5.2.5. QUALITY CONTROL/QUALITY ASSURANCE (QC/QA) TESTS

1. General

This section establishes terminology and procedures for the various tests that are included in the QC/QA system.

2. Definitions

2.1. Acceptance Program - All factors that comprise the State’s determination of the degree of compliance with contract requirements and value of a product. These factors include the State’s sampling, testing and inspection, and validated results of contractor sampling and testing.

2.2. Assurance Sampling and Testing - Split or replicate samples used as an independent check of the sampling and testing procedures and equipment. These samples are to assure testing is being performed properly by both the contractor’s and the State’s personnel. The results of assurance tests are not to be used as a basis of material acceptance.

2.3. Dispute Resolution - The procedure used to resolve conflicts resulting from discrepancies between the State’s verification results and the Contractor’s quality control results of sufficient magnitude to impact payment. Any laboratory used for dispute resolution must be accredited by the AASHTO Accreditation program for the tests to be performed.

2.4. Independent Assurance (IA) - IA is an unbiased and independent verification of the Quality Assurance system used and of the reliability of the test results obtained in the regular sampling and testing activities. KDOT’s IA will consist of observations by independent personnel to assure that specified procedures are followed (witnessing), and split or replicate sampling and testing.

2.5. Quality Assurance (QA) - All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality. QA activities include: acceptance, independent assurance, verification, and prequalification sampling and testing; inspection; reporting of results; and any follow up that may be necessary due to test failure. Without these actions, it would be impossible for the Engineer to accurately verify compliance or in many cases the level of compliance with the requirements of the contract documents.

2.6. Quality Control (QC) - The sum total of operational techniques and activities performed or conducted by the contractor and/or producer to make sure that a product meets contract specification requirements. QC activities generally are outlined in a contractor's process control plan which lists such items as types of tests to be performed, sampling locations, sampling frequencies, equipment calibration procedures and frequencies, and documentation procedures.

2.7. Qualified Laboratories - Laboratories used for sampling and testing of materials are those approved through appropriate programs as determined by KDOT.
2.8. Qualified Technician - Personnel who are certified through appropriate programs as determined by KDOT.

2.9. Replicate Tests - Tests performed by independent assurance personnel using equipment other than that used by project personnel, but performed on a portion of the sample used by project personnel.

2.10. Split Samples - Sampling and splitting of the material conducted under the observation of independent assurance personnel. Tests on separate portions are performed by KDOT designated independent assurance personnel using equipment other than that used by project personnel.

2.11. Verification Sampling and Testing - Sampling and testing performed to validate the quality of the product or to check the adequacy of mix designs. If quality control sampling and testing is used in the acceptance program, verification sampling and testing will also be used to validate the quality control sampling and testing. Verification samples are independent samples obtained by KDOT.

2.11.1. On Grade Concrete Aggregate (OGCA) Production Samples - Sampling and testing procedures utilized to verify that the production of OGCA complies with the specification quality requirements

2.12. Other - sampling and testing by the District Materials laboratories not otherwise designated in this instruction or specified in the Sampling and Testing Frequency Chart, such as determination of asphalt content in maintenance mixes, or a Marshall design.

3. Independent Assurance

KDOT uses a systems-wide approach to Independent Assurance Sampling and Testing of project produced materials. Each test is included in one of the following Groups according to the type of material: Aggregates, Concrete, Asphalt Mixes, and Soils. A breakdown of requirements for each Group is provided in Appendix C. Independent assurance will be conducted once per calendar year per technician per group of tests performed by that technician during that year. It may not be possible to witness all the tests within a group during the assurance process. There are, however, critical Core Tests within each group that must be witnessed before annual Independent Assurance requirements are completed by a technician for that group of tests. These Core Tests are marked with a double asterisk (**) on the list in Appendix C.

KDOT’s MRC at 2300 Van Buren is AASHTO Accredited. District Materials personnel are responsible for conducting the independent assurance witnessing and testing. The equipment that the Districts use to conduct independent assurance testing is calibrated or verified annually by the MRC personnel, by another AASHTO Accredited Laboratory, or by outside NIST traceable sources.

Independent Assurance consists of witnessing the technician properly conduct the test, and split or replicate samples. The District conducts the split or replicate testing whenever possible
during the independent assurance process. KDOT may hire, train, and evaluate personnel from independent laboratories to conduct independent assurance witnessing for KDOT. KDOT will still conduct the split sample testing. The independent laboratory need not be AASHTO Accredited since the personnel would be acting on behalf of KDOT.

