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1 TP ATTACHMENT 110-2 – ADOT Quality Assurance Requirements for Alternative
2 Acceptance Projects

**ARIZONA DEPARTMENT OF
TRANSPORTATION**

**QUALITY ASSURANCE REQUIREMENTS
for
ALTERNATIVE ACCEPTANCE PROJECTS**

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1 SCOPE

It is the objective of this document for the Arizona Department of Transportation (ADOT) to define the Quality Assurance requirements for Alternative Acceptance construction projects, in which the Contractor's QC results may be used as a part of the acceptance decision. The Quality Assurance requirements described herein have been developed to provide consistent implementation and supporting documentation in accordance with the Code of Federal Regulations (23 CFR 637 Subpart B) – "Quality Assurance Procedures for Construction" and Federal Highway Administration (FHWA) Technical Advisory T6120.3, which are available at the following links:

- 23 CFR 637B - <http://www.ecfr.gov/cgi-bin/text-idx?rgn=div5&node=23:1.0.1.7.25>
- TA 6120.3 - <http://www.fhwa.dot.gov/construction/t61203.cfm>

This document, established by the Arizona Department of Transportation (ADOT), ensures that materials and workmanship incorporated into Alternative Acceptance highway construction projects are in reasonable conformance with the approved plans and specifications, including any approved changes.

This document covers the procedures for an Alternative Acceptance program, including a quality control program, an acceptance program, a verification program, an independent assurance (IA) program and correlation testing. The Quality Acceptance test results performed by an Independent Quality Firm (IQF) may be used as part of an acceptance decision if the Quality Acceptance results are validated by the Owner Verification (OV) testing results performed by ADOT.

The purpose of this document is to provide statewide consistency and a programmatic approach to quality assurance where the IQF's test results are used in the acceptance decision. It clarifies federal requirements relating to Quality Acceptance and statistical analysis procedures. The content of this program is developed for Alternative Acceptance projects with no Special Experimental Project 15 (SEP-15) exceptions with respect to quality acceptance. This document is to be included (or referenced) in the contract, and other key preconstruction project documents with approvals by ADOT and FHWA.

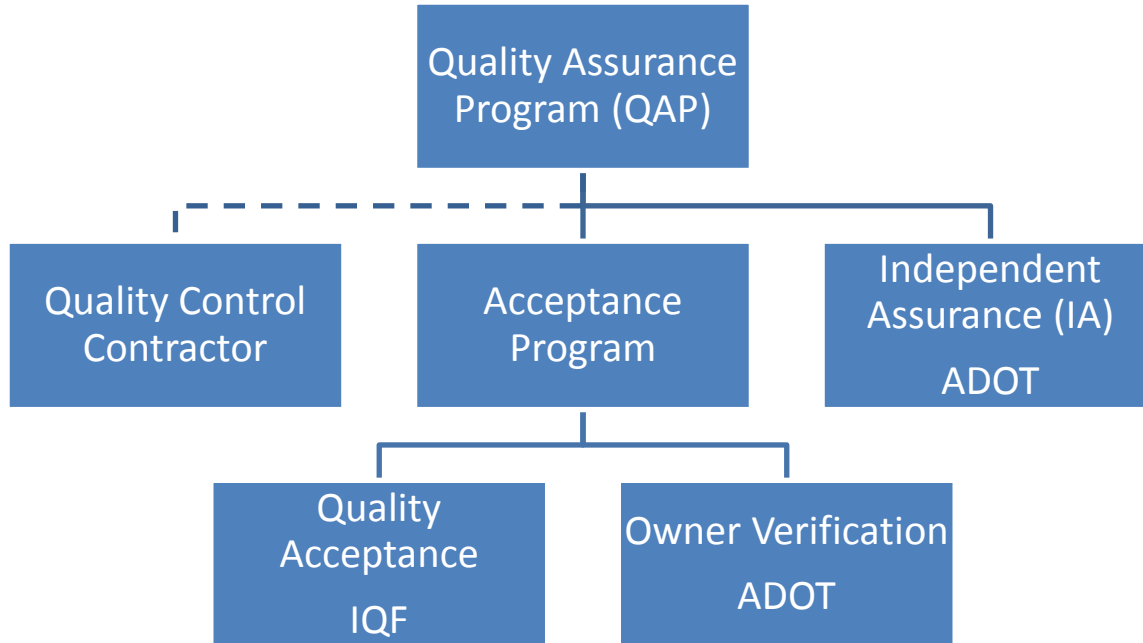
The use of IQF test results as part of the acceptance decision should be carefully evaluated for each project, because a robust ADOT owner verification program is instrumental to its success.

