# TABLE 1
# Independent Assurance (IA) Parameters
### Maximum Allowable Differences

## Gradation (Sieve Sizes with Assigned Tolerances)

| | |
|---|---|
| Larger than No. 8 | 5% |
| No. 8 | 4% |
| No.10 | 4% |
| Larger than (No. 200) and smaller than (No. 10) | 2% |
| No. 200 with targets 10.0% or less | 1.0% |
| No. 200 with targets greater than 10.0% | 1.5% |
| **Asphalt Content** | 0.40% |
| **Fracture** | 5% |
| **Wood Particles** | 0.05% |
| **Elongated Pieces** | 5:1 Ratio (2.0%) & 3:1 Ratio (4.0%) |
| **Sand Equivalent** | 8 points |
| **Moisture Content (Plant Mix Aggregate Base)** | 1% |
| **Soil Curves - Maximum Density - $D_f$** | |
| *Density* | 3.0 lbs/ft³ |
| *Moisture* | 3.0% |
| **Aggregate Base - Maximum Density - $D_f$** | |
| Density | 3.0 lbs/ft³ |
| Moisture | 2.0% |
| **Maximum Specific Gravity (Rice T-209)** | |
| Standard ($G_{mm}$) | 0.020 |
| Dryback ($_{SSD}$) “As required” | 0.020 |
| **Bulk Specific Gravity (Lab fabricated specimens T-l66)** | 0.032 |
| **Maximum Specific Gravity (T-85)** | 0.032 |
| **Air Content of Concrete (T-152)** | 0.5% |
| **Slump of Concrete (T-119)** | **¾”** |
| **Temperature of Concrete (T-309)** | 3° F |
| **Unit Weight of Concrete (T-121)** | 3.0 lbs/ft³ |

## *AGGREGATE PRODUCTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Required** | **Required** |

### *Quality Control*

The ODOT Central Materials Laboratory will retain Quality Control of source/product compliance as stated in Section 4(A). The Contractor's QC technician shall sample the aggregates, place the sample in a proper container and label as specified in Section 4(C), complete *ODOT Sample Data Sheet* (Form 734-4000), and deliver to the PM.

The Contractor's QC technician shall establish a random sampling and testing program and submit it to the PM prior to the start of production.

The Contractor's QC technician shall perform Quality Control sampling and testing required to ensure a quality product at the frequencies indicated in Section 4(D) of MFTP. The Contractor shall deliver the test results to the PM by the middle of the following work shift.

Pre-produced aggregates shall be tested at the frequency applicable for the material and use as determined by the appropriate specifications(s) and Section 4(D) of the MFTP. (i.e. a 20,000 ton stockpile of aggregate base will require 10 QC tests and 1 QA test).

The Contractor is responsible for furnishing Quality Levels during aggregate production when specified. The Contractor's QC technician shall reject material that does not meet the specified quality and notify the PM of the disposition and quantities of those materials. All required tests, except for gradation, are considered pass/fail. *Gradation is subject to statistical analysis as described in specifications Section 00165.*

*Backup samples for aggregates shall be a minimum of ½ the minimum mass shown in Table 1 of AASHTO T 2 for the appropriate Nominal Maximum size aggregate.*

### *Verification*

The QAC performs Verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)). A split of the sample taken by QC will be given to the QAC for testing.

If Verification testing fails to meet the specifications, other than gradation, the QAC will immediately notify the PM. The PM will evaluate the results and resolve the discrepancy.

If Verification test results indicate that a material is out of specification for gradation, the QAC will notify the PM, who will determine if the stockpile QL meets the specifications. The PM will determine if the stockpile is acceptable.

### *Independent Assurance*

All parties that test materials shall employ ODOT-certified technicians and use ODOT-certified laboratories.

The Contractor's QC technician shall test the Contractor's split of IA samples and provide the results to the PM the next workday. The PM will verify that the Contractor's test results and the QAC's test results are within IA parameters.

If the Contractor's test results and the QAC's test results for IA samples are not within IA parameters, the PM will evaluate the results and resolve the discrepancy. See Investigation Criteria.

# EARTHWORK
**Section 00330**

## *ESTABLISHING MAXIMUM DENSITIES*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Not Required** | **Required** |

### *Quality Control*

The Contractor's QC technician is responsible for establishing maximum densities and optimum moisture content for each unique soil type and soil/aggregate mixture incorporated into the project. *Backup samples shall be a minimum mass of (45 lbs) and retained until notified by the PM to discard.*

### *Verification*

None Required

### *Independent Assurance*

All parties involved in the testing process shall employ ODOT-certified technicians and use ODOT-certified laboratories.

The QAC will test the Contractor's split of the soil sample and provide the results to the PM within a 48 hr. period, based on the time the sample was split. The PM will verify that the Contractor's test results and the QAC's test results are within IA parameters.

If the Contractor's test results and the QAC's test results are not within IA parameters, the PM will perform an investigation (see Investigation Criteria) evaluate the results and resolve the discrepancy.

## *COMPACTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Required** | **Required** |

### *Quality Control*

The Contractor's QC technician shall establish a random sampling and testing program.

