Oregon

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To: All Holders of the Manual of Field Test Procedures

From: Justin G. Moderie, P.E., G.E.
State Construction and Materials Engineer

Subject: 2023 Revision of the Manual of Field Test Procedures

Enclosed is the 2023 revision to the Manual of Field Test Procedures. The revision package also includes a document providing a general list of the associated changes based on the layout of the Manual of Field Test Procedures. The revisions are based on comments from the Quality Assurance Steering Committee, Construction Training Coordinator, Quality Control Compliance Specialist's and industry material testing technicians.

The change package effects contracts advertised after this change date, any contract advertised prior to this change package falls under the appropriate MFTP change for that advertisement date. AASHTO test procedures are to be followed according to the latest MFTP change or the appropriate AASHTO test version to date. ODOT and WAQTC test procedures are in effect for the date the contract is advertised and may be modified to the new update change package through a Contract Change Order established by the Project Manager.

The following pages identify the appropriate add and remove sequence necessary to update the 2022 version of the MFTP. If an earlier version is being updated, then the appropriate update package will need to be applied before utilizing the enclosed documents.

To place these pages in your book, start with the package of white pages and do the following:

FIRST

SECTION 1 TAB (Test Procedures)

REMOVE	ADD	COMMENTS
INDEX (22) Pg. 1 & 2	INDEX (23) Pg. 1 & 2	Updated for 2023 Procedures

ODOT TAB

REMOVE	ADD	COMMENTS
ODOT TM 327 (21) Pg. 1~7	ODOT TM 327 (23) Pg. 1~7 ODOT TM	See Change Sheet for Details
ODOT TM 400 (15) Pg. 1~4	ODOT TM 400 (23) Pg. 1~4	Keep Random Table
ODOT TM 772 (22) Pg. 1~5	ODOT TM 772 (23) Pg. 1~5	See Change Sheet for Details

AASHTO TAB *(Note: FOP Replacement is based on the procedure date, upper Rt. corner of document. Official AASHTO designated procedures publish date is identified on the procedure cover page).*

REMOVE	ADD	COMMENTS
AASHTO T 27/11 (22) Pg. 12-1~12-40	AASHTO T 27/11 (23) Pg. 12-1~12-40	See Change Sheet for Details
AASHTO T 30 (22) Pg. 20-1~20-12	AASHTO T 30 (23) Pg. 20-1~20-11	" " " " "
AASHTO T 85 (22) Pg. 16-1~16-6	AASHTO T 85 (22) Pg. 16-1~16-6	" " " " "
AASHTO T 119 (19) Pg. 11-1~11-2	AASHTO T 119 (23) Pg. 11-1~11-2	" " " " "
AASHTO T 121 (20) Pg. 12-1~12-16	AASHTO T 121 (23) Pg. 12-1~12-16	" " " " "
AASHTO T 152 (22) Pg. 13-1~13-8	AASHTO T 152 (23) Pg. 13-1~13-8	" " " " "
AASHTO T 166 (22) Pg. 18-1~18-8	AASHTO T 166 (23) Pg. 18-1~18-8	" " " " "
AASHTO T 196 (22) Pg. T196-1~T196-11	AASHTO T 196 (23) Pg. T196-1~T196-11	" " " " "
AASHTO T 209 (22) Pg. 17-1~17-10	AASHTO T 209 (23) Pg. 17-1~17-10	" " " " "
AASHTO T 255/265 (22) Pg. 7-1~7-8	AASHTO T 255/265 (22) Pg. 12-1~12-7	" " " " "
AASHTO T 308 (22) Pg. 16-1~16-12	AASHTO T 308 (23) Pg. 16-1~16-13	" " " " "
AASHTO T 324 (22) Pg. T324-1~T324-14	AASHTO T 324 (23) Pg. T324-1~T324-14	" " " " "
AASHTO T 329 (22) Pg. 15-1~15-4	AASHTO T 329 (23) Pg. 15-1~15-4	" " " " "
AASHTO T 335 (22) Pg. 13-1~13-6	AASHTO T 335 (23) Pg. 13-1~13-5	" " " " "
AASHTO R 47 (19) Pg. 14-1~14-5	AASHTO R 47 (23) Pg. 14-1~14-5	
AASHTO R 76 (20) Pg. 10-1~10-6	AASHTO R 76 (23) Pg. 10-1~10-7	" " " " "
AASHTO R 97 (20) Pg. 13-1~13-8	AASHTO R 97 (23) Pg. 13-1~13-7	
AASHTO R 100 (22) Pg. 14-1~14-6	AASHTO R 100 (23) Pg. 14-1~14-6	" " " " "

SECTION 2 TAB (QA Program)

REMOVE	ADD	COMMENTS
Cover Sheet & Table of Contents (22)	Cover Sheet & Table of Contents (23)	See Change Sheet for Details
QA Program (22) Pg. 1~27	QA Program (23) Pg. 1~27	" " " " "

REMOVE	ADD	COMMENTS
SECTION IA TAB		
QA Program (22) Pg. 28~56	QA Program (23) Pg. 28~56	See Change Sheet for Details

SECTION 3 TAB (Report Forms & Examples)

REMOVE	ADD	COMMENTS
734-1792 (10-2015) & Examples	734-1792 (6-2023) & Examples	See Change Sheet for Details
734-1793 S (10-2022) & Examples	734-1793 S (3-2023) & Examples	" " " " "
734-1793 B (10-2022) & Example	734-1793 B (3-2023) & Example	" " " " "
734-3573 (10-2022) & Example	734-3573 (9-2023) & Example	" " " " "
734-4000_ C (10-2012) & Example	734-4000_C (3-2023) & Example	" " " " "

SECTION 4(C) TAB (Laboratory Samples)

REMOVE	ADD	COMMENTS
Sample Submittals (16) Pg. 1~5	Samples Submittals (23) Pg. 1~5	See Change Sheet for Details

SECTION 4(D) TAB (Acceptance Guide)

REMOVE	ADD	COMMENTS
Guide Pages 1~64 (November 2022)	Guide Pages 1~64 (November 2023)	See Change Sheet for Details

SECTION 5 "Green" TAB (Acceptance Guide)

REMOVE	ADD	COMMENTS
Guide Pages 1~64 (November 2022)	Guide Pages 1~64 (November 2023)	See Change Sheet for Details

SECOND

Take the yellow packet and place or remove the yellow sheets in front of the appropriate test method.

REMOVE	ADD	COMMENTS
AASHTO TAB		
Yellow Sheet T 22 (17)	-------------N/A---------------	See Change Sheet for Details
Yellow Sheet T 30 (21)	Yellow Sheet T 30 (23)	" " " " "
Yellow Sheet T 309 (04)	-------------N/A---------------	" " " " "
Yellow Sheet T 310 (13)	Yellow Sheet T 310 (23)	" " " " "
Yellow Sheet T 329 (12)	Yellow Sheet T 329 (23)	" " " " "
Yellow Sheet T 355 (18)	Yellow Sheet T 355 (23)	" " " " "

REMOVE	ADD	COMMENTS
AASHTO TAB		
Yellow Sheet R 66 (15)	Yellow Sheet R 66 (23)	See Change Sheet for Details
Yellow Sheet R 76 (16)	-------------N/A---------------	" " " " "
Yellow Sheet R 100 (22)	Yellow Sheet R 100 (23)	" " " " "

The yellow sheet letters provide additional information for the test procedure or define which method in a test procedure to use for ODOT projects.

FORMS

The forms to use on ODOT construction projects are available in Microsoft Excel format. These forms can be copied from the forms included herein or accessed and downloaded from our website at: **http://www.oregon.gov/ODOT/Construction/Pages/Forms.aspx**

We in the ODOT Construction Section welcome your questions, comments, or suggestions concerning this Manual. We will consider your input for future modifications to the Manual.

MFTP 2023 Update

Summary of Changes

Introduction – No Changes

Section 1 – Test Procedures Index

This section was updated according to the test procedure date change, if applicable.

ODOT – Test Procedures

TM 327 (Correlation of Nuclear Gauge Readings and Determination of ACP Density Using Pavement Cores) – Under the scope added a statement indicating "new nuclear gauge correlations are required when a gauge is recalibrated".

The following bullets identify additions, deletions, or modifications to the procedure:

- Section 3.2 removed the allowance to take cores according to TM 400. All core locations will be identified by the "Chevron Pattern". Removed the statement "The Contractor and the Engineer shall agree on the selected option".
- Section 3.4 stated the "contractor" shall provide core removal.
- Section 3.4.2 stated the top of each extracted core and lift line shall be identified before submitting cores to the Quality Assurance representative.
- Section 3.5 stated QA shall separate the layer of ACP at the designated lift line.
- Deleted the existing section 3.6, which stated the contractor would deliver half of the cores to QA. QA will now determine the bulk specific gravity of all cores.
- Section 3.8 stated QA has until the middle of the next work shift to provide bulk specific gravity results to the PM.
- Added a new section 3.9.8, "Existing core correlations are invalid if a nuclear gauge is recalibrated by Region QA or the manufacturer and must be re-established".

Minor formatting and editorial items were also addressed.

TM 400 (Determining Random Sampling and Testing Locations)

- Under Straight Random Sampling, step 2, corrected the forms reference to indicate section 3 (Forms and Examples) is available for random number management.
- Under Stratified Random Sampling, step 3, corrected the forms reference to indicate section 3 (Forms and Examples) is available for random number management.

Minor formatting and editorial items were also addressed.

TM 772 (Determining the International Roughness Index with an Inertial Laser Profiler)

- Under section 5.1, clarified that while operating the profiling device the graphic profiles need to be continuous for each travel lane.
- Under section 5.5, modified the existing sentence to state "data collection should be continuous for entire travel lane(s) unless otherwise authorized by the Project Manager".

Minor formatting and editorial items were also addressed.

AASHTO - Test Procedures

All the FOP's (WAQTC) for AASHTO test procedures have a revision date located in the upper right-hand corner and a publishing date at the lower right-hand corner of the document. The publishing date will change each year, but the test procedure date only changes with major content related modifications, not editorial corrections.

Other AASHTO test procedures in this section are from the AASHTO organization and won't have a WAQTC FOP reference and can be identified by the cover sheet with associated AASHTO official titles.

❖ **T 22 (Yellow Sheet) Compressive Strength of Cylindrical Concrete Specimens will be deleted** – The Standard Specifications for Construction, under section 2001.15(b-2) allows the use of unbonded caps according to ASTM C1231, so the current yellow sheet isn't necessary.

T 27/11 (Sieve Analysis of Fine and Coarse Aggregates) – Under the Scope, updated the AASHTO reference year to 2023. The following bullets identify additions, deletions, or modifications to the procedure:

Method A

- Under Procedure, note 1, added to the beginning of the first sentence "When required by the agency".
- Under Procedure, step 5, added to the last sentence "limit agitation to 10 min." for the use of the mechanical washer.
- The language from Note 2 was placed into step 5 and the note was removed.
- All other subsequent notes under Method A have been renumbered, due to the Note 2 deletion.

Method B

- Under Procedure, note 1, added to the beginning of the first sentence "When required by the agency".
- Under Procedure, step 5, added to the last sentence "limit agitation to 10 min." for the use of the mechanical washer.
- The language from Note 2 was placed into step 5 and the note was removed.
- All other subsequent notes under Method B have been renumbered, due to the Note 2 deletion.

Method C

- Under Procedure, note 3, added to the beginning of the first sentence "When required by the agency".

- Under Procedure, step 13, added to the last sentence "limit agitation to 10 min." for the use of the mechanical washer.
- The language from Note 4 was placed into step 13 and the note was removed.
- All other subsequent notes under Method C have been renumbered, due to the Note 4 deletion.

Minor formatting and editorial items were also addressed.

T 30 (Mechanical Analysis of Extracted Aggregates) – The following bullets identify additions, deletions, or modifications to the procedure:

- Under the Mass Verification section changed the mass difference between the aggregate remaining after ignition to the aggregate removed from the basket assembly from 0.01% to 0.1%. This follows the significance digits in the AASHTO procedure. Also, corrected any other references to the percentage in the procedure.
- Under Procedure, existing step 13 was broken into two steps. New step 13, place sample in the top sieve and new step 14 place sieves in mechanical shaker and shake for a minimum of 10 minutes……". Renumbered the remaining steps.
- Under the calculations section, Mass Verification, changed the given for $M_{f(T308)}$ to read as follows: Mass of aggregate *remaining in the basket assembly* after ignition from the FOP for AASHTO T 308.

Minor formatting and editorial items were also addressed.

❖ **T 30 (Yellow Sheet)** – The following bullets identify additions, deletions, or modifications to the procedure: Changed the step reference for bullet 5 from 13 to 14 and bullet 6 from 17 to 18. These changes are due to the step renumbering in the procedure.

T 85 (Specific Gravity and Absorption of Coarse Aggregate) – Under the Apparatus section, changed the large absorbent towel reference to cloth to be consistent with the official AASHTO procedure.

Minor formatting, spelling and editorial items were also addressed.

T 119 (Slump of Hydraulic Cement Concrete) – Under the Scope, updated the AASHTO reference year to 2023. The following bullets identify additions, deletions, or modifications to the procedure:

- Under Apparatus, Mold, modified the third sentence to read "The mold shall be free from dents, *deformations, and adhered mortar*".
- Under Procedure, step 5, added the following after the first sentence: "Rod the bottom layer throughout its depth".
- Under Procedure, step 9, modified the 4th sentence to read "Always keep an excess of concrete above the top of the mold".

- Under Procedure, step 13, removed the first sentence of note 1, "If a decided falling away or shearing off of concrete from one side or portion of the mass occurs, disregard the test and perform a new test on another portion of the sample" and placed as a new sub-step d. Deleted the first sentence of note 1, which is now a requirement under step 13-d. This statement should be a requirement of the procedure and not a note reference.

Minor formatting and editorial items were also addressed.

T 121 (Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete) - Under the Scope, updated the AASHTO reference year to 2023. The following bullets identify additions, deletions, or modifications to the procedure:

- Under Apparatus, Mallet, changed the 0.014m^3 volume reference to 14L and added the 2.25+-0.5 lb. mallet is used for measures larger than 14L.
- Table 1, Dimensions of Measures, removed the 76mm or 3-inch reference from the table. WAQTC member states aren't utilizing 3-inch nominal maximum size aggregate, so the 1 ft^3 measure was removed.
- Procedure Selection title was changed to Consolidation Selection, which better describes this process.
- Under Procedure, Rodding, changed the order of step 1 and 2. Step 1 now states "Dampen the insider of the measure and empty excess water" and step 2 states to determine and record the mass. This sequence follows the procedure of ASTM C138 and will be a proposed change to the official AASHTO procedure.
- Under Procedure, Rodding, removed step 12 and placed under the "Strike-off and Determining Mass" section and renumbered steps.
- Under Procedure, Internal Vibration, changed the order of step 1 and 2. Step 1 now states "Dampen the insider of the measure and empty excess water" and step 2 states to determine and record the mass. This sequence follows the procedure of ASTM C138 and will be a proposed change to the official AASHTO procedure.
- Under Procedure, Internal Vibration, deleted step 5. Tapping the perimeter 10 to 15 times isn't a required step in the procedure.
- Under Procedure, Internal Vibration, deleted step 8, which indicated to tap around the perimeter after each lift. Step 9 was deleted, and the language placed under the "Strike-off and Determining Mass" section.
- Under Procedure Self-Consolidating Concrete, changed the order of step 1 and 2. Step 1 now states "Dampen the insider of the measure and empty excess water" and step 2 states to determine and record the mass.
- Under Procedure Self-Consolidating Concrete, step 3, added the following language: "Do not exceed 5-inch drop height".
- Under Procedure Strike-off and Determining Mass, added the following as a new step 1: "After consolidation, the measure should be slightly over full, about 3 mm (1/8 in.) above the rim. If there is a great excess of concrete, remove a portion with the scoop. If the measure is under full, add a small quantity. This adjustment may be done only after consolidating the final layer and before striking off the surface of the concrete". Renumbered the remaining steps due to the insertion.

- Under Procedure Strike-off and Determining Mass, step 5, modified the first sentence to state "Finish the surface" instead of "Final finishing may be accomplished with several strokes…".

Minor formatting and editorial items were also addressed.

T 152 (Air Content of Freshly Mixed Concrete by the Pressure Method) – Under the Scope, updated the AASHTO reference year to 2023. The following bullets identify additions, deletions, or modifications to the procedure:

- Under the Scope, removed the Annex A reference. There is only one Annex in this procedure, so the "A" identifier was removed.
- Under Apparatus, 6th bullet, removed the "squeeze bottle" phrase and replaced with "plastic wash bottle".
- Procedure Selection title was changed to Consolidation Selection, which better describes this process.
- Under Procedure, Rodding, removed step 11 and placed language under the "Strike-off and Determining Mass" section and renumbered steps.
- Under Procedure Strike-off and Air Content, added the following as a new step 1: "After consolidation, the measure should be slightly over full, about 3 mm (1/8 in.) above the rim. If there is a great excess of concrete, remove a portion with a trowel or scoop. If the measure is under full, add a small quantity. This adjustment may be done only after consolidating the final layer and before striking off the surface of the concrete". Renumbering the remaining steps due to the insertion.

Minor formatting and editorial items were also addressed.

T 166 (Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens) – The following bullets identify additions, deletions, or modifications to the procedure:

- Under Procedure Method A (Suspension), step 4, clarified that the suspension apparatus needs to be completely submerged and not touching the sides or bottom of the water bath.
- Under Procedure Method B (Volumeter), removed note 2 and moved the language to the beginning of this section. "Method B is not acceptable for use with specimens that have more than 6 percent air voids". Renumbered the remaining notes, due to the removal.

Minor formatting and editorial items were also addressed.

T 196 (Air Content of Freshly Mixed Concrete by the Volumetric Method) – new procedure date reference 2023.

The following bullets identify additions, deletions, or modifications to the procedure:

- Under Section 2, ASTM Standards, added the following: C1064/C1064M., Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

Minor formatting and editorial items were also addressed.

T 209 (Theoretical Maximum Specific Gravity (G_{mm}) and Density of Asphalt Mixtures) - Under Scope, updated the AASHTO reference year to 2023.

The following bullets identify additions, deletions, or modifications to the procedure:

- Under the Apparatus, 6th bullet "vacuum measurement device", changed "accurate to 0.1 kPa (1mm-Hg)" to "readable to at least 0.2 kPa (2 mm-Hg).
- Under the Apparatus, deleted the 7th bullet. Manometer or vacuum gauge is already referenced under the 6th bullet.
- Under the Apparatus, added a new 8th bullet to describe the Suspension apparatus for the bowl method.
- Under Procedure General, step 9, changed the partial vacuum residual pressure from 3.7 ±0.3kPa (27.5 ±2.5mm-Hg) to 4.0 ±6kPa (30 ±5 mm-Hg).
- Under Procedure Bowl, step 13A, changed the 2nd sentence to read "Immerse the suspension apparatus sufficiently to cover both it and the bowl". Removed the 2nd sentence reference in 14A, which is now part of step 13A.
- Changed the Annex title from Annex A to Annex. There's only one annex referenced in the procedure.
- Under Annex, Bowl Standardization and Bowl Check, step 2, modified the 2nd sentence to read as follows: Immerse the suspension apparatus sufficiently to cover both it and the bowl.

Minor formatting and editorial items were also addressed.

T 255/265 (Total Evaporable Moisture Content of Aggregate by Drying and Laboratory Determination of Moisture Content of Soils) –

The following bullets identify additions, deletions, or modifications to the procedure:

- Under Apparatus, Suitable drying containers, created 2 subcategories as follows:
    - For soils: container requires close-fitting lid.
    - For aggregate: container lid is optional.
- Under Apparatus, 4th bullet, indicated the microwave safe container with ventilated lid is for drying aggregate only.
- Under Procedure, step 1, added two sub-steps for determining the mass of the container for soils and aggregate.
- Under Procedure, step 9, added the term "time interval" to show the drying process has a time relationship to the drying apparatus. Also, added "Drying intervals" above the associated heat sources e.g., controlled, and uncontrolled.
- In Table 3, under Soil, removed "increments (minutes)" and replaced with "interval to achieve constant mass".

Minor formatting and editorial items were also addressed.

T 308 (Determining the Asphalt Binder Content of Asphalt Mixtures by the Ignition Method) -

The following bullets identify additions, deletions, or modifications to the procedure:

- Under Sampling, the existing steps 2 and 3 were reversed. Now step 2 states "If the mixture is not sufficiently soft then heat.... until workable". Then step 3 states to reduce the mixture to the appropriate sample size.
- Created a new section, General, and moved the language in step 1 of Method A and Method B. The language from both steps was combined and moved under this new section. This is the preheat instructions for both oven types. All subsequent numbering Method A and B was adjusted based on the removal of step 1.

Procedure – Method B (External Balance)

- Added a new step 16 for determining constant mass that states "Determine percent change by subtracting the new mass determination (M_n) from the pervious mass determination (M_p), dividing by the previous mass determination (M_p), and multiplying by 100".
- Under step 17, corrected the step references, due to the removal of step 1 and revised the language for clarity.
- Corrected the note numbering reference of note 5 to note 6.
- Under the Calculations section added an example of constant mass determination.
- Under the Annex section the existing step 8 language was revised into 8a and 8b to show the two requirements if the difference between the two specimens exceeds 0.15 percent. Also, created a new step 9 to state the calculation process when determining the C_f. Renumbered subsequent steps.

Formatting and editorial items were also addressed.

- **T 309 Yellow Sheet (Temperature of Freshly Mixed Portland Cement Concrete)** – Yellow Sheet will be deleted. Metal immersion Types of Thermometers are now allowed by the procedure.

- **T 310 Yellow Sheet (In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)** – Added a bullet under the Earthwork section that states "Under Procedure, step 5, if the drive pin encounters material that prevents hole fabrication, then another test site within the random area shall be selected. If the new location still prevents hole fabrication, then the CDT should contact the field inspector, if available, for verification. Document in the remarks on form 734-1793S area was too rocky to test and if available, the inspector's name or indicate an inspector wasn't present. In the past this was discussed in the training environment for the CDT's but has never been officially documented.

Formatting and editorial items were also addressed.

T 324 (Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures) – The cover sheet has been updated to reflect the new 2023 version of the procedure. There were significant changes to the procedure.

The following bullets identify additions, deletions, or modifications to the procedure:

- Under Scope, a new section 1.5 was added as follows: "This test method is intended to be the standard; however, agencies may require deviations of various reason, including test temperature, maximum rut depth calculation, equipment, or others. Deviations must be documented and made available to any accreditation or certifying entities, or stake holders, such as contractors and material producers, upon request". Subsequent section numbers were adjusted based on the added section.
- Under Apparatus, note 1 was changed to state "Verify the sinusoidal wave requirement of the Hamburg wheel-tracking device using the Hamburg wheel-tracking device verification/calibration kit".
- Under Apparatus, Impression Measurement System, a new section 5.3.4 was added showing the formula for computing the (RMSE) or root mean square error.
- Under Apparatus, changed Note 3 to read as follows: "The locations of the deformation readings should be verified using the aluminum apparatus presented in Section A6.4".
- Under Apparatus, deleted section 5.7, Balance. Balance requirements would be under the appropriate test for specimen fabrication.
- Under the Calculations section, added the following sentence to section 9.2: "Alternatively, the specifying agency may choose to define a "test" as a single slab or core specimen or as a pair of 150-mm (6-in.) diameter cylindrical specimens".

Annex A

- Under Scope, added the following verbiage to A1.1: "Included are measurements of the wheels diameter and width, visual inspection of critical surface conditions, verification of the water bath temperature, LDT calibration, wheel loading assembly, wheel travel, and rut measurement".
- Section A1.2 added the following to the end of the sentence for minimum frequency of evaluation: "except for water bath temperature, which is 6 months".
- Under the Apparatus section, added a reference thermometer requirement and a Hamburg Wheel-Tracking Device Verification/Calibration Kit.
- Under Procedures added a new section for (Verifying the Water Bath Temperature).
- Under Procedures added a new section for (Verifying the LDT Calibration, Wheel Assembly, Rut Measurement, and Wheel Travel).
- Under the Inspection Report section, added the following new requirements:
  - Water bath temperature to the nearest 0.1°C(0.1°F).
  - LDT.
  - Wheel assembly load reading to the nearest 0.1 N (0.1 lb.).
  - Wheel travel (passes per min.).
  - RMSE at the 11 preset locations after considering the effect of curvature of the aluminum apparatus to the nearest 0.01mm (0.004 in.).
  - Deviation from a perfectly sinusoidal wave as defined through the RSE to the nearest 0.01 mm (0.004 in.).

    - Allowable maximum deviation from a perfectly sinusoidal wave as defined through the RMSE to the nearest 0.01mm (0.004 in.) unless equal to 2.54 mm (0.1 in.).
- Under the Appendix, deleted the Calibration/Equipment Verification section.

T 329 (Moisture Content of Asphalt Mixtures by Oven Method) –

The following bullets identify additions, deletions, or modifications to the procedure:

- Under Procedure, step 3, changed to read "Place the *wet* sample in the container". Wet describes the initial state of the sample.
- Under Procedure, step 4, added "to the nearest 2ºC (4ºF)". Typically, this is measured with a thermal temperature gun, so the reading is fluctuating during the measurement.
- Under Procedure, after step 7, added the steps to determine constant mass (less than 0.05 percent change after additional drying). All subsequent step numbering was adjusted.
- Under the Calculations section, constant mass example, added the term "release media" to mass of container. Added an initial "mass of sample and container" and the calculation of the "initial mass of sample" to follow the added constant mass steps in the procedure.

Formatting and editorial items were also addressed.

❖ **T 329 (Yellow Sheet) –** changed the step reference for the first bullet from "step 8" to "step 15", due to the addition of the constant mass, the steps in the procedure were renumbered.

T 335 (Determining the Percentage of Fracture in Coarse Aggregate) – The following bullets identify additions, deletions, or modifications to the procedure:

- Under Terminology, section 1, changed the "Fractured criteria" to read "The specified requirement for fractured particles determined by each agency".
- Under Sampling and Sample Preparation, step 3a and 4a, changed to read "Dry *and cool* the sample, *if necessary*, to sufficiently obtain a clean separation of FA and CA material in the sieving operation".

Minor formatting and editorial items were also addressed.

❖ **T 355 (Yellow Sheet for In-Place Density of Asphalt Mixtures by Nuclear Methods) –** Minor formatting corrections.

R 47 (Reducing Samples of Asphalt Mixtures to Testing Size) – Under Scope, updated the AASHTO reference year to 2023.

The following bullets identify additions, deletions, or modifications to the procedure:

- Under Apparatus, 9th bullet (Quartering Template), reworded the description.
- Under Selection of Procedure (Method), deleted the term "Apex" and replaced with "Sectoring".
- Added the phrase "Sectoring" to the Quartering Methods title.
- Deleted "Full" in front of Quartering title.

- Deleted "Reducing by Apex" and replaced with "Sectoring".
- Under Sectoring, step c, added "approximately" in front of "equal". The sector section will always be an approximation.
- Under Sectoring, added a new step "d" that states "If necessary, repeat until the appropriate sample mass has been obtained". Re-labeled subsequent steps.

Minor formatting and editorial items were also addressed.

❖ **R 66 (Yellow Sheet for Sampling Asphalt Materials)** – updated the AASHTO reference under bullet 2 from R 66-15 to R 66-16(2020)[1] and other minor formatting corrections.

R 76 (Reducing Samples of Aggregate to Testing Size) - Under Scope, updated the AASHTO reference year to 2023.

