ARIZONA DEPARTMENT OF TRANSPORTATION

MATERIALS QUALITY ASSURANCE PROGRAM

(ADOT Materials Testing Manual – Series 900)

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ADOT MATERIALS QUALITY ASSURANCE PROGRAM

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I. SCOPE

The ADOT Materials Quality Assurance Program has been established in accordance with requirements of the *Code of Federal Regulations (23 CFR 637, Subpart B) - "Quality Assurance Procedure for Construction"* (See **Appendix D**). Documented herein are details of the ADOT Materials Quality Assurance Program and applicable policies, procedures, and guidelines.

The Quality Assurance Program represents the Department's commitment to consistently provide our customers with products and services that meet mutually agreed upon requirements. The program is intended to ensure all materials incorporated into ADOT projects satisfy specification requirements and to provide the highest degree of confidence in the reliability of tests performed by laboratories for ADOT projects.

This document has been prepared for utilizing materials acceptance procedures which are now generally employed by ADOT, i.e., acceptance sampling and testing being performed by ADOT or its designated agent(s).

The Quality Assurance Program is administered by the Materials Group Quality Assurance Section. Revisions to this program will be issued by the Quality Assurance Section through the authority of the Assistant State Engineer, Materials Group.

The Materials Quality Assurance Section maintains a website where information regarding its function can be found. Information regarding the "ADOT System for the Evaluation of Testing Laboratories", the ADOT "Directory of Approved Materials Testing Laboratories", the ADOT Laboratory Inspection Program, the ADOT Proficiency Sample Program, and Technician Certification may be obtained from the ADOT Materials Group, Quality Assurance Section website.

The "ADOT System for the Evaluation of Testing Laboratories" has been issued as Materials Policy and Procedure Directive (P.P.D.) No. 19. The ADOT Materials Policy and Procedure Directives Manual, which contains P.P.D. No. 19, can be obtained from the ADOT Materials Group, Materials Manuals website.

II. LIST OF ABBREVIATIONS

AAP	AASHTO Accreditation Program
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADOT	Arizona Department of Transportation
AMRL	AASHTO Materials Reference Laboratory
ASTM	American Society for Testing and Materials
ATTI	Arizona Technical Testing Institute
CCRL	Cement and Concrete Reference Laboratory
CFR	Code of Federal Regulations
FAPG	Federal-Aid Policy Guide
FHWA	Federal Highway Administration
I.A.	Independent Assurance Sampling and Testing Program
ITD	Intermodal Transportation Division
NICET	National Institute for Certification in Engineering Technologies
NIST	National Institute of Standards and Technology
PPD	ADOT Materials Policy and Procedure Directive
RME	Regional Materials Engineer
QA	Quality Assurance
QC	Quality Control

III. GLOSSARY OF TERMS

Acceptance Program - All factors used by the State to determine the quality of the product as specified in the contract requirements. These factors include acceptance sampling and testing, and inspection of materials and workmanship.

Acceptance Sampling and Testing - Sampling and testing performed to determine the quality and acceptability of the materials and workmanship incorporated in a project.

Certification Acceptance Projects - Federal-aid projects which are advertised, awarded, and administered by a Local Public Agency which satisfies the requirements of their ADOT/Local Public Agency certification agreement. See **Appendix A** for information regarding Local Public Agency quality assurance requirements.

Contractor Testing - Random sampling and testing and other operational techniques and activities that are performed by the contractor/vendor to fulfill the contract requirements. Contractor testing is normally sampling and testing performed by the contractor for quality control of its materials.

Correlation Testing Program - Testing performed to check or establish variability of testing procedures and equipment between testing laboratories. ADOT requires split samples be tested by the Project Laboratory and the Regional or Central Laboratory.

Independent Assurance Sampling and Testing Program - Activities that are an unbiased and independent evaluation of sampling and testing used in the acceptance program. Independent Assurance samples and tests or other procedures shall be performed by qualified State personnel, or State designated agents such as qualified consultants, who do not have direct responsibility for contractor or acceptance sampling and testing on a project. The results of independent assurance tests are not used for determining the quality and acceptability of the materials and workmanship. Tests performed by the Materials Group Central Laboratory for use in the acceptance decision are not covered by the Independent Assurance Sampling and Testing Program.

The independent assurance sampling and testing program employed by ADOT is comprised of two different approaches. Those approaches are the “Project Basis” and the “System Basis”.

- The “Project Basis” is used for the majority of construction materials and consists of evaluating laboratories’ testing equipment and personnel by inspections, I.A. split samples, and proficiency samples. Use of the “Project Basis” for independent assurance sampling and testing is described in **Sections V(B)(1) and V(B)(2)**.

- The "System Basis" is an alternate method which is used to satisfy the independent assurance sampling and testing requirements for certain items. Currently, those items are concrete mixture properties (other than compressive strength) and field density of compacted soil and aggregate materials. The "System Basis" approach is based on observing and verifying satisfactory performance by the individuals performing acceptance sampling and testing, and the equipment utilized, for a particular period of time, rather than performing independent assurance sampling and testing at specified frequencies for a specific project. Use of the "System Basis" for independent assurance sampling and testing is described in **Section V(B)(3)**.

Inspection - The process of observing, measuring, examining, testing, gauging, or otherwise evaluating materials, products, services, testing activities, and equipment.

Laboratory Technician - An employee of the laboratory who is assigned to perform the actual testing operations primarily conducted in the laboratory. Certain specifications may require technicians who are certified through appropriate certification programs determined by the Department.

Proficiency Sample Program - Homogeneous samples that are distributed and tested by two or more laboratories. The test results are compared to assure that the laboratories are obtaining results within prescribed limits of variability.

Qualified Laboratories - Laboratories which have been approved to perform testing activities for ADOT. These laboratories have met the requirements of the "ADOT System for the Evaluation of Testing Laboratories" (PPD No. 19). The ADOT "Directory of Approved Materials Testing Laboratories" lists laboratories meeting this criteria.

Qualified Sampling and Testing Personnel - Personnel who meet the requirements as established by ADOT.

Quality - Consistently conforming to mutually agreed upon requirements.

Quality Assurance - All those planned and systematic activities necessary to provide adequate confidence that a product or service satisfies given requirements for quality.

Quality Assurance Program - The organizational structure, policies, responsibilities, procedures, processes, and resources utilized for implementing quality assurance activities and ensuring continued compliance with applicable standards.

Random Sample - A sample drawn from a lot in which each increment in the lot has an equal probability of being chosen. All samples used for contractor or acceptance sampling and testing shall be random samples.

Testing Laboratory - An organization that measures, examines, performs tests; or otherwise determines the characteristics, properties, and performance of materials or products. ADOT issues the "Directory of Approved Materials Testing Laboratories" which lists testing laboratories approved to perform testing activities on ADOT projects.

Vendor - A supplier of project-produced material that is not the contractor.

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V. QUALITY ASSURANCE

A. MATERIALS ACCEPTANCE

The quality of materials and construction incorporated into ADOT construction projects are controlled by sampling and testing, and accepted based on specification compliance. Compliance with specifications is determined by acceptance sampling and testing. All materials shall be randomly sampled at prescribed frequencies as given in the Sampling Guide Schedule, **Appendix C**. Sampling and testing shall be performed by qualified laboratories and by qualified sampling and testing personnel.

Reliance should not be placed wholly on the results of sampling and testing in determining the acceptability of materials and construction work. The sampling and testing should be supplemented by sufficient visual inspection of the materials to determine whether the samples and tests are reasonably representative. In addition, there should be sufficient observation of the construction operations and processes to assure uniformly satisfactory results.

1. Acceptance Sampling and Testing

The Sampling Guide Schedule (**Appendix C**) applies to sampling frequencies only for acceptance sampling and testing. It gives the material type to be sampled, the frequency of sampling, location of samples, and testing to be performed. Acceptance samples must be obtained randomly by ADOT technicians or ADOT designated agents.

In some cases, ADOT technicians or ADOT designated agents may not be allowed to physically perform the sampling of materials due to liability issues or safety and health regulations.

When directing and witnessing the sampling, both the name of the person physically performing the sampling and the name of the ADOT technician or ADOT designated agent directing and witnessing the sampling shall be noted on the sampling ticket.

After samples are taken, they shall be in the immediate custody of the ADOT technician or ADOT designated agent. Thereafter, the samples shall remain in ADOT's "chain of custody" until they are delivered to the appropriate laboratory for testing.

> Note: During their initial cure, concrete cylinders may not be in ADOT's continual "chain of custody". If this is the case, appropriate measures shall be taken to ensure the integrity of the samples.

It is the intent of the Sampling Guide Schedule to provide guidance to personnel responsible for sampling and testing materials, yet allow reasonable latitude for adapting to specific project needs. The frequency may vary for individual projects or

phases of projects in accordance with job conditions, such as, the uniformity of materials at the source, the methods and equipment used, and weather conditions. The number of samples and locations from which they are taken should adequately assure or verify that the materials incorporated and construction produced are acceptable in accordance with the plans and specifications. The Engineer may direct that less acceptance sampling and testing be accomplished in particular cases he deems necessary provided concurrence from Materials Group is obtained. Conversely, the Engineer may direct that an amount of acceptance testing greater than the required minimum be done when he deems necessary.

The recommended number of acceptance samples is listed on a materials sample checklist [see **Section V(E)(1)**] issued for each project by the Quality Assurance Section. The number of samples given on the materials sample checklist is the recommended minimum derived from the project special provisions bidding schedule. For materials that are sampled on a time designated lot basis, an estimated lot quantity is used to determine the recommended number of acceptance samples.

2. Acceptance of Materials by Certification or Other Means

- Acceptance of materials by “Certificate of Compliance” or “Certificate of Analysis” will be in accordance with Subsection 106.05 of the specifications, Section 1000 of the ADOT Materials Testing Manual, and applicable ADOT Materials Policy and Procedure Directives.

- Small quantities may be accepted on the basis of certification or based upon visual observations of the Engineer. Small quantities may be considered to be approximately 500 cubic yards or less of processed aggregate material or approximately 20 tons of bituminous material, portland cement, or fly ash. A small quantity of portland cement concrete should be considered to be 5 cubic yards or less. The Engineer should exercise careful judgment in the acceptance of small quantities. Considerations must include the significance of the product to the construction as well as the quantity. The recommended sizes of small quantities are to be considered approximate, not maximums.

- Some materials are pre-sampled at the supplier’s yard by the Regional or Central Laboratory, tested, and, if specifications are met, tagged with an ADOT green sticker showing the project number, lab number, lot number, individual approving material, and date of approval. Such materials include, but not are limited to, concrete curing compounds, precast concrete pipes, and glass beads. For materials that are “green tagged”, it may not be necessary to do any further sampling and testing. However, the proper laboratory should be contacted for verification of the materials acceptability.

- Some materials approved for use are shown on the Department's Approved Products List (APL). This list includes products that have been pre-tested and found acceptable for Department use; however, when such products are used they must also meet the requirements of the Sampling Guide Schedule (**Appendix C**) and/or the requirements of the specifications. Copies of the most current version of the APL are available on the internet from the ADOT Research Center, through its Product Evaluation Program.

B. INDEPENDENT ASSURANCE SAMPLING AND TESTING

The Code of Federal Regulations (23 CFR 637, Subpart B) (See **Appendix D**) requires the implementation of an Independent Assurance Program. Its definition of an independent assurance program is as follows:

> *"Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program."*

The independent assurance program evaluates the sampling/testing personnel and testing equipment used in acceptance of materials. The Code of Federal Regulations allows obervations, split sample results, and proficiency sample results as means of evaluating testing personnel within a State's independent assurance program. Calibration checks, split sample results, and proficiency sample results are permissible inclusions to the I.A. program for evaluating acceptance testing equipment. The independent assurance program does not directly determine the acceptability of materials.

For the majority of construction materials used for ADOT projects, the independent assurance sampling and testing requirements are satisfied using the "Project Basis", as described in **Sections V(B)(1) and V(B)(2)**. Using the "Project Basis", ADOT evaluates laboratories' testing equipment and personnel by obtaining and testing I.A. samples and splits of those samples.

The Regional Materials Engineers are responsible for administering the "Project Basis" independent assurance program; they provide personnel and equipment to obtain the independent assurance samples. Communication shall be maintained between project and regional lab personnel to assure timely independent assurance sampling and testing is accomplished commensurate with project progress.

A "System Basis" is used to satisfy the independent assurance sampling and testing requirements for certain items. Currently, those items are concrete mixture properties (other than compressive strength) and field density of compacted soil and aggregate materials. The "System Basis" is described in **Section V(B)(3)**.

Materials requiring independent assurance sampling and testing are outlined in the Sampling Guide Schedule (**Appendix C**).

1. Frequency of Independent Assurance Sampling and Testing when the "Project Basis" is used

For independent assurance sampling and testing administered under the "Project Basis", the frequency of sampling for independent assurance is a function of the number of samples used for acceptance on a project basis. Unless a material is represented by a small quantity, at least one I.A. sample is required for each qualifying material type on each project.

Independent assurance samples shall be of sufficient quantity for a split to be tested by the project laboratory.

Independent assurance (I.A.) sampling and testing shall be performed as early as possible after production or placement of the material begins.

I.A. sampling shall be performed by the individual(s) designated by the respective Regional Materials Engineer.

I.A. testing shall be performed by the laboratory/individual(s) designated by the respective Regional Materials Engineer.

The minimum frequency of independent assurance sampling and testing is given below.

- For asphaltic concrete <u>produced under Specifications 415, 416, or 417</u>:

  - One independent assurance <u>bituminous mixture</u> sample shall be taken for every 5 acceptance lots. The I.A. sample shall be taken at a different location than any acceptance sample, and split with the laboratory performing acceptance testing. At least one I.A. bituminous mixture sample is required for each project having less than 5 acceptance lots.
  - Independent assurance sampling and testing, other than gradation, shall be performed on <u>mineral aggregate</u> for the bituminous mixture at the rate of one I.A. sample for every 40 acceptance samples.
  - I.A. samples for <u>compaction</u> (separate cores) will <u>not</u> be taken.

- For asphaltic concrete <u>produced under Specifications 407, 413, or 414</u>:

  - Independent assurance sampling and testing for the <u>bituminous mixture</u> shall consist of observing the acceptance sampling and testing at a rate of one I.A. sample for every 20 acceptance samples.

- Independent assurance sampling and testing shall be performed on mineral aggregate for the bituminous mixture at the rate of one I.A. sample for every 40 acceptance samples.

- For Class P portland cement concrete:

  - One independent assurance concrete mixture sample for compressive strength shall be taken for every 5 acceptance lots. The I.A. sample shall be taken at a different location than any acceptance sample, and split with the laboratory performing acceptance testing. At least one I.A. concrete mixture sample for compressive strength is required for each project having less than 5 acceptance lots.
  - Independent assurance sampling and testing of the concrete mixture, other than for compressive strength, shall consist of meeting the requirements for the "system basis" described in **Section V(B)(3)**.
  - Independent assurance sampling and testing shall be performed on aggregate for the concrete mixture at the rate of one I.A. sample for every 40 acceptance samples.

- For Class S or B portland cement concrete:

  - Independent assurance sampling and testing for compressive strength of the concrete mixture shall be performed at the following rate: for Class S concrete, one I.A. sample for every 25 acceptance samples; for Class B concrete, one I.A. sample for every 40 acceptance samples. For I.A. split comparison results, duplicate sets of samples shall be taken, prepared, and tested.
  - Independent assurance sampling and testing of the concrete mixture, other than for compressive strength, shall consist of meeting the requirements for the "system basis" described in **Section V(B)(3)**.
  - Independent assurance sampling and testing shall be performed on aggregate for the concrete mixture at the rate of one I.A. sample for every 40 acceptance samples.

- For all other materials subject to I.A. sampling and testing (as indicated in the Sampling Guide Schedule, **Appendix C**):

  - One I.A. sample shall be taken for every 40 acceptance samples.

2. Comparison and Reporting of Independent Assurance Sampling and Testing when the "Project Basis" is used

For independent assurance sampling and testing administered under the "Project Basis", each I.A. sample will normally have an I.A. split run by the ADOT acceptance

lab, with some exceptions as noted below. I.A. sample results shall be promptly compared to I.A. split sample results.

- For asphaltic concrete produced under Specifications 415, 416, or 417:

  - I.A. samples of bituminous mixture are split with the acceptance lab. **The I.A. and the acceptance lab split test results are used only for evaluating the equipment and personnel. They are not to be used in the statistical acceptance of the respective lot from which the I.A. sample was taken.**
  - Each I.A. test result for samples of mineral aggregate for the bituminous mixture, other than gradation, is compared to its I.A. split result.

- For asphaltic concrete produced under Specifications 407, 413, or 414:

  - Each observation performed for independent assurance sampling and testing of the bituminous mixture shall be documented by recording the date of each observation, name of the test operator performing the acceptance sampling and testing, and the acceptability of the sampling and testing performed.
  - Each I.A. test result for samples of mineral aggregate for the bituminous mixture is compared to its I.A. split result.

- For Class P portland cement concrete:

  - I.A. samples for compressive strength of the concrete mixture are split with the acceptance lab. **The I.A. and the acceptance lab split test results are used only for evaluating the equipment and personnel. They are not to be used in the statistical acceptance of the respective lot from which the I.A. sample was taken.**
  - Each I.A. test result for samples of aggregate for the concrete mixture is compared to its I.A. split result.

- For Class S or B portland cement concrete:

  - Each I.A. test result for compressive strength of the concrete mixture is compared to its I.A. split result.
  - Each I.A. test result for samples of aggregate for the concrete mixture is compared to its I.A. split result.

- For all other materials subject to I.A. sampling and testing (as indicated in the Sampling Guide Schedule, **Appendix C**):

  - Each I.A. test result is compared to its I.A. split result.

For a favorable comparison, each specified test characteristic must be within the allowable variation listed in **Figure 1** for "SAMPLE RESULT vs. SPLIT RESULT".

