South Carolina Department of Transportation

Quality Assurance Program for the Carolina Crossroads Program

CCR Phase 3C

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Section 1

1 SCOPE

1.1 General

The South Carolina Department of Transportation (SCDOT) has developed this Quality Assurance Program (QAP) for the Carolina Crossroads (CCR) Program. This QAP has been established in compliance with the Code of Federal Regulations (23 CFR 637, Subpart B) – "Quality Assurance Procedure for Construction," Federal Highway Administration (FHWA) Technical Advisory 6120.3 and other guidance documents, which establishes processes for use of contractor-performed inspection and testing in the acceptance program.

1.2 Program Components

The QAP is comprised of two major components, the Acceptance Program and Independent Assurance (IA). The Acceptance Program includes Quality Acceptance (QA) performed by the Contractor's Independent Quality Firm (IQF) and Owner Verification (OV) performed by SCDOT or an Owner Verification Firm (OVF) acting on behalf of SCDOT. The QAP allows the use of IQF's QA as part of the acceptance program when QA results are verified by independent OV inspection and testing. SCDOT has retained an OVF to provide OV on behalf of SCDOT for the CCR Program under this QAP. The IA program consists of independent verification of equipment and personnel performing testing as part of the acceptance program and will be performed by SCDOT. Contractor-performed Quality Control (QC) is required to manage production and analyze performance of Contractor processes, but QC cannot be used as part of the acceptance program and is not subject to the IA program. Figure 1 shows the relationship between the specific components of the QAP.

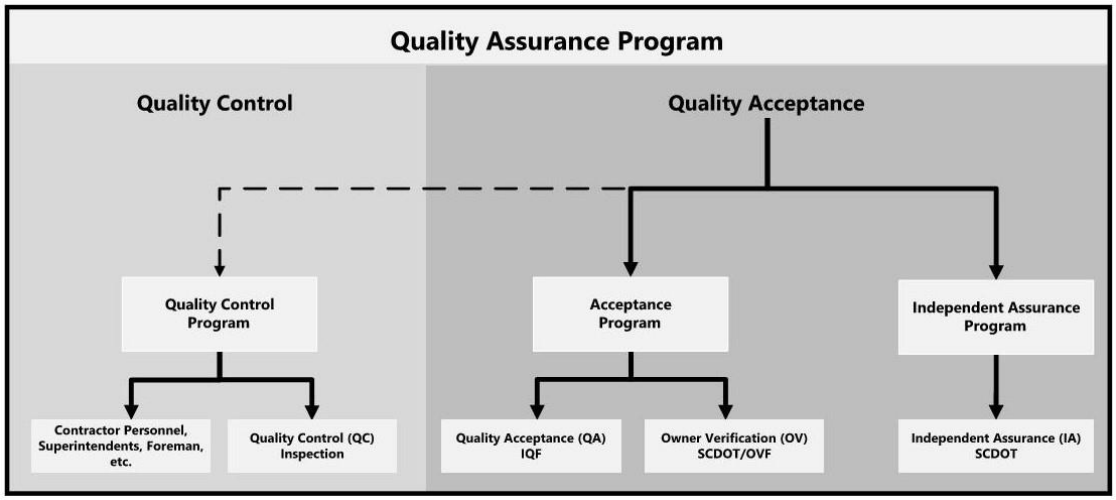

Figure 1: Components of the Quality Assurance Program (QAP)

1.3 Construction Quality Management Plan

A Construction Quality Management Plan (CQMP) will be developed by the Contractor to describe the Contractor's policies, procedures, staffing plan and approach to manage construction quality in accordance with the Contract. The CQMP will define processes and procedures of the Contractor for QC to achieve compliance with the Contract. The CQMP will also define the processes and procedures of the IQF for QA materials testing and for comprehensive inspection of all work items which will be used in acceptance decisions as described in this Program. The CQMP will include a project specific Hold Point List developed in compliance with the Minimum Hold Points as provided in Appendix A. The CQMP must be submitted by the Contractor in accordance with the Contract, included as part of the Project Management Plan (PMP), and must be reviewed and approved by SCDOT prior to Notice to Proceed #2 (NTP 2).

1.4 Owner Verification Plan

SCDOT's OVF will develop an Owner Verification Plan (OVP) that describes the processes and procedures by which the OVF will perform OV of the IQF's QA inspection and testing on behalf of SCDOT. The OVP should be approved by SCDOT prior to the start of construction.

1.5 Conflict of Interest

To avoid an appearance of a conflict of interest, each quality function must be performed by an independent and separate entity. IQF QA staff, testing and materials laboratory shall be separate and independent from the Contractor's production and QC resources. OV, IA and referee functions will only be performed by SCDOT or an entity contracted directly by SCDOT. The six (6) quality functions associated with this QAP are:

- Contractor Production
- Contractor Quality Control (QC)
- IQF Quality Acceptance (QA)
- SCDOT/OVF Owner Verification (OV)
- SCDOT Independent Assurance (IA)
- SCDOT Referee

1.6 Contractor's Obligation

The IQF's, OVF's, and SCDOT's testing and inspection in no way relieves Contractor of its obligation to comply with the Contract requirements. All materials incorporated into the Project must meet or exceed contract requirements and specifications. Furthermore, any testing and inspection by IQF, OVF or SCDOT will not relieve Contractor of any of its warranty obligations.

Section 2

2 QUALITY CONTROL

2.1 General

The Contractor is responsible for the quality of the Work. Quality will be enhanced through the daily efforts of all workers involved with the work as described in the CQMP. The Contractor's entire workforce will actively participate in and prioritize quality control to minimize/eliminate re-work.

The Contractor's QC program shall be sufficient in scope to pre-empt and avoid repeated discoveries of non-conforming work. Repeated discoveries of non-conforming work by the IQF, OVF or SCDOT, or in the opinion of SCDOT, excessive use of Engineering Judgement will be considered a breakdown of the QC program and may cause suspension of portions of the Work. This will be cause for investigation and corrective action prior to recommencement of affected work activities. Corrective action may include the revision to existing QC procedures, addition of new QC procedures, re-training of QC personnel, removal and replacement of QC personnel, or other such actions necessary to restore the effectiveness of the QC program. Additional explanation on corrective action is included in Appendix F, Process for Addressing Non-conforming Material or Workmanship.

2.2 Quality Control Staffing

The Contractor shall assign an on-site Quality Control Manager (QCM) responsible for management of the QC portion of the CQMP. The QCM will not be involved with scheduling or production activities and will report directly to the Contractor's Project Management Team and not to the Contractor's Construction Manager. The QCM will ensure that the methods and procedures contained in the approved CQMP are implemented and followed by the Contractor and subcontractors during the performance of the Work. The QCM shall be a qualified employee, agent or representative of the Contractor, be present at the project site during construction activities and has the authority to reject materials or work without additional approval from anyone else within the Contractor's organization.

The Contractor's and subcontractors' construction workforce are all considered to be vital members of the Contractor's QC staff, as each member is responsible for the quality of the Work. Personnel responsible for performing the QC inspection will be independent from IQF personnel, be knowledgeable in their duties, and receive documented training. Personnel performing QC sampling and testing will be knowledgeable and SCDOT certified in applicable testing methods and procedures.

2.3 Quality Control Requirements

The Contractor's CQMP must include the following QC requirements.

1. Designation of staff with the authority and responsibility for the administration of the CQMP including the production and updating of QC components of the CQMP;
2. Structure, responsibilities, and hierarchy of the QC organization including roles and responsibilities of Contractor management, production, and QC personnel;
3. Coordination and communication plan between Contractor's production and QC activities, IQF's QA activities, OVF's OV activities and SCDOT's IA activities;
4. Document control standards, the platform for data systems, document identification standards, and processes for logging, controlling and distributing QC documents including requirements and methods of the document control system that provides accessibility by quality organization personnel including the IQF, OVF, SCDOT and Federal Highway Administration (FHWA);
5. Contractor's QC organization and staffing plan including mobilization schedule, periods of time that the QC staff members will be present onsite and the required experience, knowledge, certifications and skill levels of QC staff for each major construction activity;
6. Designation of Contractor, supplier, and subcontractor staff on each crew responsible for performing daily field inspections of their own work and for preparing daily QC reports to document the inspection performed including report forms to be used by the responsible QC personnel;
7. Procedures for proper maintenance, control, calibration, and certification of tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality;
8. Procedures to ensure that elements of the Work are not started or continued without direct communication with the IQF, OVF and SCDOT. Inspections, tests and hold points must be identified and results communicated to the IQF, OVF and SCDOT. Procedures to progress beyond hold points will be developed so no work may be advanced until it has been subject to an acceptance hold point by the IQF and SCDOT as specified in the approved CQMP. Appendix A provides a list of minimum hold points;
9. Procedures for issuance, distribution and receipt of RFC plans, shop plans, procedures, including revisions that describe activities affecting quality including measures that ensure that approved documents, including authorized revisions, are reviewed for adequacy and approved for release by Contractor's authorized personnel and are distributed to and used at the location where the prescribed activity is performed. This should also include review and approval of changes to documents performed by the same organization(s) that performed the original review and approval;

10. Processes and procedures for executing design changes, field changes and plan revisions to the RFC plans, including potential interim secession of work, identification, notifications, internal QC procedures, naming conventions, logging, distributing, filing standards, approvals process required (including Engineer of Record), incorporation of changes into plan sets, as-built documentation, distribution, and issuance. Processes and procedures will demonstrate compliance with Contract requirements.
11. Procedures to ensure purchased materials, equipment, and services shall conform to the Contract, governmental approvals, applicable Laws, rules, and the design documents. These measures must be consistent with good industry practice and must include provisions for source evaluation and selection, objective evidence of quality furnished by subcontractors and suppliers, inspection at the manufacture or vendor source, and examination of products upon delivery. These procedures will include identification, documentation, segregation of non-conforming products or materials, disposition, and notification to SCDOT, IQF, OVF, and if appropriate, third parties;
12. Requests for Information (RFI) procedures to request clarification of discrepancies and/or questions in the contract documents, conceptual plans or specifications, so that all changes are documented and approved by Contractor's Engineer of Record (EOR) prior to incorporation into the Work. Contractor's procedures will be established to comply with Contract Requests (CR) procedures included in the Contract.
13. Identification and schedule of pre-activity coordination meetings, including the identification of work items that will require a pre-activity meeting, typical agenda of topics for discussion or review, general list of attendees required in the meeting, and generally how such meetings will be used to improve the quality of the product being constructed and/or installed;
14. Procedures to address each occurrence of non-conforming work including how Contractor will comply with the requirements of the Contract, how the Contractor will identify, classify, resolve, and document non-conforming work, and who is responsible for each phase of the corrective process;
15. Policies and procedures of a quality program to inspect, track and properly document implementation of Contractor's environmental protection activities to ensure compliance with project environmental permits and commitments as well as compliance with all Federal and State regulations;
16. Policies and procedures of a quality program as it relates to implementation of the Maintenance of Traffic (MOT) Plan such as monitoring, correcting, maintaining, and reporting on traffic control activities and acceptability of traffic control devices and materials;
17. Procedures for the accommodation of inspections, sampling and tests by third parties when applicable;
18. Procedures to ensure the adequacy of material (quantity) available for both IQF and OVF sampling and testing;

19. Procedures for identification and control of materials, equipment, and elements of the Work including procedures consistent with current industry standards to ensure that identification of the item is maintained by appropriate means, either on the item or on records traceable to the item, as necessary, throughout fabrication, erection, installation and use of the item;
20. Procedures for use of markings, such as stamps, tags, labels, routing cards, or other suitable means, to record the status of inspections and tests performed upon individual items of the Work;
21. Procedures for handling, storage, shipping, cleaning, and preservation of materials and equipment to prevent damage or deterioration;
22. Procedures for establishing measures for identification and resolution of repeatedly occurring conditions adverse to quality, such as failures, malfunctions, deficiencies, defective material and equipment, deviations, and other non- conforming work and how they are promptly identified and corrected including determination of cause of the condition and corrective action taken to preclude repetition. This will include development, documenting and reporting, in writing, using a Corrective Action Report (CAR), as approved by SCDOT. CAR shall include at a minimum (a) the identification of the non-conforming condition adverse to quality, (b) immediate action taken to correct the non-conformity, (c) root cause analysis, (d) improvements to the quality system to prevent similar occurrences, and (e) plan to monitor the effective implementation of improvement(s) identified. Completed CAR shall be submitted to SCDOT, OVF, IQF and to appropriate levels of Contractor's management for review and approval prior to implementation;
23. Summary of the documentation system and structure that comprises the construction quality records, and define the procedures to make sure quality records are immediately available to IQF, OVF, SCDOT and FHWA for review;
24. Procedures and frequency for checking and verification of the accuracy and adequacy of construction or right-of-way stakes, conformance to any accuracy requirements, survey control points and lines, and grades and benchmarks established by SCDOT and /or the Contractor; and
25. Procedures for ensuring that construction alignment and profile/grades lines and curves that comprise the completed Work are in accordance with the Contract, RFC plans and specifications.
26. Processes to ensure compliance with SCDOT Supplemental Specification "Source of Production of Iron and Steel Products and Construction Materials" (Jan. 1, 2023) including tracking quantities and dollars of domestic and foreign steel and applicable construction materials; and process for documentation to be provided to SCDOT at least monthly.

2.4 Quality Control Reporting, Record Keeping, and Documentation

The QCM will maintain all QC construction workmanship and materials quality records of all inspections and tests performed per the approved CQMP. These records will be submitted weekly to SCDOT in accordance with the process and format established in the approved CQMP.

Section 3

3 QUALITY ACCEPTANCE

3.1 General

The Quality Acceptance portion of this QAP for Carolina Crossroads includes both the Contractor QA functions performed by the IQF and SCDOT OV functions performed by the OVF. Regarding materials testing, IQF performed QA test results will be used in the acceptance decision if they are validated and/or verified by OVF performed OV test results. Likewise, workmanship and other inspection-driven features of the work will be accepted based on IQF's inspection observations and conclusions provided that OVF verifies that the QA processes, procedures and documentation are in accordance with the approved CQMP.

3.1.1 Quality Acceptance of Asphalt Mixtures

Acceptance of both hot mix and warm mix asphalt will be determined in accordance with SCDOT's SC-M-400 – Asphalt Mixture Quality Acceptance. The Contractor will provide sufficient SCDOT certified personnel to perform the required inspection, sampling, testing, verification, and documentation of asphalt production at the asphalt plant. The IQF will provide sufficient SCDOT certified Asphalt Roadway Technicians to perform the required inspection, sampling, testing, verification, and documentation at the point of asphalt mix placement on the roadway. SCDOT, or it's designee, will serve as the Asphalt Mixture Verification Manager (AMVM), the Asphalt Materials Engineer (AME) and the District Asphalt Manager (DAM) for the project. The IQF will include procedures in the CQMP for performing and documenting asphalt quality acceptance inspection and testing in accordance with SC-M-400.

3.1.2 SCDOT Inspection of Offsite Fabricated Materials

Precast, prestressed, and structural steel elements will be qualified, inspected, and/or tested as applicable by SCDOT prior to use on the project. The IQF will be responsible for acceptance of these specific elements or materials at the point of incorporation in the Work.

3.2 IQF Quality Acceptance Approach

The CQMP must establish the IQF's systematic approach to define the processes, methods, procedures, and documentation for quality acceptance of all materials and workmanship in accordance with this QAP. These methods and procedures must clearly define the levels of authority and responsibility for the administration

of the IQF's portion of the CQMP. This will include the procedures used by the IQF to ensure that the Work is inspected and tested to verify compliance with the Contract, RFC plans, shop drawings, specifications, standards and this QAP.

Materials sampling and testing must be provided in compliance with minimum guide schedule provided in Appendix B. The IQF must not rely wholly on the results of sampling and testing in determining the acceptability of materials and construction work. The sampling and testing must be complemented by sufficient visual inspection of the materials to determine whether the samples and tests are reasonably representative. In addition, there should be sufficient inspection of the construction operations and processes to assure uniformly satisfactory results and conformity to the plans, specifications, and other applicable Contract requirements.

3.2.1 Quality Acceptance Staffing, Facilities, and Equipment

The IQF staffing plan must reflect the volume of QA activities necessary for all work in progress and the IQF shall maintain such staff size in accordance with the approved CQMP. The IQF staff must perform comprehensive inspection and testing services for all construction activities, considering risk, complexity and duration of the work being performed to ensure compliance with the approved CQMP, RFC plans, specifications, other applicable Contract requirements. In general, IQF QA functions should be consistent with Construction Engineering & Inspection (CE&I) functions performed on traditional projects, unless otherwise indicated in the Contract.

The IQF shall update QA staffing requirements as necessary throughout construction to reflect changes in the actual construction schedule and levels of production. The IQF shall ensure that all active construction activities, regardless of complexity or duration, are monitored and inspected by IQF staff certified in the construction activity being performed, unless approved in advance by SCDOT at its sole discretion.

The IQF will assign an on-site Independent Quality Manager (IQM) responsible for management of the QA portion of the CQMP. The IQM is considered a key person and shall not be replaced without prior written approval from SCDOT. The IQM shall be dedicated solely to Project QA, shall have no other assigned Project responsibilities, and shall not be utilized on any other projects. The IQM shall report jointly to Contractor's governing Executive Committee (construction joint venture or construction company if only one prime contractor) and SCDOT and will not report to any person or party directly responsible for design or construction production. The IQM shall be on-site during Project construction and shall have the authority to stop construction work. IQM shall be available for weekly status meetings during the construction phase, and at the request of the SCDOT. The IQM will meet the following qualifications.

1. Be a licensed professional engineer in the state of South Carolina
2. Be an employee of the Independent Quality Firm (IQF).
3. Possess a minimum of 15 years of progressive experience and expertise in the Quality Acceptance (QA) of highway transportation projects and must include at least one project of similar magnitude and complexity as the Project

The IQM will review, approve, authorize, examine, interpret, and confirm any methods or procedures as designated in the Contract, SCDOT Standard Specifications and approved CQMP. The IQM is considered the "Resident Construction Engineer" for the purpose of this document when interpreting the SCDOT Standard Specifications, Contract, standards, policies, and technical provisions during construction and will have the authority to stop the Work. However, the IQM is not considered the Engineer of Record (EOR). Acceptance decisions by the IQM must be verified through the OV program, Deficiency Notice (DN), Engineering Judgement (EJ) or through the Non-conformance Report (NCR) process. The IQM will submit to SCDOT an “Independent Quality Firm Certification” report on a monthly basis in the format as provided in Appendix D. The IQM will also maintain and submit monthly to SCDOT an Engineering Judgement (EJ) Log and a Non-conformance (NCR) Log of all reports generated and approved during the reporting month.

The IQF inspection and materials sampling/testing staff will be under the direction of the IQM to verify compliance with the Contract for any or all parts of the Work and the materials used by any member of the Contractor’s team.

IQF inspection and materials sampling/testing staff shall have been trained and certified in the applicable inspection and material sampling and testing procedures. The IQF's staff will be experienced in highway inspection and materials testing. The training and experience of the IQF staff will be commensurate with the scope, complexity, and nature of the activity to be inspected and tested. IQF personnel qualifications will include SCDOT certifications in accordance with the SCDOT Technician Certification Policy for testing and inspection as well as appropriate nationally recognized certifications applicable to inspection or testing activities. IQF materials sampling/testing personnel shall also be subject to SCDOT’s IA program. Documentation of the training, certification, and experience will be maintained by the IQF and made available for review and audit by SCDOT.

The IQF shall use an AASHTO-accredited laboratory which shall be verified by SCDOT 30-days prior to beginning the portion of Work for which the laboratory will be performing the testing. Unless otherwise approved by SCDOT, the IQF laboratory shall be located on site or within twenty miles of the Project, shall be independent of the QC laboratory, and shall perform all laboratory testing for the Project. Approval to perform any specialty tests in another IQF laboratory shall be subject to SCDOT’s approval in its sole discretion. Acceptability of IQF Laboratory location will be agreed upon by SCDOT.

3.2.2 Quality Acceptance Requirements

The Contractor's CQMP must include the following to demonstrate compliance with the following QA requirements.

1. IQF organizational and staffing plan including (a) structure, responsibilities, and hierarchy of the QA organization (b) the period of time that the IQF staff members must be present on the site, and (c) the required minimum knowledge, technical skills, and experience level of the personnel related to the various inspection functions, such as but not limited to, environmental compliance, traffic control, grading, drainage, structures, pavements and electrical inspections. Also identify the administrative/clerical support staff for management of records/documents pertinent to IQF activities;
2. Processes to ensure compliance with minimum guide schedule provided in Appendix B, including how IQF sampling and testing frequencies and quantities are tracked (number of tests per quantity) to ensure compliance with the Contract. Process shall include submission of monthly report on minimum guide schedule compliance as part of monthly materials certification.
3. Processes for the submission of test data in a format meeting the specifications of the Appendix E, XML Definition Document.
4. Detailed procedures for inspection of each work activity to include, but not limited to, work items to be inspected, inspection methods, certified IQF staff involved in the inspection, acceptance criteria to be applied, and identify the IQF hold points and hold point criteria that must be satisfied before advancing the work activity. Procedures to ensure OV will be notified and accommodated during the inspection and hold point processes;
5. Procedures for performing inspection of work activities to verify compliance with the RFC plans, specifications, shop plans and working drawings. The procedure should identify inspection frequency and methods for performing verification inspections and documenting the work;
6. Identification of inspection references, specifications, standards, forms and other resources that are to compliment SCDOT specifications, standards and forms and are intended to be used to ensure quality of work activities and/or materials incorporated into the Project;
7. Define and provide inspection documentation format for technician daily inspection reports, work item checklists, and materials test reports.;
8. Test data organization methodology including the planned materials information database structure and sample identification methodology that documents sample ID structure, material type and usage codes, and location referencing standards. Material codes and other test identifiers must be consistent with those provided by SCDOT and identified in Appendix E, XML Definition Document;
9. Materials information management software and end user computer devices that will be utilized for collecting, organizing, processing, retrieving, and reporting test data including how the IQF will capture data and transmit reports to SCDOT in an electronic format acceptable to SCDOT;
10. Content and format of the sampling and testing requirements for all types of materials that will be used on the Project including how it will be consistent with those identified in Appendix C;
11. Procedures for checking and verifying that all collected samples and performed material tests are

reported with the proper material codes, type codes or other identifiers required by SCDOT to perform OV including internal QC methodology that will be used to check and assure data integrity;

12. Methodology for review and approval of test results including the categorization of test results in a manner acceptable to SCDOT, transmitting test results to SCDOT in a format acceptable to SCDOT for use in fulfilling its verification requirements, and working collaboratively with SCDOT to resolve nonverification between IQF and SCDOT test results;
13. Identification of specific materials, or components of items, that are to be accepted based on manufacturer's certification, how material certifications will be collected or received, how they will be provided to and monitored by IQF field personnel, how they will be correlated to specific quantities of received material, the system and processes used for receiving, storing and organizing materials certifications to facilitate future audits, what tracking certifications and who will be responsible for managing the materials certification program.;
14. Standards to ensure compliance with the sampling and testing plan that includes a process for tracking planned verses actual testing status including the nature and content of weekly reports that will be provided by the IQF to show sampling and testing plan compliance, and the manner in which non-compliance situations will be rectified, or otherwise justified;
15. Submittal processes for soil-lime treatment, soil-cement treatment and other mix designs stamped by a licensed Professional Engineer and submitted to SCDOT for review and approval at least 10 business days prior to use. For hot-mix asphalt mix designs and Portland cement concrete mix designs, processes shall include submittal to SCDOT for review at least 10 business days prior to use and submittal of revisions to SCDOT for review at least 10 business days prior to use.
16. Procedures for performing and documenting quality acceptance inspection and testing of asphalt mixtures in accordance with SCDOT's SC-M-400 - Asphalt Mixture Quality Acceptance.
17. Education, training, and certification program of IQF personnel including electronic log made available to SCDOT that contains personnel certification status and expiration dates;
18. Processes to track and assure that personnel performing QA activities are evaluated annually by SCDOT's IA staff for the sampling and testing they perform including reporting to SCDOT which individuals are due for evaluation;
19. Procedures to ensure that IQF personnel are present when work is being performed including how the Contractor shall identify and communicate inspection needs or hold points to the IQF and OVF and how to complete inspections or hold points. For each procedure, include methodology or approach to a risk-based level of inspection for each major element of work and the work effort associated (continuous, regular, or periodic) with inspecting the work;
20. Detailed list of materials and the process and authority for application of Engineering Judgement to accept material failing to meet inspection and testing specifications based on an individual test if the material still meets the intended purpose and indicate how the IQF will comply with these guiding principles;
21. Format for documentation of the IQF's application of Engineering Judgement including, at a minimum, a unique identifying number for each instance, and a written document identifying the type and location of the non-conforming work or material, the circumstances and the engineering evaluation rationale and conclusions, and any supporting documentation such as calculations or sketches, as appropriate;
22. Methodology and processes for the development, implementation and management of Deficiency

Notice (DN) procedure to notify the Contractor of non-conforming work or material failing to meet the standards of the Contract, CQMP, specifications, plans and standards in which there is still an opportunity to correct the non-conformance prior to advancing the work.