The following bullets identify additions, deletions, or modifications to the procedure:

- Added a Terminology section to define Saturated Surface-Dry (SSD) condition as follows: "condition of an aggregate particle when the permeable voids are filled with water, but no water is present on exposed surfaces".
- Under the new Terminology section added a note 1 to provide a quick approximation of the SSD condition for fine aggregate. "If the fine aggregate will retain its shape when molded in the hand, it may be considered wetter than saturated surface-dry".
- Under Apparatus, Method B, changed the title to show "Quartering and Sectoring".
- Under Apparatus, Method B, added "Stick or pipe" and added Quartering Template with the following description: "Formed in the shape of a 90-degree cross with equal length sides that exceed the diameter of the flattened cone of material sufficient to allow complete separation of the quartered sample. The height of the sides must be sufficient to extend above the thickness of the flattened cone of the sample to be quartered".
- Reworded and reformatted the Method Selection as follows:

  Selecting the method of sample reduction depends on;

  - The type of material: fine aggregate (FA), coarse aggregate (CA), and combinations of the two (FA / CA).
  - The moisture content: drier than saturated surface-dry (SSD), SSD, or wetter than SSD.
- Added a new note 2: "To use Method A on samples of FA and CA/FA that are at SSD or wetter, the entire sample may be dried – using temperatures that do not exceed those specified for any of the tests contemplated – and then reduced".
- Added splitting allowances for Method A Mechanical
  - CA
  - FA/CA drier than SSD
  - FA drier than SSD
- Added splitting allowances for Method B Quartering
  - CA
  - FA/CA
  - FA at SSD or wetter
- Added splitting allowance for Method B Sectoring (new)
  - FA at SSD or wetter

- Table 1 was updated to reflect the new addition of the sectoring method and minor editorials.
- Under Procedure, Method B, removed the existing phrase "Procedure 1: Quartering on a clean, hard, level surface" and replaced with "Surface". Step 1 describes the surface e.g., clean, hard, and level.
- Under Procedure, Method B, removed the existing phrase "Procedure 2: Quartering on a tarp" and replaced with "Tarp".
- Under Procedure, Method B, added the *new* process "Sectoring". This can be utilized for FA material in an SSD or wetter condition. 8 new steps have been added to provide direction for the process.

Minor formatting and editorial items were also addressed.

❖ **R 76 Yellow Sheet (Reducing Samples of Aggregate to Testing Size)** – Yellow Sheet will be deleted. The existing yellow sheet language is addressed in the test procedure.

R 97 (Sampling Asphalt Mixtures) – The following bullets identify additions, deletions, or modifications to the procedure:

- Under Apparatus, 6th bullet, added "Agency approved" before release agent.
- Under Procedure, General 4th bullet, modified the second sentence to state "Cardboard boxes can be used if the sample has cooled to the point that asphalt binder will not migrate from the aggregate".

Minor formatting and editorial items were also addressed.

R 100 (Method of Making and Curing Concrete Test Specimens in the Field) – Under Scope, updated the AASHTO reference year to 2023.

The following bullets identify additions, deletions, or modifications to the procedure:

- A new section was introduced "Consolidation Section" and placed before the Procedure General section. This is the language that identifies which type of consolidation process should be utilized, rodding or internal vibration, based on the slump of the concrete.
- Reformatted all the title sub-categories for cylinder fabrication and placed under a new section "Procedure". All subsequent titles the term "Procedure" has been removed.
- Changed the title of "Making Specimens – General" to "Molding Specimens – General". Also, modified step 6 to state "over fill" the mold on the final layer. Removed the second sentence.
- Established a new sub-category title under Procedure "Casting Cylinders" and now rodding, internal vibration and self-consolidating concrete are under this section.
- Established a new section for "Casting Flexural Beams" and created two sub-categories: Rodding and Internal Vibration.

Minor formatting and editorial items were also addressed.

❖ **R 100 (Yellow Sheet)** – the following bullets identify additions, deletions, or modifications to the yellow sheet entries: 3rd bullet, 2nd reference, removed the AASHTO T 23 reference from the first sentence. AASHTO T 23 was the reference before R 100 was established.

- 4th bullet changed the reference from "Making Cylinders" to "Casting Cylinders" based on procedure sub-title changes.

WAQTC Test Procedures

No Changes

Section 2 QA Program

Section I, Overview – No Changes

Section II, Roles and Responsibilities – Under Contractor, added the following bullet: "Provide extra testing or retesting according to section 00165.".

Section III, Lab Certification Program, under section Laboratory Decertification – No Changes

Section IV, Technician Certification Program, under section Certification Requirements – added a new Rights and Responsibilities agreement that's signed by material testing technicians. This new addition includes language related to the future implementation of AASHTOWare projects.

- Under the WAQTC and ODOT written examination section added the following note: "4 ½ hours will be allowed for the combined WAQTC and ODOT written exams". As currently written the timelines could be interpreted as a 5-hour allowance.
- Under Certification Requirements, added a statement indicating "The agency has the authority to require signing of modified Rights and Responsibilities agreements approved by the Certification Advisory Committee".
- Under Revocation or Suspension of Certification, added the following statement under the Level II abuse section: "AASHTOWare Project™: Sharing or unauthorized use of an individual's login credentials for electronic test data entry will be considered abuse and subject to a 60-day suspension of all Material Testing Certifications. The chair of the CAC will investigate if additional action is warranted during the 60-day suspension period". This language addition is also mentioned in the new Rights and Responsibilities Document that's required to be signed by technicians.

Section V, Quality Assurance Laboratory Proficiency Sample Program – No Changes

Section VI, Product Specific QC/QA Testing Plan – Under sections 00743 and 00745 Quality Control, added backup sample language for projects that require sampling on the grade. Also, included a list of information required on each backup sample.

Table 1 IA parameters – No Changes

Appendix A, ODOT Approved Aggregate Product Program – No Changes

Appendix B, Contractor Quality Control Plan – No Changes

Appendix C, Troubleshooting Guide – No Changes

Section 3 Report Forms and Examples

Forms Index and Introduction – No Changes

Forms Description of Worksheet and Calculation Explanations – No Changes

The following forms have been modified:

- **734-1792 (Field Worksheet for Aggregate)** – Corrected the examples based on specification updates e.g., SE from 68 to 75 etc. Also, corrected some formatting problems.
- **734-1793S (Nuclear Compaction Test Report)** – There was a minor calculation correction, so the form footer date was changed for tracking purposes.
- **734-1793B (Nuclear Compaction Test Report for Base Materials)** – during the printing process the form was showing a watermark indicating a security setting hadn't been set or classified. The form was updated, and the correct security setting was established, level 1 publishing. The footer section date was updated to show the latest modification.
- **734-3573 (Concrete Yield and W/C Ratio Worksheet)** – Corrected the units for Yield from lbs/ft^3 to yd^3 and Cement Content from lbs/ft^3 to lb/yd^3. The example reports were also corrected, and a new footer date was established.
- **734-4000_C (Sample Data Sheet for Concrete Cylinders)** - a new field was added "Slag" to accommodate mix designs with a slag constituent. The examples were updated, and a new footer date established.

Section 4A Product Compliance – No Changes

Section 4(B) Small Quantity Guidelines – No Changes

Section 4(C) Laboratory Samples – Under the Asphalt Cement Containers section added "1 qt. wide-mouth" in front of plastic containers for emulsified asphalt samples. Added "1 qt." in front of metal containers for other asphalt cements. Many samples arriving at the central materials lab aren't in the appropriate container, so this reinforces what's required in R 66.

- Under ACP Samples, added the following information required on the Form 4000: Contract Number, Date of sampling, Bid Item Lot and Sublot and location where sample was obtained.
- In the required sample size table added a new entry for "Concrete Curing Compounds" and indicated 2 – 1 qt. wide-mouth plastic containers are required.

Field Tested Materials Guide - Section 4D

How to Use the Field-Tested Materials Acceptance Guide – No Changes

Types of Tests – No Changes

Acceptance Guide – Note: many of the concrete frequency changes were due to the implementation of AASHTOWare. The existing frequencies that had a "If-Then" type of frequency action couldn't be supported by the AASHTOWare system.

The following table is an example of multiple frequencies:

TABLE 00512-1 Frequency of Quality Control Testing

Minimum frequencies per Class of concrete based on daily production records.	
Production	**Frequencies**
0 to 100 yd^3 on a single day	1 Set each day
Quantity Over 100 yd^3	
100 to 600 yd^3 on a single day	1 Set per each 100 yd^3 or portion thereof
over 600 yd^3 on a single day	1 Set per each 200 yd^3 or portion thereof after reaching 600 yd^3

The following bullets identify additions, deletions, or modifications to the Specification sections of the guide:

- The ODOT Logo "Flying T" has been added to the header section to show the document is owned by the Oregon Department of Transportation. Also, updated the revision date.

- **Section 00440**, Commercial Grade Concrete, the following changes were made:
    - Added a sublot frequency of 20 yd^3.
    - Removed the existing frequency of 1 set/20 yd^3 Cumulative (Maximum 1 set/day) and replaced with 1 per sublot maximum of 1 per day.
    - Removed the references to modifiers, admixtures and Portland cement.
    - Added Cement, Chemical Admixtures and Supplementary Cementitious Materials and indicated the "Materials listed on batch ticket must match approved design".
    - Deleted the following references: Structural Items (this will also be removed from plan sheets and 00540 concrete utilized), "Except Visual Acceptance Items", "1 set represents a minimum of 3 cylinders" and "per mix design & source".
    - Added ASTV based on a minimum of 3 Cylinders.

- **Section 442**, Controlled Low Strength Materials (CLSM) will be removed from the acceptance guide. The compressive strength requirement was only intended to be measured during the trail batch stage and not during placement.

- **Section 00512**, Drilled Shafts Aggregate Production, removed the following material references: Portland Cement, Modifiers, Admixtures, Drilling Slurry, Grout and Mixing Water. All concrete material constituents are now referenced under the Portland Cement Concrete section of 00512.

  The following changes were made in the Portland Cement Concrete section:
    - Removed the QC frequency table (00512-1) and replaced with a frequency definition of "a sublot equals 100 yd^3".
    - Removed the QC frequency and table reference and replaced with "1 per sublot, minimum 1 per mix design & shaft".

- Removed the QA testing references and replaced with "1 per 5 Sublots, minimum 1 per mix design".
- Removed the reference "1 set represents a minimum of 3 cylinders and per mix design and source".
- Added ASTV based on a minimum of 3 Cylinders.
- Added Cement, Chemical Admixtures and Supplementary Cementitious Materials and indicated the "Materials listed on batch ticket must match approved design".

- **Section 00540**, Structural Concrete Aggregate Production, removed the following material references: Portland Cement, Modifiers, Admixtures and Mixing Water. All concrete material constituents are now referenced under the Portland Cement Concrete section of 00540.

  The following changes were made in the Portland Cement Concrete section:
  - Removed the QC frequency and table reference and replaced with "a sublot equals 100 yd^3" and added "1 per sublot per mix design, minimum 1 per day".
  - Removed the QA testing frequency and replaced with "1 per 5 sublots, minimum 1 per mix design".
  - Removed the reference "1 set represents a minimum of 3 cylinders and per mix design and source".
  - Added ASTV based on a minimum of 3 Cylinders.
  - Added Aggregates, Cement, Chemical Admixtures, Supplementary Cementitious Materials, and Synthetic Fiber Reinforcing and indicated the "Materials listed on batch ticket must match approved design".

- **Section 00559**, Structural Concrete Overlays Aggregate Production, removed the requirement for Elongated Pieces testing. This now matches the aggregate production section of 00540. Also, removed the following material references: Portland Cement, Modifiers, Admixtures and Mixing Water. All concrete material constituents are now referenced under the Portland Cement Concrete section of 00559.

  The following changes were made to "Portland Cement Concrete" section:
  - Removed "a sublot equals 1 set of tests per 50 yd^3" and replaced with "a sublot equals 20 yd^3".
  - Removed the QC testing frequency and replaced with "1 per sublot per mix design, minimum 1 per day".
  - Removed the QA testing frequency and replaced with "1 per 5 sublots, minimum 1 per mix design".
  - Removed the reference "1 set represents a minimum of 3 cylinders and per mix design and source".
  - Added ASTV based on a minimum of 3 Cylinders.
  - Added Aggregates, Cement, Chemical Admixtures, Supplementary Cementitious Materials, and Synthetic Fiber Reinforcing and indicated the "Materials listed on batch ticket must match approved design".

- **Section 00641**, Base Aggregate, added a new sublot frequency for compaction, 1 per 400 tons. Changed the frequency of compaction testing for QC from 5 tests per 2000 tons to 1 test per 400 tons. Changed the QA frequency to 1 (5 Tests) per 50 Sublots, minimum 5 tests.

- **Section 00754 thru 00758,** Concrete Pavement the following changes were made to the Portland Cement Concrete section:
  - Removed "A sublot equals 1000 lane feet of slip formed pavement or 100 yd3 of non-slip formed PCC" and replaced with a "A sublot equals 350 yd3 of slip formed pavement or 100 yd3 of non-slip formed PCC".
  - Removed the QC testing frequency and replaced with "1 per Sublot per mix design, minimum 1 per day".
  - Removed the QA testing frequency and replaced with "1 per 10 sublots, minimum 1 per mix design".
  - Removed the following material references: Portland Cement, Modifiers, Admixtures, Curing Compounds and Mixing Water.
  - Added Cement, Chemical Admixtures, Supplementary Cementitious Materials and indicated the "Materials listed on batch ticket must match approved design".
  - Removed the reference "1 set represents a minimum of 3 cylinders and per mix design and source".
  - Added ASTV based on a minimum of 3 Cylinders.

- **Section 00921**, Major Sign Support Drilled Shafts Aggregate Production, removed the following material references: Portland Cement, Modifiers, Admixtures, Drilling Slurry, Grout and Mixing Water. All concrete material constituents are now referenced under the Portland Cement Concrete section of 00921.

  The following changes were made to "Portland Cement Concrete" section:
  - Removed the QC frequency table (00512-1) and replaced with a frequency definition of "a sublot equals 100 yd^3".
  - Removed the QC frequency and table reference and replaced with "1 per sublot, minimum 1 per mix design & shaft".
  - Removed the QA testing references and replaced with "1 per 5 Sublots, minimum 1 per mix design".
  - Removed the reference "1 set represents a minimum of 3 cylinders and per mix design and source".
  - Added ASTV based on a minimum of 3 Cylinders.
  - Added Aggregates, Cement, Chemical Admixtures and Supplementary Cementitious Materials and indicated the "Materials listed on batch ticket must match approved design".

Section 5 Type D & E Acceptance Guide – The same changes in section 4D will be made to this section, if applicable.

Sean P. Parker
Senior Quality Assurance Specialist
ODOT Construction, Quality Assurance

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SECTION 1
Test Procedures

INDEX OF FIELD TEST PROCEDURES

INDEX OF FIELD TEST PROCEDURES (CONTINUED)

PROCEDURE DATE	TITLE OF PROCEDURE	ODOT TM*	AASHTO T / R**	WAQTC TM*
2022	Plastic Fines In Graded Aggregates and Soils by the Use of the Sand Equivalent Test		176	
2023	Air Content of Freshly Mixed Concrete by the Volumetric Method		196	
2023	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures		209	
2018	Determination of Moisture in Soils and Fine Aggregate by Means of Calcium Carbide Gas Pressure Moisture Tester		217	
2017	Capping Cylindrical Concrete Specimens		231	
2023	Total Moisture Content of Construction Materials by Drying/Laboratory Determination of Moisture Content of Soils		255/265	
2021	One-Point Method for Determining Maximum Dry Density and Optimum Moisture		272	
2022	Resistance of Compacted Bituminous Mixture to Moisture Induced Damage		283	
2023	Determining the Asphalt Cement Content of HMAC by the Ignition Method		308	
2022	Temperature of Freshly Mixed Portland Cement Concrete		309	
2022	In-Place Density of Embankment and Base using the Nuclear Moisture-Density Gauge		310	
2023	Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures		324	
2023	Moisture Content of Hot Mix Asphalt (HMA) by Oven Method		329	
2023	Determining the Percentage of Fracture in Coarse Aggregate		335	
2020	In-Place Density of Asphalt Mixes by the Nuclear Method		355	
2023	Reducing Samples of Hot Mix Asphalt to Testing Size		R47	
2016	Sampling Bituminous Materials		R 66	
2020	Sampling Bituminous Material After Compaction (Obtaining Cores)		R 67	
2016	Developing a Family of Curves		R 75	
2023	Reducing Samples of Aggregates to Testing Size		R 76	
2022	Sampling of Aggregates		R 90	
2023	Sampling of Asphalt Mixtures		R 97	
2023	Method of Making and Curing Concrete Test Specimens in the Field		R 100	
2021	Sampling Freshly Mixed Concrete			2
2019	Volumetric Properties of Hot Mix Asphalt (HMA)			13

* (TM) – Test Method.
** (T) – Test Method is a definitive procedure (such as identification, measurement or evaluation of properties) that produces a test result.
** (R) – Recommended Practices are a definitive set of instructions for performing specific operations (such as sampling, collection, or inspection) that do not produce a test result.

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ODOT

ODOT TM 327

Method of Test for

Correlation of Nuclear Gauge Readings
and
Determination of ACP Density Using Pavement Cores

1. SCOPE

This test method describes the test procedures for the correlation of the nuclear gauge readings to the density of ACP cores, as well as determination of ACP density for acceptance using ACP cores removed from the roadway. The gauge specific core correlation factors determined per this method are applied to the nuclear gauge readings for ACP density Test Results. New nuclear gauge core correlations are required when specified or when a nuclear gauge is recalibrated.

2. APPARATUS

2.1. Nuclear Density Gauge Equipment - See AASHTO T 355, Apparatus

2.2. Coring Equipment – See AASHTO R 67, Apparatus

3. PROCEDURE CORE CORRELATION TO NUCLEAR GAUGE

When comparing the density of the core, determined by the Bulk Specific Gravity (**G_{mb}**) performed in accordance with AASHTO T 166, to the corresponding site of a nuclear density gauge reading, taken in accordance with AASHTO T 355, a correlation can be established. With the correlation, all gauge readings will be adjusted to match the in-place density based on the cores. The core correlation is gauge specific and must be obtained with no traffic allowed on the pavement between gauge readings and extraction of the core. All gauges that will be used on the project for testing the JMF represented by this process should be correlated to the core locations prior to removal of the cores.

3.1 Site Location:

3.1.1. If traffic is allowed on the pavement before the gauge density measurements are completed, measurements shall be completed within 48 hours of paving or as allowed by the Engineer.

3.1.2. Traffic shall not be allowed in the test locations between the time gauge measurements are completed and cores are removed, and holes back filled.

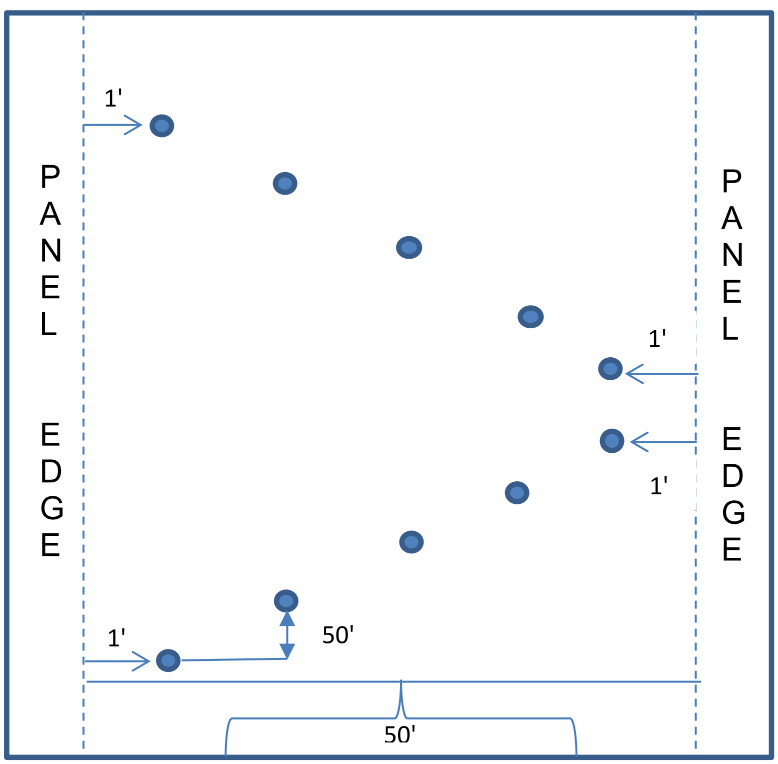
3.1.3. Select core locations that are not in the first 50’ of the panel being tested or in the area of the ODOT TM 306 Control Strip initial point development.

3.1.4. The site locations shall meet the “Test Site Location” requirements above and be representative of the entire cross-section of the panel being paved. Representatives of both the Contractor and the Quality Assurance unit shall agree on the core locations.

3.2. Select 10 core locations on the proposed pavement to be tested based on the following “Chevron Pattern”.

3.2.1. Chevron Pattern - the Chevron Pattern is a pattern of ten core locations. The pattern starts on one side of the panel, approximately one foot from the edge of the panel, evenly space five locations, moving transversely across the panel with the fifth location being approximately one foot from the opposite edge. Then an additional five locations, similarly, placed in a transverse pattern, move back to the starting edge. The core locations shall have a minimum longitudinal distance of 50 feet between each core.

The following “Chevron Pattern” Diagram is not to scale.



BEGIN PANEL

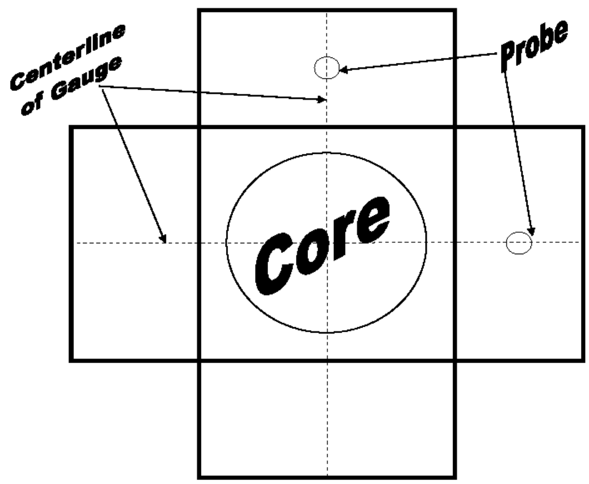
3.3. Perform Nuclear Gauge Testing in accordance with AASHTO T 355 for each gauge to be used on the project, at each core location.

3.4. The contractor shall core the location according to AASHTO R 67. Remove the core to a minimum depth of the lift being placed. The relative position of the core to the nuclear gauge readings for each test location shall be as illustrated in Figure 1.

3.4.1. Extreme care shall be taken when extracting the cores. Do not use tools such as pry-bars and screwdrivers as they will cause damage.

3.4.2. Mark the top of each extracted core to identify the test site it represents and clearly identify the lift line for core lift separation. Provide the cores to the onsite Quality Assurance Unit (QA) representative promptly following the marking of the cores and lift lines.

Figure 1



3.5. QA shall separate the layer of ACP to be tested from the remainder of each core according to AASHTO R 67. In the event the lift being tested is damaged, the number of cores remaining must meet the following conditions:

3.5.1. If a minimum of 8 cores are in good condition, proceed to step 3.6.

3.5.2. If less than 8 cores are in good condition, obtain additional cores and gauge readings from all gauges to achieve a minimum of 10 cores to be analyzed, by QA;

3.6. QA shall measure and record each specimen's thickness to the nearest 1/8" for the specimen by calculating an average of three or more measurements taken around the core.

3.7. QA will determine the Bulk Specific Gravity of each specimen in accordance with AASHTO T 166.

3.8. Once the bulking process is completed both parties will provide nuclear gauge readings and QA bulk specific gravity test results to the Project Manager for determination of the correlation factor(s) by the middle of next work shift.

3.9. Calculate a correlation factor for each nuclear gauge as follows:

3.9.1. Determine the density of the cores by multiplying the bulk specific gravity obtained from AASHTO T 166 by 62.4 lb/ft^3. Round this result to the nearest 0.1 lb/ft^3.

3.9.2. Calculate the difference by subtracting the average nuclear gauge density for each test site from the core density for the same test site and record to the nearest 0.1 lb/ft^3.

3.9.3. Calculate the average of the differences to the nearest 0.1 lb/ft^3 and standard deviation of these differences for the entire data set.

3.9.4. If the standard deviation of the differences from 3.9.3 is less than or equal to 2.5 lb/ft^3, the correlation factor shall be the average difference calculated in 3.9.3.

3.9.5. If the standard deviation of the differences from 3.9.3 is greater than 2.5 lb/ft^3, the test site with the difference furthest from the average difference shall be eliminated from the data set. Then recalculate the data set properties and correlation factor following 3.9.3 and 3.9.4.

3.9.6. Continue 3.9.5 until the standard deviation is equal to or less than 2.5.

3.9.7. If the modified data set from 3.9.5 meets the allowable standard deviation and the number of cores remaining in the data set is 8 or more cores, then use that average difference as the correlation factor. If the modified data set from 3.9.5 represents less than 8 cores, obtain additional cores and gauge readings such that there is a minimum of 10 acceptable cores to be statistically evaluated per this subsection. The minimum number of cores used to determine the correlation shall be 8.

3.9.8. Existing core correlations are invalid if a nuclear gauge is recalibrated by Region QA or the manufacturer and must be re-established.

3.10. **Core Correlation Example:**

	Core results from T 166:	Average Gauge reading:	Difference:	X	X^2
1	144.9 lb/ft^3	142.1 lb/ft^3	2.8 lb/ft^3	-0.7	0.49
2	142.8 lb/ft^3	140.9 lb/ft^3	1.9 lb/ft^3	0.2	0.04
3	143.1 lb/ft^3	140.7 lb/ft^3	2.4 lb/ft^3	-0.3	0.09
4	140.7 lb/ft^3	138.9 lb/ft^3	1.8 lb/ft^3	0.3	0.09
5	145.1 lb/ft^3	143.6 lb/ft^3	1.5 lb/ft^3	0.6	0.36
6	144.2 lb/ft^3	142.4 lb/ft^3	1.8 lb/ft^3	0.3	0.09
7	143.8 lb/ft^3	141.3 lb/ft^3	2.5 lb/ft^3	-0.4	0.16
8	142.8 lb/ft^3	139.8lb/ft^3	3.0 lb/ft^3	0.9	0.81
9	144.8 lb/ft^3	143.3 lb/ft^3	1.5 lb/ft^3	-0.6	0.36
10	143.0 lb/ft^3	141.0 lb/ft^3	2.0 lb/ft^3	-0.1	0.01
		Average Difference:	+2.1 lb/ft^3		

$$\text{Standard Deviation} = \sqrt{\frac{\sum X^2}{\text{n-1}}}$$

Where:
∑ = Sum
x = Difference from the average Difference
n-1 = number of data sets minus 1
Example: 10 – 1 = 9

$$\text{Standard Deviation} = \sqrt{\frac{2.50}{9}} = 0.53$$

The Sum of X^2 = 2.5 and the number of data sets = 9 for a computed standard deviation of 0.53. This is within the allowable 2.5 therefore no cores are eliminated, use the average difference from all ten cores.

3.11. **Applying Correlation Example:**

Reading #1: 141.5 lb/ft^3

Reading #2: 140.1 lb/ft^3 Two readings within tolerance? (YES)

Reading average: 140.8 lb/ft^3

Core Correlation : +2.1 lb/ft^3

Corrected reading: 142.9 lb/ft^3

G_{mm} and maximum density from the FOP for AASHTO T 209:

G_{mm} = 2.466 =>2.466 X 62.4 => 153.9 lb/ft^3

$$\frac{\text{Corrected Reading}}{\text{Maximum Density}} X100 = \%\text{ compaction} \qquad \frac{142.9}{153.9}\boldsymbol{X}100 = 92.9\%$$

4. PROCEDURE DENSITY CORES

This procedure is used to determine the locations and density of ACP cores removed from the roadway. It is employed for Third Party Resolution when density Verification requirements are not met and/or when pavement cores are used for acceptance.

4.1. Test Site location shall meet the 3.1 requirements listed above. Randomly identify 5 core locations representing the proposed pavement compaction sublots to be tested in accordance with ODOT TM 400 Stratified Random Sampling.

4.2. Core each location according to AASHTO R 67; remove the core to a minimum depth of the lift being evaluated. Extreme care shall be taken when extracting the cores, avoid such tools as pry-bars and screwdrivers as they will cause damage.

4.3. Separate the layer of ACP to be tested from the remainder of each core According to AASHTO R 67.

4.4. Determine the density of the cores by the AASHTO T 331, Standard Method of Test for Bulk Specific Gravity (Gmb) and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method.

4.5. Determine the percent compaction for each core density using the MAMD done in accordance with ODOT TM 305 for the pavement being evaluated. Determine the sublot compaction by averaging the percent compaction of the 5 test locations per sublot.

5. **REPORTING**

ODOT form 2327-21 is available to perform the correlation calculations.

5.1. **Core Correlation, provide the following information to the Agency:**

- Project Name and Contract Number
- Project Manager and Contractor
- Bid Item for mix being placed
- The lift of ACP being evaluated
- Type of ACP being evaluated
- ODOT Mix Design Number
- Nuclear Gauge Serial Number, Make & Model
- The individual Gauge readings at each test site
- Average Nuclear Density reading at each test site
- Document who performed the CDT & Cat-1 work, with name and cert number.