The Contractor's QC technician shall be on the project during performance of earthwork operations, as needed, to ensure that materials/products are in conformance with the specifications. The QC technician's duties include, but are not limited to, visual observation, sampling and testing. The Contractor shall rework all areas showing visual deflection. Sampling and testing procedures shall be performed at the frequencies indicated in Section 4(D) of the MFTP. The Contractor shall deliver the test results to the PM by the end of the work shift for T-99 Method A applications and within a 24 hr. period for T-99 Method D applications, based on the time the test information was collected in the field.

The Contractor's QC technician shall use the "one-point" method to establish the correct soil curve for each density test performed. If the soil does not match an established family of curves or a single curve, the Contractor shall establish a new curve for the soil, within a 48 hr. period, based on the time the sample was acquired. If use of the new maximum density curve results in a failing test, the Contractor shall take corrective action and retest until compaction is determined to meet the specifications, **prior to construction of a new lift.** *Backup samples shall be all uncontaminated portions of materials removed from beneath the gauge to perform the "one point".*

If the equipment or material changes, the QC technician shall verify by testing that the specified densities are attained.

### *Verification*

The QAC performs Verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)).

If the soil tested, according to the "one-point" method, does not match the established curves, the Contractor shall establish a new curve from the soil at the test location and provide the test results within a 48 hr. period, based on the time the sample was acquired. Do not add new lifts until compaction is proven to meet the specified densities. The QAC shall notify the contractor and PM of the test results by the end of the work shift for T-99 Method A applications and within a 24 hr. period for T-99 Method D applications, based on the time the test information was collected in the field.

If the density test fails, the Contractor shall identify the limits of failing compaction, take corrective action, and notify the PM. The PM will schedule a new Verification test. Do not add new lifts until the Verification tests demonstrate that specified densities exist.

### *Independent Assurance*

All parties involved in the testing process shall employ ODOT-certified technicians, use ODOT-certified labs, and use nuclear density gauge(s) meeting the requirements of ODOT TM 304.

# CONCRETE

**Sections 00440, 00512, 00540, 00559, 00660, 00754, 00755, 00756, 00758 and 00921**

## *AGGREGATE PRODUCTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required**<br><br>See Aggregate Production details, page 29.<br><br>Not required for commercial grade concrete | **Required**<br><br>See Aggregate Production details, page 29.<br><br>Not required for commercial grade concrete | **Required**<br><br>See Aggregate Production details, page 29.<br><br>Not required for commercial grade concrete |

## *MIXTURE*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Required**<br><br>Not required for commercial grade concrete | **Required** |

### *Quality Control*

The Contractor's QC technician shall perform Quality Control sampling and testing required to ensure a quality product at the frequencies indicated in Section 4(D) of the MFTP. The Contractor shall deliver the test results, of the plastic properties of the concrete, to the PM by the end of the work shift. Concrete Strength test results shall be delivered to the PM within 24 hrs. after the specified break date.

The Contractor's Quality Control (QC) plan shall identify the method used for standard curing, the type of capping system used in the strength testing of concrete cylinders and the size of cylinders to be cast.

### *Verification*

The QAC performs Verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)). Cylinders cast shall be of the same size identified in the QC plan. Strength testing shall use the same capping methods identified in the QC plan. Cylinders cast for strength verification will be delivered to the ODOTCL for further testing.

If Verification testing fails to meet the specifications, the QAC will immediately notify the PM. The PM will evaluate the results and resolve the discrepancy.

***Independent Assurance***

All parties involved in the testing process shall employ ODOT-certified technicians and use ODOT-certified laboratories.

The PM will perform random inspections to ensure that the contractor's Quality Control plan is followed.

The Contractor's QC technician shall test the same load and portion of load from which the Verification samples are taken. This testing will be for plastic properties and strength testing. QC technician shall immediately report the results of the plastic properties testing to the QAC. The QAC will verify that the contractor's plastic properties test results and the QAC's plastic properties test results are within IA parameters.

If the Contractor's plastic properties test results and the QAC's plastic properties test results for the Verification sample are not within IA parameters, the QAC will evaluate the results, resolve the discrepancy and notify the PM of the resolution. The QAC test results, of the plastic properties of the concrete, or the investigation of IA issues will be given to the PM by the end of the work shift, if an agency representative is available.

The Contractor's QC technician shall make and cure three (3) cylinders of the same size identified in the QC plan. Strength testing of the three concrete cylinders shall be in accordance with AASHTO T-22, using the same capping method identified in the QC plan. The PM shall compare the Contractor's results for these cylinders to the Verification cylinders and to the ongoing Quality Control. The PM shall resolve discrepancies.

***On a single truck placement when Verification/IA is performed by the Region Quality Assurance Lab the contractor's test results may be used for Normal Quality Control testing.***

# AGGREGATE BASE, SUBBASE, AND SHOULDERS
**Section 00641**

## *AGGREGATE PRODUCTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required**<br><br>See Aggregate Production details, page 29. | **Required**<br><br>See Aggregate Production details, page 29. | **Required**<br><br>See Aggregate Production details, page 29. |

## *ESTABLISHING MAXIMUM DENSITIES*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Not Required** | **Required** |

### *Quality Control*

The Contractor's QC technician is responsible for establishing maximum densities and optimum moisture content for each unique aggregate mixture type incorporated into the project. *Backup samples shall be a minimum mass of (45 lbs).*

### *Verification*

None Required

### *Independent Assurance*

All parties involved in the testing process shall employ ODOT-certified technicians and use ODOT-certified laboratories.