23. Methodology, processes and timeframe for the initiation and review of Non-Conformance Reports (NCR) to document and address each occurrence of non-conforming material failing to meet specifications or inspection to include identification of the type and location of the non-conforming material or workmanship, details of the specification non-conformity, additional testing or analysis performed, subsequent conclusions made, and final disposition of the failing material or work. SCDOT has final approval on all NCR's.
24. Procedures for proper maintenance, control, calibration, and certification of tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality at specified periods to maintain accuracy within industry standards;
25. Comprehensive system and schedule of planned and periodic internal audits, at a minimum of quarterly, of the CQMP to determine adherence to and the effectiveness of both the QC and QA portions of the CQMP including written procedures and checklists, follow-up actions, and re-audit of deficient areas and correction actions;
26. Summary of anticipated construction audit documentation to be submitted to SCDOT, and the procedures to ensure all results of audits for construction are submitted to SCDOT within five business days after the audit is completed;
27. Processes to verify compliance with SCDOT Supplemental Specification "Source of Production of Iron and Steel Products and Construction Materials" (Jan. 1, 2023) including tracking quantities and dollars of domestic and foreign steel and applicable construction materials to be made available to SCDOT at least monthly.
28. Summary of the documentation that comprises the construction quality records including how the records shall be immediately available to SCDOT for review;
29. Proposed detailed weekly report(s) which continuously track and record the quantity of material incorporated into the Project as well as documentation that the IQF is meeting the minimum sampling and testing frequencies;
30. Methods for verification of approved status of materials used on the project included on SCDOT's qualified products list (QPL), procedures to request approval of non-standard materials not included on SCDOT's QPL and how materials no longer approved on SCDOT's QPL will be sampled and tested by the IQF;
31. IQF materials sampling and testing procedures including the processes for random sampling, tracking materials samples, processing materials samples, review and approval of test records, and tracking compliance with materials testing frequency;
32. Methods for addressing failed IQF test results including a fixed test at the original failing test location and a new random independent test at a new randomly determined location in the same lot as required;
33. Procedures for addressing failed OV test results and non-validation of IQF test results in accordance with Section 3.6 and 3.7 of this document;
34. Process and schedule for development, review, approval and monitoring of Storm Water Pollution Prevention Plan (SWPPP) implementation including weekly inspections and reporting by certified CEPSCI inspectors, in accordance with TP Attachment 110-XX or as otherwise required by South

Carolina Department of Health and Environmental Control (SCDHEC) requirements;

35. Procedures for development, review, approval and monitoring of Traffic Control Plans (TCP) including inspection and hold points prior to starting construction work associated with the approved TCP. If the traffic control set up is not fully compliant with the approved TCP, procedures for IQM to make and document an engineering determination that the setup is sufficiently compliant with traffic control standards before work can be started.
36. Procedures to monitor and check the accuracy and adequacy of survey control, benchmarks, construction stakes, lines, and grades established by Contractor. Procedures to perform and document construction survey verification of Contractor's completed work at a minimum frequency per SCDOT Construction Manual and in accordance with all other contract documents.
37. Procedures for submittal of final materials certification report to SCDOT in accordance with SCDOT's standard format and containing all information required for SCDOT to complete their final material certification obligations to FHWA.

3.2.3 Quality Acceptance Reporting, Record Keeping, and Documentation

The IQF shall document and maintain project records showing how the IQF has complied with the CQMP requirements, including:

1. A system to produce electronic, searchable daily reports of all inspections performed for both Contractor and Subcontractor operations in a format acceptable to SCDOT. The daily inspection reports must identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed. The responsible inspector or technician and supervisor must sign the daily inspection reports. IQF shall provide reports of the QA daily inspections (including any material certifications associated with the work) to SCDOT via ProjectWise Deliverables Management (PWDM) in an electronic format acceptable to SCDOT within 24 hours after the work shift;
2. An electronic system for recording all material test results and certifications. The responsible technician and his/her supervisor must sign each test report. Contractor shall provide the results of the daily test to SCDOT within 24 hours of test completion and without prior review by the Contractor. The daily submission of test reports shall be formatted in conformance with requirements shown in Appendix E, XML Definition Document;
3. Inspection and materials quality program that must deliver all inspection reports, laboratory and field test results to SCDOT via PWDM. This electronic reporting is intended to allow Contractor and SCDOT to make timely and accurate decisions on workmanship and material quality issues.
4. System and procedures to approve and maintain original copies of all material certifications and manufacturer's test reports as required by the specifications prior to incorporating material into the Work and to make material certifications available to SCDOT.

3.3 Engineering Judgement

The use of Engineering Judgement is part of the acceptance program and authorizes the IQF the ability to

render decisions in the field regarding the work performed. SCDOT recognizes that the IQF is an element of the Contractor's team working with the Contractor to check for and determine compliance with the approved plans and specifications. SCDOT recognizes that the IQM should be afforded the opportunity, in concert with the IQF's independent role, to render engineering decisions on marginally, non-conforming inspection or test results. Engineering Judgement may also be applied by SCDOT, as appropriate. Engineering Judgement may be applied providing the following criteria are met:

1. The IQF will formally submit an Engineering Judgement list of inspection and testing items that it is requesting approval from SCDOT to exercise Engineering Judgement on. This list will be reviewed and approved by SCDOT at its sole discretion. Once approved by SCDOT, the IQM may only exercise Engineering Judgement on items included in the approved list. This Engineering Judgement list will be maintained by the IQF and will only be revised with approval of SCDOT at its sole discretion.
2. Delegation of authority by the IQM must be approved by SCDOT. These individuals are required to be an employee or agent of the IQF and must be a Registered Professional Engineer in the State of South Carolina. Engineering Judgement may only be applied within an individual's area of expertise.
3. Engineering Judgement to accept material or work failing specifications will never be applied solely to promote "partnering" or to help the Contractor. Quality of work is always the highest priority. Schedule impacts will not be a consideration with respect to quality delivery of the Work.
4. Engineering Judgement to accept materials or work failing specification requirements will be applied only in cases that will otherwise meet the intent of the design or that rejection of material compromises quality of a more significant item (e.g. by rejecting a load of concrete for a structural element that is subject to a cold joint).
5. Engineering Judgement will only be applied to individual tests. Patterns of failure will not be accepted and will be considered a breakdown in QC activities and shall be addressed in the CQMP. Recurring use of Engineering Judgement for the same plan or specification deviation should result in process corrections to the construction operations to assure material and work is conforming to plan and specification requirements. Engineering Judgement cannot be used to widen a specification requirement on a continuing basis.
6. The IQM shall utilize Engineering Judgement to direct that an amount of acceptance testing greater than the required minimum be done when deemed necessary.
7. The individual exercising the Engineering Judgement will apply industry standard engineering practices to ensure quality of accepted material by performing additional tests, through engineering analysis, etc. and will document his/her acceptance and justification.

8. Engineering Judgement in acceptance of work not meeting specification requirements will be applied only to situations that are technically sound and in consideration of localized conditions. Engineering Judgement will not be utilized to waive specification for conditions that have project-

wide implications. The acceptance of material or work not meeting specifications in a single instance at a specific location will not be applied as a project-wide decision. Each situation will be judged on the merits of its unique characteristics.

9. SCDOT may, at any time, remove or limit Engineering Judgement authority from the IQM if his/her Engineering Judgement is not exercised appropriately, too frequently or in a manner non-compliant with the requirements and intent of this section.
10. SCDOT and FHWA have oversight agreements in place that require specific documentation relating to non-conforming material that can remain in place. Any application of Engineering Judgement will be accompanied by appropriate documentation defined in the CQMP.
11. The IQM is encouraged but not required to consult with SCDOT prior to making acceptance decisions based on Engineering Judgement.
12. IQF personnel will not be placed, or appear to be placed, in a position that exhibits signs that they were pressured by the Contractor to accept, approve, or continue the duties of the IQF scope of work as detailed in the project under duress.

3.4 Sampling, Testing, and Analysis

This section provides requirements for sampling, testing, analysis, and acceptance requirements to be used in the acceptance decision.

3.4.1 Analysis Types and Uses

Samples or tests are either random or fixed, depending on whether the location was selected randomly (random) or if a specific location was subjectively identified (fixed). Samples or tests are also either independent or split, based on whether the sample or test is taken independently of any other sample or test taken at the same general location and period of time (independent) or whether it is taken at the same general location and period of time of another sample or test (split). Only OV and QA samples and tests selected randomly and independently shall be used to meet respective sampling guide schedule testing frequency requirements. A failing QA random independent test requires a passing fixed-independent test at the original failing location and an additional passing random-independent test within the lot for acceptance.

The IQF shall perform additional (fixed) tests when the quality of material is questionable at a location other than the randomly selected location. If these additional fixed tests fail, they shall be addressed in a similar manner to a failing random-independent test. Fixed tests do not count towards meeting minimum IQF testing frequencies.

A comparison process for performing and analyzing split samples between OV and QA is necessary during the initial implementation of this QAP to ensure that OVF and IQF equipment and testing procedures are in alignment. These samples will be analyzed by the OVF and the results discussed with the IQF to assure

laboratory and technician test results compare favorably. When the allowable deviation from the limits shown below in Figure 2. Split Sample Tolerance are exceeded, corrective actions for either or both parties will be identified, and corrective actions will be incorporated as appropriate. This process will help provide initial alignment of the OVF and IQF equipment, laboratories and testing procedures. The IQF must commit resources and sample material as necessary to accommodate splitting alignment activities described in the QAP.

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

Sample All test results in general, percent of numerical value, except as provided for below.		**Tolerance** 10% of numerical values (or less)
Soils	Liquid Limit	13% of mean (or less)
	Plasticity Index	18% of mean (or less)
	Organic Content of clay (%)	1.6 (or less)
	Organic Content of silt or sand (%)	1.0 (or less)
Aggregates	Unit weight of coarse agg (pcf)	5.3 (or less)
	Unit weight of fine agg (pcf)	7.8 (or less)
Compaction Tests	Earthwork (%)	2.0 (or less)
	Graded Aggregate Base (%)	2.0 (or less)
	Speedy Moisture (dial reading)	0.8 (or less)
	Nuclear Gauge Moisture (pcf)	2.0 (or less)
Sieve Analysis	(a) No. 4 sieve and larger (%)	5.0 (or less)
	(b) Smaller than No. 4 Sieve (%)	3.0 (or less)
Concrete	Cylinder Compressive Strength (psi)	15.0 % (or less)
	Air Content (%)	0.5 (or less)
	Temperature (^{O}F)	Observation
	Slump (inches)	Observation

Figure 2. Split Sample Tolerance

3.4.2 Inspection and Testing Notification

On a weekly basis, the Contractor will update and provide the IQF, OVF, and SCDOT with a rolling 3-week look-ahead schedule consistent with the current CPM Schedule and showing the anticipated start and finish of Work activities. The look-ahead schedule will include planned onsite construction activities and the delivery schedule of off-site fabricated materials. The look-ahead schedules will include location and

descriptors of planned activities, associated CPM Schedule activity numbers, sub-contractor or crew assignments, activity durations, and review by third parties.

3.4.3 Quantities and Testing Frequency

The quality of materials and construction incorporated into the Project are controlled by sampling and testing and must be accepted based on compliance with this QAP and the Contract. The IQF must randomly sample at prescribed frequencies based on the IQF sampling guide schedule that meet or exceed those presented in the Appendix B. The IQF's sampling guide schedule must be published in the Contractor's CQMP. Sampling and testing must be performed by AASHTO-accredited laboratories and by SCDOT-certified sampling and testing personnel who participate in the Independent Assurance (IA) program. Technicians performing specialized inspections on Intelligent Transportation Systems (ITS), lighting, or signals must have both International Municipal Signal Association (IMSA) Traffic Signals Technician Level II and IMSA Fiber Optic Technician Level II certifications. Technicians performing specialized inspections on structural steel coatings must have NACE Coating Inspector Program (CIP) Level 1 or SSPC Bridge Coating Inspector (BCI) Level 1 certification.

The IQF's sampling guide schedule frequencies shall be fulfilled using only random and independent samples and tests. It must indicate the material type to be sampled, the controlling specification(s), the frequency of sampling, the location where sampling will occur, the testing to be performed, and the acceptance criteria. Material test identification and labelling will be in accordance with standard SCDOT practices with some modifications to accommodate the separation of materials into appropriate categories for statistical validation or verification. The IQF shall comply with and coordinate with the SCDOT test identification and labelling practices for the Project.

For materials that are sampled on a time designated lot basis, the CQMP must define the methodology to estimate the relationship between the production lot quantity and the time required to produce such quantity. This relationship is required for the IQF to determine the required number of acceptance samples.

Some materials may be accepted through material certifications and manufacturer's test reports. Certifications and test reports will be reviewed and approved by the IQM. Certifications and test reports approved by the SCDOT's Office of Materials and Research (OMR) in the *SCDOT Standard Specifications for Highway Construction* will continue to be reviewed and approved by SCDOT's OMR.

The IQF will continuously track and record the quantities of materials incorporated into the Project. The IQF will reconcile their accepted (testing and inspection) quantities with Contractor installed quantities and provide SCDOT a detailed monthly report to verify compliance with the approved guide schedule in the CQMP. CQMP shall include a draft of the monthly report. SCDOT will use the report to verify compliance

of both the IQF and OVF testing frequency.

OVF will perform oversight monitoring and material verification sampling/testing. To verify IQF test results, OVF will perform testing in accordance with this QAP and at a frequency shown in Appendix C – Owner Verification Levels for Materials Verification. OVF testing frequency will be established at SCDOT's sole discretion.

3.5 Owner Verification Requirements

OVF will perform OV to verify IQF inspections, test results and conclusions. For materials testing, verification will be achieved through comparisons between IQF testing results and OVF testing results or the observation of IQF test performance. OV testing will be performed in an AASHTO-accredited laboratory for which the laboratory will be performing the testing. For workmanship and inspection activities, OVF will verify that the IQF is performing the inspection procedures adequately and documenting the results in accordance with the CQMP. In addition to real-time evaluations, OVF will also conduct periodic audits to verify Contractor's and IQF's compliance with the approved CQMP.

OVF will develop a comprehensive Owner Verification Plan (OVP) for the Project and submit it to SCDOT and FHWA for their concurrence. The OVP will include internal procedures used by the OVF to ensure that the IQF's frontline acceptance activities are performed in accordance with the approved CQMP. OVF will complete the development of the OVP in parallel with approval of the Contractor's CQMP.
The OVP must include the following to demonstrate compliance with the following requirements:

1. Methods and procedures that clearly define the authority and responsibility for the administration of the OVP.
2. Procedures for overseeing and monitoring the Work for compliance with Contractor's CQMP for each construction operation.
3. Procedures to ensure that the education, training, and certification of personnel performing OV activities are achieved and maintained in accordance with the approved OVP.
4. Procedures to oversee the status and disposition of any identified non-compliance with the plans and specifications.
5. Measures to ensure that tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality are properly maintained, controlled, calibrated, certified, and adjusted at specified periods to maintain accuracy within industry standards.
6. A system of planned and periodic audits of the Contractor's CQMP to determine adherence to and the effectiveness of the CQMP. Audit results will be documented, reviewed, and sent to SCDOT and the Contractor. Follow-up action, including re-audit of deficient areas following corrective action,

will be taken where indicated.

7. A system of planned and periodic audits to determine OVF adherence to and the effectiveness of the OVP. Audit results will be documented, reviewed, and sent to SCDOT. Follow-up action, including re-audit of deficient areas following corrective action, will be taken where indicated.
8. Procedures for performing periodic monitoring of Work to verify that the IQF has inspected the Work in compliance with the RFC plans, specifications, and shop plans and working drawings. The procedure should identify a target oversight frequency and methods for performing verification monitoring.
9. Procedures for performance of OVF material sampling and testing including the process for generating random test locations, tracking material samples, processing material samples, review and approval of test records, and tracking compliance with material testing frequency.
10. Procedures for reviewing QA and OV test results for compliance with mutually agreed-upon processes and naming conventions to ensure data integrity for accurate statistical analyses.
11. Procedures for verifying that only tests performed by qualified IQF and OVF testing personnel are submitted to SCDOT for analysis.
12. Procedures for monitoring the QA inspection and testing of asphalt mixtures in accordance with SCDOT's SC-M-400 - Asphalt Mixture Quality Acceptance.
13. Procedures for auditing QC and QA records, documentation, procedures, and processes to verify compliance with the Contract and approved CQMP.
14. Roles and procedures for reviewing and approving Shop Plans, Working Drawings and mix designs.
15. Target frequencies for the independent sampling and testing that are to be conducted as a part of OV. The initial target frequency will include a higher frequency of testing at the beginning of the Project and will be adjusted, as appropriate throughout the Project, based on the observed consistency of the product and the statistical comparison between OV and QA test results.
16. Procedures for ensuring that OV testing is performed at the frequencies stipulated in the OVP.
17. Identification of the platform and data structure of the database management system that will be used to collect, store and retrieve OV test data. Identification of a strategy to coordinate data between the IQF and OVF, meeting Appendix E, XML Definition Document.
18. Procedures for performing statistical analyses in compliance with procedures outlined in this QAP.
19. Procedures for satisfying IA requirements of this QAP.
20. Procedures for review and approval of Corrective Action Report (CAR) for resolutions of reoccurring, non-conforming work as submitted by the Contractor.
21. Procedures for review and approval of Non-Conformance Reports (NCR) for disposition of each item of work or materials test failing to meet specifications as submitted by the IQF.
22. Procedures for review and acceptance of Field Change Notifications (FCN) as submitted by the IQF.
23. Format for documentation of the OVF's application of Engineering Judgement including, at a

minimum, a unique identifying number for each instance, and a written document identifying the type and location of the non-conforming work or material, the circumstances and the engineering evaluation rationale and conclusions, and any supporting documentation such as calculations or sketches, as appropriate.

3.6 Owner Verification Levels of Material Verification

Each material testing procedure expected to be performed by the IQF, and verified by SCDOT, has been assigned a level of materials verification (Appendix C).

For Level 1 test procedures, verification is achieved through continuous analyses. Verification involves statistical analyses using test result comparison packages that have been prepared for specific materials during specific time frames. The F-test is used to determine if the OV and QA data population variances are equal, and the t-test is used to determine if their means are equal. The F- and t- tests are performed continually through the life of the project. The target OV testing frequency is approximately ten percent of the QA testing frequency and can be increased at SCDOT's discretion.

For Level 2 test procedures, verification is achieved through independent verification. Verification involves obtaining independent OV samples and utilizing Engineering Judgement to compare OV test results with the corresponding QA test results. Test result verification is accomplished on a quarterly basis or as dictated by actual construction operations and schedule. The target OV testing frequency is once per quarter and can be increased at SCDOT's discretion.

For Level 3 test procedures, verification is achieved though observation verification. Verification involves observing the IQF performing the specific test methods. This type of verification will occur once per test method, unless otherwise determined necessary by SCDOT.

If the OV results or observation verification do not verify the QA test results, OVF and the IQF will both proactively investigate and resolve the nonverification. OVF and the IQF will also proactively take prudent steps to minimize the occurrence of nonverification.

3.7 Material Quality and Acceptance

In addition to the need to investigate and resolve material category non-verifications, non-conforming material identified by a single quality test must be immediately evaluated to determine if it can be left in place or must be removed, reworked, or repaired, regardless of whether the material category is verifying or not. If a specific non-conforming material is to remain incorporated into the Project, the material in question will be evaluated by the IQF and/or OVF who may exercise Engineering Judgement to determine whether the material will perform its intended purpose, or the NCR process may be initiated for further analysis by the Engineer of Record (EOR) and /or SCDOT.

Figure 3 provides the process for acceptance decisions for possible scenarios of passing and failing results between IQF and OVF tests.

