo.gov/nara/cfr/waisidx/01/23cfr63701.html>

The following are the specific requirements set forth in "Subpart B - Quality Assurance Procedures for Construction" **for projects on the NHS** (not all Sections are shown):

Section 637.201 - Purpose

To prescribe policies, procedures, and guidelines to assure the quality of materials and construction in all Federal-aid highway projects on the National Highway System.

Section 637.207 - Quality Assurance Program

- (a) Each State Transportation Department's (STD)* quality assurance program shall provide for an acceptance program and an independent assurance (IA) program consisting of the following:

*(Caltrans Editorial Comment: Local agencies administering construction contracts on the NHS must follow the requirements for the STD which is Caltrans in California.)

(1) Acceptance program

- (i) Each STD's acceptance program shall consist of the following:

- (A) Frequency schedules for verification sampling and testing personnel responsible for the program and allow adaptation to specific project conditions and needs.
- (B) Identification of the specific location in the construction or production operation at which verification sampling and testing is to be accomplished.
- (C) Identification of the specific attributes to be inspected which reflect the quality of the finished product.

- (ii) Quality control sampling and testing results may be used as part of the acceptance decision provided that:

- (A) The sampling and testing has been performed by qualified laboratories and qualified sampling and testing personnel.
- (B) The quality of the material has been validated by the verification sampling and testing. The verification testing shall be performed on samples that are taken independently of the quality control samples.
- (C) The quality control sampling and testing is evaluated by an IA program.

Appendix A (continued)

- (iii) If the results from the quality control sampling and testing are used in the acceptance program, the STD shall establish a dispute resolution system. The dispute resolution system shall address the resolution of discrepancies occurring between the verification sampling and testing and the quality control sampling and testing. The dispute resolution system may be administered entirely with the STD.
 - (iv) In the case of a design-build project on the NHS, warranties may be used where appropriate. See 23 CFR 635.413 (e) for specific requirements.
- (2) The IA program shall evaluate the qualified sampling and testing personnel and their testing equipment. The program shall cover sampling procedures, testing procedures, and testing equipment. Each IA program shall include a schedule of frequency for IA evaluation. The schedule may be established based on either a project basis or a system basis. The frequency can be based on either a unit of production or on a unit of time.
- (i) The testing equipment shall be evaluated by using one or more of the following: Calibration checks, split samples or proficiency samples.
 - (ii) Testing personnel shall be evaluated by observations and split samples or proficiency- samples.
 - (iii) A prompt comparison and documentation shall be made of test results obtained by the tester being evaluated and IA tester. The STD shall develop guidelines including tolerance limits for the comparison of test results.
 - (iv) If the STD uses the system approach to the IA program, the STD shall provide an annual report to the FHWA summarizing the results of the IA program.
- (3) The preparation of a materials certification conforming in substance to Appendix A of this subpart, shall be submitted to the FHWA Division Administrator for each construction project which is subject to FHWA construction oversight activities.
- (b) In the case of a design-build project funded under Title 23, U.S Code, the STD's quality assurance program should consider the specific contractual needs of the design-build project. All provisions of paragraph (a) of this section are applicable to design build projects. In addition, the quality assurance program may include the following:
- (1) Reliance on a combination of contractual provisions and acceptance methods.
 - (2) Reliance on quality control sampling and testing as part of the acceptance decision, provided that adequate verification of the design-builder's quality control sampling and testing is performed to ensure that the design-builder is providing the quality of materials and construction required by the contract documents.
 - (3) Contractual provisions which require the operation of the completion facility for a specific time period.

Appendix A (continued)

Section 637.209 - Laboratory and sampling and testing personnel qualifications

(a) Laboratories

- (1) After June 29, 2000, all contractor, vendor, and STD testing used in the acceptance decision shall be performed by qualified laboratories.
- (2) After June 30, 1997, each STD shall have its central laboratory accredited by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by the FHWA.
- (3) After June 29, 2000, any non-STD designated laboratory which performs IA sampling and testing shall be accredited in the testing to be performed by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by the FHWA.
- (4) After June 29, 2000, any non-STD laboratory that is used in dispute resolution sampling and testing shall be accredited in the testing to be performed by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by the FHWA.
- (5) After September 24, 2009, laboratories that perform crash testing for acceptance of roadside hardware by the FHWA shall be accredited by a laboratory accreditation body that is recognized by the National Cooperation for Laboratory Accreditation (NACLA), is a signatory to the Asia Pacific Laboratory Accreditation Cooperation (APLAC) Mutual Recognition Arrangement (MRA), is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA), or another accreditation body acceptable to FHWA.

(b) Sampling and testing personnel. After June 29, 2000, all sampling and testing data to be used in the acceptance decision or the IA program, shall be executed by qualified sampling and testing personnel.

(c) Conflict of interest. In order to avoid an appearance of a conflict of interest, any qualified non-STD laboratory shall perform only one of the following types of testing on the same project:
Verification testing, quality control testing, IA testing or dispute resolution testing.

Projects not on the NHS or SHS shall not utilize IA services.

