

Section 7:

Quality Control Plans and SCDOT Specifications for Coarse Aggregate Sources

Quality Control Topics

- Aggregate QC/QA Policy
- QC Plans for Sources
- Gradation Specifications
- Physical Property Specifications

QC/QA Policy - General

- In order to be listed on the SCDOT Approved Listing for aggregate suppliers, each source must participate in the QC/QA program
- An aggregate source is required to be listed on the Approved Listing to supply material for use in SCDOT projects
 - Construction
 - Maintenance

Source Approval

- In order to be considered for the Approved Listing for Coarse Aggregate, a source must have:
 - A processing operation in place
 - Stockpiled Material processed to meet SCDOT specs
 - Samples will be taken from last point of source handling
 - Quarry
 - Terminal
 - An approved QC plan
 - Certified data from previous testing
 - Certified testing laboratory
 - Certified QC Technician(s)

Quality Control Plans

- What are they?
- Why are they needed?
- How are they completed?
- When are they submitted?
- Where are they kept?

QC Plans

What are they?

- A QC plan is a written set of guidelines for the aggregate supplier and SCDOT to use in performing QC/QA testing and analysis on material produced at that source

QC Plans

Why are they needed?

- QC plans identify location of the source (map) so that anyone can find the source for sampling, inspections, etc.
- QC plans identify quality control personnel so that the correct person can be contacted to discuss materials produced at the source
 - Job titles and functions
 - Certification status
- QC plans identify materials being produced
 - Parent rock type
 - Gradation classification

QC Plans

Why are they needed?

- QC plans identify tests performed and frequency of testing so that inspections can be conducted to make sure the equipment required is on site and calibrated
 - AASHTO, ASTM, SC-T-xx
 - Lab(s) being used
 - on-site
 - off-site
 - consultant
 - Frequency of sampling and testing

QC Plans

Why are they needed?

- QC plans identify procedure for monitoring QC test data
 - Who will review data?
 - What to do with results out of tolerance?
 - Who will submit the QC data to the SCDOT?

QC Plans

How are they completed?

- There is no standard format for QC plans
- Sources can use plans modified from other states
- Attach copy of QC test results for materials produced prior to submittal
 - Each material produced
 - 30-60 days of tests
- Send 2 copies to the SCDOT Geotechnical Materials Engineer for approval

QC Plans

When are they submitted?

- After laboratory is certified
- After personnel are certified

QC Plans

Where are they kept?

- One approved copy should be kept on site at all times
- One approved copy will be filed with the SCDOT Geotechnical Materials Engineer

QC Plans

Adjustments

- New QC plans are required for any changes to existing plan
- Send 2 copies of revised plan to SCDOT Geotechnical Materials Engineer
 - Brief explanation of revisions

QC Plans

Final Remarks

- An approved QC Plan has no set expiration date.
- An approved QC plan remains valid as long as everything written remains exactly the same

Testing Laboratory Certification

- Each laboratory used for QC testing must be certified by SCDOT
 - AASHTO accreditation acceptable as equivalent to SCDOT approval
 - All technicians must be Level I or II certified depending on the tests they are to perform

Testing Laboratory Certification

- Equipment must be calibrated and verified
 - Equipment must be calibrated using standards traceable to NIST
 - SCDOT does not provide list of equipment or requirements on lab dimensions. These items are listed in each test procedure
- Consultant laboratories must be certified in the same manner

Testing Laboratory Inspection

- Each lab will be inspected for all tests indicated in QC Plan on at least a yearly basis. Split samples will be obtained during the inspection for comparison purposes.