Material Quality Acceptance					
Scenario	Scenario Number	Acceptance Test Results meet Spec		Action	Acceptance Decision
		IQF	OVF		
Both IQF and OVF Tests Pass	1	Yes	Yes	IQF Accepts OVF Verifies	Material may be incorporated into the project
IQF Test Fails and OVF Test Passes *	2	No, but reasonable conformance	Yes	IQF exercises EJ	Material may be incorporated into the project
		No		IQF initiates NCR process	Material may/may not be incorporated based on NCR disposition
Both IQF and OVF Tests Fail *	3a	No, but reasonable conformance	No, but reasonable conformance	Both IQF and SCDOT exercise EJ	Material may be incorporated into the project
	3b	No	No	IQF initiates NCR process	Material may/may not be incorporated based on NCR disposition
	3c	No	No, but reasonable conformance	IQF initiates NCR process	Material may/may not be incorporated based on NCR disposition
	3d	No, but reasonable conformance	No	IQF performs Fixed-Split test at failed OV location *(see below actions)*	
		IQF Fixed-Split - No		IQF initiates NCR process	Material may/may not be incorporated based on NCR disposition
		IQF Fixed-Split - Yes or No, but reasonable conformance		*SCDOT further investigates with additional OV Fixed-Independent test*	
				1. If OV Fixed-independent tests acceptable, both IQF and SCDOT exercise EJ	Material may be incorporated into the project
				2. If OV Fixed-independent tests not acceptable, IQF initiates NCR process	Material may/may not be incorporated based on NCR disposition
IQF Test Passes and OVF Test Fails *	4a	Yes	No, but reasonable conformance	SCDOT exercises EJ	Material may be incorporated into the project
	4b	Yes	No	IQF performs Fixed-Split test at failed OV location *(see below actions)*	
		IQF Fixed-Split - No		IQF initiates NCR process	Material may/may not be incorporated based on NCR disposition
		IQF Fixed-Split - Yes or No, but reasonable conformance		*SCDOT further investigates with additional OV Fixed-Independent test*	
				1. If OV Fixed-independent tests acceptable, SCDOT exercise EJ	Material may be incorporated into the project
				2. If OV Fixed-independent tests not acceptable, IQF initiates NCR process	Material may/may not be incorporated based on NCR disposition

* Contractor may elect to rework or replace non-conforming material to bring material into compliance at any time.

Additional testing for reworked material / area:

1. IQF perform Fixed test at previous failed test location (IQF or OVF failed test location)
2. If Fixed test passes, IQF and OVF perform Random-Independent test

Figure 3: Process for Acceptance Decision of Materials

3.8 Referee Testing

While expected to occur very rarely, disputes over specific QA and OV test results may be resolved in a reliable, unbiased manner by referee testing and evaluation performed by SCDOT's Office of Materials & Research or an independent third-party testing laboratory as appointed by SCDOT's Office of Materials & Research. The decision by SCDOT, or its designee, is final. Referee testing is solely an owner function. Therefore, if a third-party laboratory is utilized, SCDOT will pay for this testing.

3.9 FHWA Reporting

SCDOT will submit quarterly reports to FHWA for concurrence with SCDOT's compliance with the QAP. The reporting period for specific pay items or materials is dependent on the pace of construction, the number of tests performed in each analysis category, the time period of the sampling, and the specification and quality requirements.

The FHWA quarterly report must address the following areas:

1. Statistical analysis and verification results;
2. Non-validation investigation;
3. Split sample test results;
4. IQF Engineering Judgement log;
5. OVF Engineering Judgement log
6. Non-conformance log; and
7. IQF Monthly Certifications

Section 4

4 INDEPENDENT ASSURANCE

4.1 General

The Code of Federal Regulations (23 CFR 637, Subpart B) requires the implementation of an Independent Assurance (IA) program. SCDOT, or its designee, will implement the IA program as described in this section.

The IA program evaluates the sampling/testing personnel and testing equipment used in acceptance of materials. The Code of Federal Regulations allows observations, split sample results, and proficiency sample results as means of evaluating testing personnel within a State's IA program. The IA program allows for the inclusion of calibration checks, split sample results, and proficiency sample results for evaluating acceptance testing equipment. The IA program does not directly determine the acceptability of materials but evaluates all personnel and equipment involved in the acceptance decision.

4.2 SCDOT Independent Assurance for Testing Personnel

Independent Assurance for testing personnel performing materials acceptance activities will be in accordance with the latest version of the SCDOT Independent Assurance System Based Work Plan for Carolina Crossroads Construction.

4.3 Qualification of Testing Personnel

All personnel supervising or performing acceptance or verification sampling and testing activities must meet the qualification requirements in the *SCDOT Technician Certification Policy* and participate in annual IA proficiency testing.

Appendix A Minimum Hold Points

Appendix A
Carolina Crossroads - Minimum Hold Points

Discipline	Hold Point	Pre-Activity Meeting Required	IQF Approval Required	SCDOT Approval Required	Comments	Form Numbers
Environmental Mitigation	Prior to initiating land disturbance activities	Yes	Yes	Yes	Confirm approved SCDHEC NOI on file with NPDES General Permit for SCDOT SCR160000	
	Prior to land disturbance activities at off-site borrow pits, waste areas or stockpile areas		Yes	No	Confirm all permits submitted, approved and on file	200.04
	Prior to resuming grading operations on a weekly basis		Yes	No	Confirm Grading and Stabilization Log up to date to include when grading occurs, construction activities cease, and initiation of stabilization measures.	800.05
Embankments	After clearing, grubbing, and mucking, prior to fill placement in areas with < 5' fill.		Yes	No	Confirm stumps, roots, debris, etc. have been completely removed.	
	After clearing, grubbing, and mucking, prior to fill placement in areas with > 5' fill.		Yes	No	Confirm roots, debris, etc. have been completely removed and remaining stumps are below 8" in height	
	Prior to embankment construction and/or incorporation of borrow material into project	Yes	Yes	No	Confirm material borrow material is tested and approved	
	Prior to placement of subsequent lift of embankment/borrow placement - below top 18".		Yes	No	Confirm compaction testing performed and meets specifications.	
	Prior to placement of initial top 18" material.		Yes	Yes	Confirm proof roll conducted on final lift of embankment below 18"	
	Prior to placement of subsequent lift of embankment/borrow placement - within the top 18".	Yes	Yes	Yes	Confirm compaction testing performed and meets specifications. Confirm proof roll conducted on each lift.	200.02, 200.03
	Prior to installation of base course (CMRB, GAB, CTB, Sand Clay, etc.)	Yes	Yes	~~No~~ Yes	Confirm that material is sampled, tested and approved or mix design is submitted, approved and on file	
	Prior to paving over base course		Yes	Yes	Confirm depth checks, cement rates, gradation, segregation, etc. meet specifications. Confirm proof roll is conducted and approved.	
	Prior to removal of settlement surcharge		Yes	Yes	Confirm settlements/rates have been achieved and approved by EOR.	
	Prior to installing ground improvements	Yes	Yes	No	Confirm Ground Improvement Plan is submitted and approved.	
	Prior to placing embankment over ground improvements		Yes	No	Confirm ground improvements were installed according to RFC plans and approved by EOR.	
Drainage (includes Drainage Box Structures)	Prior to placing drainage pipe and placing structural backfill	Yes	Yes	No	Confirm RCP has been stamped as approved or HDPE is on SCDOT QPL and certification is on file. Confirm structural fill material has been sampled, tested and approved. Confirm foundation and bedding material is sound and acceptable.	
	After placing backfill over drainage pipe and prior to initiating grading operations		Yes	No	Confirm compaction testing performed and meets specifications. Confirm pipe meets specifications for roundness and other defects.	
	After excavation and prior to placing/building drainage structures		Yes	No	Confirm that reinforcing steel has been sampled, tested and approved. Confirm pre-cast structure has been stamped as approved. Confirm foundation and bedding material is sound and acceptable	
	After reinforcement and form placement and prior to pouring concrete for drainage structures.		Yes	No	Confirm reinforcing steel size and spacing meets specifications. Confirm stability, alignment and grade of forms meet plans and specifications. Confirm Pre-Pour Checklist completed and approved.	
	Prior to backfilling drainage box structures		Yes	No	Confirm concrete meets required strength. Confirm final alignment and grade of completed structure. Confirm structural fill material has been submitted and approved	

Appendix A - Minimum Hold Points

Discipline	Hold Point	Pre-Activity Meeting Required	IQF Approval Required	SCDOT Approval Required	Comments	Form Numbers
Cast In Place Structures (Bridges, Retaining Walls, and Box Culverts)	Prior to initiating drilled foundation installation	Yes	Yes	Yes	Confirm Drill Foundation Plan is submitted and approved. Confirm pre-activity meeting held. Confirm Pre-Pour Checklist completed and approved.	700.01
	Prior to conducting Cross-hole Sonic Logging (CSL)		Yes	No	Confirm Drilled Shaft Logs filled out, signed, approved by EOR and on file.	700.10 700.15
	Prior to column installation		Yes	Yes	Confirm CSL test results on file and shaft is accepted by EOR. Confirm CSL pipes are filled/grouted. Confirm Pre-Pour Checklist completed and approved.	700.01
	Prior to initiating production pile installation	Yes	Yes	Yes	Confirm Pile Diving Analysis (PDA) has been completed and Pile Installation Plan is submitted, approved by EOR and on file.	
	Prior to construction of subsequent bridge components (footings, caps, etc.)		Yes	No	Confirm Pile Driving Logs filled out, signed, approved by EOR and on file.	700.15
	Prior to initiating structural concrete pour	Yes	Yes	No	Confirm concrete mix designs are submitted, approved and on file. Confirm that reinforcing steel has been sampled, tested and approved. Confirm Pre-Pour Checklist completed and approved. Confirm RFIs and/or NCRs are approved. Confirm pre-pour conference held	700.01
	Prior to initiating mass concrete pour	Yes	Yes	Yes	Confirm Mass Concrete Placement plan submitted, approved and on file. Confirm Pre-Pour Checklist completed and approved. Ensure that required monitoring and/or cooling equipment is installed as per plans.	700.01
	Prior to stripping forms on structural concrete member		Yes	No	Confirm concrete meets minimum strength for form removal	
	Prior to loading structural members		Yes	No	Confirm concrete meets minimum strength for loading	
	Prior to placing bridge girders (concrete or steel)	Yes	Yes	No	Confirm Girder Erection Plan submitted, approved and on file. Confirm Shop Drawings submitted, approved and on file.	
	Prior to installing overhang brackets		Yes	No	Confirm Shop Drawings submitted, approved and on file.	
	Prior to placing reinforcing steel for bridge deck		Yes	No	Confirm beam and deck grades submitted, approved and on file. Confirm that reinforcing steel has been sampled, tested and approved. Confirm stay-in-place (SIP) forms are installed at proper grade and as per shop drawings.	
	Prior to initiating concrete bridge deck pour.	Yes	Yes	Yes	Confirm concrete mix designs are submitted, approved and on file. Confirm Pre-Pour Checklist completed and approved. Confirm RFIs and/or NCRs are approved. Confirm dry run depth checks has been performed and accepted. Confirm pre-pour conference held	700.01 700.05
	Prior to abrasive cleaning and applying primer paint coat to structural steel members.	Yes	Yes	No	Confirm shop drawings and plans for containment system is submitted and approved by EOR. Confirm Environmental Protection and Employee Protection plans are submitted and approved. Confirm primer in on QPL	
	Prior to applying finish coat to structural steel members.		Yes	No	Confirm primer application meets minimal paint thickness	
	Prior to demolition of existing structures		Yes	Yes	Confirm Demolition Plan submitted, approved and on file.	
	Prior to initiation of Field Welding		Yes	No	Confirm Structural Field Welding Quality Control Plan submitted, approved and on file.	700.16
	Prior to placing post-tensioned structural members	Yes	Yes	Yes	Confirm pre-construction conference for post-tensioning procedures is held.	

Appendix A - Minimum Hold Points

Discipline	Hold Point	Pre-Activity Meeting Required	IQF Approval Required	SCDOT Approval Required	Comments	Form Numbers
MSE Walls	Prior to initiating MSE Wall construction	Yes	Yes	No	Confirm Shop Plans and Working Drawings submitted, approved and on file.	
	Prior to placement of structural backfill		Yes	No	Confirm reinforced backfill material sampled, tested and meets specifications and has been approved for incorporation into the project	
Sign, Signal, Lighting, and ITS Support Structures	Prior to initiation of foundation excavation	Yes	Yes	Yes	Confirm Shop Plans and Working Drawings submitted, approved and on file.	
	Prior to initiating structural concrete pour.		Yes	No	Confirm concrete mix designs are submitted, approved and on file. Confirm that reinforcing steel has been sampled, tested and approved. Confirm Pre-Pour Checklist completed and approved. Confirm pre-pour conference held.	700.01
	Prior to placement of support structures		Yes	No	Confirm concrete meets required strength for loading	
Asphalt and Concrete Paving	Prior to mix production and placement of first lift	Yes	Yes	Yes	Confirm production plant has been certified. Confirm mix designs are submitted, approved and on file. Confirm Paving Plan is submitted, approved and on file (i.e. target rates, paving widths, joint spacing, taper lengths, etc.). Confirm Pre-Activity meeting has been held. Confirm base is in acceptable condition.	
	Prior to placement of subsequent course/lift.		Yes	No	Confirm compaction of previous course/lift is achieved and inspected for segregation.	
Management of Traffic and Traffic Devices	Prior to installation of temporary lane closures		Yes	No	Confirm Traffic Control Plan (TCP) submitted, approved and on file.	
	Prior to removing a temporary lane closure.		Yes	No	Confirm all conflicting markings are eradicated. Confirm all new markings accurately installed according to plans and specifications. Confirm all pavement edges/drop-offs are within specifications.	
	Prior to implementing a long-term, lane shift or closure		Yes	Yes	Confirm Traffic Control Plan (TCP) submitted, approved and on file. Confirm temporary barrier wall system is approved and stamped. Confirm impact attenuators are on QPL and approved for use.	
	Prior to opening to traffic on new roadway or changed configuration.		Yes	Yes	Confirm safety features (guardrail, attenuators, etc.) are installed according to plans and specifications. Confirm pavement markings accurately installed according to plans and specifications. Confirm all pavement edges/drop-offs are within specifications.	
	Prior to placement of guardrail, end treatments, and attenuators		Yes	No	Confirm proper shoulder slope and clear zone area is achieved.	
Miscellaneous	Prior to initiating permanent grassing operations		Yes	No	Confirm soil analysis completed and seeding schedule approved. Confirm final grade and alignment of shoulder breaks and percent slopes. Confirm slopes are properly tracked and free of debris.	800.04
	Prior to placement of non structural concrete (curb & gutter, sidewalk, driveways, ped ramps, raised medians)		Yes	No	Confirm concrete mix designs are submitted, approved and on file. Confirm Pre-Pour Checklist completed and approved. Confirm subgrade checked for stability.	700.03
	Prior to placing material in waste pits or placing debris on private property		Yes	No	Confirm SCDOT agreement and required permit are on file.	200.04
	Prior to demolition of structures (bridges, homes, and businesses)	Yes	Yes	Yes	Confirm asbestos and lead based paint inspections and reports are on file. Ensure all SCDHEC demolition permits and hazardous materials disposal permits are submitted, approved and on file. Confirm refrigerant recovered from AC units and signed statement on file. Confirm all utilities have been properly disconnected.	

Appendix B
Independent Quality Firm
Minimum Sampling Guide Schedule

SCDOT Quality Acceptance Sampling & Testing Guide

Amendment to Figure 106B & 106C of the SCDOT Construction Manual (Rev. 1/16/2023)

Product	Material Description	SiteManager Material Code	Minimum Sample Frequency	Sample Size	Sampling Procedure	QPL	Office to Obtain Sample	RCE to Test (Test-Minimum Frequency)		Spec Reference	Remarks
Aggregate, Coarse (non asphalt)	Aggregate, # 1 Stone	Agg1	(1) per 500 Tons[F]	(1) 40 Lbs.	SC-T-1	QPL 2	RCE	-	-	**S:** 501, 701, 802 **Appendix:** A-2, A-3, A-4, A-6 **STS:** SC-M-203-5 (7/18) SC-M-205-2 (7/17)	Sample requirement waived for: 1) Temporary applications used in CMRB Curing Methods B & C 2) Use in Non-structural Class 2500 concrete **Small Quantity Acceptance*
	Aggregate, # 4 Stone	Agg4									
	Aggregate, # 5 Stone	Agg5									
	Aggregate, # 56 Stone	Agg56									
	Aggregate, # 57 Stone	Agg57									
	Aggregate, # 67 Stone	Agg67									
	Aggregate, # 6M Stone	Agg6M									
	Aggregate, # 7 Stone	Agg7									
	Aggregate, # 78 Stone	Agg78									
	Aggregate, # 789 Stone	Agg789									
	Aggregate, # 89M Stone	Agg89M									
	Aggregate, # 8M Stone	Agg8M									
	Aggregate, Light Weight Stone	AggLightWeight									
	Aggregate, CR-14 Stone Crusher Run	AggCR-14									
	Aggregate, Stone Column Backfill	AggStnColmnBack									
Aggregate, Fine (non asphalt)	Aggregate, FA-10	AggFA10	(1) per 500 Tons[F]	(1) 20 Lbs.	SC-T-2	QPL 1	RCE	-	-	**S:** 501, 701, 802 **Appendix:** A-2, A-3, A-5, A-6 **SS:** (5/1/08)	Sample requirement waived for: 2) Use in Non-structural Class 2500 concrete **Small Quantity Acceptance*
	Aggregate, FA-10 / Manufactured Sand	AggFA10M-701									
	Aggregate, FA-12	AggFA12									
	Aggregate, FA-13	AggFA13									
	Aggregate, Fine Agg. Blended	AggFABlend-701									
	Aggregate, Natural Sand used in Asphalt	AggNatSand401									
	Aggregate, Regular Screenings	AggScr									
	Aggregate, Washed Screenings	AggWScr									
Asphalt Emulsions (used in Tack Coat Applications)	Asphalt, Emulsified RS-1 (Rapid Set)	AsphLiqRS1-406	Obtain sample only if field application issue exists	(1) 0.5 Gallon	SC-T-61	QPL 38	RCE	Roadway Placement: SC-T-86	(1) Each Application (Form 400.04)	**S:** 401.4.18	Submit to OMR within 7 days of sampling
	Asphalt, Emulsified HFMS-1	AspLiqHFMS1-406									
	Asphalt, Emulsified HFMS-1H	AspLiqHFMS1H406									
	Asphalt, Emulsified HFMS-2	AspLiqHFMS2-406									
	Asphalt, Emulsified SS-1 (Slow Set)	AsphLiqSS1-406									
	Asphalt, Emulsified CRS-1	AsphLiqCRS1-406									
	Asphalt, Emulsified CRS-2	AsphLiqCRS2-407									
	Asphalt, Emulsified CMS-2	AsphLiqCMS2-406									
	Asphalt, Emulsified CSS-1H	AsphLiqCSS-1H									
	Asphalt, Emulsified Non-Tracking Tack	AsphLiqNTT									
Asphalt Emulsions (used in Surface Treatment Applications)	Asphalt, Emulsified CRS-1	AsphLiqCRS1-406	(1) per 25,000 Gallons	(1) 0.5 Gallon	SC-T-61	QPL 38	RCE	Roadway Placement: SC-T-86	(1) Each Application (Form 400.04)	**S:** 406, 407, 408 **Appendix:** A-2, A-3 **SS:** (3/1/16)	Sample requirement waived for: Temporary applications used in CMRB Curing Methods B & C Submit to OMR within 7 days of sampling **Small Quantity Acceptance*
	Asphalt, Emulsified CRS-2	AsphLiqCRS2-407									
	Asphalt, Emulsified CRS-2L (Latex)	AsphLiqCRS2L406									
	Asphalt, Emulsified CRS-2P (Polymer)	AsphLiqCRS2P407									
	Asphalt, Emulsified CSS (FDR)	AsphLiqCSS(FDR)									
	Asphalt, Emulsified CSS-1H	AsphLiqCSS-1H									
	Asphalt, Emulsified EAP Special	AsphLiqEAPS-407									
	Poly Mod Emulsified Asph Fog Seal - OGFC	AsphLiqFogSeal									
Asphalt, Micro-Surfacing	Asphalt, Emulsified CQS-Micro	AsphLiqCQSMicro	(1) per 25,000 Gallons	(1) 0.5 Gallon	SC-T-61	QPL 38	RCE	Compute the Daily Average of Residual Asphalt & Mix Rate: (Based on Contractors QC readings)	(1) per Days Production	**SS:** (1/1/19)	Observe test section construction for approval of Mix Design and System Performance
	Aggregate, Micro Surface Screenings	AggMicroScrn	(1) per 50,000 SY Installed	(1) 20 Lbs.	SC-T-2	QPL 1	RCE				

Product	Material Description	SiteManager Material Code	Minimum Sample Frequency	Sample Size	Sampling Procedure	QPL	Office to Obtain Sample	RCE to Test (Test-Minimum Frequency)		Spec Reference	Remarks
Asphalt, PMTLS	Preventative Maintenance Thin Surf. WMA	Surf-PrevMa_WMA	(1) per 5,000 Tons	(1) 15-50 Lbs.	SC-T-62	-	DAM	Ambient Temperature: SC-T-84 Mix/Mat Temperature: SC-T-84 Depth Check:	(1) Before paving starts, then (2) per LOT (Form 400.04) (4) per LOT (Form 400.04) (1) Each 200 ft	**SS:** (11/1/13)	-
	Preventative Maintenance Thin Surface	Surf-PrevMaint									
Asphalt Binder	Asphalt, Liquid PG 64-22	AsphLiqPG64-401	(1) per 10,000 Tons of Mix Produced	(1) Quart	SC-T-61	QPL 37	DAM	-	-	**S:** 401 **SS:** (1/1/19)	**Small Quantity Acceptance*
	Asphalt, Liquid PG 76-22	AsphLiqPG76-401									
Asphalt, OGFC	Open Graded Friction Course 12.5mm	OGFC-403	(1) per 5,000 Tons	(1) 1500-1900 gram Sample	SC-T-110	-	DAM	Ambient Temperature: SC-T-84 Mix/Mat Temperature: SC-T-84 Lay Down Rate: SC-T-85	(1) Before paving starts, then (2) per LOT (Form 400.04) (4) per LOT (Form 400.04) (1) per 200 Tons (Form 400.04)	**S:** 409 **SS:** (1/1/19) **SS (Table):** (4/1/16) SC-M-403 (7/21)	Establish and document the roller pattern required to seat the mix
	Maintenance Open Graded Friction Course	Surf-Maint-OGFC									
Asphalt, Surface	Asphalt SMA Surface 9.5mm	AsphSMASurf95	(1) per 5,000 Tons	(1) 15-50 Lbs.	SC-T-62	-	DAM	Calculate & Mark Core Locations for SMA, STA & STB Mixes: SC-T-101 Ambient Temperature: SC-T-84 Mix/Mat Temperature: SC-T-84 Lay Down Rate: SC-T-85 Calculate & Mark Density Gauge for STC & STD Mixes: (SC-T-101)	(1) per 1,500 ft paved (1) Before paving starts, then (2) per LOT (Form 400.04) (4) per LOT (Form 400.04) (1) per 200 Tons (Form 400.04) (1) per 500 ft paved	Contract Special Provision **S:** 401, 403 **STS:** SC-M-400 (1/20) SC-M-403 (7/21)	Document Control Strip Density Test (Form 400.02) Observe and document the in-place density test procedures being performed: SC-T-87 SC-T-65 No in-place density performed on STE Mixes
	Asphalt SMA Surface 12.5mm	AsphSMASurf125									
	Surface Type A	Surf-T-A									
	Surface Type B	Surf-T-B									
	Surface Type B Warm Mix Asphalt	Surf-T-B_WMA									
	Surface Type C	Surf-T-C									
	Surface Type C Warm Mix Asphalt	Surf-T-C_WMA									
	Surface Type D	Surf-T-D									
	Surface Type D Warm Mix Asphalt	Surf-T-D_WMA									
	Surface Type E (Sand Seal)	Surf-T-E									
	Surface Type E Warm Mix Asphalt	Surf-T-E_WMA									

