Quality Assurance Program

Texas
Department
of Transportation

June 2005

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Quality Assurance Program
June 2005
Manual Notices

Manual Notice 2005-1*To:* Users of the *Quality Assurance Program* for Construction

From: Thomas R. Bohuslav, P.E., Director, Construction Division

Manual: *Quality Assurance Program*

Effective Date: June 1, 2005

Purpose

To make the *Quality Assurance Program* available through the TxDOT Online Manual System.

Contents

All chapters and sections of the *Quality Assurance Program*.

Supersedes

This revised document supersedes prior versions of this document..

Contact

For more information or questions regarding the manual content, contact the Construction Division, Materials & Pavements Section at 512/506-5803 or dbelser@dot.state.tx.us.

Chapter 1
Introduction

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Section 1
Overview

Introduction

The Texas Department of Transportation (TxDOT) established the Quality Assurance Program (QAP) to ensure that materials and workmanship incorporated into any highway construction project are in reasonable conformity with the requirements of the approved plans and specifications, including any approved changes. This program conforms to the criteria in 23 CFR 637(b). It consists of an "Acceptance Program" and "Independent Assurance (IA) Program" based on test results obtained by qualified persons and equipment.

The QAP allows for the use of validated contractor-performed quality control (QC) test results as part of an acceptance decision. It also allows for the use of test results obtained by commercial laboratories in the IA program, as well as in acceptance decisions. The acceptance of all materials and workmanship shall be the responsibility of the engineer.

Definitions

The following terms and definitions are referenced in this manual:

- *Abuse.* Abuse is defined as the intentional deviations from approved procedures.
- *Acceptance Program.* An Acceptance Program is defined as all factors that comprise the State highway agency's (SHA) 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.* An Independent Assurance Program is defined as 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 SHA's central laboratory, would not be covered by an independent assurance program.
- *Neglect.* Neglect is defined as unintentional deviations from approved procedures that may or may not cause erroneous results.
- *Proficiency samples.* Proficiency samples are defined as homogenous samples that are distributed and tested by two or more laboratories and/or personnel. The test results are compared to assure that the laboratories and/or personnel are obtaining the same results.
- *Qualified laboratories.* Qualified laboratories are laboratories that are capable as defined by appropriate programs established by the SHA. As a minimum, the qualification program shall include provisions for checking testing equipment and the laboratory shall keep records of calibration checks.
- *Qualified sampling and testing personnel.* Qualified sampling and testing personnel are personnel who are capable as defined by appropriate programs established by the SHA.

- *Quality assurance.* Qualified assurance is defined as all those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality.
- *Quality control.* Quality control is defined as all contractor/vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements.
- *Vendor.* Vendor is defined as a supplier of project-produced material that is not the contractor.
- *Verification sampling and testing.* Verification sampling and testing is defined as sampling and testing performed to validate the quality of the product.

Remarks

For more information regarding the information and procedures in the manual, contact the Materials & Pavements Section of the Construction Division (512-506-5803).

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Section 1

Overview

Materials incorporated into any highway construction project shall be subject to verification sampling and testing, as well as quality control (QC) sampling and testing when required by the specifications.

Section 2

Sampling and Testing Frequency and Location

Verification sampling and testing shall be performed at the location and frequency established in the Guide Schedule of Sampling and Testing or in the specifications specific to each project.

Section 3

Quality Control Sampling and Testing

Contractor-performed QC sampling and testing may be used as part of an acceptance decision when required or allowed by specification.

These QC sampling and testing personnel, laboratories, and equipment shall be qualified according to the "Sampling and Testing Personnel Qualification Program" and the "Laboratory Qualification Program" and shall be evaluated under the "Independent Assurance Program" in this manual.

These QC test results shall be validated by verification test results obtained from independently taken samples. Qualified TxDOT personnel or their designated agents shall perform verification sampling and testing.

Section 4

Dispute Resolution System

When QC test results are used in the acceptance decision, testing disputes arising between TxDOT, or its designated agents, and the contractor shall be resolved in a reliable, unbiased manner by referee testing or evaluation performed by the Construction Division, Materials & Pavements Section (CST/M&P) central laboratory. The decision by the CST/M&P central laboratory will be final.

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Section 1

Overview

The Independent Assurance (IA) program evaluates all sampling and testing procedures, personnel, and equipment used as part of an acceptance decision.