Appendix A (continued)

Appendix A to Subpart B of Part 637 -
Guide Letter of Certification by State Engineer

Date _____
Project No. _____

This is to certify that:

The results of the tests used in the acceptance program indicate that the materials incorporated in the construction work, and the construction operations controlled by sampling and testing, were in conformity with the approved plans and specifications. (The following sentence should be added if the IA testing frequencies are based on project quantities. All independent assurance samples and tests are within tolerance limits of the samples and testes that used in the acceptance program.) Exceptions to the plans and specifications are explained on the back hereof (or on attached sheet).

Director of STD Laboratory or other appropriate STD Official.

Appendix B - Proficiency Testing Through AMRL, CCRL and Caltrans Reference Sample Program

Whenever possible, local agencies should perform annual proficiency tests (also known as round-robin tests and split-sample tests) with one or more laboratories to ensure that the laboratories are obtaining consistent test results. Three organizations that perform proficiency tests and utilize statistical methods to evaluate their test results are: the AASHTO Materials Reference Laboratory (AMRL), Cement and Concrete Reference Laboratory (CCRL) and Caltrans Reference Samples Program (RSP).

It should be noted that AMRL and CCRL use ASTM and AASHTO standards when evaluating their proficiency samples. Caltrans uses only CT methods to evaluate proficiency samples in their RSP. California local agencies that use Caltrans plans and specifications are encouraged to have their city, county or consultant's laboratories regularly participate in Caltrans' RSP.

Each program tests the following materials:

AASHTO Materials Reference Laboratory (AMRL)

- Soil
- Bituminous Asphalt Concrete (or Hot Mix Asphalt)
- Emulsified Asphalt
- Bituminous Concrete Design
- Bituminous Concrete Analysis
- Coarse Aggregate
- Fine Aggregate

Cement and Concrete Reference Laboratory (CCRL)

Portland Cement Concrete (or Hydraulic Cement Concrete)
Mineral Admixtures (Types C, F and N)
Portland Cement (Chemical Tests)
Portland Cement (Physical Tests)

Caltrans Reference Samples Program (RSP)

- Soils
- Asphalt Concrete
- Fine Aggregate
- Coarse Aggregate

Note: AMRL and CCRL prepare thousands of representative samples each year for correlations testing. These samples are then shipped to materials testing laboratories throughout the world. The various material types are noted above. When a laboratory determines its final results, according to specified ASTM and/or AASHTO standards, the results are mailed to AMRL (100 Bureau Drive, Stop 8619, Building 202, Room 211, Gaithersburg, Maryland, 0899-8619); or CCRL (100 Bureau Drive, Stop 8618, Building 220, Room A63, Gaithersburg, Maryland, 0899-8618); for data analysis. Each laboratory is then mailed an individual rating (from 0 to 5) for the testing standards that were performed by the laboratory. When all results are finalized, CCRL mails their finding to AMRL. For laboratories with test ratings of 3 (or greater), AMRL mails certificates to these laboratories, stating they are an accredited laboratory by AMRL and/or CCRL. Caltrans RSP is conducted at 5900 Folsom Blvd, Sacramento, CA 95825.

Appendix D - Acceptance Sampling and Testing Frequencies

Portland Cement Concrete (Hydraulic Cement Concrete)- Continue

| Materials to be Sampled or Tested | Procedure | Sample Size | Sampling/Testing Frequency | Typical Test Methods | Description of Comments |
|--|------------------|--|--|--------------------------|---|
| Air Entraining Admixtures (Sampling & Testing) | | If liquid, take a 1-qt. sample using a clean, lined can or plastic bottle. If powder, take a 2.5 lb. sample. | If the product is accepted based on a Certificate of Compliance, No testing is required. | ASTM C233 | If testing appears warranted, test for sulfates and chlorides. Admixtures with sulfates and chlorides greater than 1% should not be used. |
| Water Reducers or Set Retarders (Sampling & Testing) | | If liquid, take a 1-qt. sample using a clean plastic can. If powder, take a 2.5 lb. sample. | If the product is accepted based on a Certificate of Compliance, No testing is required. | ASTM C494 | If testing appears warranted, test for sulfates and chlorides. Admixtures with sulfates and chlorides greater than 1% should not be used. |
| Freshly mixed Concrete (Sampling) | Sampling | Approx. 150 lb/ (or 1 cu ft.) near mixer discharge. | When tests are required, take at least one sample for each 100 cu. yd. of PCC. | ASTM C172 C685 CT 539 | This describes a method to sample freshly-mixed concrete. |
| Freshly mixed Concrete (Testing) | Slump (cone) | Approx. 150 lb/ (or 1 cu ft.) near mixer discharge. | On projects with 100 cu. yd., or more, test at least one sample per day. | ASTM C143 | This test determines the slump of the freshly-mixed concrete. |
| Freshly mixed Concrete (Testing) | Slump (Ball) | Approx. 150 lb/ (or 1 cu ft.) near mixer discharge. | On projects with 100 cu. yd., or more, test at least one sample per day. | ASTM C360 CT 533 | This test determines the ball penetration of the freshly-mixed concrete. |
| Freshly mixed Concrete (Testing) | % Air (pressure) | Approx. 150 lb/ (or 1 cu ft.) near mixer discharge. | On projects with 100 cu. yd., or more, test at least one sample per day. | ASTM C231 CT 504 | This test determines the air content of freshly-mixed concrete (pressure method). |
| Freshly mixed Concrete (Testing) | Unit Weight | Approx. 150 lb/ (or 1 cu ft.) near mixer discharge. | On projects with 100 cu. yd., or more, test at least one sample per day. | ASTM C138 CT 518 | This test determines the unit weight of freshly-mixed concrete. |