Product	Material Description	SiteManager Material Code	Minimum Sample Frequency	Sample Size	Sampling Procedure	QPL	Office to Obtain Sample	RCE to Test (Test-Minimum Frequency)		Spec Reference	Remarks
Asphalt, Intermediate	Intermediate Type A	Inter-T-A	(1) per 5,000 Tons	(1) 35-50 Lbs.	SC-T-62	-	DAM	Ambient Temperature: SC-T-84	(1) Before paving starts, then(2) per LOT (Form 400.04)	**S:** 401, 403 **STS:** SC-M-400 (1/20)	Document Control Strip Density Test (Form 400.02) Observe and document the in-place density test procedures being performed: SC-T-87 *ITB-Special Acceptance, Placement rate: < = 300 #, Cores > 300 #, Gauge
	Intermediate Type B	Inter-T-B						Mix/Mat Temperature: SC-T-84	(4) per LOT (Form 400.04)		
	Intermediate Type B Special	Inter-T-B(Spec)						Lay Down Rate: SC-T-85	(1) per 200 Tons (Form 400.04)		
	Intermediate Type B Warm Mix Asphalt	Inter-T-B_WMA						Calculate & Mark Core Locations for ITA, ITB, & *ITB-Special Mixes: SC-T-101	(1) per 1500 ft paved		
	Intermediate Type C	Inter-T-C						Calculate & Mark Density Gauge Locations for ITC Mixes: SC-T-101	(1) per 500 ft paved		
	Intermediate Type C Warm Mix Asphalt	Inter-T-C_WMA									
Asphalt, Base	Base Type A	Base-T-A	(1) per 5,000 Tons	(1) 25-50 Lbs.	SC-T-62	-	DAM	Ambient Temperature: SC-T-84	(1) Before paving starts, then (2) per LOT (Form 400.04)	**S:** 401, 309, 310 **STS:** SC-M-400 (1/20)	Document Control Strip Density Test (Form 400.02) Observe and document the in-place density test procedures being performed: SC-T-65
	Base Type A Warm Mix Asphalt	Base-T-A_WMA						Mix/Mat Temperature: SC-T-84	(4) per LOT (Form 400.04)		
	Base Type B	Base-T-B						Lay Down Rate: SC-T-85	(1) per 200 Tons (Form 400.04)		
	Base Type B Warm Mix Asphalt	Base-T-B_WMA						Calculate & Mark Density Gauge Locations: SC-T-101	(1) per 500 ft. paved		
	Base Type C (Surface Sand Base)	Base-T-C									
	Base Type C Warm Mix Asphalt	Base-T-C_WMA									
	Base Type D (Surface Sand Base)	Base-T-D									
	Base Type D Warm Mix Asphalt	Base-T-D_WMA									
Asphalt, Shoulder Widening	HMA Shoulder Widening Course	Shoulder-HMA	(1) per 5,000 Tons	(1) 25-50 Lbs.	SC-T-62	-	DAM	Ambient Temperature: SC-T-84	(1) Before paving starts, then (2) per LOT (Form 400.04)	**S:** 401 **SS:** (4/3/09) **STS:** SC-M-400 (1/20)	-
								Mix/Mat Temperature: SC-T-84	(4) per LOT (Form 400.04)		
								Lay Down Rate: SC-T-85	(1) per 200 Tons (Form 400.04)		

Product	Material Description	SiteManager Material Code	Minimum Sample Frequency	Sample Size	Sampling Procedure	QPL	Office to Obtain Sample	RCE to Test (Test-Minimum Frequency)		Spec Reference	Remarks
Backfill	Backfill Materials, MSEW	Backfill-713.08	(1) Initial Source Evaluation Sample (1) per 2,000 CY (Short Test) (1) per 15, 000 CY (Full Test)	Stone: (5) 70 Lb. bags Granular: (2) 70 Lb. bags Stone: (1) 70 Lb. bags Granular: (1) 20 Lb. bag Stone: (5) 70 Lb. bags Granular: (2) 70 Lb. bags	SC-T-1 SC-T-2	QPL 1 QPL 2	RCE	Compaction: SC-T-29 SC-T-30 SC-T-31 SC-T-32 (Not required for stone)	(1) per every 2 Lifts for every: (Form 200.03) 25 ft of wall for any portion of wall within 150 ft of bridge 100 ft of wall for any portion of the wall greater than 150 ft away from bridge	**S:** 713 **STS:** SC-M-713 (01/19)	Specify what level of testing is required when submitting the sample (Initial Source, Short, Full) *Short Test: completed in-house* *Full Test: sent out for internal friction angle test*
	Reinforced Soil Slope	Backfill-RSS	(1) per 4,000 CY (Short Test) (1) per 20,000 CY (Full Test)	Soil: (1) 20 Lb. bag	SC-T-1 SC-T-2	QPL 1 QPL 2	RCE	Compaction: SC-T-29 SC-T-30 SC-T-31 SC-T-32	(1) per every lift for every: (Form 200.03) 25 ft of wall for any portion of wall within 150 ft of bridge 75 ft of wall for any portion of the wall greater than 150 ft away from bridge	**STS:** SC-M-206 (04/16)	Specify what level of testing is required when submitting the sample (Initial Source, Short, Full) *Short Test: completed in-house* *Full Test: sent out for internal friction angle test*
	Pipe, Culvert Backfill (bed for Pipe)	BackfillPipeCul	(1) Verification Sample at start of operations & (1) per 1000 LF of production	Fine: (1) 20 Lbs. Course: (1) 40 Lbs. Base: (1) 70 Lbs.	SC-T-1 SC-T-2	QPL 1 QPL 2	RCE	Compaction: SC-T-29 SC-T-30 SC-T-31 SC-T-32	See **STS** (01/21) (Form 200.07 & 200.08)	**S:** 714 **STS:** SC-M-714 (01/21)	Specify if Project has approved Pipe Backfill Material Waiver
Embankment	Unclassified Excavation used in Embankment	BorrEmb-203	Below Top 5 ft – none required* Top 5 ft – Weekly Sample (or when material changes) Top 18 inches – Sample Daily		Obtain a representative sample from entire width of roadway	-	RCE	Compaction: SC-T-29 SC-T-30 SC-T-31 SC-T-32	Below 18 inches: (1) Each 2,000 CY min. of (1) per Lift Top 18 inches: (1) Each 1,000 ft per 2 lanes	**S:** 205	Specify if the sample is Below 5 ft of Finished Grade *If material placed below top 5 ft is questionable as muck, it can be sampled as needed
	Borrow, Embankment	BorrEmb-203	(1) Each day of work from each source used For Screenings or other consistent manufactured materials: sample daily for 1st 10 days per source and if consistent, then weekly		Obtain a representative sample from entire width of roadway	-	RCE	Compaction: SC-T-29 SC-T-30 SC-T-31 SC-T-32	(1) Each 2,000 CY min. of (1) per Lift	**S:** 205	Specify if the sample is Below 5 ft of Finished Grade For Screenings or other consistent manufactured materials: use AASHTO T99 in lieu of SC-T-29 for compaction testing
	Borrow Embankment Subgrade Top 18 inches	BorrSubgrade203	(1) Each 1,000 ft per 2 lanes		Obtain a representative sample from entire width of roadway	-	RCE	Compaction: SC-T-29 SC-T-30 SC-T-31 SC-T-32	(1) Each 1,000 ft per 2 lanes	**S:** 205	For Screenings or other consistent manufactured materials: use AASHTO T99 in lieu of SC-T-29 for compaction testing

Product	Material Description	SiteManager Material Code	Minimum Sample Frequency	Sample Size	Sampling Procedure	QPL	Office to Obtain Sample	RCE to Test (Test-Minimum Frequency)		Spec Reference	Remarks
Base	Base, Sand Clay	BaseSanClay-303	(1) Each 1,000 ft per 2 lanes	10 Lbs.	Obtain a representative sample from entire width of roadway	-	RCE	Compaction: SC-T-29 SC-T-30 SC-T-31 SC-T-32 Depth Check:	(1) Each 2,000 CY min. of (1) per Lift (1) Each 250 ft per 2 lanes (Form 300.01)	**S:** 303	-
	Base, Coquina Shell Course	BaseCoq-304	(1) Initial Theoretical Density Sample (1) Each 1000 ft per 2 lanes each layer	(5) 70 Lb. bags 25 Lbs.	SC-T-1	QPL 4	RCE	Compaction: SC-T-30 SC-T-31 SC-T-32	(1) Each 2,000 CY min. of (1) per Lift (Form 300.03) Each 250 ft per 2 lanes (Form 300.01)	**S:** 304	-
Graded Aggregate Base	Base, Macadam Course	BaseMac-305	(1) Initial Theoretical Density Sample (1) Each 1000 ft per 2 lanes each layer	(5) 70 Lb. bags 70 Lbs.	SC-T-1 SC-T-100	QPL 2	RCE	Compaction: SC-T-30 SC-T-31 SC-T-32 Depth Check:	(1) Each 1,000 ft per 2 lanes each layer (Form 300.03) Each 250 ft per 2 lanes (Form 300.01)	**S:** 305 **SS:** (1/2/14) (5/1/09)	-
	Base, Marine Limestone	BaseMarLime-305									
	Base, Recycled PC Concrete	BaseRecyConc305									
Cement Treated Base	Earth Base, Cement Stabilized	-	(1) Initial Mix Design & Theoretical Density Sample	(2) 70 Lb. bags	Obtain a representative sample	-	RCE	Compaction: SC-T-30 SC-T-31 SC-T-32 Depth Check: Cement App Rate: SC-T-141	(1) Each 1,000 ft per 2 lanes (Form 300.03) Each 250 ft per 2 lanes (Form 300.01) Daily Average & Spot Checks	**S:** 306	Submit material for Mix Design to OMR 30 days prior to construction
	Recycled Base, Cement Modified	-	-	-	-	-	RCE	Compaction: SC-T-30 SC-T-31 SC-T-32 SC-T-33 Depth Check: Cement App Rate: SC-T-141	(1) Each 1,000 ft per 2 lanes (Form 300.06) Each 500 ft per 2 lanes (Form 300.01) (1) per Tanker Load	**S:** 306 **STS:** SC-M-306 (7/21)	Submit Contractor's Mix Design to OMR for approval 2 weeks prior to construction
	Aggregate Base, Cement Stabilized	-	Sample & submit aggregate samples according to GAB guidelines	-	If a Pugmill is used, sample the virgin aggregate from the stockpile (1) Each 1,000 Tons SC-T-1	-	RCE	Compaction: SC-T-33 Depth Check: Cement App Rate: SC-T-141	(1) Each 1,000 ft per 2 lanes (Form 300.03) Each 250 ft per 2 lanes (Form 300.01) Daily Average & Spot Checks	**S:** 308 **STS:** SC-M-308 (10/15)	Submit Contractor's Mix Design to OMR for approval 2 weeks prior to construction Observe & document QC compressive strength specimen sampling & testing
	Subbase, Cement Modified	SubCemMod-301	(1) Initial Mix Design & Theoretical Density Sample (1) per Day	(2) 70 Lb. bags (2) 4" diameter Cores	Obtain a representative sample Construction Manual 301.3.3.5	-	RCE	Compaction: SC-T-30 SC-T-31 SC-T-32 Depth Check: Cement App Rate: SC-T-141	(1) Each 1,000 ft per 2 lanes (Form 300.06) Each 500 ft per 2 lanes (Form 300.01) Daily Average & Spot Checks	**S:** 301	Submit material for Mix Design to OMR 30 days prior to construction

Product	Material Description	SiteManager Material Code	Minimum Sample Frequency	Sample Size	Sampling Procedure	QPL	Office to Obtain Sample	RCE to Test (Test-Minimum Frequency)		Spec Reference	Remarks
Cement	Portland Cement Type I	CementTypeI	(1) Each 100 Tons for Concrete use	(1) Gallon	SC-T-47	QPL 6	RCE	-	-	**S:** 701 **SS:** (5/5/14)	Sample requirement waived for use in non-structural Class 2500 concrete Mill Test Report is required. Submit to OMR along with sample.
	Portland Cement Type II	CementTypeII	(1) Each 400 Tons for Base use								
	Portland Cement Type III	CementTypeIII									
	Cement Type I (Slag Modified)	CementTypeISM	(1) Each 100 Tons			QPL 18				**SS:** (5/5/14) **S:** 701.4.9	
	Fly Ash, PC Concrete	FlyAshPCC-701	(1) Each 50 Tons			QPL 3				**SS:** (5/5/14) **S:** 701.4.9	
	Slag, Granulated	SlagPCC-701	(1) Each 50 Tons			QPL 6				**SS:** (5/5/14)	
Masonry	Clay Brick	ClayBrick	(1) Each 50,000 Bricks	(6) Bricks	-	-	RCE	-	-	**S:** 718	-
	Concrete Block	ConBlock-718	(1) Each Source	(6) Blocks							
	Concrete Brick	ConcBrick	(1) Each 50,000 Bricks	(6) Bricks							
	Grout	Grout	(1) per 10 CY	(1) Set of 3 Cubes (2")	ASTM C109					**S:** 704 **SS:** (1/2/13)	
Concrete	Concrete Cylinder, Class 2500	ConcCyl. 2500	Non-structural Class 2500: (1) per 50 CY Structural: (1) per 50 CY on small pours & min. of 1/structure if < 50 CY or (1) per 100 CY on large pours* **exceeds 100 CY* Pavement: (1) per 1500 CY & a min. of 1 per production day	Non-structural Class 2500: (1) Set of 3 Cylinders (4" x 8") Structural: (1) Set of 3 Cylinders (4" x 8") Pavement: (1) Set of 6 Cylinders (6" x 12") 3 Cylinders will be tested at 72 hrs 3 Cylinders will be tested at 28 days	ASTM C172 ASTM C31	QPL 28	RCE	Slump: (AASHTO T119, ASTM C143) Air Content: (AASHTO T196, ASTM C231 or ASTM C173) Temperature: (ASTM C1064) Thickness Verification:	Structural: (1) each time test specimens are made Pavement: (4) each days production, and (1) each time test specimens are made Pavement: See **STS** SC-M-503 (03/08)	*Structural:* **S:** 701, 702, 704 **SS:** (2/1/2015) (8/1/2014) (5/5/2014) (8/2/2013) *Pavement:* **S:** 501 **SS:** (8/2/2013) **STS:** SC-M-501 (03/08)	Report field test results on Ready Mix Concrete Report (Form 700.04) Not Required for Non-structural Class 2500 concrete **Small Quantity Acceptance* Air Content & Temperature field testing is waived for High Early Strength Mix
	Concrete Cylinder, Class 3000	ConcCyl. 3000									
	Concrete Cylinder, Class 4000	ConcCyl. 4000									
	Concrete Cylinder, Class 4500	ConcCyl. 4500									
	Concrete Cylinder, Class 5000	ConcCyl. 5000									
	Concrete Cylinder, Class 5500	ConcCyl. 5500									
	Concrete Cylinder, Class 6000	ConcCyl. 6000									
	Concrete Cylinder, Class 6500	ConcCyl. 6500									
	Concrete Cylinder, Class 7000	ConcCyl.7000									
	Concrete Cylinder, Class 7500	ConcCyl. 7500									
	Concrete Cylinder, Class 8000	ConcCyl. 8000									
	Concrete Cylinder, Class 8500	ConcCyl. 8500									
	Concrete Cylinder, Class 9000	ConcCyl. 9000									
	Concrete Cylinder, Class 9500	ConcCyl 9500									
	Concrete Cylinder, Class 10,000	ConcCyl. 10,000									
	Water	Water-701	(1) Each Source	(1) Gallon	Obtain a representative sample	-	RCE	-	-	**S:** 701.2.11	-
Roller Compacted Concrete	Roller Compacted Portland Cement	CementTypeI	*According to Cement Guidelines*			-	RCE	Compaction: SC-T-33 Paver Compaction Verification: SC-T-33	(1) Each 1,000 ft per 2 lanes (Form 300.03) (1) per Project, & as determined necessary	Contract Special Provision	Observe & document QC compressive strength specimen sampling & testing
	Roller Compacted Concrete Aggregate	AggCompConcPvmt	(1) per 500 Tons Agg	(1) 40 Lbs.	SC-T-1	QPL 2					
High Friction Surface Treatment	High Friction Surface Treatment Binder	HFST-PolyRes	(1) per 2,000 SY of Treatment & (1) Each Batch	(1) 1/2 - 1 Gallon, Each component	Obtain each component of the binder in a separate tightly sealed container.	QPL 87	RCE	Depth Check:	(1) per 100 SY	**SS:** (9/1/15)	Compare manual depth checks to equipment output readings to verify calibration
	High Friction Surface Treatment Agg.	AggHighFriction	(1) per 2,000 SY of Treatment	(1) 10 Lbs.	SC-T-2	-	RCE	-	-	**SS:** (9/1/15)	Verify adequate rate/coverage

Product	Material Description	SiteManager Material Code	Minimum Sample Frequency	Sample Size	Sampling Procedure	QPL	Office to Obtain Sample	RCE to Test (Test-Minimum Frequency)		Spec Reference	Remarks
Bridge Lift	Stone Bridge Lift Material	StoneBridgeLift	(1) per 500 Tons	(1) 100 Lbs.	SC-T-1	QPL 2	RCE	-	-	**SS:** (3/8/16)	-
	Granular Bridge Lift Material	GranBridgeLift	(1) Each day of work from each source used	Base: (1) 70 Lbs. Granular: (1) 20 Lbs.	SC-T-1 SC-T-2	-	RCE	-	-	**SS:** (3/8/16)	-
	Borrow Bridge Lift Material	BorrBridgeLift	(1) Each day of work from each source used	(1) 10 Lbs.	Obtain a representative sample	-	RCE	-	-	**SS:** (3/8/16)	-
Reinforcing Steel	Reinforcing Steel # 3 Bar / 10mm	SteelReinf-#3	(1) per month, each size, each shipment Exemption shown in Section 703.2.1.3 of **SS:** (7/1/19)	(1) 30"	Encompass the entire mill marking in the sampled section	QPL 60	RCE	-	-	**S:** 703 **SS:** (7/1/20)	Mill Test Report is required. Submit to OMR along with sample. No reinforcing steel samples are required for Catch Basins. RCE should obtain mill test report for file.
	Reinforcing Steel # 4 Bar / 13mm	SteelReinf-#4									
	Reinforcing Steel # 5 Bar / 16mm	SteelReinf-#5									
	Reinforcing Steel # 6 Bar / 19mm	SteelReinf-#6									
	Reinforcing Steel # 7 Bar / 22mm	SteelReinf-#7									
	Reinforcing Steel # 8 Bar / 25mm	SteelReinf-#8									
	Reinforcing Steel # 9 Bar / 29mm	SteelReinf-#9									
	Reinforcing Steel # 10 Bar / 32mm	SteelReinf-#10									
	Reinforcing Steel # 11 Bar / 36mm	SteelReinf-#11									
	Reinforcing Steel # 14 Bar / 43mm	SteelReinf-#14									
	Reinforcing Steel # 18 Bar / 57.3mm	SteelReinf-#18									
	Steel Reinforcing Wire, Spiral	SteelWireSpiral	(1) Each Size Each Shipment	(1) 40"	-	-	RCE	-	-	**S:** 703	-
	Steel, Butt-Welded Splice, Welded Hoop	SteelButtWeld	(1) Each Size Each Shipment	(1) Spliced sample, 30"	Splice located at mid-point of assembled sample	-	RCE	-	-	**S:** 704	-
	Mechanical Couplers for Reinf. Steel	SteelCoupler	(1) Each Lot, Each Size	(1) Assembled sample, 30" (2) Assembled Check Samples: 12" of rebar from each end of coupler		QPL 73	RCE	-	-	**S:** 703 **SS:** (7/1/20)	Mill Test Report is required. Submit to OMR along with sample. 30" rebar control bar from heat used in coupler assembly required with check samples. Submit to OMR along with sample.
	Structural Steel Fasteners High Strength	StlStrucFast709	(1) Each possible combo. of bolt lot, nut lot, washer lot, & DTI lot	(3) Assemblies of Bolt, Nut, Washer, & DTI	-	-	RCE	-	-	**S:** 709	Certification is required. Submit to OMR along with sample. *No sample required for bolt assemblies through prestressed girders attaching steel diaphragms.*

Summary Of Revisions	
Revision Date:	***Summary:***
1/6/2023	Added sample frequencies for unclassified and added clarification for manufactured borrow materials.
7/1/2021	Removed sample requirement for Reinforcing Steel (Seven-Wire Strand Reinforcing Cable)
7/1/2021	Corrected the Asphalt Surface sample size requirement to (1) 15-50 Lbs.
3/1/2020	Updated CMRB reference and curing methods to comply with SC-M-306 (1/2018)
3/1/2020	Added new SM material code for Stone Column Backfill
1/1/2020	Removed sample requirements for Reinforcing Steel (Wire Mesh 4x4, 6x6, & Deformed Wire)
1/1/2020	Revised sample requirements for Concrete Brick- decreased sample size to 6 bricks
1/1/2020	Revised sample requirements for Concrete Block - increased sample size to 6 blocks
6/25/2019	Revised Structural Steel Fasteners to include DTI lot & Remark for bolt assemblies req.
6/19/2019	Revised sampling frequency for Structural Concrete to include small & large pours
6/19/2019	Added Spec Ref SCM 403 to Asphalt OGFC & Surface
6/19/2019	Added Asphalt SMA Surface 9.5mm & 12.5mm
4/1/2019	Added Roller Compacted Concrete sampling of Portland Cement (for clarification)
4/1/2019	Removed sample requirement for Preformed Joint Filler for Concrete (cert only)
4/1/2019	Removed sample requirement for PipePVC (Perf & Solid - Underdrain, Slope Drain)
1/1/2019	Editorial updates to some form numbers and notes
11/1/2018	Revised sample requirements for Reinforcing Steel per updated SS (7/1/18)
11/1/2018	Added note in Reinforcing Steel eliminating the sample requirements for steel in catch basins - material code SteelReinf - CB (mill test report required for RCE file)
11/1/2018	Added sample requirements and new SM material code for Reinforced Soil Slopes
11/1/2018	Removed sample requirements for fence materials
2/7/2018	Revised Micro Surfacing screenings minimum sampling frequency
1/23/2018	Added new Asphalt and CMRB specifications, clarified cement sampling frequencies based on use
10/27/2017	Added Slag, Granulated

* Small Quantity Acceptance		
RCE must submit Form 100.25 to report acceptance of small quantity materials to OMR		
Material	**Criteria**	**Maximum Small Quantity**
Aggregates	Other than in critical concrete work or asphalt mixes	500 Tons each type
Asphalt PG Binder	-	2500 Tons of Asphalt Mix produced
Asphalt Emulsions	-	5000 Gallons
Portland Cement Concrete	Including component materials for use in structural non-critical items such as sidewalks, curb & gutter, catch basins, signs, fence posts, & guardrail anchoring	50 Cubic Yards

F = Sampling Frequencies may be modified on large projects, as approved by the Materials & Research Engineer.