The IA program evaluates the qualified sampling and testing personnel and testing equipment and is established using the system approach. The system approach bases frequency of IA activities on time, regardless of the number of tests, quantities of materials, or numbers of projects tested by the individual being evaluated.

Section 2

Sampling and Testing Frequency

Perform IA sampling and testing at the frequency established in 'Required Frequencies and Activities.'

NOTE: Testing procedures performed at the Construction Division, Materials & Pavements Section (CST/M&P) central laboratory are not subject to the IA program.

Section 3

Testing Equipment

CST/M&P will qualify district laboratory testing equipment used for IA sampling and testing, according to the "Laboratory Qualification Program."

The district laboratory will qualify all other department testing equipment and AASHTO accredited commercial laboratory equipment used for IA sampling and testing. (*Note*: Any commercial laboratory used for IA sampling and testing must be AASHTO accredited.)

Qualify testing equipment according to these guidelines:

- frequency for qualifying IA sampling and testing equipment will not exceed one (1) year
- calibration/verification is required whenever the laboratory or equipment is moved
- IA equipment shall be other than that used for performing verification or quality control (QC) testing.

Any equipment used to perform verification and/or QC sampling and testing in making an acceptance decision will be evaluated by IA sampling and testing personnel. This evaluation includes calibration checks and split or proficiency sample tests. The requirements for, and frequency of, equipment calibrations are shown in TxDOT's test procedures, as referenced in 'Calibration Standards and Frequencies for Laboratory Equipment.' Acceptable tolerance limits for the comparison of test results from split or proficiency samples are shown in "Acceptable Tolerance Limits for Independent Assurance."

Section 4

Testing Personnel

CST/M&P qualifies district laboratory personnel performing IA sampling and testing, according to the "Sampling and Testing Personnel Qualification Program."

The district laboratory qualifies all other department personnel and AASHTO accredited commercial laboratory personnel performing IA sampling and testing.

Individuals performing IA sampling and testing will be other than those performing verification or QC testing.

IA sampling and testing personnel will evaluate any individual performing verification or QC sampling and testing. This evaluation includes observations and split or proficiency sample testing. Acceptable tolerance limits for the comparison of test results for split or proficiency samples are shown in
"Acceptable Tolerance Limits for Independence Assurance."

Section 5

Comparing Test Results

The engineer performs a prompt comparison of the test results obtained by the individual being evaluated and the IA tester. Acceptable tolerance limits for comparing test results from split and proficiency samples are shown in "Acceptable Tolerance Limits for Independence Assurance."

If the comparisons of the test results do not comply with the tolerances, an engineering review of the test procedures and equipment will be performed immediately to determine the source of the discrepancy.

Identify and incorporate corrective actions as appropriate.

Document and report test results from all samples involved in the IA Program in the appropriate district or project files.

Section 6

Annual Report of IA Program Results

CST/M&P will compose and submit an annual report to the Federal Highway Administration (FHWA) Division Administrator summarizing the results of TxDOT's systems approach IA program. This report identifies:

- number of sampling and testing personnel evaluated by the systems approach IA testing
- number of IA evaluations found to be acceptable
- number of IA evaluations found to be unacceptable
- summary of any significant system-wide corrective actions taken.

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Section 1

Overview

A materials certification, conforming in substance to the example, 'Letter of Certification of Materials Used,' shall be submitted to the Federal Highway Administration (FHWA) Division Administrator for each construction project that is subject to FHWA construction oversight activities.

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Section 1

Overview

To avoid an appearance of a conflict of interest, any qualified non-TxDOT laboratory shall perform only one of the following types of testing on the same project:

- verification testing,
- quality control testing, or
- Independent Assurance (IA) testing.

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Sampling and Testing Personnel Qualification Program

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Section 1

Purpose

This program provides uniform statewide procedures for sampling and testing personnel qualification to ensure that tests required by the specifications are performed according to the prescribed sampling and testing methods.

Section 2

Personnel Qualification

Sampling and testing personnel will be qualified to perform tests for the acceptance of materials in the areas of portland cement concrete, soils and aggregates and bituminous materials.

The test methods for which individuals can be qualified include, but are not limited to, the following. (*Denotes tests on which split or proficiency sample evaluations are required.)