This document is comprised of several components, and the relationships between the parties and functions are shown in Figure 1.

The Alternative Acceptance process is composed of the following main components:

- Personnel qualifications
- Laboratory qualifications
- Approval of Contractor's Construction Quality Management Plan (CQMP)
- Contractor QC requirements
- IQF Quality Acceptance requirements
- Owner Verification Testing and Inspection Plan (OVTIP)
- Independent Assurance program

Figure 1: Components and Relationships in this QAP



2 LIST OF ABBREVIATIONS

ADOT	Arizona Department of Transportation
CFR	Code of Federal Regulations
CQMP	Construction Quality Management Plan
IA	Independent Assurance
IQF	Independent Quality Firm
NCR	Non-Conformance Record
OV	Owner Verification
OVTIP	Owner Verification Testing and Inspection Program
QC	Quality Control
RFP	Request for Proposals
TP	Technical Provisions

3 GLOSSARY OF TERMS

The following Glossary of Terms is in addition to the Glossary of Terms to be found in **Section III of ADOT's Materials Quality Assurance Program**.

Alternative Acceptance - Projects where the Contractor's QC results may be used as a part of the acceptance decision.

Construction Quality Management Plan – A plan developed by the Contractor which consists of both QC and Quality Acceptance activities with respect to performance of the work. The CQMP is provides procedures that clearly describe how the Contractor's staff will address various quality requirements.

Contractor - The entity identified in the Agreement to perform work under the applicable project, together with its successors and assigns.

Correlation Testing – Testing performed to check or establish variability of testing procedures and equipment between testing laboratories.

Dispute Resolution – Testing to resolve differences in material test results or statistical sample populations between the IQF and ADOT

Independent Assurance - All activities that are included in an unbiased and independent evaluation program for all the sampling and testing procedures used in the Acceptance Program.

Independent Quality Firm (IQF) - The independent Quality Firm required as part of the Contractor's team who will perform Quality Acceptance.

Owner Verification - Sampling and testing performed to validate the quality of the product. The sampling and testing are to be performed by qualified testing personnel employed by ADOT or its designated agent, excluding the Contractor.

Owner Verification Testing and Inspection Program - Describes the commitments of the owner for oversight of the Contractor's work. ADOT staff, or their designee, performs OV inspection and testing and conducts audits to verify the Contractor's compliance with the approved CQMP

Quality Acceptance - All planned and systematic actions performed by the IQF, as defined in the contract for their portion of the acceptance decision.

Quality Control – All Contractor operational techniques and activities that are performed or conducted to fulfill the contract requirements.

Referee Testing – Testing performed by ADOT's central laboratory to resolve disputes over specific test results between the IQF and ADOT.

System Basis – A method of IA which is based on observing and verifying satisfactory performance by the individuals performing acceptance sampling and teting, and the equipment utilized, for a particular period of time.

4 QUALIFICATION OF TESTING PERSONNEL

All field and laboratory personnel performing sampling or testing of construction materials on a construction project with Alternative Acceptance must meet the technician qualification requirements as presented in the Section VII of the ADOT Materials Quality Assurance Program ("Sampling and Testing Personnel Qualification Requirements"). This includes IQF and ADOT

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personnel. Contractor technicians may need to meet these qualification requirements if so specified in the RFP.

5 QUALIFICATION OF LABORATORIES

All laboratories engaged in sampling or testing of construction materials on an Alternative Acceptance construction project must meet the laboratory qualification requirements as presented in Section VI of the ADOT Materials Quality Assurance Program (“Laboratory Qualifications”).

Laboratories satisfying these requirements are listed in the ADOT “Directory of Approved Materials Testing Laboratories” (<https://www.azdot.gov/docs/default-source/business/directory-of-approved-materials-testing-laboratories.pdf?sfvrsn=12>), which is updated periodically. If the Contractor or IQF utilizes a laboratory from this directory, the Contractor is responsible for confirming the laboratory still meets the approval requirements, and that such requirements are maintained over the life of the project.