Testing Laboratory Inspection

- Certification is for an indefinite period of time – inspections conducted annually to assure policy compliance
- Inspection fees
 - No fees for routine visits to SC, NC and GA
 - Recovery costs for visits to other states and follow-up visits to SC, NC and GA

Revocation of Laboratory Certification

- If a Lab no longer meets requirements, its certification will be revoked.
- Notification will be given in writing - 15 days will be allowed to correct problem
 - May use another lab during that time
 - If problem is fixed after 15 days, certification remains
 - If problem is not fixed after 15 days, certification revoked for minimum of 45 calendar days
 - If problem is fixed after 45 days, certification reinstated
 - If problem is not fixed after 45 days, certification revoked for 12 months

Technician Certification

- Certification is required for anyone sampling or testing
- Certifications are valid for 5 years
 - SCDOT Level I - Sampling and grading
 - SCDOT Level II - Physical property testing (must be Level I certified)

Technician Certification

- To become certified as a Level I technician, one must...
 - Study course materials obtained from Tri County Technical College.
 - Demonstrate sampling / testing proficiency to a certified Level II technician from a different company
 - Pass written exam.
- AASHTO accreditation acceptable
 - No other state certifications accepted

QC Test Report Submittals

- Monthly results must be furnished electronically to the SCDOT Geotechnical Materials Engineer
 - Results are due by the 10th of each month
- Results listed by material type, i.e. 57, 789, 89m
- Target values established by the supplier should also be included
 - These may not directly relate to the material specs, etc.

QC Test Report Submittals

- Both in- and out-of-tolerance results reported
 - Material variability database is being collected by SCDOT
 - Only the site visit (split-sample) results will be compared directly to each other
 - Failure to report out-of-tolerance results may cause narrowing specification bands that can't be met due to normal plant variability

SCDOT Monitoring

- SCDOT monitoring of supplier QC programs will consist of the following:
 - Visit each supplier location at least once annually
 - Split-Samples will be obtained for comparison purposes
 - Obtained from material already produced to meet SCDOT specs
 - Obtained from most recently produced stockpile

SCDOT Monitoring

- Visit each supplier location at least once annually, cont'd.
 - Review supplier QC data
 - Review equipment and certification records
 - Discuss new developments or concerns
- Compare split-sample results
 - SCDOT results versus supplier results
 - Non-comparison may prompt additional testing to determine the cause of the differences

Removal from Approval Listing

- Limits the amount of non-conforming material that is shipped to SCDOT projects
- Acceptance testing is still performed at point of use
- End product does not meet specifications (even if all other sections of the QC/QA policy are in conformance)

Removal from Approval Listing

- SCDOT Geotechnical Materials Engineer notifies supplier
 - By phone with follow-up letter
- Supplier given 15 days to correct problem
 - Supplier remains on approval listing during the 15 day period
 - Additional time can be requested
 - Approval suspended for 45 days if not remedied after the 15-day period

Removal from Approval Listing

- Approval suspension
 - SCDOT Geotechnical Materials Engineer will notify supplier officer and key SCDOT personnel
 - SCDOT Geotechnical Materials Engineer will review progress after 45 days
 - If problem satisfactorily corrected, approval status reinstated
 - If problem not satisfactorily corrected, approval status revoked
 - Can apply for re-approval after a 12-month period

SCDOT Aggregate Testing and Specifications

- Minimum Testing Frequency
- Gradation Specifications
- Physical Property Specifications

Minimum Testing Frequency

- See Table 1. Required Minimum Aggregate Testing Frequency in SCDOT Approval Policy in Appendix 1
- Listed tests:
 - Aggregate Dry Gradation
 - Los Angeles Abrasion Type B
 - Sand Equivalency
 - Specific Gravity and % Absorption

Minimum Testing Frequency

- Value range:
 - This range will be determined for each source by the SCDOT Geotechnical Materials Engineer based on the average of the supplier's tests from the most recent month

Aggregate Dry Gradation

Test Procedure: AASHTO T27/ASTM C136

Materials	Value Range	Minimum Testing Frequency
All	All	1 each per 1000 tons shipped with a minimum of 1 per day

Note: Applies to each individual material produced with the intent to meet SCDOT specifications.