ODOT TM 400

Method of Test for

Determining Random Sampling and Testing locations

Significance

This procedure is used to determine random sampling and test location for various field-tested materials used in highway construction. Use of accepted random sampling techniques is intended to minimize any bias on the part of the person taking the sample. Testing and sampling locations and procedures are just as important as testing. For test results or measurements to be meaningful, it is necessary that the sampling locations be selected at random, typically by use of a table of random numbers. Other approved techniques yielding a system of randomly selected locations may also be allowed.

Scope

This method is intended for use during Quality Control and Quality Assurance sampling and testing during the manufacturing of aggregates, during the production of mixtures, and/or during the placement of materials in their final location on the grade. This method is also intended for post construction use in identifying in-place materials for sampling and testing when production results are called into question.

This method covers determining random samples by tonnage or by geometric stations. The method also covers a methodology for converting a predetermined random tonnage to an equivalent random station when stationing is more advantageous for use by the technician.

Definitions

Lots and Sublots

A lot is a pre-selected quantity representing a sample of the whole or the entire quantity being sampled or measured can be defined as a lot. A lot may be comprised of several portions that are called sublots. Each sublot can then be analyzed to better represent the whole or “lot”.

Straight Random Sampling vs. Stratified Random Sampling

Straight random sampling considers an entire lot as a single unit and determines each sample location based on the entire lot size. Stratified random sampling divides the lot into a specified number of sublots or units and then determines each sample location within the distinct sublot or unit. Both methods result in random distribution of samples to be tested for compliance and are normally outlined in the agency’s specification.

Procedure

Straight Random Sampling

1. Determine the size of the lot and number of tests required. If statistical means are to be used for acceptance use a minimum of three random tests.

2. Obtain the random numbers to be utilized using a random number table or other approved method. I.e. Calculator, computer, etc.

   The MFTP, Section 3 (Forms and Examples), have form(s) to assist with random number management. (A Random Number Table is included in this procedure).

3. Normally, a five-digit value is used to determine the random sample location. The entire five-digit number can be utilized or portions there of. Multiply the lot by the random number. This will yield the test location within the lot to perform the testing.

Stratified Random Sampling

1. Determine the number of sublots in the lot by dividing the lot quantity by the defined sublot size and round up to the nearest whole number. If statistical means are to be used for acceptance use a minimum of three sublots. If the lot generates less than three defined sublots, divide the lot quantity by three and redefine the sublots to this new smaller size.

2. Divide the sublot size by the number of tests required. i.e., 5 tests per 1000-ton sublot, equals 1 test per 200-ton sublot segment.

3. Obtain the random numbers to be utilized using a random number table or other approved method. I.e. Calculator, computer, etc.

   The MFTP, Section 3 (Forms and Examples), have form(s) to assist with random number management. (A Random Number Table is included in this procedure).

4. Multiply the sublot segment size by the random number and add the beginning tonnage or station to determine the sampling or testing locations. This will yield the test location within the sublot segment to perform the testing.

Converting Predetermined Random Tonnages to Equivalent Random Stations by use of Yield Calculations (In-Place Testing)

1. Designation of a random sample location can be based on either a tonnage or station. Station application is for in-place field work such as density on ACP or sampling of aggregates or soils. Because the required sublot size is typically in a tonnage it is necessary to convert that tonnage into a length per ton to find the corresponding station in the field.

Note: All measurements must be expressed in Feet and % density is in decimal form.

English Example (computing feet per ton):

Given:

- MAMD is 151.9 lbs/ft^3
- Density Requirement is 92% (0.92) or the average density determined in the field can be utilized.
- Panel thickness is 2" (2"/12") = (0.167 ft)
- Panel Width 16ft.
- Random Tonnage = 714 tons
- Beginning Station = 183+50

Step 1: Compute the Average Volume per ton.

$$Average\ Volume = \frac{2000_{lbs\,/\,ton}}{151.9_{lbs\,/\,ft^3} \times 0.92}$$

$$Average\ Volume = \frac{2000_{\cancel{lbs}\,/\,ton}}{151.9_{\cancel{lbs}\,/\,ft^3} \times 0.92} = 14.31_{ft^3\,/\,ton}$$

Step 2: Calculate the cross-sectional area.

$$Cross - Sectional\ \ Area = 0.167_{ft} \times 16_{ft} = 2.67_{ft^2}$$

Step 3: Calculate the yield in feet per ton of paving by dividing the average volume by the cross-sectional area.

$$Yield = \frac{14.31_{ft^3}\,/\,_{ton}}{2.67_{ft^2}}$$

$$Yield = \frac{14.31\,\cancel{ft^3}\,/\,ton}{2.67\,\cancel{ft^2}} = 5.36\,ft\,/\,ton$$

Step 4: Calculate the number of feet required to pave 714 tons of ACP (714 tons is the random generated value).

$$Feet\ of\ Paving = 714_{tons} \times 5.36_{ft\,/\,ton}$$

$$Feet\ of\ Paving = 714_{\cancel{tons}} \times 5.36_{ft\,/\,\cancel{ton}} = 3827_{ft}$$

Step 5: Calculate the random location based on stationing by adding the distance in feet to the reference station.

- First convert the distance to a station reference by dividing the value by 100. 3827 / 100 = 38.27 or 38+27.
- Starting reference station is 183+50.
- 183+50 plus 38+27 = 221+77 random location longitudinally.
- Then measure the random distance from desired edge of panel for test site offset.

Note: *Taking the inverse or reciprocal of the yield factor, based on a length / weight relationship, a weight to length factor can be determined. Either convention can be utilized to determine a distance of coverage based on a known quantity.*

Example:

$$\frac{1}{5.36} = 0.18657_{tons\,/\,ft}$$

$$\frac{714_{tons}}{0.18657_{tons\,/\,ft}} =$$

$$\frac{714_{\cancel{tons}}}{0.18657_{\cancel{tons}\,/\,ft}} = 3827_{ft}$$

Report

All random numbers shall be submitted on standard forms approved by the agency.

ODOT TM 772-23

Method of Test for

DETERMINING THE INTERNATIONAL ROUGHNESS INDEX WITH AN INERTIAL LASER PROFILER

1. SCOPE

1.1 This test method describes the procedure for operating a profiler, checking the calibration (horizontal and vertical accuracy) of the profiler, and determining the International Roughness Index (IRI) and areas of Localized Roughness from pavement profiles obtained by an inertial profiler. A procedure for Quality Control and Quality Assurance smoothness measurements on paving projects is also included.

2. REFERENCED DOCUMENTS

2.1 AASHTO M 328
2.2 AASHTO R 54
2.3 AASHTO R 56
2.4 AASHTO R 57
2.5 ProVAL User Manual

3. EQUIPMENT

3.1 Profilers

3.1.1 The profilers shall employ an accelerometer established inertial profiling reference and a laser height sensing instrument to produce a true profile of the pavement surface, as described in AASHTO M 328.

3.1.2 The device must be capable of reporting elevations with a resolution of 0.001 inches or finer at a sampling interval of 2 inches or less within the operating speed of the profiler. The device must provide a means to field calibrate and measure the horizontal distance traveled. A device equipped with GPS must also have a Distance Measurement Instrument (DMI) that can be calibrated according to Subsection 4.2.2 to compensate when GPS coverage is unavailable.

3.1.3 The device must be equipped with software capable of generating, displaying, storing, and reporting IRI at 0.10-mile intervals. The profiler software is required to generate .PPF files that contain the data in .PPF format. If GPS is used for horizontal distance measurement, the device must be capable of producing Keyhole Markup Language (.KML) and REFERENCE.KML files.

3.1.4 Maintain the low pass filter setting at 0.00 feet.

3.1.5 Maintain the high pass filter setting at 200.00 feet

4. CALIBRATION VERIFICATION

Submit the following to the Project Manager for approval at least 10 days before smoothness measurements are to begin:

- Documentation detailing equipment to be used and the manufacturer's recommended calibration and calibration check procedures.
- The ODOT Pavement Services Unit Certification documentation, showing certification of the operator and profiling equipment.

Perform all calibration verifications in the presence of the designated representative of the Project Manager.

4.1 Calibration Frequency

At a minimum, perform calibration once per calendar year per the manufacturer's recommendations and procedures.

4.2 Profiler Calibration Check

Perform horizontal and vertical calibration check at the frequency recommended by the manufacturer or at any time during testing if the test results are questionable. At a minimum, check vertical and horizontal calibration daily and at any time a configuration change is made to the profiler.

4.2.1 Vertical Calibration Check

Perform a vertical calibration check on each height sensor in the profiler according to the manufacturer's recommendations. At a minimum, (1) obtain a reading on a smooth base plate, then place a 0.25-in thick block on the base plate, and obtain a reading, and from these two readings compute the thickness of the block as measured by the profiling system, (2) obtain a reading on a smooth base plate, then place a 0.50-in thick block on the base plate and obtain a reading, and from these two readings compute the thickness of the block as measured by the profiling system, (3) obtain a reading on a smooth base plate, then place a 1.00-in thick block on the base plate and obtain a reading, and from these two readings compute the thickness of the block as measured by the profiling system. The thickness of the blocks used for this test shall meet the requirements of AASHTO R 57. The thickness of the blocks as determined by the profiling system should be within 0.01 inches of the actual thickness of the block.

4.2.2 Horizontal Calibration Check

This check is performed to verify the accuracy of the Distance Measurement Instrument (DMI). As a minimum, measure and mark off (to within 0.05%) a straight distance of 528 feet on a reasonably level, paved surface. Test the section 3 times.

The average of the three runs should be less than 1-foot absolute difference from the known 528 feet. If the profiler fails to meet this requirement, calibrate the DMI according to the manufacturer's recommendations and repeat the horizontal calibration and adjustments until the required average is achieved.

Note: Check the air pressure in the tires on the vehicle as necessary during horizontal calibration process to ensure the tire pressure is maintained. If the tire pressure changes, adjust the pressure, or recalibrate the horizontal measurement until an acceptable and repeatable horizontal calibration check is accomplished. Tire pressure will influence the horizontal distance measured by the profiler.

4.3 Bounce Test

Perform the Bounce test according to the manufacturer's recommendations. As a minimum, place the profiler on a flat level smooth pavement with the electronics on and the vehicle stationary. The IRI corresponding to each sensor should be less than 3.0 inches/mile, for the time that it would take the profiler to travel 528 feet. Next, move the vehicle ("bounce") vertically with 2 inches minimum of vertical travel, for the time that it would take the profiler to travel 0.10 mile. The IRI corresponding to each sensor should be under 10.0 inch/mile or under the manufacturer's recommended maximum, whichever is less.

4.4 Calibration Verification

Before performing smoothness measurements on the project for each shift (day or night) of testing, verify the calibration of the Profiler by operating the machine twice over a 528-foot section of pavement with repeating test results. The calibration shall be considered acceptable when the difference in IRI between 2 consecutive test runs is 4.0 in/mile or less. If a single laser is used, then one wheel path will be tested. If two lasers are used (right and left) the average of the two IRI will be used. Provide documentation to the Project Manager verifying that the calibration and test runs have been successfully completed for each shift of testing.

A fog line or other straight line on a relatively smooth pavement surface is suggested for performing this check.

Maintain a log to be kept with the profiler, to provide a record of calibration history.

5. QUALITY CONTROL PROFILE TESTING AND REPORTING

5.1 Operate the profiling device to provide data for complete and continuous graphic profiles for each travel lane and at all locations required by the contract specification.

5.2 Locate and mark all excluded areas by specification. Use white paint or other approved marking material on the shoulder adjacent to each lane to show where each auto trigger was placed (multiple marks on the shoulder may be required for multiple lane approaches and departures for skewed bridges and end panels). If surveyed locations were used for GPS auto trigger for start, stop and exclusion areas, provide those locations for each lane profiled in REFERENCE.KML format.

Do not evaluate, for IRI, excluded areas noted in the specifications. These areas are to be left out of the IRI analysis. Test excluded areas according to the applicable specification.

For auxiliary and slow lanes in passing sections, start the profile of the slow lane at the end of the taper where the lane becomes full width, and terminate the profile at the start of the taper from the full lane width (usually first skip stripe to last skip stripe). On bridges with skews, locate the start and end of the bridge exclusion where the 50 feet is the minimum distance from any point in the profiled lane from the bridge joint or end panel, as applicable (i.e. 50 feet from where the lane line first contacts the skew of the bridge when traveling towards the bridge).

5.3 Operate the profiling device in the direction of travel.

5.4 Set the reporting interval to 2.0 inches or less.

5.5 Operate the profiler to collect data continuously along the specified wheel paths for the entire length of the travel lane(s) unless otherwise authorized by the Project Manager. Operate the profiler at a constant speed which is within the operating speed range recommended by the manufacturer (see Section 5.9 for the location of the wheel paths). Take care to keep the device as parallel as possible to centerline. Bring the profiler to the desired speed and alignment prior to the beginning of the test section. Maintain the profiler speed at as constant a rate as possible throughout the test section. Use the manufacturer's recommended lead-in and lead-out distances, or a minimum of 200 feet. Profiler speed will be maintained through the end of the test section.

5.6 Label profile reports and data files with the appropriate identification and project stationing, matching the project plans, for each profile. For example: northbound, fast lane could be identified as NB-A-Lane. Include project identification and project stations on the report that contains the table outlined in section 5.11.

5.7 Mark and identify the project stationing on the profiles. Initial and date the beginning and ending project stations of each day's test runs on the profile reports.

5.8 A horizontal distance tolerance of a maximum of 1.0% or 53 feet/mile is required. Reference the project stationing on the profile at a known project station at the beginning and ending of each run and excluded area. Write the project station on the chart or use event markers to reference the locations of verified project stationing. Check the project stationing every mile at a minimum.

5.9 Measure both the right and left wheel path. Measure the left wheel path at 3 feet from the lane divider (center line). Measure the right wheel path at 9 feet from the lane divider (center line). When using an inertial profiler that collects a single wheel path per pass, make sure that each wheel path starts and stops at the same longitudinal location.

5.10 Do not mix travel lanes in the same data file. Submit complete and continuous profile data (hard copies and data files – in .PPF, .KML, and manufacturer specific file formats) for all travel lanes and wheel paths for the entire project (except for excluded areas) per specification.

5.11 Submit to the Project Manager a table that identifies the lanes, wheel paths, and distance locations (stations and/or mile posts) tested for each data file, representing all profiles on the project. (Most profile manufacturers have a reporting format that is acceptable.)

5.12 The Project Manager will evaluate the profile reports generated from manufacturer specific or .PPF raw data files through the most current version of the ProVAL software (available at www.roadprofile.com) for determination of the Smoothness Price Adjustment according to the applicable Specification. IRI values are evaluated to the nearest 0.1 inches/mile.

6. DETERMINATION OF THE INTERNATIONAL ROUGHNESS INDEX

Using ProVAL, or equivalent profiler manufacturer software, calculate the left wheel path IRI, right wheel path IRI, and the mean IRI (average of left and right wheel path IRI) for each 0.10 mile and partial section. The mean IRI will be used for incentive/disincentive determination according to 00745.96.

7. DETERMINATION OF LOCALIZED ROUGHNESS

Use the most current version of ProVAL, or equivalent profiler manufacturer software, to evaluate profiles for areas of Localized Roughness per the Specification minimum. Determine areas of Localized Roughness by computing the IRI over a continuous 25-ft length. Determine areas of Localized Roughness for each wheel path. Generate a report and submit it to the Project Manager for review. Stake or mark areas identified as exceeding the minimum specified Localized Roughness in a method acceptable to the Engineer for the ride test per Specification.

8. QUALITY ASSURANCE

At the discretion of the Agency, the Agency will perform Quality Assurance of profiles on projects according to the following:

The Agency profiler or a Third-Party profiler may run a verification of completed wearing course areas under the IRI specification for the contract or season of paving. The Contractor run profile will be considered acceptable if the mean IRI of both wheel paths averaged over all profiled lanes has a minimum of 90.0% of all measured 0.1-mile segments deviate by less than ±6.0 in/mile IRI. The Project Manager will resolve any discrepancies; this could include re-certification of the profilers, or Third-Party testing of smoothness on the project.

INSERT TAB

AASHTO

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES
FOP FOR AASHTO T 27
MATERIALS FINER THAN 75 µM (NO. 200) SIEVE IN MINERAL AGGREGATE BY WASHING
FOP FOR AASHTO T 11

Scope

A sieve analysis, or 'gradation,' measures distribution of aggregate particle sizes within a given sample.

Accurate determination of the amount of material smaller than 75 µm (No. 200) cannot be made using just AASHTO T 27. If quantifying this material is required, use AASHTO T 11 in conjunction with AASHTO T 27.

This FOP covers sieve analysis in accordance with AASHTO T 27-23 and materials finer than 75 µm (No. 200) in accordance with AASHTO T 11-22 performed in conjunction with AASHTO T 27. The procedure includes three methods: A, B, and C.

Apparatus

- Balance or scale: Capacity sufficient for the masses shown in Table 1, accurate to 0.1 percent of the sample mass or readable to 0.1 g, and meeting the requirements of AASHTO M 231
- Sieves: Meeting the requirements of ASTM E11
- Mechanical sieve shaker: Meeting the requirements of AASHTO T 27
- Suitable drying equipment (refer to FOP for AASHTO T 255)
- Containers and utensils: A pan or vessel of sufficient size to contain the sample covered with water and permit vigorous agitation without loss of material or water
- Optional
    - Mechanical washing device
    - Mallet: With a rubber or rawhide head having a mass of 0.57 ±0.23 kg (1.25 ±0.5 lb)

Sample Sieving

- In all procedures, the sample is shaken in nested sieves. Sieves are selected to furnish information required by specification. Intermediate sieves are added for additional information or to avoid overloading sieves, or both.
- The sieves are nested in order of increasing size from the bottom to the top, and the sample, or a portion of the sample, is placed on the top sieve.
- The loaded sieves are shaken in a mechanical shaker for approximately 10 minutes, refer to Annex A, *Time Evaluation*.

- Care must be taken so that sieves are not overloaded, refer to Annex B, *Overload Determination*. The sample may be sieved in increments and the mass retained for each sieve added together from each sample increment to avoid overloading sieves.

Sample Preparation

Obtain samples according to the FOP for AASHTO R 90 and reduce to sample size, shown in Table 1, according to the FOP for AASHTO R 76.

TABLE 1
Sample Sizes for Aggregate Gradation Test

Nominal Maximum Size* mm (in.)	Minimum Dry Mass g (lb)
125 (5)	300,000 (660)
100 (4)	150,000 (330)
90 (3 1/2)	100,000 (220)
75 (3)	60,000 (130)
63 (2 1/2)	35,000 (77)
50 (2)	20,000 (44)
37.5 (1 1/2)	15,000 (33)
25.0 (1)	10,000 (22)
19.0 (3/4)	5000 (11)
12.5 (1/2)	2000 (4)
9.5 (3/8)	1000 (2)
6.3 (1/4)	1000 (2)
4.75 (No. 4)	500 (1)

*Nominal maximum size: One sieve larger than the first sieve to retain more than 10 percent of the material using an agency specified set of sieves based on cumulative percent retained. Where large gaps between specification sieves exist, intermediate sieve(s) may be inserted to determine nominal maximum size.

Sample sizes in Table 1 are standard for aggregate sieve analysis, due to equipment restraints samples may need to be divided into several “subsamples.” For example, a gradation that requires 100 kg (220 lbs.) of material would not fit into a large tray shaker all at once.

Some agencies permit reduced sample sizes if it is proven that doing so is not detrimental to the test results. Some agencies require larger sample sizes. Check agency guidelines for required or permitted sample sizes.

Selection of Procedure

Agencies may specify which method to perform. If a method is not specified, perform Method A.

Overview

Method A

- Determine original dry mass of the sample
- Wash over a 75µm (No. 200) sieve
- Determine dry mass of washed sample
- Sieve washed sample
- Calculate and report percent retained and passing each sieve

Method B

- Determine original dry mass of the sample
- Wash over a 75 µm (No. 200) sieve
- Determine dry mass of washed sample
- Sieve sample through coarse sieves, 4.75 mm (No. 4) sieves and larger
- Determine mass of fine material, minus 4.75 mm (No. 4)
- Reduce fine material
- Determine mass of reduced portion
- Sieve reduced portion
- Calculate and report percent retained and passing each sieve

Method C

- Determine original dry mass of the sample
- Sieve sample through coarse sieves, 4.75 mm (No. 4) sieves and larger
- Determine mass of fine material, minus 4.75 mm (No. 4)
- Reduce fine material
- Determine mass of reduced portion
- Wash reduced portion over a 75µm (No. 200) sieve
- Determine dry mass of washed reduced portion
- Sieve washed reduced portion
- Calculate and report percent retained and passing each sieve

Procedure Method A

1. Dry the sample to constant mass 110 ± 5°C (230 ± 9°F) according to the FOP for AASHTO T 255. Cool to room temperature.
2. Determine and record the original dry mass of the sample to the nearest 0.1 percent or 0.1 g. Designate this mass as *M*.

   When the specification does not require the amount of material finer than 75 µm (No. 200) be determined by washing, skip to Step 11.
3. Nest a sieve, such as a 2.0 mm (No. 10), above the 75 µm (No. 200) sieve.
4. Place the sample in a container and cover with water.

Note 1: When required by the agency, add a detergent, dispersing solution, or other wetting agent to the water to assure a thorough separation of the material finer than the 75 µm (No. 200) sieve from the coarser particles. There should be enough wetting agent to produce a small amount of suds when the sample is agitated. Excessive suds may overflow the sieves and carry material away with them.

5. Agitate vigorously to ensure complete separation of the material finer than 75 µm (No. 200) from coarser particles and bring the fine material into suspension above the coarser material. Avoid degradation of the sample when using a mechanical washing device limit agitation to 10 min.
6. Immediately pour the wash water containing the suspended material over the nested sieves; be careful not to pour out the coarser particles or over fill the 75 µm (No. 200) sieve.
7. Add water to cover material remaining in the container, agitate, and repeat Step 5. Continue until the wash water is reasonably clear.
8. Remove the upper sieve and return material retained to the washed sample.
9. Rinse the material retained on the 75 µm (No. 200) sieve until water passing through the sieve is reasonably clear and detergent or dispersing agent is removed, if used.
10. Return all material retained on the 75 µm (No. 200) sieve to the container by rinsing into the washed sample.

Note 2: Excess water may be carefully removed with a bulb syringe; the removed water must be discharged back over the 75 µm (No. 200) sieve to prevent loss of fines.

11. Dry the washed sample to constant mass at 110 ± 5°C (230 ± 9°F)according to the FOP for AASHTO T 255. Cool to room temperature.
12. Determine and record the dry mass of the sample.
13. Select sieves required by the specification and those necessary to avoid overloading as described in Annex B. With a pan on bottom, nest the sieves increasing in size starting with the 75 µm (No. 200).
14. Place the sample, or a portion of the sample, on the top sieve. Sieves may already be in the mechanical shaker, if not place sieves in mechanical shaker and shake for the minimum time determined to provide complete separation for the sieve shaker being used (approximately 10 minutes, the time determined by Annex A).

Note 3: Excessive shaking (more than 10 minutes) may result in degradation of the sample.

15. Determine and record the individual or cumulative mass retained for each sieve and in the pan. Ensure that all material trapped in full openings of the sieve are removed and included in the mass retained.

Note 4: For sieves 4.75 mm (No. 4) and larger, check material trapped in less than a full opening by sieving over a full opening. Use coarse wire brushes to clean the 600 µm (No. 30) and larger sieves, and soft bristle brushes for smaller sieves.

Note 5: In the case of coarse / fine aggregate mixtures, distribute the minus 4.75 mm (No. 4) among two or more sets of sieves to prevent overloading of individual sieves.

16. Perform the *Check Sum* calculation – Verify the *total mass after sieving* compared to the *dry mass before sieving* is not more than 0.3 percent. The *dry mass before sieving* is the dry mass after wash or the original dry mass (*M*) if performing the sieve analysis without washing. Do not use test results for acceptance if the *Check Sum* result is more than 0.3 percent.
17. Calculate the total percentages passing, and the individual or cumulative percentages retained to the nearest 0.1 percent by dividing the individual sieve masses or cumulative sieve masses by the original dry mass (*M*) of the sample.
18. Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Method A Calculations

Check Sum

$$Check\ Sum = \frac{dry\ mass\ before\ seiving - total\ mass\ after\ sieving}{dry\ mass\ before\ sieving} \times 100$$

Percent Retained

$$IPR = \frac{IMR}{M} \times 100 \qquad or \qquad CPR = \frac{CMR}{M} \times 100$$

Where:

IPR	=	Individual Percent Retained
CPR	=	Cumulative Percent Retained
M	=	Original dry mass of the sample
IMR	=	Individual Mass Retained
CMR	=	Cumulative Mass Retained

Percent Passing (PP)

$$PP = PPP - IPR \qquad or \qquad PP = 100 - CPR$$

Where:

PP	=	Percent Passing
PPP	=	Previous Percent Passing

Method A Example Individual Mass Retained

Original dry mass of the sample (*M*):	5168.7 g
Dry mass of the sample after washing:	4911.3 g
Total mass after sieving equals	
Sum of Individual Masses Retained (IMR), including minus 75 µm (No. 200) in the pan:	4905.9 g
Amount of 75µm (No. 200) minus washed out (5168.7 g – 4911.3 g):	257.4 g

Check Sum

$$Check\ Sum = \frac{4911.3\ g - 4905.9\ g}{4911.3\ g} \times 100 = 0.1\%$$

The result is not more than 0.3 percent therefore the results can be used for acceptance purposes.

Individual Percent Retained (IPR) for 9.5 mm (3/8 in.) sieve:

$$IPR = \frac{619.2\ g}{5168.7\ g} \times 100 = 12.0\%$$

Percent Passing (PP) 9.5 mm (3/8 in.) sieve:

$$PP = 86.0\% - 12.0\% = 74.0\%$$

Reported Percent Passing = 74%

**Method A Individual
Gradation on All Sieves**

Sieve Size mm (in.)	Individual Mass Retained g (IMR)	Determine IPR by dividing IMR by *M* and multiplying by 100	Individual Percent Retained (IPR)	Determine PP by subtracting IPR from previous PP	Percent Passing (PP)	Reported Percent Passing*
19.0 (3/4)	0		0		100.0	100
12.5 (1/2)	724.7	$\frac{724.7}{5168.7} \times 100 =$	14.0	$100.0 - 14.0 =$	86.0	86
9.5 (3/8)	619.2	$\frac{619.2}{5168.7} \times 100 =$	12.0	$86.0 - 12.0 =$	74.0	74
4.75 (No. 4)	1189.8	$\frac{1189.8}{5168.7} \times 100 =$	23.0	$74.0 - 23.0 =$	51.0	51
2.36 (No. 8)	877.6	$\frac{877.6}{5168.7} \times 100 =$	17.0	$51.0 - 17.0 =$	34.0	34
1.18 (No. 16)	574.8	$\frac{574.8}{5168.7} \times 100 =$	11.1	$34.0 - 11.1 =$	22.9	23
0.600 (No. 30)	329.8	$\frac{329.8}{5168.7} \times 100 =$	6.4	$22.9 - 6.4 =$	16.5	17
0.300 (No. 50)	228.5	$\frac{228.5}{5168.7} \times 100 =$	4.4	$16.5 - 4.4 =$	12.1	12
0.150 (No. 100)	205.7	$\frac{205.7}{5168.7} \times 100 =$	4.0	$12.1 - 4.0 =$	8.1	8
0.075 (No. 200)	135.4	$\frac{135.7}{5168.7} \times 100 =$	2.6	$8.1 - 2.6 =$	5.5	5.5
minus 0.075 (No. 200) in the pan	20.4					
Total mass after sieving = sum of sieves + mass in the pan = 4905.9 g						
Original dry mass of the sample *(M)*: 5168.7g						

* Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Method A Example Cumulative Mass Retained

Original dry mass of the sample (*M*):	5168.7 g
Dry mass of the sample after washing:	4911.3 g
Total mass after sieving equals Final Cumulative Mass Retained (FCMR) (includes minus 75 µm (No. 200) from the pan):	4905.9 g
Amount of 75µm (No. 200) minus washed out (5168.7 g – 4911.3 g):	257.4 g

Check Sum

$$Check\ Sum = \frac{4911.3\ g - 4905.9\ g}{4911.3\ g} \times 100 = 0.1\%$$

The result is not more than 0.3 percent therefore the results can be used for acceptance purposes.

Cumulative Percent Retained (CPR) for 9.5 mm (3/8 in.) sieve:

$$CPR = \frac{1343.9\ g}{5168.7\ g} \times 100 = 26.0\%$$

Percent Passing (PP) 9.5 mm (3/8 in.) sieve:

$$PP = 100.0\% - 26.0\% = 74.0\%$$

Reported Percent Passing = 74%

Method A Cumulative
Gradation on All Sieves

Sieve Size mm (in.)	**Cumulative Mass Retained g (CMR)**	Determine CPR by dividing CMR by M and multiplying by 100	**Cumulative Percent Retained (CPR)**	Determine PP by subtracting CPR from 100.0	**Percent Passing (PP)**	**Reported Percent Passing***
19.0 (3/4)	0		0.0		100.0	100
12.5 (1/2)	724.7	$\frac{724.7}{5168.7} \times 100 =$	14.0	$100.0 - 14.0 =$	86.0	86
9.5 (3/8)	1343.9	$\frac{1343.9}{5168.7} \times 100 =$	26.0	$100.0 - 26.0 =$	74.0	74
4.75 (No. 4)	2533.7	$\frac{2533.7}{5168.7} \times 100 =$	49.0	$100.0 - 49.0 =$	51.0	51
2.36 (No. 8)	3411.3	$\frac{3411.3}{5168.7} \times 100 =$	66.0	$100.0 - 66.0 =$	34.0	34
1.18 (No. 16)	3986.1	$\frac{3986.1}{5168.7} \times 100 =$	77.1	$100.0 - 77.1 =$	22.9	23
0.600 (No. 30)	4315.9	$\frac{4315.9}{5168.7} \times 100 =$	83.5	$100.0 - 83.5 =$	16.5	17
0.300 (No. 50)	4544.4	$\frac{4544.4}{5168.7} \times 100 =$	87.9	$100.0 - 87.9 =$	12.1	12
0.150 (No. 100)	4750.1	$\frac{4750.1}{5168.7} \times 100 =$	91.9	$100.0 - 91.9 =$	8.1	8
0.075 (No. 200)	4885.5	$\frac{4885.5}{5168.7} \times 100 =$	94.5	$100.0 - 94.5 =$	5.5	5.5
FCMR	4905.9					
Total mass after sieving: 4905.9 g						
Original dry mass of the sample *(M)*: 5168.7 g						

* Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Procedure Method B

1. Dry the sample to constant mass at 110 ± 5°C (230 ± 9°F)according to the FOP for AASHTO T 255. Cool to room temperature.
2. Determine and record the original dry mass of the sample to the nearest 0.1 percent or 0.1 g. Designate this mass as *M*.

   When the specification does not require the amount of material finer than 75 µm (No. 200) be determined by washing, skip to Step 11.
3. Nest a protective sieve, such as a 2.0 mm (No. 10), above the 75 µm (No. 200) sieve.
4. Place the sample in a container and cover with water.

Note 1: If required by the agency, add a detergent, dispersing solution, or other wetting agent to the water to assure a thorough separation of the material finer than the 75 µm (No. 200) sieve from the coarser particles. There should be enough wetting agent to produce a small amount of suds when the sample is agitated. Excessive suds may overflow the sieves and carry material away with them.

5. Agitate vigorously to ensure complete separation of the material finer than 75 µm (No. 200) from coarser particles and bring the fine material into suspension above the coarser material. Avoid degradation of the sample when using a mechanical washing device limit agitation to 10 min.
6. Immediately pour the wash water containing the suspended material over the nested sieves; be careful not to pour out the coarser particles or over fill the 75 µm (No. 200) sieve.
7. Add water to cover material remaining in the container, agitate, and repeat Step 5. Continue until the wash water is reasonably clear.
8. Remove the upper sieve and return material retained to the washed sample.
9. Rinse the material retained on the 75 µm (No. 200) sieve until water passing through the sieve is reasonably clear and detergent or dispersing agent is removed, if used.
10. Return all material retained on the 75 µm (No. 200) sieve to the container by rinsing into the washed sample.

Note 2: Excess water may be carefully removed with a bulb syringe; the removed water must be discharged back over the 75 µm (No. 200) sieve to prevent loss of fines.

11. Dry the washed sample to constant mass at 110 ± 5°C (230 ± 9°F) according to the FOP for AASHTO T 255. Cool to room temperature.
12. Determine and record the dry mass after wash.
13. Select sieves required by the specification and those necessary to avoid overloading as described in Annex B. With a pan on bottom, nest the sieves increasing in size starting with the 4.75 mm (No. 4).
14. Place the sample, or a portion of the sample, on the top sieve. Sieves may already be in the mechanical shaker, if not place the sieves in the mechanical shaker and shake for the minimum time determined to provide complete separation for the sieve shaker being used (approximately 10 minutes, the time determined by Annex A).

Note 3: Excessive shaking (more than 10 minutes) may result in degradation of the sample.

15. Determine and record the individual or cumulative mass retained for each sieve. Ensure that all particles trapped in full openings of the sieve are removed and included in the mass retained.

Note 4: For sieves 4.75 mm (No. 4) and larger, check material trapped in less than a full opening by sieving over a full opening. Use coarse wire brushes to clean the 600 µm (No. 30) and larger sieves, and soft hair bristle for smaller sieves.

16. Determine and record the mass of the minus 4.75 mm (No. 4) material in the pan. Designate this mass as M_1.
17. Perform the *Coarse Check Sum* calculation – Verify the *total mass after coarse sieving* compared to the *dry mass before sieving* to not more than 0.3 percent. The *dry mass before sieving* is the dry mass after wash or the original dry mass (M) if performing the sieve analysis without washing. Do not use test results for acceptance if the *Check Sum* result is more than 0.3 percent.
18. Reduce the minus 4.75 mm (No. 4) according to the FOP for AASHTO R 76 to produce a sample with a minimum mass of 500 g. Determine and record the mass of the minus 4.75 mm (No. 4) split, designate this mass as M_2.
19. Select sieves required by the specification and those necessary to avoid overloading as described in Annex B. With a pan on bottom, nest the sieves increasing in size starting with the 75 µm (No. 200) up to, but not including, the 4.75 mm (No. 4) sieve.
20. Place the sample portion on the top sieve and place the sieves in the mechanical shaker. Shake for the minimum time determined to provide complete separation for the sieve shaker being used (approximately 10 minutes, the time determined by Annex A).
21. Determine and record the individual or cumulative mass retained for each sieve and in the pan. Ensure that all particles trapped in full openings of the sieve are removed and included in the mass retained. (See Note 4.)
22. Perform the *Fine Check Sum* calculation – Verify the *total mass after sieving* compared to the *dry mass before sieving* (M_2) is not more than 0.3 percent. Do not use test results for acceptance if the *Check Sum* result is more than 0.3 percent.
23. Calculate to the nearest 0.1 percent, the Individual Mass Retained (IMR) or Cumulative Mass Retained (CMR) of the size increment of the reduced sample and the original sample.
24. Calculate the total percent passing.
25. Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Method B Calculations

Check Sum

$$Coarse\ Check\ Sum = \frac{dry\ mass\ before\ sieveing - total\ mass\ after\ coarse\ sieving}{dry\ mass\ before\ sieving} \times 100$$

$$Fine\ Check\ Sum = \frac{M_2 - total\ mass\ after\ fine\ sieving}{M_2} \times 100$$

Percent Retained for 4.75 mm (No. 4) and larger

$$IPR = \frac{IMR}{M} \times 100 \qquad or \qquad CPR = \frac{CMR}{M} \times 100$$

Where:

IPR	=	Individual Percent Retained
CPR	=	Cumulative Percent Retained
M	=	Original dry mass of the sample
IMR	=	Individual Mass Retained
CMR	=	Cumulative Mass Retained

Percent Passing (PP) for 4.75 mm (No. 4) and larger

$$PP = PPP - IPR \qquad or \qquad PP = 100 - CPR$$

Where:

PP	=	Percent Passing
PPP	=	Previous Percent Passing

Minus 4.75mm (No. 4) adjustment factor (R)

The mass of material retained for each sieve is multiplied by the adjustment factor, the total mass of the minus 4.75 mm (No. 4) from the pan, M_1, divided by the mass of the reduced split of minus 4.75 mm (No. 4), M_2. For consistency, this adjustment factor is carried to three decimal places.

$$R = \frac{M_1}{M_2}$$

where:

R	= minus 4.75 mm (No. 4) adjustment factor
M_1	= total mass of minus 4.75 mm (No. 4) before reducing
M_2	= mass of the reduced split of minus 4.75 mm (No. 4)

Total Individual Mass Retained (TIMR):

$$TIMR = R \times B$$

where:

TIMR	= Total Individual Mass Retained
R	= minus 4.75 mm (No. 4) adjustment factor
B	= individual mass of the size increment in the reduced portion sieved

Total Cumulative Mass Retained (TCMR)

$$TCMR = (R \times B) + D$$

where:

TCMR	= Total Cumulative Mass Retained
R	= minus 4.75 mm (No. 4) adjustment factor
B	= cumulative mass of the size increment in the reduced portion sieved
D	= cumulative mass of plus 4.75mm (No. 4) portion of sample

Method B Example Individual Mass Retained

Dry mass of total sample, before washing:	3214.0 g
Dry mass of sample after washing:	3085.1 g
Total mass after sieving	
Sum of Individual Masses Retained (IMR) plus the minus 4.75 mm (No. 4) from the pan:	3085.0 g
Amount of 75 µm (No. 200) minus washed out (3214.0 g – 3085.1 g):	128.9 g

Coarse Check Sum

$$Coarse\ Check\ Sum = \frac{3085.1\ g - 3085.0\ g}{3085.1\ g} \times 100 = 0.0\%$$

The result is not more than 0.3 percent therefore the results can be used for acceptance purposes.

Individual Percent Retained (IPR) for 9.5 mm (3/8 in.) sieve

$$IPR = \frac{481.4\ g}{3214.0\ g} \times 100 = 15.0\%$$

Percent Passing (PP) for 9.5 mm (3/8 in.) sieve:

$$PP = 95.0\% - 15.0\% = 80.0\%$$

Reported Percent Passing = 80%

Method B Individual
Gradation on Coarse Sieves

Sieve Size mm (in.)	Individual Mass Retained g (IMR)	Determine IPR by dividing IMR by M and multiplying by 100	Individual Percent Retained (IPR)	Determine PP by subtracting IPR from previous PP	Percent Passing (PP)
16.0 (5/8)	0		0		100
12.5 (1/2)	161.1	$\frac{161.1}{3214.0} \times 100 =$	5.0	$100.0 - 5.0 =$	95.0
9.50 (3/8)	481.4	$\frac{481.4}{3214.0} \times 100 =$	15.0	$95.0 - 15.0 =$	80.0
4.75 (No. 4)	475.8	$\frac{475.8}{3214.0} \times 100 =$	14.8	$80.0 - 14.8 =$	65.2
Minus 4.75 (No. 4) in the pan	1966.7 (**M_1**)				
Total mass after sieving: sum of sieves + mass in the pan = 3085.0 g					
Original dry mass of the sample *(M)*: 3214.0 g					

Fine Sample

The minus 4.75 mm (No. 4) from the pan, M_1 (1966.7 g), was reduced according to the FOP for AASHTO R 76, to at least 500 g. In this case, the reduced mass was determined to be **512.8 g**. This is M_2.

The reduced mass was sieved.

Total mass after sieving equals

Sum of Individual Masses Retained (IMR) including minus 75 µm (No. 200) in the pan 511.8 g

Fine Check Sum

$$Fine\ Check\ Sum = \frac{512.8\ g - 511.8\ g}{512.8\ g} \times\ 100 = 0.2\%$$

The result is not more than an 0.3 percent therefore the results can be used for acceptance purposes.

Adjustment Factor (*R*) for Total Individual Mass Retained (TIMR) on minus 4.75 (No. 4) sieves

The mass of material retained for each sieve is multiplied by the adjustment factor (*R*) carried to three decimal places.

$$R = \frac{M_1}{M_2} = \frac{1{,}966.7\ g}{512.8\ g} = 3.835$$

where:

R = minus 4.75 mm (No. 4) adjustment factor

M_1 = total mass of minus 4.75 mm (No. 4) from the pan

M_2 = mass of the reduced split of minus 4.75 mm (No. 4)

Each "individual mass retained" on the fine sieves must be multiplied by *R* to obtain the *Total Individual Mass Retained (TIMR)*.

Total Individual Mass Retained (TIMR) for 2.00 mm (No. 10) sieve

$$TIMR\ = 3.835\ \times\ 207.1\ g\ =\ 794.2\ g$$

Individual Percent Retained (IPR) for 2.00 mm (No. 10) sieve:

$$IPR\ = \frac{794.2\ g}{3214.0\ g} \times 100 = 24.7\%$$

Percent Passing (PP) 2 mm (No. 10) sieve:

$$PP = 65.2\% - 24.7\% = 40.5\%$$

Reported Percent Passing = 41%

Method B Individual Gradation on Fine Sieves

Sieve Size mm (in.)	Individual Mass Retained g (IMR)	Determine TIMR by multiplying IMR by R $\left(\frac{M_1}{M_2}\right)$	Total Individual Mass Retained (TIMR)
2.00 (No. 10)	207.1	$207.1 \times 3.835 =$	794.2
0.425 (No. 40)	187.9	$187.9 \times 3.835 =$	720.6
0.210 (No. 80)	59.9	$59.9 \times 3.835 =$	229.7
0.075 (No. 200)	49.1	$49.1 \times 3.835 =$	188.3
minus 0.075 (No. 200) in the pan	7.8		
Total mass after sieving: sum of fine sieves + the mass in the pan = 511.8 g			

Method B Individual
Final Gradation on All Sieves

Sieve Size mm (in.)	Total Individual Mass Retained g (TIMR)	Determine IPR by dividing TIMR by M and multiplying by 100	Individual Percent Retained (IPR)	Determine PP by subtracting IPR from previous PP	Percent Passing (PP)	Reported Percent Passing*
16.0 (5/8)	0		0		100	100
12.5 (1/2)	161.1	$\frac{161.1}{3214.0} \times 100 =$	5.0	$100.0 - 5.0 =$	95.0	95
9.50 (3/8)	481.4	$\frac{481.4}{3214.0} \times 100 =$	15.0	$95.0 - 15.0 =$	80.0	80
4.75 (No. 4)	475.8	$\frac{475.8}{3214.0} \times 100 =$	14.8	$80.0 - 14.8 =$	65.2	65
2.00 (No. 10)	794.2	$\frac{794.2}{3214.0} \times 100 =$	24.7	$65.2 - 24.7 =$	40.5	41
0.425 (No. 40)	720.6	$\frac{720.6}{3214.0} \times 100 =$	22.4	$40.5 - 22.4 =$	18.1	18
0.210 (No. 80)	229.7	$\frac{229.7}{3214.0} \times 100 =$	7.1	$18.1 - 7.1 =$	11.0	11
0.075 (No. 200)	188.3	$\frac{188.3}{3214.0} \times 100 =$	5.9	$11.0 - 5.9 =$	5.1	5.1
minus 0.075 (No. 200) in the pan	29.9					
Original dry mass of the sample *(M)*: 3214.0 g						

* Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Method B Example Cumulative Mass Retained

Original dry mass of the sample *(M)*:	3214.0 g
Dry mass of sample after washing:	3085.1 g
Total mass after sieving equals	
Cumulative Mass Retained (CMR) on the 4.75 (No. 4) plus the minus 4.75 mm (No. 4) in the pan:	3085.0 g
Amount of 75 µm (No. 200) minus washed out (3214.0 g – 3085.1 g):	128.9 g

Coarse Check Sum

$$Coarse\ Check\ Sum = \frac{3085.1\ g - 3085.0\ g}{3085.1\ g} \times 100 = 0.0\%$$

The result is not more than 0.3 percent therefore the results can be used for acceptance purposes.

Cumulative Percent Retained (CPR) for 9.5 mm (3/8 in.) sieve

$$CPR\ = \frac{642.5\ g}{3214.0\ g} \times 100 = 20.0\%$$

Percent Passing (PP) for 9.5 mm (3/8 in.) sieve

$$PP = 100.0\% - 20.0\% = 80.0\%$$

Reported Percent Passing = 80%

Method B Cumulative
Gradation on Coarse Sieves

Sieve Size mm (in.)	Cumulative Mass Retained g (CMR)	Determine CPR by dividing CMR by M and multiplying by 100	Cumulative Percent Retained (CPR)	Determine PP by subtracting CPR from 100.0	Percent Passing (PP)
16.0 (5/8)	0		0		100
12.5 (1/2)	161.1	$\frac{161.1}{3214.0} \times 100 =$	5.0	$100.0 - 5.0 =$	95.0
9.50 (3/8)	642.5	$\frac{642.5}{3214.0} \times 100 =$	20.0	$100.0 - 20.0 =$	80.0
4.75 (No. 4)	1118.3 (*D*)	$\frac{1118.3}{3214.0} \times 100 =$	34.8	$100.0 - 34.8 =$	65.2
Minus 4.75 (No. 4) in the pan	1966.7 (M_1)				
CMR: 1118.3 + 1966.7 = 3085.0					
Original dry mass of the sample *(M)*: 3214.0 g					

Fine Sample

The mass of minus 4.75 mm (No. 4) material in the pan, M_1 (1966.7 g), was reduced according to the FOP for AASHTO R 76, to at least 500 g. In this case, the reduced mass was determined to be **512.8 g**. This is M_2.

The reduced mass was sieved.

Total mass after fine sieving equals

Final Cumulative Mass Retained (FCMR) (includes minus 75 µm (No. 200) from the pan): 511.8 g

Fine Check Sum

$$Fine\ Check\ Sum = \frac{512.8\ g - 511.8\ g}{512.8\ g} \times 100 = 0.2\%$$

The result is not more than 0.3 percent therefore the results can be used for acceptance purposes.

The cumulative mass of material retained for each sieve is multiplied by the adjustment factor (R) carried to three decimal places to obtain the *Adjusted Cumulative Mass Retained (ACMR)* and added to the cumulative mass retained on the 4.75 mm (No. 4) sieve, *D,* to obtain the *Total Cumulative Mass Retained (TCMR)*.

Adjustment factor (*R*) for Adjusted Cumulative Mass Retained (ACMR) in minus 4.75 (No. 4) sieves.

$$R = \frac{M_1}{M_2} = \frac{1{,}966.7\ g}{512.8\ g} = 3.835$$

where:

R	= minus 4.75 mm (No. 4) adjustment factor
M_1	= total mass of minus 4.75 mm (No. 4) from the pan
M_2	= mass of the reduced split of minus 4.75 mm (No. 4)

Adjusted Cumulative Mass Retained (ACMR) for the 2.00 mm (No. 10) sieve

$$ACMR = 3.835 \times 207.1\ g = 794.2\ g$$

Total Cumulative Mass Retained (TCMR) for the 2.00 mm (No. 10) sieve

$$TCMR = 794.2\ g + 1118.3\ g = 1912.5\ g$$

Cumulative Percent Retained (CPR) for 2.00 mm (No. 10) sieve:

$$CPR = \frac{1912.5\ g}{3214.0\ g} \times 100 = 59.5\%$$

Percent Passing (PP) 2.00 mm (No. 10) sieve:

$$PP = 100.0\% - 59.5\% = 40.5\%$$

Reported Percent Passing = 41%

Method B Cumulative
Gradation on Fine Sieves

Sieve Size mm (in.)	**Cumulative Mass Retained, g (CMR)**	Determine TCMR by multiplying CMR by R $\left(\frac{M_1}{M_2}\right)$ and adding D	**Total Cumulative Mass Retained (TCMR)**
2.00 (No. 10)	207.1	$207.1 \times 3.835 + 1118.3 =$	1912.5
0.425 (No. 40)	395.0	$395.0 \times 3.835 + 1118.3 =$	2633.1
0.210 (No. 80)	454.9	$454.9 \times 3.835 + 1118.3 =$	2862.8
0.075 (No. 200)	504.0	$504.0 \times 3.835 + 1118.3 =$	3051.1
FCMR	511.8		
Total: sum of masses on fine sieves + minus 75 µm (No. 200) in the pan = 511.8			

Method B Cumulative
Final Gradation on All Sieves

Sieve Size mm (in.)	**Total Cumulative Mass Retained g (TCMR)**	Determine CPR by dividing CMR by M and multiplying by 100	**Cumulative Percent Retained (CPR)**	Determine PP by subtracting CPR from 100.0	**Percent Passing (PP)**	**Reported Percent Passing***
16.0 (5/8)	0		0		100.0	100
12.5 (1/2)	161.1	$\frac{161.1}{3214.0} \times 100 =$	5.0	$100.0 - 5.0 =$	95.0	95
9.5 (3/8)	642.5	$\frac{642.5}{3214.0} \times 100 =$	20.0	$100.0 - 20.0 =$	80.0	80
4.75 (No. 4)	1118.3 (*D*)	$\frac{1118.3}{3214.0} \times 100 =$	34.8	$100.0 - 34.8 =$	65.2	65
2.00 (No. 10)	1912.5	$\frac{1912.5}{3214.0} \times 100 =$	59.5	$100.0 - 59.5 =$	40.5	41
0.425 (No. 40)	2633.1	$\frac{2633.1}{3214.0} \times 100 =$	81.9	$100.0 - 81.9 =$	18.1	18
0.210 (No. 80)	2862.8	$\frac{2862.8}{3214.0} \times 100 =$	89.1	$100.0 - 89.1 =$	10.9	11
0.075 (No. 200)	3051.1	$\frac{3051.1}{3214.0} \times 100 =$	94.9	$100.0 - 94.9 =$	5.1	5.1
FCMR	3081.1					
Original dry mass of the sample *(M):* 3214.0 g						

* Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Procedure Method C

1. Dry the sample to constant mass at 110 ± 5°C (230 ± 9°F) according to the FOP for AASHTO T 255. Cool to room temperature.
2. Determine and record the original dry mass of the sample to the nearest 0.1 percent or 0.1 g. Designate this mass as *M***.**
3. Break up any aggregations or lumps of clay, silt, or adhering fines to pass the 4.75 mm (No. 4) sieve.
4. Select sieves required by the specification and those necessary to avoid overloading as described in Annex B. With a pan on bottom, nest the sieves increasing in size starting with the 4.75 mm (No. 4) sieve.
5. Place the sample, or a portion of the sample, on the top sieve. Sieves may already be in the mechanical shaker, if not place the sieves in the mechanical shaker and shake for the minimum time determined to provide complete separation for the sieve shaker being used (approximately 10 minutes, the time determined by Annex A).

Note 1: Excessive shaking (more than 10 minutes) may result in degradation of the sample.

6. Determine and record the cumulative mass retained for each sieve. Ensure that all material trapped in full openings of the sieve are removed and included in the mass retained.

Note 2: For sieves 4.75 mm (No. 4) and larger, check material trapped in less than a full opening sieving over a full opening. Use coarse wire brushes to clean the 600 µm (No. 30) and larger sieves, and soft bristle brush for smaller sieves.

7. Determine and record the mass of the minus 4.75 mm (No. 4) material in the pan. Designate this mass as M_1.
8. Perform the *Coarse Check Sum* calculation –Verify the *total mass after coarse sieving* compared to the *original dry mass (M*) is not more than 0.3 percent.
9. Reduce the minus 4.75 mm (No. 4) according to the FOP for AASHTO R 76, to produce a sample with a minimum mass of 500 g.
10. Determine and record the mass of the minus 4.75 mm (No. 4) split, designate this mass as M_3.
11. Nest a protective sieve, such as a 2.0 mm (No. 10), above the 75 µm (No. 200) sieve.
12. Place the sample in a container and cover with water.

Note 3: If required by the agency, adda detergent, dispersing solution, or other wetting agent to the water to assure a thorough separation of the material finer than the 75 µm (No. 200) sieve from the coarser particles. There should be enough wetting agent to produce a small amount of suds when the sample is agitated. Excessive suds may overflow the sieves and carry material away with them.

13. Agitate vigorously to ensure complete separation of the material finer than 75 µm (No. 200) from coarser particles and bring the fine material into suspension above the coarser material. Avoid degradation of the sample when using a mechanical washing device limit agitation to 10 min.

14. Immediately pour the wash water containing the suspended material over the nested sieves; be careful not to pour out the coarser particles or over fill the 75 µm (No. 200) sieve.
15. Add water to cover material remaining in the container, agitate, and repeat Step 12. Repeat until the wash water is reasonably clear.
16. Remove the upper sieve and return material retained to the washed sample.
17. Rinse the material retained on the 75 µm (No. 200) sieve until water passing through the sieve is reasonably clear and detergent or dispersing agent is removed, if used.
18. Return all material retained on the 75 µm (No. 200) sieve to the container by flushing into the washed sample.

Note 4: Excess water may be carefully removed with a bulb syringe; the removed water must be discharged back over the 75 µm (No. 200) sieve to prevent loss of fines.

19. Dry the washed sample portion to constant mass at 110 ± 5°C (230 ± 9°F) according to the FOP for AASHTO T 255. Cool to room temperature. Determine and record the dry mass, designate this mass as *dry mass before sieving*.
20. Select sieves required by the specification and those necessary to avoid overloading as described in Annex B. With a pan on bottom, nest the sieves increasing in size starting with the 75 µm (No. 200) sieve up to, but not including the 4.75 mm (No. 4) sieve.
21. Place the sample portion on the top sieve. Place the sieves in the mechanical shaker and shake for the minimum time determined to provide complete separation for the sieve shaker being used (approximately 10 minutes, the time determined by Annex A).

Note 5: Excessive shaking (more than 10 minutes) may result in degradation of the sample.

22. Determine and record the cumulative mass retained for each sieve. Ensure that all material trapped in full openings of the sieve are removed and included in the mass retained.

Note 6: For sieves 4.75 mm (No. 4) and larger, check material trapped in less than a full opening by sieving over a full opening. Use coarse wire brushes to clean the 600 µm (No. 30) and larger sieves, and soft bristle brushes for smaller sieves.

23. Perform the *Fine Check Sum* calculation – Verify the *total mass after fine sieving* compared to the *dry mass before sieving* is not more than 0.3 percent. Do not use test results for acceptance if the *Check Sum* is more than 0.3 percent.
24. Calculate the Cumulative Percent Retained (CPR) and Percent Passing (PP) for the 4.75 mm (No. 4) and larger.
25. Calculate the Cumulative Percent Retained ($CPR_{-\#4}$) and the Percent Passing ($PP_{-\#4}$) for minus 4.75 mm (No. 4) split and Percent Passing (PP) for the minus 4.75 mm (No. 4).
26. Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Method C Calculations

Check Sum

$$\text{Coarse check sum} = \frac{M - \text{total mass after coarse sieving}}{M} \times 100$$

$$\text{Fine check sum} = \frac{\text{dry mass before sieving} - \text{total mass after fine sieving}}{\text{dry mass before sieving}} \times 100$$

where:

M = Original dry mass of the sample

Cumulative Percent Retained (CPR) for 4.75 mm (No. 4) sieve and larger

$$CPR = \frac{CMR}{M} \times 100$$

where:

CPR = Cumulative Percent Retained of the size increment for the total sample

CMR = Cumulative Mass Retained of the size increment for the total sample

M = Total dry sample mass before washing

Percent Passing (PP) 4.75 mm (No. 4) sieve and larger

$$PP = 100 - CPR$$

where:

PP = Percent Passing of the size increment for the total sample

CPR = Cumulative Percent Retained of the size increment for the total sample

Or calculate PP for sieves larger than 4.75 mm (No. 4) sieve without calculating CPR

$$\frac{M - CMR}{M} \times 100$$

Cumulative Percent Retained ($CPR_{-\#4}$) for minus 4.75 mm (No. 4) split

$$CPR_{-\#4} = \frac{CMR_{-\#4}}{M_3} \times 100$$

where:

$CPR_{-\#4}$	=	Cumulative Percent Retained for the sieve sizes of M_3
$CMR_{-\#4}$	=	Cumulative Mass Retained for the sieve sizes of M_3
M_3	=	Total mass of the minus 4.75 mm (No. 4) split before washing

Percent Passing ($PP_{-\#4}$) for minus 4.75 mm (No. 4) split

$$PP_{-\#4} = 100 - CPR_{-\#4}$$

where:

$PP_{-\#4}$	=	Percent Passing for the sieve sizes of M_3
$CPR_{-\#4}$	=	Cumulative Percent Retained for the sieve sizes of M_3

Percent Passing (PP) for sieves smaller than 4.75 mm (No. 4) sieve

$$PP = \frac{(PP_{-\#4} \times \#4\ PP)}{100}$$

where:

PP	=	Total Percent Passing
$PP_{-\#4}$	=	Percent Passing for the sieve sizes of M_3
#4 PP	=	Total Percent Passing the 4.75 mm (No. 4) sieve

Or calculate PP for sieves smaller than 4.75 mm (No. 4) sieve without calculating $CPR_{-\#4}$ and $PP_{-\#4}$

$$PP = \frac{\#4\ PP}{M_3} \times (M_3 - CMR_{-\#4})$$

where:

PP	=	Total Percent Passing
#4 PP	=	Total Percent Passing the 4.75 mm (No. 4) sieve
M_3	=	Total mass of the minus 4.75 mm (No. 4) split before washing
$CMR_{-\#4}$	=	Cumulative Mass Retained for the sieve sizes of M_3

Method C Example

Original dry mass of the sample (*M*): 3304.5 g

Total mass after sieving equals

Cumulative Mass Retained (CMR) on the 4.75 (No. 4) plus the minus 4.75 mm (No. 4) from the pan: 3085.0 g

Coarse Check Sum

$$Coarse\ Check\ Sum = \frac{3304.5\ g - 3304.5\ g}{3304.5\ g} \times 100 = 0.0\%$$

The result is not more than 0.3 percent therefore the results can be used for acceptance purposes.

Cumulative Percent Retained (CPR) for the 9.5 mm (3/8 in.) sieve:

$$CPR = \frac{604.1\ g}{3304.5\ g} \times 100 = 18.3\%$$

Percent Passing (PP) for the 9.5 mm (3/8 in.) sieve:

$$PP = 100.0\% - 18.3\% = 81.7\%$$

Reported Percent Passing = 82%

Example for Alternate Percent Passing (PP) formula for the 9.5 mm (3/8 in.) sieve:

$$PP = \frac{3304.5 \ - 604.1}{3304.5} \times 100 = 81.7\%$$

Reported Percent Passing = 82%

Method C Cumulative
Gradation on Coarse Sieves

Sieve Size mm (in.)	**Cumulative Mass Retained, g (CMR)**	Determine CPR by dividing CMR by M and multiplying by 100	**Cumulative Percent Retained (CPR)**	Determine PP by subtracting CPR from 100.0	**Percent Passing (PP)**	**Reported Percent Passing***
16.0 (5/8)	0		0.0		100.0	100
12.5 (1/2)	125.9	$\frac{125.9}{3304.5} \times 100 =$	3.8	$100.0 - 3.8 =$	96.2	96
9.50 (3/8)	604.1	$\frac{604.1}{3304.5} \times 100 =$	18.3	$100.0 - 18.3 =$	81.7	82
4.75 (No. 4)	1295.6	$\frac{1295.6}{3304.5} \times 100 =$	39.2	$100.0 - 39.2 =$	**60.8 (#4 PP)**	61
Mass in pan	2008.9					
CMR: 1295.6 + 2008.9 = 3304.5						
Original dry mass of the sample *(M)*: 3304.5						

Fine Sample

The pan (2008.9 g) was reduced according to the FOP for AASHTO R 76, to at least 500 g. In this case, the reduced mass was determined to be **527.6 g**. This is M_3.

Dry mass of minus 4.75mm (No. 4) reduced portion before wash (M_3):	527.6 g
Dry mass of minus 4.75mm (No. 4) reduced portion after wash:	495.3 g
Total mass after fine sieving equals	
Final Cumulative Mass Retained (FCMR) (includes minus 75 µm (No. 200) from the pan):	495.1 g

Fine Check Sum

$$Fine\ Check\ Sum = \frac{495.3\ g - 495.1\ g}{495.3\ g} \times 100 = 0.0\%$$

The result is not more than 0.3 percent therefore the results can be used for acceptance purposes.

Cumulative Percent Retained ($CPR_{-\#4}$) for minus 4.75 mm (No. 4) for the 2.0 mm (No. 10) sieve:

$$CPR_{-\#4} = \frac{194.3\ g}{527.6\ g} \times 100 = 36.8\%$$

Percent Passing ($PP_{-\#4}$) for minus 4.75 mm (No. 4) for the 2.0 mm (No. 10) sieve:

$$PP_{-\#4} = 100.0\% - 36.8\% = 63.2\%$$

Method C Cumulative
Gradation on Fine Sieves 77

Sieve Size mm (in.)	Cumulative Mass Retained g ($CMR_{-\#4}$)	Determine $CPR_{-\#4}$ by dividing CMR by M_3 and multiplying by 100	Cumulative Percent Retained$_{-\#4}$ ($CPR_{-\#4}$)	Determine $PP_{-\#4}$ by subtracting $CPR_{-\#4}$ from 100.0	Percent Passing$_{-\#4}$ ($PP_{-\#4}$)
2.0 (No. 10)	194.3	$\frac{194.3}{527.6} \times 100 =$	36.8	100.0 – 36.8 =	63.2
0.425 (No. 40)	365.6	$\frac{365.6}{527.6} \times 100 =$	69.3	100.0 – 69.3 =	30.7
0.210 (No. 80)	430.8	$\frac{430.8}{527.6} \times 100 =$	81.7	100.0 – 81.7 =	18.3
0.075 (No. 200)	484.4	$\frac{484.4}{527.6} \times 100 =$	91.8	100.0 – 91.8 =	8.2
FCMR	495.1				
Dry mass of minus 4.75mm (No. 4) reduced portion before wash *(M_3)*: 527.6 g					
Dry mass after washing: 495.3 g					

Percent Passing (PP) for the 2.0 mm (No. 10) sieve for the entire sample: 78

#4 PP (Total Percent Passing the 4.75 mm (No. 4) sieve) = 60.8%

$$PP = \frac{63.2\% \times 60.8\%}{100} = 38.4\%$$

Reported Percent Passing = 38%

Method C Cumulative
Final Gradation on All Sieves

Sieve Size mm (in.)	Cumulative Mass Retained g (CMR)	Cumulative Percent Retained (CPR)	Percent Passing (PP -#4)	Determine PP by multiplying $PP_{-\#4}$ by #4 PP and dividing by 100	Percent Passing (PP)	Reported Percent Passing*
16.0 (5/8)	0	0.0			100.0	100
12.5 (1/2)	125.9	3.8			96.2	96
9.5 (3/8)	604.1	18.3			81.7	82
4.75 (No. 4)	1295.6	39.2			**60.8 (#4 PP)**	61
2.0 (No. 10)	194.3	36.8	63.2	$\frac{63.2 \times 60.8}{100} =$	38.4	38
0.425 (No. 40)	365.6	69.3	30.7	$\frac{30.7 \times 60.8}{100} =$	18.7	19
0.210 (No. 80)	430.8	81.7	18.3	$\frac{18.3 \times 60.8}{100} =$	11.1	11
0.075 (No. 200)	484.4	91.8	8.2	$\frac{8.2 \times 60.8}{100} =$	5.0	5.0
FCMR	495.1					

* Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Example for Alternate Percent Passing (PP) for the 4.75 mm (No. 4) sieve for the entire sample:

#4 PP (Total Percent Passing the 4.75 mm (No. 4) sieve) = 60.8%

$$PP = \frac{60.8\%}{527.6} \times (527.6 - 194.3) = 38.4\%$$

Reported Percent Passing = 38%

Alternate Method C Cumulative Gradation on Coarse Sieves

Sieve Size mm (in.)	**Cumulative Mass Retained, g (CMR)**	Determine PP by subtracting CMR from M, and dividing the result by M then multiplying by 100	**Percent Passing (PP)**	**Reported Percent Passing***
16.0 (5/8)	0.0		100.0	100
12.5 (1/2)	125.9	$\frac{3304.5 - 125.9}{3304.5} \times 100 =$	96.2	96
9.5 (3/8)	604.1	$\frac{3304.5 - 604.1}{3304.5} \times 100 =$	81.7	82
4.75 (No. 4)	1295.6	$\frac{3304.5 - 1295.6}{3304.5} \times 100 =$	**60.8 (#4 PP)**	61
Mass in Pan	2008.9			
Cumulative sieved mass: 1295.6 + 2008.9 = 3304.5				
Original dry mass of the sample *(M)*: 3304.5				

Alternate Method C Cumulative Gradation on Fine Sieves

Sieve Size mm (in.)	**Cumulative Mass Retained g ($CMR_{-\#4}$)**	Determine $PP_{-\#4}$ by subtracting $CMR_{-\#4}$ from M_3, dividing result by M_3 and multiplying by 100	**Percent Passing$_{-\#4}$ ($PP_{-\#4}$)**
2.0 (No. 10)	194.3	$\frac{527.6 - 194.3}{527.6} \times 100 =$	63.2
0.425 (No. 40)	365.6	$\frac{527.6 - 365.6}{527.6} \times 100 =$	30.7
0.210 (No. 80)	430.8	$\frac{527.6 - 430.8}{527.6} \times 100 =$	18.3
0.075 (No. 200)	484.4	$\frac{527.6 - 484.4}{527.6} \times 100 =$	8.2
FCMR	495.1		
Dry mass of minus 4.75mm (No. 4) reduced portion before wash (**M_3**): 527.6 g			
Dry mass after washing: 495.3 g			

Alternate Method C Cumulative
Final Gradation on All Sieves

Sieve Size mm (in.)	**Percent Passing$_{-\#4}$ ($PP_{-\#4}$)**	Determine PP by multiplying $PP_{-\#4}$ by #4 PP and dividing by 100	**Determined Percent Passing (PP)**	**Reported Percent Passing***
16.0 (5/8)			100.0	100
12.5 (1/2)			96.2	96
9.5 (3/8)			81.7	82
4.75 (No. 4)			**60.8 (#4 PP)**	61
2.0 (No. 10)	63.2	$\frac{63.2 \times 60.8}{100} =$	38.4	38
0.425 (No. 40)	30.7	$\frac{30.7 \times 60.8}{100} =$	18.7	19
0.210 (No. 80)	18.3	$\frac{18.3 \times 60.8}{100} =$	11.1	11
0.075 (No. 200)	8.2	$\frac{8.2 \times 60.8}{100} =$	5.0	5.0

* Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

FINENESS MODULUS

Fineness Modulus (FM) is used in determining the degree of uniformity of the aggregate gradation in PCC mix designs. It is an empirical number relating to the fineness of the aggregate. The higher the FM the coarser the aggregate. Values of 2.40 to 3.00 are common for fine aggregate in PCC.

The sum of the cumulative percentages retained on specified sieves in the following table divided by 100 gives the FM.

Sample Calculation

	Example A				**Example B**		
	Percent				**Percent**		
		Retained				**Retained**	
Sieve Size mm (in)	**Passing**		**On Spec'd Sieves***		**Passing**		**On Spec'd Sieves***
75*(3)	100	0	0		100	0	0
37.5*(11/2)	100	0	0		100	0	0
19*(3/4)	15	85	85		100	0	0
9.5*(3/8)	0	100	100		100	0	0
4.75*(No.4)	0	100	100		100	0	0
2.36*(No.8)	0	100	100		87	13	13
1.18*(No.16)	0	100	100		69	31	31
0.60*(No.30	0	100	100		44	56	56
0.30*(No.50)	0	100	100		18	82	82
0.15*(100)	0	100	100		4	96	96
			∑ = 785				∑ = 278
			FM = 7.85				FM = 2.78

In decreasing size order, each * sieve is one-half the size of the preceding * sieve.

Report

- On forms approved by the agency
- Sample ID
- Percent passing for each sieve
- Individual mass retained for each sieve
- Individual percent retained for each sieve

  or

- Cumulative mass retained for each sieve
- Cumulative percent retained for each sieve
- FM to the nearest 0.01

Report percentages to the nearest 1 percent except for the percent passing the 75 µm (No. 200) sieve, which shall be reported to the nearest 0.1 percent.

ANNEX A
Time Evaluation

(Mandatory information)

The sieving time for each mechanical sieve shaker shall be checked at least annually to determine the time required for complete separation of the sample by the following method:

1. Shake the sample over nested sieves for approximately 10 minutes.
2. Provide a snug-fitting pan and cover for each sieve and hold in a slightly inclined position in one hand.
3. Hand shake each sieve by striking the side of the sieve sharply and with an upward motion against the heel of the other hand at the rate of about 150 times per minute, turning the sieve about one sixth of a revolution at intervals of about 25 strokes.

Note A1: A mallet may be used instead of the heel of the hand if comparable force is used.

If more than 0.5 percent by mass of the total sample before sieving passes any sieve after one minute of continuous hand shaking adjust shaker time and re-check.

In determining sieving time for sieve sizes larger than 4.75 mm (No. 4), limit the material on the sieve to a single layer of particles.

ANNEX B
Overload Determination

(Mandatory information)

The amount of material retained on a sieve may be regulated by:

- adding a sieve with larger openings immediately above the given sieve
- testing the sample in multiple increments
- testing the sample over a nest of sieves with a larger sieve-frame dimension.

Additional sieves may be necessary to provide other information, such as fineness modulus. For sieves with openings smaller than 4.75 mm (No. 4), the mass retained on any sieve shall not exceed 7 kg/m^2 (4 g/in^2) of sieving surface.

- For sieves with openings 4.75 mm (No. 4) and larger, the mass, in grams shall not exceed the product of 2.5 × (sieve opening in mm) × (effective sieving area). See Table B1.

TABLE B1

Maximum Allowable Mass of Material Retained on a Sieve, g
Nominal Sieve Size, mm (in.)
Exact size is smaller (see AASHTO T 27)

Sieve Size mm (in.)		203 dia (8)	305 dia (12)	305 by 305 (12 × 12)	350 by 350 (14 × 14)	372 by 580 (16 × 24)
				Sieving Area m^2		
		0.0285	**0.0670**	**0.0929**	**0.1225**	**0.2158**
90	(3 1/2)	*	15,100	20,900	27,600	48,500
75	(3)	*	12,600	17,400	23,000	40,500
63	(2 1/2)	*	10,600	14,600	19,300	34,000
50	(2)	3600	8400	11,600	15,300	27,000
37.5	(1 1/2)	2700	6300	8700	11,500	20.200
25.0	(1)	1800	4200	5800	7700	13,500
19.0	(3/4)	1400	3200	4400	5800	10,200
16.0	(5/8)	1100	2700	3700	4900	8600
12.5	(1/2)	890	2100	2900	3800	6700
9.5	(3/8)	670	1600	2200	2900	5100
6.3	(1/4)	440	1100	1500	1900	3400
4.75	(No. 4)	330	800	1100	1500	2600
-4.75	(-No. 4)	200	470	650	860	1510

MECHANICAL ANALYSIS OF EXTRACTED AGGREGATE FOP FOR AASHTO T 30

Scope

This procedure covers mechanical analysis of aggregate recovered from asphalt mix samples in accordance with AASHTO T 30-21. This FOP uses the aggregate recovered from the ignition furnace used in AASHTO T 308. AASHTO T 30 was developed for analysis of extracted aggregate and thus includes references to extracted bitumen and filter element, which do not apply in this FOP.

Sieve analyses determine the gradation or distribution of aggregate particles within a given sample to determine compliance with design and production standards.

Apparatus

- Balance or scale: Capacity sufficient for the sample mass, accurate to 0.1 percent of the sample mass or readable to 0.1 g and conforming to AASHTO M 231.
- Sieves, meeting the requirements of FOP for AASHTO T 27/T 11.
- Mechanical sieve shaker, meeting the requirements of FOP for AASHTO T 27/T 11.
- Mechanical Washing Apparatus (optional).
- Suitable drying equipment, meeting the requirements of the FOP for AASHTO T 255.
- Containers and utensils: A pan or vessel of a size sufficient to contain the sample covered with water and to permit vigorous agitation without loss of any part of the sample or water.
- Wetting Agent: Any dispersing agent, such as dishwashing detergent, that will promote separation of the fine materials.

Sample Sieving

- In this procedure, it is required to shake the sample over nested sieves. Sieves are selected to furnish information required by specification. Intermediate sieves are added for additional information or to avoid overloading sieves, or both.
- The sieves are nested in order of increasing size from the bottom to the top, and the test sample, or a portion of the test sample, is placed on the top sieve.
- The loaded sieves are shaken in a mechanical shaker for approximately 10 minutes, refer to Annex A; *Time Evaluation*.

Mass Verification

The aggregate sample mass, $M_{(T30)}$, determined in this method, shall agree with the mass of the aggregate remaining after ignition, M_f from the FOP for AASTHO T 308, within 0.1 percent. If the variation exceeds 0.1 percent, the results cannot be used for acceptance.

Procedure

1. Determine and record the mass of the sample that was removed from the basket in the FOP for AASHTO T 308 to 0.1 g. Designate this mass as $M_{(T30)}$.
2. Verify the mass of the sample is within 0.1 percent by subtracting $M_{(T30)}$ from $M_{f(T308)}$ dividing by $M_{f(T308)}$ and multiplying by 100 (see *Mass Verification Calculation* and example).

   If the variation exceeds 0.1 percent, the sieve analysis results cannot be used for acceptance.
3. Nest a sieve, such as a 2.0 mm (No. 10) or 1.18 mm (No. 16), above the 75µm (No. 200) sieve.
4. Place the test sample in a container and cover with water. Add a wetting agent to the water to assure a thorough separation of the material finer than the 75µm (No. 200) sieve from the coarser particles. There should be enough wetting agent to produce a small amount of suds when the sample is agitated. Excessive suds may overflow the sieves and carry material away with them.
5. Agitate vigorously to ensure complete separation of the material finer than 75µm (No. 200) from coarser particles and bring the fine material into suspension above the coarser material. Avoid degradation of the sample when using a mechanical washing device. Maximum agitation is 10 min.

Note 1: When mechanical washing equipment is used, the introduction of water, agitating, and decanting may be a continuous operation. Use care not to overflow or overload the 75µm (No. 200) sieve.

6. Immediately pour the wash water containing the suspended material over the nested sieves; be careful not to pour out the coarser particles or over fill the 75 µm (No. 200) sieve.
7. Add water to cover material remaining in the container, agitate, and repeat Step 6. Continue until the wash water is reasonably clear.
8. Remove the upper sieve, return material retained to the washed sample.
9. Rinse the material retained on the 75 µm (No. 200) sieve until water passing through the sieve is reasonably clear and wetting agent is removed.
10. Return all material retained on the 75 µm (No. 200) sieve to the washed sample by rinsing into the washed sample.
11. Dry the washed test sample to constant mass according to the FOP for AASHTO T 255. Cool to room temperature. Determine and record the "dry mass after washing."
12. Select sieves required by the specification and those necessary to avoid overloading. (See Annex B.) With a pan on bottom, nest the sieves increasing in size starting with the 75 µm (No. 200).
13. Place the test sample, or a portion of the test sample, on the top sieve.
14. Place sieves in mechanical shaker and shake for the minimum time determined to provide complete separation for the sieve shaker being used (approximately 10 minutes, the time determined by Annex A).

Note 2: Excessive shaking (more than 10 minutes) may result in degradation of the sample.

15. Determine and record the individual or cumulative mass retained for each sieve including the pan. Ensure that all material trapped in full openings of the sieves are removed and included in the mass retained.

Note 3: For sieves 4.75 mm (No. 4) and larger, check material trapped in less than a full opening by sieving over a full opening. Use coarse wire brushes to clean the 600 µm (No. 30) and larger sieves, and soft bristle brushes for smaller sieves.

16. Perform the *Check Sum* calculation – Verify the *total mass after sieving* of material compared to the *dry mass after washing* is not more than 0.2 percent. Do not use test results for acceptance if the *Check Sum* result is more than 0.2 percent.
17. Calculate the total percentages passing, and the individual or cumulative percentages retained, to the nearest 0.1 percent by dividing the individual sieve masses or cumulative sieve masses by the total mass of the initial dry sample.
18. Apply the Aggregate Correction Factor (ACF) to the calculated percent passing, as required in the FOP for AASHTO T 308 "Correction Factor," to obtain the reported percent passing.
19. Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Calculations

Mass verification

$$Mass\ verification = \frac{M_{f\,(T308)} - M_{(T30)}}{M_{f\,(T308)}} \times 100$$

Where:

$M_{f(T308)}$ = Mass of aggregate remaining in the basket assembly after ignition from the FOP for AASHTO T 308

$M_{(T30)}$ = Mass of aggregate sample obtained from the FOP for AASHTO T 308

Check Sum

$$check\ sum = \frac{dry\ mass\ after\ washing - total\ mass\ after\ sieving}{dry\ mass\ after\ washing} \times 100$$

Percent Retained

Individual

$$\text{IPR} = \frac{IMR}{M_{T30}} \times 100$$

Cumulative

$$\text{CPR} = \frac{CMR}{M_{T30}} \times 100$$

Where:

IPR	=	Individual Percent Retained
CPR	=	Cumulative Percent Retained
M_{T30}	=	Total dry sample mass before washing
IMR	=	Individual Mass Retained
CMR	=	Cumulative Mass Retained

Percent Passing

Individual

$$PP = PCP - IPR$$

Cumulative

$$PP = 100 - CPR$$

Where:

PP	=	Calculated Percent Passing
PCP	=	Previous Calculated Percent Passing

Reported Percent Passing

$$RPP = PP + ACF$$

Where:

RPP	=	Reported Percent Passing
ACF	=	Aggregate Correction Factor (if applicable)

Example

Mass verification

$$Mass\ verification = \frac{2422.5\ g\ -\ 2422.3\ g}{2422.5\ g} \times\ 100\ = 0.01\%$$

Given:

$M_{f(T308)}$	=	2422.5 g
$M_{(T30)}$	=	2422.3 g

Dry mass of total sample, before washing (M_{T30}):	2422.3 g
Dry mass of sample, after washing out the 75 µm (No. 200) minus:	2296.2 g
Amount of 75 µm (No. 200) minus washed out (2422.3 g – 2296.2g):	126.1 g

Check sum

$$check\ sum = \frac{2296.2\ g - 2295.3\ g}{2296.2\ g} \times 100 = 0.0\%$$

This is not more than 0.2 percent therefore the results can be used for acceptance purposes.

Percent Retained for the 75 µm (No. 200) sieve

$$IPR = \frac{63.5\ g}{2422.3\ g} \times 100 = 2.6\%$$

or

$$CPR = \frac{2289.6\ g}{2422.3\ g} \times 100 = 94.5\%$$

Percent Passing using IPR and PCP for the 75 µm (No. 200) sieve

$$PP = 8.1\% - 2.6\% = 5.5\%$$

Percent Passing using CPR for the 75 µm (No. 200) sieve

$$PP = 100.0\% - 94.5\% = 5.5\%$$

Reported Percent Passing

$$RPP = 5.5\% + (-0.6\%) = 4.9\%$$

Individual Gradation on All Sieves

Sieve Size mm (in.)	Individual Mass Retained g (IMR)	Determine IPR by dividing IMR by *M* and multiplying by 100	Individual Percent Retained (IPR)	Determine PP by subtracting IPR from Previous PP	Percent Passing (PP)	Agg. Corr. Factor from T 308 (ACF)	Reported Percent Passing*
19.0 (3/4)	0		0		100.0		100
12.5 (1/2)	346.9	$\frac{346.9}{2422.3} \times 100 =$	14.3	$100.0 - 14.3 =$	85.7		86
9.5 (3/8)	207.8	$\frac{207.8}{2422.3} \times 100 =$	8.6	$85.7 - 8.6 =$	77.1		77
4.75 (No. 4)	625.4	$\frac{625.4}{2422.3} \times 100 =$	25.8	$77.1 - 25.8 =$	51.3		51
2.36 (No. 8)	416.2	$\frac{416.2}{2422.3} \times 100 =$	17.2	$51.3 - 17.2 =$	34.1		34
1.18 (No. 16)	274.2	$\frac{274.2}{2422.3} \times 100 =$	11.3	$34.1 - 11.3 =$	22.8		23
0.600 (No. 30)	152.1	$\frac{152.1}{2422.3} \times 100 =$	6.3	$22.8 - 6.3 =$	16.5		17
0.300 (No. 50)	107.1	$\frac{107.1}{2422.3} \times 100 =$	4.4	$16.5 - 4.4 =$	12.1		12
0.150 (No. 100)	96.4	$\frac{96.4}{2422.3} \times 100 =$	4.0	$12.1 - 4.0 =$	8.1		8
0.075 (No. 200)	63.5	$\frac{63.5}{2422.3} \times 100 =$	2.6	$8.1 - 2.6 =$	5.5	-0.6 ($5.5 - 0.6 =$)	4.9
minus 75 µm (No. 200) in the pan	5.7						
Total mass after sieving = sum of sieves + mass in the pan = 2295.3 g							
Dry mass of total sample, before washing (M_{T30}): 2422.3g							

* Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Cumulative
Gradation on All Sieves

Sieve Size mm (in.)	Cumulative Mass Retained g (CMR)	Determine CPR by dividing CMR by M and multiplying by 100	Cumulative Percent Retained (CPR)	Determine PP by subtracting CPR from 100.0	Percent Passing (PP)	Agg. Corr. Factor from T 308 (ACF)	Reported Percent Passing*
19.0 (3/4)	0		0.0		100.0		100
12.5 (1/2)	346.9	$\frac{346.9}{2422.3} \times 100 =$	14.3	$100.0 - 14.3 =$	85.7		86
9.5 (3/8)	554.7	$\frac{554.7}{2422.3} \times 100 =$	22.9	$100.0 - 22.9 =$	77.1		77
4.75 (No. 4)	1180.1	$\frac{1180.1}{2422.3} \times 100 =$	48.7	$100.0 - 48.7 =$	51.3		51
2.36 (No. 8)	1596.3	$\frac{1596.3}{2422.3} \times 100 =$	65.9	$100.0 - 65.9 =$	34.1		34
1.18 (No. 16)	1870.5	$\frac{1870.5}{2422.3} \times 100 =$	77.2	$100.0 - 77.2 =$	22.8		23
0.600 (No. 30)	2022.6	$\frac{2022.6}{2422.3} \times 100 =$	83.5	$100.0 - 83.5 =$	16.5		17
0.300 (No. 50)	2129.7	$\frac{2129.7}{2422.3} \times 100 =$	87.9	$100.0 - 87.9 =$	12.1		12
0.150 (No. 100)	2226.1	$\frac{2226.1}{2422.3} \times 100 =$	91.9	$100.0 - 91.9 =$	8.1		8
0.075 (No. 200)	2289.6	$\frac{2289.6}{2422.3} \times 100 =$	94.5	$100.0 - 94.5 =$	5.5	-0.6 $(5.5 - 0.6 =)$	4.9
minus 75 µm (No. 200) in the pan	2295.3						
Total mass after sieving = 2295.3 g							
Dry mass of total sample, before washing (M_{T30}): 2422.3g							

* Report total percent passing to 1 percent except report the 75 µm (No. 200) sieve to 0.1 percent.

Report

- On forms approved by the agency
- Sample ID
- Depending on the agency, this may include:
  - Individual mass retained on each sieve
  - Individual percent retained on each sieve
  - Cumulative mass retained on each sieve
  - Cumulative percent retained on each sieve
  - Aggregate Correction Factor for each sieve from AASHTO T 308
  - Calculated percent passing each sieve to 0.1 percent
- Percent passing to the nearest 1 percent, except 75 µm (No. 200) sieve to the nearest 0.1 percent.

ANNEX A TIME EVALUATION

(Mandatory Information)

The minimum time requirement should be evaluated for each shaker at least annually by the following method:

1. Shake the sample over nested sieves for approximately 10 minutes.
2. Provide a snug-fitting pan and cover for each sieve and hold in a slightly inclined position in one hand.
3. Hand-shake each sieve by striking the side of the sieve sharply and with an upward motion against the heel of the other hand at the rate of about 150 times per minute, turning the sieve about one sixth of a revolution at intervals of about 25 strokes.

If more than 0.5 percent by mass of the total sample before sieving passes any sieve after one minute of continuous hand sieving adjust shaker time and re-check.

In determining sieving time for sieve sizes larger than 4.75 mm (No. 4), limit the material on the sieve to a single layer of particles.

ANNEX B OVERLOAD DETERMINATION

(Mandatory Information)

- For sieves with openings smaller than 4.75 mm (No. 4), the mass retained on any sieve shall not exceed 7 kg/m^2 (4 g/in^2) of sieving surface.
- For sieves with openings 4.75 mm (No. 4) and larger, the mass (in kg) shall not exceed the product of 2.5 x (sieve opening in mm) x (effective sieving area). See Table B1.

Additional sieves may be necessary to keep from overloading the specified sieves. The sample may also be sieved in increments or sieves with a larger surface area.

TABLE B1
Maximum Allowable Mass of Material Retained on a Sieve, g
Nominal Sieve Size, mm (in.)
Exact size is smaller (see AASHTO T 27)

Sieve Size mm (in.)		203 mm (8 in.) dia.	254 mm (10 in.) dia.	305 mm (12 in.) dia.
		Sieving Area m^2 (in^2)		
		0.0285 (44.2)	0.0457 (70.8)	0.0670 (103.5)
50	(2)	3600	5700	8400
37.5	(1 1/2)	2700	4300	6300
25.0	(1)	1800	2900	4200
19.0	(3/4)	1400	2200	3200
16.0	(5/8)	1100	1800	2700
12.5	(1/2)	890	1400	2100
9.5	(3/8)	670	1100	1600
6.3	(1/4)	440	720	1100
4.75	(No. 4)	330	540	800
-4.75	(-No. 4)	200	320	470

SPECIFIC GRAVITY AND ABSORPTION OF COARSE AGGREGATE FOP FOR AASHTO T 85

Scope

This procedure covers the determination of specific gravity and absorption of coarse aggregate in accordance with AASHTO T 85-22. Specific gravity may be expressed as bulk specific gravity (G_{sb}), bulk specific gravity, saturated surface dry (G_{sb} SSD), or apparent specific gravity (G_{sa}). G_{sb} and absorption are based on aggregate after soaking in water. This procedure is not intended to be used with lightweight aggregates.

Terminology

Absorption – the increase in the mass of aggregate due to water being absorbed into the pores of the material, but not including water adhering to the outside surface of the particles, expressed as a percentage of the dry mass. The aggregate is considered "dry" when it has been maintained at a temperature of 110 ±5°C (230 ±9°F) for sufficient time to remove all uncombined water.

Saturated Surface Dry (SSD) – condition of an aggregate particle when the permeable voids are filled with water, but no water is present on exposed surfaces.

Specific Gravity – the ratio of the mass, in air, of a volume of a material to the mass of the same volume of gas-free distilled water at a stated temperature.

Apparent Specific Gravity (G_{sa})– the ratio of the mass, in air, of a volume of the impermeable portion of aggregate to the mass of an equal volume of gas-free distilled water at a stated temperature.

Bulk Specific Gravity (G_{sb})– the ratio of the mass, in air, of a volume of aggregate (including the permeable and impermeable voids in the particles, but not including the voids between particles) to the mass of an equal volume of gas-free distilled water at a stated temperature.

Bulk Specific Gravity (SSD) (G_{sb} SSD) – the ratio of the mass, in air, of a volume of aggregate, including the mass of water within the voids filled to the extent achieved by submerging in water for 15 to 19 hours (but not including the voids between particles), to the mass of an equal volume of gas-free distilled water at a stated temperature.

Apparatus

- Balance or scale: with a capacity of 5 kg, sensitive to 0.1 g. Meeting the requirements of AASHTO M 231.
- Sample container: a wire basket of 3.35 mm (No. 6) or smaller mesh, with a capacity of 4 to 7 L (1 to 2 gal) to contain aggregate with a nominal maximum size of 37.5 mm (1 1/2 in.) or smaller; or a larger basket for larger aggregates, or both.
- Water tank: watertight and large enough to completely immerse aggregate and basket, equipped with an overflow valve to keep water level constant.

- Suspension apparatus: wire used to suspend apparatus shall be of the smallest practical diameter.
- Sieves: 4.75 mm (No. 4) or other sizes as needed, meeting the requirements of FOP for AASHTO T 27/T 11.
- Large absorbent cloth

Sample Preparation

1. Obtain the sample in accordance with the FOP for AASHTO R 90 (see Note 1).
2. Mix the sample thoroughly and reduce it to the approximate sample size required by Table 1 in accordance with the FOP for AASHTO R 76.
3. Reject all material passing the appropriate sieve by dry sieving.
4. Thoroughly wash sample to remove dust or other coatings from the surface.
5. Dry the sample to constant mass according to the FOP for AASHTO T 255/T 265 at a temperature of 110 ±5°C (230 ±9°F) and cool in air at room temperature for 1 to 3 hours.

Note 1: Where the absorption and specific gravity values are to be used in proportioning concrete mixtures in which the aggregates will be in their naturally moist condition, the requirement for initial drying to constant mass may be eliminated, and, if the surfaces of the particles in the sample have been kept continuously wet until test, the 15-to-19-hour soaking may also be eliminated.

6. Re-screen the sample over the appropriate sieve. Reject all material passing that sieve.
7. The sample shall meet or exceed the minimum mass given in Table 1.

Note 2: If this procedure is used only to determine the G_{sb} of oversized material for the FOP for AASHTO T 99 / T 180, the material can be rejected over the appropriate sieve. For T 99 / T 180 Methods A and B, use the 4.75 mm (No. 4) sieve; T 99 / T 180 Methods C and D use the 19 mm (3/4 in).

Table 1

Nominal Maximum Size* mm (in.)	Minimum Mass of Sample, g (lb)
12.5 (1/2) or less	2000 (4.4)
19.0 (3/4)	3000 (6.6)
25.0 (1)	4000 (8.8)
37.5 (1 1/2)	5000 (11)
50 (2)	8000 (18)
63 (2 1/2)	12,000 (26)
75 (3)	18,000 (40)

* One sieve larger than the first sieve to retain more than 10 percent of the material using an agency specified set of sieves based on cumulative percent retained. Where large gaps in specification sieves exist, intermediate sieve(s) may be inserted to determine nominal maximum size.

Procedure

1. Immerse the sample in water at room temperature for a period of 15 to 19 hours.

Note 3: When testing coarse aggregate of large nominal maximum size requiring large samples, it may be more convenient to perform the test on two or more subsamples, and then combine the values obtained.

2. Place the empty basket into the water bath and attach to the balance. Inspect the immersion tank to ensure the water level is at the overflow outlet height and basket is fully submerged. Tare the balance with the empty basket attached in the water bath.
3. Remove the sample from the water and roll it in a large absorbent cloth until all visible films of water are removed. Wipe the larger particles individually. If the sample dries past the SSD condition, immerse in water for 30 min, and then resume the process of surface-drying.

Note 4: A moving stream of air may be used to assist in the drying operation but take care to avoid evaporation of water from aggregate pores.

4. Determine the SSD mass of the sample, and record this and all subsequent masses to the nearest 0.1 g or 0.1 percent of the sample mass, whichever is greater. Designate this mass as “B.”
5. Immediately place the SSD sample in the sample container and weigh it in water maintained at 23.0 ±1.7°C (73.4 ±3°F). Shake the container to release entrapped air before recording the weight. Re-inspect the immersion tank to ensure the water level is at the overflow outlet height and basket is fully submerged. Designate this submerged weight as “C.”

Note 5: The container should be immersed to a depth sufficient to cover it and the sample during mass determination. Wire suspending the container should be of the smallest practical size to minimize any possible effects of a variable immersed length.

6. Remove the sample from the basket. Ensure all material has been removed. Place in a container of known mass.
7. Dry the sample to constant mass according to the FOP for AASHTO T 255 / T 265 at 110 ±5°C (230 ±9°F) and cool in air at room temperature for 1 to 3 hours.
8. Determine and record the dry mass. Designate this mass as “A.”

Calculations

Perform calculations and determine values using the appropriate formula below.

Bulk specific gravity (G_{sb})

$$G_{sb} = \frac{A}{B - C}$$

Bulk specific gravity, SSD (G_{sb} SSD)

$$G_{sb}SSD = \frac{B}{B - C}$$

Apparent specific gravity (G_{sa})

$$G_{sa} = \frac{A}{A - C}$$

Absorption

$$\text{Absorption} = \frac{B - A}{A} \times 100$$

Where:

A = oven dry mass, g

B = SSD mass, g

C = weight in water, g

Sample Calculations

Sample	A	B	C	B - C	A - C	B - A
1	2030.9	2044.9	1304.3	740.6	726.6	14.0
2	1820.0	1832.5	1168.1	664.4	651.9	12.5
3	2035.2	2049.4	1303.9	745.5	731.3	14.2

Sample	G_{sb}	G_{sb} SSD	G_{sa}	Absorption
1	2.742	2.761	2.795	0.7
2	2.739	2.758	2.792	0.7
3	2.730	2.749	2.783	0.7

These calculations demonstrate the relationship between G_{sb}, G_{sb} SSD, and G_{sa}. G_{sb} is always lowest since the volume includes voids permeable to water. G_{sb} SSD is always intermediate. G_{sa} is always highest since the volume does not include voids permeable to water. When running this test, check to make sure the values calculated make sense in relation to one another.

Report

- On forms approved by the agency
- Sample ID
- Specific gravity values to the nearest 0.001
- Absorption to the nearest 0.1 percent

SLUMP OF HYDRAULIC CEMENT CONCRETE FOP FOR AASHTO T 119

Scope

This procedure provides instructions for determining the slump of hydraulic cement concrete in accordance with AASHTO T 119-23. It is not applicable to non-plastic and non-cohesive concrete.

Warning—Fresh Hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.

Apparatus

- Mold: conforming to AASHTO T 119
  - Metal: a metal frustum of a cone provided with foot pieces and handles. The mold must be constructed without a seam. The interior of the mold shall be relatively smooth and free from projections such as protruding rivets. The mold shall be free from dents, deformations, and adhered mortar. A mold that clamps to a rigid nonabsorbent base plate is acceptable provided the clamping arrangement is such that it can be fully released without movement of the mold.
  - Non-metal: see AASHTO T 119, Section 5.1.2.
- Tamping rod: 16 mm (5/8 in.) diameter and 400 mm (16 in.) to 600 mm (24 in.) long, having a hemispherical tip the same diameter as the rod. (Hemispherical means "half a sphere"; the tip is rounded like half of a ball.)
- Scoop: a receptacle of appropriate size so that each representative increment of the concrete sample can be placed in the container without spillage.
- Tape measure or ruler with at least 5 mm or 1/8 in. graduations
- Base: flat, rigid, non-absorbent moistened surface on which to set the slump mold

Procedure

1. Obtain the sample in accordance with the FOP for WAQTC TM 2. If the concrete mixture contains aggregate retained on the 37.5mm (1½ in.) sieve, the aggregate must be removed in accordance with the Wet Sieving portion of the FOP for WAQTC TM 2.

   Begin testing within five minutes of obtaining the sample.
2. Dampen the inside of the mold and place it on a dampened, rigid, nonabsorbent surface that is level and firm.
3. Stand on both foot pieces to hold the mold firmly in place.
4. Use the scoop to fill the mold 1/3 full by volume, to a depth of approximately 67 mm (2 5/8 in.).
5. Consolidate the layer with 25 strokes of the tamping rod, using the rounded end. Rod the bottom layer throughout its depth. Distribute the strokes evenly over the entire cross section of the concrete.

For the bottom layer, incline the rod slightly and make approximately half the strokes near the perimeter, and then progress with vertical strokes, spiraling toward the center.

6. Use the scoop to fill the mold 2/3 full by volume, to a depth of approximately 155 mm (6 1/8 in.).
7. Consolidate this layer with 25 strokes of the tamping rod, penetrate approximately 25 mm (1 in.) into the bottom layer. Distribute the strokes evenly.
8. Use the scoop to fill the mold to overflowing.
9. Consolidate this layer with 25 strokes of the tamping rod, penetrate approximately 25 mm (1 in.) into the second layer. Distribute the strokes evenly. If the concrete falls below the top of the mold, stop, add more concrete, and continue rodding for a total of 25 strokes. Always keep an excess of concrete above the top of the mold. Distribute strokes evenly.
10. Strike off the top surface of concrete with a screeding and rolling motion of the tamping rod.
11. Clean overflow concrete away from the base of the mold.
12. Remove the mold from the concrete by raising it carefully in a vertical direction. Raise the mold 300 mm (12 in.) in 5 ±2 seconds by a steady upward lift with no lateral or torsional (twisting) motion being imparted to the concrete.

    Complete the entire operation from the start of the filling through removal of the mold without interruption within an elapsed time of 2 1/2 minutes.
13. Immediately measure the slump:
    a. Invert the slump mold and set it next to the specimen.
    b. Lay the tamping rod across the mold so that it is over the test specimen.
    c. Measure the distance between the bottom of the rod and the displaced original center of the top of the specimen to the nearest 5 mm (1/4 in.).
    d. If a decided falling away or shearing off of concrete from one side or portion of the mass occurs, disregard the test and perform a new test on another portion of the sample.

Note 1: If two consecutive tests on a sample of concrete show a falling away or shearing off of a portion of the concrete from the mass of the specimen, the concrete probably lacks the plasticity and cohesiveness necessary for the slump test to be applicable.

14. Discard the tested sample.

Report

- Results on forms approved by the agency
- Sample ID
- Slump to the nearest 5 mm (1/4 in.).

DENSITY (UNIT WEIGHT), YIELD, AND AIR CONTENT (GRAVIMETRIC) OF CONCRETE
FOP FOR AASHTO T 121

Scope

This method covers the determination of density, or unit weight, of freshly mixed concrete in accordance with AASHTO T 121-23. It also provides formulas for calculating the volume of concrete produced from a mixture of known quantities of component materials and provides a method for calculating cement content and cementitious material content – the mass of cement or cementitious material per unit volume of concrete. A procedure for calculating water/cement ratio is also covered.

Warning—Fresh Hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.

Apparatus

- Measure: May be the bowl portion of the air meter used for determining air content under the FOP for AASHTO T 152. Otherwise, it shall be a cylindrical metal container meeting the requirements of AASHTO T 121. The capacity and dimensions of the measure shall conform to those specified in Table 1.
- Balance or scale: Accurate to within 45 g (0.1 lb) or 0.3 percent of the test load, whichever is greater, at any point within the range of use.
- Tamping rod: 16 mm (5/8 in.) diameter and 400 mm (16 in.) to 600 mm (24 in.) long, having a hemispherical tip the same diameter as the rod. (Hemispherical means "half a sphere"; the tip is rounded like half of a ball.)
- Vibrator: frequency at least 9000 vibrations per minute (150 Hz), at least 19 to 38 mm (3/4 to 1 1/2 in.) in diameter but not greater than 38 mm (1 1/2 in.), and the length of the shaft shall be at least 75 mm (3 in.) longer than the depth of the section being vibrated.
- Scoop: a receptacle of appropriate size so that each representative increment of the concrete sample can be placed in the container without spillage.
- Strike-off plate: A flat rectangular metal plate at least 6 mm (1/4 in.) thick or a glass or acrylic plate at least 12 mm (1/2 in.) thick, with a length and width at least 50 mm (2 in.) greater than the diameter of the measure with which it is to be used. The edges of the plate shall be straight and smooth within tolerance of 1.5 mm (1/16 in.).
- Mallet: With a rubber or rawhide head having a mass of 0.57 ±0.23 kg (1.25 ±0.5 lb) for use with measures of 14 L (1/2 ft^3) or less or having a mass of 1.02 ±0.23 kg (2.25 ±0.5 lb) for use with measures larger than 14 L (0.5 ft^3).

Table 1
Dimensions of Measures*

Capacity	Inside Diameter	Inside Height	Minimum Thicknesses mm (in.)		Nominal Maximum Size of Coarse Aggregate***
m^3 (ft^3)	mm (in.)	mm (in.)	Bottom	Wall	mm (in.)
0.0071	203 ±2.54	213 ±2.54	5.1	3.0	25
(1/4)**	(8.0 ±0.1)	(8.4 ±0.1)	(0.20)	(0.12)	(1)
0.0142	254 ±2.54	279 ±2.54	5.1	3.0	50
(1/2)	(10.0 ±0.1)	(11.0 ±0.1)	(0.20)	(0.12)	(2)

* ***Note 1:*** The indicated size of measure shall be for aggregates of nominal maximum size equal to or smaller than that listed.

** Measure may be the base of the air meter used in the FOP for AASHTO T 152.

*** Nominal maximum size: One sieve larger than the first sieve to retain more than 10 percent of the material using an agency specified set of sieves based on cumulative percent retained. Where large gaps in specification sieves exist, intermediate sieve(s) may be inserted to determine nominal maximum size.

Consolidation Selection

There are two methods of consolidating the concrete – rodding and vibration. If the slump is greater than 75 mm (3 in.), consolidation is by rodding. When the slump is 25 to 75 mm (1 to 3 in.), internal vibration or rodding can be used to consolidate the sample, but the method used must be that required by the agency to obtain consistent, comparable results. For concrete with slump less than 25 mm (1 in.), consolidate the sample by internal vibration. Do not consolidate self-consolidating concrete (SCC).

When using measures greater than 0.0142 m^3 (1/2 ft^3), see AASHTO T 121.

Procedure

Sampling

1. Obtain the sample in accordance with the FOP for WAQTC TM 2. Testing may be performed in conjunction with the FOP for AASHTO T 152. When doing so, this FOP should be performed before the FOP for AASHTO T 152.

   Note 2: If the two tests are being performed using the same sample, this test shall begin within five minutes of obtaining the sample.

Rodding

1. Dampen the inside of the measure and empty excess water.
2. Determine and record the mass of the measure.
3. Use the scoop to fill the measure approximately 1/3 full with concrete. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.

4. Consolidate the layer with 25 strokes of the tamping rod, using the rounded end. Distribute the strokes evenly over the entire cross section of the concrete. Rod throughout its depth without hitting the bottom too hard.
5. Tap around the perimeter of the measure smartly 10 to 15 times with the mallet to close voids and release trapped air.
6. Add the second layer, filling the measure about 2/3 full. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
7. Consolidate this layer with 25 strokes of the tamping rod, penetrating about 25 mm (1 in.) into the bottom layer.
8. Tap around the perimeter of the measure smartly 10 to 15 times with the mallet.
9. Add the final layer, slightly overfilling the measure. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
10. Consolidate this layer with 25 strokes of the tamping rod, penetrating about 25 mm (1 in.) into the second layer.
11. Tap around the perimeter of the measure smartly 10 to 15 times with the mallet.
12. Continue with 'Strike-off and Determining Mass.'

Internal Vibration

1. Dampen the inside of the measure and empty excess water.
2. Determine and record the mass of the measure.
3. Use the scoop to fill the measure approximately 1/2 full with concrete. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
4. Insert the vibrator at three different points in each layer. Do not let the vibrator touch the bottom or side of the measure. Continue vibration only long enough to achieve proper consolidation of the concrete. Over vibration may cause segregation and loss of appreciable quantities of intentionally entrained air.
5. Slightly overfill the measure. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
6. Insert the vibrator at three different points, penetrating the first layer approximately 25 mm (1 in.). Do not let the vibrator touch the side of the measure.
7. Continue with 'Strike-off and Determining Mass.'

Self-Consolidating Concrete

1. Dampen the inside of the measure and empty excess water.
2. Determine and record the mass of the measure.
3. Use the scoop to slightly overfill the measure. Do not exceed 125 mm (5 in.) drop height. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.

5. Continue with 'Strike-off and Determining Mass.'

Strike-off and Determining Mass

1. After consolidation, the measure should be slightly over full, about 3 mm (1/8 in.) above the rim. If there is a great excess of concrete, remove a portion with the scoop. If the measure is under full, add a small quantity. This adjustment may be done only after consolidating the final layer and before striking off the surface of the concrete.
2. Press the strike-off plate flat against the top surface, covering approximately 2/3 of the measure.
3. Withdraw the strike-off plate with a sawing motion to finish the 2/3 originally covered.
4. Cover the original 2/3 again with the plate; finishing the remaining 1/3 with a sawing motion (do not lift the plate; continue the sawing motion until the plate has cleared the surface of the measure).
5. Finish the surface with the inclined edge of the strike-off plate. The surface should be smooth and free of voids.
6. Clean off all excess concrete from the exterior of the measure including the rim.
7. Determine and record the mass of the measure and the concrete.
8. If the air content of the concrete is to be determined, ensure the rim (flange) is clean and proceed to 'Strike-off and Air Content' Step 3 of the FOP for AASHTO T 152.

Calculations

Mass of concrete in the measure

$$concrete\ mass = M_c - M_m$$

Where:

Concrete mass	=	mass of concrete in measure
M_c	=	mass of measure and concrete
M_m	=	mass of measure

Density

$$\rho = \frac{concrete\ mass}{V_m}$$

Where:

ρ	=	density of the concrete mix
V_m	=	volume of measure (Annex)

Yield m^3

$$Y_{m^3} = \frac{W}{\rho}$$

Where:

$Y_m{}^3$	=	yield (m^3 of the batch of concrete)
W	=	total mass of the batch of concrete

Yield yd^3

$$Y_{ft^3} = \frac{W}{\rho} \qquad Y_{yd^3} = \frac{Y_{ft^3}}{27ft^3/yd^3}$$

Where:

Y_{ft}^3	=	yield (ft^3 of the batch of concrete)
Y_{yd}^3	=	yield (yd^3 of the batch of concrete)
W	=	total mass of the batch of concrete
ρ	=	density of the concrete mix

Note 5: The total mass, W, includes the masses of the cement, water, and aggregates in the concrete.

Cement Content

$$N = \frac{N_t}{Y}$$

Where:

N	=	actual cementitous material content per Y_m^3 or Y_{yd}^3
N_t	=	mass of cementitious material in the batch
Y	=	Y_m^3 or Y_{yd}^3

Note 6: Specifications may require Portland Cement content and supplementary cementitious materials content.

Water Content

The mass of water in a batch of concrete is the sum of:

- water added at batch plant
- water added in transit
- water added at jobsite
- free water on coarse aggregate*
- free water on fine aggregate*
- liquid admixtures (if required by the agency)

*Mass of free water on aggregate

This information is obtained from concrete batch tickets collected from the driver. Use the Table 2 to convert liquid measures.

Table 2
Liquid Conversion Factors

To Convert From	To	Multiply By
Liters, L	Kilograms, kg	1.0
Gallons, gal	Kilograms, kg	3.785
Gallons, gal	Pounds, lb	8.34
Milliliters, mL	Kilograms, kg	0.001
Ounces, oz	Milliliters, mL	28.4
Ounces, oz	Kilograms, kg	0.0284
Ounces, oz	Pounds, lb	0.0625
Pounds, lb	Kilograms, kg	0.4536

Mass of free water on aggregate

$$Free\ Water\ Mass = CA\ or\ FC\ Aggregate - \frac{CA\ or\ FC\ Aggregate}{1 + (Free\ Water\ Percentage/100)}$$

Where:

Free Water Mass	=	on coarse or fine aggregate
FC or CA Aggregate	=	mass of coarse or fine aggregate
Free Water Percentage	=	percent of moisture of coarse or fine aggregate

Water/Cement Ratio

$$\frac{Water\ Content}{C}$$

Where:

Water Content	=	total mass of water in the batch
C	=	total mass of cementitious materials

Example

Mass of concrete in measure (M_m)	16.290 kg (36.06 lb)
Volume of measure (V_m)	0.007079 m^3 (0.2494 ft^3)

From batch ticket:

Yards batched	4 yd^3
Cement	950 kg (2094 lb)
Fly ash	180 kg (397 lb)
Coarse aggregate	3313 kg (7305 lb)
Fine aggregate	2339 kg (5156 lb)
Water added at plant	295 L (78 gal)

Other

Water added in transit	0
Water added at jobsite	38 L (10 gal)
Total mass of the batch of concrete (W)	7115 kg (15,686 lb)
Moisture content of coarse aggregate	1.7%
Moisture content of coarse aggregate	5.9%

Density

$$\rho = \frac{concrete\ mass}{V_m}$$

$$\rho = \frac{16.920\ kg}{0.007079\ m^3} = 2390\ \ kg/m^3 \quad \rho = \frac{36.06\ lb}{0.2494\ ft^3} = 144.6\ \ lb/ft^3$$

Given:

concrete mass = 16.920 kg (36.06 lb)

V_m = 0.007079 m^3 (0.2494 ft^3) (Annex)

Yield m^3

$$Y_{m^3} = \frac{W}{\rho}$$

$$Y_{m^3} = \frac{7115\ kg}{2390\ kg/m^3} = 2.98\ m^3$$

Given:

Total mass of the batch of concrete (W), kg = 7115 kg

Yield yd³

$$Y_{ft^3} = \frac{W}{\rho} \qquad Y_{yd^3} = \frac{Y_{ft^3}}{27 ft^3/yd^3}$$

$$Y_{ft^3} = \frac{15{,}686\ lb}{144.6\ lb/ft^3} = 108.48\ ft^3 \qquad Y_{yd^3} = \frac{108.48\ ft^3}{27\ ft^3/yd^3} = 4.02\ yd^3$$

Given:

Total mass of the batch of concrete (W), lb = 15,686 lb

Cement Content

$$N = \frac{N_t}{Y}$$

$$N = \frac{950\ kg + 180\ kg}{2.98\ m^3} = 379\ kg/m^3 \quad N = \frac{2094\ lb + 397\ lb}{4.02\ yd^3} = 620\ lb/yd^3$$

Given:

N_t (cement)	=	950 kg (2094 lb)
N_t (flyash)	=	180 kg (397 lb)
Y	=	Y_{m^3} or Y_{yd^3}

Note 6: Specifications may require Portland Cement content and supplementary cementitious materials content.

Free water

$$Free\ Water\ Mass = CA\ or\ FC\ Aggregate - \frac{CA\ or\ FC\ Aggregate}{1 + (Free\ Water\ Percentage/100)}$$

$$CA\ Free\ Water = 3313\ kg - \frac{3313\ kg}{1 + (1.7/100)} = 55\ kg$$

$$CA\ Free\ Water = 7305\ lb - \frac{7305\ lb}{1 + (1.7/100)} = 122\ lb$$

$$FA\ Free\ Water = 2339\ kg - \frac{2339\ kg}{1 + (5.9/100)} = 130\ kg$$

$$FA\ Free\ Water = 5156\ lb - \frac{5156\ lb}{1 + (5.9/100)} = 287\ lb$$

Given:

CA aggregate	=	3313 kg (7305 lb)
FC aggregate	=	2339 kg (5156 lb)
CA moisture content	=	1.7%
FC moisture content	=	5.9%

Water Content

Total of all water in the mix.

$$Water\ Content = [(78\ gal + 10\ gal) * 3.785\ kg/gal] + 55\ kg + 130\ kg = 518\ kg$$

$$Water\ Content = [(78\ gal + 10\ gal) * 8.34\ lb/gal] + 122\ lb + 287\ lb = 1143\ lb$$

Given:

Water added at plant	=	295 L (78 gal)
Water added at the jobsite	=	38 L (10 gal)

Water/ Cement Ratio

$$W/C = \frac{518\ kg}{950\ kg + 180\ kg} = 0.458 \quad W/C = \frac{1143\ lb}{2094\ lb + 397\ lb} = 0.459$$

Report 0.46

Report

- Results on forms approved by the agency
- Sample ID
- Density (unit weight) to the nearest 1 kg/m^3 (0.1 lb/ft^3)
- Yield to the nearest 0.01 m^3 (0.01 yd^3)
- Cement content to the nearest 1 kg/m^3 (1 lb/yd^3)
- Cementitious material content to the nearest 1 kg/m^3 (1 lb/yd^3)
- Water/Cement ratio to the nearest 0.01

ANNEX – STANDARDIZATION OF MEASURE

(Mandatory Information)

Standardization is a critical step to ensure accurate test results when using this apparatus. Failure to perform the standardization procedures as described herein will produce inaccurate or unreliable test results.

Apparatus

- Listed in the FOP for AASHTO T 121
  - Measure
  - Balance or scale
  - Strike-off plate
- Thermometer: Standardized liquid-in-glass, or electronic digital total immersion type, accurate to 0.5°C (1°F)

Procedure

1. Determine the mass of the dry measure and strike-off plate.
2. Fill the measure with water at a temperature between 16°C and 29°C (60°F and 85°F) and cover with the strike-off plate in such a way as to eliminate bubbles and excess water.
3. Wipe the outside of the measure and cover plate dry, being careful not to lose any water from the measure.
4. Determine the mass of the measure, strike-off plate, and water in the measure.
5. Determine the mass of the water in the measure by subtracting the mass in Step 1 from the mass in Step 4.
6. Measure the temperature of the water and determine its density from Table A1, interpolating as necessary.
7. Calculate the volume of the measure, V_m, by dividing the mass of the water in the measure by the density of the water at the measured temperature.

Calculations

$$V_m = \frac{M}{\rho_w}$$

Where:

V_m	=	volume of the mold
M	=	mass of water in the mold
ρ_w	=	density of water at the measured temperature

Example

Mass of water in Measure	=	7.062 kg (15.53 lb)
Density of water at 23°C (73.4°F) (ρ_w)	=	997.54 kg/m^3 (62.274 lb/ft^3)

$$V_m = \frac{7.062\ kg}{997.54\ \ kg/m^3} = 0.007079\ m^3 \qquad V_m = \frac{15.53\ lb}{62.274\ \ lb/ft^3} = 0.2494\ ft^3$$

Table A1
Unit Mass of Water
15°C to 30°C

°C	(°F)	kg/m³	(lb/ft³)	°C	(°F)	kg/m³	(lb/ft³)
15	(59.0)	999.10	(62.372)	23	(73.4)	997.54	(62.274)
15.6	(60.0)	999.01	(62.366)	23.9	(75.0)	997.32	(62.261)
16	(60.8)	998.94	(62.361)	24	(75.2)	997.29	(62.259)
17	(62.6)	998.77	(62.350)	25	(77.0)	997.03	(62.243)
18	(64.4)	998.60	(62.340)	26	(78.8)	996.77	(62.227)
18.3	(65.0)	998.54	(62.336)	26.7	(80.0)	996.59	(62.216)
19	(66.2)	998.40	(62.328)	27	(80.6)	996.50	(62.209)
20	(68.0)	998.20	(62.315)	28	(82.4)	996.23	(62.192)
21	(69.8)	997.99	(62.302)	29	(84.2)	995.95	(62.175)
21.1	(70.0)	997.97	(62.301)	29.4	(85.0)	995.83	(62.166)
22	(71.6)	997.77	(62.288)	30	(86.0)	995.65	(62.156)

Report

- Measure ID
- Date Standardized
- Temperature of the water
- Volume, V_m, of the measure

AIR CONTENT OF FRESHLY MIXED CONCRETE BY THE PRESSURE METHOD FOP FOR AASHTO T 152

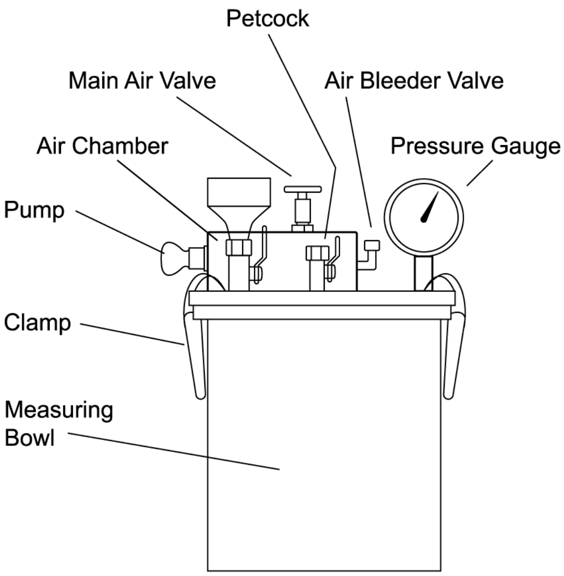
Scope

This procedure covers determination of the air content in freshly mixed Portland Cement Concrete containing dense aggregates in accordance with AASHTO T 152-23, Type B meter. It is not for use with lightweight or highly porous aggregates. This procedure includes standardization of the Type B air meter gauge, Annex.

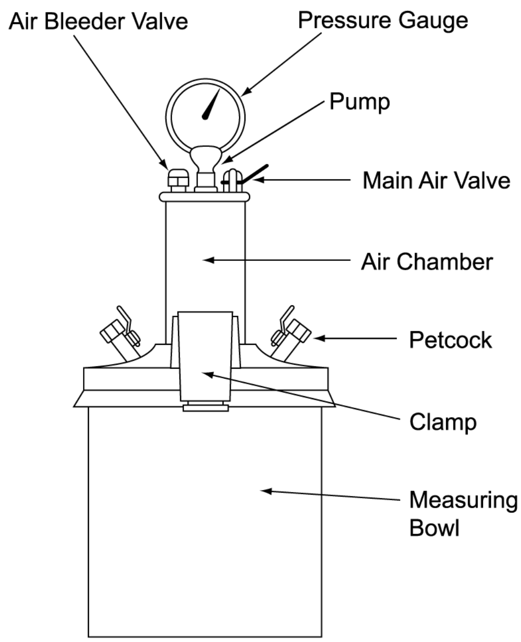
Warning—Fresh Hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.

Apparatus

- Air meter: Type B, as described in AASHTO T 152



2a. Horizontal Air Chamber



2b. Vertical Air Chamber

Type B Meter

- Balance or scale: Accurate to 0.3 percent of the test load at any point within the range of use (for Method 1 standardization only)
- Tamping rod: 16 mm (5/8 in.) diameter and 400 mm (16 in.) to 600 mm (24 in.) long, having a hemispherical tip the same diameter as the rod. (Hemispherical means “half a sphere”; the tip is rounded like half of a ball.)

- Vibrator: frequency at least 9000 vibrations per minute (150 Hz), at least 19 to 38 mm (3/4 to 1 1/2 in.) in diameter but not greater than 38 mm (1 1/2 in.), and the length of the shaft shall be at least 75 mm (3 in.) than the depth of the section being vibrated.
- Scoop: a receptacle of appropriate size so that each representative increment of the concrete sample can be placed in the container without spillage.
- Container for water: rubber syringe or plastic wash bottle
- Strike-off bar: Approximately 300 mm x 22 mm x 3 mm (12 in. x 3/4 in. x 1/8 in.)
- Strike-off plate: A flat rectangular metal plate at least 6 mm (1/4 in.) thick or a glass or acrylic plate at least 12 mm (1/2 in.) thick, with a length and width at least 50 mm (2 in.) greater than the diameter of the measure with which it is to be used. The edges of the plate shall be straight and smooth within tolerance of 1.5 mm (1/16 in.).

  Note 1: Use either the strike-off bar or strike-off plate; both are not required.
- Mallet: With a rubber or rawhide head having a mass of 0.57 ±0.23 kg (1.25 ±0.5 lb)

Consolidation Selection

There are two methods of consolidating the concrete – rodding and vibration. If the slump is greater than 75 mm (3 in.), consolidation is by rodding. When the slump is 25 to 75 mm (1 to 3 in.), internal vibration or rodding can be used to consolidate the sample, but the method used must be that required by the agency to obtain consistent, comparable results. For concrete with slumps less than 25 mm (1 in.), consolidate the sample by internal vibration. Do not consolidate self-consolidating concrete (SCC).

Procedure

Sampling

1. Obtain the sample in accordance with the FOP for WAQTC TM 2. If the concrete mixture contains aggregate retained on the 37.5mm (1½ in.) sieve, the aggregate must be removed in accordance with the Wet Sieving portion of the FOP for WAQTC TM 2.

   Testing shall begin within five minutes of obtaining the sample.

Rodding

1. Dampen the inside of the air meter measure and place on a firm level surface.
2. Use the scoop to fill the measure approximately 1/3 full with concrete. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
3. Consolidate the layer with 25 strokes of the tamping rod, using the rounded end. Distribute the strokes evenly over the entire cross section of the concrete. Rod throughout its depth without hitting the bottom too hard.
4. Tap around the perimeter of the measure smartly 10 to 15 times with the mallet to close voids and release trapped air.

5. Add the second layer, filling the measure about 2/3 full. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
6. Consolidate this layer with 25 strokes of the tamping rod, penetrating about 25 mm (1 in.) into the bottom layer.
7. Tap around the perimeter of the measure smartly 10 to 15 times with the mallet.
8. Add the final layer, slightly overfilling the measure. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
9. Consolidate this layer with 25 strokes of the tamping rod, penetrating about 25 mm (1 in.) into the second layer.
10. Tap around the perimeter of the measure smartly 10 to 15 times with the mallet.
11. Continue with 'Strike-off and Air Content.'

Internal Vibration

1. Dampen the inside of the air meter measure and place on a firm level surface.
2. Use the scoop to fill the measure approximately 1/2 full with concrete. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
3. Insert the vibrator at three different points. Do not let the vibrator touch the bottom or side of the measure. Remove the vibrator slowly, so that no air pockets are left in the material. Continue vibration only long enough to achieve proper consolidation of the concrete. Over vibration may cause segregation and loss of appreciable quantities of intentionally entrained air.
4. Tap around the perimeter of the measure smartly 10 to 15 times with the mallet.
5. Use the scoop to fill the measure a bit over full. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
6. Insert the vibrator at three different points, penetrating the first layer approximately 25 mm (1 in.). Do not let the vibrator touch the side of the measure. Remove the vibrator slowly, so that no air pockets are left in the material. Continue vibration only long enough to achieve proper consolidation of the concrete. Over vibration may cause segregation and loss of appreciable quantities of intentionally entrained air.
7. Tap around the perimeter of the measure smartly 10 to 15 times with the mallet.
8. Continue with 'Strike-off and Air Content.'

Self-Consolidating Concrete

1. Dampen the inside of the air meter measure and place on a firm level surface.
2. Use the scoop to slightly overfill the measure. Evenly distribute the concrete in a circular motion around the inner perimeter of the measure.
3. Continue with 'Strike-off and Air Content.'

Strike-Off and Air Content

1. After consolidation, the measure should be slightly over full, about 3 mm (1/8 in.) above the rim. If there is a great excess of concrete, remove a portion with the trowel or scoop. If the measure is under full, add a small quantity. This adjustment may be done only after consolidating the final layer and before striking off the surface of the concrete.
2. Strike off the surface of the concrete and finish it smoothly with a sawing action of the strike-off bar or inclined plate, using great care to leave the measure just full. The surface should be smooth and free of voids.
3. Clean the top flange of the measure to ensure a proper seal.
4. Moisten the inside of the cover and check to see that both petcocks are open, and the main air valve is closed.
5. Clamp the cover on the measure.
6. Inject water through a petcock on the cover until water emerges from the petcock on the opposite side. Jar the meter gently until all air is expelled from this same petcock.
7. Verify that water is present in both petcocks.
8. Close the air bleeder valve and pump air into the air chamber until the needle goes past the initial pressure determined for the gauge. Allow a few seconds for the compressed air to cool.
9. Tap the gauge gently with one hand while slowly opening the air bleeder valve until the needle rests on the initial pressure. Close the air bleeder valve.
10. Close both petcocks.
11. Open the main air valve.
12. Tap the side of the measure smartly with the mallet.
13. With the main air valve open, lightly tap the gauge to settle the needle, and then read the air content to the nearest 0.1 percent.
14. Release or close the main air valve.
15. Open both petcocks to release pressure, remove the concrete, and thoroughly clean the cover and measure with clean water.
16. Open the main air valve to relieve the pressure in the air chamber.

Report

- On forms approved by the agency
- Sample ID
- Percent of air to the nearest 0.1 percent.
- Some agencies require an aggregate correction factor to determine total percent of entrained air.

  Total % entrained air = Gauge reading – aggregate correction factor from mix design

  (See AASHTO T 152 for more information.)

ANNEX
STANDARDIZATION OF AIR METER GAUGE

(Mandatory Information)

Standardization is a critical step to ensure accurate test results when using this apparatus. Failure to perform the standardization procedures as described below will produce inaccurate or unreliable test results.

Standardization shall be performed at a minimum of once every three months. Record the date of the standardization, the standardization results, and the name of the technician performing the standardization in the logbook kept with each air meter.

There are two methods for standardizing the air meter, mass or volume, both are covered below.

1. Screw the short piece of straight tubing into the threaded petcock hole on the underside of the cover.
2. Determine and record the mass of the dry, empty air meter measure and cover assembly (mass method only).
3. Fill the measure nearly full with water.
4. Clamp the cover on the measure with the tube extending down into the water. Mark the petcock with the tube attached for future reference.
5. Add water through the petcock having the pipe extension below until all air is forced out the other petcock.
6. Wipe off the air meter measure and cover assembly; determine and record the mass of the filled unit (mass method only).
7. Pump up the air pressure to a little beyond the predetermined initial pressure indicated on the gauge. Wait a few seconds for the compressed air to cool, and then stabilize the gauge hand at the proper initial pressure by pumping up or relieving pressure, as needed.
8. Close both petcocks and immediately open the main air valve exhausting air into the measure. Wait a few seconds until the meter needle stabilizes. The gauge should now read 0 percent. If two or more tests show a consistent variation from 0 percent in the result, change the initial pressure line to compensate for the variation, and use the newly established initial pressure line for subsequent tests.
9. Determine which petcock has the straight tube attached to it. Attach the curved tube to external portion of the same petcock.
10. Pump air into the air chamber. Open the petcock with the curved tube attached to it. Open the main air valve for short periods of time until 5 percent of water by mass or volume has been removed from the air meter. Remember to open both petcocks to release the pressure in the measure and drain the water in the curved tube back into the measure. To determine the mass of the water to be removed, subtract the mass found in Step 2 from the mass found in Step 6. Multiply this value by 0.05. This is the mass of the water that must be removed. To remove 5 percent by volume, remove water until the external standardization vessel is level full.

Note A1: Many air meters are supplied with a standardization vessel(s) of known volume that are used for this purpose. Standardization vessel must be protected from crushing or denting. If an external standardization vessel is used, confirm what percentage volume it represents for the air meter being used. Vessels commonly represent 5 percent volume, but they are for specific size meters. This should be confirmed by mass.

11. Remove the curved tube. Pump up the air pressure to a little beyond the predetermined initial pressure indicated on the gauge. Wait a few seconds for the compressed air to cool, and then stabilize the gauge hand at the proper initial pressure by pumping up or relieving pressure, as needed.
12. Close both petcocks and immediately open the main air valve exhausting air into the measure. Wait a few seconds until the meter needle is stabilized. The gauge should now read 5.0 ±0.1 percent. If the gauge is outside that range, the meter needs adjustment. The adjustment could involve adjusting the starting point so that the gauge reads 5.0 ±0.1 percent when this standardization is run or could involve moving the gauge needle to read 5.0 percent. Any adjustment should comply with the manufacturer's recommendations.
13. When the gauge hand reads correctly at 5.0 percent, additional water may be withdrawn in the same manner to check the results at other values such as 10 percent or 15 percent.
14. If an internal standardization vessel is used, follow Steps 1 through 8 to set initial reading.
15. Release pressure from the measure and remove cover. Place the internal standardization vessel into the measure. This will displace 5 percent of the water in the measure. (See AASHTO T 152 for more information on internal standardization vessels.)
16. Place the cover back on the measure and add water through the petcock until all the air has been expelled.
17. Pump up the air pressure chamber to the initial pressure. Wait a few seconds for the compressed air to cool, and then stabilize the gauge hand at the proper initial pressure by pumping up or relieving pressure, as needed.
18. Close both petcocks and immediately open the main air valve exhausting air into the measure. Wait a few seconds until the meter needle stabilizes. The gauge should now read 5 percent.
19. Remove the extension tubing from threaded petcock hole in the underside of the cover before starting the test procedure.

Report

- Air meter ID
- Date standardized
- Initial pressure (IP)

BULK SPECIFIC GRAVITY (G_{mb}) OF COMPACTED ASPHALT MIXTURES USING SATURATED SURFACE-DRY SPECIMENS
FOP FOR AASHTO T 166

Scope

This procedure covers the determination of bulk specific gravity (G_{mb}) of compacted asphalt mixtures using three methods – A, B, and C – in accordance with AASHTO T 166-22. This FOP is for use on specimens not having open or interconnecting voids or absorbing more than 2.00 percent water by volume, or both. When specimens have open or interconnecting voids or absorbing more than 2.00 percent water by volume, or both, AASHTO T 275 or AASHTO T 331 should be performed.

Overview

- Method A: Suspension
- Method B: Volumeter
- Method C: Rapid test for A or B

Test Specimens

Test specimens may be either laboratory-molded or sampled from asphalt mixture pavement. For specimens it is recommended that the diameter be equal to four times the maximum size of the aggregate and the thickness be at least one- and one-half times the maximum size.

Terminology

Constant Mass: The state at which a mass does not change more than a given percent, after additional drying for a defined time interval, at a required temperature.

Apparatus – Method A (Suspension)

- Balance or scale: 5 kg capacity, readable to 0.1 g, and fitted with a suitable suspension apparatus and holder to permit weighing the specimen while suspended in water, conforming to AASHTO M 231.
- Suspension apparatus: Wire of the smallest practical size and constructed to permit the container to be fully immersed.
- Water bath: For immersing the specimen in water while suspended under the balance or scale and equipped with an overflow outlet for maintaining a constant water level.
- Towel: Damp cloth towel used for surface drying specimens.
- Oven: Capable of maintaining a temperature of 52 ± 3°C (126 ±5°F) for drying the specimens to a constant mass.

- Pan: Pan or other suitable container of known mass, large enough to hold a sample for drying in oven.
- Thermometer: Having a range of 15 to 45°C (59 to 113°F) and, graduated in 0.1°C (0.2°F) subdivisions.
- Vacuum device: refer to the FOP for AASHTO R 79 (optional)

Procedure – Method A (Suspension)

Recently molded laboratory samples that have not been exposed to moisture do not need drying.

1. Dry the specimen to constant mass, if required.
   a. Oven method
      i. Initially dry overnight at 52 ±3°C (125 ±5°F).
      ii. Determine and record the mass of the specimen. Designate this mass as M_p.
      iii. Return the specimen to the oven for at least 2 hours.
      iv. Determine and record the mass of the specimen. Designate this mass as M_n.
      v. Determine percent change by subtracting the new mass determination, M_n, from the previous mass determination, M_p, dividing by the previous mass determination M_p, and multiplying by 100.
      vi. Continue drying until there is no more than 0.05 percent change in specimen mass after 2-hour drying intervals (constant mass).
      vii. Constant mass has been achieved; sample is defined as dry.

   Note 1: To expedite the procedure, steps 1 and 2 may be performed last. To further expedite the process, see Method C.

   b. Vacuum dry method according to the FOP for AASHTO R 79.
2. Cool the specimen in air to 25 ±5°C (77 ±9°F), and determine and record the dry mass to the nearest 0.1 g. Designate this mass as A.
3. Fill the water bath to the overflow level with water at 25 ±1°C (77 ±2°F) and allow the water to stabilize.
4. Zero or tare the balance with the suspension apparatus attached, ensuring that the suspension apparatus is completely submerged and not touching the sides or the bottom of the water bath.
5. Immerse the specimen shaking to remove the air bubbles. Place the specimen on its side in the suspension apparatus. Leave it immersed for 4 ±1 minutes.
6. Determine and record the submerged weight to the nearest 0.1 g. Designate this submerged weight as C.
7. Remove the sample from the water and quickly surface dry with a damp cloth towel within 5 sec.

8. Zero or tare the balance.
9. Immediately determine and record the mass of the saturated surface-dry (SSD) specimen to nearest 0.1 g. Designate this mass as B. Any water that seeps from the specimen during the mass determination is considered part of the saturated specimen. Do not exceed 15 sec. performing Steps 7 through 9.

Calculations – Method A (Suspension)

Constant Mass:

Calculate constant mass using the following formula:

$$\%Change = \frac{M_p - M_n}{M_p} \times 100$$

Where:

M_p = previous mass measurement, g

M_n = new mass measurement, g

Bulk specific gravity (G_{mb}) and percent water absorbed:

$$G_{mb} = \frac{A}{B - C}$$

$$Percent\ Water\ Absorbed\ (by\ volume) = \frac{B - A}{B - C} \times 100$$

Where:

G_{mb} = Bulk specific gravity

A = Mass of dry specimen in air, g

B = Mass of SSD specimen in air, g

C = Weight of specimen in water at 25 ±1°C (77 ±2°F), g

Example:

$$G_{mb} = \frac{4833.6\ g}{4842.4\ g - 2881.3\ g} = 2.465$$

$$\%\ Water\ Absorbed\ (by\ volume) = \frac{4842.4\ g - 4833.6\ g}{4842.4\ g - 2881.3\ g} \times 100 = 0.45\%$$

Given:

A	=	4833.6 g
B	=	4842.4 g
C	=	2881.3 g

Apparatus – Method B (Volumeter)

- Balance or scale: 5 kg capacity, readable to 0.1 g and conforming to AASHTO M 231.
- Water bath: For immersing the specimen in water, capable of maintaining a uniform temperature at 25 ± 1°C (77 ± 2°F).
- Thermometer: Range of 15 to 45°C (59 to 113°F) and graduated in 0.1°C (0.2°F) subdivisions.
- Volumeter: Calibrated to 1200 mL or appropriate capacity for test sample and having a tapered lid with a capillary bore.
- Oven: Capable of maintaining a temperature of 52 ± 3°C (126 ± 5°F). for drying the specimens to a constant mass.
- Pan: Pan or other suitable container of known mass, large enough to hold a sample for drying in oven.
- Towel: Damp cloth towel used for surface drying specimens.
- Vacuum device: refer to the FOP for AASHTO R 79 (optional)

Procedure – Method B (Volumeter)

Method B is not acceptable for use with specimens that have more than 6 percent air voids.

Recently molded laboratory samples that have not been exposed to moisture do not need drying.

1. Dry the specimen to constant mass, if required.
   a. Oven method:
      i. Initially dry overnight at 52 ±3°C (125 ±5°F).
      ii. Determine and record the mass of the specimen. Designate this mass as M_p.
      iii. Return the specimen to the oven for at least 2 hours.
      iv. Determine and record the mass of the specimen. Designate this mass as M_n.
      v. Determine percent change by subtracting the new mass determination, M_n, from the previous mass determination, M_p, dividing by the previous mass determination, M_p, and multiplying by 100.
      vi. Continue drying until there is no more than 0.05 percent change in specimen mass after 2-hour drying intervals (constant mass).
      vii. Constant mass has been achieved; sample is defined as dry.

   Note 1: To expedite the procedure, steps 1 and 2 may be performed last. To further expedite the process, see Method C.

   b. Vacuum dry method according to the FOP for AASHTO R 79.
2. Cool the specimen in air to 25 ±5°C (77 ±9°F), and determine and record the dry mass to the nearest 0.1 g. Designate this mass as A.
3. Immerse the specimen in the temperature-controlled water bath at 25 ±1°C (77 ±2°F) for at least 10 minutes.
4. At the end of the ten-minute period, fill the volumeter with distilled water at 25 ±1°C (77 ±2°F) making sure some water escapes through the capillary bore of the tapered lid.
5. Wipe the volumeter dry. Determine the mass of the volumeter and water to the nearest 0.1 g. Designate this mass as D.
6. Remove the specimen from the water bath and quickly surface dry with a damp cloth towel within 5 sec.
7. Immediately determine and record the mass of the SSD specimen to the nearest 0.1 g. Designate this mass as B. Any water that seeps from the specimen during the mass determination is considered part of the saturated specimen.
8. Place the specimen in the volumeter and let stand 60 sec.
9. Bring the temperature of the water to 25 ±1°C (77 ±2°F) and cover the volumeter, making sure some water escapes through the capillary bore of the tapered lid.
10. Wipe the volumeter dry.

11. Determine and record the mass of the volumeter, water, and specimen to the nearest 0.1 g. Designate this mass as E.

Calculations – Method B (Volumeter)

Constant Mass:

Calculate constant mass using the following formula:

$$\%Change = \frac{M_p - M_n}{M_p} \times 100$$

Where:

M_p = previous mass measurement, g

M_n = new mass measurement, g

Bulk specific gravity (G_{mb}) and percent water absorbed:

$$G_{mb} = \frac{A}{B + D - E}$$

$$Percent\ Water\ Absorbed\ (by\ volume) = \frac{B - A}{B + D - E} \times 100$$

Where:

G_{mb} = Bulk specific gravity

A = Mass of dry specimen in air, g

B = Mass of SSD specimen in air, g

D = Mass of volumeter filled with water at 25 ±1°C (77 ±2°F), g

E = Mass of volumeter filled with specimen and water, g

Example:

$$G_{mb} = \frac{4833.6\ g}{4842.4\ g + 2924.4\ g - 5806.0\ g} = 2.465$$

$$\%\ Water\ Absorbed\ (by\ volume) = \frac{4842.4\ g - 4833.6\ g}{4842.4\ g + 2924.4\ g - 5806.0\ g} \times 100 = 0.45\%$$

Given:

A	=	4833.6 g
B	=	4842.4 g
D	=	2924.4 g
E	=	5806.0 g

Apparatus – Method C (Rapid Test for Method A or B)

- Oven: Capable of maintaining a temperature of 110 ±5°C (230 ±9°F) for drying the specimens to a constant mass.

See Methods A or B.

Note 2: This procedure can be used for specimens that are not required to be saved and contain substantial amounts of moisture. Cores can be tested the same day as obtained by this method.

Procedure – Method C (Rapid Test for Method A or B)

1. Start on Step 3 of Method A or B, and complete that procedure, then determine dry mass, A, as follows.
2. Determine and record mass of a large, flat-bottom container.
3. Place the specimen in the container.
4. Place in an oven at 110 ± 5 C (230 ± 9 F).
5. Dry until the specimen can be easily separated into fine aggregate particles that are not larger than 6.3 mm (¼ in.).
6. Determine and record the mass of the specimen. Designate this mass as M_p.
7. Return the specimen to the oven for at least 2 hours.
8. Determine and record the mass of the specimen. Designate this mass as M_n.

9. Determine percent change by subtracting the new mass determination, M_n, from the previous mass determination, M_p, dividing by the previous mass determination, M_p, and multiplying by 100.
10. Continue drying until there is no more than 0.05 percent change in specimen mass after 2-hour drying intervals (constant mass).
11. Constant mass has been achieved; sample is defined as dry.
12. Cool in air to 25 ±5°C (77 ±9°F).
13. Determine and record the mass of the container and dry specimen to the nearest 0.1 g.
14. Determine and record the mass of the dry specimen to the nearest 0.1 g by subtracting the mass of the container from the mass determined in Step 13. Designate this mass as A.

Calculations – Method C (Rapid Test for Method A or B)

Complete the calculations as outlined in Methods A or B, as appropriate.

Report

- On forms approved by the agency
- Sample ID
- G_{mb} to the nearest 0.001
- Absorption to the nearest 0.01 percent
- Method performed.

Air Content of Freshly Mixed Concrete by the Volumetric Method

AASHTO Designation: T 196-23
ASTM Designation: C 173M-16

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THEORETICAL MAXIMUM SPECIFIC GRAVITY (G_{mm}) AND DENSITY OF ASPHALT MIXTURES
FOP FOR AASHTO T 209

Scope

This procedure covers the determination of the maximum specific gravity (G_{mm}) of uncompacted asphalt mixtures in accordance with AASHTO T 209-23. Two methods using different containers – bowl and pycnometer / volumetric flask– are covered.

Specimens prepared in the laboratory shall be cured according to agency standards.

Apparatus

- Balance or scale: 10,000 g capacity, readable to 0.1 g, meeting AASHTO M 231, Class G2
- Container: A glass, metal, or plastic bowl, pycnometer or volumetric flask between 2000 and 10,000 mL as required by the minimum sample size requirements in Table 1 sample and capable of withstanding full vacuum applied
- Pycnometer / volumetric flask cover: A glass plate or a metal or plastic cover with a vented opening
- Vacuum lid: A transparent lid with a suitable vacuum connection, with a vacuum opening to be covered with a fine wire mesh
- Vacuum pump or water aspirator: Capable of evacuating air from the container to a residual pressure of 3.4 kPa (25 mm Hg)
- Vacuum measurement device: Residual pressure manometer or vacuum gauge, capable of measuring residual pressure down to 3.4 kPa (25 mmHg) or less and readable to at least 0.2 kPa (2 mmHg)
- Suspension apparatus: Suitable apparatus and holder to permit determining the mass of the sample while suspended below the balance. The wire suspending the holder shall be the smallest practical size to minimize any possible effects of a variable immersed length for Bowl Method.
- Water bath: A constant-temperature water bath (optional for Pycnometer or Volumetric Flask Method)
- Thermometers: Thermometric devices accurate to 0.25°C (0.5°F) and with a temperature range of at least 20 to 45°C (68 to 113°F).
- Bleeder valve to adjust vacuum
- Automatic vacuum control unit (optional)
- Timer
- Towel

Standardization

Use a container that has been standardized according to the Annex. The container shall be standardized periodically in conformance with procedures established by the agency.

Test Sample Preparation

1. Obtain samples in accordance with the FOP for AASHTO R 97 and reduce according to the FOP for AASHTO R 47.
2. Test sample size shall conform to the requirements of Table 1. Samples larger than the capacity of the container may be tested in two or more increments. Results will be combined by calculating the weighted average ($G_{mm\ (avg)}$.). If the increments have a specific gravity difference greater than 0.013, the test must be re-run.
3. Plant-produced samples may be short-term conditioned according to AASHTO R 30 as specified by the agency.

Note 1: Short-term conditioning at the specified temperature is especially important when absorptive aggregates are used. This short-term conditioning will ensure the computation of realistic values for the amount of asphalt absorbed by the aggregate and void properties of the mix. Plant-produced asphalt mixtures should be evaluated to make sure short-term conditioning has taken place during production and delivery.