To avoid an appearance of a conflict of interest, any qualified laboratory and any qualified personnel shall perform only one of the following types of testing on the same Alternative Acceptance project:

- A. Contractor Quality Control testing;
- B. IQF Quality Acceptance testing;
- C. ADOT Owner Verification testing;
- D. ADOT Independent Assurance testing; or
- E. Dispute Resolution testing.

6 CONTRACTOR’S CONSTRUCTION QUALITY MANAGEMENT PLAN (CQMP)

The Contractor's Construction Quality Management Plan (CQMP) shall consist of the quality control (QC) to be performed by the Contractor (see Section 7) and the Quality Acceptance to be performed by the IQF, in conjunction with OVT, with respect to performance of the work (see Section 8). The CQMP shall establish a clear distinction between QC and Quality Acceptance activities and the persons performing each function.

ADOT will be responsible for developing more detailed requirements for the Contractor’s CQMP to be included in the Technical Provisions (TPs) of the project’s Request for Proposals (RFP).

Contractor shall submit the CQMP to ADOT for review and approval prior to the performance of any work.

7 CONTRACTOR QUALITY CONTROL REQUIREMENTS

The Contractor shall be responsible for the quality of the work. Project quality will be enhanced through the daily efforts of all the workers involved with the work, supported by Contractor's CQMP. The Contractor's QC portion of the CQMP shall include the internal procedures used by the Contractor that will ensure that the work is delivered in accordance with the released-for-construction plans, approved shop drawings, working drawings, and specifications. This involves the active participation of the entire work force in working to achieve "quality" initially and to minimize/eliminate re-work. Contractor’s QC shall not be part of the acceptance program.

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The Contractor's CQMP shall establish a systematic approach to define the processes, methods, procedures, and documentation for delivery of QC on the Project. These methods and procedures shall clearly define the authority and responsibility for the administration of Contractor's QC plan.

8 INDEPENDENT QUALITY FIRM (IQF) QUALITY ACCEPTANCE REQUIREMENTS

The Quality Acceptance on Alternative Acceptance projects consists of frontline acceptance testing and inspection being performed by the IQF. Owner Verification (OV) and Quality Acceptance together are the basis for the acceptance decision, provided that the IQF-performed Quality Acceptance results be provided they are statistically validated and/or verified by the OV results (See Section 9 for details about OV). Quality acceptance is performed by the IQF, and OV is performed by ADOT or their consultant(s).

The Contractor's Quality Acceptance portion of the CQMP shall include the procedures used by the IQF to ensure that the work is inspected and tested to verify compliance with the released-for-construction plans, approved shop drawings, working drawings, and specifications. Contractor's Quality Acceptance shall be separate from the Contractor's QC program.

Contractor's CQMP shall establish a systematic approach to define the processes, methods, procedures, and documentation for the IQF to deliver Quality Acceptance on the Project. These methods and procedures shall clearly define the authority and responsibility for the administration of IQF's Quality Acceptance plan.

ADOT will be responsible for developing more detailed requirements for the IQF's Quality Acceptance to be included in the Technical Provisions (TPs) of the Project Request for Proposals (RFP).

9 OWNER VERIFICATION TESTING AND INSPECTION PROGRAM (OVTIP)

ADOT has responsibility for verifying that the Project is designed and constructed in compliance with the contract. As such, ADOT or their consultant(s) will perform owner verification testing and inspection to verify the quality of materials used on the construction project. ADOT will also conduct audits to verify the Contractor's compliance with the approved CQMP.

ADOT or its designated agent will develop a comprehensive Owner Verification Testing and Inspection Plan (OVTIP) for each Alternative Acceptance project and submit it to FHWA for their concurrence. ADOT's OVTIP shall include internal procedures used by ADOT to ensure that the IQF's frontline acceptance is performed in accordance with the approved CQMP and to verify Quality Acceptance testing and inspection. ADOT shall complete the development of the OVTIP following acceptance of the Contractor's CQMP.

ADOT's OVTIP shall clearly address, at the minimum, how ADOT's OV staff will address the following requirements:

- A. Methods and procedures that clearly define the authority and responsibility for the administration of OVTIP.
- B. Procedures for overseeing and inspecting the work for compliance with the Contractor's CQMP for each operation.

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- C. Procedures to ensure that the education, training, and certification of personnel performing OV activities are achieved and maintained and that all work is performed in accordance with the approved OVTIP.
- D. Procedures to oversee the status and disposition of any identified noncompliance with the plans and specifications.
- E. Measures to ensure that tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality are properly maintained, controlled, calibrated, certified, and adjusted at specified periods to maintain accuracy within industry standards.
- F. A system of planned and periodic audits of Contractor's CQMP to determine adherence to and the effectiveness of the CQMP. Audit results shall be documented, reviewed, and sent to ADOT and the Contractor. Follow-up action, including re-audit of deficient areas following corrective action, shall be taken where indicated.
- G. A system of planned and periodic audits to determine adherence to and the effectiveness of the OVTIP. Audit results shall be documented, reviewed, and sent to ADOT. Follow-up action, including re-audit of deficient areas following corrective action, shall be taken where indicated.
- H. Procedures for performing periodic inspection of work to verify that the IQF has performed work in compliance with the released-for-construction plans, specifications, and approved working and shop drawings. The procedure should identify a target oversight inspection rate and methods for performing verification inspections for all QC and IQF inspectors.
- I. Procedures on how OV material sampling and testing will be performed including the process for generating random test locations, tracking material samples, processing material samples, review and approval of test records, and tracking compliance with material testing frequency.
- J. Procedures for reviewing Quality Acceptance and OV test results for compliance with mutually agreed-upon processes and naming conventions to ensure data integrity for accurate statistical analyses.
- K. Procedures for ensuring that only tests performed by qualified IQF testing personnel are submitted to ADOT.
- L. Procedures for auditing of QC and Quality Acceptance records, documentation, procedures, and processes to verify compliance with the contract and approved CQMP.
- M. Procedures for reviewing Portland cement concrete and hot-mix asphaltic concrete mix designs.
- N. Target frequency for the independent sampling to be conducted as a part of OV, subject to project-specific recommendations. The target frequency shall include a higher frequency of testing at the beginning of the project.
- O. Procedures for ensuring OV testing shall be performed at the frequency stipulated in the OVTIP.
- P. Procedures for performing statistical analyses in compliance with procedures outlined in this Appendix E.

10 SAMPLE TYPES AND USES

Sampling is either random or fixed, depending on whether the location was selected randomly (random) or if a specific location was subjectively identified (fixed). Sampling is also either independent or dependent, based on whether the location was independently selected (independent) or whether it is based on the location of another sample (dependent/split). The F- and t- tests described in the “FHWA Reporting” section below are only valid when using random independent samples.

The IQF shall perform additional (fixed) tests when the quality of material is questionable at a location other than the randomly selected location. This fixed test shall constitute an acceptance test, and a failing result shall be addressed in a similar manner to a failing random independent test. Fixed tests shall not count towards meeting minimum IQF testing frequencies and shall not be used in statistical analysis.

Split samples may be used outside of the statistical analysis for owner verification of IQF-performed acceptance tests under ADOT’s OVTIP. A comparison process for performing and analyzing split samples between ADOT and IQF is necessary during the initial implementation of the QAP to ensure that ADOT and IQF laboratory and testing procedures are in alignment. These samples will be analyzed by ADOT and the results discussed with the IQF to assure laboratory and technician test results compare favorably. When the allowable variation limits in OVTIP are exceeded, corrective actions for either or both parties will be identified and corrective actions will be incorporated as appropriate. This process will help provide initial alignment of the ADOT and IQF laboratories and testing procedures.

Split samples may also be performed throughout the life of the project as necessary to investigate non- validating material categories and verify or realign testing equipment and personnel.

ADOT will review the IQF’s weekly report which continuously tracks and records the quantity of material incorporated into the Project. ADOT shall use the report to verify compliance of both the Quality Acceptance and OV testing frequency.

11 DISPUTE RESOLUTION

Throughout the life of the Project, there may be differences in material test results or statistical sample populations between the IQF and ADOT. It is important to recognize the difference between material quality and statistical validation.

Material quality is measured by whether a test passes or fails and is an indication of whether the material will perform its intended purpose. Engineering judgment may be used to substantiate the use of material failing to meet the specification if the material still meets the intended purpose. Statistical validation is a measure of whether the OV and Quality Acceptance populations are statistically equal. It does not represent the quality of material being incorporated into the Project. Refer to Section 15, “Referee Testing”.

12 NON-VALIDATION AND STATUS OF MATERIAL QUALITY

When OV test results do not statistically validate the Quality Acceptance test results, ADOT and IQF jointly investigate the source of non-validation. In addition to the need to investigate the non-validation, the material in question must be immediately evaluated to determine if it can be left in place or has to be removed, reworked, or repaired. If material is to remain incorporated into the Project, the material in question will be evaluated using the process described in this section. The appropriate (IQF or ADOT) party may exercise engineering judgment to determine

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whether the material will perform its intended purpose. There are four possible combinations of passing and failing results between the Quality Acceptance and OV test results.

1. Both the Quality Acceptance and OV test results pass specification limits.

Although statistical validation has not occurred, both the IQF and OV test results are passing the established specification limits; thus, material quality in question is considered acceptable.

2. Quality acceptance test results fail and OV test results pass specification limits.

Material may be left in place if the IQF determines that engineering judgment may be used to accept the material or if the material is accepted through the NCR process.

3. Both the Quality Acceptance and OV test results fail the specification limits.

Material may be left in place if the IQF determines that engineering judgment may be used to accept the material or if the material is accepted through the NCR process. The acceptance of material is subject to one of the two scenarios below.

- a. OV test result indicates reasonable conformance with specification requirements, and ADOT exercises engineering judgment to concur with acceptance of material based on the IQF's engineering judgment or through the NCR process.
- b. OV test result does not indicate reasonable conformance with specification requirement, and the IQF must perform an additional fixed test at the OV failed test location. Based on the results of IQF test result and subsequent investigation discussions between ADOT and the Contractor, a determination is made and documented on whether the material may be left in place.

4. Quality acceptance test results pass but OV test results fail specification limits.

Material may be left in place if the IQF determines that engineering judgment may be used to accept the material or if the material is accepted through the NCR process. This is subject to ADOT response in the two scenarios below.

- a. OV test result indicates reasonable conformance with specification requirements, and ADOT exercises engineering judgment to concur with acceptance of material based on the IQF's engineering judgment or through the NCR process.
- b. OV test result does not indicate reasonable conformance with specification requirement, and the IQF must perform an additional fixed test at the OV failed test location. Based on the results of IQF test result and subsequent investigation discussions between ADOT and the Contractor, a determination is made and documented on whether the material may be left in place.

13 FHWA REPORTING

ADOT will submit quarterly reports to FHWA for concurrence with ADOT's compliance with the OVTIP. Approved reports shall be distributed to the IQF after receiving FHWA concurrence. The reporting period for specific pay items or materials is dependent on the pace of construction and the number of tests performed in each analysis category, the time period of the sampling, and the specification and quality requirements. Each report shall cover a period of construction not greater than three months.

The FHWA quarterly report shall address the following areas:

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- A. Statistical analysis results, to include specification requirements and status of validation process during start-up and completion of an item;
- B. Monthly Materials Certification letter from the IQF;
- C. Non-validation investigation;
- D. Non-conformance log; and
- E. Construction certification.

14 STATISTICAL ANALYSIS

F-tests and t- tests will be used to analyze OV and Quality Acceptance data. The F-test is a comparison of variances to determine if the OV and Quality Acceptance population variances are equal. The t-test is a comparison of means to determine if the OV and Quality Acceptance population means are equal. In addition to these two types of analyses, independent verification and observation verification will also be used to validate the Quality Acceptance test results. ADOT will perform a project-specific analysis of risks in order to develop the type of analysis and recommended level of significance for specific tests to be performed during OV by ADOT. This information will be included in the project OVTIP.

15 REFEREE TESTING

While expected to occur very rarely, disputes over specific test results may be resolved in a reliable, unbiased manner by Referee Testing and evaluation performed by ADOT's central laboratory. The decision by ADOT's central laboratory, or its designee, shall be final. ADOT will pay for this testing.

16 INDEPENDENT ASSURANCE (IA) PROGRAM

ADOT, or its designee, shall implement the Independent Assurance (IA) program as designated in the ADOT Materials Quality Assurance Program, Sections V.B ("Independent Assurance Sampling and Testing") and V.C ("Correlation Testing").

ADOT shall utilize the System Basis for implementing the IA program. The IA program does not directly determine the acceptability of materials.