Soils & Aggregates (100-E Series & 400-A Series)

- Tex-101-E, Preparing Soil and Flexible Base Materials for Testing
- Tex-102-E, Determining Slaking Time
- Tex-103-E, Determining Moisture Content in Soil Materials
- Tex-104-E, Determining Liquid Limit of Soils*
- Tex-105-E, Determining Plastic Limit of Soils*
- Tex-106-E, Calculating the Plasticity Index of Soils*
- Tex-107-E, Determining the Bar Linear Shrinkage of Soils*
- Tex-108-E, Determining the Specific Gravity of Soils
- Tex-110-E, Particle Size Analysis of Soils*
- Tex-111-E, Determining the Amount of Material in Soils Finer than 75 μm (No.200) Sieve
- Tex-113-E, Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials
- Tex-114-E, Laboratory Compaction Characteristics and Moisture-Density Relationship of Subgrade and Embankment Soils
- Tex-115-E, Field Method for Determining In-Place Density of Soils and Base Materials
- Tex-116-E, Ball Mill Method for Determining the Disintegration of Flexible Base Material
- Tex-117-E, Triaxial Compression Tests for Disturbed Soils and Base Materials
- Tex-120-E, Soil-Cement Testing
- Tex-121-E, Soil-Lime Testing
- Tex-126-E, Molding, Testing, and Evaluating Bituminous Black Base Materials*
- Tex-127-E, Lime Fly-Ash Compressive Strength Test Methods
- Tex-128-E, Determining Soil pH
- Tex-129-E, Measuring the Resistivity of Soil Materials

- Tex-140-E, Measuring Thickness of Pavement Layer
- Tex-400-A, Sampling Stone, Gravel, Sand, and Mineral Aggregates
- Tex-401-A, Sieve Analysis of Fine and Coarse Aggregate*
- Tex-402-A, Fineness Modulus of Fine Aggregate
- Tex-403-A, Saturated Surface Dry Specific Gravity and Absorption of Aggregates
- Tex-404-A, Determining Unit Mass (Weight) of Aggregates
- Tex-405-A, Determining Percent Solids and Voids in Concrete Aggregates
- Tex-406-A, Material Finer Than 75 μm (No. 200) Sieve in Mineral Aggregates (Decantation Test for Concrete Aggregates)
- Tex-408-A, Organic Impurities in Fine Aggregate for Concrete
- Tex-409-A, Free Moisture and Water Absorption in Aggregate for Concrete
- Tex-411-A, Soundness of Aggregate by Using Sodium Sulfate or Magnesium Sulfate
- Tex-413-A, Determining Deleterious Materials in Mineral Aggregates
- Tex-425-A, Determining Moisture Content in Fine Aggregate by the "Speedy" Moisture Method
- Tex-460-A, Determining Crushed Face Particle Count

Bituminous (200-F Series)

- Tex-200-F, Sieve Analysis of Fine and Coarse Aggregate*
- Tex-201-F, Bulk Specific Gravity and Water Absorption of Aggregate
- Tex-202-F, Apparent Specific Gravity of Material Finer than 180 μm (No. 80) Sieve
- Tex-203-F, Sand Equivalent Test*
- Tex-204-F, Design of Bituminous Mixtures
- Tex-205-F, Laboratory Method of Mixing Bituminous Mixtures
- Tex-206-F, Compacting Test Specimens of Bituminous Mixtures*
- Tex-207-F, Determining Density of Compacted Bituminous Mixtures*
- Tex-208-F, Test for Stabilometer Value of Bituminous Mixtures*
- Tex-210-F, Determining Asphalt Content of Bituminous Mixtures by Extraction*
- Tex-211-F, Recovery of Asphalt from Bituminous Mixtures by the Abson Process
- Tex-212-F, Determining Moisture Content of Bituminous Mixtures
- Tex-213-F, Determining Hydrocarbon-Volatile Content of Bituminous Mixtures
- Tex-217-F, Determining Deleterious Material and Decantation Test for Coarse Aggregates

- Tex-221-F, Sampling Aggregate for Bituminous Mixtures, Surface Treatments and Limestone Rock Asphalt
- Tex-222-F, Sampling Bituminous Mixtures
- Tex-224-F, Determining Flakiness Index
- Tex-226-F, Indirect Tensile Strength Test
- Tex-227-F, Theoretical Maximum Specific Gravity of Bituminous Mixtures*
- Tex-228-F, Determining Asphalt Content of Bituminous Mixtures by the Nuclear Method*
- Tex-229-F, Combined HMAC Cold-Belt Sampling and Testing Procedure
- Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method*