This guide serves an amendment to Figure 106B & 106C of the SCDOT Construction Manual. It should be used in conjunction with the Materials Certification Requirements List, Qualified Products Policies & Listings, Pretested Materials Policies & Listings, and all other applicable guidance for quality acceptance of materials to be incorporated into the work of SCDOT projects.

Specification Reference Abbreviations:

S = SCDOT 2007 Standard Specifications for Highway Construction

SS = Supplemental Specification

STS = Supplemental Technical Specification

CCR Laboratory Testing Guide 1/16/2023				
Product	**Material Description**	**SiteManager Material Code**	**Lab Testing**	**Remarks**
Aggregate, Coarse (non asphalt)	Aggregate, # 1 Stone	Agg1	AASHTO T27, Gradation	
	Aggregate, # 4 Stone	Agg4		
	Aggregate, # 5 Stone	Agg5		
	Aggregate, # 56 Stone	Agg56		
	Aggregate, # 57 Stone	Agg57		
	Aggregate, # 67 Stone	Agg67		
	Aggregate, # 6M Stone	Agg6M		
	Aggregate, # 7 Stone	Agg7		
	Aggregate, # 78 Stone	Agg78		
	Aggregate, # 789 Stone	Agg789		
	Aggregate, # 89M Stone	Agg89M		
	Aggregate, # 8M Stone	Agg8M		
	Aggregate, CR-14 Stone Crusher Run	AggCR-14		
	Aggregate, Light Weight Stone	AggLightWeight	AASHTO T27, Gradation AASHTO T267 or ASTM D2974, Organic Content	
Aggregate, Fine (non asphalt)	Aggregate, FA-10	AggFA10	AASHTO T27, Gradation	
	Aggregate, FA-10 / Manufactured Sand	AggFA10M-701		
	Aggregate, FA-12	AggFA12		
	Aggregate, FA-13	AggFA13		
	Aggregate, Fine Agg. Blended	AggFABlend-701		
	Aggregate, Natural Sand used in Asphalt	AggNatSand401		
	Aggregate, Regular Screenings	AggScr		
	Aggregate, Washed Screenings	AggWScr		
Asphalt Emulsions (used in Tack Coat Applications)	Asphalt, Emulsified RS-1 (Rapid Set)	AsphLiqRS1-406	AASHTO T59, Saybolt Viscosity (25° C or 50°C) AASHTO T59, % Residue by Evaporation AASHTO T49, Penetration (1H Only)	Sample only if field application issues exist.
	Asphalt, Emulsified HFMS-1	AspLiqHFMS1-406		
	Asphalt, Emulsified HFMS-1H	AspLiqHFMS1H406		
	Asphalt, Emulsified HFMS-2	AspLiqHFMS2-406		
	Asphalt, Emulsified SS-1 (Slow Set)	AsphLiqSS1-406		
	Asphalt, Emulsified CRS-1	AsphLiqCRS1-406		
	Asphalt, Emulsified CRS-2	AsphLiqCRS2-407		
	Asphalt, Emulsified CMS-2	AsphLiqCMS2-406		
	Asphalt, Emulsified CSS-1H	AsphLiqCSS-1H		
	Asphalt, Emulsified Non-Tracking Tack	AsphLiqNTT		

Product	Material Description	SiteManager Material Code	Lab Testing	Remarks
Asphalt Emulsions (used in Surface Treatment Applications)	Asphalt, Emulsified CRS-1	AsphLiqCRS1-406	AASHTO T59, Saybolt Viscosity (25° C or 50°C) AASHTO T59, % Residue by Evaporation AASHTO T49, Penetration (1H Only)	
	Asphalt, Emulsified CRS-2	AsphLiqCRS2-407		
	Asphalt, Emulsified CRS-2L (Latex)	AsphLiqCRS2L406		
	Asphalt, Emulsified CRS-2P (Polymer)	AsphLiqCRS2P407		
	Asphalt, Emulsified CSS (FDR)	AsphLiqCSS(FDR)		
	Asphalt, Emulsified CSS-1H	AsphLiqCSS-1H		
	Asphalt, Emulsified EAP Special	AsphLiqEAPS-407		
	Poly Mod Emulsified Asph Fog Seal - OGFC	AsphLiqFogSeal		
Asphalt, Micro-Surfacing	Asphalt, Emulsified CQS-Micro	AsphLiqCQSMicro	AASHTO T59, Saybolt Viscosity (25° C) AASHTO T59, % Residue by Evaporation	
	Aggregate, Micro Surface Screenings	AggMicroScrn	AASHTO T27, Gradation AASHTO T176, Sand Equivalent	
Asphalt, PMTLS	Preventative Maintenance Thin Surf. WMA	Surf-PrevMa_WMA	SC-T-75, Ignition Oven SC-T-102, Extracted Aggregate Dry Gradation	
	Preventative Maintenance Thin Surface	Surf-PrevMaint		
Asphalt Binder	Asphalt, Liquid PG 64-22	AsphLiqPG64-401	AASHTO T315, DSR AASHTO T316, Rotational Viscometer	Unaged
	Asphalt, Liquid PG 76-22	AsphLiqPG76-401		
Asphalt, OGFC	Open Graded Friction Course	OGFC-403	SC-T-75, Ignition Oven SC-T-90, Drain Down of Uncompacted Mixture SC-T-102, Extracted Aggregate Dry Gradation	Acceptance based on SC-M-400
	Maintenance Open Graded Friction Course	Surf-Maint-OGFC		
Asphalt, SMA Surface	Stone Matrix Asphalt Course	AspSurf12.5-403 (SMA 9.5)	SC-T-68, Percent Voids SC-T-71, Percent Lime SC-T-75, Ignition Oven SC-T-83, Maximum Specific Gravity SC-T-90, Drain Down of Uncompacted Mixture SC-T-102, Extracted Aggregate Dry Gradation	Acceptance based on SC-M-400
Asphalt, Surface	Surface Type A	Surf-T-A	SC-T-68, Percent Voids SC-T-71, Percent Lime SC-T-75, Ignition Oven SC-T-83, Maximum Specific Gravity SC-T-90, Drain Down of Uncompacted Mixture SC-T-102, Extracted Aggregate Dry Gradation SC-T-96, Stability of Asphalt Mixtures by Gyratory*	*SC-T-96 for Type E only. Acceptance based on SC-M-400
	Surface Type B	Surf-T-B		
	Surface Type B Warm Mix Asphalt	Surf-T-B_WMA		
	Surface Type C	Surf-T-C		
	Surface Type C Warm Mix Asphalt	Surf-T-C_WMA		
	Surface Type D	Surf-T-D		
	Surface Type D Warm Mix Asphalt	Surf-T-D_WMA		
	Surface Type E (Sand Seal)	Surf-T-E		
	Surface Type E Warm Mix Asphalt	Surf-T-E_WMA		

Product	Material Description	SiteManager Material Code	Lab Testing	Remarks
Asphalt, Intermediate	Intermediate Type A	Inter-T-A	SC-T-68, Percent Voids SC-T-75, Ignition Oven SC-T-83, Maximum Specific Gravity SC-T-102, Extracted Aggregate Dry Gradation	Acceptance based on SC-M-400
	Intermediate Type B	Inter-T-B		
	Intermediate Type B Special	Inter-T-B(Spec)		
	Intermediate Type Warm Mix Asphalt	Inter-T-B_WMA		
	Intermediate Type C	Inter-T-C		
	Intermediate Type C Warm Mix Asphalt	Inter-T-C_WMA		
Asphalt, Base	Base Type A	Base-T-A	SC-T-75, Ignition Oven SC-T-102, Extracted Aggregate Dry Gradation	Acceptance based on SC-M-400
	Base Type A Warm Mix Asphalt	Base-T-A_WMA		
	Base Type B	Base-T-B		
	Base Type B Warm Mix Asphalt	Base-T-B_WMA		
	Base Type C (Surface Sand Base)	Base-T-C	SC-T-75, Ignition Oven SC-T-96, Stability of Asphalt Mixtures by Gyratory* SC-T-102, Extracted Aggregate Dry Gradation	*Type C & D only Acceptance based on SC-M-400
	Base Type C Warm Mix Asphalt	Base-T-C_WMA		
	Base Type D (Surface Sand Base)	Base-T-D		
	Base Type D Warm Mix Asphalt	Base-T-D_WMA		
Asphalt, Shoulder Widening	HMA Shoulder Widening Course	Shoulder-HMA	SC-T-75, Ignition Oven SC-T-102, Extracted Aggregate Dry Gradation	Acceptance based on SC-M-400
Backfill	Backfill Materials, MSEW	Backfill-713.08	AASHTO T27, Gradation AASHTO T289 or ASTM D1293, pH AASHTO T89 & T90, Atterberg Limits Cu Calculation from T27 results	Initial Sample and every 2000CY
			AASHTO T236, Direct Shear or ASTM D4767 or AASHTO T297, Triaxial Compression AASHTO T267, Organic Content AASHTO T288 or ASTM D1125, Resistivity	Initial Sample and every 15000CY
	Reinforced Soil Slope	Backfill-RSS	AASHTO T27 or SC-T-4 and SC-T-5, Gradation AASHTO T289 or ASTM G51, pH AASHTO T89 & T90 or ASTM D4318, Atterberg Limits AASHTO T267 or ASTM D2974, Organic Content	Initial Sample and every 4000CY
			AASHTO T236 or ASTM D3080, Direct Shear or ASTM D4767, Triaxial Compression	Initial Sample and every 20000CY
	Pipe, Culvert Backfill (bed for Pipe)	BackfillPipeCul	AASHTO T27, Gradation (or SC-T-34, Elutriation) AASHTO M145, Classification	

Product	Material Description	SiteManager Material Code	Lab Testing	Remarks
Embankment	Unclassified Excavation used in Embankment	BorrEmb-203	SC-T-34 or AASHTO T27, Gradation/Elutriation Method* AASHTO T89 & T90, Atterberg Limits AASHTO T267, Loss on Ignition AASHTO T99, Max Dry Density & Optimum Moisture Content** *AASHTO T27 may be used in lieu of SC-T-34 for screenings or other consistent manufactured materials (A-1 to A-3)	Max Dry Density & Optimum Moisture Content in the field will be determined by SC-T-29 or SC-T-25. **For screenings or other consistent manufactured materials: use AASHTO T99 in lieu of SC-T-29 for compaction testing. AASHTO T267, Loss on Ignition not required on below 5 ft samples and is optional for manufactured materials. Max LOI 4%
	Borrow, Embankment	BorrEmb-203		
	Borrow Embankment Subgrade Top 18 inches	BorrSubgrade203		
Base	Base, Sand Clay	BaseSanClay-303	SC-T-34, Gradation, % Silt, % Clay AASHTO T89 & T90, Atterberg Limits	
	Base, Coquina Shell Course	BaseCoq-304	AASHTO T27, Gradation AASHTO T89 & T90, Atterberg Limits AASHTO T193, CBR SC-T-6, Calcium Carbonate	
Graded Aggregate Base	Base, Macadam Course	BaseMac-305	AASHTO T27, Gradation AASHTO T89 & T90, Atterberg Limits SC-T-140, Max Dry Density & Optimum Moisture Content*	*SC-T-140 to be ran minimum once per source per year or material change
	Base, Marine Limestone	BaseMarLime-306		
	Base, Recycled PC Concrete	BaseRecyConc306		
Cement Treated Base	Aggregate Base, Cement Stabilized	-	AASHTO T27, Gradation	Sample and submit aggregate according to GAB guidelines.
Cement	Portland Cement Type I	CementTypeI	ASTM C114 ASTM C150 ASTM C204 ASTM C187 ASTM C151 ASTM C191 ASTM C109	
	Portland Cement Type II	CementTypeII		
	Portland Cement Type III	CementTypeIII		
	Cement Type I (Slag Modified)	CementTypeI		
	Fly Ash, PC Concrete	FlyAshPCC-701	ASTM C311 ASTM C430	
	Slag, Granulated	SlagPCC-701	ASTM C989 ASTM C109 ASTM C430 ASTM C1437	
Masonry	Clay Brick	ClayBrick	ASTM C67, Compressive Strength & Absorption	
	Concrete Block	ConBlock-718	ASTM C140, Compressive Strength & Absorption	
	Concrete Brick	ConcBrick		
	Grout	Grout	ASTM C109	

Product	Material Description	SiteManager Material Code	Lab Testing	Remarks
Concrete	Concrete Cylinder, Class 2500	ConcCyl. 2500	ASTM C39, Compressive Strength	
	Concrete Cylinder, Class 3000	ConcCyl. 3000		
	Concrete Cylinder, Class 4000	ConcCyl. 4000		
	Concrete Cylinder, Class 4500	ConcCyl. 4500		
	Concrete Cylinder, Class 5000	ConcCyl. 5000		
	Concrete Cylinder, Class 5500	ConcCyl. 5500		
	Concrete Cylinder, Class 6000	ConcCyl. 6000		
	Concrete Cylinder, Class 6500	ConcCyl. 6500		
	Concrete Cylinder, Class 7000	ConcCyl.7000		
	Concrete Cylinder, Class 7500	ConcCyl. 7500		
	Concrete Cylinder, Class 8000	ConcCyl. 8000		
	Concrete Cylinder, Class 8500	ConcCyl. 8500		
	Concrete Cylinder, Class 9000	ConcCyl. 9000		
	Concrete Cylinder, Class 9500	ConcCyl 9500		
	Concrete Cylinder, Class 10,000	ConcCyl.		
	Water	Water-701	ASTM C109, Compressive Strength at 7 days ASTM C191, Time of Set ASTM C151, Autoclave Expansion/Soundness AASHTO T26, pH	Only test non-public water sources
Roller Compacted Concrete	Roller Compacted Concrete Aggregate	AggCompConcPvmt	AASHTO T27, Gradation	
	Portland Cement	Sample and test according to the applicable Portland Cement guidelines.		
Bridge Lift	Stone Bridge Lift Material	StoneBridgeLift	AASHTO T27, Gradation AASHTO T19, Unit Weight	
	Granular Bridge Lift Material	GranBridgeLift	SC-T-34, Gradation/Elutriation Method* AASHTO T89 & T90, Atterberg Limits AASHTO M145, Classification AASHTO T99, Max Dry Density & Optimum Moisture Content AASHTO T267, Organic Content *AASHTO T27 may be used in lieu of SC-T-34 for screenings or other consistent manufactured materials (A-1 to A-3)	AASHTO T267 is optional for manufactured materials. Max LOI 4%
	Borrow Bridge Lift Material	BorrBridgeLift	SC-T-34, Gradation/Elutriation Method* AASHTO T89 & T90, Atterberg Limits AASHTO M145, Classification AASHTO T99, Max Dry Density & Optimum Moisture Content AASHTO T267, Organic Content *AASHTO T27 may be used in lieu of SC-T-34 for screenings or other consistent manufactured materials (A-1 to A-3)	AASHTO T267 is optional for manufactured materials. Max LOI 4%

Product	Material Description	SiteManager Material Code	Lab Testing	Remarks
Reinforcing Steel	Reinforcing Steel # 3 Bar / 10 Metric	SteelReinf-#3	AASHTO T244, AASHTO M31 (Yield, Ultimate, Elongation, % Theoretical Weight, Gap Width, Deformation Height)	Gap width and deformation height are not generally failure criteria, however, should be reported with each sample.
	Reinforcing Steel # 4 Bar / 13mm	SteelReinf-#4		
	Reinforcing Steel # 5 Bar / 16mm	SteelReinf-#5		
	Reinforcing Steel # 6 Bar / 19mm	SteelReinf-#6		
	Reinforcing Steel # 7 Bar / 22mm	SteelReinf-#7		
	Reinforcing Steel # 8 Bar / 25mm	SteelReinf-#8		
	Reinforcing Steel # 9 Bar / 29mm	SteelReinf-#9		
	Reinforcing Steel # 10 Bar / 32mm	SteelReinf-#10		
	Reinforcing Steel # 11 Bar / 36mm	SteelReinf-#11		
	Reinforcing Steel # 14 Bar / 43mm	SteelReinf-#14		
	Reinforcing Steel # 18 Bar / 57.3mm	SteelReinf-#18		
	Steel Reinforcing Wire, Spiral	SteelWireSpiral	AASHTO M336, T244 Wire Diameter, Reduction in Area, and Ultimate Stress	
	Steel, Butt-Welded Splice, Welded Hoop	SteelButtWeld	AASHTO T244 Tensile Strength	
	Mechanical Couplers for Reinf. Steel	SteelCoupler	AASHTO T244 Tensile Strength	Coupler model and manufacturer should be compared with QPL 73 to determine eligibility for usage as ultimate or service couplers, and noted on report.
	Structural Steel Fasteners High Strength	StlStrucFast709	ASTM E18 Bolt, Nut and Washer Hardness SC-T-150 or SC-T-151 Bolt Assembly Rotational Capacity SC-T-152 DTI Verification	Three assemblies of every heat and lot combination of every component should be sampled and submitted for testing. Certification packets should be submitted and reviewed with each sample of assemblies as shown in S:709.2.4.6.8. Heat and lot numbers should be shown for each component with results on test reports.

Appendix C
Owner Verification Materials Levels of Analysis

SCDOT - CCR OV Levels of Analysis	*Level 1*	*Level 2*	*Level 3*	
FIELD QAST & LAB TESTING GUIDE				
PRODUCT	*MATERIAL DESCRIPTION*	*TEST*	*TEST METHODS*	*LEVEL OF ANALYSIS*	Level of Significance (α)
Aggregate, Coarse (Non Asphalt)	Aggregate, Stone (All Except Light Weight Stone) (No testing required on Construction Entrance/Exit, Non-Structural Concrete, Erosion Control Aggregate, and Maintenance Stone)	AASHTO T27	Gradation	Level 2	
	Aggregate, Light Weight Stone	AASHTO T27	Gradation	Level 2	
		AASHTO T267 or ASTM D2974	Organic Content	Level 2	
Aggregate, Fine (Non Asphalt)	Aggregates	AASHTO T27	Gradation	Level 2	
Backfill	Backfill Materials, MSEW	AASHTO T99	Proctor	Level 3	
		SC-T-30, 31, or 32	Compaction	Level 1	0.01
		AASHTO T27	Gradation	Level 2	
		AASHTO T289 or ASTM D1293	pH	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
		AASHTO T236 or AASHTO T297 or ASTM D4767	Direct Shear or Triaxial Compression	Level 2	
		AASHTO T267	Organic Content	Level 2	
		AASHTO T288 or ASTM D1125	Resistivity	Level 2	
	Reinforced Soil Slope	SC-T-25 or ASTM D698	Proctor	Level 3	
		SC-T-30, 31, or 32	Compaction	Level 1	0.01
		AASHTO T27 or SC-T-4 or SC-T-5	Gradation	Level 2	
		AASHTO T289 or ASTM G51	pH	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90 or ASTM D4318	Plasticity Index	Level 2	
		AASHTO T267 or ASTM D2974	Organic Content	Level 2	
		AASHTO T236 or ASTM D3080 or ASTM D4767	Direct Shear or Triaxial Compression	Level 3	
	Pipe, Culvert Backfill (bed for Pipe)	SC-T-29	Proctor	Level 3	
		SC-T-30, 31, or 32	Compaction	Level 1	0.01
		AASHTO T27 or SC-T-34	Gradation or Elutriation	Level 2	

SCDOT - CCR OV Levels of Analysis		*Level 1*	*Level 2*	*Level 3*	
FIELD QAST & LAB TESTING GUIDE					
PRODUCT	*MATERIAL DESCRIPTION*	*TEST*	*TEST METHODS*	*LEVEL OF ANALYSIS*	Level of Significance (α)
Embankment	Unclassified Excavation used in Embankment	SC-T-30, 31, or 32	Compaction	Level 1	0.01
		SC-T-34 or AASHTO T27	Gradation/Elutriation Method	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
		AASHTO T267	Loss of Ignition (If Mica Content Present)	Level 3	
		SC-T-29 or AASHTO T99	Max Dry Density & Optimum Moisture Content	Level 3	
	Borrow, Embankment	SC-T-30, 31, or 32	Compaction	Level 1	0.01
		SC-T-34 or AASHTO T27	Gradation/Elutriation Method	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
		AASHTO T267	Loss of Ignition (If Mica Content Present)	Level 3	
		SC-T-29 or AASHTO T99	Max Dry Density & Optimum Moisture Content	Level 3	
	Borrow Embankment Subgrade Top 18 inches	SC-T-30, 31, or 32	Compaction	Level 1	0.01
		SC-T-34 or AASHTO T27	Gradation/Elutriation Method	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
		AASHTO T267	Loss of Ignition (If Mica Content Present)	Level 3	
		SC-T-25 or SC-T-29 or AASHTO T99	Max Dry Density & Optimum Moisture Content	Level 3	
Base	Base, Sand Clay	SC-T-25 or SC-T-29	Proctor	Level 3	
		SC-T-30, 31, or 32	Compaction	Level 1	0.01
		SC-T-34	Gradation, % Silt, % Clay	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
	Base, Coquina Shell Course	SC-T-140	Proctor	Level 3	
		SC-T-30, 31, or 32	Compaction	Level 1	0.01
		AASHTO T27	Gradation	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
		AASHTO T193	CBR	Level 3	
		SC-T-6	Calcium Carbonate	Level 3	
Graded Aggregate Base	Base, Macadam Course, Base, Marine Limestone, Base, Recycled PC Concrete	SC-T-30, 31, or 32	Compaction	Level 1	0.01
		AASHTO T27	Gradation	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
		SC-T-140	Max Dry Density & Optimum Moisture Content	Level 3	