The Regional Materials Engineer is responsible to determine allowable variations for test characteristics not listed in **Figure 1**.

An example of the comparison of test results and the report of Independent Assurance Sampling and Testing performed is given in **Figure 2**.

If there are no unfavorable comparisons, the results of the independent assurance testing shall be reported by the Regional Materials Engineer to the Resident Engineer/Project Lab within five working days of receiving the sample in the I.A. testing laboratory.

If there are any unfavorable comparisons, an investigation shall be initiated to determine the cause of the discrepancy. The investigation may include a check of the test data, calculations, and results; an inspection of the equipment used to perform the testing; a discussion with the test operators regarding their knowledge of the procedure in question; retesting of samples; exchanging samples; and observation of each other's techniques. When the problem is isolated, the steps taken to resolve it shall be documented. The results of the I.A. testing, comparisons, findings, and resolutions shall be reported by the Regional Materials Engineer to the Resident Engineer/Project Lab in a prompt and timely manner.

When Central Lab performs testing of independent assurance samples:

- If there are no unfavorable comparisons, the results will be communicated to the Regional Materials Engineer who will notify the Resident Engineer/Project Lab within five working days of receipt of the sample by Central Lab.

- If there are any unfavorable comparisons, they shall be investigated as described above and a report of the results of the I.A. testing, comparisons, findings, and resolutions shall be communicated to the Regional Materials Engineer, who will notify the Resident Engineer/Project Lab in a prompt and timely manner.

When an I.A. split is used as an acceptance sample, it is recorded as an acceptance test on the project Materials Sample Checklist.

INDEPENDENT ASSURANCE AND CORRELATION TESTING ALLOWABLE VARIATIONS (±)
(See Notes 1 and 2 below.)

PORTLAND CEMENT CONCRETE	
TEST	SAMPLE RESULT vs. SPLIT RESULT (See Note 3 below.)
Coarse Aggregate Gradation:	
+1”	4
1”	4
3/4”	4
1/2”	4
3/8”	4
1/4”	4
No. 4	4
No. 8	4
Fine Aggregate Gradation:	
No. 4	4
No. 16	3
No. 50	3
No. 100	3
No. 200	1.5
28-Day Compressive Strength: (Class P, S, and B) (See Note 4 below.)	15% of the mix design strength

BITUMINOUS MIXTURES	
TEST	SAMPLE RESULT vs. SPLIT RESULT (See Note 3 below.)
Mineral Aggregate Gradation:	
+3/4”	4
3/4”	4
1/2”	4
3/8”	4
No. 4	4
No. 8	4
No. 30	2
No. 40	2
No. 200	1.0
Percent Asphalt	0.4
Bulk Density, pounds/cu. ft.	2.0
Rice Density, pounds/cu. ft.	2.0
Voids, percent	1.5
Marshall Stability, pounds	1200

SOILS AND AGGREGATES	
TEST	SAMPLE RESULT vs. SPLIT RESULT (See Note 3 below.)
Gradation, except for Portland Cement Concrete and Bituminous Mixtures:	
+1”	4
1”	4
3/4”	4
1/2”	4
3/8”	4
1/4”	4
No. 4	4
No. 8	4
No. 16	4
No. 40	3
No. 200	1.5
Sand Equivalent	6
Flakiness Index	3
Uncompacted Void Content	1.0
pH	0.4
Optimum Moisture, percent	2.0
Proctor Density, pounds/cu. ft.	4.0
Fractured Coarse Aggregate Particles (See Note 5 below.)	15% of the mean of the results
Plasticity Index: (See Note 5 below.)	
Liquid Limit (LL)	13% of the mean of the results
Plastic Limit (PL)	18% of the mean of the results

Note 1: Use applicable test characteristics specified for material being tested.

Note 2: Regional Materials Engineer to determine allowable variations for test characteristics not shown.

Note 3: Allowable variations apply for both independent assurance testing and correlation testing comparisons.

Note 4: Allowable variations based on a percentage of the mix design strength shall be rounded if necessary to the nearest whole number.

Note 5: Allowable variations based on a percentage of the mean of the results shall be rounded if necessary to the nearest whole number.

Figure 1

Arizona Department of Transportation
Report of Independent Assurance Sampling and Testing

Project #: F-99-B(100)T
TRACS #: H888801C
Project Name: RED RIVER VALLEY- GREEN GORGE
Material Type: Aggregate Base Class 2
Sample Location: Rdwy/windrow 1' rt of CL
Location of Supply: Dunlap Plant #117

Resident Engineer: George Washington
Contractor: DESERT CONSTRUCTION
District: Holbrook
Sample Date: 05/14/2013 Sample Received: 05/15/2013 12:00 am
Sampled By: Ronald Reagan
I.A. Sample ID#: 6 Tested By (Lab): Flagstaff Regional Lab
I.A. Split ID#: 6 Tested By (Lab): Flagstaff Area

	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#16	#40	#200	Opt Mst %	Proc Den	PL	LL	PI	FF	FF2	SE	pH	Res
I.A. Test Results	100	100	100	100	100	95	78	70	58	51	35	22	11	5.0					NP	100				
I.A. Split Test Results	100	100	100	100	100	97	81	71	59	52	35	22	12	5.0					NP	99				
Variation (I.A. vs. Split)	0	0	0	0	0	2	3	1	1	1	0	0	1	0.0						1				
Allowable Variation (+/-)				4	4	4	4	4	4	4	4	4	3	1.5						15				
Unfavorable Comparison (X):																								
Avg. Acceptance Results	100	100	100	100	100	96	81	72	61	54	37	24	13	5.8	17.4	118.7				99				
Variation (I.A. vs. Avg.)	0	0	0	0	0	1	3	2	3	3	2	2	2	0.8						1				

Favorable Comparison ● Yes ○ No

I.A. Sample is Complete ● Yes ○ No a7198 05/17/2013 12:31 pm

I.A. Split is Complete ● Yes ○ No a1871 05/17/2013 12:15 pm

Individual Contacted and Date/Time Acceptance Lab Notified: Ronald Reagan 05/17/13 12:25 PM

Action Taken:

Remarks:

Regional Materials Engineer: Thomas Jefferson 05/20/13 08:11 am

EXAMPLE REPORT OF INDEPENDENT ASSURANCE SAMPLING AND TESTING

Figure 2

3. Use of the "System Basis" for Independent Assurance Sampling and Testing Requirements for Certain Materials

The "system basis" outlined below is an alternate I.A. method which is based on observing and verifying satisfactory performance by the individuals performing acceptance sampling and testing, and the equipment utilized, for a particular period of time, rather than performing independent assurance sampling and testing at specified frequencies for a specific project.

The "system basis" is used to satisfy the requirements for independent assurance sampling and testing only for certain materials. Currently, the materials for which the "system basis" is applicable are concrete mixture properties (other than compressive strength) and field density of compacted soil and aggregate materials.

The objective of the "system basis" is to observe and verify that the the individuals performing acceptance sampling and testing, and the equipment utilized, are qualified for a twelve month period. Ideally, all individuals who are performing such sampling and testing, and the equipment utilized, in a given twelve month period would be covered by this verification. It is recognized that this may not be possible in all cases. In the first 12 months of this program, a target of 75 percent of all technicians performing acceptance sampling and testing on ADOT projects for concrete mixture properties (other than compressive strength) and field density of compacted soil and aggregate materials will be identified, observed, and verified. In subsequent 12-month periods, it is anticipated that the target percentage will be increased.

The "system basis" is a more effective means of performing independent assurance sampling and testing than performing independent assurance sampling and testing at specified frequencies for a specific project since it ensures that most of the individuals performing acceptance sampling and testing are reviewed and that the same individuals are not continually reviewed.

ADOT Materials Group has implemented a system by which the majority of individuals performing acceptance sampling and testing, and the equipment utilized, are identified, observed, and verified for each twelve month period. The Regional Materials Engineers and the Materials Quality Assurance Section will administer the I.A. "System Basis" program.

For each twelve month period, the Assistant State Engineer, Materials Group, will submit a report to the FHWA documenting activities of the I.A. "System Basis" program. The report will include the following information:

1. Names and number of technicians performing acceptance sampling and testing of concrete mixture properties (other than compressive strength) and field density of compacted soil and aggregate materials on ADOT projects.

2. Number of such technicians evaluated by the program.

3. Number of such technicans that had deviations, as determined by the evaluation.

4. Summary of how the deviations were addressed, along with any potential systematic solutions to recurring deficiencies.

5. Goals for the upcoming twelve month period.

C. CORRELATION TESTING

Correlation testing is a quality assurance activity conducted to supplement independent assurance sampling and testing. Correlation testing provides a method to isolate problems that originate from sample splitting or testing error. Correlation samples are taken by Project Lab personnel and are split with the Regional Lab unless otherwise directed by the Regional Materials Engineer.

1. Frequency of Correlation Testing

At the prescribed frequency given below, a representative split of acceptance samples taken on the project is obtained for correlation testing. The correlation split samples shall be properly indentifed and promptly submitted to the Regional Lab for testing. The correlation split will be of sufficient size for the Regional Lab to duplicate the testing that is performed at the Project Lab.

Correlation testing shall be preformed at a minimum frequency of one correlation sample split for every five acceptance samples. Every effort should be made to obtain a correlation split sample from the first acceptance sample. If favorable comparisons are achieved on three consecutive correlation splits for a given material, the Regional Materials Engineer may revise the correlation frequency for that material to a minimum of one correlation sample split for every ten acceptance samples.

- For asphaltic concrete produced under Specifications 415, 416, or 417:

  - Correlation testing is not performed on the bituminous mixture.
  - Correlation testing, other than gradation, shall be performed at the frequency described above on mineral aggregate materials for the bituminous mixture.

- For asphaltic concrete produced under Specifications 407, 413, or 414:

  - Correlation testing is not performed on the bituminous mixture.
  - Correlation testing shall be performed at the frequency described above on mineral aggregate materials for the bituminous mixture.

- For Class P, S, or B portland cement concrete:

  - Correlation testing is not performed on portland cement concrete mixtures.
  - Correlation testing shall be performed at the frequency described above on the aggregate materials for the concrete mixture.

- For all other materials subject to correlation testing:

  - Correlation testing shall be performed at the frequency described above.

2. Comparison and Reporting of Correlation Testing

The Regional Materials Engineer or their designated representative will compare the results of tests performed on the acceptance sample and the correlation split. For a favorable comparison, each specified test characteristic must be within the allowable variation listed in **Figure 1** for "SAMPLE RESULT vs. SPLIT RESULT".

The Regional Materials Engineer is responsible to determine allowable variations for test characteristics not listed in **Figure 1**.

An example of the comparison of test results and the report of Correlation Sampling and Testing performed is given in **Figure 3**.

If there are no unfavorable comparisons, the results of the correlation testing shall be reported by the Regional Materials Engineer to the Resident Engineer/Project Lab within five working days of receiving the sample in the correlation testing laboratory.

Arizona Department of Transportation
Report of Correlation Sampling and Testing

Project #: 007-A-STA
TRACS #: H999901C
Project Name: ARIZONA STATE PARK
Material Type: Mineral Aggregate AZ409 Miscellaneous
Sample Location: Cold Feed
Location of Supply: Cactus Plant #111

Resident Engineer: George Bush
Contractor: HAMMERD ENGINEERING CONSTRUCTION
District: Globe
Sample Date: 04/04/2013 Sample Received: 04/16/2013 12:05 pm
Sampled By: Bill Clinton
Correlation Sample ID#: 3 Tested By (Lab): Tucson Regional Lab
Acceptance ID #: 3 Tested By (Lab): Globe Lab

	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100	#200	FF	FF2	FI	SE	UV
Correlation Split Test Results	100	100	100	100	93	83	67	56	39	36	27	18	15	11	6	3.8	79			81	
Acceptance Sample Test Results	100	100	100	100	92	82	67	57	41	38	30	21	17	13	8	4.9	78			76	
Variation (Split vs. Acceptance)	0	0	0	0	1	1	0	1	2	2	3	3	2	2	2	1.1	1			5	
Allowable Variation (+/-)	4	4	4	4	4	4	4	4	4		4		3			1.5	12			6	
Unfavorable Comparison (X):																					
Avg. Acceptance Results	100	100	100	100	92	82	67	57	41	38	30	21	17	13	8	4.9	78			76	
Variation (Split vs. Avg.)	0	0	0	0	1	1	0	1	2	2	3	3	2	2	2	1.1	1			5	

Favorable Comparison ● Yes ○ No

Correlation Split Sample is Complete ● Yes ○ No B4713 04/18/2013 01:36 pm

Acceptance Sample is Complete ● Yes ○ No b3330 04/08/2013 08:21 am

Individual Contacted and Date/Time Acceptance Lab Notified: Bill Clinton 04/18/13 01:36 PM

Action Taken:

Remarks:

Regional Materials Engineer: Abe Lincoln 04/18/2013 1:40 pm

EXAMPLE REPORT OF CORRELATION SAMPLING AND TESTING

Figure 3

If there are any unfavorable comparisons, an investigation shall be initiated to determine the cause of the discrepancy. The investigation may include a check of the test data, calculations, and results; an inspection of the equipment used to perform the testing; a discussion with the test operators regarding their knowledge of the procedure in question; retesting of samples; exchanging samples; and observation of each other's techniques. When the problem is isolated, the steps taken to resolve it shall be documented. The results of the correlation testing, comparisons, findings, and resolutions shall be reported by the Regional Materials Engineer to the Resident Engineer/Project Lab in a prompt and timely manner.

When Central Lab performs testing of correlation samples:

- If there are no unfavorable comparisons, the results will be communicated to the Regional Materials Engineer who will notify the Resident Engineer/Project Lab within five working days of receipt of the sample by Central Lab.

- If there are any unfavorable comparisons, they shall be investigated as described above and a report of the results of the correlation testing, comparisons, findings, and resolutions shall be communicated to the Regional Materials Engineer, who will notify the Resident Engineer/Project Lab in a prompt and timely manner.

D. CONTRACTOR TESTING

When specified by Standard Specifications or Special Provisions, the contractor is required to perform specific sampling, testing, and other related activities. The primary purpose of contractor sampling and testing is to assure the contractor that their process is in control and producing a product satisfying ADOT contractual specifications.

Contractor sampling and testing shall be performed by qualified technicians and testing laboratories. Laboratory and technician qualification requirements are presented in the "ADOT System for the Evaluation of Testing Laboratories" (PPD No. 19). Laboratories satisfying the "ADOT System for the Evaluation of Testing Laboratories" are listed in the ADOT "Directory of Approved Materials Testing Laboratories", which is updated monthly. Information on accessing/obtaining the "ADOT System for the Evaluation of Testing Laboratories" and the ADOT "Directory of Approved Materials Testing Laboratories" is given in **Section I**.

The Resident Engineer has the responsibility and authority to review and approve contractor sampling and testing activities. Project personnel are also responsible for monitoring the contractor's performance and compliance with specification requirements. When requested by the Project or District, Materials Quality Assurance Section will perform an inspection of the contractor's testing laboratory in accordance with **Section VI (A)**.

E. FINAL CERTIFICATION OF MATERIALS INCORPORATED IN THE WORK

The following information outlines the procedure to be followed in certifying 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.

A "Final Materials Certification Flow Chart" is given in **Figure 9**. This flow chart provides a brief illustration of the Materials Certification requirements described herein.

For Local Public Agency projects, the final certification of materials incorporated in the work is described in **Appendix A**.

For Consultant Administered Projects, the final certification of materials incorporated in the work is described in **Appendix B**.

1. Materials Sample Checklist

Materials Group, Quality Assurance Section, will originate the project "Materials Sample Checklist" recommending the number of acceptance, independent assurance, and correlation samples to be taken for each material. Materials that are not listed, but are accepted by testing shall be added to the sample checklist by the project. "As-Built" quantities that are substantially different from plans quantities shall be noted on the sample checklist and the Quality Assurance Section contacted for revised sampling and testing requirements. A blank sample checklist and cover letter are given in **Figures 4 through 6**. Upon completion of each project, the sample checklist shall be completed and signed by the Resident Engineer, and submitted to the Regional Materials Engineer for review.

2. Materials Certificate Log

A "Materials Certificate Log" shall be maintained in accordance with Series 1000 of the Materials Testing Manual. Upon completion of each project, the Materials Certificate Log shall be signed by the Resident Engineer. A copy of the log shall be attached to the Materials Sample Checklist and submitted to the Regional Materials Engineer for review.

ADOT

Intermodal Transportation

MEMORANDUM

TO: **(Name)**
Construction Supervisor
(District Name) (Mail Drop)

FROM: **(Name)**
Quality Assurance Engineer
Materials Group (068-R)

CC: **(Name)**
Regional Materials Engineer
(Name) Regional Materials Lab

DATE: (Mon. Day, Year)

RE: **PROJECT NO.**
PROJECT NAME
(Project Location)

Materials Group has prepared the following checklist of the materials to be used in constructing this project which require testing for approval. The number of recommended samples for acceptance (ACCP), independent assurance (IAS), and correlation (CORR) testing are derived from the "Materials Quality Assurance Program" (Series 900 of the Materials Testing Manual) which includes the Sampling Guide Schedule (Appendix C). The recommendations are estimates for the plan quantity and may change due to actual material production rates. Documentation must be provided in the Materials Exception Report if the required testing detailed in the Sampling Guide Schedule is not performed. All materials used on the project which require testing should be listed. Materials used which were not originally listed should be added.

Acceptance samples taken by the project are to be recorded under the ACCP SAMPLES TAKEN BY PROJECT column, regardless of where the tests are performed. The number of samples tested shall be recorded in the appropriate column. Acceptance testing performed by the project is to be recorded under the ACCP SAMPLES TESTED BY PROJECT column, acceptance testing performed by the Regional Lab is to be recorded under the REGIONAL ACCP column, and acceptance testing performed by the Central Lab is to be recorded under the CENTRAL ACCP column. Independent assurance sample splits used for acceptance testing are to be recorded under the ACCP column for the lab performing the acceptance testing. Correlation testing performed by the Regional Lab is to be recorded in the REGIONAL CORR column. Independent assurance sample testing is to be recorded under the column for the lab performing the testing, i.e., REGIONAL IAS or CENTRAL IAS columns.

Upon completion of the project, the Materials Sample Checklist shall be signed and submitted to the Regional Materials Engineer for review and signature. A copy of the completed and signed Certificate Log(s) shall be attached to the Materials Sample Checklist. These documents shall be forwarded to the District Engineer for review and approval. The District Engineer will then forward the Sample Checklist, Certificate Log, Exception Report (if needed) and Certification Letter to the Quality Assurance Engineer, Materials Group.

Glass Beads, Concrete Curing Compound, Geosynthetics, and Paint should be pre-approved by Central Lab prior to use. If not pre-approved by Central Lab, obtain samples for testing by the Central Lab as detailed in the applicable Policy and Procedures Directive (PPD). Water utilized for concrete batching does not require sampling if obtained from a potable source. See Section 900 appendix C – Sampling Guide Schedule of the Materials Testing Manual if there are questions on sampling

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MATERIALS SAMPLE CHECKLIST (COVER SHEET)

Figure 4

ARIZONA DEPARTMENT OF TRANSPORTATION
MATERIALS SAMPLE CHECKLIST

PROJECT LOCATION: _____ PROJECT NUMBER: _____

ITEM NUMBER	MATERIAL	PLAN QUANTITY	ACTUAL QUANTITY IF VARIES FROM PLAN QUANTITY	NUMBER OF SAMPLES				NUMBER OF SAMPLES TESTED					
				RECOMMENDED			PROJECT		REGIONAL			CENTRAL	
				ACCP	IAS	COR	ACCP SAMPLES TAKEN BY PROJECT	ACCP SAMPLES TESTED BY PROJECT	ACCP	IAS	COR	ACCP	IAS

* Small quantity, no samples required.

Page 2 of 3

MATERIALS SAMPLE CHECKLIST (FIRST PAGE)

Figure 5

ARIZONA DEPARTMENT OF TRANSPORTATION
MATERIALS SAMPLE CHECKLIST

PROJECT NUMBER: _____

ITEM NUMBER	MATERIAL	ADDITIONAL COMMENTS

NOTE:
A. One acceptance sample every other day of production. Minimum one IAS per 40 acceptance and one Correlation per 5 acceptance.
B. Class B and Class S with design compressive strength below 4000 psi - One acceptance sample per 100 CY. Class S with design compressive strength of 4000 psi or greater, one acceptance per 50 CY. Minimum one IAS per 40 acceptance samples.
C. Class P - Five samples per lot for acceptance. Minimum one IAS per 25 acceptance samples.
D. Minimum one acceptance sample per shift. Minimum one IAS per 40 acceptance samples.
E. One sample per delivery unit. (per PPD No. 8)

REMARKS: _____

This is to certify that all materials, except those materials accepted by certification and those where no samples are required, were properly sampled and tested.

Report prepared by _____ Date _____

Resident Engineer (Signature and Date) _____ Reviewed by: _____ Regional Materials Engineer (Signature and Date)

Page 3 of 3

MATERIALS SAMPLE CHECKLIST (LAST PAGE)

Figure 6

3. Materials Certification / Exception Report

The materials records for each project shall be reviewed by the Resident Engineer. A "Materials Certification / Exception Report" shall then be prepared by the Resident Engineer. The Materials Certification / Exception Report must include at a minimum the following statement:

> "I certify that I have reviewed the materials records for the above referenced project. 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. In addition, all material sampling and testing was performed in accordance with the ADOT Materials Quality Assurance Program."

Any exceptions to the certification shall be detailed in the report. Exceptions may include, but are not limited to, the following: material represented by failing tests which has been incorporated into the work, inadequate certificates, insufficient sampling and testing, and other deficiencies in meeting the requirements of the Materials Quality Assurance Program. Each exception, including exceptions that are covered by supplemental agreements, must be listed and explained in the report. The explanation shall include the corrective action taken to remedy the exception, including references to any supplemental agreements that provided for changes in specifications and/or acceptance of the material.

The Materials Certification / Exception Report shall be signed by the Resident Engineer and be submitted with the Materials Sample Checklist to the Regional Materials Engineer for review.

An example Materials Certification / Exception Report is given in **Figure 7**.

4. Regional Material Engineer's Responsibilities

The Regional Materials Engineer shall review the completed Materials Sample Checklist, Materials Certificate Log, and Materials Certification / Exception Report. If necessary, they shall be returned to the Resident Engineer for correction. The Regional Materials Engineer shall also review the results of correlation and independent assurance sampling and testing for the project.

ADOT
Intermodal Transportation

MEMORANDUM

TO: (Name)
(District Name) District Engineer (Mail Drop)

THRU: (Name)
(Region Name) Regional Materials Engineer (Mail Drop)

FROM: (Name)
Resident Engineer (Mail Drop)

DATE: (Month, Day, Year)

RE: **MATERIALS CERTIFICATION / EXCEPTION REPORT**

Fed. Proj. No: (_____)
TRACS No: (_____)
PROJECT NAME/DESCRIPTION:
(_____)
(_____)

I certify that I have reviewed the materials records for the above referenced project. 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. In addition, all material sampling and testing was performed in accordance with the ADOT Materials Quality Assurance Program.

Exceptions to the above certification are as follows:

1. Lots #1 and #2 of section 416 Asphaltic Concrete (End Product) paving, were in reject, but were allowed to remain in place at the maximum negative penalty (see Memo from Materials Group dated March 8, 2013).

2. Two-point barbed wire was installed rather than the 4-point barbed wire required in the project plans. This change was initiated by the State Game and Fish Department and is documented in Change Order #7.

3. An insufficient number of Aggregate Base correlation samples were obtained. Correlation frequency requirements have been reviewed with the proper personnel to ensure an adequate number of samples are obtained in the future.

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EXAMPLE MATERIALS CERTIFICATION/EXCEPTION REPORT

Figure 7 (Continued on next page)

MATERIALS CERTIFICATION / EXCEPTION REPORT Date (Month, Day, Year)
Fed. Proj. No: (_____) Page 2
TRACS No. (_____)
PROJECT NAME/DESCRIPTION:
(_____)
(_____)

4. Concrete Curing Compound: The contractor did not supply an acceptable Certificate of Compliance for curing compound that was used on the project. The project personnel were advised to review the Materials Certification requirements to prevent recurrence.

5. One of seventeen cover material acceptance tests failed on the #4 screen at 12% passing vs. 10% passing specification. Results of the other 16 acceptance tests met specification. The material was judged to be in substantial conformance by the Resident Engineer and was left in place with no penalties.

6. Concrete cylinders for the sidewalk at station 15+10 failed to meet the required compressive strength of 3000 psi. The strength average was 2850 psi. A penalty of 6% was applied to the contract unit price for the sidewalk represented by the testing results.

7. The slump of the first load of concrete for the box culvert at station 67+45 was measured at 2.75 inches. The submitted mix design required a slump of 3 to 5 inches. The slump was adjusted at the batch plant and all future loads had the required slump. All concrete met compressive strength requirements.

8. It was found that Joe Tester, who performed acceptance testing on concrete, did not have a current "ACI Concrete Field Testing Technician Grade I" certification. The project will monitor technician certifications more closely on future projects.

_____
(Name)
Resident Engineer

EXAMPLE MATERIALS CERTIFICATION/EXCEPTION REPORT

Figure 7 (Continued from previous page))

The Regional Materials Engineer shall then prepare a "Final Materials Certification" on behalf of the District Engineer. The Final Materials Certification must include at a minimum the following statement:

> "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. In addition, all material sampling and testing was performed in accordance with the ADOT Materials Quality Assurance Program. "

If there are exceptions, the Final Materials Certification shall also state, "**See exceptions listed in the attached Materials Certification / Exception Report.**"

If independent assurance or correlation testing were required, the Final Materials Certification must also include the following statement:

> "Independent assurance sampling and testing, and correlation testing, were performed in accordance with the ADOT Materials Quality Assurance Program. Results of this testing compared favorably with the results of acceptance sample testing."

If independent assurance or correlation testing were not required, the above statement shall be modified accordingly.

Significant deviations in the required independent assurance sampling and testing or correlation testing shall be noted in the Final Materials Certification as exceptions.

The Final Materials Certification shall be signed by the Regional Materials Engineer and forwarded, along with the Materials Sample Checklist, Materials Certificate Log, and Materials Certification / Exception Report, to the District Engineer for review and signature.

An example Final Materials Certification is given in **Figure 8**.

ADOT
Intermodal Transportation

MEMORANDUM

TO: (Name)
Assistant State Engineer
Materials Group (MD 068R)

FROM: (Name)
(District Name) District Engineer (Mail Drop)

FROM: (Name)
(Region Name) Regional Materials Engineer (Mail Drop)

DATE: (Month, Day, Year)

RE: **FINAL MATERIALS CERTIFICATION**

Fed. Proj. No: (_____)
TRACS No: (_____)
PROJECT NAME/DESCRIPTION:
(_____)
(_____)

Attached are the Materials Sample Checklist, Materials Certificate Log, and Materials Certification / Exception Report for this project.

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. In addition, all material sampling and testing was performed in accordance with the ADOT Materials Quality Assurance Program. **See exceptions listed in the attached Materials Certification / Exception Report.**

Independent assurance sampling and testing, and correlation testing, were performed in accordance with the ADOT Materials Quality Assurance Program. Results of the IA and Correlation testing compared favorably with the results of acceptance sample testing.

_____ _____
(District Name) District Engineer (Region Name) Regional Materials Engineer

Attachments: Materials Sample Checklist
Materials Certificate Log
Materials Certification / Exception Report

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EXAMPLE FINAL MATERIALS CERTIFICATION

Figure 8

5. Certification of Materials for Federal-Aid Projects

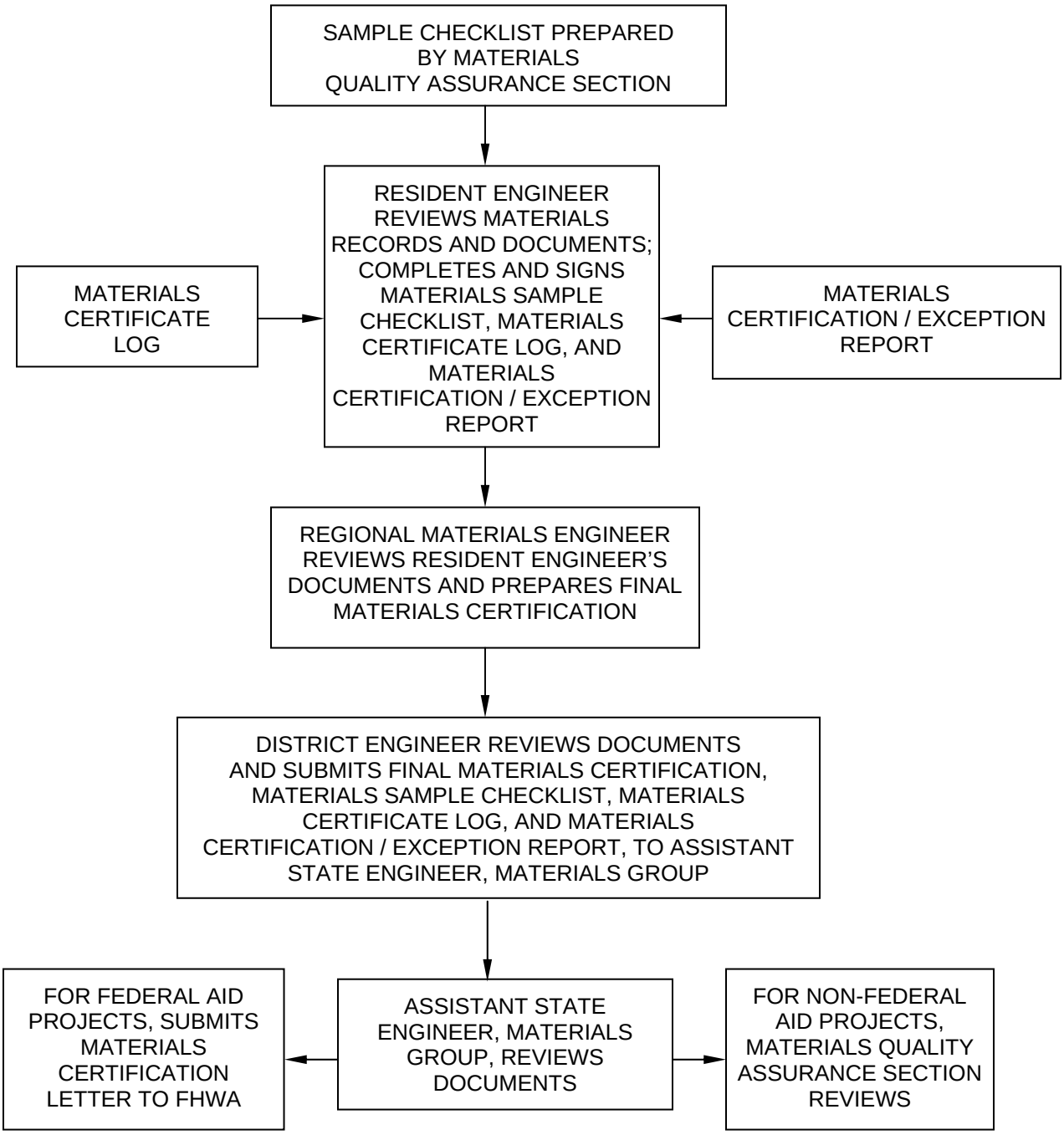
The Final Materials Certification, including attachments (Materials Sample Checklist, Materials Certificate Log, and Materials Certification / Exception Report), shall be sent to the Assistant State Engineer, Materials Group. The Assistant State Engineer, Materials Group, will review the documentation furnished by the District Engineer. Based on this documentation, the Assistant State Engineer, Materials Group, will prepare and submit a certification letter to the Federal Highway Administration. Accompanying that certification letter will be a copy of the Materials Certification / Exception Report. A copy of the certification letter and supporting documentation will be maintained on file by the Materials Group Quality Assurance Section.

6. Certification of Materials for Non Federal-Aid Projects

The Final Materials Certification, including attachments (Materials Sample Checklist, Materials Certificate Log, and Materials Certification / Exception Report), shall be sent to the Assistant State Engineer, Materials Group. The Materials Group, Quality Assurance Section, will review the documentation furnished by the District Engineer. Based on this documentation, the Materials Group, Quality Assurance Section, will prepare a certification letter. The certification letter and supporting documentation will be maintained on file by the Materials Group Quality Assurance Section.

VI. LABORATORY QUALIFICATIONS

The “ADOT System for the Evaluation of Testing Laboratories” (PPD No. 19) details the requirements that laboratories must satisfy to be approved for performing testing activities for ADOT. In addition to being AASHTO certified through the AASHTO Accreditation Program (AAP), laboratories must participate in the ADOT Laboratory Inspection Program and the ADOT Proficiency Sample Program. AAP accreditation and ADOT approval must be received for all test methods that are to be performed on ADOT projects. Laboratories which have been approved to perform testing activities on ADOT projects are listed in the ADOT “Directory of Approved Materials Testing Laboratories”. Included in that directory are the individual tests for which a laboratory has been approved.



FINAL MATERIALS CERTIFICATION FLOW CHART

Figure 9

A. ADOT LABORATORY INSPECTION PROGRAM

The Quality Assurance Section of Materials Group administers an inspection program of all materials testing laboratories performing testing activities for the Department. Compliance to test procedures and equipment requirements are included in the inspection. All laboratories performing Acceptance or Referee testing are inspected on a frequency not to exceed 18 months. Information regarding the ADOT Laboratory Inspection Program is also available on the ADOT Materials Group, Quality Assurance Section website.

1. Participation

All independent, contractor, materials supplier, government, and other testing laboratories desiring to perform testing activities for ADOT must submit to an inspection as specified in the "ADOT System for the Evaluation of Testing Laboratories" (PPD No. 19). The inspection considers those elements of service that the respective laboratory proposes to offer to the Department. This requirement includes laboratories submitting asphaltic concrete mix designs and those performing acceptance and referee testing for the Department.

The Quality Assurance Section will inspect only laboratories that are involved, or seeking involvement, in an activity related to the design or construction of an ADOT project.

2. Equipment Inspection

The laboratory equipment inspection will consist of checking dimensional, calibration, and specification conformance of all apparatus and equipment required by the test procedures contained in the Materials Testing Manual or other applicable specifications. Equipment related documentation, required by AASHTO R18, is also checked during this inspection. This inspection is not a calibration service for non-ADOT laboratories. Any equipment found unacceptable must be repaired, properly calibrated, or removed from service at the expense of the owner laboratory. Laboratory facilities will also be checked for compliance with applicable standards, such as, proper temperature and humidity control.

Documentation of the calibration and verification of equipment used in field testing which is not available during the inspection will be reviewed for compliance with applicable requirements.

3. Procedural Inspection

The procedural inspection serves as a tool to evaluate the performance of laboratory technicians when performing tests in accordance with the ADOT Materials Testing Manual or other applicable specifications. Arizona, AASHTO, and ASTM test methods referenced in the Materials Testing Manual will be observed. In the event that Arizona Test Methods deviate from those given in a similar AASHTO or ASTM procedure, the Materials Testing Manual will govern.

4. Procedure and Report

The equipment and procedural inspections are normally conducted simultaneously; however,circumstances may dictate independent inspections. The inspection formats will generally conform to the techniques employed by AMRL and CCRL, as appropriate. When a departure from the requirements of a test method is observed by the inspectors, they will point it out to the laboratory personnel so that immediate corrections can be made if possible. The inspectors will present a summary of their findings and identify deficiencies requiring corrective action at an informal exit review where any deficiencies discovered can be discussed openly. It is requested that the Laboratory Manager and Supervising Engineer be present at the exit review.

A written inspection report will be issued by the Quality Assurance Section to the laboratory that has been inspected. The laboratory must provide the Quality Assurance Engineer with satisfactory responses to the noted deficiencies within 30 days of the report issuance. The responses must provide satisfactory evidence that all significant deficiencies were corrected or that corrective action is in progress. The laboratory's inspection and responses will be considered when evaluating ADOT eligibility.

B. ADOT PROFICIENCY SAMPLE PROGRAM

The Quality Assurance Section administers the ADOT Materials Proficiency Sample Program. The program allows participants to evaluate the reliability of their testing by comparing their test results to a population of test data generated by all participants. Specified routine tests are performed in accordance with standard Arizona and AASHTO test methods by each participating laboratory on carefully prepared samples of highway construction materials and the test results reported to ADOT for review and analysis. Information regarding the ADOT Proficiency Sample Program is also available on the ADOT Materials Group, Quality Assurance Section website.

1. Participation

Participation in the ADOT Proficiency Sample Program is required for all laboratories performing Acceptance or Referee testing activities for the Department, as specified in

the ADOT "System for the Evaluation of Testing Laboratories" (PPD No. 19). Participation by government agency laboratories not performing testing activities for the Department is voluntary.

2. Proficiency Samples

Proficiency samples are carefully prepared to be as homogeneous as possible to minimize the effect of material variability in evaluating the results. Each sample is sequentially numbered and, using random numbers, a set of samples is allocated to each participant. To permit an estimate of single-operator precision, instructions are given for a single test operator to conduct all repetitions of an individual test method; however, it is not required that the same person conduct all test methods prescribed for a set of proficiency samples.

The program generally provides 8 to 10 proficiency samples per year. Typically, the material types and routine tests performed are:

- **Soil -** Gradation, Atterberg limits (PI), pH, resistivity, and moisture-density relations.

- **Fine Aggregate -** Gradation, sand equivalent, fine specific gravity, absorption, and uncompacted void content.

- **Coarse Aggregate -** Gradation, specific gravity, absorption, L.A. Abrasion, unit weight, fractured coarse aggregate particles, flakiness index, and percent carbonates.

- **Asphaltic Concrete -** Asphalt content, maximum theoretical specific gravity/density (Rice), Marshall stability/flow, Marshall compaction/density, gyratory compaction/density, moisture content, and gradation of mineral aggregate.

- **Portland Cement Concrete -** 7-day and 28-day compressive strengths of prepared cylinders.

- **Asphalt Cement/Binder -** Rotational viscosity, pressurized aging, bending beam rheometer, and dynamic sheer rheometer.

- **Emulsified Asphalt -** Saybolt-Furol viscosity, % residue, % uncoated particles, absolute viscosity, and sieve test.

3. Analysis/Reporting of Proficiency Sample Results

Proficiency sample test results are required to be submitted promptly upon completion of testing to the Quality Assurance Section no later than a specified date. All test data submitted is analyzed similar to the method presented in the paper: *"Statistical Evaluation of Interlaboratory Cement Tests"* by J. R. Crandall and R. L. Blaine, Volume 59 (1959) of the Proceedings of the American Society for Testing and Materials. A final report summarizing the results of the analysis is issued for each proficiency sample. The final report presents a statistical summary of results for the population of test data and a tabulation of each laboratory's individual data. Statistical characteristics presented are averages, standard deviations, coefficients of variation, z-scores, and performance ratings. The z-score is equal to the number of standard deviations the data departs from the population mean. A laboratory's performance ratings are based on the following scale:

Rating	Standard Deviations from Mean (z-score)
5	0 to ≤1.0
4	> 1.0 to ≤1.5
3	> 1.5 to ≤2.0
2	>2.0 to ≤2.5
1	>2.5 to ≤3.0
0	> 3.0; eliminated from analysis
N	No data received

All data submitted is initially reviewed and analyzed. Invalid data is eliminated, then the remaining data is reanalyzed and presented in the proficiency sample final report. A single low rating, or a pair of low ratings, is not considered significant. A continuing trend of low ratings for a test characteristic should cause a laboratory to investigate its equipment and test methodology.

The "History of Z – Scores" charts accompany each proficiency sample final report. These charts show a laboratory's performance trend for each test characteristic. In addition, scatter diagrams are included in each proficiency sample report for each test characteristic. A scatter diagram shows each laboratory's reported results as a point on the graph, relative to the population averages for that test.

Participating laboratories are required to investigate the reason for discrepancies when their results are 2 or more standard deviations from the population average values (rating of 2 and less). The laboratories must report findings and corrective actions to the Quality Assurance Section within 30 days of the final report issuance. The

performance and adequacy of the laboratory's responses will be considered when evaluating the eligibility of the laboratory to conduct testing activities for ADOT.

C. CONFLICT OF INTEREST

In order to avoid a conflict of interest, any qualified laboratory shall perform only one of the following types of testing on the same project: Acceptance testing, contractor testing, Independent Assurance testing, or dispute resolution (referee) testing. Independent assurance testing and correlation testing are performed as described herein.

VII. SAMPLING AND TESTING PERSONNEL QUALIFICATION REQUIREMENTS

All personnel supervising or performing sampling and testing activities for ADOT must meet the qualification requirements given in the table below.

Soils and Aggregate	
Field	Laboratory
Arizona Technical Testing Institute (ATTI) "Field" certification.	Arizona Technical Testing Institute (ATTI) "Laboratory Soils/Aggregate" certification.
Asphaltic Concrete	
Field	Laboratory
Arizona Technical Testing Institute (ATTI) "Field" certification.	Arizona Technical Testing Institute (ATTI) "Asphalt" certification.
Concrete	
Field	Laboratory
American Concrete Institute (ACI) "Concrete Field Testing Technician Grade I" certification.	American Concrete Institute (ACI) "Concrete Strength Testing Technician" certification.

Information regarding requirements for the qualification of sampling and testing personnel is also available on the ADOT Materials Group, Quality Assurance Section website.

Individuals performing sampling and testing activities for ADOT who are not employed by ADOT or who are not associated with a laboratory which has met the requirements of the "ADOT System for the Evaluation of Testing Laboratories" must, in addition to meeting the qualification requirements specified in the above paragraph, utilize equipment and apparatus which has been inspected and found acceptable. Inspection of equipment and apparatus must be performed at the intervals specified

in Appendix A3 of the ADOT Materials Testing Manual. Documentation of equipment and apparatus inspection(s) shall be properly maintained. Upon request by the Department, that documentation shall be made available for review. All equipment and apparatus shall be maintained in good working order. Inspection of equipment and apparatus shall be performed by either:

- An AASHTO accredited laboratory that has been approved by ADOT.
- An individual or company who, as a business, performs inspection and calibration of sampling and testing equipment.

Inspections and calibrations must be performed in accordance with established ADOT, AASHTO, ASTM, and *National Institute of Standards and Technology* (NIST) specifications. Proper calibration equipment that is traceable to NIST standards shall be used.

APPENDIX A

ARIZONA DEPARTMENT OF TRANSPORTATION LOCAL PUBLIC AGENCY CERTIFICATION ACCEPTANCE QUALITY ASSURANCE REQUIREMENTS

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APPENDIX A

ARIZONA DEPARTMENT OF TRANSPORTATION
LOCAL PUBLIC AGENCY
CERTIFICATION ACCEPTANCE
QUALITY ASSURANCE REQUIREMENTS

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A1. SCOPE

It is the objective of this document for the Arizona Department of Transportation (ADOT) to define the Quality Assurance requirements for any Local Public Agency (LPA) that has been granted Certification Acceptance (CA) status to administer Federal-Aid construction projects. The LPA Quality Assurance requirements described herein have been developed by ADOT Materials Group, Quality Assurance Section 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"* (See **Appendix D**). Appendix A has been developed with the understanding that significant portions of the Phoenix and Tucson metropolitan areas will be designated as part of the National Highway System (NHS) under Federal Authorization MAP-21.

The LPA Quality Assurance process is composed of the following main components:

- Qualification of Testing Personnel
- Qualification of Laboratories
- Pre-Construction Approval by ADOT of the LPA Materials Sampling and Testing Plan
- Acceptance Samplng and Testing
- Independent Assurance (I.A.) Sampling and Testing
- Certificates of Compliance and Certificates of Analysis
- Buy America Requirements for Steel and Iron Products
- Final Certification of Materials
- Records Retention and Audit Requirements

To determine compliance with applicable regulations, the contractual relationship between the acceptance laboratory, sampling/testing personnel, contractor, and LPA must be clearly defined.

A2. LIST OF ABBREVIATIONS

AAP	AASHTO Accreditation Program
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADOT	Arizona Department of Transportation
ATTI	Arizona Technical Testing Institute
CA	Certification Acceptance
CFR	Code of Federal Regulations
I.A.	Independent Assurance Sampling and Testing Program
LPA	Local Public Agency
MAP-21	"Moving Ahead for Progress in the 21st Century" Act
NHS	National Highway System

A3. LIST OF FIGURES

NUMBER	TITLE	PAGE
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Figure A2	Example Bid Schedule ……	5
Figure A3	Example Materials Sample Checklist ……	6
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A4. QUALIFICATION OF SAMPLING AND TESTING PERSONNEL

All field and laboratory personnel performing sampling or testing of construction materials on a LPA construction project must have the certifications shown in **Figure A1**, as applicable for the scope of the project.

Soils and Aggregate	
Field	Laboratory
Arizona Technical Testing Institute (ATTI) "Field" certification.	Arizona Technical Testing Institute (ATTI) "Laboratory Soils/Aggregate" certification.
Asphaltic Concrete	
Field	Laboratory
Arizona Technical Testing Institute (ATTI) "Field" certification.	Arizona Technical Testing Institute (ATTI) "Asphalt" certification.
Concrete	
Field	Laboratory
American Concrete Institute (ACI) "Concrete Field Testing Technician Grade I" certification.	American Concrete Institute (ACI) "Concrete Strength Testing Technician" certification.

REQUIREMENTS FOR SAMPLING AND TESTING TECHNICIANS

Figure A1

A5. QUALIFICATION OF LABORATORIES

ADOT recognizes the AASHTO Accreditation Program (AAP) in conjunction with AASHTO R 18, *"Establishing and Implementing a Quality Management System for Construction Materials Laboratories"*, for a laboratory to demonstrate competency in the performance of specific tests on construction materials. All laboratories that perform construction materials testing on LPA construction projects must be AAP accredited in the testing procedures performed.

A6. PRE-CONSTRUCTION APPROVAL OF THE LPA MATERIALS SAMPLING AND TESTING PLAN

The LPA will submit the following documents to the ADOT Materials Group, Quality Assurance Engineer for approval prior to beginning construction:

1. Bid Schedule that shows the Item Number, Item Description, Unit, and Quantity of project construction materials and activities. **Figure A2** shows an example Bid Schedule.

2. Materials Sample Checklist that details the scope of the proposed sampling and testing. The materials that are to be sampled and tested, as well as the frequency at which the sampling and testing are to be performed, is to be shown on the Materials Sample Checklist. **Figure A3** shows an example Materials Sample Checklist.

3. Materials Certificate Log that lists Certificates of Compliance and Certificates of Analysis that will be required during construction. An example Materials Certificate Log is shown in **Figure A4**.

4. Statement that details the contractual relationship between the acceptance laboratory, independent assurance laboratory, field sampling/testing personnel, contractor, and the LPA. If the acceptance laboratory or the independent assurance laboratory receives payment from the contractor, that relationship must be clearly defined.

A flow chart showing the process listed above is given in **Figure A5**.

A7. ACCEPTANCE SAMPLING AND TESTING

Acceptance Sampling and Testing is separate from Independent Assurance Sampling and Testing.

It is the responsibility of the Local Public Agency to develop a Sampling Guide which outlines the requirements for Acceptance Sampling and Testing. The guide shall be submitted to the ADOT Materials Quality Assurance Engineer for review and approval.

An LPA Central Laboratory may perform both Acceptance Sampling and Testing and Independent Assurance Sampling and Testing on a particular project. However, the same individual shall not perform both the Acceptance Sampling and Testing and the Independent Assurance Sampling and Testing.

A laboratory other than an LPA Central Laboratory shall not perform both Acceptance Sampling and Testing and Independent Assurance Sampling and Testing on a particular project.

BID SCHEDULE

Project Number: (_____)

Item No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
4040116	APPLY BITUMINOUS TACK COAT	HOUR	260		
4040125	FOG COAT	TON	2		
4040163	BLOTTER MATERIAL	TON	10		
4040264	ASPHALT BINDER (PG 64-22)	TON	2,260		
4090003	ASPHALTIC CONCRETE (MISCELLANEOUS STRUCTURAL)	TON	1,350		
4140040	ASPHALTIC CONCRETE FRICTION COURSE (ASPHALT-RUBBER)	TON	9,350		
4140042	ASPHALT RUBBER MATERIAL (FOR AR-ACFC)	TON	890		
4140044	MINERAL ADMIXTURE (FOR AR-ACFC)	TON	85	$90.00	$7,650.00
4160002	ASPHALTIC CONCRETE (3/4" MIX) (END-PRODUCT)	TON	45,200		
4160031	MINERAL ADMIXTURE	TON	430	$90.00	38,700.00
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	40		
7015041	TEMPORARY PAINTED MARKING (ARROW, SYMBOL, OR LEGEND)	EACH	6		
70115042	TEMPORARY PAINTED MARKING (STRIPE)	L. FT.	231,000		
70116030	BARRICADE (TYPE II, VERT. PANEL, TUBULAR MARKER)	EACH-DAY	2,250		

EXAMPLE BID SCHEDULE

Figure A2

LOCAL PUBLIC AGENCY
MATERIALS SAMPLE CHECKLIST
(Date)

PROJECT LOCATION: (_____)
(_____)

PROJECT NUMBER: (_____)
(_____)

ITEM NUMBER	MATERIAL	PLAN QUANTITY	ACTUAL QUANTITY IF VARIES FROM PLAN QUANTITY	NUMBER OF SAMPLES			NUMBER OF SAMPLES TESTED	
				RECOMMENDED		PROJECT		LPA CENTRAL LABORATORY OR INDEPENDENT LABORATORY
				ACCP	IAS	ACCP SAMPLES TAKEN BY PROJECT	ACCP SAMPLES TESTED BY PROJECT	IAS
4040264	Asphalt Binder (PG 64-22)	470 T		5				
4140040	Asphaltic Concrete Friction							
	Course (Asphalt-Rubber)							
	AR-ACFC	2,650 T		4				
	Mineral Aggregate for AR-ACFC	2,438 T		5	1			
4140042	Asphalt Rubber Material							
	(for AR-ACFC)	240 T		2				
	Binder for Asphalt Rubber							
	Material	200 T		2				
	Rubber for Asphalt Rubber							
	Material	40 T		1				
41600004	Asphaltic Concrete (End-Product)							
	(Special Mix)	9,400 T		20	1			
	Mineral Aggregate for AC							
	(End Product) (Special Mix)	8,836 T		4	1			

EXAMPLE MATERIALS SAMPLE CHECKLIST

Figure A3

ARIZONA DEPARTMENT OF TRANSPORTATION

MATERIALS CERTIFICATE LOG

PROJECT NO. Local Public Agency CONTRACTOR Prime SHEET 1 OF 1

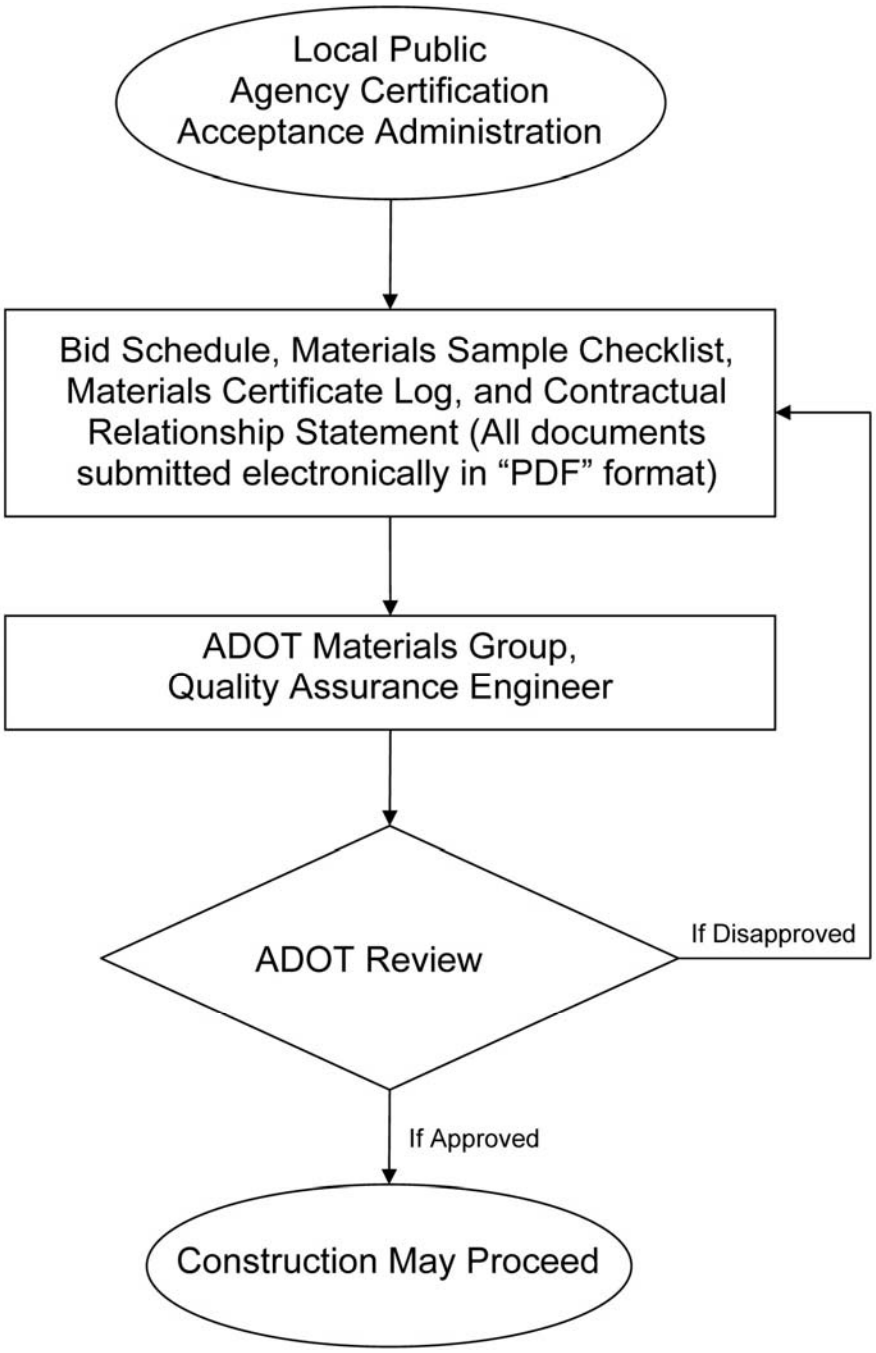
DESCRIPTION / IDENTIFICATION OF MATERIAL	TYPE OF CERT. REQ'D.	DATE CERT. REC'D	CHECKLIST: DESCRIPTION OF MATERIAL	CHECKLIST: QUANTITY REPRESENTED	CHECKLIST: MATL. IDENTIFICATION	CHECKLIST: COMPLIANCE STATEMENT	CHECKLIST: AUTH. SIGNATURE/DATE	CHECKLIST: TEST RESULTS (CERT. OF ANALYSIS)	DATE MATERIAL CHECKED AGAINST CERT.	CERT. ACCEPTABLE (Y / N)	INSPECTOR	COMMENTS
Raised Pavement Markers (Type D)	Compl.											
Permanent Paint	Compl.											
Erosion Control Sediment Logs	Compl.											
Barbed Wire Fence (type II)	Compl.											
409 Tack Coat	Compl.											
411 Friction Course Admix (lime)	Compl.											
411 PG Asphalt Binder	Compl.											

RESIDENT ENGINEER _____ (Signature) DATE _____

44-4409 R02/04

EXAMPLE MATERIALS CERTIFICATE LOG

Figure A4



PRE-CONSTRUCTION APPROVAL OF THE LPA MATERIALS SAMPLING AND TESTING PLAN FLOW CHART

Figure A5

Acceptance Sampling and Testing may be performed by:

- Local Public Agency sampling and testing personnel.
- An independent consultant laboratory selected and compensated by the Local Public Agency.
- Contractor sampling and testing personnel.
- An independent consultant laboratory selected and compensated by the contractor.

A8. INDEPENDENT ASSURANCE (I.A.) SAMPLING AND TESTING

Independent Assurance Sampling and Testing is separate from Acceptance Sampling and Testing.

The LPA is responsible for administering the Independent Assurance Sampling and Testing.

An LPA Central Laboratory may perform both Independent Assurance Sampling and Testing and Acceptance Sampling and Testing on a particular project. However, the same individual shall not perform both the Independent Assurance Sampling and Testing and the Acceptance Sampling and Testing.

A laboratory other than an LPA Central Laboratory shall not perform both Independent Assurance Sampling and Testing and Acceptance Sampling and Testing on a particular project.

Independent assurance samples shall be obtained from project or processing facility by the LPA or by an independent consultant laboratory selected and compensated by the LPA.

If the acceptance testing is performed by the LPA, or an independent consultant laboratory which is selected and compensated by the LPA, the ratio of independent assurance sampling and testing is one I.A. per 20 acceptance tests.

If the acceptance testing is performed by the contractor, or an independent consultant laboratory which is selected and compensated by the contractor, the ratio of independent assurance sampling and testing is one I.A. per 5 acceptance tests.

Note: The increased frequency of I.A. sampling and testing when acceptance sampling and testing is performed by the contractor, or an independent consultant laboratory which is selected and compensated by the contractor, is utilized as verification of the contractor's acceptance testing.

When an LPA Central Laboratory does not perform both the independent assurance testing and the acceptance testing, each I.A. field sample shall be split between the laboratory performing the independent assurance testing and the laboratory performing the acceptance testing.

If the test results do not compare favorably, cooperative efforts to investigate and identify the cause of the discrepancy should commence immediately. As a minimum, these efforts should include a check of the test data, calculations, and results; an inspection of the equipment used to perform the testing; a discussion with the test operators regarding their knowledge of the procedure in question; retesting of samples; exchanging samples; and observation of each other's techniques. When the problem is isolated, the steps taken to resolve it shall be documented.

A9. CERTIFICATES OF COMPLIANCE AND CERTIFICATES OF ANALYSIS

Manufactured products that are accepted by the LPA through a Certificate of Compliance or Certificate of Analysis shall include, as a minimum:

- The current name, address, and phone number of the manufacturer or supplier of the material.
- A description of the material supplied.
- Quantity of material represented by the certificate.
- Means of material identification, such as label, lot number, or marking.
- A statement that the material complies in all respects with the requirements of the cited specifications.
- The name, title, and signature an individual has the legal authority to bind the manufacturer or the supplier of the material. The date of the signature shall also be given. In addition, a statement that the individual has such legal authority.

A10. BUY AMERICA REQUIREMENTS FOR STEEL AND IRON PRODUCTS

Steel and iron materials and products used shall comply with the current "Buy America" requirements of 23 CFR 635.410.

All steel and iron products permanently incorporated into a LPA project must be domestically produced and have appropriate certification statements provided by the manufacturer. Records for the steel and iron products must be traceable through heat numbers and mill certificates. Certification statements should be verified by visual inspection at the time of material delivery to the project site.

A11. FINAL CERTIFICATION OF MATERIALS

Following completion of the project construction, the LPA shall submit copies of the Testing Summaries and the Materials Certification/Exception Report to the Materials Group, Quality Assurance Engineer. The copies shall be submitted electronically in "pdf" format. The Materials Quality Assurance Engineer will review these items, and if necessary notify the LPA Project Engineer of any deficiencies that require correction. A flow chart illustrating this process is shown in **Figure A7**.

A11.1 Submittal of Testing Summaries

The LPA shall submit copies of the project testing summaries to the ADOT Materials Group, Quality Assurance Engineer. As a minimum, the testing summaries must include the following:

1. Name of laboratory and technician that performed the testing, and the date the testing was performed.

2. Summary of test results. The summary shall include a comprehensive report of all test results.

A11.2 Exception Reporting Requirement

The materials records for each project shall be reviewed by the LPA Project Engineer. A "Materials Certification / Exception Report" shall then be prepared by the LPA Project Engineer. The Materials Certification / Exception Report must include at a minimum the following statement:

> "I certify that I have reviewed the materials records for the above referenced project. 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. In addition, all material sampling and testing was performed in accordance with the Approved LPA Materials Sampling and Testing Plan."

Construction materials that failed to meet specification requirements, but were incorporated in the project, must be summarized in the Materials Certification/Exception Report with a detailed explanation listing penalties or justification for acceptance.

An example Materials Certification / Exception Report is given in **Figure A6**.

The Materials Certification / Exception Report shall be submitted to the Materials Group, Quality Assurance Engineer under seal of a professional engineer registered the State of Arizona.

A12. RECORDS RETENTION AND AUDIT REQUIREMENTS

The LPA shall maintain all test reports, certificates, and test summaries for a minimum of five years after the project has been completed. All records shall be available for review by ADOT at any time while the project is in construction or during the five year retention period.

(Local Public Agency Letterhead)

(Date)

TO: (Name)
Quality Assurance Engineer
ADOT Materials Group
1221 N. 21st Avenue
Phoenix, AZ 85009

FROM: Name of Project Engineer
(LPA Name)

RE: MATERIALS CERTIFICATION/EXCEPTION REPORT

PROJECT: (Project Name from the plans and specifications)
(TRACS Number)
(Federal ID Number)

I certify that I have reviewed the materials reports for the above referenced project. 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. In addition, all materials sampling and testing was performed in accordance with the Approved LPA Materials Sampling and Testing Plan. Exceptions to the above certification are as follows:

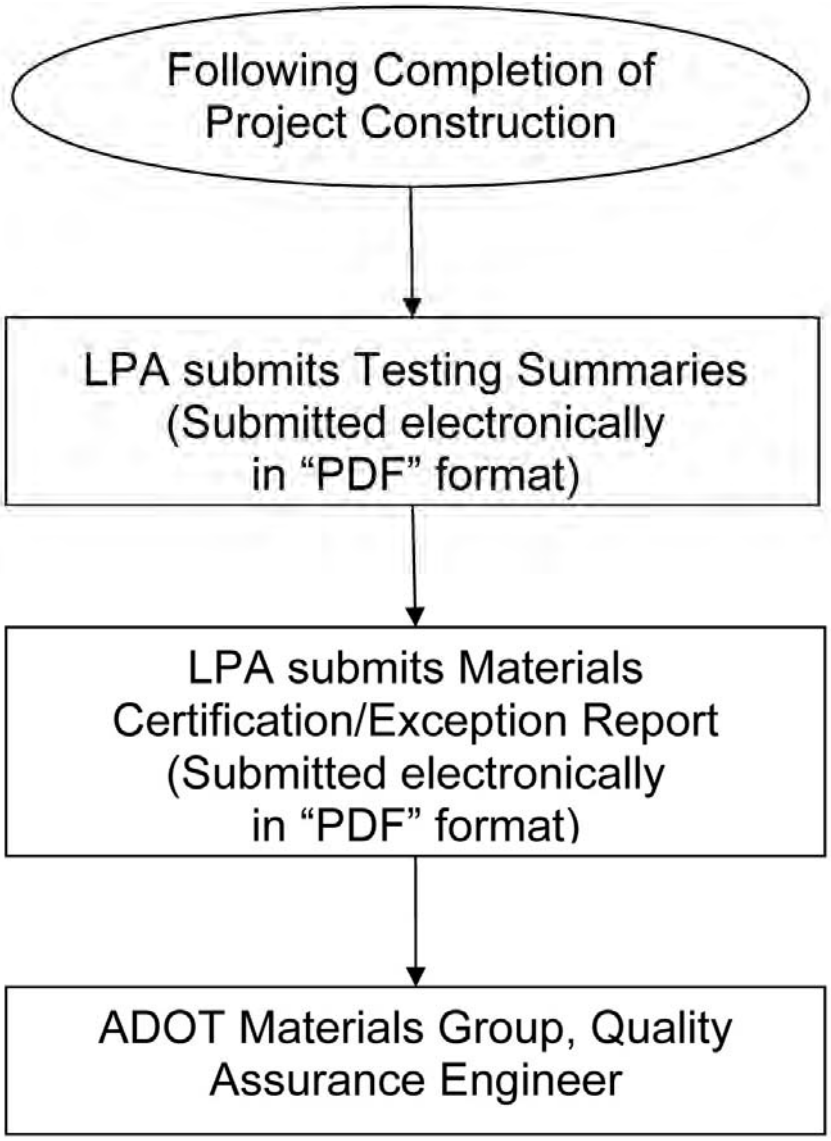
1. *List any materials that were incorporated in the completed construction project where testing indicated non-conformance to the plans and specifications. If Materials Quality penalties were imposed or contract change orders associated with Material Quality were initiated, list the specific details of those agreements.*

2. *List any item that were not sampled and testing as indicated in the Approved LPA Materials Sampling and Testing Plan and provide details on how the LPA plans to prevent recurrence of the sampling and testing deficiencies on future projects.*

LPA Project Engineer

EXAMPLE MATERIALS CERTIFICATION/EXCEPTION REPORT

Figure A6



FINAL CERTIFICATION OF MATERIALS FLOW CHART

Figure A7

APPENDIX B

FINAL CERTIFICATION OF MATERIALS FOR CONSULTANT ADMINISTERED PROJECTS

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APPENDIX B

Final Certification of Materials for Consultant Administered Projects

B1. The final certification of materials for consultant administered projects will be conducted as follows:

B1.1 The consultant engineer will be responsible for sampling and testing materials in accordance with the ADOT Materials Testing Manual and the Specifications.

B1.2 Independent Assurance Sampling and Testing and Correlation Testing will be performed by the ADOT Regional Lab as the work progresses.

B1.3 Independent Assurance and Correlation samples taken by ADOT personnel, as outlined in item (b) above do not relieve the consultant engineer of the responsibility for sampling and testing of materials in accordance with **Section B1.1** above.

B1.4 At the completion of the project, the consultant engineer will complete the Materials Sample Checklist, Materials Certificate Log, and Materials Certification / Exception Report, as detailed in **Sections (V)(E)(1) through (V)(E)(3)**. These documents will be submitted to the ADOT Project Monitor for review. If necessary, the documents will be returned to the consultant engineer for correction. Upon approval by the ADOT Project Monitor, the documents will be forwarded to the Regional Materials Engineer for review.

B1.5 The Regional Materials Engineer and District Engineer will prepare the Final Materials Certification as outlined in **Section (V)(E)(4)**. The Final Materials Certification, including attachments (Materials Sample Checklist, Materials Certificate Log, and Materials Certification / Exception Report), shall be sent to the Assistant State Engineer, Materials Group.

B1.6 For Federal-Aid projects, the Assistant State Engineer, Materials Group, will review the documentation furnished by the District Engineer. Based on this documentation, the Assistant State Engineer, Materials Group, will prepare and submit a certification letter to the Federal Highway Administration. Accompanying that certification letter will be a copy of the Materials Certification / Exception Report. A copy of the certification letter and supporting documentation will be maintained on file by the Materials Group Quality Assurance Section.

B1.7 For Non Federal-Aid projects, the Materials Group, Quality Assurance Section, will review the documentation furnished by the District Engineer. Based on this documentation, the Materials Group, Quality Assurance Section, will prepare a certification letter. The certification letter and supporting documentation will be maintained on file by the Materials Group Quality Assurance Section.

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APPENDIX C

SAMPLING GUIDE SCHEDULE

Tables 1 through 8 (Pages 1–60) - Acceptance Sampling Guide.

Table 1 Soils (Pages 1-3)
Table 2 Aggregates (Pages 4-26)
Table 3 Bituminous Materials (Pages 27-34)
Table 4 Portland Cement Concrete (Pages 35-38)
Table 5 Materials Used With Portland Cement Concrete (Pages 39-42)
Table 6 Stablized Soils and Bases (Pages 43-44)
Table 7 Bituminous Mixtures (Pages 45-48)
Table 8 Miscellanous Materials (Pages 49-60)

Table 9 (Page 61) - Illustration of Sampling Ticket and Listing of Codes for Purpose, Testing Lab, Size, and Roadway.

Table 10 (Pages 62–65) - Listing of Material Codes and Type Codes Used By FAST (Field Office Automation SysTem).

Table 11 (Pages 66-69) - Index of Materials Listed in Tables 1 through 8.

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TABLE 1
ACCEPTANCE SAMPLING GUIDE FOR SOILS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
203	Borrow (within 3 ft. of finished subgrade elevation)	Gradation [1]	In-Place	One per 1500 ft.
		PI [1]		
203	Embankment	Proctor Density	In-Place	One per soil type, and as needed.
		Optimum Moisture		
		Compaction	In-Place	One per 1500 ft. per lift.
	Embankment for Metal Pile Location only	pH	In-Place or Source	One per source.
		Resistivity		
203	Natural Ground for Embankment 5 ft. or less in height	Proctor Density	In-Place	One per soil type, and as needed.
		Optimum Moisture		
		Compaction	In-Place	One per 1500 ft.

[1] Independent Assurance Sampling and Testing required.

TABLE 1 (continued)
ACCEPTANCE SAMPLING GUIDE FOR SOILS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
203	Subgrade	Proctor Density	Roadway	One per soil type, and as needed.
		Optimum Moisture		
		Compaction	Roadway	One per 1500 ft.
		Gradation (1)	Roadway	One per 1500 ft. or change in material.
		PI (1)		
203	Soil for Shoulder Build-up	Gradation	In-Place or Source	One per soil type.
		PI		
		pH		
		Soluble Salts		
		Compaction	In-Place	One per 1500 ft. or as directed by the Engineer.
501	Trench Backfill	Proctor Density	In-Place	One per soil type, and as needed.
		Optimum Moisture		
		Compaction	In-Place	One per 100 CY.

(1) Independent Assurance Sampling and Testing required.

TABLE 1 (continued)
ACCEPTANCE SAMPLING GUIDE FOR SOILS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
803	Granite Mulch or Decomposed Granite	Gradation	In-Place or Source	One per 10,000 CY.
804	Top Soil	Gradation (1)	In-place	Written soil analysis per source and six samples per lot [a lot is considered approximately 20,000 CY per source].
		PI (1)		
		pH (1)		
		Soluble Salts		
		Calcium Carbonate		
		Exchange-able Sodium in percent and parts per million		

(1) Independent Assurance Sampling and Testing required.

TABLE 2
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFICATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
203 501 (When Contractor Quality Control **is not** a bid item.)	Structure Backfill or Pipe Backfill	Proctor Density	Stockpile	One per source, and as needed.
		Optimum Moisture		
		Compaction	In-Place	One per 75 CY.
		Resistivity	Source or Stockpile	One per source.
		pH		
		Gradation (1)	On Job Site	One per 500 CY per source.
		PI (1)		
203 501 (When Contractor Quality Control **is** a bid item.)	Structure Backfill or Pipe Backfill	Proctor Density	Stockpile	One per source, and as needed.
		Optimum Moisture		
		Compaction	In-Place	One per 100 CY.
		Resistivity	Source or Stockpile	One per source.
		pH		
		Gradation (1)	On Job Site	One per 1500 CY per source.
		PI (1)		

(1) Independent Assurance Sampling and Testing required.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303 (When Contractor Quality Control **is not** a bid item.)	Aggregate Base Class 1, Class 2, and Class 3	Abrasion [2]	Source	One per source.
		Proctor Density	Crusher Belt or Stockpile	At start of production, then as material changes.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1000 ft.
		Fractured Coarse Aggregate Particles [1]	Stockpile	One per 10,000 tons.
		Gradation [1]	Windrow	One per 2000 tons, minimum one per shift.
		PI [1]		

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303 (When Contractor Quality Control **is** a bid item.)	Aggregate Base Class 1, Class 2, and Class 3	Abrasion [2]	Source	One per source.
		Proctor Density	Crusher Belt or Stockpile	At start of production, then as material changes.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1500 ft.
		Fractured Coarse Aggregate Particles [1]	Stockpile	One per 10,000 tons.
		Gradation [1]	Windrow	One per 2000 tons, minimum one per shift.
		PI [1]		

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303 (When Contractor Quality Control **is not** a bid item.)	Aggregate Subbase Class 4, Class 5, and Class 6	Proctor Density	Crusher Belt or Stockpile	At start of production, then as material changes.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1000 ft.
	Class 4	Fractured Coarse Aggregate Particles (1)	Stockpile	One per 10,000 tons.
		Gradation (1)	Windrow	One per 2000 tons, minimum one per shift.
		PI (1)		
		Abrasion (2)	Source	One per source.
	Class 5 and Class 6	Gradation (1)	Windrow	One per 2000 tons, minimum one per shift.
		PI (1)		

(1) Independent Assurance Sampling and Testing required.

(2) Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303 (When Contractor Quality Control **is** a bid item.)	Aggregate Subbase Class 4, Class 5, and Class 6	Proctor Density	Crusher Belt or Stockpile	At start of production, then as material changes.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1500 ft.
	Class 4	Fractured Coarse Aggregate Particles (1)	Stockpile	One per 10,000 tons.
		Gradation (1)	Windrow	One per 2000 tons, minimum one per shift.
		PI (1)		
		Abrasion (2)	Source	One per source.
	Class 5 and Class 6	Gradation (1)	Windrow	One per 2000 tons, minimum one per shift.
		PI (1)		

(1) Independent Assurance Sampling and Testing required.

(2) Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
304 305	Aggregate for Cement Treated Base or Lean Concrete Base	Gradation [1]	Stockpile	One per 2000 tons, minimum one per shift.
		Fractured Coarse Aggregate Particles [1]	Stockpile	One per 10,000 tons.
		Abrasion [2]	Source	One per source.
	for Cement Treated Base	PI [1]	Stockpile	One per 2000 tons, minimum one per shift.
	for Lean Concrete Base	Sand Equivalent [1]	Stockpile	One every other day of Lean Concrete Base production.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
404	Cover Material	Abrasion [2]	Source or Stockpile	One per source.
		Bulk O.D. Specific Gravity	Stockpile	One per source.
		Percent Carbonates		
		Dry Unit Weight		
		Fractured Coarse Aggregate Particles	Stockpile	One per 600 tons.
		Flakiness Index		
		Gradation [1]	Final Stockpile	One per 300 tons.
		Moisture Content	Trucks at Scale	One per 300 tons.
404 412 413 415	Blotter Material	Gradation [1]	Final Stockpile	One per stockpile.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Mineral Aggregate for Micro-Surfacing	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates	Stockpile	One per source.
		Gradation [1]	Final Stockpile	One prior to start of Micro-Surfacing production, and one per 300 tons
		Sand Equivalent	Stockpile	One prior to start of Micro-Surfacing production, and one per 600 tons
		Fractured Coarse Aggregate Particles		
		Uncompacted Void Content		
		Moisture Content	Trucks at Scale	One per 300 tons.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
407	Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC)	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates		
		Specific Gravity		
		Gradation	Cold Feed	One prior to the start of ACFC production.
		Sand Equivalent [1]	Cold Feed or Stockpile	One prior to the start of ACFC production and one per each two days of ACFC production, minimum of two per project.
		Flakiness Index [1]		
		Fractured Coarse Aggregate Particles [1]		
		Gradation [1]	Cold Feed or Hot Bins	One per 500 tons of ACFC production, minimum of one per shift.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
409	Mineral Aggregate for Asphaltic Concrete (Miscellaneous Structural) [For Special Mix, see below.]	Abrasion (2)	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent	Stockpile	One per source.
		Fractured Coarse Aggregate Particles		
		Gradation	Cold Feed or Hot Bins	At discretion of the Engineer.
409	Mineral Aggregate for Asphaltic Concrete (Miscellaneous Structural – Special Mix)	Abrasion (2)	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent (1)	Stockpile	One per source.
		Uncompacted Void Content (1)	Stockpile	One prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles (1)	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete (Miscellaneous Structural - Special Mix) on Page 45.)	

(1) Independent Assurance Sampling and Testing required.

(2) Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
411	Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC) - Miscellaneous	Abrasion [2]	Source or Stockpile	One per source.
		Sand Equivalent	Stockpile	One per source.
		Flakiness Index		
		Fractured Coarse Aggregate Particles		
		Gradation	Cold Feed or Hot Bins	At the discretion of the Engineer.
413	Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) [AR-AC]	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Specific Gravity	Stockpile	One per source.
		Gradation	Cold Feed	One prior to the start of AR-AC production.
		Sand Equivalent [1]	Cold Feed or Stockpile	One prior to the start of AR-AC production and one per each two days of AR-AC production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Gradation [1]	Cold Feed or Hot Bins	One per 500 tons of AR-AC production, minimum of one per shift.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
414	Mineral Aggregate for Asphaltic Concrete Friction Course (Asphalt-Rubber) [AR-ACFC]	Abrasion [2]	Source or Stockpile	One per source.
		Specific Gravity	Stockpile	One per source.
		Percent Carbonates		
		Gradation	Cold Feed	One prior to the start of AR-ACFC production.
		Sand Equivalent [1]	Cold Feed or Stockpile	One prior to the start of AR-ACFC production and one per each two days of AR-ACFC production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Flakiness Index [1]		
		Gradation [1]	Cold Feed or Hot Bins	One per 500 tons of AR-ACFC production, minimum of one per shift.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFICATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
415	Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) - End Product [AR-AC]	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent	Stockpile	One at least five working days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles		
		Uncompacted Void Content		
		Ignition Furnace Calibration		
		Sand Equivalent [1]	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Uncompacted Void Content [1]		
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete (Asphalt-Rubber) - End Product on Page 46.)	

[1] Independent Assurance Sampling and Testing required.

[2] Historical abrasion values may be used provided testing was conducted within the past two years.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
416	Mineral Aggregate for Asphaltic Concrete - End Product **[without reclaimed asphalt pavement (RAP)]** (See Page 18 for mixes with RAP.)	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent	Stockpile	One at least five days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles		
		Uncompacted Void Content **(Special Mix only)**		
		Ignition Furnace Calibration		
		Sand Equivalent [1]	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Uncompacted Void Content [1] **(Special Mix only)**		
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete - End Product on Page 47.)	

[1] Independent Assurance Sampling and Testing required.

[2] Historical abrasion values may be used provided testing was conducted within the past two years.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
416	Mineral Aggregate for Asphaltic Concrete - End Product **[with reclaimed asphalt pavement (RAP)]** See PPD [3]. (See Page 17 for mixes without RAP.)	Abrasion [2] (Virgin Agg. and RAP Agg. separately)	Source or Stockpile	One per source.
		Percent Carbonates (if required) (Composite of Virgin Agg. and RAP Agg.)		
		Sand Equivalent (Virgin Agg. only)	Stockpile	One at least five days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles (Composite of Virgin Agg. and RAP Agg.)		
		Uncompacted Void Content **(Special Mix only)** (Virgin Agg. only)		
		Ignition Furnace Calibration (Virgin Agg., RAP Agg., and RAP material)		
		Gradation, Binder Content [1], and Moisture Content of RAP material	Individual stockpiles (belt cut may be used for single stockpile)	One per each lot of asphaltic concrete production.
		Sand Equivalent [1] (Virgin Agg. only)	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1] (Composite of Virgin Agg. and RAP Agg. obtained from Arizona Test Method 428)		
		Uncompacted Void Content [1] **(Special Mix only)** (Virgin Agg. only)		
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete - End Product on Page 47.)	

[1] Independent Assurance Sampling and Testing required.
[2] Historical abrasion values may be used provided testing was conducted within the past two years.
[3] ADOT Materials Policy and Procedure Directive.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
417	Mineral Aggregate for Asphaltic Concrete (End Product) SHRP Volumetric Mix **[without reclaimed asphalt pavement (RAP)]** (See Page 20 for mixes with RAP.)	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent	Stockpile	One at least five days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles		
		Uncompacted Void Content		
		Ignition Furnace Calibration		
		Sand Equivalent [1]	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Uncompacted Void Content [1]		
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete (End Product) SHRP Volumetric Mix on Page 48.)	

[1] Independent Assurance Sampling and Testing required.

[2] Historical abrasion values may be used provided testing was conducted within the past two years.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
417	Mineral Aggregate for Asphaltic Concrete (End Product) SHRP Volumetric Mix **[with reclaimed asphalt pavement (RAP)]** See PPD [3]. (See Page 19 for mixes without RAP.)	Abrasion [2] (Virgin Agg. and RAP Agg. separately)	Source or Stockpile	One per source.
		Percent Carbonates (if required) (Composite of Virgin Agg. and RAP Agg.)		
		Sand Equivalent (Virgin Agg. only)	Stockpile	One at least five days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles (Composite of Virgin Agg. and RAP Agg.)		
		Uncompacted Void Content (Virgin Agg. only)		
		Ignition Furnace Calibration (Virgin Agg., RAP Agg., and RAP material)		
		Gradation, Binder Content [1], and Moisture Content of RAP material	Individual stockpiles (belt cut may be used for single stockpile)	One per each lot of asphaltic concrete production.
		Sand Equivalent [1] (Virgin Agg. only)	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1] (Composite of Virgin Agg. and RAP Agg. obtained from Arizona Test Method 428)		
		Uncompacted Void Content [1] (Virgin Agg. only)		
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete (End Product) SHRP Volumetric Mix on Page 48.)	

[1] Independent Assurance Sampling and Testing required.
[2] Historical abrasion values may be used provided testing was conducted within the past two years.
[3] ADOT Materials Policy and Procedure Directive.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Mineral Aggregate for Asphaltic Concrete - Miscellaneous Paving	Abrasion [2]	Source or Stockpile	One per source.
		Sand Equivalent	Stockpile	One per source.
		Gradation	Cold Feed or Hot Bins	At discretion of the Engineer.
501	Bedding Material for Pipe	Gradation [1]	Source or Stockpile	One per 300 CY per source.
		PI [1]		
		pH [1]		One per source.
		Resistivity [1]		
		Proctor Density	Source or Stockpile	One per source, and as needed.
		Optimum Moisture		
		Compaction	In-Place	One every 50 CY.
501	Filter Material for Perforated Pipe	Gradation [1]	Source or Stockpile	One per 300 CY per source.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
501	Plating Material for Pipe Ends	Gradation	Source or Stockpile	One per source, and as needed.
		PI		
		Proctor Density		
		Optimum Moisture		
		Compaction	In-Place	One every 50 CY.
702	Crash Barrel Sand	Gradation	Plant or Site	One per each attenuator system location.
		Dry Unit Weight per cubic foot		
		Moisture Content		
	Sand and Rock Salt Mixture (when Sand Barrel Crash Cushions are installed at elevations above 3,000 feet)	Percent Rock Salt		
808	Bedding Material for Polyvinyl Chloride (PVC) Irrigation Pipe	Gradation	Source or Stockpile	One per source.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
913	Rock for Wire Tied Riprap, Gabions, Riprap (Slope Mattress), and Rail Bank Protection	Specific Gravity	Source	One per source.
		Gradation (visual)	Project	One per 1/2 shift.
	Rock for Grouted Riprap and Dumped Riprap	Specific Gravity	Source	One per source.
		Gradation	Project	One per 1/2 shift.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Fine Aggregate for Portland Cement Concrete (PCC) Classes P, S, and B	Gradation [1]	Batch Plant Conveyer Belt or Stockpile	One every other day of PCC production.
		Sand Equivalent [1]		
		Soundness [when used in concrete over 4500 ft. elevation]	Stockpile	One per source. For evaluation of concrete aggregate sources, see PPD [3].
		Organic Impurities		
		Mortar Strength		
		Deleterious Substances [Clay Lumps and Friable Particles; Lightweight Particles]	Stockpile	At the discretion of Materials Group. For evaluation of concrete aggregate sources, see PPD [3].

[1] Independent Assurance Sampling and Testing required.

[3] ADOT Materials Policy and Procedure Directive.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Coarse Aggregate for Portland Cement Concrete (PCC) Classes P, S, and B	Gradation [1]	Batch Plant Conveyer Belt or Stockpile	One every other day of PCC production.
		Soundness [when used in concrete over 4500 ft. elevation]	Stockpile	One per source. For evaluation of concrete aggregate sources, see PPD [3].
		Abrasion [2]		
		Deleterious Substances [Clay Lumps and Friable Particles; Lightweight Particles; Material Passing No. 200 Sieve]	Stockpile	With the exception of "Material Passing No. 200 Sieve", at the discretion of Materials Group. For evaluation of concrete aggregate sources, see PPD [3].
		Fractured Coarse Aggregate Particles	Stockpile	One per source.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

[3] ADOT Materials Policy and Procedure Directive.

TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Aggregate for Arrestor Bed	Abrasion [2]	Screen Belt or Stockpile	One per source.
		Specific Gravity		
		Gradation [1]	Screen Belt or Stockpile	One per shift.
		Fractured Coarse Aggregate Particles [1]		
		Flakiness Index [1]		
Refer to Special Provisions	Aggregate for Soil-Cement Bank Protection or Cement Stabilized Alluvium	Gradation [1]	Source or Stockpile	One per 2000 tons, minimum of one per day.
		PI [1]		

[1] Independent Assurance Sampling and Testing required.

[2] Provided Materials Group concurs, historical abrasion values may be used.

TABLE 3
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005	Recycling Agent RA-1 RA-5 RA-25 RA-75	Per Specifications	Circulation Line Recom-mended [4]	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) per 1/2 shift.
1005 404	Liquid Asphalt [Cutback Asphalt - (Medium Curing Type)] MC-70 MC-250 MC-800 MC-3000 for Prime Coat	Per Specifications	Distributor Recom-mended [4]	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) per delivery unit.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005	Emulsified Asphalt RS-1 CRS-1 RS-2 CRS-2 SS-1 CSS-1 CRS-2P	Per Specifications	Supplier (For pre-approval of material.)	See PPD [3].
		Residue	Distibutor Recom-mended [4]	See PPD [3].
				For preapproved emulsions, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
404	for Chip Seal Coat, Tack Coat, and Fog Coat			For emulsions not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.

[3] ADOT Materials Policy and Procedure Directive.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005	Emulsified Asphalt Special Type (Diluted SS-1 or CSS-1)	Residue	Distributor Recom-mended [4]	See PPD [3].
				For preapproved undiluted emulsions, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
404	for Tack Coat and Fog Coat			For undiluted emulsions not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.

[3] ADOT Materials Policy and Procedure Directive.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005	Asphalt Cement (PG XX-XX)	Per Specifications		
404	for Tack Coat			Certificate of Compliance required.
416 417	for Asphaltic Concrete		Supplier or Project Circulation Line Recom-mended [4]	A two gallon sample (two full one-gallon metal cans) at least five days prior to start of asphaltic concrete production (for calibration of ignition furnace).
407 409 411 416 417	for Asphaltic Concrete, or ACFC		Supplier or Project Circulation Line Recom-mended [4]	Certificate of Analysis and a one gallon sample in a metal can required at least seven days prior to start of asphaltic concrete production.
			Circulation Line Recom-mended [4]	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) per 1/2 shift.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005	Emulsified Recycling Agent (ERA) ERA-1 ERA-5 ERA-25 ERA-75	Per Specifications	Supplier (For pre-approval of material)	See PPD [3].
		Residue	Distributor Recom-mended [4]	See PPD [3].
				For preapproved ERA, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
				For ERA not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
	ERA (Diluted)	Residue	Distributor Recom-mended [4]	See PPD [3].
				For preapproved undiluted ERA, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
404	for Fog Coat			For undiluted ERA not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.

[3] ADOT Materials Policy and Procedure Directive.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005 1009 410	Asphalt Cement (PG XX-XX) for Asphalt - Rubber (Sprayed Applications)	Per Specifications	Circulation Line - Delivery Unit	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) for each shipment - not less than one set of duplicate samples for each 40 tons.
1005 1009 413 414 415	Asphalt Cement (PG XX-XX) for Asphalt - Rubber for AR-AC or AR-ACFC	Per Specifications	Delivery Unit Recom-mended (4)	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) per 1/2 shift.
1009	Crumb Rubber for Asphalt - Rubber Type A or Type B	Gradation	Project	Certificate of Compliance required and one sample [approximately 1500 grams (one gallon) per Arizona Test Method 714] per lot per type.
1009 410	Asphalt - Rubber [CRA (5)] Type 1, Type 2, or Type 3 (Sprayed Applications)	Per Special Provisions.	Distributor Recom-mended (4)	Certificate of Compliance required and a one gallon sample in a metal can per delivery unit.

(4) Point of sampling specified by Engineer.

(5) CRA = Crumb Rubber Asphalt

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1009 413 414 415	Asphalt - Rubber [CRA [5]] Type 1, Type 2, or Type 3 For AR-AC or AR-ACFC			Certificate of Compliance required.
		Penetration	Circulation Line Recom-mended [4]	Duplicate samples (each one gallon in a metal can) per 1/2 shift.
		Softening Point		
		Resilience		
		Rotational Viscosity		
		Rotational Viscosity (at plant)		One sample (one gallon in a metal can) per batch.
415	for AR-AC		Supplier or Project	A two gallon sample (two full one-gallon metal cans) at least five days prior to start of asphaltic concrete production (for calibration of ignition furnace).
			Circulation Line Recom-mended [4]	

[4] Point of sampling specified by Engineer.

[5] CRA = Crumb Rubber Asphalt

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Emulsified Asphalt for Cold Recycled Asphaltic Concrete HFE-150P HFE-300P	Per Special Provisions.	Supplier (for pre-approval of material.)	See PPD [3].
		Residue	Distibutor Recom-mended [4]	See PPD [3].
				For preapproved emulsions, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
				For emulsions not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.

[3] ADOT Materials Policy and Procedure Directive.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

TABLE 4
ACCEPTANCE SAMPLING GUIDE FOR PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
401 1006	Portland Cement Concrete (PCC) Class P	Compressive Strength [1]	Immediately before going into paver or forms, or as otherwise directed by the Engineer.	Five samples per lot. (For compressive strength, one set of three cylinders per sample.)
		Slump		
		Air Content (when Required)		
		Temperature		
		Thickness	Roadway	10 cores per lot.
1006	Portland Cement Concrete (PCC) Class S **(with a compressive strength requirement less than 4,000 psi)**	Compressive Strength [1]	At Discharge [6]	One sample for each 100 CY, or fraction thereof, of continuously placed concrete per day from each batch plant. For daily placements of 10 CY or less, at the discretion of the Engineer. (For compressive strength, one set of two cylinders per sample.)
		Slump		
		Temperature		
		Air Content (when Required)	At Discharge [6]	Sample for air content every 50 CY when elevation is above 3000 ft. For daily placements of 10 CY or less, at the discretion of the Engineer.

[1] Independent Assurance Sampling and Testing required.

[6] If concrete is pumped to facilitate placement, at the discretion of the Engineer, samples may be taken from the truck and pump hose discharge to determine that the compressive strength specifications are met in the structure, and to correlate temperature, slump, and air content results. If the correlation is satisfactory and meets with the approval of the Engineer, sampling may continue from the most convenient location with occasional retesting for correlation. Rejection of concrete due to improper temperature or slump may occur at either the truck or pump hose discharge; however, rejection of concrete due to improper air content will only occur due to a failing test for a sample obtained at the final point of discharge.

TABLE 4 (continued)
ACCEPTANCE SAMPLING GUIDE FOR PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Portland Cement Concrete (PCC) Class S **(with a compressive strength requirement equal to or greater than 4,000 psi)**	Compressive Strength [1]	At Discharge [6]	One sample for each 50 CY, or fraction thereof, of continuously placed concrete per day from each batch plant. For daily placements of 10 CY or less, at the discretion of the Engineer.
		Slump		
		Temperature		(For compressive strength, one set of three cylinders per sample.)
		Air Content (when Required)	At Discharge [6]	Sample for air content every 50 CY when elevation is above 3000 ft. For daily placements of 10 CY or less, at the discretion of the Engineer.

[1] Independent Assurance Sampling and Testing required.

[6] If concrete is pumped to facilitate placement, at the discretion of the Engineer, samples may be taken from the truck and pump hose discharge to determine that the compressive strength specifications are met in the structure, and to correlate temperature, slump, and air content results. If the correlation is satisfactory and meets with the approval of the Engineer, sampling may continue from the most convenient location with occasional retesting for correlation. Rejection of concrete due to improper temperature or slump may occur at either the truck or pump hose discharge; however, rejection of concrete due to improper air content will only occur due to a failing test for a sample obtained at the final point of discharge.

TABLE 4 (continued)
ACCEPTANCE SAMPLING GUIDE FOR PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Portland Cement Concrete (PCC) Class B	Compressive Strength [1]	At Discharge [6]	One sample for each 100 CY of concrete placed from each batch plant For daily placements of 10 CY or less, at the discretion of the Engineer.
		Slump		
		Temperature		(For compressive strength, one set of two cylinders per sample.)
		Air Content (when Required)	At Discharge [6]	Sample for air content every 50 CY when elevation is above 3000 ft. For daily placements of 10 CY or less, at the discretion of the Engineer.

[1] Independent Assurance Sampling and Testing required.

[6] If concrete is pumped to facilitate placement, at the discretion of the Engineer, samples may be taken from the truck and pump hose discharge to determine that the compressive strength specifications are met in the structure, and to correlate temperature, slump, and air content results. If the correlation is satisfactory and meets with the approval of the Engineer, sampling may continue from the most convenient location with occasional retesting for correlation. Rejection of concrete due to improper temperature or slump may occur at either the truck or pump hose discharge; however, rejection of concrete due to improper air content will only occur due to a failing test for a sample obtained at the final point of discharge.

TABLE 4 (continued)
ACCEPTANCE SAMPLING GUIDE FOR PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
601 1006	Portland Cement Structural Concrete for Minor Precast Structures (Manholes, Cattle Guards, Utility Vaults, Catch Basins, Flared Ends, etc.)	Rebound Hammer	At Fabrication Yard	One set of readings per precast unit.
601 1006	Prestressed Concrete	Compressive Strength	At Discharge [6]	One sample per member or for each day's production. (For compressive strength, a minimum of two sets of 3 cylinders for detensioning, and one set of 3 cylinders for 28-day breaks.)
		Slump		
		Temperature		
912	Shotcrete	Compressive Strength	Test Panels	Three cores from a test panel every 100 CY or fraction thereof, per day.
		Slump	At Mixer Discharge	One per 50 CY or fraction thereof, per day.
		Air Content (For Shotcrete placed at elevations of 3,000 feet and above)	From In-Place Material	
922 1006	Utility Concrete	None		

[6] If concrete is pumped to facilitate placement, at the discretion of the Engineer, samples may be taken from the truck and pump hose discharge to determine that the compressive strength specifications are met in the structure, and to correlate temperature, slump, and air content results. If the correlation is satisfactory and meets with the approval of the Engineer, sampling may continue from the most convenient location with occasional retesting for correlation. Rejection of concrete due to improper temperature or slump may occur at either the truck or pump hose discharge; however, rejection of concrete due to improper air content will only occur due to a failing test for a sample obtained at the final point of discharge.

TABLE 5
ACCEPTANCE SAMPLING GUIDE FOR MATERIALS USED WITH PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
602 1003	Prestressing Steel (Spiral, Bars, Strand Wire, or Wire)	Tensile Strength	Project or Fabrication Plant	Certificate of Compliance required and one 6 ft. piece from each bar size, heat, reel, or coil.
602 1003	Post-Tensioning Steel	Tensile Strength	Project	Certificate of Compliance required and one 6 ft. piece from each bar size, heat, reel, or coil.
605 1003	Reinforcement Bars (Epoxy Coated or Uncoated)	Yield Strength, Tensile Strength, Bend Test, Elongation, Weight/Foot, and Coating Thickness (if applicable)		
	Phoenix and Tucson Sources		Fabrication Plant or Supplier's Yard	Certificate of Compliance required and samples as per PPD [3].
			Project	Certificate of Compliance required and one 7 ft. bar per shipment. See PPD [3].
	Other sources		Project	Certificate of Compliance required and samples as per PPD [3].
1003	Welded Wire Fabric (Smooth)	Tensile Strength, Diameter, Spelter, Weld Shear, Reduction in Area	Supplier's Yard or Project	Certificate of Compliance required and one 2 ft. x 2 ft. sample per 25 rolls.

[3] ADOT Materials Policy and Procedure Directive.

TABLE 5 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MATERIALS USED WITH PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1003	Welded Wire Fabric (Deformed)	Tensile Strength, Weld Shear, Weight/Foot	Supplier's Yard or Project	Certificate of Compliance required and one 4 ft. x 4 ft. sample per 25 sheets.
1006	Admixtures			Certificate of Compliance required and must be on the Department's Approved Products List. See PPD [3].
1006	Curing Compound	Water Loss % Solids	Supplier's Yard or Project	For material from preapproved lot, Certificate of Compliance only. See PPD [3]. For material not preapproved, Certificate of Compliance and a 1/2 gallon sample per lot. See PPD [3].
1006	Fly Ash and Natural Pozzolan	Chemical and Physical		Material supplied from an Approved Material Source. See PPD [3].
1006	Silica Fume			Certificate of Compliance required with each delivery. See PPD [3].

[3] ADOT Materials Policy and Procedure Directive.

TABLE 5 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MATERIALS USED WITH PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Water	Soluble Salts pH	Source	One sample (1 pint in glass container) per source [7].
1006	Hydraulic Cement (All Types)	Chemical and Physical		Material supplied from an Approved Material Source. See PPD [3].
1011	Joint Materials	Per Specifications		Silicone joint sealant must be on the Department's Approved Product List. In addition, a Certificate of Analysis shall accompany each lot or batch of sealant. For joint materials other than silicone joint sealant, only a Certificate of Compliance is required.

[3] ADOT Materials Policy and Procedure Directive.

[7] No sample is necessary if water is potable and comes from a proven source.

TABLE 5 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MATERIALS USED WITH PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1013 604	Bearing Pads (Preformed Fabric)	Thickness Compression Load	Project	Certificate of Analysis required and two sample pads from every 100, or fraction thereof, with a minimum of one sample pad from each lot for each type of pad. (Tested by ADOT.)
1013 604	Bearing Pads (Plain and Fabric Reinforced Elastomeric)	Per Specification Subsection 1013-2	Project	Certificate of Analysis required and two sample pads from every 100, or fraction thereof, with a minimum of one sample pad from each lot for each type of pad. [Tested by Engineer approved testing laboratory. See PPD (3).]
1013 604	Bearing Pads (Steel Reinforced Elastomeric)	Per Specification Subsection 1013-2	Project	Certificate of Analysis required and two sample pads from every 100, or fraction thereof, with a minimum of one sample pad from each lot for each type of pad. [Tested by Engineer approved testing laboratory. See PPD (3).]

(3) ADOT Materials Policy and Procedure Directive.

TABLE 6
ACCEPTANCE SAMPLING GUIDE FOR STABILIZED SOILS AND BASES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
301	Lime Treated Subgrade	Proctor Density	Roadway	One per soil type, and as needed.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1000 ft.
302	Cement Treated Subgrade	Proctor Density	Roadway	One per soil type, and as needed.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1000 ft.
304	Cement Treated Base	Proctor Density	Roadway	At start of production then one per week, and as needed.
		Optimum Moisture		
		Compaction	Roadway or Point of Placement	One per lift per 1000 ft.
		Compressive Strength (1)		Three random samples per shift. (Three specimens from each sample.)

(1) Independent Assurance Sampling and Testing required.

TABLE 6 (continued)
ACCEPTANCE SAMPLING GUIDE FOR STABILIZED SOILS AND BASES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
305	Lean Concrete Base	Compressive Strength [1]	At Discharge	Four random samples per 4000 SY, minimum four samples per shift.
		Slump		
		Air Content (when required)		
		Thickness	Roadway	Per Specifications.
Refer to Special Provisions	Bituminous Treated Base	See Special Provisions	Roadway	At the discretion of the Engineer.
Refer to Special Provisions	Cement Stabilized Alluvium	Compressive Strength [1]	Roadway or Point of Placement	One set of three per 1500 CY, minimum one set of three per 1/2 shift.
Refer to Special Provisions	Soil-Cement Bank Protection	Compressive Strength [1]	Roadway or Point of Placement	One set of three per 1500 CY, minimum one set of three per 1/2 shift.

[1] Independent Assurance Sampling and Testing required.

TABLE 7
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MIXTURES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
407	Asphaltic Concrete Friction Course (ACFC)	% Asphalt (1) Moisture Content (1)	Trucks at Mixing Plant	1 per 1/2 shift.
409	Asphaltic Concrete (Miscellaneous Structural) [For Special Mix, see below]	% Asphalt Moisture Content Rice Marshall Density	Roadway	At the discretion of the Engineer.
409	Asphaltic Concrete (Miscellaneous Structural - Special Mix)	% Asphalt (1) Moisture Content (1) Rice (1) Marshall Density (1) Gradation (1)	Roadway	One sample per 500 tons.
411	Asphaltic Concrete Friction Course (ACFC) - Miscellaneous	% Asphalt Moisture Content	Trucks at Mixing Plant	At the discretion of the Engineer.
413	Asphaltic Concrete (Asphalt – Rubber) [AR-AC]	% Asphalt-Rubber (1) Moisture Content (1)	Roadway	4 per shift.

(1) Independent Assurance Sampling and Testing required.

TABLE 7 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MIXTURES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
414	Asphaltic Concrete Friction Course (Asphalt – Rubber) [AR-ACFC]	% Asphalt-Rubber (1)	Trucks at Mixing Plant	4 per shift.
		Moisture Content (1)		
415	Asphaltic Concrete (Asphalt-Rubber) - End Product [AR-AC]	% Asphalt-Rubber (1)	Roadway	4 per lot.
		Moisture Content (1)		
		Gradation (1)		
		Marshall Density (1)		
		Rice (1)		
		Compaction	Roadway	20 cores per lot (10 locations/2 cores per location).

(1) Independent Assurance Sampling and Testing required.

TABLE 7 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MIXTURES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
416	Asphaltic Concrete - End Product [For mixes containing reclaimed asphalt pavement (RAP), see PPD [3].]	% Asphalt [1]	Roadway	4 per lot.
		Moisture Content [1]		
		Gradation [1]		
		Marshall [1] [Density, Stability, and Flow]		
		Rice [1]		
		Compaction, unless otherwise specified. (Courses > 1½ inch in nominal thickness)	Roadway	20 cores per lot (10 locations/2 cores per location).

[1] Independent Assurance Sampling and Testing required.

[3] ADOT Materials Policy and Procedure Directive.

TABLE 7 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MIXTURES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
417	Asphaltic Concrete (End Product) SHRP Volumetric Mix [For mixes containing reclaimed asphalt pavement (RAP), see PPD (3).]	% Asphalt (1)	Roadway	4 per lot.
		Moisture Content (1)		
		Gradation (1)		
		Gyratory Density (1)		
		Rice (1)		
		Compaction (Courses > 1½ inch in nominal thickness)	Roadway	20 cores per lot (10 locations/2 cores per location).
Refer to Special Provisions	Asphaltic Concrete - Miscellaneous Paving			Tested at the discretion of the Engineer.

(1) Independent Assurance Sampling and Testing required.

(3) ADOT Materials Policy and Procedure Directive.

TABLE 8
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
301 503 913 1010	Lime (for use in soil stabilization, mortar, and grout)	Chemical and Physical		See PPD [3].
407 409 411 413 414 415 416 417	Hydrated Lime (for use as mineral admixture in asphaltic concrete mixes)			Material supplied from an Approved Material Source. See PPD [3].
302 304 501 503 505 601 602 912 913 1010	Hydraulic Cement (for use in soil stabilization, mortar, and grout)	Chemical and Physical		See PPD [3].
407 409 411 413 414 415 416 417	Portland Cement and Blended Hydraulic Cement (for use as mineral admixture in asphaltic concrete mixes)			Material supplied from an Approved Material Source. See PPD [3].

[3] ADOT Materials Policy and Procedure Directive.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
501	Corrugated Metal Pipe (CMP) [Coated or Non-coated]	Yearly check by Central Lab	Supplier's Yard	Certificate of Compliance required.
501 1006	Non-Reinforced, Cast-in-Place Concrete Pipe	Compressive Strength	At Discharge [6]	Per Specifications.
		Slump		
		Air Content (when required)		
		Temperature		
		Wall Thickness	Site	
501 1010	Precast Reinforced or Non-Reinforced Concrete Pipe	Compression (D-Load)	Supplier's Yard	Certificate of Compliance required and one sample for each 100 sections per size per type.
		Wall Thickness		
Refer to Special Provisions	Vitrified Clay Pipe	Compression	Project	One sample for each 100 sections per size per type.
505	Brick for Manholes	Compression	Project	One sample (3 bricks) per project.

[6] If concrete is pumped to facilitate placement, at the discretion of the Engineer, samples may be taken from the truck and pump hose discharge to determine that the compressive strength specifications are met in the structure, and to correlate temperature, slump, and air content results. If the correlation is satisfactory and meets with the approval of the Engineer, sampling may continue from the most convenient location with occasional retesting for correlation. Rejection of concrete due to improper temperature or slump may occur at either the truck or pump hose discharge; however, rejection of concrete due to improper air content will only occur due to a failing test for a sample obtained at the final point of discharge.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Paving Brick	Compression Absorption	Project	One sample (3 paving bricks) per project.
Refer to Special Provisions	Cinder Block	Compression Absorption	Project	One sample (3 cinder blocks) per project.
Refer to Special Provisions	Slump Block	Compression Absorption	Project	One sample (3 slump blocks) per project.
604 731 1004 1012	High Strength Bolts, Nuts, Washers, or Anchor Bolts	Rockwell Hardness Wedge Tensile Strength	Project	Certificate of Analysis required and three samples per lot, or 0.1% of lots in excess of 3000, for each bolt diameter, including nuts and washers.
608 1007	Retroreflective Sheeting	Per Specifications		Certificate of Compliance required and also must be on the Department's Approved Products List
608	Sign Panel Silk-Screened Characters			Certificate of Compliance required.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
704 708 709	Glass Beads	Roundness Gradation Refractive Index Moisture Resistance Heavy Metal Concentration (if required)	Supplier's Yard (Recom-mended) or Project	See PPD [3]. For other than Dual Component Pavement Markings: Certificate of Compliance required*, and if preapproved, a copy of the Central Lab test results. If not preapproved by Central Lab, Certificate of Compliance required*, and a one gallon sample when material is supplied in a "super sack", or one full bag when material is supplied in a 50 pound bag. *If required, a Certificate of Analysis must also be submitted (certifying that the Heavy Metal Concentration meets the specifications). For Dual Component Pavement Markings: Certificate of Analysis required**, and if preapproved, a copy of the Central Lab test results. If not preapproved by Central Lab, Certificate of Analysis required**, and a one gallon sample when material is supplied in a "super sack", or one full bag when material is supplied in a 50 pound bag. **The Certificate of Analysis shall also include a Material Safety Data Sheet (MSDS).

[3] ADOT Materials Policy and Procedure Directive.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
705	Preformed Plastic Pavement Marking			Certificate of Compliance required*, and also must be on the Department's Approved Products List. *A Certificate of Analysis is also required (certifying that the Heavy Metal Concentration of the glass beads meets the specifications).
704	Thermoplastic Pavement Markings	Per Specifications	Supplier or Contractor	At the discretion of the Engineer, a sample (one gallon in a metal can) of the material from each batch or, alternatively, sufficient material from one or more bags of material to make a representative one gallon sample, may be submitted to Central Lab for testing prior to use.
			Project	Certificate of Compliance and, if applicable, a copy of the Central Materials Chemistry Lab test results are required. Also must be on the Department's Approved Products List.
				Random spot checks for thickness of thermoplastic material while being applied.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
706	Raised Pavement Markers	Per Specifications	Project	Certificate of Compliance required for markers and adhesive.
				Adhesive must be on the Department's Approved Products List.
				For non-reflective pavement markers, one sample (one marker) per lot per type.
				For reflective pavement markers, one sample (three markers) per lot per type.
708	Permanent Pavement Markings (Painted)	Per Specifications	Supplier or Contractor	A sample (one quart in a metal can) of the material from each batch must be submitted to Central Lab for testing prior to use.
			Project	Certificate of Compliance and a copy of the Central Materials Chemistry Lab test results are required.
				Check-samples of finished paint while being applied, at intervals determined by the Engineer.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
709	Dual Component Pavement Markings	Per Specifications	Project	Certificate of Analysis required and must be on the Department's Approved Projects List. Random spot checks for thickness.
732	Polyvinyl Chloride (PVC) Pipe for Electrical Conduit	Resistance to Crushing	Project	One sample per 5000 ft.
808	Polyvinyl Chloride (PVC) Pipe for Water	Wall Thickness Burst Pressure Diameter	Project	One sample per 10,000 ft.
902	Chain Link Fabric			Certificate of Compliance required.
902	Fence Post and Rails			Certificate of Compliance required.
902 903	Miscellaneous Fence Hardware			Certificate of Compliance required.
902 903	Post Clips, Hog Rings, Tie Wire, or Tension Wire			Certificate of Compliance required.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
903	Barbed Wire or Barbless Wire	Tensile Strength Spelter Diameter	Supplier's Yard or Project	Certificate of Compliance[8] required and one 4 ft. sample per 50 rolls.
903	Fence Stays			Certificate of Compliance required.
903	T-Post	Weight/Foot Length	Supplier's Yard or Project	Certificate of Compliance[8] required and one post per 500 posts, or fraction thereof, per lot.
903	Woven Wire Fabric	Spelter Diameter Tensile Strength	Supplier's Yard or Project	Certificate of Compliance[8] required and one sample [3 feet long, the full height (width) of the fabric] per 50 rolls.
904 913	Wire Rope			Certificate of Compliance required.

[8] Certifying that manufacturing processes and application of coating occurred in the United States. (This certification required for Federal-Aid projects only. See Special Provisions for exception based on quantity being used.)

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1002	Paint	Per Specifications		Paint for use on structural steel and other metallic surfaces:
			Project	Certificate of Compliance is required and the system must be on the Department's Approved Products List.
				Paint for use on concrete or masonry surfaces:
			Supplier or Contractor	A sample (one quart in a metal can) of the material from each batch must be submitted to Central Lab for testing prior to use.
			Project	Certificate of Compliance and a copy of the Central Materials Chemistry Lab test results are required. Also must be on the Department's Approved Products List.
				Paint for use on other than structural steel and other metallic surfaces, concrete surfaces, or masonry surfaces:
			Project	Certificate of Compliance is required and one sample (one quart in a metal can) per batch submitted to Central Lab for testing.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1012	Guardrail Elements			Certificate of Compliance required.
1012	Guardrail Fasteners	Rockwell Hardness Tensile Strength	Project	For other than High Strength Anchor Bolts, Certificate of Compliance required and three samples per lot, or 0.1% of lots in excess of 3000, for each bolt diameter, including nuts and washers. For High Strength Anchor Bolts, see Page 51.
1012	Guardrail Posts and Blocks	None		Certificate of Compliance required. For timber guardrail posts and blocks, see PPD [3].

[3] ADOT Materials Policy and Procedure Directive.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1014	Geosynthetics		Supplier and Project	If material has been preapproved, Certificate of Compliance required and one sample for every 10 rolls per lot. (Minimum of one sample per lot.) Samples shall not be taken within 5 feet from either end of the roll, and shall be at least 6 feet long by the full width of the roll.
			Project	If material has not been preapproved, Certificate of Analysis required and one sample for every 10 rolls per lot. (Minimum of one sample per lot.) Samples shall not be taken within 5 feet from either end of the roll, and shall be at least 6 feet long by the full width of the roll.

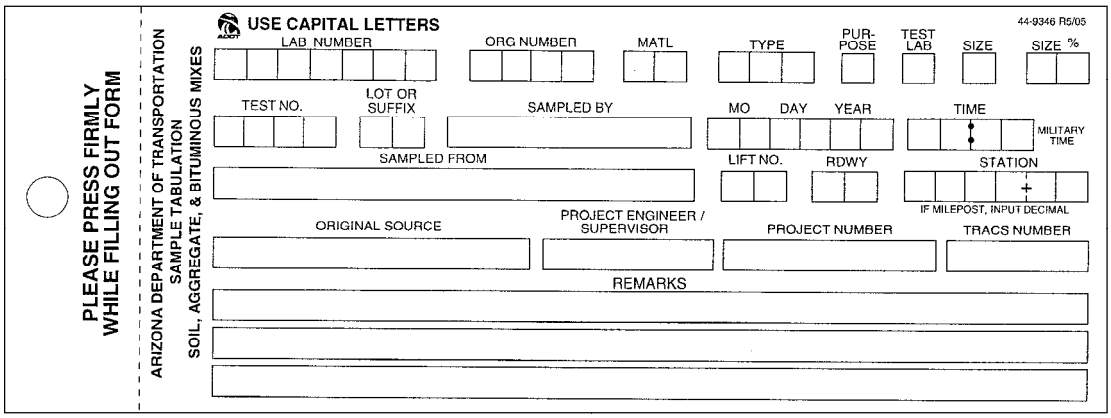
NOTE: Information on Geosynthetics continued on next page.

TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
NOTE: Information on Geosynthetics continued from previous page.				
1014 412	Pavement Fabric	Per Specification Subsection 1014-2		
1014 306	Geogrid	Per Specification Subsection 1014-3		
1014 208	Separation Geotextile Fabric	Per Specification Subsection 1014-4		
1014 913	Bank Protection Fabric	Per Specification Subsection 1014-5		
1014 203	Geocomposite Wall Drain System	Per Specification Subsection 1014-6		
1014 307	Geocomposite Edge Drain System	Per Specification Subsection 1014-7		
208	Geomembrane	See Special Provisions.		

TABLE 9
ILLUSTRATION OF SAMPLING TICKET AND LISTING OF CODES FOR PURPOSE, TESTING LAB, SIZE, AND ROADWAY

Sample Ticket



Purpose Codes

A Acceptance
M Miscellaneous
C Control
P Independent Assurance
I Informational

Testing Lab Codes

C Central Lab
R Regional Lab
P Project Lab

Size Codes

Stockpiles:
- B Blend
- F Fine
- I Intermediate
- C Coarse
- K Coarsest

Bins:
- 9 Composite of Bins
- 1 Bin #1
- 2 Bin #2, etc.

Roadway Codes

NB Northbound
SB Southbound, etc.
RA Ramp A
RB Ramp B, etc.
FR Frontage Road
XR Crossroad

TABLE 10
LISTING OF MATERIAL CODES AND TYPE CODES
USED BY FAST [Field Office Automation SysTem] [9]

Material Description	Material Code	Type Description	Type Code
Admix	AD		
Aggregate	AG	Bituminous Treated Base	BB
Aggregate	AG	Cement Treated Base	CB
Aggregate	AG	Cement Treated Subgrade	CS
Aggregate	AG	Lean Concrete Base	LC
Aggregate	AG	Lime Treated Subgrade	LS
Aggregate	AG	Road Mix	RM
Aggregate	AG	Soil Cement	SC
Aggregate Base	AB	Class 1	1
Aggregate Base	AB	Class 2	2
Aggregate Base	AB	Class 3	3
Aggregate Subbase	AS	Class 4	4
Aggregate Subbase	AS	Class 5	5
Aggregate Subbase	AS	Class 6	6
Arrestor Bed Aggregate	AA		
Asphaltic Concrete	AC	1/2" Asphaltic Concrete	12
Asphaltic Concrete	AC	1/2" Fine Band 417 AC	12F
Asphaltic Concrete	AC	1/2" Coarse Band 417 AC	12K
Asphaltic Concrete	AC	3/4" Asphaltic Concrete	34
Asphaltic Concrete	AC	3/4" Fine Band 417 AC	34F
Asphaltic Concrete	AC	3/4" Coarse Band 417 AC	34K
Asphaltic Concrete	AC	Asphaltic Concrete Friction Course (ACFC)	FC
Asphaltic Concrete	AC	Asphalt-Rubber Asphaltic Concrete (AR-AC)	RD
Asphaltic Concrete	AC	Asphalt-Rubber Asphaltic Concrete Friction Course (AR-ACFC)	RF
Asphaltic Concrete	AC	Base Mix	BM
Asphaltic Concrete	AC	Bituminous Treated Base	BB
Asphaltic Concrete	AC	AZ409 Miscellaneous Structural	409MI
Asphaltic Concrete	AC	AZ409 Miscellaneous Structural (Special Mix)	409SP

[9] FAST may revise codes, delete codes, or add codes at various times. Users must assure that they are utilizing the current FAST codes.

TABLE 10 (continued)
LISTING OF MATERIAL CODES AND TYPE CODES
USED BY FAST [Field Office Automation SysTem] [9]

Material Description	Material Code	Type Description	Type Code
Asphaltic Concrete	AC	Other	OT
Asphaltic Concrete	AC	Recycled Asphaltic Concrete	RC
Asphaltic Concrete	AC	Road Mix	RM
Asphaltic Concrete Friction Course (ACFC)	FC		
Asphalt-Rubber Asphaltic Concrete (AR-AC)	RD		
Asphalt-Rubber Asphaltic Concrete Friction Course (AR-ACFC)	RF		
Backfill	BF	Aluminum Pipe	AP
Backfill	BF	Concrete Pipe	CP
Backfill	BF	Metal Pipe	MP
Backfill	BF	Plastic Pipe	PP
Backfill	BF	Slurry	SL
Backfill	BF	Special	SP
Backfill	BF	Trench	TR
Bedding Material	BM	Concrete Pipe	CP
Bedding Material	BM	Corrugated Metal Pipe	MP
Bedding Material	BM	PVC Pipe	PV
Bedding Material	BM	Slurry	SL
Blotter Material	BL		
Borrow	BW		
Cement Stabilized Alluvium	CS		
Coarse Aggregate	CA	Size 1	1
Coarse Aggregate	CA	Size 2	2
Coarse Aggregate	CA	Size 3	3
Coarse Aggregate	CA	Size 4	4
Coarse Aggregate	CA	Size 5	5
Coarse Aggregate	CA	Size 6	6
Coarse Aggregate	CA	Size 7	7
Coarse Aggregate	CA	Size 8	8
Coarse Aggregate	CA	Size 9	9

[9] FAST may revise codes, delete codes, or add codes at various times. Users must assure that they are utilizing the current FAST codes.

TABLE 10 (continued)
LISTING OF MATERIAL CODES AND TYPE CODES
USED BY FAST [Field Office Automation SysTem] [9]

Material Description	Material Code	Type Description	Type Code
Coarse Aggregate	CA	Size 10	10
Coarse Aggregate	CA	Size 24	24
Coarse Aggregate	CA	Size 56	56
Coarse Aggregate	CA	Size 57	57
Coarse Aggregate	CA	Size 67	67
Coarse Aggregate	CA	Size 68	68
Coarse Aggregate	CA	Size 78	78
Coarse Aggregate	CA	Size 89	89
Coarse Aggregate	CA	Size 357	357
Coarse Aggregate	CA	Size 467	467
Coarse Aggregate	CA	Composite Samples	NA
Cover Material	CM		
Crash Barrel Sand	CB		
Decomposed Granite	DG		
Embankment	EM		
Entrained Air (Air Content)	ET		
Filter Material	FM		
Fine Aggregate	FA		
Fly Ash	FF		
Granite Mulch	GM		
Granulated (Crumb) Rubber	GR		
Grout	GT		
Maintenance	MT		
Membrane Seal	MS		
Mineral Aggregate	MA		
Mineral Aggregate	MA	1/2" Asphaltic Concrete	12
Mineral Aggregate	MA	1/2" Fine Band 417 AC	12F
Mineral Aggregate	MA	1/2" Coarse Band 417 AC	12K
Mineral Aggregate	MA	3/4" Asphaltic Concrete	34
Mineral Aggregate	MA	3/4" Fine Band 417 AC	34F
Mineral Aggregate	MA	3/4" Coarse Band 417 AC	34K
Mineral Aggregate	MA	AZ409 Miscellaneous Structural	409MI
Mineral Aggregate	MA	AZ409 Miscellaneous Structural (Special Mix)	409SP

[9] FAST may revise codes, delete codes, or add codes at various times. Users must assure that they are utilizing the current FAST codes.

TABLE 10 (continued)
LISTING OF MATERIAL CODES AND TYPE CODES
USED BY FAST [Field Office Automation SysTem] [9]

Material Description	Material Code	Type Description	Type Code
Mineral Aggregate	MA	Asphaltic Concrete Friction Course (ACFC)	FC
Mineral Aggregate	MA	Asphalt-Rubber Asphaltic Concrete (AR-AC)	RD
Mineral Aggregate	MA	Asphalt-Rubber Asphaltic Concrete Friction Course (AR-ACFC)	RF
Mineral Aggregate	MA	Base Mix	BM
Mineral Aggregate	MA	Other	OT
Mineral Aggregate	MA	Recycled Asphaltic Concrete	RC
Natural Ground	NG		
Other	OT		
Pipe Plating	PM		
Pneumatically Placed Mortar	NM		
Reclaimed Asphalt Pavement	RP	Coarse	C
Reclaimed Asphalt Pavement	RP	Fine	F
Reclaimed Asphalt Pavement	RP	Other	O
Rip Rap	RR		
Rock Mulch	RM		
Slurry	SL	3/8" Aggregate	38
Slurry	SL	#4 Aggregate	4
Structure Backfill	SB		
Subgrade	SG		
Subgrade Seal	SS		
Top Soil	TS		
Water	HO		
Winter Cinders	WC		

[9] FAST may revise codes, delete codes, or add codes at various times. Users must assure that they are utilizing the current FAST codes.

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Blotter Material	10
Borrow	1
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TABLE 11 (continued)
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APPENDIX D

CODE OF FEDERAL REGULATIONS

23 CFR 637, SUBPART B
"QUALITY ASSURANCE PROCEDURES FOR CONSTRUCTION"

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CODE OF FEDERAL REGULATIONS

23 CFR 637, Subpart B

"Quality Assurance Procedures for Construction"

April 1, 2013

§ 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.

§ 637.203 Definitions.

Acceptance program. All factors that comprise the State transportation department's (STD) determination of the quality of the product as specified in the contract requirements. These factors include verification sampling, testing, and inspection and may include results of quality control sampling and testing.

Independent assurance program. Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program. Test procedures used in the acceptance program which are performed in the STD's central laboratory would not be covered by an independent assurance program.

Proficiency samples. Homogeneous samples that are distributed and tested by two or more laboratories. The test results are compared to assure that the laboratories are obtaining the same results.

Qualified laboratories. Laboratories that are capable as defined by appropriate programs established by each STD. As a minimum, the qualification program shall include provisions for checking test equipment and the laboratory shall keep records of calibration checks.

Qualified sampling and testing personnel. Personnel who are capable as defined by appropriate programs established by each STD.

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

Quality control. All contractor/vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements.

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

Vendor. A supplier of project-produced material that is not the contractor.

Verification sampling and testing. Sampling and testing performed to validate the quality of the product.

§ 637.205 Policy.

(a) *Quality assurance program.* Each 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. The program must meet the criteria in § 637.207 and be approved by the FHWA.

(b) *STD capabilities.* The STD shall maintain an adequate, qualified staff to administer its quality assurance program. The State shall also maintain a central laboratory. The State's central laboratory shall meet the requirements in § 637.209(a)(2).

(c) *Independent assurance program.* Independent assurance samples and tests or other procedures shall be performed by qualified sampling and testing personnel employed by the STD or its designated agent.

(d) *Verification sampling and testing.* The verification sampling and testing are to be performed by qualified testing personnel employed by the STD or its designated agent, excluding the contractor and vendor.

(e) *Random samples.* All samples used for quality control and verification sampling and testing shall be random samples.

§ 637.207 Quality assurance program.

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

(1) Acceptance program.

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

(A) Frequency guide schedules for verification sampling and testing which will give general guidance to 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.

(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 within the STD.

(iv) In the case of a design-build project on the National Highway System, 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 the 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 the 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 completed facility for a specific time period.

[60 FR 33717, June 29, 1995, as amended at 67 FR 75934, Dec. 10, 2002]

§ 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.

[60 FR 33717, June 29, 1995, as amended at 72 FR 54212, Sept. 24, 2007]

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 tests that are 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.