Los Angeles Abrasion Type B

Test Procedure: AASHTO T96/ASTM C131

Materials	Value Range	Minimum Testing Frequency
Stone (non-slag)	55.0 & above	1 daily
	50.0 – 54.9	1 weekly
	40.0 – 49.5	1 monthly
	Less than 40.0	1 every 6 months
Slag	35.0 & above	1 weekly
	Less than 35.0	1 every 6 months

Sand Equivalency

Test Procedure: AASHTO T176/ASTM D 2419

Materials	Value Range	Minimum Testing Frequency
Stone (non-limestone)	45.0 & less	1 weekly
	Over 45.0	1 monthly
Limestone	33.0 & less	1 weekly
	Over 33.0	1 monthly

Note: Unwashed screenings only

Specific Gravity and % Absorption

Test Procedure: AASHTO T85/ASTM C127

Materials	Value Range (Apparent)	Minimum Testing Frequency
Stone (non-slag)	2.85 & above	1 weekly
	Less than 2.85	1 every 3 months
Slag	2.00 & less	1 weekly
	2.01 – 2.84	1 every 3 months
	2.85 & above	1 weekly

SCDOT Gradation Specifications

Sieve	Stone								Graded Aggregate Base		
	CR-14	5	57	67	6M	8M	789	89M	Macadam	MLBC	RPCC
2"	100								100	100	100
1 1/2"	95-100	100	100						95-100	95-100	95-100
1"	70-100	90-100	95-100	100	100				70-100	70-100	70-100
3/4"		20-55		90-100	90-100	100	100				
1/2"	35-65	0-10	25-60			95-100	95-100	100	48-75	50-85	48-75
3/8"		0-5		20-55	0-20	75-100	80-100	98-100			
No. 4	10-40		0-10	0-10	0-5	10-35	20-50	20-70	30-60	30-60	30-60
No. 8			0-5	0-5				2-20			
No. 16						0-5	0-6				
No. 30									11-30	17-38	11-30
No. 100						0-2	0-2	0-3			
No. 200									0-12	0-20	0-12
LL									25 Max	25 Max	25 Max
PI									6 Max	6 Max	6 Max

Physical Property Specifications

- Los Angeles Abrasion Type B
- Sand Equivalency
- Specific Gravity and % Absorption
- Sodium Sulfate Soundness
- Flat & Elongated Particles

Los Angeles Abrasion (B Grade)

Material Use	Specification
Slag for Concrete	40 Max
Slag for Asphalt Concrete	45 Max
Asphalt Concrete Surface and Intermediate Types A and B	55 Max
Asphalt Concrete Surface and Intermediate Type C, Surface Types D and E, and all Base Mixes	60 Max
Asphalt Surface Treatment - Single, Double and Triple	60 Max
Concrete	60 Max
Marine Limestone Base	65 Max
Soil-Aggregate Subbase	65 Max

Sand Equivalency (Unwashed Screenings Only)

Material Use	Specification
Regular Screenings in Asphalt	40 Min
Limestone Screenings in Asphalt	28 Min
Limestone Crusher Run Fines	28 Min

Specific Gravity (Bulk, Bulk SSD, Apparent) and % Absorption

Material Use	Specification
Used in Asphalt Single, Double, and Triple Surface Treatments (w/o adjustments*)	2.65* (Apparent)
Combined Aggregate in Asphalt Concrete	2.90 Max (ESG)

*Note: if ASG differs from 2.65, adjustments must be made in the required placement rate (pounds per square yard), so please notify customers of any SG changes.

Sodium Sulfate Soundness

Material Use	Specification
Used in HMA Surface Types A, B, and C	15% Max
Used in Structural Concrete	15% Max
Used in Structural Concrete (Marine Limestone)	25% Max

Flat & Elongated Particles (5:1 Ratio)

Material Use	Specification
Used in HMA	10% Max (based on 5:1 ratio)