Appendix D (continued)

Portland Cement Concrete (Hydraulic Cement Concrete)- Continue

| Materials to be Sampled or Tested | Procedure | Sample Size | Sampling/Testing Frequency | Typical Test Methods | Description of Comments |
|--|------------------|---|---|-----------------------------|---|
| Freshly-mixed Concrete (Testing) | f'c | Approx. 150 lb/ (or 1 cu ft.) near mixer discharge. | Fabricate at least two concrete cylinders per day when required. Test for compressive strength at least once for each 100 to 500 cu. Yd of structural concrete. | ASTM C39 CT 521 | This test is used to fabricate 6" x 12" concrete cylinders. Compressive strengths are determined when needed. |

Soils and Aggregates

| | | | | | |
|--------------------------------|-----------|--|--|----------------------|---|
| Soils and Aggregates (Testing) | Gradation | One 50-lb sample | Take one sample for every 500 to 1,000 tons of material imported. | ASTM C136 CT 202 | This test determines the gradation of soils and aggregates by sieve analysis. |
| Soils and Aggregates (Testing) | SE | One 50-lb sample | Take one sample for every 500 to 1,000 tons of material imported. | ASTM D2419 CT 217 | This test determines the Sand Equivalent of soils and aggregates. |
| Soils and Aggregates (Testing) | R-value | One 50-lb sample | Take one sample for every 500 to 1,000 tons of material imported. | ASTM D2844 CT 301 | This test determines the Resistance Valve (R-) and expansion pressure of compacted materials. |
| Soils and Aggregates (Testing) | Dr | One random location for every 2,500 sq.ft. | Take one test for every 2,500 sq. ft. of surface compacted. Test at least one sample at per project. | ASTM D2922 CT 231 | This test determines field densities using the nuclear gage. |
| Soils and Aggregates (Testing) | W% | One random location for every 2,500 sq.ft. | Take one test for every 2,500 sq. ft. of surface compacted. Test at least one sample at per project. | ASTM D3017 CT 231 | This test determines the water content using nuclear gage. |

Appendix D (continued)

Hot Mix Asphalt (Asphalt Concrete) - Concrete

| Materials to be Sampled or Tested | Procedure | Sample Size | Sampling/Testing Frequency | Typical Test Methods | Description of Comments |
|---|----------------------------|--|---|---------------------------------|---|
| Asphalt Concrete (Sampling) | AC (Sampling) | Obtain one 30-lb sample each day of production. | Obtain one sample at the site for 1,000 tons of asphalt concrete placed. | ASTM D75, D140, D979 CT125 | This test describes the procedure to sample the asphalt concrete. |
| Asphalt Concrete (Testing) | Marshall | One 30 lb sample | Obtain one sample for every 1,000 tons of asphalt concrete. | ASTM D1559 | This test determines the resistance to plastic flow of prepared mixes as determined by the Marshall Method. |
| Asphalt Concrete (Testing) | AC Gradation | One 30 lb sample | Obtain one sample for every 1,000 tons of asphalt concrete. | ASTM C117, D2172 (use Method B) | This test determines the screen analysis of aggregates recovered from asphalt materials. |
| Geotextile Fabric (Placed under the Asphalt Concrete) | Geo-textile strength | One 12 ft. X 3 ft. sample | Obtain one sample per job. | ASTM D4632 | This test determines the weight per sq. yd. and grabs strength of geotextile fabrics. |
| Asphalt Concrete (Testing) | Relative Density (Nuclear) | One random location for every 2,500 sq.ft. | Take one test for every 2,500 sq. ft. of surface compacted. Test at least one sample per project. | ASTM D2950 CT 375 | This test determines the nuclear field density of in-place asphalt concrete. |
| Slurry Seals (Sample) | Slurry (sample) | One 0.5 gal. sample in a clean, dry plastic container. | Obtain one sample per truck | ASTM D979 CT 125 | This test describes the procedure for sampling the slurry seal. |
| Aggregate for Slurry Seals (Testing) | Sand Equivalent (slurry) | One 30 lb sample | Obtain at least one sample per project from the belt, hopper or stockpile and test for Sand Equivalent. | ASTM D2419 CT 217 | This test determines Sand Equivalent of aggregates. |

Appendix D (continued)

Slurry Seals

| Materials to be Sampled or Tested | Procedure | Sample Size | Sampling/Testing Frequency | Typical Test Methods | Description of Comments |
|--|------------------|--|---|-----------------------------|--|
| Aggregate for Slurry (Testing) | | One 30 lb sample | Obtain at least one sample per project from the belt, hopper or stockpile and test for Sieve Analysis of fine sand. | ASTM C117 | This test determines the sieve analysis of fine sand (gradation of materials finer than No. 200 sieve by washing grading). |
| Slurry Seals (Testing) | | One 0.5 gal. sample in a clean, dry plastic container. | Test at least one sample per project and test for Abrasion. | ASTM D3910 | This test determines the Wet Tract Abrasion Test (2) (WTAT). |