SCDOT - CCR OV Levels of Analysis		*Level 1*	*Level 2*	*Level 3*	
FIELD QAST & LAB TESTING GUIDE					
PRODUCT	*MATERIAL DESCRIPTION*	*TEST*	*TEST METHODS*	*LEVEL OF ANALYSIS*	Level of Significance (α)
Cement Treated Base	Earth Base, Cement Stabilized	SC-T-25 or SC-T-29	Proctor	Level 3	
		SC-T-30, 31, or 32	Compaction	Level 1	0.01
	Recycled Base, Cement Modified	SC-T-23, SC-T-26, SC-T-27, or SC-T-29	Proctor	Level 3	
		SC-T-30, 31, 32, or 33	Compaction	Level 1	0.01
	Aggregate Base, Cement Stabilized	SC-T-140	Proctor	Level 3	
		SC-T-33	Compaction	Level 1	0.01
		AASHTO T27	Gradation	Level 2	
	Subbase, Cement Modified	SC-T-29	Proctor	Level 3	
		SC-T-30, 31, or 32	Compaction	Level 1	0.01
Masonry	Clay Brick	ASTM C67	Compressive Strength & Absorption	Level 3	
	Concrete Block, Concrete Brick	ASTM C140	Compressive Strength & Absorption	Level 3	
	Grout	ASTM C109	Compressive Strength	Level 3	
Concrete	Concrete Cylinders	AASHTO T119, ASTM C143	Slump	Level 2	
		AASHTO T196, ASTM C231 or ASTM C173	Air Content	Level 2	
		ASTM C1064	Temperature	Level 3	
		Cores	Thickness Verification	SCDOT Acceptance	
		ASTM C39	Compressive Strength	Level 1	0.025
	Water (non-public source)	ASTM C109	Compressive Strength @ 7 days	Level 3	
		ASTM C191	Time of Set	Level 3	
		ASTM C151	Autoclave Expansion/Soundness	Level 3	
		AASHTO T26	pH	Level 3	
Roller Compacted Concrete	Roller Compacted Portland Cement	SC-T-33	Compaction	Level 3	
	Roller Compacted Concrete Aggregate	SC-T-33	Paver Compaction Verification	Level 3	
		AASHTO T27	Gradation	Level 2	
Bridge Lift	Stone Bridge Lift Material	AASHTO T27	Gradation	Level 2	
		AASHTO T19	Unit Weight	Level 2	
	Granular Bridge Lift Material	SC-T-34 or AASHTO T27	Gradation/Elutriation Method	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
		AASHTO T99	Max Dry Density & Optimum Moisture Content	Level 3	
		AASHTO T267	Organic Content	Level 2	
	Borrow Bridge Lift Material	SC-T-34 or AASHTO T27	Gradation/Elutriation Method	Level 2	
		AASHTO T89	Liquid Limit	Level 2	
		AASHTO T90	Plasticity Index	Level 2	
		AASHTO T99	Max Dry Density & Optimum Moisture Content	Level 3	
		AASHTO T267	Organic Content	Level 2	

SCDOT - CCR OV Levels of Analysis		*Level 1*	*Level 2*	*Level 3*	
FIELD QAST & LAB TESTING GUIDE					
PRODUCT	*MATERIAL DESCRIPTION*	*TEST*	*TEST METHODS*	*LEVEL OF ANALYSIS*	Level of Significance (α)
Reinforcing Steel	Reinforcing Steel	AASHTO T244, M31	Yield, Ultimate, Elongation, % Theoretical Weight, Gap Width, Deformation Height)	Level 3	
	Steel Reinforcing Wire, Spiral	AASHTO M336, T244	Wire Diameter, Reduction in Area, and Ultimate Stress	Level 3	
	Steel, Butt-Welded Splice, Welded Hoop	AASHTO T244	Tensile Strength	Level 2	
	Mechanical Couplers for Reinf. Steel	AASHTO T244	Tensile Strength	Level 2	
	Structural Steel Fasteners High Strength	ASTM E18	Bolt, Nut and Washer Hardness	Level 3	
		SC-T-150 or SC-T-151	Bolt Assembly Rotational Capacity	Level 3	
		SC-T-152	DTI Verification	Level 3	

* Tests not shown in this table are sampled by the IQF and tested by SCDOT.
* Tests not shown in this table are field tests performed by the IQF as part of inspection efforts or sampled by the IQF and tested by SCDOT.

Appendix D
Monthly Independent Quality Firm Certification

[Independent Quality Firm's Letterhead or Logo]

South Carolina Department of Transportation Carolina Crossroads Project

Independent Quality Firm Certification Draw Request No.__Certification
The undersigned hereby certifies that:

1. Except as specifically noted in the certification, all Work that is the subject of the Draw Request, including Subcontractors, and Suppliers, has been checked or inspected by the Construction Independent Quality Firm, with respect to the Construction Work;
2. Except as specifically noted in the certification, all Work that is the subject of the Draw Request has been inspected and tested in accordance with the approved Construction Quality Management Plan, and there are no known deficiencies, non-conformances or other deviations that are outstanding associated with the Work that is the subject of this Draw Request. Therefore, the Work conforms to the requirements of the Contract;
3. All the measures and procedures provided in the Construction Quality Management Plan are functioning properly and are being followed;
4. The construction percentages and incorporated material values indicated are accurate and correct; and
5. All quantities for which payment is requested on a unit price basis are accurate.

Exceptions:

_____

_____

_____

Name: _____
(Print)

Signature: _____
Independent Quality Manager

Date: _____

Seal:

Appendix E
XML Definition Document

SCDOT CCR XML Definition Document

- **Purpose**

The purpose of this document is to provide schema details for the tables and fields used within the *Sampling Testing Reporting & Technician Analysis* (STRATA) Portal. Each xml record submitted contains header and material test form (body) information that provide the necessary metadata and test results for analysis. Header information is captured alongside each material test form and are common fields for any test form submitted.

Some fields reference domain values to ensure data integrity of analysis results. Domain values that are global in nature are included in Attachment A. Domains unique to a project will be configured and distributed to the project team prior to the commencement of a project. Updates or additions to any of these values throughout a project lifecycle will be accommodated and communicated to the project team.

- **Overview**

XML submissions will be made by the IQF and OVF teams through a secure ftp. Imports will be scheduled (at a minimum, daily) by the OVF Materials Management Team. More detailed information about each section and business rules are outlined within this appendix.

Provided below is an example of the XML submission format that is used to import records. Configure data in the following format:

- All header fields shall be lowercase
- Teams may choose any format for naming/managing their xml submissions, using sample IDs, internal identifiers, date/time stamps, etc. to help tie the record back to each team's respective systems
- All dates shall be provided in a standard date/time format of YYYY-MM-DD HH:MM:SS; this is especially needed in the date_sampled field, which helps determine the order of tests within a retest scenario

- **Example.xml**

```
<submittal>
 <meta>
  <team>
   <name>IQF Phase 99</name>
   <teamidentifier>93b5b60c-f6cb-4e18-90ec-057fca3f7005</teamidentifier>
   <submitdate> 2020-05-29 20:00:00</submitdate>
  </team>
 </meta>
 <headers>
  <system_guid>b60e98e4-8fad-48cf-8a69-049d52964d15</system_guid>
  <form_id>AASHTOT27</form_id>
```

```
   <sample_id>20200422-1234-01-</sample_id>
   <contract_id>8888860</contract_id>
   <project_id>0040692RD01</project_id>
   <sample_type>IQF</sample_type>
   <analysis_type>Random-Split</analysis_type>
   <linked_sample_id>1234-20200131-01</linked_sample_id>
   <version_status>Original</version_status>
   <date_sampled>2020-05-28 08:23:18</date_sampled>
   <sampled_by>123456</sampled_by>
   <material>Backfill-713.08</material>
   <mix_id>Basemac-305</mix_id>
   <material_supplier>Supplier XYZ</material_supplier>
   <spec_item>713</spec_item>
   <intended_use>MSE wall</intended_use>
   <comments></comments>
   <location_feature>I-26 Exit 43 EB</location_feature>
   <station>192+00</station>
   <offset>4.5r</offset>
   <elevation>124.35</elevation>
  </headers>
  <form form_id="AASHTOT27">
   <field name="PASS_4IN"></field>
   <field name="PASS_3_5IN"></field>
   <field name="PASS_3IN"></field>
   <field name="PASS_2_5IN"></field>
   <field name="PASS_2IN">100</field>
   <field name="PASS_1_5IN">98</field>
   <field name="PASS_1IN">75</field>
   <field name="PASS_0_75IN"></field>
   <field name="PASS_0_5IN">60</field>
   <field name="PASS_0_375IN"></field>
   <field name="PASS_NO_4"></field>
   <field name="PASS_NO_8"></field>
   <field name="PASS_NO_16"></field>
   <field name="PASS_NO_18"></field>
   <field name="PASS_NO_30">36</field>
   <field name="PASS_NO_40"></field>
   <field name="PASS_NO_50"></field>
   <field name="PASS_NO_100"></field>
   <field name="PASS_NO_200">10</field>
   <field name="DATE_TESTED">2020-05-29 07:15:19</field>
   <field name="TESTED_BY">"Jane Smith"</field>
   <field name="LABORATORY">"ABC Lab"</field>
   <field name="RESULTS_STATEMENT">"Does Meet SCDOT Specifications"</field>
  </form>
  <footers />
</submittal>
```

Meta Fields

Meta fields within the xml provide identifying information about the submission. The *name* and *teamidentifier* field values will be provided to the team at **Project Initiation** and will remain constant throughout the project. The *submitdate* should be system-generated by the team for each record, providing the date/time stamp the record was generated and placed into the ftp.

```
<team>
 <name>IQF Phase 99</name>
 <teamidentifier>93b5b60c-f6cb-4e18-90ec-057fca3f7005</teamidentifier>
 <submitdate> 2020-05-29 20:00:00</submitdate>
</team>
```

Header Fields

The header provides the necessary metadata in relation to the material test form. It is used within STRATA for searching, tracking, and analyzing records. Each material test form submitted uses the same header schema.

Header Data

Alias	Field Name	Data Type	Domain Values	Required	Description	Example Values
System GUID	system_guid	GUID		Required	Every record imported into STRATA should be assigned a GUID that will be used in tracking versions of each form/sample ID combination. Corrections will need to be submitted with this GUID identifier for version tracking	b4699dd3-1ae4-44c7-a9d9-59ba5b6d7a73
Form ID	form_id	nvarchar	Form	Required	Identifies the related form associated to header record	AASHTOT27
Sample ID	sample_id	nvarchar		Required	Label to track material sampled or tested. ID convention and versioning standards are agreed upon during project setup	20200422-1234-01
Contract ID	contract_id	nvarchar	Projects	Required	Contract ID. This information is provided at project initiation and will remain constant throughout the project.	8888860
Project	project_id	nvarchar	Projects	Required	Project ID (PIN). This information is provided at project initiation and will remain constant throughout the project.	0040692RD01

Alias	Field Name	Data Type	Domain Values	Required	Description	Example Values
Sample Type	sample_type	nvarchar	Sample_Type	Required	This field identifies the sample type, referencing the agency submitting the record (OVF, IQF, SCDOT)	IQF
Analysis Type	analysis_type	nvarchar	Analysis_Type	Required	How a sample or test location was determined based on the sampling procedures outlined in the quality acceptance program	Random-Split
Linked Sample ID	linked_sample_id	nvarchar		Conditional*	For 'Retest' scenarios, the parent Sample ID will be recorded in this field. For 'Check Sample', the parent Sample ID will be recorded in this field in order to trace and reference the follow-up check samples. For 'Random-Split' or 'Fixed-Split' samples, the inspector will record the Sample ID generated in the field from the other party. Additional details and examples for when these scenarios rarely overlap are outlined within this document.	1234-20200131-01
Version Status	version_status	nvarchar	Version_Status	Required	This field identifies the version of the record being submitted. i.e. Original, Correction, or Retest.	Original
Date Time Sampled	date_time_sampled	datetime2(7)		Required	Sample Date and Time. Records with Version_Status = 'Retest' should accurately depict the sequence of tests, showing the date/time stamp of the tests using the following format: YYYY-MM-DD hh:mm:ss	2020-05-28 09:01:23
Sampled By	sampled_by	nvarchar		Required	Sampler (SCDOT Number assigned to the inspector)	SC912340
Material	material	nvarchar	Material_Code	Required	Material Code	Backfill-713.08
Material Subcategory	material_sub	nvarchar	Material_Sub	Required	Material subcategory which includes mix designs for concrete or sub-material categories for other materials	BaseMac-305
Material Supplier	material_supplier	nvarchar	Suppliers	Required	Supplier / Location Description	Supplier XYZ
Spec Item	spec_item	nvarchar	Spec_Item	Required	Section of the SCDOT standard specifications	713

Alias	Field Name	Data Type	Domain Values	Required	Description	Example Values
Intended Use	intended_use	nvarchar(255)		Optional	Free form field, providing additional detail about the intended use of the product	MSE Wall
Comments	comments	nvarchar(255)		Optional	Free form field, where comments about the test record can be submitted	
Location Feature	location_feature	nvarchar	Loc_Feature	Required	Roadway and feature, chosen from a list; defined by how designers break down the plans into different components, specific to the project and agreed upon during initiation. Additional values can be added throughout the project.	I-29 Exit 43 EB
Station	station	nvarchar		Conditional*	Station	192+00
Offset	offset	nvarchar		Conditional*	Offset and offset direction	4.5 R
Elevation	elevation	float		Conditional*	Elevation (ft)	124.35

*Note: 'Linked Sample ID' is required for 'Random-Split', 'Fixed-Split', or 'Check Sample' types. It is also required where version_status = 'Retest'.
'Intended Use' and 'Comments are optional.
For 'Station', 'Offset', and 'Elevation', see specific test method descriptions below for when these are required.

Footer Fields

There are no required fields for the footers.

Project Initiation

XML submissions will be made through an ftp account, provisioned at project initiation. The OVF and IQF teams shall provide an email account at this time to accommodate receipt of ftp credentials and messages that will be system-generated throughout the project life-cycle. Emails are expected to be sent from STRATA based on validation errors or records rejected from the OV Materials Manager. Multiple recipients are allowed. The following applies:

1. FTP provisioning is managed by the OVF Materials Management Team
2. Firms will provide the OVF Materials Management Team with an email account to receive the ftp credentials, and any additional email account(s) to act as the email recipient of system messages
3. Firms verify connection and parameters of the FTP are correct
4. Firms set up routine to submit data via the FTP, using the credentials generated above
5. Feedback from rejected records will arrive in the email account(s) provided during project initiation. Additional emails can be added throughout the project.

At initiation, the development teams may provide additional credentials to a development environment, so that firms can test field forms, xsd schema, and configurations prior to construction.

Additional Schema Information

The following sections provide additional details regarding submittals for corrections, split samples, and retests. Procedural information can be found in the Quality Assurance Program (QAP) documentation.

System Validation:

After xmls are submitted, the system will run xsd schema validation and other business logic. An XML import log will be emailed to the team members provided during **Project Initiation**, listing the files that passed system validation and any files (and their errors) that need re-submitting. The record can be adjusted and resubmitted to the system. Note: if it has not passed system validation checks, the record can be adjusted and resubmitted without following correction rules.

Materials Management Review

After a record has passed the system validation, the OV Materials Analyst for the project has the ability to reject records after they have been imported and passed system validation checks. The system or OV Materials Manager will email these records along with comments back to the IQF or OVF for correction and resubmittal. Records resubmitted with an update after a rejection from the Materials Analyst should be submitted as a Correction:

Corrections:

Corrections to any records that have previously passed system validation can be submitted to STRATA. The record should adhere to the following schema rules:

1. The record should have the same system_guid, and
2. version_status = ‘Correction’
3. The import date/time will be used to determine ‘last one in’

4. The record should contain updates to one or more attributes in the record

Split Samples:

Detailed information about the comparison process for performing split samples between agencies can be found in the QAP documentation. Test results with a Random-Split or Fixed-Split type should adhere to the following schema rules:

1. If analysis_type is equal to 'Random-Split' or 'Fixed-Split', the inspector should record the opposite agency's sample_id in the linked_sample_id field.
2. Exception: If version_status = 'Retest' and analysis_type is 'Random-Split' or 'Fixed Split', then the inspector should record the opposite agency's sample_id in the comments field.

For split sample examples, see Attachment B

Retests:

Reference the QAP for retesting requirements. This section provides additional information for XML submittals expected during field or laboratory retesting scenarios. Failing field tests that can be reworked, such as density or depth checks, require a passing fixed test at the original failing location and an additional passing random test within the lot for acceptance. Subsequent tests after the failing result should adhere to the following schema rules:

1. The first failing record should be assigned a version_status = 'Original'
2. Each subsequent retest record will have a unique system_guid and a unique sample_id
3. Subsequent retest records should be flagged with a version_status = 'Retest'
4. The linked_sample_id field should be populated with the parent Sample ID (from the original failing test)
5. The date_time_sampled field must utilize a date **and** time stamp to reflect the sequence of inspections
6. Field_results should depict the status of each test record, either Pass or Fail

Note: In rare instances where a split sample was performed when the version_status = 'Retest', then the inspector should record the parent ID from the original failing sample, and the sample_id from the opposite firm should be recorded in the comments field.

For field rework retest examples, see Attachment B

A failing laboratory test requires two check sample records and an update to the results statement of the original record after a determination about the material is made. The test results should adhere to the following schema rules:

1. The original failing test record should be submitted with a version_status = 'Original' and the results_statement = 'Does Not Meet SCDOT Specifications'.
2. Each check sample record will be submitted and have a unique system guid and a unique sample id.
3. Check sample records should be flagged with a version_status = 'Retest' and analysis_type = 'Check Sample'.

4. For the check sample records with version_status = ‘Retest’, the linked_sample_id field should be populated with the parent sample id (from the original failing test record).
5. The original failing test record should be submitted again, with a version_status = ‘Correction’ and an updated results statement (Either analysis_type = ‘Not Incorporated’ for removed materials or updating the results statement to ‘Engineering Judgement’, denoting that the material was approved using Engineering judgement).

For lab retest examples, see Attachment B

Material Test Forms (Body Fields)

Material test forms are the body of the submission record and capture results from each field or lab test performed. If a field is not applicable to the material-form being submitted, the value field can be left null in the xml submission.

Field requirements for test forms identified in Appendix B of the QAP are as follows. Note that due to document formatting, some test methods are broken across two pages.

Test Method Guide:

Soils and Aggregates

SCT6 - Calcium Carbonate

Table Name: SCT6

*Report calcium carbonate equivalent to the nearest 0.1 percent.

Field Description	Field Name	Data Type	Domain Values	Example Values
CALCIUM CARBONATE EQUIVALENT (percent)	CCE	decimal		50.1
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

SCT36 - Loss on Ignition (If Mica Content Present)

Table Name: SCT36

*Report loss of ignition as a percentage of the material passing the 2-mm sieve expressed to the nearest 0.1 percent.

Field Description	Field Name	Data Type	Domain Values	Example Values
LOSS OF IGNITION (percent)	LOSS_IGNITION	decimal		0.8
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

SCT30 – Compaction (And SCT29 – Proctor)

Table Name: SCT30

*Report all values to the nearest 0.1 (percent and pound per cubic foot).

Field Description	Field Name	Data Type	Domain Values	Example Values
WET DENSITY (lbs/cuft)	WET_DENSITY	decimal		119.3
MOISTURE PERCENT (percent)	MOISTURE_PERCENT	decimal		16.2
DRY DENSITY (lbs/cuft)	DRY_DENSITY	decimal		102.7
OPTIMUM MOISTURE CONTENT (percent)	OPT_MOIST_CON	decimal		17.5
MAXIMUM DRY DENSITY (lbs/cuft)	MAX_DRY_DENS	decimal		105.8
PERCENT COMPACTION (percent)	PERCENT_COMPACT	decimal		97.0
FIELD RESULTS STATEMENT	FIELD_RESULTS	nvarchar(255)	Field_Results	Pass

Additional Procedural Notes:

--All compaction tests will be reviewed for location information and will be rejected by materials management if the record is missing Station, Offset, and Elevation.

--If percent compaction is greater than 100, please use the comments field in the header to provide additional information.

SCT34 - Gradation/Elutriation

Table Name: SCT34

*Report all values to the nearest whole percent. Report the percentage of clay to the nearest whole percent as % Clay by Elutriation. The percentage of material passing the 75-µm sieve is reported as % silt. The percentage of material passing the 2-mm sieve and retained on the 75-µm sieve is reported as Total Sand.

Field Description	Field Name	Data Type	Domain Values	Example Values
PASSING 2 1/2"	PASS_2_5IN	decimal		100
PASSING 1 1/2"	PASS_1_5IN	decimal		100
PASSING 3/4"	PASS_0_75IN	decimal		97
PASSING 3/8"	PASS_0_375IN	decimal		95
PASSING NO. 4	PASS_NO_4	decimal		91
PASSING NO. 10	PASS_NO_10	decimal		87
SILT (as a whole)	SILT_WHOLE	decimal		14
CLAY (as a whole)	CLAY_WHOLE	decimal		22
RETAINED NO. 20	RET_NO_20	decimal		11
PASSING NO. 20 RET. NO. 40	RET_NO_40	decimal		14

Field Description	Field Name	Data Type	Domain Values	Example Values
PASSING NO. 40 RET. NO. 60	RET_NO_60	decimal		11
SAND ABOVE NO. 60	SAND_ABOVE_60	decimal		36
PASSING NO. 60 RET. NO. 100	RET_NO_100	decimal		10
PASSING NO. 100 RET. NO. 200	RET_NO_200	decimal		13
TOTAL SAND	TOTAL_SAND	decimal		59
SILT	SILT	decimal		16
CLAY (BY ELUTRIATION)	CLAY_BY_ELUT	decimal		26
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

Additional Procedural Note:
--Add AASHTO soil classification to comments.

SCT140 - Max Dry Density & Optimum Moisture Content

Table Name: SCT140

*Report optimum moisture content to the nearest 0.1 percent and maximum dry density to the nearest 0.1 pound per cubic foot.

Field Description	Field Name	Data Type	Domain Values	Example Values
OPTIMUM MOISTURE CONTENT (percent)	OPTIMUM_MOISTURE	decimal		6.3
MAXIMUM DRY DENSITY (lbs/cuft)	MAX_DRY_DENSITY	decimal		121.3
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	For Information Only

AASHTOT19 - Unit Weight

Table Name: AASHTOT19

*Report dry unit weight to the nearest 1 pound per cubic foot (whole number).