4. Comparison Procedures

4.1. Assurance Samples. Acceptable variations for between laboratory reproducibility are listed in Appendix C. Precision statements from ASTM or AASHTO test procedures are used when available, and these statements are included in the KT Methods. Where precision statements are not available the standard deviations from the last 10 AMRL Proficiency Samples are used to calculate the 95% reproducibility limit (between laboratories) – d2s as defined in ASTM E-177. These calculated values are reviewed annually for applicability and may be adjusted when warranted. Where precision statements and AMRL Samples are not available, the Engineer will use the Engineer’s discretion to determine acceptable variations. The comparisons are made by personnel who are knowledgeable of testing variation and who have the authority to resolve any problems in equipment, procedures, etc.

4.2. Under a “method spec” the numerical results obtained on Verification Samples are compared promptly with the specifications, or certified results, as applicable. Appropriate action is taken by the person responsible for making comparisons in each case. In the case of verification sample test results obtained at the MRC, the Engineer of Tests informs the district of any test results which do not comply with specifications and retains the reports pending receipt of information from the district regarding its investigation of circumstances for non-compliance and corrective action taken, if needed, resulting from its investigation.

Under QC/QA specifications, Verification test results are statistically compared to the contractor’s test results by the use of the F and T tests outlined in section 5.2.6. or some other statistically valid practice. Use F & T tests only when enough verification results are available. KDOT prefers results from at least 3 to 5 verification tests for statistical comparisons. If the data passes the T test, use the contractor’s numbers to calculate pay quantities. If the data fails the T test, use KDOT’s numbers to calculate pay quantities.

4.3. Reports of Verification Samples shall show sufficient information to facilitate comparison with the corresponding Acceptance Test, related certifications, or producer’s test results.

4.3.1. When statistical comparisons are made, include a comment in the report similar to one of the following:

4.3.1.1. "Statistical comparison of results indicates it is reasonable to assume all associated samples came from the same population."

4.3.1.2. "Statistical comparison of results indicates it is reasonable to assume all associated samples did not come from the same population (or lot)."

4.3.2. When no statistical comparison can be made, include a comment in the report similar to one of the following:
4.3.2.1. "The results of this test appear to agree reasonably well with data reported previously for this project.

4.3.2.2. "Comparison of these data with data reported previously for this product indicates that further monitoring or corrective action is merited."

5. Dispute resolution

If a dispute exists between the Engineer and the contractor about the validity of the other’s test results, the KDOT Materials Research Center will perform referee testing. If one of the disputed Department test results was generated at the MRC, then an Independent AASHTO Accredited Laboratory agreeable to both parties will be selected. If referee testing indicates that the department’s test results are correct then the contractor pays for the additional testing, including referee testing performed at the MRC. If the referee testing indicates that the contractor’s test results are correct then the Department pays for the additional testing.

6. Sampling and Testing Frequency

6.1. The two Sampling and Testing Frequency Charts (Appendix A and Appendix B) reflect the minimum rate for sampling and testing. It is understood that if a problem occurs, more samples or tests may be necessary.

6.1.1. It is also intended that Verification and Assurance Samples may be used for items other than those required by the Sample and Testing Frequency Chart. However, Assurance Samples will never be used for Acceptance.

7. Reporting Procedures

7.1. Assurance Samples are reported in CMS on the data input screen appropriate for the item being tested. Identify the individual tests by CMS ID nos. or by the Assurance Sample Number (assigned by the District Materials Engineer), the name of the person requesting the sample, and the appropriate sample number used by the group performing the test or a notation as to which group performed each test.

When entering split and replicate samples into CMS the contractor’s or field personnel’s results are entered as Sample A and the District’s or MRC’s results are entered as Sample B under the same CMS sample ID number.

7.2. Contractors do not currently have access to CMS. District or field personnel are responsible for entering Acceptance and Verification test results into CMS. When test results on Acceptance Samples fall outside of the specification limits, underline or circle in red the points of noncompliance. This option is not available in CMS.

7.3. Number of copies and distributions:
Non CMS

Bureau of Construction and Materials - 1 copy
District Engineer - 1 copy
Field Engineer - 1 copy

CMS

In CMS it is the users responsibility to identify the need for information and obtain such information. Information can be obtained using on-line service or ordering reports.

8. Responsibility

The Chief of Construction and Materials will maintain a complete file of non-CMS reports on Assurance Samples, Acceptance Samples, Verification Samples and other tests. District Materials Engineers are responsible for forwarding these reports to the Bureau of Construction and Materials.

8.1. The District Materials Engineer is responsible for reporting the results on all Assurance Samples performed in the District and may be required to perform Acceptance Tests shown on the Sampling and Testing Frequency Chart in Appendix A or Verification Tests shown in Appendix B. In addition, performance of additional tests such as, but not limited to, Marshall Designs, Soil Compaction Standards, and Asphalt Extractions will be required.

8.2. The Engineer of Tests is responsible for reporting results on samples that are submitted to the Materials and Research Center for Test.

8.3. The Field Engineer is normally responsible for the Acceptance Tests shown on the Sample and Testing Frequency Chart in Appendix A or the Verification Tests shown in Appendix B.