Steel

| Materials to be Sampled or Tested | Procedure | Sample Size | Sampling/Testing Frequency | Typical Test Methods | Description of Comments |
|--|------------------|---------------------------------|---|-----------------------------|--|
| Steel Strand (Testing) | | Sample strand at various sizes. | This item may be accepted using a Certificate of Compliance. Sample and test at least two steel strands per job when a Certificate of Compliance is not used. | ASTM A370, A416, E328 | This test determines the tensile strength of uncoated seven-wire stress-relieved strand for pre-stressed concrete. |
| Steel Rebar (Testing) | | Sample rebar at various sizes. | This item may be accepted using a Certificate of Compliance. Sample and test at least two steel rebar per job when a Certificate of Compliance is not used. | ASTM A615, A370 | This test determines the steel reinforcement bar tensile strength and bend capability. |

Appendix E - Check List to Assist Local Agencies Monitor Acceptance Testing Requirements

| No. | Item | Yes, No or N/A |
|-----|--|----------------|
| 1 | Was the Resident Engineer able to present an approved QAP, when requested to do so? | |
| 2 | Were there Certificates of Compliance in the project files for materials that were accepted (without testing) on the project? | |
| 3 | Did the type and number of acceptance tests taken on the project match (or exceed) the minimum type and number required in the frequency tables of the approved QAP? | |
| 4 | Did all acceptance samplers and testers (local agency employees and/or consultants) have valid Certificates of Proficiency for the duration of the project? | |
| 5 | Were there calibration stickers firmly affixed to all the test equipment used by the acceptance samplers and testers on the project? | |
| 6 | Were the calibration dates on the stickers (affixed to the test equipment) within 12 months of the current date? | |
| 7 | Did the Resident Engineer have a log summary sheet of all acceptance tests performed on the project? | |
| 8 | If plant inspection and/or source inspection were performed on this project, were there test records to show that testing was performed for the items used? | |
| 9 | Did any acceptance samplers and testers get decertified for any test during the construction of the project? | |
| 10 | Did the Resident Engineer provide written approval of the PCC mix designs used on the project? | |
| 11 | Did the Resident Engineer provide written approval of the hot mix asphalt designs used on the project? | |
| 12 | If materials did not meet minimum specifications but were still used on the project, did the Resident Engineer fully document all testing and attach justifications for use and cost reduction information to the Materials Certificate? | |
| 13 | Did the Resident Engineer sign and date the Materials Certificate after the project was completed? | |

Note (for No. 3 above):

Assume that a concrete structure was 50% complete and approximately 1000 cubic yards of PCC will be used on the project. If the testing frequency in the local agency's QAP states that two concrete cylinders will be tested for compressive strength every 500 cubic yards, did the Resident Engineer have at least two compressive- strength tests in the project file? Likewise if the structure was 100% complete, were there four compressive-strength tests in the project file?

Printed Name of the Local Agency: _____

Printed Name of the Resident Engineer: _____

Printed Name of the Reviewer: _____

Date of Review: _____

Appendix F - Construction Materials Accepted by a Certificate of Compliance *

Soil Amendment
Fiber
Mulch
Stabilizing Emulsion Plastic Pipe Lime
Reinforcing Steel
Structural Timber and Lumber
Treated Timber and Lumber
Timber and Lumber
Culvert and Drainage Pipe Joints
Reinforced Concrete Pipe
Corrugated Steel Pipe and Corrugated Steel Pipe Arches Structural Metal Plate Pipe Arches and Pipe Arches Perforated Steel Pipe
Polyvinyl Chloride Pipe and Polyethylene Tubing
Steel Entrance Tapers, Pipe Down drains, Reducers, Coupling Bands and Slip Joints
Aluminum Pipe (Entrance Tapers, Arches, Pipe Down drains, Reducers, Coupling Bands and Slip Joints)
Metal Target Plates
Electrical Conductors
Portland Cement
Minor Concrete
Waterstop

* If Caltrans Standard Specifications May 2006 is part of contract specifications.

Note: Usually these items are inspected at the site of manufacture or fabrication and reinspected after delivery to the job site.

Appendix G - Example of an Acceptance Testing Record

Material Tested: Fresh Concrete

Location of Test: Station 100 + 50 (50 feet right of centerline)

Type of Work: Retaining Wall Foundation

| Date | Test Number | Description of Test | Test Results | Specification |
|----------|-------------|---------------------|--------------|----------------|
| 07/07/07 | CT 504 | Air Content | 4.2% | 4.0% Minimum |
| 07/07/07 | CT 533 | Ball Penetration | 1.5 in. | 0.5 to 2.0 in. |

Printed Name of Acceptance Tester: Bill Johnson

Company: ABC Engineering Company (Middletown, CA)

Date: 07/07/07

Note: An air content test was recommended because the foundation elevation was over 5,000 feet.