Concrete (400-A Series)

- Tex-407-A, Sampling Freshly-Mixed Concrete
- Tex-414-A, Air Content of Freshly Mixed Concrete by the Volumetric Method*
- Tex-415-A, Slump of Portland Cement Concrete*
- Tex-416-A, Air Content of Freshly Mixed Concrete by the Pressure Method*
- Tex-417-A, Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
- Tex-418-A, Compressive Strength of Cylindrical Concrete Specimens*
- Tex-419-A, Compressive Strength of Concrete Using Portions of Beams Broken in Flexure
- Tex-424-A, Obtaining and Testing Drilled Cores of Concrete
- Tex-436-A, Measuring Texture Depth by the Sand Patch Method
- Tex-437-A, Test for Flow of Grout Mixtures (Flow Cone Method)
- Tex-447-A, Making and Curing Concrete Test Specimens
- Tex-448-A, Flexural Strength of Concrete Using Simple Beam Third-Point Loading*
- Tex-450-A, Capping Cylindrical Concrete Specimens
- Tex-460-A, Determining Crushed Face Particle Count

Asphalt (500-C Series)

- Tex-502-C, Penetration of Bituminous Materials (refer to AASHTO T 49)
- Tex-530-C, Effect of Water on Bituminous Paving Mixtures
- Tex-531-C, Prediction of Moisture-Induced Damage to Bituminous Paving Materials Using Molded Specimens

Special Procedures (1000-S Series)

- Tex-1000-S, Operating Pavement Profilograph and Evaluating Profiles

There may be other tests, not listed above, that are routinely performed in specific geographical locations of the state for which applicable TxDOT districts may require qualification.

Section 3

Who Must be Qualified?

Any individual who performs tests on materials for acceptance must be qualified.

NOTE: Reciprocity may be granted to individuals who have been successfully qualified under another state's program. These situations will be considered on a case-by-case basis and must meet the approval of the Construction Division director.

Section 4

Who Can Qualify Sampling and Testing Personnel?

The following personnel may qualify an individual to perform the required sampling and testing of materials:

- Construction Division, Materials & Pavements Section (CST/M&P) personnel
- qualified district materials engineer/laboratory supervisor
- qualified district laboratory personnel who have been authorized by the district material engineer/laboratory supervisor to qualify others
- other TxDOT personnel who have been qualified to perform a specific test may be authorized by the district material engineer/laboratory supervisor to qualify others
- other independent sources (when required by specifications), such as the Hot Mix Asphalt Center or the American Concrete Institute (ACI). Certifications received from these institutions may be used to satisfy the written exam and observation part of the "Sampling and Testing Personnel Qualification Program."

Each district laboratory will maintain a minimum of one (1) individual qualified by CST/M&P for each test procedure performed within the district.

Section 5

Qualification Procedure

To qualify, an individual must successfully perform the specific test and the necessary calculations required to determine specification compliance in the presence of an authorized evaluator. Successful performance is defined as demonstrating the ability to properly perform the key elements for each test method. If the individual fails to demonstrate the ability to perform a test, the individual will be allowed one retest per test method at the evaluator's convenience.

After successful performance of a test method, the individual must also pass a written examination (minimum score of 80%) administered by an authorized evaluator. An individual failing the written examination may request a retest. The retest must be scheduled and administered within thirty days of notification of failure. Failure to pass the second written examination shall be considered as failing the entire qualification.

If an individual fails to qualify on a specific test method or the qualification is revoked, the individual must obtain additional training before the individual can retest on that specific test.

In addition, for tests that CST/M&P determines to require a split/proficiency sample evaluation, the individual must participate in split/proficiency samples given by the qualification authority to validate the qualification. CST/M&P determines the qualification authority for the split/proficiency sample. The results of the samples will be evaluated with acceptable tolerance limits. If the comparisons of the test results do not comply with the tolerances, an engineering review of the test procedures and equipment will be performed immediately to determine the source of the discrepancy. Corrective actions must be identified and incorporated as appropriate, prior to the individual performing additional testing on that test method.