Field Description	Field Name	Data Type	Domain Values	Example Values
DRY UNIT WEIGHT (lb/cuft)	UNIT_DRY_WT	decimal		103
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

AASHTOT27 - Gradation

Table Name: AASHTOT27

*Report percentages to the nearest percent (whole number), except if the percentage passing the 75-µm (No. 200) sieve is less than 10 percent, it shall be reported to the nearest 0.1 percent. If the sieve is not required per the applicable material spec, leave the field null.

Field Description	Field Name	Data Type	Domain Values	Example Values
PASSING 4”	PASS_4IN	decimal		
PASSING 3.5"	PASS_3_5IN	decimal		
PASSING 3"	PASS_3IN	decimal		
PASSING 2.5"	PASS_2_5IN	decimal		
PASSING 2”	PASS_2IN	decimal		
PASSING 1 1/2”	PASS_1_5IN	decimal		100
PASSING 1”	PASS_1IN	decimal		99
PASSING 3/4”	PASS_0_75IN	decimal		83
PASSING 1/2”	PASS_0_5IN	decimal		37
PASSING 3/8”	PASS_0_375IN	decimal		
PASSING NO. 4	PASS_NO_4	decimal		8
PASSING NO. 8	PASS_NO_8	decimal		4
PASSING NO. 16	PASS_NO_16	decimal		
MATERIAL PASSING NO. 30	PASS_NO_30	decimal		
MATERIAL PASSING NO. 40	PASS_NO_40	decimal		

Field Description	Field Name	Data Type	Domain Values	Example Values
MATERIAL PASSING NO. 50	PASS_NO_50	decimal		
MATERIAL PASSING NO.100	PASS_NO_100	decimal		
MATERIAL PASSING NO.200	PASS_NO_200	decimal		0.4
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	LU_Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	LU_Results_Statement	Does Meet SCDOT Specifications

AASHTOT89 - Liquid Limit

Table Name: AASHTOT89

*Report liquid limit to the nearest percent (whole number).

Field Description	Field Name	Data Type	Domain Values	Example Values
LIQUID LIMIT (percent)	LIQUID_LIMIT	decimal		36
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

Additional Procedural Notes:
--Add AASHTO soil classification to comments.
--If material is Non-Plastic, report 0 for the liquid limit, and add NP to the comments.

AASHTOT90 - Plastic Limit

Table Name: AASHTOT90

*Report plasticity index to the nearest percent (whole number).

Field Description	Field Name	Data Type	Domain Values	Example Values
PLASTICITY INDEX (percent)	PLASTICITY_INDEX	decimal		13
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab

RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

Additional Procedural Notes:
--Add AASHTO soil classification to comments.
--If material is Non-Plastic, report 0 for the plasticity index, and add NP to the comments.

AASHTOT99 - Max Dry Density & Optimum Moisture Content

Table Name: AASHTOT99

*Report optimum moisture content to the nearest 0.1 percent and maximum dry density to the nearest 0.1 pound per cubic foot.

Field Description	Field Name	Data Type	Domain Values	Example Values
OPTIMIUM MOISTURE CONTENT (percent)	OPT_MOIST_CON	decimal		17.5
MAXIMUM DRY DENSITY (lbs/cuft)	MAX_DRY_DENS	decimal		105.8
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	For Information Only

AASHTOT193 - CBR

Table Name: AASHTOT193

*Report California bearing ratio to the nearest percent (whole number).

Field Description	Field Name	Data Type	Domain Values	Example Values
CALIFORNIA BEARING RATIO AT 100% (percent)	CBR	decimal		62
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

AASHTOT236 - Direct Shear

Table Name: AASHTOT236

*Report internal friction angle to nearest 0.1 degree and cohesion to the nearest 0.1 pound per square inch.

Field Description	Field Name	Data Type	Domain Values	Example Values
INTERNAL FRICTION ANGLE (degrees)	INT_FR_ANGLE	decimal		34.6
COHESION (psi)	COHESION	decimal		3.1
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

AASHTOT267 - Organic Content

Table Name: AASHTOT267

*Report organic content to the nearest 0.1 percent.

Field Description	Field Name	Data Type	Domain Values	Example Values
ORGANIC CONTENT (percent)	ORGANIC_CONTENT	decimal		1.5
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

AASHTOT288 - Resistivity

Table Name: AASHTOT288

*Report resistivity to the nearest 1 ohm-cm (whole number).

Field Description	Field Name	Data Type	Domain Values	Example Values
RESISTIVITY (ohm-cm)	RESISTIVITY	decimal		5000
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab

RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

AASHTOT289 - pH of Soil

Table Name: AASHTOT289

*Report pH to nearest 0.1.

Field Description	Field Name	Data Type	Domain Values	Example Values
pH OF SOIL	PH_SOIL	decimal		6.8
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTMD4767 - Triaxial Compression

Table Name: ASTMD4767

*Report friction angle (total and effective) to nearest 0.1 degree and cohesion (total and effective) to the nearest 0.1 pound per square inch.

Field Description	Field Name	Data Type	Domain Values	Example Values
TOTAL FRICTION ANGLE (degrees)	T_INT_FR_ANGLE	decimal		12.2
TOTAL COHESION (psi)	T_COHESION	decimal		3.0
EFFECTIVE FRICTION ANGLE (degrees)	E_INT_FR_ANGLE	decimal		28.1
EFFECTIVE COHESION (psi)	E_COHESION	decimal		1.8
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

Concrete

AASHTOT26 - Quality of Water (pH)

Table Name: AASHTOT26

*Report pH to nearest 0.1.

Field Description	Field Name	Data Type	Domain Values	Example Values
pH VALUE OF SAMPLE	pH_VALUE	decimal		7.5
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTMC39 - Compressive Strength (Cylindrical Concrete)

Table Name: ASTMC39

*Report dimensions (diameter and length) to the nearest 0.01 inch, max. load to the nearest pound (whole number), and strength (compressive and average) to the nearest 10 pounds per square inch.

Field Description	Field Name	Data Type	Domain Values	Example Values
FOR ACCEPTANCE	ACCEPTANCE	nvarchar	YES, NO	YES
REQUIRED AGE AT BREAK (Days)	AGE	Integer		28
DIAMETER (in)	DIAMETER_IN	decimal		6.00
LENGTH (in)	LENGTH_IN	decimal		12.00
CROSS SECTIONAL AREA (in^2)	CRS_SEC_AREA	decimal		28.27
SPECIMEN 1 MAXIMUM LOAD FORCE	MAX_LD_FRC1	decimal		148010
SPECIMEN 1 COMPRESSIVE STRENGTH (psi)	COMPRESSIVE_STRENGTH1	decimal		5240
SPECIMEN 1 TYPE OF FRACTURE	TYPE_FRAC1	decimal		2
SPECIMEN 2 MAXIMUM LOAD FORCE	MAX_LD_FRC2	decimal		144570
SPECIMEN 2 COMPRESSIVE STRENGTH (psi)	COMPRESSIVE_STRENGTH2	decimal		5110
SPECIMEN 2 TYPE OF FRACTURE	TYPE_FRAC2	decimal		2
SPECIMEN 3 MAXIMUM LOAD FORCE	MAX_LD_FRC3	decimal		146900
SPECIMEN 3 COMPRESSIVE STRENGTH (psi)	COMPRESSIVE_STRENGTH3	decimal		5200
SPECIMEN 3 TYPE OF FRACTURE	TYPE_FRAC3	decimal		2

AVERAGE STRENGTH (psi)	AVERAGE_STRENGTH	decimal		5180
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTMC67 - Compressive Strength & Absorption (Brick and Structural Clay Tile)

Table Name: ASTMC67

*Report the average width, length, and height of each specimen tested to the nearest 1⁄32 in. Report the average absorption of all specimens to the nearest 0.1 %. Report the average of the compressive strength determinations to the nearest 10 psi.

Field Description	Field Name	Data Type	Domain Values	Example Values
BRICK NUMBER 1 LENGTH (in)	BRICK1_LENGTH	decimal		
BRICK NUMBER 1 WIDTH (in)	BRICK1_WIDTH	decimal		
BRICK NUMBER 1 HEIGHT (in)	BRICK1_HEIGHT	decimal		
BRICK NUMBER 1 ABSORPTION (percent)	BRICK1_ABSORPTION	decimal		
BRICK NUMBER 1 (psi)	BRICK1_PSI	decimal		
BRICK NUMBER 2 LENGTH (in)	BRICK2_LENGTH	decimal		
BRICK NUMBER 2 WIDTH (in)	BRICK2_WIDTH	decimal		
BRICK NUMBER 2 HEIGHT (in)	BRICK2_HEIGHT	decimal		
BRICK NUMBER 2 ABSORPTION (percent)	BRICK2_ABSORPTION	decimal		
BRICK NUMBER 2 (psi)	BRICK2_PSI	decimal		
BRICK NUMBER 3 LENGTH (in)	BRICK3_LENGTH	decimal		
BRICK NUMBER 3 WIDTH (in)	BRICK3_WIDTH	decimal		
BRICK NUMBER 3 HEIGHT (in)	BRICK3_HEIGHT	decimal		
BRICK NUMBER 3 ABSORPTION (percent)	BRICK3_ABSORPTION	decimal		
BRICK NUMBER 3 (psi)	BRICK3_PSI	decimal		
BRICK NUMBER 4 LENGTH (in)	BRICK4_LENGTH	decimal		
BRICK NUMBER 4 WIDTH (in)	BRICK4_WIDTH	decimal		
BRICK NUMBER 4 HEIGHT (in)	BRICK4_HEIGHT	decimal		

Field Description	Field Name	Data Type	Domain Values	Example Values
BRICK NUMBER 4 ABSORPTION (percent)	BRICK4_ABSORPTION	decimal		
BRICK NUMBER 4 (psi)	BRICK4_PSI	decimal		
BRICK NUMBER 5 LENGTH (in)	BRICK5_LENGTH	decimal		
BRICK NUMBER 5 WIDTH (in)	BRICK5_WIDTH	decimal		
BRICK NUMBER 5 HEIGHT (in)	BRICK5_HEIGHT	decimal		
BRICK NUMBER 5 ABSORPTION (percent)	BRICK5_ABSORPTION	decimal		
BRICK NUMBER 5 (psi)	BRICK5_PSI	decimal		
AVERAGE COMPRESSIVE STRENGTH (psi)	AVG_COMPRESSIVE_STRENGTH	decimal		
AVERAGE ABSORPTION (percent)	AVG_ABSORPTION	decimal		
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTMC109 - Compressive Strength (Hydraulic Cement Mortars)

Table Name: ASTMC109

*Report the compressive strength to the nearest 10 psi.

Field Description	Field Name	Data Type	Domain Values	Example Values
LENGTH	LENGTH	decimal		
WIDTH	WIDTH	decimal		
CROSS SECTIONAL AREA	CRS_SEC_AREA	decimal		
SPECIMEN NO 1 AGE AT BREAK	SPEC1_AGE	decimal		
SPECIMEN NO 1 MAXIMUM LOAD FORCE	SPEC1_MAX_LD_FRC	decimal		
SPECIMEN NO 1 COMPRESSIVE STRENGTH (psi)	SPEC1_COMP_STRENGTH	decimal		
SPECIMEN NO 2 AGE AT BREAK	SPEC2_AGE	decimal		
SPECIMEN NO 2 MAXIMUM LOAD FORCE	SPEC2_MAX_LD_FRC	decimal		
SPECIMEN NO 2 COMPRESSIVE STRENGTH (psi)	SPEC2_COMP_STRENGTH	decimal		

Field Description	Field Name	Data Type	Domain Values	Example Values
SPECIMEN NO 3 AGE AT BREAK	SPEC3_AGE	decimal		
SPECIMEN NO 3 MAXIMUM LOAD FORCE	SPEC3_MAX_LD_FRC	decimal		
SPECIMEN NO 3 COMPRESSIVE STRENGTH (psi)	SPEC3_COMP_STRENGTH	decimal		
AVERAGE STRENGTH (psi)	AVERAGE_STRENGTH	decimal		
MORTAR STRENGTH WITH COLUMBIA CITY WATER - TESTED AT 7 DAYS (psi)	MORTAR_CITY_WT	decimal		
MORTAR STRENGTH WITH SAMPLE WATER - TESTED AT 7 DAYS(psi)	MORTAR_SAMPLE_WT	decimal		
PERCENT OF SAMPLE STRENGTH TO COLUMBIA CITY WATER - TESTED AT 7 DAYS (percent)	PERC_STRGTH_COMPARE	decimal		
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTMC140 - Compressive Strength & Absorption (Masonry Units)

Table Name: ASTMC140

*Report the average width, height, and length to the nearest 0.1 in. Report the average absorption of all specimens to the nearest 0.1 %. Report the average of the compressive strength determinations to the nearest 10 psi.

Field Description	Field Name	Data Type	Domain Values	Example Values
BRICK NUMBER 1 LENGTH (in)	BRICK1_LENGTH	decimal		
BRICK NUMBER 1 WIDTH (in)	BRICK1_WIDTH	decimal		
BRICK NUMBER 1 HEIGHT (in)	BRICK1_HEIGHT	decimal		
BRICK NUMBER 1 ABSORPTION (percent)	BRICK1_ABSORPTION	decimal		
BRICK NUMBER 1 (psi)	BRICK1_PSI	decimal		
BRICK NUMBER 2 LENGTH (in)	BRICK2_LENGTH	decimal		
BRICK NUMBER 2 WIDTH (in)	BRICK2_WIDTH	decimal		

Field Description	Field Name	Data Type	Domain Values	Example Values
BRICK NUMBER 2 HEIGHT (in)	BRICK2_HEIGHT	decimal		
BRICK NUMBER 2 ABSORPTION (percent)	BRICK2_ABSORPTION	decimal		
BRICK NUMBER 2 (psi)	BRICK2_PSI	decimal		
BRICK NUMBER 3 LENGTH (in)	BRICK3_LENGTH	decimal		
BRICK NUMBER 3 WIDTH (in)	BRICK3_WIDTH	decimal		
BRICK NUMBER 3 HEIGHT (in)	BRICK3_HEIGHT	decimal		
BRICK NUMBER 3 ABSORPTION (percent)	BRICK3_ABSORPTION	decimal		
BRICK NUMBER 3 (psi)	BRICK3_PSI	decimal		
AVERAGE COMPRESSIVE STRENGTH (psi)	AVG_COMPRESSIVE_STRENGTH	decimal		
AVERAGE ABSORPTION (percent)	AVG_ABSORPTION	decimal		
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTMC143 - Slump

Table Name: ASTMC143

*Report slump to the nearest 0.25 inch.

Field Description	Field Name	Data Type	Domain Values	Example Values
SLUMP (in)	SLUMP	decimal		3.75
FIELD RESULTS STATEMENT	FIELD_RESULTS	nvarchar	Field_Results	Pass

ASTMC151 - Autoclave Expansion/Soundness

Table Name: ASTMC151

*Report autoclave expansion/soundness to the nearest 0.01.

Field Description	Field Name	Data Type	Domain Values	Example Values
STANDARD SOUNDNESS	STANDARD_SOUNDNESS	decimal		0.01

SAMPLE SOUNDNESS	SAMPLE_SOUNDNESS	decimal		0.02
THERE ARE	THERE_ARE	nvarchar	Soundness	NO INDICATIONS OF UNSOUNDNESS
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTMC191 - Time of Set

Table Name: ASTMC191

*Report the final time of setting to the nearest 5 minutes.

Field Description	Field Name	Data Type	Domain Values	Example Values
STANDARD INITIAL TIME OF SET (minutes)	STND_INITIAL_TOS	decimal		
STANDARD FINAL TIME OF SET (minutes)	STND_FINAL_TOS	decimal		
SAMPLE INITIAL TIME OF SET (minutes)	SMPL_INITIAL_TOS	decimal		
SAMPLE FINAL TIME OF SET (minutes)	SMPL_FINAL_TOS	decimal		
COMPARISON INITIAL TIME OF SET (minutes)	COMP_INITIAL_TOS	decimal		
COMPARISON FINAL TIME OF SET (minutes)	COMP_FINAL_TOS	decimal		
COMPARISON COMPARES WITH CITY WATER	COMP_COMPARES	nvarchar	Water_Comparison	
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTMC231 - Air Content

Table Name: ASTMC231

*Report air content to the nearest 0.1 percent.

Field Description	Field Name	Data Type	Domain Values	Example Values
AIR CONTENT (percent)	AIR_CONTENT	decimal		4.5
FIELD RESULTS STATEMENT	FIELD_RESULTS	nvarchar	Field_Results	Pass

ASTMC1064 - Temperature

Table Name: ASTMC1064

*Report temperature to the nearest degree °F (whole number).

Field Description	Field Name	Data Type	Domain Values	Example Values
CONCRETE TEMPERATURE (degrees)	CONC_TEMP	decimal		82
FIELD RESULTS STATEMENT	FIELD_RESULTS	nvarchar	Field_Results	Pass

Reinforcing Steel

SCT150_151 - Bolt Assembly Rotational Capacity

Table Name: SCT150_151

*Report tension to the nearest 1 kip (whole number) and torque to the nearest 10 ft-lbs.

Field Description	Field Name	Data Type	Domain Values	Example Values
TENSION AT REQUIRED TURN (kips)	TENSION_AT_TURN	decimal		65
TORQUE AT REQUIRED TURN (ft-lbs)	TORQUE_AT_TURN	decimal		1210
PHSYICAL APPEARANCE	PHYS_APPEAR	nvarchar	GoodFairBad	GOOD, FAIR, BAD
LUBRICATION	LUBRICATION	nvarchar	GoodFairBad	GOOD, FAIR, BAD
ROTATIONAL-CAPACITY TEST OF BOLT ASSEMBLY IS	ROT_CAP_IS	nvarchar	Satisfactory	SATISFACTORY, UNSATISFACTORY
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab

RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

SCT152 - DTI Verification

Table Name: SCT152

*Report strength test to the nearest 1 kip (whole number).

Field Description	Field Name	Data Type	Domain Values	Example Values
HEAT NUMBER	HEAT_NUM	nvarchar		
PHYSICAL MEASUREMENTS	PHYS_MEASURE	nvarchar	Satisfactory	SATISFACTORY, UNSATISFACTORY
LOT NUMBER	LOT_NUM	nvarchar		
STRENGTH TEST (kips)	STRENGTH_TEST	decimal		95
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

AASHTOM203 - Strand Breaking Strength

Table Name: AASHTOM203

*Report ultimate strength to the nearest 100 lbs. Report diameter to the nearest 0.001 in. Report diameter greater than to the nearest 0.0001 in.

Field Description	Field Name	Data Type	Domain Values	Example Values
DIAMETER OF STRAND, CROWN TO CROWN (in)	DIAM_CTOC	decimal		0.438
DIAMETER OF CENTER STRAND IS GREATER THAN LARGEST OUTER STRAND BY (in)	DIFF_DIAM	decimal		0.0028
ULTIMATE STRENGTH OF CABLE STRAND (lbs)	ULTIMATE_STRENGTH	decimal		41300
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

AASHTOT244 - Mechanical Testing of Steel Products

Table Name: AASTHTOT244

*Report yield strength and tensile strength to the nearest 500 psi. Report elongation and reduction of area to the nearest 0.5 percent.

Field Description	Field Name	Data Type	Domain Values	Example Values
BAR NO. (AS SUBMITTED)	BAR_NO	nvarchar		6
BAR MARKS…SOURCE-BAR NO	SOURCE_BAR_NO	nvarchar		CMCCSC-6
BAR MARKS…TYPE-GRADE	TYPE_GRADE	nvarchar		W-60
WEIGHT (lbs/ft)	WEIGHT	decimal		1.467
WIRE DIAMETER (in)	WIRE_DIAMETER	decimal		
GAUGE	GAUGE	nvarchar		
YIELD STRENGTH (psi)	YIELD_STRENGTH	decimal		66000
TENSILE STRENGTH (psi)	TENSILE_STRENGTH	decimal		94500
PERCENT OF THEORETICAL WEIGHT (percent)	PERCENT_THEORETICAL	decimal		97.653
DEFORMATION HEIGHT (in)	DEFORMATION_HEIGHT	decimal		0.045
DEFORMATION GAP (in)	DEFORMATION_GAP	decimal		0.102
PERCENT OF ELONGATION (percent)	PERCENT_ELONGATION	decimal		19.5
REDUCTION IN AREA (percent)	REDUCTION_AREA	decimal		14.0
ULTIMATE STRESS (psi)	ULTIMATE_STRESS	decimal		
COUPLER QUALIFIES AS	COUPLER_QUALIFIES	nvarchar	Coupler	SERVICE COUPLER, ULTIMATE COUPLER
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

ASTME18 - Bolt, Nut, and Washer Hardness

Table Name: ASTME18

*Report hardness to the nearest whole number.

Field Description	Field Name	Data Type	Domain Values	Example Values
BOLT HEAT NUMBER	BOLT_HEAT	nvarchar		
BOLT LOT NUMBER	BOLT_LOT	nvarchar		
BOLT PHYSICAL MEASUREMENTS	BOLT_MEASURE	nvarchar	Satisfactory	SATISFACTORY, UNSATISFACTORY
BOLT HARDNESS (ROCKWELL "C")	BOLT_HARNESS	decimal		29
BOLT MEETS SPEC	BOLT_MEETS_SPEC	nvarchar	Satisfactory	SATISFACTORY, UNSATISFACTORY
NUT HEAT NUMBER	NUT_HEAT	nvarchar		
NUT LOT NUMBER	NUT_LOT	nvarchar		
NUT PHYSICAL MEASUREMENTS	NUT_MEASURE	nvarchar	Satisfactory	SATISFACTORY, UNSATISFACTORY
NUT HARDNESS (ROCKWELL "C")	NUT_HARDNESS	decimal		30
NUT MEETS SPEC	NUT_MEETS_SPEC	nvarchar	Satisfactory	SATISFACTORY, UNSATISFACTORY
FLAT WASHER HEAT NUMBER	FLAT_WSH_HEAT	nvarchar		
FLAT WASHER LOT NUMBER	FLAT_WSH_LOT	nvarchar		
FLAT WASHER PHYSICAL MEASUREMENTS	FLAT_WSH_MEASURE	nvarchar	Satisfactory	SATISFACTORY, UNSATISFACTORY
FLAT WASHER HARDNESS (ROCKWELL "C")	FLAT_WSH_HARDNESS	decimal		28
FLAT WASHER MEETS SPEC	FLAT_WSH_MEETS_SPEC	nvarchar	Satisfactory	SATISFACTORY, UNSATISFACTORY
DATE TESTED	DATE_TESTED	datetime2(7)		2020-05-28 09:01:23
TESTED BY	TESTED_BY	nvarchar		Jane Smith
LABORATORY	LABORATORY	nvarchar	Laboratory	ABC Lab
RESULTS STATEMENT	RESULTS_STATEMENT	nvarchar	Results_Statement	Does Meet SCDOT Specifications

Attachment A: Domain Values

Global Domains

Global domains remain constant between all projects. Updates are anticipated to be rare, but will be communicated to the project team, if they occur.