Appendix H - Example of a Log Summary Sheet

Subgrade Materials

| Date | CT | Station | Elevation | Test Results | Minimum Spec. | Passed or Failed | Action Taken |
|---------|-----|---------------|-----------|--------------|---------------|------------------|--------------|
| 5/15/07 | 231 | 1+ 00 (30' L) | 99.00 | 93 | 90 or greater | Passed | N/A |
| 5/16/07 | 231 | 1+ 50 (20' R) | 100.50 | 94 | 90 or greater | Passed | N/A |
| 5/17/07 | 231 | 2+ 25 (25' R) | 101.00 | 96 | 90 or greater | Passed | N/A |
| 5/18/07 | 231 | 1+ 50 (30' L) | 101.50 | 95 | 95 or greater | Passed | N/A |
| 5/19/07 | 231 | 2+ 50 (20' L) | 102.00 | 92 * | 95 or greater | Failed | See Note 1 |
| 5/19/07 | 231 | 2+ 50 (20' L) | 102.00 | 95 | 95 or greater | Passed | N/A |

CT 231 = Compaction (Nuclear Gage)

* Note 1: The Contractor used a water tank to dampen the soil surface at the failed subgrade location. Using a sheep's foot compactor, he reworked the subgrade (making at least 10 passes) from Station 2+ 00 to Station 3+ 00. After approximately 30 minutes, another compaction test was taken. This time the relative compaction was 95.

Aggregates and Base Materials

| Date | CT | Station | Elevation | Test Results | Minimum Spec. | Passed or Failed | Action Taken |
|---------|-----|---------------|-----------|----------------|----------------|------------------|--------------|
| 6/20/07 | 202 | 1+ 00 (10' R) | 102.50 | See data sheet | See data sheet | Passed | N/A |
| 6/20/07 | 202 | 2+ 00 (20' L) | 102.50 | See data sheet | See data sheet | Passed | N/A |
| 6/22/07 | 217 | 1+ 00 (10' R) | 102.50 | 75 | 25 or greater | Passed | N/A |
| 6/22/07 | 217 | 2+ 00 (20' L) | 102.50 | 83 | 25 or greater | Passed | N/A |
| 6/20/07 | 227 | 1+ 00 (20' R) | 102.50 | 86 | 71 or greater | Passed | N/A |
| 6/20/07 | 227 | 1+ 50 (20' L) | 102.50 | 85 | 71 or greater | Passed | N/A |
| 6/24/07 | 231 | 2+ 00 (20' R) | 102.50 | 98 | 95 or greater | Passed | N/A |
| 6/24/07 | 231 | 2+ 50 (20' L) | 102.50 | 97 | 95 or greater | Passed | N/A |

CT 202 = Sieve Analysis, CT 217 = Sand Equivalent, CT 227 = Cleanness Value, CT 231 = Compaction (Nuclear Gage)

Appendix H (continued)

Hot Mix Asphalt

| Date | CT | Station | Elevation | Test Results | Minimum Spec. | Passed or Failed | Action Taken |
|---------|-----|---------------|-----------|-----------------|----------------------|------------------|--------------|
| 7/10/07 | 339 | 1+ 00 (10' R) | 103.00 | 0.08 gal/ sq yd | 0.05 -0.10 gal/sq yd | Passed | N/A |
| 7/10/07 | 366 | 2+ 00 (20' L) | 103.00 | 32 | >23 | Passed | N/A |
| 7/10/07 | 366 | 1+ 00 (10' R) | 103.00 | 41 | >23 | Passed | N/A |
| 7/10/07 | 375 | 2+ 00 (20' L) | 103.00 | 94 | RC = 93 to 97 | Passed | N/A |
| 7/15/07 | 375 | 1+ 00 (20' R) | 103.00 | 96 | RC = 93 to 97 | Passed | N/A |
| 7/15/07 | 375 | 1+ 50 (20' L) | 103.00 | 95 | RC = 93 to 97 | Passed | N/A |

CT 339 = Distributor Spread Rate, CT 366 = Stabilometer Value CT

375 = In-Place Density & Relative Compaction

Portland Cement Concrete

| Date | CT | Station | Elevation | Test Results | Minimum Spec. | Passed or Failed | Action Taken |
|---------|-----|-----------------|-----------|-------------------|----------------|------------------|--------------|
| 9/25/07 | 504 | 10 + 50 (50' R) | 102.50 | 6.5% | >6.0% | Passed | N/A |
| 9/25/07 | 533 | 12 + 50 (50' R) | 102.50 | 1.5" | <2" | Passed | N/A |
| 9/25/07 | 518 | 11 + 50 (50' R) | 102.50 | 151 lb/cu ft | > 145 lb/cu ft | Passed | N/A |
| 9/25/07 | 521 | 10 + 50 (50' R) | 102.50 | 28 day = 4200 psi | >3800 psi | Passed | N/A |
| 9/28/07 | 521 | 11 + 50 (50' R) | 102.50 | 28 day = 4290 psi | >3800 psi | Passed | N/A |
| 9/30/07 | 521 | 12 + 50 (50' R) | 102.50 | 28 day = 4160 psi | >3800 psi | Passed | N/A |