The QAC will test the Contractor's split of the aggregate sample and provide the results to the PM the next day. The PM will verify that the Contractor's test results and the QAC's test results are within IA parameters.

If the Contractor's test results and the QAC's test results are not within IA parameters, the PM will perform an investigation (see Investigation Criteria), evaluate the results and resolve the discrepancy.

## *AGGREGATE MIXTURE*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Required** | **Required** |

### *Quality Control*

The Contractor's QC technician shall establish a random sampling and testing program and submit it to the PM prior to the start of production.

The Contractor's QC technician shall perform Quality Control sampling and testing required to ensure a quality product at the frequencies indicated in Section 4(D) of the MFTP. The Contractor shall deliver the test results to the PM by middle of the following work shift. *Backup samples shall be a minimum mass shown in Table 1 of T 255 / T 265 and kept in an airtight container.*

### *Verification*

The QAC performs Verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)).

If the moisture content exceeds the limits according to specification, the Contractor shall, take corrective action, and notify the PM. The PM will schedule a new Verification test.

### *Independent Assurance*

All parties that test materials shall employ ODOT-certified technicians and use ODOT-certified laboratories.

If the Contractors test results and the QAC's test results for IA samples are not within IA parameters, the PM will perform an investigation (see investigation Criteria), evaluate the results and resolve the discrepancy.

## *COMPACTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Required** | **Required** |

### *Quality Control*

The Contractor's QC technician shall establish a random sampling and testing program and submit it to the PM prior to the start of production.

The Contractor shall perform Quality Control sampling and testing required to ensure a quality product at the frequencies indicated in Section 4(D) of the MFTP. The Contractor shall deliver the test results to the PM on the same day the testing is performed.

The Contractor's QC technician shall also perform the following:

- Use the test procedures applicable for determination of the maximum density for this material indicated in Section 4(D) of the MFTP.
- Establish a rolling pattern to provide the specified compaction
- Stop placement if the specified densities are not met

### *Verification*

The QAC performs Verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)).

If the density test fails, the Contractor shall identify the limits of failing compaction, take corrective action, and notify the PM. The PM will schedule a new Verification test. Do not add new lifts until the Verification test demonstrates that the specified densities exist.

### *Independent Assurance*

All parties involved in the testing process shall employ ODOT-certified technicians, use ODOT-certified laboratories, and use nuclear density gauge(s) meeting the requirements of ODOT TM 304.

# EMULSIFIED ASPHALT PRODUCTS/MATERIALS

**Sections 00710, 00711, 00712, 00715 and 00730**

## *AGGREGATE PRODUCTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required**<br><br>See Aggregate Production details, page 29. | **Required**<br><br>See Aggregate Production details, page 29. | **Required**<br><br>See Aggregate Production details, page 29. |

## *EMULSIFIED ASPHALT CEMENT*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Not Required** | **Not Required** |

### *Quality Control*

Sample all required materials as specified in Sections 4(C) and 4(D). Complete *ODOT Sample Data Sheet* (Form 734-4000), place in the proper containers and label as specified in Section 4(C), and deliver to the PM by the middle of the following work shift.

# EMULSIFIED ASPHALT CONCRETE PAVEMENT (EAC)
**Section 00735**

## *AGGREGATE PRODUCTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required**<br><br>See Aggregate Production details, page 29. | **Required**<br><br>See Aggregate Production details, page 29. | **Required**<br><br>See Aggregate Production details, page 29. |

## *MIXTURE PRODUCTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Required** | **Required** |

### *Quality Control*

The Contractor's QC technician shall establish a random sampling and testing program and submit it to the PM prior to the start of production.

The Contractor's QC technician shall perform Quality Control sampling and testing required to ensure a quality product at the frequencies indicated in Section 4(D) of the MFTP. The Contractor shall deliver the test results to the PM by the middle of the following work shift. *Backup samples for aggregates shall be a minimum of ½ the minimum mass shown in Table 1 of AASHTO T 2 for the appropriate Nominal Maximum size aggregate.*

The Contractor's QC technician is responsible for monitoring plant operation to ensure that specification materials are delivered to the project. Monitoring activities may include, but are not limited to, the following:

- Calibrate the asphalt plant
- Maintain an inventory of materials, including generated waste
- Control segregation in silo(s) and truck loading operations
- Reject any mixture that is visually defective. Inform the PM of the quantity and disposition of the rejected material
- Sample all required materials as specified in Sections 4(C) and 4(D), (e.g. liquid asphalt, emulsion, cement, tack, etc.), place in the proper container and label as specified in Section 4(C), complete *ODOT Sample Data Sheet* (Form 734-4000), and deliver to the PM by the middle of the following work shift.

### Verification

The QAC performs Verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)). A split of the sample taken by QC will be given to the QAC for testing.

If Verification testing fails to meet specifications, the QAC will immediately notify the PM. The PM will evaluate the results and resolve the discrepancy.

### *Independent Assurance*

All parties that test materials shall employ ODOT-certified technicians and use ODOT-certified laboratories.

The PM will perform random inspections to ensure that the Contractor's Quality Control plan is followed.

The Contractor's QC technician shall test the Contractor's split of IA samples and provide the results to the PM the next day. The PM will verify that the Contractor's test results and the QAC's test results are within IA parameters.

If the Contractor's test results and the QAC's test results for IA samples are not within IA parameters, the PM will perform an investigation (see Investigation Criteria), evaluate the results and resolve the discrepancy.

## *COMPACTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Not Required**<br>See specifications – 00735.46 | **Not Required** | **Not Required** |

# POROUS ASPHALT CONCRETE & ASPHALT CONCRETE PAVEMENT (STATISTICAL ACCEPTANCE)

**Sections 00743 and 00745**

## *AGGREGATE PRODUCTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required**<br><br>See Aggregate Production details, page 29. | **Required**<br><br>See Aggregate Production details, page 29. | **Required**<br><br>See Aggregate Production details, page 29. |

## *MIXTURE PRODUCTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Required** | **Required** |

### *Quality Control*

The Contractor's QC technician shall establish a random sampling and testing program and submit it to the PM prior to the start of production.

The Contractor's QC technician shall perform Quality Control sampling and testing required to ensure a quality product at the frequencies indicated in Section 4(D) of the MFTP. The Contractor shall deliver the test results to the PM by the middle of the following work shift. *Backup samples shall be a minimum mass of (45 lbs) or for Porous Asphalt Concrete (PAC), accepted under the Cold Feed Method, a backup sample of ½ the minimum mass shown in Table 1 of AASHTO T 2 for the appropriate Nominal Maximum size aggregate can be used.*

The Contractor's QC technician is responsible for monitoring plant operation to ensure that specification materials are delivered to the project. Monitoring activities may include, but are not limited, to the following:

- Calibrate the asphalt plant
- Maintain an inventory of materials, including generated waste
- Control segregation in silo(s) and truck loading operations
- Monitor mix temperature
- Reject any mixture that is visually defective (e.g. graybacks, overheated, contamination, slumping loads etc.) Inform the PM of the disposition and quantity of rejected material
- Sample all required materials as specified in Sections 4(C) and 4(D) (e.g. liquid asphalt, emulsion, cement, tack, etc.), place in the proper container and label as specified in Section 4(C), complete *ODOT Sample Data Sheet* (Form 734-4000), and deliver to the PM by the middle of the following work shift.

### *Verification*

The QAC performs Verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)). A split of the sample taken by QC will be given to the QAC for testing.

If Verification testing fails to meet the specifications, the QAC will immediately inform the PM. The PM will evaluate the results and resolve the discrepancy.

### *Independent Assurance*

All parties that test materials shall employ ODOT-certified technicians and use ODOT-certified laboratories.

The PM will perform random inspections to ensure that the Contractor's Quality Control plan is followed.

The Contractor's QC technician shall test the Contractor's split of IA samples and provide the results to the PM the next day. The PM will verify that the Contractor’s test results and the QAC's test results are within IA parameters.

If the Contractors test results and the QAC's test results for IA samples are not within IA parameters, the PM will perform an investigation (see Investigation Criteria), evaluate the results and resolve the discrepancy.

## *COMPACTION*

| *Quality Control* | *Verification* | *Independent Assurance* |
|---|---|---|
| **Required** | **Required** | **Required** |

### *Quality Control*

***Dense Graded:*** The Contractor's QC technician shall establish a random sampling and testing program and submit it to the PM prior to the start of production.

The Contractor's QC technician shall perform Quality Control sampling and testing required to ensure a quality product at the frequencies indicated in Section 4(D) of the MFTP. The Contractor shall deliver the test results to the PM on the same day the test is completed.

The Contractor's QC technician shall also perform the following:
*(activities listed below are not exhaustive and are considered minimums).*

- Establish a rolling pattern according to (TM-306) to provide the specified compaction
- Notify PM and CAT-II if rolling pattern is not being maintained
- Notify the PM and CAT-II if the specified densities are not achieved
- Monitor the mix temperature during laydown and compaction to keep the mix within the specifications
- Coordinate with the plant technician when changing lots
- Notify the Region QAC and PM when performing Core Correlations
- Notify the CAT-II of Control Strip Results
- Notify PM, CAT-I and CAT-II if any density results exceed 95%

***Porous Asphalt Concrete:*** Compaction to a specified density is not required. See 00743.49 in the specifications.

### *Verification*

***Dense Graded:*** The QAC performs Verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)).

The QAC selects random numbers for the test locations within the contractor's sublot size If Verification testing fails to meet the specifications, the QAC will immediately notify the PM.

The PM will initiate an investigation. If the investigation determines there is nonspecification material the PM will evaluate the test results using the Compaction Guidelines (Pg. 44) and perform resolution process as needed.

***Porous Asphalt Concrete:*** None Required

### *Independent Assurance*

***Dense Graded:*** All parties involved in the testing process shall employ ODOT-certified technicians, use ODOT-certified labs and use nuclear density gauge(s) meeting the requirements of ODOT TM 304.

The Region QAC may elect to perform a gauge check as outlined in Appendix C and ODOT TM 304.

***Porous Asphalt Concrete:*** None Required

## Failing ACP Compaction Guidelines

1. QC Density Results Fail

    a. Are the test results suitable for the intended use per Section 00150.25?

    b. If yes, PM will apply test results to statistical acceptance procedures or Small Quantity guidelines according to Contract Requirements. Contractor should take corrective action.

    c. If no, PM consults Pavement Services and Quality Assurance for recommendations on:

    - Methods of investigating, evaluating, and isolating nonspecification material
    - Application of appropriate corrective action and/or price adjustment for nonspecification material

2. QC Density Results Passing and QA Density Results Failing

    a. PM determines the quantity of material represented by this verification. The PM should consider all material back to the last passing verification.

    b. PM consults Pavement Services and Quality Assurance for recommendations on:

    - Methods of investigating, evaluating, and isolating nonspecification material
    - Application of appropriate corrective action and/or price adjustment for nonspecification material

Note: when cores are used, laboratory testing will be conducted by the ODOT Central Materials Lab, under Third Party Dispute Resolution, according to the Quality Assurance Program. Third Party can be initiated by the PM or Contractor.

The PM can apply a price adjustment based on values entered into STATSPEC, or can use Form 734-3946 for a small number of sublots. The PM also has the ability per section 165.50(c) to isolate material that is shown to be nonspecification. Core density results or isolated nonspecification material, will be evaluated as a separate lot per section 165.40 or 165.50(c).

# APPENDIX A
# ODOT APPROVED COMMERCIAL AGGREGATE PRODUCT PROGRAM

***ODOT Policy***

For Aggregate Production Testing of Commercially available Aggregate Products

**Commercial Aggregate Products—**Aggregates not specifically manufactured and stockpiled for use on ODOT or Local Agency projects from a single source.

When requested by a supplier and the Region QAC agrees that it is to the benefit of the Department, a product may be put on the ODOT Approved Commercial Aggregate Product Program (OACAPP) using the following guidelines, or as modified and approved.

When a commercial aggregate supplier is proposing to produce an Aggregate Base Product(s) as an ODOT Approved Commercial Product, a plan may be submitted for performing AASHTO T 99. This plan shall replace the requirements in the FTMAG for that source.

A commercial aggregate supplier shall have an ODOT-certified QC technician sample, on a random basis, each stockpile being manufactured by the supplier and test the sample in an ODOT- certified laboratory. The commercial aggregate supplier shall submit to the Region QAC, in the Region the source is located, a Quality Control Plan. The Region QAC is responsible for reviewing and approving that Quality Control Plan. The products covered by the approved Quality Control Plan are classified as ODOT Approved Commercial Products.

The supplier's QC technician shall perform all sampling and testing for each product at the minimum frequencies shown in the Field Tested Materials Acceptance Guide (Section 4(D)). When materials are produced at very high production rates, the Region QAC may allow the minimum frequency to be altered after the supplier submits a written proposal to do so. The written proposal shall detail the proposed sampling and testing frequencies and shall describe how uniformity of production will be assured.

The supplier shall retain backup samples, for the previous 10 sublots, until the test results are verified by the Region QA group or as required by the Region QAC.

The supplier shall obtain under the supervision of the Region QAC, at the minimum required frequency as shown in section 4A of the MFTP, samples for product compliance and then the Region QAC shall submit them for testing at the Central Materials Laboratory.

The supplier shall send requests to waive tests, as allowed by the specifications, to the Region QAC, who will notify the appropriate people of any waivers granted. Waivers will apply to all projects which are supplied from that source.

When a waiver requires periodic testing by the supplier, the test results shall be sent to the Region QAC. All specified tests shall be performed for Verification and Independent Assurance Testing.

The supplier shall submit all requests for changes in production sizes to the Region QAC, who will obtain the approval of the discipline specific engineer. If approved, changes in produced sizes will apply to all projects which are supplied from that source.

The commercial supplier shall maintain files of all QC tests for each stockpile. It shall enter the test results into the ODOT Stat. Spec. program to calculate the Quality Level for each stockpile. The QL for gradation shall meet the requirements of Section 00165 of the Oregon Standard Specifications for Construction. Other required test results shall be shown in columns to the right in the program. The Region QAC may, with approval of the QAE, accept alternate means of statistical analysis for the supplier's product. The supplier shall deliver weekly or at an interval determined by the Region QAC, copies of the ongoing sublot test results, along with the ongoing QL (Quality Levels).

The supplier shall keep the Region QAC informed about production schedules so that Verification testing can be scheduled. The Region QA group will obtain Verification samples on a random basis and the split of this Verification sample shall be ran by the supplier's QC technician to test for Independent Assurance. The test results shall be available within 24 hours of the time of sampling. If the test results indicate that the produced material meets quality requirements and the results are within IA parameters, the QAC may allow all backup QC samples prior to the Verification sample to be discarded.

The Region QAC will randomly audit the QC files to verify that the Quality Levels reflect actual test results. The Region QAC will retain QL information for each stockpile along with Verification and IA test results. When requested by the Project Manager, the Region QAC will send a memo to the PM verifying and identifying what materials where produced under the ODOT APPROVED COMMERCIAL AGGREGATE PRODUCT PROGRAM and meet the required specifications.

If Verification test results, for tests other than gradation, do not meet the quality requirements, no material from the stockpile in question will be accepted until the problem has been resolved. The Region QAC will notify each PM, for the projects being supplied from that source, that the material in question shall not be used until the problem has been satisfactorily resolved. The resolution may involve rejection of the stockpile if the investigation confirms non-specification material. If the material test results do not meet IA parameters, the Region QAC will work with the supplier to resolve the problem.

If the supplier is not following their Quality Control Plan or product(s) fails to meet compliance testing requirements. The Region QAC may discontinue that suppliers Commercial Product status of those products effected. That product's status will be returned upon approval of the Region QAC.

The Region QAC will provide data to other Regions that are using material considered ODOT Approved Commercial Products.

# APPENDIX B

## Contractor Quality Control Plan

This plan is intended to provide a description of the personnel involved in the testing activities and identify the system or process for material Quality Control. The Quality Control Plan must contain at a minimum the following information.

- Include: Project Name, Contract Number and date of anticipated use and author of submitted plan.

- Provide office telephone, cellular phone & fax numbers for contractor's superintendent & quality control manager.

- Describe personnel & methods to deliver accurate, legible & complete test results to designated agency representative, within required time limits.

- Designate who will provide required QL analysis.

- Describe location and methods for backup sample storage.

- Provide random numbers and include examples of your method for applying, to provide representative samples.

- Provide Technician and Lab Certifications for all equipment, laboratories, & technicians used to perform testing on and offsite for the project.

- Provide current Scale License and Certification for all weighting devices used on the project. Identify the location of the scales and type of scale i.e. platform, silo etc

- For every material that has tolerances or limits for tests listed in the Manual of Field Test Procedures, provide:

    - Bid item & Specification Section number(s) for product to be used.
    - Source and supplier of material
    - Proposed production rate, methods & source of testing
    - Anticipated earliest date of use

- For each material supplier & subcontractor, provide:

    - Company name, address, & physical location.
    - Quality control contact name and telephone #.
    - Location, type, & quantity of materials to be used.

# APPENDIX C - TROUBLESHOOTING GUIDE

The following information is a guide to assist in the evaluation of discrepancies that commonly occur between Independent Assurance test results and Verification test results. This information is only a guide and is not necessarily a comprehensive list of all potential areas to be investigated. A best practice is to consult the Region QAC for help early in the troubleshooting process.

## *General*

1. Check if the technician signing the report is the person performing the tests.
2. Check that the technician performing the testing is certified.
3. Check that the lab and equipment used are ODOT certified.
4. Check that the proper procedures and methods were performed.
5. Check all mathematics.
6. Check Balances for accuracies and functionality.
7. Check constant mass calculations if available, comparing moistures can also indicate incomplete drying of sample.
8. Contact Region QAC, their involvement can significantly reduce time spent troubleshooting and getting to resolution.

## *AGGREGATE TESTING*

### *Gradation*

1. Check sample size meets minimum requirements.
2. Inspect sieves for deformed wires or torn fabric.
3. Compare both test results for sample initial wet weights, initial dry weights, after wash dry weights, individual sieve weights and any tare weights if used. May point to a transposed or incorrectly recorded weight. May point to a splitting error.
4. Check sieve loss calculations.
5. Are their screens overloaded?
6. Check to see if the hand sieving procedure shows equipment operating correctly.
7. Check wash loss. May point to error in initial dry weight.
8. Have QC run QA split and observe. This action might indicate equipment, procedural discrepancies and /or splitting issues.
9. Compare results to ongoing Stat spec mean values.

### *WOODWASTE TEST*

1. Is the drying method burning up wood?
2. Check equipment used for the procedure for correct size and state of repair.

### *FRACTURE TEST*

1. Did both parties test the same? (Splitting the sample or not splitting the sample.)
2. If samples not split, do F+Q+N match closely to the retained mass(es) for gradation?

3. Do both parties have approximately the same amounts of F, Q, and N? If not may indicate a difference in interpretation of fractured particles.
4. Have QC run QA split and observe. This action might reveal procedural discrepancies and if results do not vary from originals, may indicate difference introduced during splitting.

***FLAT AND ELONGATED TEST***

1. Did both parties test the same? (Based on individual screens during gradation analysis and summed up or material recombined and split out with one evaluation)
2. Does MS closely match the retained masses for gradation (4.75mm (+ No. 4) material)
3. Proper caliper ratio used by both parties?
4. Have QC run QA split and observe. May indicate differences introduced during splitting.
5. Check caliper for tight fit between points when closed and smooth operation of armature.

***SAND EQUIVALENT TEST***

1. Compare Sand reading, if significant differences present this is an indication a under sized Tin or insufficient compacting effort when filling Tin.
2. Did both parties test at the same moisture content?
3. Are the methods of shaking suspending all fines?
4. Check lab temperatures and SE stock solution's age and the SE working solution's age and temperature. When in doubt observe technician prepare new batch of working solution.
5. Have QC run QA split of sample and observe procedures.
    a. Look for vibration in surface where SE's tubes are set.
    b. Were all the fines put into suspension?
    c. Check shaking device for proper throw distance and proper number of strokes.
    d. Check irrigation wand to insure good fluid flow from both openings.
    e. Digital timer being used.
    f. Weighted foot assembly in good condition and properly lowered.
    g. Graduated marks properly read
6. Observe parties cleaning the +4.75mm (No. 4) material insuring fine particles are removed.
7. If results do not vary from originals, may point to a splitting issue.

## *SOIL/AGGREGATE RELATIVE MAXIMUM DENSITY AND OPTIMUM MOISTURE*

1. Was the sample initially oven-dried (not allowed)? Separate samples at each point or re-compacted? Samples tested immediately or "marinated" moistures overnight?
2. Check plotting of data. Correct scale used. Dry densities plotted vs. dry basis moistures.
3. Check tare weights on molds/base plates. Collar removed?
4. Check mold volumes according to T 19, is there a significant difference from the standard volume?
5. Check surface on which samples were compacted. Is it unyielding surface?
6. Check constant mass on individual samples if available.
7. If available, check planning sheets for correct moisture addition calculations.

8. When held up to a light (or placed on a light table) do the two curve shapes match closely? Same shape, but one curve plots higher and to the left, indicates different compaction energy consistently applied to samples.
9. Was the passing no.4 or 3/4" material brushed off the retained no.4 or 3/4" material?
10. Have QC run a point at optimum moisture from their curve on the passing no.4 or 3/4" observe them perform the sample preparation and compaction procedure. Correct moisture computed and material properly mixed? Correct layers and layer heights? Hammer dropped from the correct height? Correct number of blows? Correct trimming and cleaning of mold? Moisture samples obtained correctly tested?

***COARSE AGGREGATE BULK SPECIFIC GRAVITY TEST***

1. Check thermometers.
2. How do values compare with pit history?
3. Were samples oven dried prior to soaking?
4. Do both parties have approximately the same Gsa? This indicates the difference is probably in interpretation of the SSD point. If these results are very different this points to weight in water error, so was empty basket weighed in water or "zeroed" in water?
5. Screen over a nested 1/4" and No. 4 sieve. Significant material passing the No. 4 indicates an error in screening of material.
6. Have QC run QA sample and observe the sample preparation procedure.

## *COMPACTION OF SOILS & PROCESSED AGGREGATE*

There are no IA parameters for compaction. If verification for compaction fails see the Specification specific section for how the QC is to resolve the failing area.

1. Is the correct curve being used? Is the correct density information being used?
2. Coarse Particles fit the rules for Method A or Method D? Fits curve used?
3. Observe testing in the field and look for the following: Random Representative location selected. Correct site preparation, drilling of the test hole, placement and seating of the gauge, data recorded.
4. For Soils. Observe proper fabrication of the one point and look for the following: Proper screening of material, in-place moisture measured prior to addition of additional moisture if needed, proper compaction of sample in correct mold, stable surface for compaction of one point?
5. Check Speedy moisture tester, balances and has density gauge been calibrated and calibration been verified by Region QA lab.

# *ACP TESTING*

The following should be considered in addition to the items listed in the Aggregate section.

### *IGNITION OVEN – AC CONTENT*

1. Was the correct calibration factor used?
2. Were calibration samples batched properly and calculations performed correctly?
3. Was companion moisture used or sample dried prior to testing?
4. Sample have a clean burn? Sample achieve constant mass?
5. Check basket weights. Check sample size.
6. Check gradation results. The coarse half of a split may have lower asphalt content than the fine half.
7. Is the Oven set at the correct temperature?
8. Does the manufacture scale drift test meet parameters?
9. Was the thermometer removed prior to Initial and Final Weighing?
10. Were the initial and final weights taken at the same temperatures?
11. Was the mix moisture removed from the initial mass reading?

### *RICE GRAVITY TESTING*

1. Check tare weights of pycnometers and lids.
2. Check sample sizes.
3. Check pycnometers calibration numbers.
4. Check equipment. Proper vacuum pressure? Calibrated thermometer?
5. Is the “dry back” procedure appropriate for this material?
6. Check gradation results. The coarse half of a split will have a higher Rice Gravity than the fine half.

### *BULK GRAVITY TESTING*

1. Check sample heights.
2. Check measured volumes compared to heights. Tallest specimen should have largest volume.
3. Check equipment. Suspension apparatus hanging free? Calibrated thermometers? Tank overflow? Damp towel for SSD?
4. Check compaction equipment. Proper gyrations, pressure, angle of gyration, compaction temp?
5. Observe testing. Swap samples and observe performing procedure. Watch immersion and SSD procedures. Is basket and wire assembly free floating?
6. If results do not vary from originals, may point to a splitting or compaction error.
7. If results vary from originals, may point to a technician or equipment error.

# *ACP DENSITY TESTING*

**There is not opportunity to rework ACP; therefore, it is imperative to troubleshoot density testing issues immediately.**

### *QC Best Practice*

Once the gauge has been initially ODOT calibrated, identify a location that can act as a reference, this site should be an area of flat concrete. Set the gauge on the flat concrete surface and scribe a line around the case. Take a four-minute test on the site and document the result. It is a good idea to paint the density on the concrete so that others may use it too. Test the gauge at this site prior to going to the project to assure that the gauge is still reading consistently. Performing Standard Counts on project site before starting daily work is required and running another set at mid shift helps to maintain consistent readings.

### *Project Manager*

1. Has the Contractor's gauge calibrated or verified by the Region QA group? Ask to see Cert.
2. Correct MAMD used? Core Correlation factor applied if needed?
3. Check the following correct; site preparation, placement and seating of the gauge, footprint marked, data recorded, rotation gauge.
4. Does the first sublot MDT match the JMF MDT within reasonable parameters? Specification is *50* kg/m$^3$ (3.0 lb/ft$^3$) this is really a large variation - check the asphalt content of the mixture.
5. If compaction is low, are there sufficient rollers of proper weight to achieve compaction? Does compaction correlate with Voids i.e. high voids low compaction?
6. Is the mix tender? Seek help from QAC or ODOT Pavements.
7. Is rolling compacting the whole panel, not just the center? Consistent with Control Strip?
8. Is the lay down temperature correct according to the JMF or has temperature changed during production? Has there been a substantial change in lift thickness?
9. Is weather a factor (colder, wetter, or windy)?
10. Is the existing surface being paved on in question? I.e. paving over open graded ACP, PCC surfaces or extremely distressed existing pavement.
11. Does Coring need to be performed to validate in-place compaction? Call the pavements unit for guidance.

If any problems are found that cannot be resolved, the inspector or QCCS should contact the Region QA group immediately.

***QA***

QA is to verify compaction using separate, randomly selected sites. There is no direct comparison Independent Assurance parameter for nuclear density testing.

1. Periodically during the construction, perform counts on the Region calibration blocks in the backscatter position.
2. On the project, choose one or two sites at random and perform the normal tests on these sites with both the QC and QA gauges. The average for each gauge when compared to the other should be within 2 $lb/ft^3$.
3. If the difference between the two gauges is greater than 2 $lb/ft^3$, the Contractor's QC technician should rerun the tests while the QAT observes.
4. If the two gauges are not in agreement, re-standardize both gauges and re-shoot the location two shots in the same direction. If the gauges still do not compare take both gauges back to the calibration blocks and check their calibration and follow TM 304.
5. If either gauge is out of calibration, recalibrate prior to project testing.
6. If the gauges are in calibration. Core Correlation should be performed to remove gauge differences.
7. The Project Manager and Region QAC should work together to resolve QC sublots brought into question by Verification results.

# *Plastic Concrete Testing*

### *General For All Concrete Tests*

1. Was the test started within prescribed time limits of obtaining the sample?
2. Were the QA and QC samples taken from the same portion of the load?
3. Was the sample adequately recombined if taken from two parts of the load?
4. Was the concrete covered if ambient conditions were adverse?
5. Was all equipment used within specification/tolerance, clean and damp prior to test?
6. Was excess water removed from the sampling container prior to obtaining the sample?

### *Slump (T-119)*

1. Once the test was started was it completed in the allotted 2 ½ minutes and immediately measured?
2. Does Equipment meet specification?
3. Tamping rod w/hemispherical tip
4. Flat, rigid, non-absorbent base, level and on a surface free of vibration or disturbance (not a warped water damaged piece of plywood)
5. Cone that is free of dents, rust damage and concrete build up on the inside
6. Correct amount of layers and quantity/volume in each layer?
7. Was each layer rodded 25 times extending into the preceding layer?
8. On the top layer, was a head kept above the top of the cone at all times?
9. Was the excess concrete cleaned away from the base of the cone prior to lifting?
10. Was the cone pulled too fast/slow?
11. Was the cone pulled straight with no twisting or lateral movement?
12. Was the measurement reading taken from the displaced original center?

**Note: If mix has 1 ½ inch or larger aggregate, it must be removed by the wet sieve method prior to performing the test.**

### *Air Content (AASHTO T-152)*

1. Was the test started within 5 minutes of obtaining the sample?
2. Has the air meter gauge been calibrated within the last three months?

**NOTE: The air meter calibration can be checked in the field.**

3. Was the bowl filled in approximately equal 1/3 layers?
4. Was each layer rodded 25 times extending into the preceding layer?
5. Were the sides of the bowl tapped 10 to 15 times with a mallet after each layer had been rodded?
6. Was the cover seal moistened and seated properly on the bowl?
7. Was water injected into the petcocks and meter rocked until no air bubbles appeared?

8. Was air pumped into the initial air chamber until it passed the initial pressure setting (as determined in the calibration process) and allowed to cool? Was any air noted seeping out of open petcocks at this time?
9. Was initial gauge adjusted to initial air pressure before opening main air valve?
10. Were the sides of the bowl tapped “smartly” during release of main air valve?
11. During release of main air valve was there any air leaking out the sides due to an incomplete seal?

***Temperature (AASHTO T-309)***

1. Has the measuring device been calibrated or verified for accuracy within the last year?
2. Was there adequate concrete cover around the measuring device sensor?
3. Was the concrete pressed around the measuring device at the surface?
4. Was the temperature recorded after a minimum of 2 minutes and the measuring device allowed to stabilize?

***Unit Weight (AASHTO T-121)***

Since the unit weight test is usually performed in conjunction with the air content test, see steps 3, 4 and 5 under the air content portion of this guide.

1. Check math
2. Was the dry mass of the measure accurately recorded?
3. Has the measure’s volume been accurately calibrated?
4. Was a strike off plate used to create a smooth surface free of voids and level with the rim?
5. Is the scale accurate? Cross check QA and QC scales to field verify accurate measurement.