Under unique circumstances, the qualification authority may grant a verbal examination upon request. The reason(s) for requesting a verbal examination must be presented and documented prior to the individual being allowed to take the examination.

Unless otherwise stated, qualification of an individual is valid for not more than three years, after which the individual must be re-qualified. Under the Independent Assurance (IA) system approach, interim evaluations will be required as specified in "Frequency of System Approach Independent Assurance Testing."

Section 6

Documentation

CST/M&P and the district material engineer/laboratory supervisor are responsible for maintaining documentation of all individuals qualified under their authority who perform required tests for acceptance of materials. Area offices must also maintain copies of the certificates for individuals performing testing on projects under their supervision.

Documentation to be maintained by CST/M&P and the district material engineer/laboratory supervisor includes:

- sampling and testing personnel qualification form
  - a form for each individual listing all the tests the individual has been qualified to perform.
- qualification worksheet
  - a form listing the key elements of the test method. The evaluator conducting the observation uses the form to record the results.
- copy of qualification certificates issued
- copies of written examinations.

Documentation retention will be for the life of the qualification. Qualification authority must be shown on the certificate given to each individual.

Section 7

Disqualification

Accusations of neglect or abuse of the rights and responsibilities are made to the district engineer. The difference between neglect and abuse is intent and shall be determined by the district engineer.

Penalties are implemented upon recommendation by the district engineer, and the penalties range from a minimum of ninety days suspension to a maximum of permanent revocation of the certification.

- The first instance of neglect results in a ninety-day suspension; any subsequent instance shall be considered as and treated the same as abuse.
- The first instance of abuse results in a six-month suspension.
- The second instance of abuse results in permanent revocation of the certification.
- Permanent revocation of a certification results in that individual being ineligible for certification at any level.

Certifications are considered as statewide and, therefore, any suspensions and/or revocations will apply statewide.

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Section 1

Purpose

This program provides uniform statewide procedures to ensure that laboratory facilities and equipment are adequate for the performance of required sampling and testing methods.

Section 2

Laboratories to be Qualified

All laboratories performing testing for TxDOT require qualification. These include, but are not limited to the following:

- Construction Division, Materials & Pavements Section (CST/M&P) central laboratory
- district laboratories
- area/project laboratories (includes field laboratories)
- CST/M&P field laboratories
- commercial laboratories
- contractor laboratories
- vendor laboratories (material suppliers).

Section 3

Laboratory Qualification Responsibility

CST/M&P central laboratory will be accredited under the AASHTO Laboratory Accreditation Program.

CST/M&P is responsible for overseeing the statewide laboratory qualification program and for qualifying district laboratories. At the district level, the qualifying authority will be the district material engineer/laboratory supervisor. However, the district material engineer/laboratory supervisor may authorize other TxDOT personnel to perform laboratory qualification activities.

Section 4
Qualification Process

The laboratory qualifying authority will:

- ♦ identify the scope of testing to be performed
- ♦ verify that manuals and/or test methods used to perform tests are available and up-to-date
- ♦ document that the laboratory has the required equipment to perform the tests
- ♦ check the calibration/verification records for each piece of equipment, to include:
  - description of equipment
  - identification of any traceable standard used
  - frequency of calibration
  - date of last calibration
  - date of next calibration
  - procedure used to calibrate equipment
  - procedure used to identify equipment not in compliance.

In addition, all equipment may be subjected to calibration verification or other inspection by the qualifying authority.

Section 5

Calibration Standards and Frequencies for Laboratory Equipment

The standards for calibration and the frequencies for laboratory equipment calibrations are shown in "Tex-198-E, Minimum Standards for Acceptance of a Laboratory for Soils and Flexible Base Testing;" Tex-237-F, Minimum Standards for Acceptance of a Laboratory for Hot Mix Testing;" and "Tex-498-A, Minimum Standards for Acceptance of a Laboratory for Concrete and Aggregate Testing."

Section 6

Frequency for Laboratory Qualification

Laboratories are qualified at an interval not to exceed three (3) years.
Calibration/verification is required whenever the laboratory or equipment is moved.
Equipment used in IA sampling and testing will be verified at intervals not to exceed one (1) year.

Section 7

Non-compliance

A laboratory that does not meet the above requirements is subject to disqualification. Any equipment in a qualified laboratory failing to meet specified equipment requirements for a specific test method will not be used for that test method.

Section 8

Documentation

All districts are responsible for verifying that laboratories are qualified to perform TxDOT testing. Documentation will be required to be kept by the qualified laboratory and district laboratory. Calibration records will be maintained for three (3) years, unless another agency requires a longer period.

Section 9

Dispute Resolution

The next higher qualification authority will resolve disputes concerning calibration and verification of equipment. For disputes that cannot be resolved at the district level, CST/M&P will be the final authority.

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Section 1

Acceptable Tolerance Limits

The following tables indicate the acceptable tolerance limits for the specified material.

- Embankment

Embankment		
Procedure	**Texas Test Method**	**Tolerance**
In-place Density	"Tex-115-E, Field Method for Determining In-Place Density of Soils and Base Materials"	± 2.5% Field Density

- Untreated & Treated Sub-base and Base Courses

Untreated & Treated Sub-base and Base Courses		
Procedure	**Texas Test Method**	**Tolerance**
In-place Density	"Tex-115-E, Field Method for Determining In-Place Density of Soils and Base Materials"	± 2.5% Field Density
Gradation: ♦ > No. 4 ♦ ≤ No. 4	"Tex-110-E, Particle Size Analysis of Soils"	 ♦ ± 5% ♦ ± 3%
Liquid Limit	"Tex-104-E, Determining Liquid Limit of Soils"	15% of the mean*
Plasticity Index	"Tex-106-E, Calculating the Plasticity Index of Soils"	20% of the mean*
*The difference between compared test results shall not exceed the indicated percentage of the mean of the compared test results - the mean being the average of the two test results.		

- Asphalt Stabilized Base

Asphalt Stabilized Base		
Procedure	**Texas Test Method**	**Tolerance**
Gradation: ♦ >No. 4 ♦ ≤ No. 4	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	 ♦ ± 5% ♦ ± 3%
Liquid Limit	"Tex-104-E, Determining Liquid Limit of Soils"	15% of the mean*
Plasticity Index	"Tex-106-E, Calculating the Plasticity Index of Soils"	20% of the mean*
Percent Asphalt	"Tex-210-F, Determining Asphalt Content of Bituminous Mixtures by Extraction" "Tex-228-F. Determining Asphalt Content of Bituminous Mixtures by the Nuclear Method" "Tex-126-E, Molding, Testing, and Evaluating Bituminous Black Base Materials" "Tex-229-F, Combined HMAC Cold-belt Sampling and Testing Procedure" "Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method"	± 0.3% ± 0.3% ± 0.3% ± 0.3% ± 0.3%
In-place Density (Cores)	"Tex-207-F, Determining Density of Compacted Bituminous Mixtures"	± 1% Field Density
*The difference between compared test results shall not exceed the indicated percentage of the mean of the compared test results - the mean being the average of the two test results.		

- Surface Treatment Aggregates

Surface Treatment Aggregates		
Procedure	**Texas Test Method**	**Tolerance**
Gradation: ♦ > No. 4 ♦ ≤ No. 4	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	 ♦ ± 5% ♦ ± 3%

♦ Portland Cement Concrete Coarse Aggregate

Portland Cement Concrete Coarse Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation: ♦ > No. 4 ♦ ≤ No. 4	"Tex-401-A, Sieve Analysis of Fine and Coarse Aggregate"	 ♦ ± 5% ♦ ± 3%

♦ Portland Cement Concrete Fine Aggregate

Portland Cement Concrete Fine Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation (3/8" through No. 200)	"Tex-401-A, Sieve Analysis of Fine and Coarse Aggregate"	± 3%
Sand Equivalent	"Tex-203-F, Sand Equivalent Test"	± 10

♦ Portland Cement Concrete Complete Mixture

Portland Cement Concrete Complete Mixture		
Procedure	**Texas Test Method**	**Tolerance**
Flexural Strength Compressive	'Tex-448-A, Flexural Strength of Concrete Using Simple Beam Third-Point Loading" "Tex-418-A, Compressive Strength of Cylindrical Concrete Specimens"	20% of the mean*
Slump	"Tex-415-A, Slump of Portland Cement Concrete"	± 1.0"
Entrained Air	"Tex-414-A, Air Content of Freshly Mixed Concrete by the Volumetric Method" "Tex-416-A, Air Content of Freshly Mixed Concrete by the Pressure Method"	± 1%
*The difference between compared test results shall not exceed the indicated percentage of the mean of the compared test results - the mean being the average of the two test results.		

♦ Asphaltic Concrete Coarse Aggregate

Asphaltic Concrete Coarse Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation: ♦ > No. 10 ♦ ≤ No. 10	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	 ♦ ± 5% ♦ ± 3%
Deleterious Material	"Tex-217-F, Determining Deleterious Material and Decantation Test for Coarse Aggregates"	± 0.3 %
Decantation	"Tex-217-F, Determining Deleterious Material and Decantation Test for Coarse Aggregates"	20% of the mean*
*The difference between compared test results shall not exceed the indicated percentage of the mean of		

Asphaltic Concrete Coarse Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
the compared test results - the mean being the average of the two test results.		

- Asphaltic Concrete Fine Aggregate

Asphaltic Concrete Fine Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation (No. 10 through No. 200)	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	± 3%
Bar Linear Shrinkage	"Tex-107-E, Determining the Bar Linear Shrinkage of Materials"	± 2

- Asphaltic Concrete Combined Aggregate

Asphaltic Concrete Combined Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation: ♦ > 5/8" ♦ 5/8" through No. 200 ♦ Passing No. 200	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	 ♦ ± 5% ♦ ± 3% ♦ ± 1.5%
Sand Equivalent	"Tex-203-F, Sand Equivalent Test"	± 10

- Asphaltic Concrete Complete Mixture

Asphaltic Concrete Complete Mixture		
Procedure	**Texas Test Method**	**Tolerance**
Asphalt Content	"Tex-210-F, Determining Asphalt Content of Bituminous Mixtures by Extraction"	± 0.3%
	"Tex-228-F, Determining Asphalt Content of Bituminous Mixtures by the Nuclear Method"	± 0.3%
	"Tex-229-F, Combined HMAC Cold-belt Sampling and Testing Procedure"	± 0.3%
	"Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method"	± 0.3%
Maximum Theoretical Specific Gravity	"Tex-227-F, Theoretical Maximum Specific Gravity of Bituminous Mixtures"	± 0.020
Laboratory Molded Density	"Tex-207-F, Determining Density of Compacted Bituminous Mixtures"	± 1.0%
Laboratory Molded Bulk Specific Gravity	"Tex-207-F, Determining Density of Compacted Bituminous Mixtures"	± 0.020
Stability	"Tex-208-F, Test for Stabilometer Value of Bituminous Mixtures"	5 points
Moisture	"Tex-212-F, Determining Moisture Content of Bituminous Mixtures"	± 0.2 mL
In-place Air Voids (Core)	"Tex-207-F, Determining Density of Compacted Bituminous Mixtures"	± 1.0%

Note: The above tolerances are to be used when comparison of test results is by split samples. A tolerance of plus or minus two (2) standard deviations shall be used when comparison of test results is by proficiency samples.

EXAMPLE: Plasticity Index

Job Control test value	18
IA Test value	22
Mean	20
20% difference	4

Both values are within 20% of the mean.

Chapter 9

Frequency for System Approach Independent Assurance Testing

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Section 1

Overview

The system approach for Independent Assurance (IA) requires IA activities to occur on a time basis as opposed to occurring on a quantity of material or project basis.

Section 2

Required Frequencies and Activities

The following frequencies and activities are required for evaluating sampling and testing personnel and equipment under the system approach to IA.

Frequencies and Activities	
Time	**Activity**
Prior to performing acceptance sampling and testing.	Qualification is required under the "Sampling and Testing Personnel Qualification Program" and the "Laboratory Qualification Program."
Within 12 months after Observation and Qualification.	Each qualified technician is required to participate in one proficiency or split sample test for each test method requiring IA. Results must compare to the IA test results to within the established tolerance.
Within 24 months after Observation and Qualification.	Each qualified technician is required to participate in one proficiency or split sample test for each test method requiring IA. Results must compare to the IA test results to within the established tolerance.
Within 36 months of qualification	Qualification is again required under the "Sampling and Testing Personnel Qualification Program" and the "Laboratory Qualification Program."

NOTE: For American Concrete Institute (ACI) certification, Field Technician Grade I, the above frequency is extended to five years with observation occurring at the 36-month interval.

Maintaining technician qualification under the IA systems approach requires continuation of the above cycle of qualification and successful split or proficiency sample testing.