CT 504 = Air Content, CT 518 = Unit Weight, CT 521 = Compressive Strength, CT

533 = Ball Penetration

Appendix J.1 - Example of a Vendor's Certificate of Compliance

No. 583408

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
VENDOR'S CERTIFICATE OF COMPLIANCE
 MR-0543 (REV. 5/93) #CT-7541-6020-2

PRECAST CONCRETE PRODUCTS OR SOUNDWALL

TO: BILL SYNDER

STATE HIGHWAY ENGINEER
RESIDENT ENGINEER - CITY OF FLATLAND

We certify that the portland cement, chemical and mineral admixtures contained in the material described below are brands stated and comply with specifications for:

| | | |
|--------------------|----------------|------------------------|
| CONTRACT NUMBER: | | |
| CEMENT BRAND | XYZ CEMENT CO. | MILL LOCATION |
| TYPE | II MODIFIED | MIDLAND, CALIFORNIA |
| CHEMICAL ADMIXTURE | | |
| 1. BRAND | ABC. ADMIXTURE | MANUFACTURER |
| TYPE | WATER REDUCER | XYZ SUPPLIER |
| 2. BRAND | | MANUFACTURER |
| TYPE | | |

CHECK BOX IF A CHEMICAL ADMIXTURE WAS NOT USED

| | |
|-------------------|-------|
| MINERAL ADMIXTURE | |
| MANUFACTURER | CLASS |
| POZZ. INC. | F |

CHECK BOX IF A MINERAL ADMIXTURE WAS NOT USED

| | |
|---------------------------|--------------------------------|
| DELIVERY DATE (Ready-Mix) | DATES OF FABRICATION (Precast) |
| 7/7/07 | |

LIST PRODUCTS TO WHICH CERTIFICATE APPLIES. (Show size and lin. ft. of pipe, etc., delivery slip numbers for ready-mix.)

*Portland Cement
 Flyash
 Water Reducer*

| | |
|---|---------------------|
| MANUFACTURER OF CONCRETE PRODUCTS | A. & B. READY MIX |
| By: AUTHORIZED REPRESENTATIVE SIGNATURE | <i>Joe Anderson</i> |

Appendix J.2 - Example of a Certificate of Compliance for Portland Cement (continued)

This is to certify that the

Portland Cement

Supplied by ABC Cement Company complies with all requirements for Type II Portland Cement when tested in accordance with ASTM C - 494.

Local Agency Project No.
HP21L - 5055 - 111

Albert Howakowa
Quality Assurance Engineer
ABC Cement Company

Date: 07/07/07.

**Appendix K - Examples of Materials Certificates/Exceptions
(Signed by the Resident Engineer at the
Completion of the Project)**

Federal-aid Project No.: Project HP21L - 5055 - 111

Subject: Materials Certification

This is to certify that the results of the tests on acceptance samples indicate that the materials incorporated in the construction work and the construction operations controlled by sampling PX and testing were in conformity with the approved plans and specifications.

All materials exceptions to the plans and specifications on this project are noted below.

No exceptions were found to the plans and specifications on this project.

| | | |
|--------------------------------|-------------------------------|---------------|
| <u>Bill Sanders</u> | <u><i>Bill Sanders</i></u> | <u>7/7/07</u> |
| Resident Engineer (Print Name) | Resident Engineer (Signature) | (Date) |

Note: The signed original of this certificate is placed in the Resident Engineer's project files and one copy is mailed to the DLAE and filed under "Report of Expenditures."

See the attachment (next page)

Appendix K (continued)

Attachments: Materials Exceptions (Acceptance Testing)

| Type of Test | Description of Work | Total Tests Performed On the Project | Number of Failed Tests | Action Taken |
|-----------------|-----------------------------------|--------------------------------------|------------------------|---|
| Slump Test | Concrete Sidewalk | 8 | 1 | When the measured slump exceeded the maximum limit, the entire concrete load was rejected. |
| Sand Equivalent | Aggregate for Structural Concrete | 10 | 1 | The tested S.E. was 70 and the contract compliance specification was 71 minimum. However, the concrete 28-day compressive strength was 4800 psi. The concrete was considered adequate and no materials deductions were taken. |
| Compaction | Sub grade Material | 12 | 1 | One failed test was noted. The failed area was watered and reworked. When this was completed, a retest was performed. The retest was acceptable. |
| Compaction | Hot Mix Asphalt | 12 | 1 | One failed area was noted. It was reworked and retested. The second test met specifications. |

Bill Sanders

Date

Bill Sanders
Resident Engineer (Print Name)

July 4, 2007
Resident Engineer (Signature)

Appendix Q - Example of a Certificate of Proficiency (Acceptance Sampler and Tester)

This is to certify that Harry J. Jones is a consultant for XYZ Construction Company in Midtown, CA. He has been evaluated by the City of Midtown and is shown to be fully qualified to perform the following tests:

| <u>Standard Test Method</u> | <u>Date Certified</u> | <u>Recertification Date</u> |
|-----------------------------------|-----------------------|-----------------------------|
| CT 125 - Sampling Materials | 4/07 | 4/10 |
| CT 202 - Sieve Analysis | 4/07 | 4/10 |
| CT 217 - Sand Equivalent | 4/07 | 4/10 |
| CT 227 - Cleanness Value | 4/07 | 4/10 |
| CT 375 - Relative Compaction (AC) | 4/07 | 4/10 |
| CT 504 - Air Content (PCC) | 4/07 | 4/10 |
| CT 518 - Unit Weight (PCC) | 4/07 | 4/10 |
| CT 533 - Penetration (PCC) | 4/07 | 4/10 |

Issued By: Mary Harrington
(Printed Name)
IA Person for the City of Midtown

Signed By: Mary Harrington
(Signature)
IA Person for the City of Midtown

Date Issued: April 15, 2007
(Date)

Note: This certificate is valid until April 15, 2010, provided the acceptance sampler and tester successfully:

1. Maintains test equipment in good working condition and has current calibration stickers.
2. Passes all witness tests, and
3. Achieves acceptable split sample test results, as noted in the City of Midtown's approved QAP.

Appendix S - Example of a Laboratory Accreditation Letter

This is to certify that on August 10, 2007, I inspected the City of Maintown's testing laboratory at 1500 Main Street, Maintown, California. I hereby certify that this laboratory is accredited to perform acceptance testing for all City of Maintown projects from August 10, 2007 to August 10, 2008.

The laboratory samplers and testers all had current Certificates of Proficiency records. The laboratory was clean and equipped with adequate safety items (a plastic shield on their compression machine, a nearby emergency shower, two fire extinguishers and a first-aid kit). All testing equipment inspected conformed to the requirements noted in their updated California Test manual. In addition, calibration stickers were firmly affixed to all scales and testing equipment. All calibration stickers had dates on or after July 1, 2007.

The laboratory also had a QAP that was approved by the City of Maintown in 2007. The City of Maintown regularly participates in Caltrans Reference Samples Program and achieved ratings of 3 (or better) on the tests they normally perform.

Printed Name of Resident Engineer: Mary Harrington

City of Maintown

Signature of Resident Engineer: Mary Harrington

Date Signed: August 10, 2007

Appendix X - Typical Questions Asked During a FHWA/Caltrans Process Review

During a FHWA/Caltrans process review, the local agency's Resident Engineer and the IA person are usually asked specific questions pertaining to the control of materials on a city or county Federal-aid transportation project. Typical questions include:

- Do you have a copy of your agency's approved Quality Assurance Program?
- May we see your log summary sheet for all the acceptance tests performed on your project?
- Who certifies your laboratory or your consultant's laboratory?
- Who calibrates your test equipment? May we see your calibration records?
- Do you have written evidence that your laboratory is qualified?
- Do you have Certificates of Proficiency for the samplers and testers on your project?
- Do you know the difference between acceptance and assurance testing?
- Can you show me with the acceptance tests that were performed on this project?
- Can you show me the independent assurance tests that were performed on this project?
- Who approves your mix designs?
- Can you show me Certificates of Compliance for materials accepted on your project, but were not tested by your laboratory?
- Can you show me your local agency's ratings from your last few Reference Samples Programs?
- Do you have plant inspection and/or source inspection records?
- If your test records indicated that some materials did not meet minimum standards (but the materials were used on your project), who approved this action? Do you have a copy of this authorization?
- Please show me signed copies of the Materials Certificates and any Materials Exceptions when the Resident Engineer closed out the project.

QUALITY ASSURANCE PROGRAM (QAP) AGENCY: City of Victorville

The purpose of this program is to provide assurance that the materials incorporated into the construction projects are in conformance with the contract specifications. This program should be updated every five years or more frequent if there are changes of the testing frequencies or to the tests themselves. To accomplish this purpose, the following terms and definitions will be used:

DEFINITION OF TERMS

- Acceptance Testing (AT) - Sampling and testing, or inspection, to determine the degree of compliance with contract requirements.
- Quality Assurance Program (QAP) - A sampling and testing program that will provide assurance that the materials and workmanship incorporated into the construction project are in conformance with the contract specifications. The main elements of a QAP are the AT.
- Source Inspection - AT of manufactured and prefabricated materials at locations other than the job site, generally at the manufactured location.

MATERIALS LABORATORY

The AGENCY will use their own materials laboratory or a private consultant materials laboratory to perform AT on Federal-aid and other designated projects. The materials laboratory shall be under the responsible management of a California registered Engineer with experience in sampling, inspection and testing of construction materials. The Engineer shall certify the results of all tests performed by laboratory personnel under the Engineer's supervision. The materials laboratory shall contain certified test equipment capable of performing the tests conforming to the provisions of this QAP.

The materials laboratory used shall provide documentation that the laboratory complies with the following procedures:

1. Correlation Testing Program - The materials laboratory shall be a participant in one or more of the following testing programs:
 - a. AASHTO Materials Reference Laboratory (AMRL)
 - b. Cement and Concrete Reference Laboratory (CCRL)
 - c. Caltrans' Reference Samples Program (RSP)
2. Certification of Personnel - The materials laboratory shall employ personnel who are certified by one or more of the following:
 - a. Caltrans District Materials Engineer
 - b. Nationally recognized non-Caltrans organizations such as the American Concrete Institute, Asphalt, National Institute of Certification of Engineering Technologies, etc.
 - c. Other recognized organizations approved by the State of California and/or Recognized by local governments or private associations.

3. Laboratory and Testing Equipment - The materials laboratory shall only use laboratory and testing equipment that is in good working order. All such equipment shall be calibrated at least once each year.
All testing equipment must be calibrated by impartial means using devices of accuracy traceable to the National Institute of Standards and Technology. A decal shall be firmly affixed to each piece of equipment showing the date of the last calibration.

ACCEPTANCE TESTING (AT)

AT will be performed by a materials laboratory certified to perform the required tests. The tests results will be used to ensure that all materials incorporated into the project are in compliance with the contract specifications.

Testing methods will be in accordance with the CT Methods or a national recognized standard (i.e., AASHTO, ASTM, etc.) as specified in the contract specifications.

Sample locations and frequencies may be in accordance with the contract specifications. If not so specified in the contract specifications, samples shall be taken at the locations and frequencies as shown in Attachment #1 (Appendix D, "Acceptance Sampling and Testing Frequencies" of the QAP Manual).

REPORTING ACCEPTANCE TESTING RESULTS

The following are time periods for reporting material test results to the Resident Engineer:

- When the aggregate is sampled at material plants, test results for Sieve Analysis, Sand Equivalent and Cleanness Value should be submitted to the Resident Engineer within 24 hours after sampling.
- When materials are sampled at the job site, test results for compaction and maximum density should be submitted to the Resident Engineer within 24 hours after sampling.
- When soils and aggregates are sampled at the job site:
 - (1) Test results for Sieve Analysis, Sand Equivalent and Cleanness Value should be submitted to the Resident Engineer within 72 hours after sampling.
 - (2) Test results for "R" Value and asphalt concrete extraction should be submitted to the Resident Engineer within 96 hours after sampling.

When sampling products such as Portland Cement Concrete (PCC), cement-treated base (CTB), hot mix asphalt (HMA), and other such materials; the time of such sampling shall be varied with respect to the time of the day insofar as possible, in order to avoid a predictable sampling routine. The reporting of AT results, if not performed by the Resident Engineer's staff, shall be done on an expedited basis such as by fax or telephone.

TESTING OF MANUFACTURED MATERIALS

During the Design phase of the project, the Project Engineer may submit a "Source Inspection Request" see Attachment#2 (Exhibit 16-V of the LAPM) to the Agency, consultant, or Caltrans for inspection and testing of manufactured and prefabricated materials by their materials laboratory. A list of materials that can be typically accepted on the basis of certificates of compliance during construction is found in Attachment #3 (Appendix F of the QAP Manual). All certificates of compliance shall conform to the requirements of the contract specifications, for examples see Attachment #4 (Appendix J of the QAP Manual).

Should the Agency request Caltrans to conduct the source inspection, and the request is accepted, all sampling, testing, and acceptance of manufactured and prefabricated materials will be performed by Caltrans' Office of Materials Engineering and Testing Services.

For Federal-aid projects on the National Highway System (NHS), Caltrans will assist in certifying the materials laboratory, and the acceptance samplers and testers. For Federal-aid projects off the NHS, Caltrans may be able to assist in certifying the materials laboratory, and the acceptance samplers and testers.

PROJECT CERTIFICATION

Upon completion of a Federal-aid project, a "Materials Certificate" shall be completed by the Resident Engineer. The Agency shall include a "Materials Certificate" in the Report of Expenditures submitted to the Caltrans District Director, Attention: District Local Assistance Engineer. A copy of the "Materials Certificate" shall also be included in the Agency's construction records. The Resident Engineer in charge of the construction function for the Agency shall sign the certificate. All materials incorporated into the work which did not conform to specifications must be explained and justified on the "Materials Certification", including changes by virtue of contract change orders. See Attachment # 5 for an example (Appendix K of the QAP Manual).

RECORDS

All material records of samples and tests, material releases and certificates of compliance for the construction project shall be incorporated into the Resident Engineer's project file. If a Federal-aid project:

- The files shall be organized as described in Section 16.8 "Project Files" of the Local Assistance Procedures Manual.
- It is recommended that the complete project file be available at a single location for inspection by Caltrans and Federal Highway Administration (FHWA) personnel.
- The project files shall be available for at least three years following the date of final project voucher.
- The use of a "Log Summary," as shown in Appendix H of the QAP Manual , facilitates reviews of material sampling and testing by Caltrans and FHWA, and assists the Resident Engineer in tracking the frequency of testing.

When two or more projects are being furnished identical materials simultaneously from the same plant, it is not necessary to take separate samples or perform separate tests for each project; however, copies of the test reports are to be provided for each of the projects to complete the records.

APPROVED BY: Brian W. Gengler **44730 March 31, 2018**
(Signature) (CE# and Expiration Date)

NAME: Brian W. Gengler
TITLE: City Engineer

DATE: March 3, 2016
City of Victorville