Form and Description

AASHTOT26	Quality of Water (pH)	Concrete
ASTMC1064	Temperature	Concrete
ASTMC109	Compressive Strength (Hydraulic Cement Mortars)	Concrete
ASTMC140	Compressive Strength & Absorption (Masonry Units)	Concrete
ASTMC143	Slump	Concrete
ASTMC151	Autoclave Expansion/Soundness	Concrete
ASTMC191	Time of Set	Concrete
ASTMC231	Air Content	Concrete
ASTMC39	Compressive Strength (Cylindrical Concrete)	Concrete
ASTMC67	Compressive Strength & Absorption (Brick and Structural Clay Tile)	Concrete
AASHTOT244	Mechanical Testing of Steel Products	ReinforcingSteel
ASTME18	Bolt, Nut, and Washer Hardness	ReinforcingSteel
SCT150_151	Bolt Assembly Rotational Capacity	ReinforcingSteel
SCT152	DTI Verification	ReinforcingSteel
AASHTOT19	Unit Weight	SoilAndAggregate
AASHTOT193	CBR	SoilAndAggregate
AASHTOT236	Direct Shear	SoilAndAggregate
AASHTOT267	Organic Content	SoilAndAggregate
AASHTOT27	Gradation	SoilAndAggregate
AASHTOT288	Resistivity	SoilAndAggregate
AASHTOT289	pH of Soil	SoilAndAggregate
AASHTOT89	Liquid Limit	SoilAndAggregate
AASHTOT90	Plastic Limit	SoilAndAggregate
AASHTOT99	Max Dry Density & Optimum Moisture Content	SoilAndAggregate
ASTMD4767	Triaxial Compression	SoilAndAggregate
SCT140	Max Dry Density & Optimum Moisture Content	SoilAndAggregate
SCT30	Compaction, Proctor (1 pt.)	SoilAndAggregate
SCT34	Gradation/Elutriation	SoilAndAggregate
SCT6	Calcium Carbonate	SoilAndAggregate

Analysis_Type

Fixed-Independent
Fixed-Split
Internal
Not Incorporated
Random-Independent
Random-Split
Check Sample

Acceptance

YES
NO

Coupler

SERVICE COUPLER
ULTIMATE COUPLER

Field_Results

Pass
Fail
Engineering Judgement

GoodFairBad

GOOD
FAIR
BAD

Results_Statement

Does Meet SCDOT Specifications
Does Not Meet SCDOT Specifications
Engineering Judgement
For Information Only

Sample_Type

IQF
OVF
SCDOT

Satisfactory

SATISFACTORY
UNSATISFACTORY

Soundness

NO INDICATIONS OF UNSOUNDNESS
INDICATIONS OF UNSOUNDNESS

Version_Status

Original
Correction
Retest

Water_Comparison

SAMPLE IS WITHIN 30 MINUTES OF CITY WATER
SAMPLE EXCEEDS 30 MINUTES OF CITY WATER

Project Domains

Project domains will be configured at the beginning of a project. Updates and additions to the values for these domains will be communicated to the project team. Included in this list are:

- Valid combinations of Material/Material Subcategory/Supplier/Spec Item:
    - Material (list will be derived from SCDOT material codes listed in the QAST)
    - Material Subcategory
    - Material_Supplier
    - Spec_Item
- Contract_ID
- Project_ID
- Sampled_By
- Location_Feature (Roadway and Feature Name)

Attachment B: Split Sample and Retest Examples

Split Sample Examples:

IQF Density Split Sample (Not a Retest Scenario)

Example 1

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Field Results	Comments
6ee32e37-8fba-4049-9b22-d81b684f1e4f	IQF200527-01	OVF2005271615	5/27/20 07:00:23	Random-Split	Original	Pass	

Example 2

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Field Results	Comments
aa139364-4e05-4bda-a9a6-dbbcefe0b0ad	IQF200528-06	OVF2005281622	5/28/20 09:32:12	Fixed-Split	Original	Pass	

Field Rework, Retesting Examples:

IQF Density Retest with One Fail

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Field Results	Comments
8da825a5-59ae-4e2d-b697-9c082324db70	IQF200527-01		5/27/20 07:00:00	Random-Independent	Original	Fail	
caa985e0-4ad0-4270-a623-872f7b114c41	IQF200527-02	IQF200527-01	5/27/20 08:00:00	Fixed-Independent	Retest	Pass	
e32112f2-4f6b-438b-b20c-1a989b2a16ef	IQF200527-03	IQF200527-01	5/27/20 9:00:00	Random-Independent	Retest	Pass	

IQF Density Retest with One Fail Split with OVF

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Field Results	Comments
8053a9ee-0647-4f51-b57d-0efaa4414b68	IQF200527-01		5/27/20 13:00:00	Random-Independent	Original	Fail	
a4bbc4d0-597a-4f15-85fa-48ebd895003f	IQF200527-02	IQF200527-01	5/27/20 14:00:00	Fixed-Independent	Retest	Pass	
013708ef-8116-4a3c-b612-f688a24be7c0	IQF200527-03	IQF200527-01	5/27/20 15:00:00	Random-Split	Retest	Pass	OVF2005271615

IQF Density Retest with Two Fails

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Field Results	Comments
f9472159-db4e-4e4a-a53c-6d1d65b9dacd	IQF200528-01		5/28/20 8:00:00	Random-Independent	Original	Fail	
d341f8db-22d3-4263-9d5a-2a3af499e475	IQF200528-02	IQF200528-01	5/28/20 9:00:00	Fixed-Independent	Retest	Fail	
b6d09c90-04cd-4ecf-bc70-4661fe440f13	IQF200528-03	IQF200528-01	5/28/20 10:00:00	Fixed-Independent	Retest	Pass	
c1f4cf0d-fb1b-4ef3-b299-4038224cef9d	IQF200528-04	IQF200528-01	5/28/20 11:00:00	Random-Independent	Retest	Pass	

IQF Density Retest with Two Fails and Two Splits with OVF

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Field Results	Comments
30599739-3d16-424c-87fd-bea6abbd358c	IQF200526-01	OVF2005261400	5/26/20 8:00:00	Random-Split	Original	Fail	
1b16e789-08ee-45af-9297-706c3a5d0994	IQF200526-02	IQF200526-01	5/26/20 9:00:00	Fixed-Independent	Retest	Fail	
311b02d4-a99d-4339-b72f-e0d56c64f3a8	IQF200527-03	IQF200526-01	5/27/20 8:00:00	Fixed-Independent	Retest	Pass	
ef3ff8ec-ae69-4433-8061-852566fabe89	IQF200528-04	IQF200526-01	5/28/20 8:00:00	Random-Split	Retest	Pass	OVF2005281500

Correction of a Record in a Retest Scenario

The bolded record was rejected by a materials manager after it had passed system validation. It can be resubmitted using a correction (same GUID, flagged as version_status=Correction)

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Value	Field Results	Comments
f9472159-db4e-4e4a-a53c-6d1d65b9dacd	IQF200528-01		5/28/20 8:00:00	Random-Independent	Original	95.2	Fail	
d341f8db-22d3-4263-9d5a-2a3af499e475	IQF200528-02	IQF200528-01	5/28/20 9:00:00	Fixed-Independent	Retest	96.2	Fail	
b6d09c90-04cd-4ecf-bc70-4661fe440f13	**IQF200528-03**	**IQF200528-01**	**5/28/20 10:00:00**	**Fixed-Independent**	**Retest**	**89.1**	**Pass**	
c1f4cf0d-fb1b-4ef3-b299-4038224cef9d	IQF200528-04	IQF200528-01	5/28/20 11:00:00	Random-Independent	Retest	98.2	Pass	

Corrected record:

b6d09c90-04cd-4ecf-bc70-4661fe440f13	IQF200528-03	IQF200528-01	5/28/20 10:00:00	Fixed-Independent	Correction	99.1	Pass	

Laboratory Retesting Examples:

- Check Samples (Same Applies to OVF)

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Results Statement	Comments
b33ee77b-2ac8-403b-84d1-e168fd1c7766	IQF200511-01		5/11/20 15:00:00	Random-Independent	Original	Does Not Meet SCDOT Specifications	
a190b18f-b204-400c-8948-9cfb0b56b867	IQF200513-01	IQF200511-01	5/13/20 8:00:00	Check Sample	Retest	Does Not Meet SCDOT Specifications	
60b9a6bb-6818-4303-93e1-1a60d2b152ab	IQF200515-01	IQF200511-01	5/15/20 7:00:00	Check Sample	Retest	Does Meet SCDOT Specifications	
b33ee77b-2ac8-403b-84d1-e168fd1c7766	IQF200511-01		5/11/20 8:00:00	Random-Independent	Correction	Engineering Judgement	

- Check Samples Split with OVF (Same Applies to OVF)

System GUID	Sample ID	Linked ID	Date Time Sampled	Analysis Type	Version Status	Results Statement	Comments
f7d5ebb8-d7c4-4391-8cb6-40f2e9884aae	IQF200518-01	OVF2005180900	5/18/20 7:00:00	Random-Split	Original	Does Not Meet SCDOT Specifications	
144641e9-f1ed-4085-b06f-539eab4c139d	IQF200520-01	IQF200518-01	5/20/20 12:00:00	Check Sample	Retest	Does Not Meet SCDOT Specifications	OVF2005180900
7af6eabe-f8a4-44e5-b66c-5cc6d9cb1a1f	IQF200522-01	IQF200518-01	5/22/20 8:00:00	Check Sample	Retest	Does Meet SCDOT Specifications	OVF2005180900
f7d5ebb8-d7c4-4391-8cb6-40f2e9884aae	IQF200518-01	OVF2005180900	5/18/20 16:00:00	Random-Split	Correction	Engineering Judgement	

Appendix F
Processes for Addressing Non-conforming Material or Workmanship

Process for Addressing Non-conforming Material or Workmanship

Purpose

The purpose of this document is to better define the use of and processes for addressing non-conforming material or workmanship for the Carolina Crossroads project Phase 3 as defined in SCDOT's Quality Assurance Program (QAP). A ***Deficiency Notice (DN)*** may be used for non-conforming work or material which there is still an opportunity to correct the non-conformance prior to advancing the work. Acceptance decisions on non-conforming material or workmanship made by the Independent Quality Manager (IQM) as described below must be documented and logged by use of a ***Engineering Judgement (EJ)*** or by use of a ***Non-Conformance Report (NCR)***. In some cases, the EOR is required to review and sign off on the acceptance decisions. The IQM will maintain documentation of all non-conformance dispositions. In addition, the IQF will submit monthly to SCDOT a Deficiency Notice Log, an Engineering Judgement Log, and a Non-conformance Log of all reports generated during the reporting month. A ***Corrective Action Report (CAR)*** is required in instances where the Contractor provides materials and/or workmanship which results in repeatedly occurring conditions adverse to quality, such as failures, malfunctions, deficiencies, defective material and equipment, deviations, and other non-conforming work. A CAR shall not be utilized for the basis of an acceptance decision on an individual test or acceptance of a material or element of work.

Deficiency Notice (DN)

A Deficiency Notice (DN) is required to place the Contractor on notice of an occurrence of non-conforming work or material failing to meet the standards of the Contract, CQMP, specifications, plans and standards in which there is still an opportunity to correct the non-conformance prior to advancing the work. DNs can be initiated by the IQF, OVF or SCDOT and shall remain in effect until the deficiency is fully corrected and the item of work is brought into conformance. Any DN which is unresolved prior to advancement of the work shall be converted to a Non-Conformance Report (NCR) in accordance with the NCR procedure outlined below. DN's must identify the type and location of the non-conforming work or material, detail the specification used to evaluate the non-conformity and requirements necessary to bring the failing work and/or material into conformity. It will be the responsibility of the IQM to track and monitor DNs until fully resolved or converted to an NCR. The IQM is required to perform and document additional testing or analysis to verify compliance. The Owner Verification Resident Engineer (OVRE) will monitor the DN process to ensure the IQF manages the DN process to confirm all non-conforming work is properly addressed. All DNs will be logged in a DN Log and submitted to the SCDOT by the IQF as part of the monthly materials certification report. The development of required DN documentation, the DN Log and processes for review and approval is the responsibility of the IQM and will be detailed in the CQMP. Minimum DN documentation requirements are below. An example of a DN is included as Attachment A.

Minimum DN Fields

DN # - *Sequential and unique identification*
Date - *Date inspection conducted, sample taken or test performed*
Location of Non-Conformance – *member, Unit ID, Station/Offset, etc.*
Item of Work or Material - *i.e. Pile installation, Reinforcing Steel placement, Concrete – Class A, etc.*
Specification and/or Requirement - *i.e. Spec #, Dimensions, Measurement, Strength, Classification, etc.*
Sample / Test ID – *Identification # of sample taken or test performed*
Description of Non-Conformance – *Test results, specification and deviation/non-conformance*
Corrective Action Taken – *Description of corrective work performed by Contractor*
Acceptance Decision - *evaluation, analysis, basis of acceptance decision, any additional testing, corrective action performed, etc.*
Subsequent NCR # (as applicable) – *Reference to NCR issued if DN is not resolved prior to advancing work*
IQM Comments and Recommendation / Signature – *IQM Review*

Engineering Judgement (EJ)

The IQM may exercise EJ only on an individual test to accept material or work failing to meet the standards of the Contract, CQMP, specifications, plans and standards and only in cases that will otherwise meet the intent of the design or that rejection of material compromises quality of a more significant item. EJ is typically exercised on field indicator tests (i.e. slump, air content, time, etc.) when a time sensitive decision must be made to advance the work. EJ should not be utilized to accept materials or workmanship on completed or in-place work where schedule is no longer a significant factor (i.e. 28-day compressive strength, steel tensile strength, pile misalignment, etc.) or when additional work activities may bring the material or activity into specifications (i.e. compaction, gradation, moisture content, etc.). Non-conforming materials not eligible for EJ determination must be addressed utilizing a Non-Conformance Report (NCR). Prior to starting work on the project, the IQF must submit to SCDOT for approval an Engineering Judgement List of the materials, items or test which the IQF requests authorization to administer EJ. IQF may request, in writing to SCDOT for approval, modifications and additions to the list through the project. The IQM may only exercise EJ on the approved pre-determined inspection and testing items included in the Engineering Judgement List. Any application of EJ will be accompanied by appropriate documentation and recorded in an EJ Log, which will be submitted by the IQF with the monthly materials certification report. The development of the required EJ Log and process for review and approval of EJ authorization will be the responsibility of the Contractor as submitted for SCDOT review and approval as part of their Construction Quality Management Plan (CQMP). Minimum EJ Log requirements are below. An example of an EJ Log is included as Attachment B.

Minimum EJ Log Fields

EJ # - *Sequential and unique identification*
Date - *Date sample taken*
Location of Non-Conformance – *member, Unit ID, Station/Offset, etc.*
Item of Work / Material - *i.e. Concrete – Class A, Embankment, Borrow, etc.*
Test/Sample Type - *i.e. Slump, Air Content, Compaction, Gradation, etc.*
Specification and Description of Non-Conformance – S*pecification requirement and deviation from specification*
EJ Issue Resolution – *Description of EJ, basis of acceptance decision, any additional testing, etc.*
Name / Signature – *Responsible, Authorized Engineer exercising EJ*

Non-Conformance Report (NCR)

A Non-Conformance Report (NCR) is required to document and address each occurrence of non-conforming work or material failing to meet the standards of the Contract, CQMP, specifications, plans and standards where impacts to quality or performance of the work are beyond that normally accepted by SCDOT. NCRs can be initiated by the IQF, OVF or SCDOT. NCR's must include an evaluation by the Engineer of Record (EOR) assessing the impacts to quality and/or performance including investigating the non-conformance, identifying the type and location of the non-conforming work or material, detailing the specification non-conformity and recommending final disposition of the failing material and/or non-conformance. The EOR shall report conclusions and/or findings determined and recommend additional testing or analysis to be performed by the IQM. The IQM is required to perform and document additional testing or analysis performed. The NCR will require the signature of the EOR and IQM with their recommendation for acceptance. The Owner Verification Project Engineer (OVPE) will review and make a recommendation to the SCDOT Construction Manager for Mega-Projects (CMMP). SCDOT may reject any NCR. All NCRs will be logged in an NCR Log and submitted by the IQF with the monthly materials certification report. The development of required NCR documentation, the NCR Log and process for review and approval of NCR's are the responsibility of the IQM. Minimum NCR documentation

requirements are below. An example of an NCR is included as Attachment C.

Minimum NCR Fields
NCR # - *Sequential and unique identification*
Date - *Date inspection conducted, sample taken or test performed*
Location of Non-Conformance – *member, Unit ID, Station/Offset, etc.*
Item of Work or Material - *i.e. Pile installation, Reinforcing Steel placement, Concrete – Class A, etc.*
Specification and/or Requirement - *i.e. Spec #, Dimensions, Measurement, Strength, Classification, etc.*
Sample / Test ID – *Identification # of sample taken or test performed*
Description of Non-Conformance – *Test results, specification and deviation/non-conformance*
Evaluation and Proposed Corrective Action – *Description of evaluation, analysis, basis of acceptance decision, any additional testing, corrective action performed, etc.*
Engineer of Record Comments and Recommendation / Signature – *EOR Review*
IQM Comments and Recommendation / Signature – *IQM Review*
OVPE Comments and Recommendation / Signature – *OVPE Review*
SCDOT CMMP Comments and Approval / Signature – *CMMP Acceptance*

Corrective Action Report (CAR)

A CAR is required in instances where Contractor provided materials and/or workmanship results in repeatedly occurring conditions adverse to quality, such as failures, malfunctions, deficiencies, defective material and equipment, deviations, and other non- conforming work. Recurring non-conformance with specifications should typically be discovered by the Contractor's QC process and therefore CARs should normally be initiated by the Contractor's Quality Control Manager (IQM) and approved through a process defined in the approved CQMP. Where the IQM does not initiate a CAR, the IQF or OVF may prepare a CAR and place the burden on the Contractor for evaluating the non-conformance, adjusting or correcting processes and completing CAR documentation. The Contractor's CQMP shall define procedures for establishing measures for identification and resolution of repeatedly occurring conditions adverse to quality and how they are promptly identified and corrected including determination of cause of the condition and corrective action taken to preclude repetition. The process shall include the development of a Corrective Action Report (CAR), that includes at a minimum (a) the identification of the non-conforming condition adverse to quality, (b) immediate action taken to prevent and/or correct the non-conformity, (c) root cause analysis of the non-conformance, (d) improvements to the quality system to prevent similar occurrences, and (e) plan to monitor the effective implementation of improvement(s) identified. Completed CAR shall be submitted to SCDOT, the IQF and to appropriate levels of Contractor's management for review and approval prior to implementation. A CAR shall not be utilized for documentation of an acceptance decision of an individual test or acceptance of a material or element of work. The development of required CAR documentation and process for review and approval of CAR's is the responsibility of the QCM. Minimum CAR documentation requirements are below. An example of a CAR is included as Attachment D.

Minimum CAR Fields
CAR # - *Sequential and unique identification*
Date - *Date evaluation initiated for recurring non-conformance*
Location of Non-Conformance – *i.e. member, Unit ID, Station/Offset, etc.*
Item of Work or Material - *i.e. Pile installation, Reinforcing Steel placement, Concrete – Class A, etc.*
Description of Non-Conformance – *i.e. Test results, specification and deviation/non-conformance, etc.*
Immediate Action Taken – *i.e. halt production, re-train staff, change supplier, etc.*
Evaluation and Root Cause Analysis – *i.e. Description of evaluation, analysis, additional testing, etc.*

Proposed Corrective Action – *i.e. corrective action performed, improvement plan, etc.*
Monitoring Plan – *i.e. method, frequency, testing, etc. to ensure effectiveness of corrective action, etc.*
Responsible Person Comments and Recommendation / Signature – *IQM Review*
OVPE Comments and Recommendation / Signature – *OVPE Review*
SCDOT CMMP Comments and Approval / Signature – *CMMP Review*

DEFICIENCY NOTICE (DN)

PROJECT INFORMATION

Project ID:	DN No.:
Work Element:	Date:
Location:	Spec/Plan Sheet Ref:

MATERIAL INFORMATION

Sample Of:	Date Sampled:
Supplier:	Sample ID:

SPECIFICATION AND DESCRIPTION OF NON-CONFORMANCE

PROPOSED CORRECTIVE ACTION

EVALUATION, ADDITIONAL TESTING FOR ACCEPTANCE

Requested Disposition: ☐ Accepted ☐ Convert to NCR #

Independent Quality Firm Comments and Recommendation

Independent Quality Manager (IQM): Date:

Additional Comments:

Attachment B – Example Engineering Judgement Log

EJ Number	Date	Location of Non-Conformance	Item of Work / Material	Test/Sample Type	Specification and Description of Non-Conformance	Engineering Judgement Resolution	Name / Signature

NON-CONFORMANCE REPORT (NCR)

PROJECT INFORMATION

Project ID:	NCR No.:
Work Element:	Date:
Location:	Spec/Plan Sheet Ref:

MATERIAL INFORMATION

Sample Of:	Date Sampled:
Supplier:	Sample ID:

SPECIFICATION AND DESCRIPTION OF NON-CONFORMANCE

EVALUATION, ADDITIONAL TESTING AND/OR PROPOSED CORRECTIVE ACTION

Engineer of Record Comments and Recommendation

Requested Disposition: ☐ Remove/Replace ☐ Use As Is ☐ Rework/Repair

Engineer of Record (EOR): Date:

Independent Quality Firm Comments and Recommendation

Independent Quality Manager (IQM): Date:

Owner Verification Firm Comments and Recommendation

OV Project Engineer (OVPE): Date:

SCDOT Comments and Acknowledge

SCDOT Construction Manager: Date:

Corrective Action Report (CAR)

Project Number: **Project Name:** **CAR Initiator:**	**CAR No:** **Date:**

NONCONFORMITY IDENTIFICATION
Material or Work Item and Location: **Description of Recurring Non-Conformance:** **Specification/Plans Reference**:
IMMEDIATE ACTION TAKEN (***Describe the immediate action taken to prevent this nonconformity)***
EVALUATION OR ROOT CAUSE ANALYSIS (***Determine the key problem(s) that, when corrected, will prevent a recurrence***)_____
Proposed Corrective Action *(Improvements to the quality system to be implemented to prevent similar occurrences.)*
PLANNED MONITORING ACTIVITIES (***Plan to monitor the effectiveness of the Corrective Action)***
Proposed Corrective Action Recommended By: Contractor /QC Manager / IQM Date:
Reviewed By OV Project Engineer Date:
Accepted By SCDOT Construction Manager Date: