WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

PROCEDURE FOR THE INDEPENDENT ASSURANCE PROGRAM

1. PURPOSE

1.1 To provide a procedure for the WVDOH to meet FHWA's requirements for the Independent Assurance (IA) program.

2. SCOPE

2.1 This procedure applies to the following IA Materials:

2.1.1 Portland Cement Concrete (PCC)

2.1.2 Asphalt

2.1.3 Aggregate

2.1.4 Compacted Soil, Aggregate and Asphalt Materials

2.1.4.1 The WVDOH is in the process of evaluating the method to incorporate this testing into the IA program.

3. REFERENCED DOCUMENTS

3.1 Office of Pavement Technology Publication No. FHWA-HIF-12-001[1], October 2011. Included as Attachment 2.

3.2 23 CFR - PART 637—CONSTRUCTION INSPECTION AND APPROVAL[2]

3.3 MP 106.03.50 - General Information Guide for Technician and Inspector Certification Program (TICP).

3.4 MP 700.00.54 - Procedure for Evaluating Quality Control Sample Test Results with Verification Sample Test Results

3.5 AASHTO R44-07.

4. DEFINITIONS

4.1 QA – Quality Acceptance: The Division test used for the acceptance of material on a project.

4.2 IA Sampler: The employee(s) at MCS&T Division who oversees the IA program. This person may perform 1:X testing when the population (X) is not large enough to compare samples statistically or comparing samples statistically is not practical. The IA Sampler may, at the discretion of the Director of MCS&T, delegate this task to a qualified Division employee.

[1] https://www.fhwa.dot.gov/pavement/materials/hif12001.pdf
[2] https://www.ecfr.gov/current/title-23/chapter-I/subchapter-G/part-637

4.3 Evaluation Period: The calendar year in which the IA program is evaluated. This begins on January 1st and ends on December 31st of the same year.

4.4 IA Material: Each unique material that is evaluated by the IA program. These materials are listed in Section 2.1 of this document.

4.5 IA Test: A test that is performed by a QA Tester which is evaluated either directly or indirectly by the IA sampler to demonstrate both the QA Tester and their QA Testing Equipment's proficiency.

4.6 QA Tester: Each individual who performs an IA Test on an IA Material for QA, during the Evaluation Period. Each unique instance of these must be evaluated based on the frequency noted in Section 5.

4.7 QA Testing Equipment: Each primary piece of equipment used to perform an IA Test on an IA Material for QA, during the Evaluation Period. This equipment is noted in the respective sections of this document. Each unique instance of these must be evaluated based on the frequency noted in Section 5.

4.8 AASHTO: The American Association of State Highway and Transportation Officials, a nonprofit organization that sets technical standards for highway systems and acts as a liaison between state and federal transportation departments.

4.9 AASHTO re:source[3]: A technical services program that provides audits and accreditation to material testing laboratories. This program distributes proficiency samples nationally and evaluates the results. The WVDOH uses the evaluations from this program for both asphalt and aggregate IA Tests.

4.10 Proficiency Sample: A single (homogeneous) sample that is distributed by an agency or designated agent to be tested at multiple laboratories. The distributing agency will provide a "score", which statistically compares results amongst the laboratories.

4.11 Split Sample: A single sample taken by a single entity that is divided into two or more separate sub-samples for subsequent laboratory analysis. The division shall be done such that these sub-samples are equivalent.

4.12 Satisfactory Evaluation: If the results of a test fall within the guidelines established in Section 13 of this document, the test will be considered satisfactory.

4.13 Non-Satisfactory Evaluation: If the results of a test do not fall within the guidelines established in Section 13 of this document, the test will be considered non-satisfactory.

4.14 Corrective Action Report (CAR): An action report identifying the probable source of a Non-Satisfactory Evaluation. This report identifies the non-conformance, explains issues which lead to this non-conformance, and explains corrective actions to address this non-conformance.

5. SYSTEM APPROACH FOR IA SAMPLING AND TESTING

5.1 The WVDOH IA program shall operate under the system approach as described in Office of Pavement Technology Publication No. FHWA-HIF-12-001 and AASHTO R44-07.

[3] https://aashtoresource.org/

5.2 Each QA Test Equipment and each QA Tester shall be evaluated for each Evaluation Period. Redundant testing shall be avoided unless a failure or faulty testing is reported during the testing.

5.3 If a QA Tester is testing and the equipment fails, they shall complete the test on another piece of equipment. If this occurs, it shall be noted in a corrective action report.

5.4 The goal of the IA program is to meet a 90% evaluation threshold for each QA Tester and QA Test Equipment. Each of these entities is considered separate and independent of each other.

5.5 QA Testers shall be evaluated for each unique IA Material they test during the evaluation period. If a person tests multiple IA Materials during the evaluation period, they will be required to be evaluated for each material independently.

5.6 The evaluation procedure for tests is described in Section 13 of this document.

5.7 If the 90% evaluation threshold is not met, a corrective action summary shall be included in the IA report.

6. POPULATION OF QUALITY ACCEPTANCE TESTERS AND EQUIPMENT

6.1 Once per year, before any work is performed by District QA Testers, a signed letter stating the names of each of their QA Testers shall be submitted by the District Construction Engineer to the Director of MCS&T Division. In lieu of this letter, Districts may utilize an MCS&T provided online form.

6.2 If, during the calendar year, additional QA Testers are added to the District's roster, the District Construction Engineer shall submit an amended list to the Director of MCS&T Division. This shall be done before any quality assurance work is performed by the tester.

6.3 In the event where a project incorporates non-DOH QA Testers and/or QA Testing Labs, the District Construction Engineer shall submit to the Director of MCS&T a signed letter stating the names of each of the QA Testers. As part of their duties, this person must participate in the IA program for each evaluation period.

6.4 All QA Testing Equipment shall be inventoried yearly and entered into the Division's approved equipment tracking system. If additional testing equipment is acquired, it shall be added to this system.

7. PORTLAND CEMENT CONCRETE (PCC)

7.1 Each QA Tester who tests PCC during the evaluation period shall perform an IA Test corresponding to the test they performed during that evaluation period.

7.2 The minimum required IA Sample test frequency for each QA Tester and QA Test Equipment is as follows:

PCC IA Samples Frequency	
Air – AASHTO T 152	1/Year
Compressive Strength Testing - AASHTO T 22	1 Set/Year
Slump – AASHTO T 119	1/Year

7.3 For PCC, the Division will host at least one in-house proficiency sample style test of plastic concrete. This event shall be a group event where plastic concrete is provided, and each QA Tester is present. The QA Tester will test the material using the equipment they typically use to test concrete. If a QA Tester cannot attend this event, they shall attend a make-up event or be individually evaluated by the IA sampler.

7.4 Plastic Concrete Testing:

7.4.1 For plastic concrete testing, each QA Tester, their testing equipment, as well as their results shall be recorded.

7.4.2 Plastic concrete testing at a minimum includes AASHTO T 152 (air content) and AASHTO T 119 (slump).

7.4.3 During the event described in Section 7.3, the IA Sampler as well as representatives from MCS&T Division will observe the QA Testers to ensure proper testing procedures are followed.

7.4.4 If a QA Tester is observed deviating significantly from testing procedures, the IA Sampler or an MCS&T Division representative may note that test as a Non-Satisfactory Evaluation, regardless of the QA Tester's results. In this case, the test shall be considered Non-Satisfactory, and a CAR will be required. Also, the QA Tester's results shall be discarded from the population of results.

7.5 Cylinder Testing:

7.5.1 For each set of cylinders in cylinder testing the QA Tester, testing equipment, and results shall be recorded and sent to the IA sampler.

7.5.1.1 The cylinder fabricator for each set of cylinders shall follow AASHTO T 23 and is evaluated visually by the IA Sampler or representative from MCS&T Division to ensure proficiency in the procedure. The fabricator is also documented so that any severe outliers in the Compressive Strength Testing results and their root cause can be investigated.

7.5.2 Cylinder testing at a minimum includes AASHTO T 22 (compressive strength).

7.5.3 At the event described in Section 7.3, a standard set of 4"x8" cylinders shall be created for each of the QA Testers who performs the AASHTO T22 test at each District. This set of cylinders shall be fabricated by a tester from that District, if one is present. If a District has more than 1 QA Tester or more than 1 set of testing equipment, additional sets of cylinders shall be fabricated for each instance.

7.5.4 In the instance of a non-DOH testing laboratory, a certified individual from the lab's primary District shall fabricate the cylinders as they would for their own District testing laboratory.

7.5.5 If a QA Tester for a particular District does not attend, a set of cylinders shall be fabricated for that District by either the IA Sampler or another District. This set of cylinders will be tested by that District but will only be considered a "back-up" case if that District cannot attend another session.

7.6 For PCC the QA Testing Equipment is as follows:

1. Compressive Strength Testing Machine
2. Type B Pressure Meter
3. Slump Cone

8. ASPHALT CONTENT – IGNITION OVEN – BURN OFF

8.1 Each QA Tester who tests for Asphalt Content during the evaluation period shall perform a yearly burn off IA Test.

8.2 The minimum required IA Sample test frequency for each QA Tester and QA Test Equipment is as follows:

Asphalt IA Samples	
Asphalt Content by Ignition - AASHTO T 308	1/year
Percent Passing the #200 Sieve - AASHTO T 30	1/year

8.3 AASHTO re:source:

8.3.1 Each QA Tester shall participate in the AASHTO re:source proficiency program for Asphalt Mixture Ignition Oven (HMI). This shall apply to all the tests listed in Section 8.2.

8.3.2 If there are more QA Testers in a District than distributed samples, the District shall request additional AASHTO re:source aggregate samples.

8.4 MCS&T Distributed Samples:

8.4.1 Since most Districts operate multiple ignition ovens, in addition to the AASHTO re:source samples, MCS&T Division shall obtain and distribute a homogeneously split sample for each of the District's ignition ovens.

8.4.2 MCS&T shall also distribute a sample of this material to Non-DOH laboratories for each QA Tester and QA testing equipment.

8.5 For AASHTO re:source and MCS&T distributed samples, the QA Tester, QA Testing Equipment, and test results shall be recorded and sent to the IA Sampler. This shall apply to all the tests listed in Section 8.2.

8.6 For Ignition Oven Asphalt tests the QA Testing Equipment is as follows:

1. Ignition Oven

9. SUPERPAVE ASPHALT CONCRETE

9.1 Each QA Tester who tests SuperPave Asphalt Concrete during the evaluation period, in addition to the yearly burn off IA test, shall perform an IA Test corresponding to each test they performed during that evaluation period.

9.2 The minimum required IA Sample test frequency for each QA Tester and QA Test Equipment is as follows:

SuperPave IA Samples	
Air Voids - AASHTO T 269	1/year
Bulk Specific Gravity, Vacuum - AASHTO T 331	1/year
Bulk Specific Gravity, SSD - AASHTO T 166	1/year
Maximum Specific Gravity - AASHTO T 209	1/year

9.3 Each QA Tester shall participate in the AASHTO re:source proficiency program for Asphalt Mixture Gyratory (HMG) for SuperPave Asphalt Material. This shall apply to all the tests listed in Section 9.2.

9.3.1 If a District has multiple QA Testers and/or QA Testing Equipment, that District shall request additional AASHTO re:source samples to ensure that all QA Testers and QA Testing Equipment are evaluated.

9.4 The QA Tester, QA Testing Equipment, and test results shall be recorded and sent to the IA Sampler. This shall apply to all the tests listed in Section 9.2.

9.5 For SuperPave Asphalt Concrete the QA Testing Equipment is as follows:

1. Gyratory Compactor
2. Core Lok - Asphalt Density Measurement System

10. MARSHALL ASPHALT CONCRETE

10.1 Each QA Tester who tests Marshall Asphalt Concrete during the evaluation period, in addition to the yearly burn off IA test, shall perform an IA Test corresponding to each test they performed during that evaluation period.

10.2 The minimum required IA Sample test frequency for each QA Tester and QA Test Equipment is as follows:

Marshall IA Samples	
Bulk Specific Gravity, SSD - AASHTO T166	1/year
Maximum Specific Gravity - AASHTO T209	1/year
Air Voids - AASHTO T 269	1/year
Marshall Stability/Flow - AASHTO T245	1/year

10.3 Each QA Tester shall participate in the AASHTO re:source proficiency program for Asphalt Mixture Marshall Design (MAR) for Marshall Asphalt Material. This shall apply to all the tests listed in the Table in Section 10.2.

10.3.1 If a District has multiple QA Testers and/or QA Testing Equipment, that District shall request additional AASHTO re:source samples to ensure that all QA Testers and QA Testing Equipment are evaluated.

10.4 The QA Tester, QA Testing Equipment, and test results shall be recorded and sent to the IA Sampler. This shall apply to all the tests listed in Section 10.2.

10.5 For Marshall Asphalt Concrete the QA Testing Equipment is as follows:

1. Marshall Hammer
2. Marshall Stabilometer

11. AGGREGATE GRADATION

11.1 Each QA Tester who tests Aggregate during the evaluation period shall perform an IA Test corresponding to the test they performed during that evaluation period.

11.2 The minimum required IA Sample test frequency for each QA Tester and each piece of QA Testing Equipment is as follows:

Aggregate Gradation Samples	
AASHTO T27 (Sieve Analysis of Aggregates)	1/year
AASHTO T11 (Materials Finer Than No. 200 Sieve)	1/year

11.3 AASHTO re:source

11.3.1 Each District QA Tester shall participate in the AASHTO re:source proficiency program for Aggregate.

11.3.2 If there are more QA Testers in a District than distributed samples, the District shall request additional AASHTO re:source aggregate samples.

11.4 MCS&T Distributed Samples:

11.4.1 Because the Districts have multiple shakers, in addition to the AASHTO re:source samples, MCS&T shall distribute a homogeneously split sample to each testing lab for each set of QA testing equipment. Any QA Tester in the District may test these samples.

11.4.2 MCS&T shall also distribute a sample of this material to non-DOH laboratories for each QA Tester and QA testing equipment.

11.4.3 The specific class and type of material shall be selected by the IA Sampler. The material shall consist of AASHTO specified gradation.

11.5 All specified sieves will be evaluated for the material passing. For the AASHTO re:source proficiency sample, all scored sieves will be evaluated.

11.6 For AASHTO re:source and MCS&T distributed samples the QA Tester, QA Testing Equipment, and test results shall be recorded and sent to the IA Sampler. This shall apply to all the tests listed in Section 11.2.

11.7 For Aggregate Gradations the QA Testing Equipment is as follows:

1. Aggregate Shaker

12. COMPACTION

12.1 The WVDOH is currently evaluating the process of adding Asphalt and/or Aggregate/Soil Compaction to the IA program. The goal is to add this to the program for the 2026 evaluation period.

13. EVALUATION PROCEDURE

13.1 IA Samples will be evaluated statistically when the population of results is 5 or greater. If the IA Sample is not provided by AASHTO re:source in the form of a Proficiency Sample, it will be evaluated by the WVDOH IA Sampler. The calculation method used by ASHTO re:source shall be followed. The calculation method is shown in Attachment 3.

13.2 If the samples are provided by AASHTO re:source a rating of 3, 4, 5, as assigned by the testing agency, shall be considered satisfactory.

13.3 In the event where the population is less than 5, samples will be evaluated by averaging the test results and using the respective AASHTO Precision and Bias Table as the acceptable range of values between the IA Sampler and the QA Tester(s). In

this event, the evaluation method will be specifically described in that year's IA report.

13.3.1 For example, if the average is 5.0 and the table provides a precision and biased of 1.2, the test values must fall between 3.8 and 6.2 to be considered satisfactory.

13.4 If the results of an evaluation are satisfactory, the evaluation will be considered successful. A successful evaluation will verify both the QA Tester and the QA Testing Equipment used during the IA Test.

13.5 If the results of an evaluation are deemed non-satisfactory, the IA Test will be reviewed by the IA Sampler and/or the respective District Materials Supervisor. Within 30 days of notification of the non-satisfactory evaluation, the reviewer shall submit a Corrective Action Report to the Director of Materials Control Soils and Testing Division. This Corrective Action Report will be included in the yearly IA Report. A sample of this Corrective Action Report is provided in Attachment 1. The live version of the file is in the WVDOH MCS&T Toolbox[4].

13.5.1 If possible, an additional IA Sample will be tested by the QA Tester in that calendar year, using the same QA Testing Equipment. This IA Test will be closely observed by the IA Sampler or their designee to help establish the root cause.

13.5.2 If this cannot be accomplished during the calendar year, the process will be followed for the subsequent calendar year's IA Sample.

13.5.3 If the QA Tester's evaluation for a given test is non-satisfactory for two or more successive evaluation periods, and is not caused by QA test equipment or sampling methods, then actions outside a CAR shall be taken by the IA Sampler to confirm the Tester's proficiency for the given test.

13.6 The evaluation criteria in this section shall be evaluated every three years. The most recent evaluation of this criterion was on :

NOVEMBER 10, 2025 by Michael Mance Digitally signed by Michael Mance Date: 2025.11.10 09:50:57 -05'00' (Director of MCS&T)**.

** Note: This document shall be effective as per the signature date at the end of this document. However, the live version of this document will be updated as indicated above. This review date will not affect the signature nor effective date of the procedure, but rather provide documentation of WVDOH's compliance with Federal guidelines.

14. RECIPROCITY OF IA TESTING AND TECHNICIAN CERTIFICATION

14.1 If the practical exam portion of the technician certification program (as described in MP 106.03.50) is equivalent to that of an IA Sample, reciprocity between these tests can be applied if agreed upon by both the Technician Certification Coordinator and the IA Sampler.

14.2 At the discretion of the Technician Certification and Training Coordinator, a successful IA sample may be considered the "Practical" portion of a technician's recertification for the respective material.

14.3 At the discretion of the IA sampler, the practical portion of either a certification or recertification may be considered a successful IA sample.

[4] https://transportation.wv.gov/highways/mcst/Pages/tbox.aspx

15. REPORTING

15.1 The evaluation period shall be the calendar year, starting with January 1st and ending December 31st.

15.2 The annual IA report shall be submitted to FHWA. The due date for the report is April 1st of the year following the evaluation year. The annual report shall include the following information: the number of certified technicians, the number of testing equipment used for QA, the number of active technicians, the number of technicians covered by the IA program, the number of IA Samples that were Non-Satisfactory, and a summary of the Corrective Action Reports along with the potential systematic solutions to reoccurring deficiencies (FHWA-HIF-12-001).

15.2.1 The report shall also include a summary of the Division's performance verifying QC samples with QA samples during as per MP 700.00.54. The evaluation shall be for each of the required tests for each material during the evaluation period.

Michael Mance

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Date: 2025.11.10 09:51:12 -05'00'

Michael A Mance, PE
Director
Materials Control, Soils & Testing Division

MP 700.00.53 Steward – Materials Control Section
MAM:Bb
ATTACHMENTS

Attachment 1: Sample Corrective Action Report

WVDOH Independent Assurance Corrective Action Report		
	Form 2025-IA-CAR	
Date of Occurrence:		
Date Submitted:		
Name of Tester:		
Testing Equipment:		
Material Tested:		
Describe the issue reported:		
Sample		
What was the root cause of the issue?		
What actions have been done to correct this issue?		
Signature of QA Tester		
Signature of District Materials Supervisor		
Signature of District Construction Engineer	Review: MCST	

TechBrief

The Construction and Materials Quality Assurance Program is an integrated, national effort to improve the effectiveness of the State acceptance of materials both in the inspection, sampling and testing. The program is designed to provide tools and guidance in implementing Quality Assurance programs. The program is designed to provide tools and guidance in implementing Quality Assurance programs.

U.S. Department of Transportation
Federal Highway Administration

Office of Pavement Technology

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INDEPENDENT ASSURANCE PROGRAMS

This Technical Brief provides information regarding independent assurance as it relates to activities for the evaluation of the sampling and testing procedures used in a materials and quality acceptance program.

Introduction

23 CFR 637 defines an Independent Assurance Program as: Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program.

An Independent Assurance Program ensures the sampling and testing is performed correctly and the testing equipment used in the program is operating correctly and remains calibrated. It involves a separate and distinct schedule of sampling, testing and observation.

Qualified sampling and testing personnel, other than those performing the verification and quality control (QC) sampling and testing, should perform the Independent Assurance (IA) tests. Likewise, equipment other than that used for verification and QC should be used for IA sampling and testing. By regulation IA sampling and testing is conducted by agency personnel or an accredited laboratory designated by the agency.

The regulation requires IA specifically be designed to include testing performed on project produced materials. Since the testing of project produced materials are tested in multiple locations and by multiple personnel it is necessary to have some assurance the testing is being performed accurately. Manufactured products are typically tested in the State's central laboratory or by a designated consultant laboratory. Testing in the central laboratory is considered to be covered by the laboratories accreditation and participation in proficiency testing.

Background

In the early sixties Congressional investigation uncovered improper testing and fraud in some of the federally funded highway projects. To address the issue of improper testing a separate sampling and testing program was developed. The program was operated by personnel different than project personnel on different equipment. The samples were split with project personnel and the test results were compared. In addition, testing procedures were also observed. This was done to ensure sampling procedures were performed correctly and equipment stayed in calibration. In later rewrites of the regulation this program became the Independent Assurance program.

Scope

The regulation, 23 CFR 637, only covers projects that are on the National Highway System (NHS). The regulation requires testing personnel that perform any verification testing or QC testing used in the acceptance decision be covered by an IA program regardless of the agency, including a local agency or a toll authority administering a project.

Some States have IA testing personnel perform other duties such as: (1) instructing other testers, (2) obtaining samples for the verification of manufactured products,(3) obtaining samples of aggregate, cement, binder samples at production facilities for purposes other than IA, (4) inspecting precast or other facilities. Even though these functions are a necessary part of an overall Quality Assurance (QA) program they will not be discussed in this Tech Brief since the purpose of this Tech Brief is to discuss the IA functions as defined in the regulation.

Regulation 23 CFR 637

The text of the entire regulation can be found at this website:
http://www.access.gpo.gov/nara/cfr/waisidx_03/23cfr637_03.html

The following is a summary of the elements of the IA program:

1. Establish IA sampling and testing frequencies;
2. Evaluate testing equipment by using one or more of the following: calibration checks, split samples, or proficiency samples.
3. Evaluate testing personnel by observations and results from testing split samples or proficiency samples.
4. Prompt comparison and documentation of test results obtained by the tester being evaluated and the IA tester.
5. Develop guidelines including tolerance limits for the comparison of test results.

6. Provide an annual report to the FHWA when the system approach is used.

The rest of the Tech Brief will discuss best practices for each of the above requirements.

System versus Project Approach

The Independent Assurance Program can be set up on a project basis, which is the traditional approach, or on a system basis. The difference in the two approaches is the basis of the frequency of testing (cover all projects versus cover all personnel).

Some States have moved away from having testing personnel on all projects and are moving toward centralizing testing away from the project level. As this occurs testers may perform testing on several projects and it becomes more efficient to have a frequency based on the testers instead of projects quantities. In addition, the project approach does not always include all the testing personnel.

As States have moved toward the system approach they have also incorporated the IA program results as part of the technician qualification program.

Frequency of Independent Assurance Testing

Project Approach - The State establishes the frequency for the IA testing based on the testing frequency performed on the project or on a time frequency on a project. Typically, the States use a frequency of 10 percent of the verification/acceptance testing. For example if the verification testing is performed at the rate of 1 per 500 tons the IA frequency would be 1 per 5000 tons.

System Approach - An alternative method to basing frequency on project testing frequencies is to base the IA frequency on a time basis for all testers and equipment. In this case, the personnel and equipment would be verified on a "system" basis. The purpose is to cover all the testers and equipment over a period of a year. While States strive to reach all testers, it is not always possible. States typically set a goal of reaching 90% of the active testers. Active testers are defined as those testers that are performing testing in a given year, in most States this is a subset that is smaller than all “qualified” testers since some qualified personnel may have retired, move to other jobs or resigned. The system approach can be a more effective means of performing IA since it ensures that most testers are reviewed and that the same testers are not continually reviewed.

One challenge is to determine the active testers. For States that have an electronic materials management system it is very easy to determine the active testers since these systems indicate who is performing a given test. The IA testers will run reports periodically (monthly) to

determine the testers that need to be reviewed. For those States that do not have an electronic materials management system it becomes more challenging to determine the active testers. A good practice under these circumstances is to require the project personnel to identify the personnel that are going to perform testing, state, consultant, and contractor, at the beginning of the project along with any changes to the IA personnel. The IA testers will then know the active testers along with the testers that they have already been reviewed and will thus know the testers that need to be reviewed in the future.

Mixed Approach - It is permissible to separate the verification of equipment and personnel, i.e., one method to check equipment is to require a calibration and inspection frequency. Personnel can be checked by sending out proficiency samples. It is permissible to use a mixed approach, i.e. where some test procedures and or some testers are covered by a project approach where the remaining procedures are covered by a system approach.

Equipment and Personnel

Testing equipment may be evaluated by using one or more of the following: calibration checks, split samples, or proficiency samples.

Testing personnel may be evaluated by observations and split samples or proficiency samples.

The typical approach for performing IA is to check equipment and personnel at the same time. This is performed by IA personnel visiting a job site to observe the sampling and testing on site and to also test a split of the sample on site with equipment the IA personnel brought or to take the split to another laboratory for testing. When the test results are compared it checks both the equipment and tester. If a set of samples do not compare further analysis is required to determine if the source of the error is in procedure or equipment.

Some States send out proficiency samples to district, other subsidiary laboratories as well as consultants and contractors. Some of these States develop their own samples, while others require the laboratories to subscribe to the AASHTO Materials Reference proficiency samples. Proficiency samples are a way to address equipment and test procedures. Some States are preparing enough proficiency samples for all the active testers. In cases where all the testers are covered by the proficiency samples additional IA work would only need to review those that did not compare. If the proficiency program did not cover all the testers additional IA work would also be required.

Another method that covers just the equipment is performed by frequent standardization and or calibration. The frequency for standardization and/or calibration differs by equipment due to the unique nature of each testing device. AASHTO R-18 and some of the test procedures contain a frequency for standardization/calibration of the testing equipment. However, if standardization/calibration is the only check on the equipment (no split samples or proficiency samples) the standardization/calibration should probably be run frequently.

As some States move toward the system approach the States are checking testers in a central location. This allows the IA inspectors to cover numerous testers at one time. This has worked especially effectively in States where the projects and or laboratories are spread across a large geographic area. The States that use this approach are also including this data for requalification of testing personnel. When this approach is used the equipment needs to also be covered by standardization/calibration, split sample or proficiency sample testing.

Some States will suspend and/or revoke a technician's qualification/certification for repeated poor performance on IA evaluations. These are in addition to suspensions and/or revocation due to fraudulent activities. Some States will also perform testing on 3 way split-samples. In this approach one split is tested by project personnel, one split is tested by the contractor personnel and the third split is tested by the IA personnel. This is typically performed at the beginning of production to ensure that all testing personnel and equipment are performing correctly.

Prompt Comparison and Documentation

It is essential the IA Program compare results and detect deficiencies in State or contractor testing procedures in a timely manner. This improves the reliability of sampling and testing. The timely comparison of data may be restricted by the resources of an agency including personnel, facilities, and geographical constraints. These resource needs must be considered in an agency program.

Deviations from the established tolerances will require an engineering audit of the respective sampling and testing procedures, and the equipment used. When comparison of QC and verification data reveals significant differences in test values, the variables involved should be evaluated by the IA personnel to determine whether further testing and investigation is needed to establish the source of the discrepancy.

Corrective actions should be incorporated as appropriate under the direction of IA personnel.

Tolerances for Comparison of Test Results

A common place to start in establishing comparison tolerances are the D2S limits in the published test procedures. However, as States reduce the options in published test procedures and as testers become more proficient, the tolerances should be reduced. When split samples are used, the materials and sampling variability are eliminated from the analysis and only the variability due to the testing procedures and the equipment are included.

The comparison of split sample test results should be based on established deviation values or tolerances that are representative of the testing procedures and materials used. AASHTO and ASTM have published precision statements for some test methods. However, many of these procedures have multiple methods and or options inside the procedure. In order to reduce

testing variability most States have specified the particular options within the test procedures. Therefore the agency should develop Independent Assurance tolerances based on their specific options that the State is requiring. Care must be taken when historical data are used in establishing theses limits to ascertain that the data are not biased; i.e., they were obtained in a random manner and that all test results have been reported. Otherwise, the variability may be underestimated and the limits too restrictive.

Many States distribute proficiency samples to their district laboratories. This data can be analyzed to determine IA tolerances. The formula for D2S is $D2S = 2\sqrt{2}(1S)$ where

$1S = the\ standard\ deviation\ of\ the\ results$.

Established tolerances should be periodically evaluated and modified to ensure that the goals of IA are being met; that is, it assures the reliability of contractor and agency test results. Some States are evaluating their tolerance every year. As a minimum the tolerances should be evaluated every 5 years.

In situations where multiple split tests are performed on a project a paired t-test can also be used to analyze data.

Annual Reports

The regulation requires those States that use a system approach to prepare and submit an annual report to the FHWA Division Office.

The annual report should include the following information: the number of certified technicians, the number of active technicians, the number of technicians covered by the IA program, the number of IA reports that had deviations, and a summary of how the deviations were addressed along with the potential systematic solutions to reoccurring deficiencies.

Alternate Approach

One State is statistically analyzing State and Contractor data in an innovative manner to accomplish both verification and IA.

An example of this approach is shown in Figure 1. In this approach the contractor performs sampling and testing at the rate of 4 samples per lot. The State takes verification samples, at the beginning of production; a minimum of 4 samples are taken the first week of production and at least 1 per lot. The State's verification samples are taken at the plant by contractor personnel under the direction of the State personnel. The verification samples are split and one split is given to the contractor. Analysis is performed in two ways. First, for IA, the split results are compared using IA comparison tolerances. In the figure below; IA1 is compared to the contractor split of that sample, sample 4 of lot 1. For validation, the State verification

samples are made independent by removing the corresponding contractor splits. In the figure below samples 1, 2, 3 from lot 1; samples 1, 2, 4 from lot 2; samples 1, 2, 3 from lot 3; and samples 1, 3, 4 from lot 4 are compared to the State's IA1, IA2, IA3, and IA4 with the F& t tests.

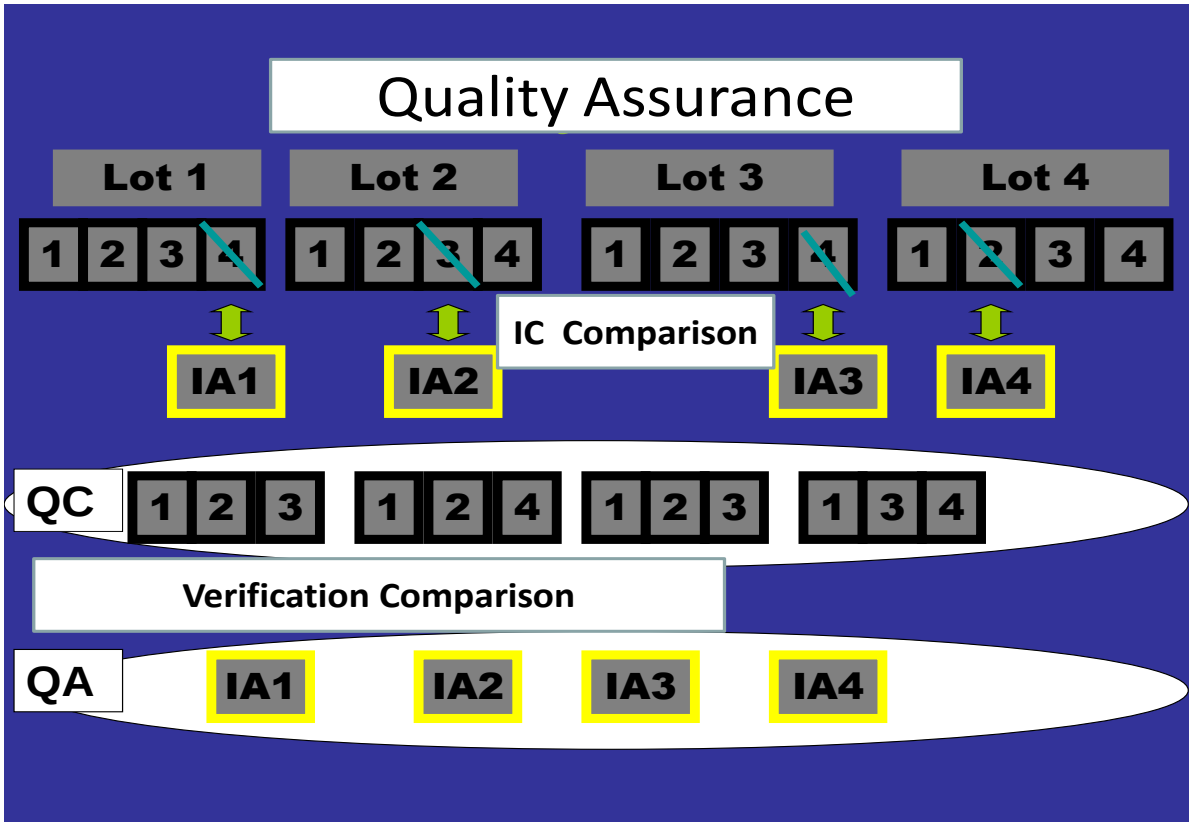

Figure 1. Example of Alternate Approach.

Conclusion - Commonly Noted Areas of Concern

- Test results from the IA program should only be compared to split test results or results from others testing the same set of proficiency samples.
- IA results are not to be used in the acceptance decision.
- IA should be based on split samples or proficiency samples not independent samples so that data can be compared without material variability.
- All tests that are performed in the field to determine the final acceptability of the materials should be covered by the IA program.

- All technicians that are performing testing that is used in the acceptance decision need to be covered by the IA program.
- Observation of sampling and testing procedures should be included as part of an IA system to evaluate sampling and testing personnel and ensure that testing and sampling procedures are performed correctly.

Further Information:

- "23 CFR Part 637," Subpart B - Quality Assurance Procedures for Construction, Federal Highway Administration, *Federal Register*, Washington, DC published on June 29, 1995, and amended on December 10, 2002, and September 24, 2007, http://www.access.gpo.gov/nara/cfr/waisidx_03/23cfr637_03.html
- Non-regulatory supplement for 23 CFR Part 637, Subpart B - Quality Assurance Procedures for Construction, Federal Highway Administration. The non-regulatory supplement was updated on July 19, 2006. http://www.fhwa.dot.gov/legsregs/directives/fapg/0637bsup.htm
- Frequently asked questions (FAQ) on the Quality Assurance Regulation. The FAQs were updated on November 26, 2006. http://www.fhwa.dot.gov/pavement/materials/matnote11.cfm - qaa
- AASHTO Standard Practice R 44, “Independent Assurance Programs” has been published in the 2007 AASHTO Standards. This guide will assist the States in developing Independent Assurance Programs
- NHI Course 134042, “Materials Control and Acceptance –Quality Assurance.” The course is four days long and covers the basic essentials of QA. A two-day version of the course is also available. http://www.nhi.fhwa.dot.gov/training/brows_catalog.aspx
- NHI Course 134064 – “Transportation Construction Quality Assurance”

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