Table 1
Test Sample Size for G_{mm}

Nominal Maximum* Aggregate Size mm (in.)	Minimum Mass g
37.5 or greater (1½)	4000
19 to 25 (3/4 to 1)	2500
12.5 or smaller (1/2)	1500

*Nominal maximum size: One sieve larger than the first sieve to retain more than 10 percent of the material using an agency specified set of sieves based on cumulative percent retained.

Procedure – General

Two procedures – bowl and pycnometer / volumetric flask – are covered. The first 11 steps are the same for both.

1. Separate the particles of the sample, taking care not to fracture the mineral particles, so that the particles of the fine aggregate portion are not larger than 6.3 mm (1/4 in.). If the mixture is not sufficiently soft to be separated manually, place it in a large flat pan and warm in an oven only until it is pliable enough for separation.
2. Cool the sample to room temperature.
3. Determine and record the mass of the dry container to the nearest 0.1 g.
4. Place the sample in the container.
5. Determine and record the mass of the dry container and sample to the nearest 0.1 g.

6. Determine and record the mass of the sample by subtracting the mass determined in Step 3 from the mass determined in Step 5. Designate this mass as "A."
7. Add sufficient water at approximately 25° C (77° F) to cover the sample by about 25 mm (1 in.).

Note 1: The release of entrapped air may be facilitated by the addition of a wetting agent. Check with the agency to see if this is permitted and, if it is, for a recommended agent.

8. Place the lid on the container and attach the vacuum line. To ensure a proper seal between the container and the lid, wet the O-ring or use a petroleum gel.
9. Remove entrapped air by subjecting the sample to a partial vacuum of 4.0 ±0.6 kPa (30 ±5 mmHg) residual pressure for 15 ±1 minutes.
10. Agitate the container and sample, either continuously by mechanical device or manually by vigorous shaking at 2-minute intervals. This agitation facilitates the removal of air.
11. Release the vacuum. Increase the pressure to atmospheric pressure in 10 to 15 seconds if the vacuum release is not automated. Turn off the vacuum pump and remove the lid. When performing the pycnometer / volumetric flask method, complete steps 12B through 16B within 10 ±1 minute.

Procedure – Bowl

12A. Fill the water bath to overflow level with water at 25 ±1°C (77 ±2°F) and allow the water to stabilize.

13A. Zero or tare the balance with the immersion apparatus attached, ensuring that the device is not touching the sides or the bottom of the water bath. Immerse the suspension apparatus sufficiently to cover both it and the bowl.

14A. Suspend and immerse the bowl and sample in water at 25 ±1°C (77 ±2°F) for 10 ±1 minute.

15A. Determine and record the submerged weight of the bowl and sample to the nearest 0.1 g. Designate as "C."

Procedure – Pycnometer or Volumetric Flask

12B. Immediately fill the pycnometer / volumetric flask with water without reintroducing air.

13B. Stabilize the temperature of the pycnometer / volumetric flask and sample so that the final temperature is within 25 ±1°C (77 ±2°F).

14B. Finish filling the pycnometer / volumetric flask with water that is 25 ±1°C (77 ±2°F), place the cover or a glass plate on the pycnometer / volumetric flask, and eliminate all air.

Note 2: When using a metal pycnometer and cover, place the cover on the pycnometer and push down slowly, forcing excess water out of the hole in the center of the cover. Use care when filling the pycnometer to avoid reintroducing air into the water.

15B. Towel dry the outside of the pycnometer / volumetric flask and cover.

16B. Determine and record the mass of the pycnometer / volumetric flask, cover, de-aired water, and sample to the nearest 0.1 g. within 10 ±1 minute of completion of Step 11. Designate this mass as "E."

Procedure – Mixtures Containing Uncoated Porous Aggregate

If the pores of the aggregates are not thoroughly sealed by an asphalt binder film, they may become saturated with water during the vacuuming procedure, resulting in an error in G_{mm} and theoretical maximum density. To determine if this has occurred, complete the general procedure and then:

1. Carefully drain water from sample through a towel held over the top of the container to prevent loss of material.
2. Spread sample in a flat shallow pan and place before an electric fan to remove surface moisture.
3. Determine the mass of the sample when the surface moisture appears to be gone.
4. Continue drying and determine the mass of the sample at 15-minute intervals until less than a 0.5 g loss is found between determinations.
5. Record the mass as the saturated surface dry mass to the nearest 0.1 g. Designate this mass as "A_{SSD}."
6. Calculate, as indicated below, G_{mm} using "A" and "A_{SSD}," and compare the two values.

Calculation

Calculate the G_{mm} to three decimal places as follows:

Bowl Procedure

$$G_{mm} = \frac{A}{A + B - C} \qquad or \qquad G_{mm} = \frac{A}{A_{SSD} + B - C}$$

(for mixes containing uncoated aggregate materials)

Where:

A = mass of dry sample in air, g

A_{SSD} = mass of saturated surface dry sample in air, g

B = standardized submerged weight of the bowl, g (see Annex)

C = submerged weight of sample and bowl, g

Example:

$$G_{mm} = \frac{1432.7\ g}{1432.7\ g + 286.3\ g - 1134.9\ g} = 2.453 \quad or$$

$$G_{mm} = \frac{1432.7\ g}{1434.2\ g + 286.3\ g - 1134.9\ g} = 2.447$$

Given:

A	= 1432.7 g
A_{SSD}	= 1434.2 g
B	= 286.3 g
C	= 1134.9 g

Pycnometer / Volumetric Flask Procedure

$$G_{mm} = \frac{A}{A + D - E} \qquad or \qquad G_{mm} = \frac{A}{A_{SSD} + D - E}$$

(for mixtures containing uncoated materials)

Where:

A	=	mass of dry sample in air, g
A_{SSD}	=	mass of saturated surface-dry sample in air, g
D	=	standardized mass of pycnometer / volumetric flask filled with water at 25°C (77°F), g, (See Annex)
E	=	mass of pycnometer / volumetric flask filled with water and the test sample at test temperature, g

Example (two increments of a large sample):

$$G_{mm_1} = \frac{2200.3\ g}{2200.3\ g + 7502.5\ g - 8812.0\ g} = 2.470$$

$$G_{mm_2} = \frac{1960.2\ g}{1960.2\ g + 7525.5\ g - 8690.8\ g} = 2.466$$

Given:

Increment 1	Increment 2
A_1 = 2200.3 g	A_2 = 1960.2 g
D_1 = 7502.5 g	D_2 = 7525.5 g
E_1 = 8812.0 g	E_2 = 8690.8 g

Variation = 2.470 - 2.466 = 0.004, which is < 0.013

Allowable variation is: 0.013. The values may be used.

Weighted average

For large samples tested a portion at a time, calculate the $G_{mm\ (avg)}$ by multiplying the dry mass of each increment by its G_{mm}, add the results together (Σ) and divide by the sum (Σ) of the dry masses.

$$G_{mm(avg)} = \frac{\sum\left(A_x \times G_{mm_x}\right)}{\sum A_x}$$

or

$$G_{mm(avg)} = \frac{\left(A_1 \times G_{mm_1}\right) + \left(A_2 \times G_{mm_2}\right)}{A_1 + A_2}\ etc.$$

Where:

A_x = mass of dry sample increment in air, g

G_{mmx} = theoretical maximum specific gravity of the increment

Example:

$$G_{mm(avg)} = \frac{(2200.3\ g \times 2.470) + (1960.2\ g \times 2.466)}{2200.3\ g + 1960.2\ g} = \frac{10{,}268.6}{4160.5\ g} = 2.468$$

Theoretical Maximum Density

To calculate the theoretical maximum density at 25°C (77°F) use one of the following formulas. The density of water at 25°C (77°F) is 997.1 kg/ m^3 in Metric units or 62.245 lb/ft^3 in English units.

Theoretical maximum density $kg/m^3 = G_{mm} \times 997.1\ kg/\ m^3$

$2.468 \times 997.1\ kg/\ m^3 = 2461\ kg/\ m^3$

or

Theoretical maximum density $lb/ft^3 = G_{mm} \times 62.245\ lb/ft^3$

$2.468 \times 62.245\ lb/ft^3 = 153.6\ lb/ft^3$

Report

- On forms approved by the agency
- Sample ID
- G_{mm} to the nearest 0.001
- Theoretical maximum density to the nearest 1 kg/m^3 (0.1 lb/ft^3)

ANNEX – STANDARDIZATION OF BOWL AND PYCNOMETER OR VOLUMETRIC FLASK

(Mandatory Information)

Bowl – Standardization

1. Fill the water bath to overflow level with 25 ±1°C (77 ±2°F) water and allow the water to stabilize.
2. Zero or tare the balance with the immersion apparatus attached, ensuring that the device is not touching the sides or the bottom of the water bath. Immerse the suspension apparatus sufficiently to cover both it and the bowl.
3. Suspend and completely immerse the bowl for 10 ±1 minute.
4. Determine and record the submerged weight of the bowl to the nearest 0.1 g.
5. Refill the water bath to overflow level.
6. Perform Steps 2 through 5 two more times for a total of three determinations.
7. If the range of the three determinations is less than or equal to 0.3 g., average the determinations. Designate as “B.”
8. If the range of the three determinations is greater than 0.3 g., take corrective action and perform the standardization procedure again.

Bowl – Check

1. Fill the water bath to overflow level 25 ±1°C (77 ±2°F) water and allow the water to stabilize.
2. Zero or tare the balance with the immersion apparatus attached, ensuring that the device is not touching the sides or the bottom of the water bath. Immerse the suspension apparatus sufficiently to cover both it and the bowl.
3. Suspend and completely immerse the bowl for 10 ±1 minute.
4. Determine and record the submerged weight of the bowl to the nearest 0.1 g.
5. If this determination is within 0.3 g of the standardized value, use the standardized value for “B.”
6. If it is not within 0.3 g, take corrective action and perform the standardization procedure again.
7. For labs that check the bowl standardization frequently (such as daily), calculate the moving average and range of the last three mass determinations. Designate the average of the last three masses as “B.”
8. If the moving range exceeds 0.3 g at any time, take corrective action and perform the standardization procedure again.

Pycnometer or Volumetric Flask – Standardization

1. Fill the pycnometer / volumetric flask with water at approximately 25°C (77°F).
2. Place the metal or plastic cover, or a glass plate on the pycnometer / volumetric flask and eliminate all air. (See Note 2.)
3. Stabilize the pycnometer / volumetric flask at 25 ± 1ºC (77 ± 2ºF) for 10 ± 1 min.
4. Towel dry the outside of the pycnometer / volumetric flask and cover.
5. Determine and record the mass of the pycnometer / volumetric flask, water, and cover or plate to the nearest 0.1 g.
6. Perform Steps 2 through 5 two more times for a total of three determinations.
7. If the range of the three determinations is less than or equal to 0.3 g, average the three determinations. Designate as "D."
8. If the range of the determinations is greater than 0.3 g., take corrective action and perform the "Pycnometer or Volumetric Flask – Standardization" again.

Pycnometer or Volumetric Flask – Check

1. Fill the pycnometer / volumetric flask with water at approximately 25°C (77°F).
2. Place the metal or plastic cover or a glass plate on the pycnometer / volumetric flask and eliminate all air. (See Note 2.)
3. Stabilize the pycnometer / volumetric flask at 25 ± 1ºC (77 ± 2ºF) for 10 ± 1 min.
4. Towel dry the outside of the pycnometer / volumetric flask and cover.
5. Determine and record the mass of the pycnometer / volumetric flask, water, and cover or plate.
6. If this determination is within 0.3 g of the standardized value, use the standardized value for "D."
7. If it is not within 0.3 g, perform the standardization procedure again.

TOTAL EVAPORABLE MOISTURE CONTENT OF AGGREGATE BY DRYING
FOP FOR AASHTO T 255
LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS
FOP FOR AASHTO T 265

Scope

This procedure covers the determination of moisture content of aggregate and soil in accordance with AASHTO T 255-22 and AASHTO T 265-22. It may also be used for other construction materials.

Overview

Moisture content is determined by comparing the wet mass of a sample and the mass of the sample after drying to constant mass. The term constant mass is used to define when a sample is dry.

Constant mass – the state at which a mass does not change more than a given percent, after additional drying for a defined time interval, at a required temperature.

Apparatus

- Balance or scale: capacity sufficient for the principal sample mass, accurate to 0.1 percent of sample mass or readable to 0.1 g, and meeting the requirements of AASHTO M 231
- Containers: clean, dry, and capable of being sealed
- Suitable drying container
    - For soils: container requires close-fitting lid
    - For aggregate: container lid is optional
- Microwave safe container with ventilated lid (for drying aggregate only)
- Heat source, thermostatically controlled, capable of maintaining 110 ± 5°C (230 ± 9°F).
    - Forced draft oven (preferred)
    - Ventilated oven
    - Convection oven
- Heat source, uncontrolled, for use when allowed by the agency, will not alter the material being dried, and close control of the temperature is not required:
    - Infrared heater/heat lamp, hot plate, fry pan, or any other device/method allowed by the agency .
    - Microwave oven (900 watts minimum)
- Utensils such as spoons
- Hot pads or gloves

Sample Preparation

Obtain a representative sample according to the FOP for AASHTO R 90 in its existing condition. If necessary, reduce the sample to moisture content sample size according to the FOP for AASHTO R 76.

For aggregate, the moisture content sample size is based on Table 1 or other information that may be specified by the agency.

TABLE 1
Sample Sizes for Moisture Content of Aggregate

Nominal Maximum Size* mm (in.)	Minimum Sample Mass g (lb)
150 (6)	50,000 (110)
100 (4)	25,000 (55)
90 (3 1/2)	16,000 (35)
75 (3)	13,000 (29)
63 (2 1/2)	10,000 (22)
50 (2)	8000 (18)
37.5 (1 1/2)	6000 (13)
25.0 (1)	4000 (9)
19.0 (3/4)	3000 (7)
12.5 (1/2)	2000 (4)
9.5 (3/8)	1500 (3.3)
4.75 (No. 4)	500 (1.1)

* One sieve larger than the first sieve to retain more than 10 percent of the material using an agency specified set of sieves based on cumulative percent retained. Where large gaps in specification sieves exist, intermediate sieve(s) may be inserted to determine nominal maximum.

For soils the moisture content sample size is based on Table 2 or other information that may be specified by the agency.

TABLE 2
Sample Sizes for Moisture Content of Soil

Maximum Particle Size mm (in.)	Minimum Sample Mass g
50 (2)	1000
25.0 (1)	500
12.5 (1/2)	300
4.75 (No. 4)	100
0.425 (No. 40)	10

Immediately seal or cover moisture content samples to prevent any change in moisture content or follow the steps in "Procedure."

Procedure

Determine and record the sample masses as follows:

- For aggregate, determine and record all masses to the nearest 0.1 percent of the sample mass or to the nearest 0.1 g.
- For soil, determine and record all masses to the nearest 0.1 g.

When determining the mass of hot samples or containers or both, place and tare a buffer between the sample container and the balance. This will eliminate damage to or interference with the operation of the balance or scale.

1. Determine and record the mass of the container .
   a. For soils: the container includes the mass of the close-fitting lid.
   b. For aggregate: the lid is optional unless drying with a microwave then a ventilated lid is required.
2. Place the wet sample in the container.
3. Determine and record the total mass of the container and wet sample.
   a. For oven(s), hot plates, infrared heaters, etc.: Spread the sample in the container.
   b. For microwave oven: Heap sample in the container; cover with ventilated lid.
4. Determine and record the wet mass of the sample (M_W) by subtracting the container mass determined in Step 1 from the mass of the container and sample determined in Step 3.
5. Place the sample in one of the following drying apparatuses:
   a. For aggregate –
      i. Controlled heat source (oven): at 110 ±5°C (230 ±9°F).
      ii. Uncontrolled heat source (Hot plate, infrared heater, or other heat source as allowed by the agency): Stir frequently to avoid localized overheating.

   b. For soil – controlled heat source (oven): at 110 ±5°C (230 ±9°F).

Note 1: Soils containing gypsum or significant amounts of organic material require special drying. For reliable moisture contents dry these soils at 60°C (140°F). For more information see AASHTO T 265, Note 2.

6. Dry until sample appears moisture free.
7. Determine mass of sample and container.
8. Determine and record the mass of the sample by subtracting the container mass determined in Step 1 from the mass of the container and sample determined in Step 7.
9. Return sample and container to the heat source for the additional time interval.
   a. Drying intervals for aggregate –
      i. Controlled heat source (oven): 30 minutes
      ii. Uncontrolled heat source (Hot plate, infrared heater, or other heat source as allowed by the agency): 10 minutes
      iii. Uncontrolled heat source (Microwave oven): 2 minutes

Caution: Some minerals in the sample may cause the aggregate to overheat, crack, and explode; altering the aggregate gradation.

   b. Drying interval for soil – controlled heat source (oven): 1 hour

10. Determine mass of sample and container.
11. Determine and record the mass of the sample by subtracting the container mass determined in Step 1 from the mass of the container and sample determined in Step 10.
12. Determine percent change by subtracting the new mass determination (M_n) from the previous mass determination (M_p), dividing by the previous mass determination (M_p), and multiplying by 100.
13. Continue drying, performing steps 9 through 12, until there is less than a 0.10 percent change after additional drying time.
14. Constant mass has been achieved; sample is defined as dry.
15. Allow the sample to cool. Immediately determine and record the total mass of the container and dry sample.
16. Determine and record the dry mass of the sample (M_D) by subtracting the mass of the container determined in Step 1 from the mass of the container and sample determined in Step 15.
17. Determine and record percent moisture (w) by subtracting the final dry mass determination (M_D) from the initial wet mass determination (M_W), dividing by the final dry mass determination (M_D), and multiplying by 100.

Table 3
Methods of Drying

Aggregate		
Heat Source	**Specific Instructions**	**Drying intervals to achieve constant mass (minutes)**
Controlled: Forced draft (preferred), ventilated, or convection oven	110 ±5°C (230 ±9°F)	30
Uncontrolled:		
Hot plate, infrared heater, or any other device/method allowed by the agency	Stir frequently	10
Microwave	Heap sample and cover with ventilated lid	2
Soil		
Heat Source	**Specific Instructions**	**Drying interval to achieve constant mass**
Controlled: Forced draft (preferred), ventilated, or convection oven	110 ±5°C (230 ±9°F)	1 hour

Calculation

Constant Mass

Calculate constant mass using the following formula:

$$\% \, Change = \frac{M_p - M_n}{M_p} \times 100$$

Where:

M_p = previous mass measurement

M_n = new mass measurement

Example:

Mass of container:		1232.1 g
Mass of container and sample after first drying cycle:		2637.2 g
Mass, M_p, of possibly dry sample:	2637.2 g - 1232.1 g =	1405.1 g
Mass of container and sample after second drying cycle:		2634.1 g
Mass, M_n, of sample:	2634.1 g - 1232.1 g =	1402.0 g

$$\% \, Change = \frac{1405.1 \, g - 1402.0 \, g}{1405.1 \, g} \times 100 = 0.22\%$$

0.22 percent is not less than 0.10 percent, so continue drying.

Mass of container and sample after third drying cycle: 2633.0 g

Mass, M_n, of sample: 2633.0 g - 1232.1 g = 1400.9 g

$$\% \, Change = \frac{1402.0 \, g - 1400.9 \, g}{1402.0 \, g} \times 100 = 0.08\%$$

0.08 percent is less than 0.10 percent, so constant mass has been reached.

Moisture Content:

Calculate the moisture content, as a percent, using the following formula:

$$w = \frac{M_W - M_D}{M_D} \times 100$$

where:

w	=	moisture content, percent
M_W	=	wet mass
M_D	=	dry mass

Example:

Mass of container:	1232.1 g
Mass of container and wet sample:	2764.7 g
Mass, M_W, of wet sample:	2764.7 g - 1232.1 g = 1532.6 g
Mass of container and dry sample (COOLED):	2633.5 g
Mass, M_D, of dry sample:	2633.5 g - 1232.1 g = 1401.4 g

$$w = \frac{1532.6\ g - 1401.4\ g}{1401.4\ g} \times 100 = \frac{131.2g}{1401.4\ g} \times 100 = 9.36\% \quad report\ 9.4\%$$

Report

- On forms approved by the agency
- Sample ID
- M_W, wet mass
- M_D, dry mass
- w, moisture content to the nearest 0.1 percent

DETERMINING THE ASPHALT BINDER CONTENT OF ASPHALT MIXTURES BY THE IGNITION METHOD
FOP FOR AASHTO T 308

Scope

This procedure covers the determination of asphalt binder content of asphalt mixtures by ignition of the binder in accordance with AASHTO T 308-22.

Overview

The sample is heated in a furnace at 538°C (1000°F) or less; samples may be heated by convection or direct infrared irradiation (IR). The aggregate remaining after burning can be used for sieve analysis using the FOP for AASHTO T 30.

Some agencies allow the use of recycled asphalt mixtures. When using recycled asphalt mixtures, check with the agency for specific correction procedures.

Asphalt binder in the asphalt mixture is ignited in a furnace. Asphalt binder content is calculated as the percentage difference between the initial mass of the asphalt mixture and the mass of the residual aggregate, with the asphalt binder correction factor, and moisture content subtracted. The asphalt binder content is expressed as a percent of moisture-free mix mass.

Two methods, A and B, are presented.

Apparatus

Note 1: The apparatus must be calibrated for the specific mix design. See “Correction Factors” at the end of this FOP.

The apparatus for Methods A and B is the same except that the furnace for Method A requires an internal balance.

- Ignition Furnace: A forced-air ignition furnace that heats the specimens by either the convection or direct IR irradiation method. The convection-type furnace must be capable of maintaining the temperature between at least 530 and 545°C (986 and 1013°F) and have a temperature control accurate within ±5°C (±9°F).

  For Method A, the furnace will be equipped with an internal scale thermally isolated from the furnace chamber and accurate to 0.1 g. The scale shall be capable of determining the mass of a 3500 g sample in addition to the sample baskets. A data collection system will be included so that mass can be automatically determined and displayed during the test. The furnace shall have a built-in computer program to calculate the change in mass of the sample and provide for the input of a correction factor for aggregate loss. The furnace shall provide a printed ticket with the initial specimen mass, specimen mass loss, temperature compensation, correction factor, corrected asphalt binder content, test time, and test temperature. The furnace shall provide an audible alarm and indicator light when the sample mass loss does not exceed 0.01 percent of the total sample mass for three consecutive minutes. Perform lift test according to manufacturer’s instructions weekly during use, if applicable.

The furnace shall be designed to permit the operator to change the ending mass loss percentage from both 0.01 percent to 0.02 percent.

For both Method A and Method B, the furnace chamber dimensions shall be adequate to accommodate a 3500 g sample. The furnace door shall be equipped so that it cannot be opened during the ignition test. A method for reducing furnace emissions shall be provided and the furnace shall be vented so that no emissions escape into the laboratory. The furnace shall have a fan to pull air through the furnace to expedite the test and to eliminate the escape of smoke into the laboratory.

- Sample Basket Assembly: consisting of sample basket(s), catch pan, and basket guards. Sample basket(s) will be of appropriate size allowing samples to be thinly spread and allowing air to flow through and around the sample particles. Sets of two or more baskets shall be nested. A catch pan: of sufficient size to hold the sample basket(s) so that aggregate particles and melting asphalt binder falling through the screen mesh are caught. Basket guards will completely enclose the basket and be made of screen mesh, perforated stainless steel plate, or other suitable material.
- Thermometer, or other temperature measuring device, with a temperature range of 10 - 260°C (50-500°F).
- Oven capable of maintaining 110 ±5°C (230 ±9°F).
- Balance or scale: Capacity sufficient for the sample mass and conforming to the requirements of M 231, Class G2.
- **Safety equipment**: Safety glasses or face shield, high temperature gloves, long sleeved jacket, a heat resistant surface capable of withstanding 650°C (1202°F), a protective cage capable of surrounding the sample baskets during the cooling period, and a particle mask for use during removal of the sample from the basket assembly.
- Miscellaneous equipment: A container larger than the sample basket(s) for transferring sample after ignition, large flat pan, spatulas, bowls, and wire brushes.

Sampling

1. Obtain samples of asphalt mixture in accordance with the FOP for AASHTO R 97.
2. If the mixture is not sufficiently soft to separate with a spatula or trowel, place it in a large flat pan in an oven at 110 ±5°C (230 ±9°F) until workable.
3. Reduce asphalt mixture samples in accordance with the FOP for AASHTO R 47.
4. Test sample size shall conform to the mass requirement shown in Table 1.

Note 2: When the mass of the test specimen exceeds the capacity of the equipment used or for large samples of fine mixes, the test specimen may be divided into suitable increments, tested, and the results appropriately combined through a weighted average for calculation of the asphalt binder content.

Table 1

Nominal Maximum Aggregate Size* mm (in.)	Minimum Mass Specimen g	Maximum Mass Specimen g
37.5 (1 ½)	4000	4500
25.0 (1)	3000	3500
19.0 (3/4)	2000	2500
12.5 (1/2)	1500	2000
9.5 (3/8)	1200	1700
4.75 (No. 4)	1200	1700

* One sieve larger than the first sieve to retain more than 10 percent of the material using an agency specified set of sieves based on cumulative percent retained. Where large gaps in specification sieves exist, intermediate sieve(s) may be inserted to determine nominal maximum size.

General

1. For the convection-type furnace, preheat the ignition furnace to 538 ± 5°C (1000 ± 9°F) or to the temperature determined in the Correction Factors Annex of this method. Manually record the furnace temperature (set point) before the initiation of the test if the furnace does not record automatically. For the direct IR irradiation-type furnace, use the same burn profile as used during the correction factor determination.

Procedure – Method A (Internal Balance)

1. Dry the sample to constant mass, according to the FOP for AASHTO T 329; or determine the moisture content of a companion sample in accordance with the FOP for AASHTO T 329.
2. Determine and record the mass of the sample basket assembly to the nearest 0.1 g.
3. Evenly distribute the sample in the sample basket assembly, taking care to keep the material away from the edges of the basket. Use a spatula or trowel to level the sample.
4. Determine and record the total mass of the sample and sample basket assembly at room temperature to the nearest 0.1 g.
5. Calculate the initial mass of the sample by subtracting the mass of the sample basket from the mass of the sample and sample basket assembly and record to the nearest 0.1 g. Designate this mass as (M_i).
6. Record the correction factor or input into the furnace controller for the specific asphalt mixture.

7. Input the initial mass of the sample (M_i) into the ignition furnace controller. Verify that the correct mass has been entered.

8. Verify the furnace scale is reading zero, if not, reset to zero.

   CAUTION: Operator should wear safety equipment – high temperature gloves, face shield, fire-retardant shop coat – when opening the door to load or unload the sample.

9. Open the chamber door and gently set the sample basket assembly in the furnace. Carefully position the sample basket assembly so it is not in contact with the furnace wall. Close the chamber door and verify that the sample mass displayed on the furnace scale equals the total mass of the sample and sample basket assembly recorded in Step 5 within ±5 g.

   Note 3: Differences greater than 5 g or failure of the furnace scale to stabilize may indicate that the specimen basket assembly is contacting the furnace wall.

   Note 4: Furnace temperature will drop below the set point when the door is opened but will recover when the door is closed, and ignition begins. Sample ignition typically increases the temperature well above the set point – relative to sample size and asphalt binder content.

10. Initiate the test by pressing the start button. This will lock the sample chamber and start the combustion blower.

    Safety note: Do not attempt to open the furnace door until the asphalt binder has been completely burned off.

11. Allow the test to continue until the stable light and audible stable indicator indicate that the change in mass does not exceed 0.01 percent for three consecutive minutes. Press the stop button. This will unlock the sample chamber and cause the printer to print out the test results.

    Note 5: An ending mass loss percentage of 0.02 may be used, if allowed by the agency, when aggregate that exhibits an excessive amount of loss during ignition testing is used.

12. Open the chamber door, remove the sample basket assembly, and place on the cooling plate or block. Place the protective cage over the sample basket assembly and allow it to cool to room temperature (approximately 30 minutes).

13. Determine and record the mass of the sample and sample basket assembly after ignition to the nearest 0.1 g.

14. Calculate the mass of the sample by subtracting the mass of the sample basket assembly from the mass of the sample and sample basket assembly and record to the nearest 0.1 g. Designate this mass as M_f.

15. Use the asphalt binder content percentage from the printed ticket. Subtract the moisture content and the correction factor if not entered into the furnace controller from the printed ticket asphalt binder content and report the difference as the corrected asphalt binder content.

    Asphalt binder content percentage can also be calculated using the formula from "Method B" Step 16.

Calculation

Corrected asphalt binder content:

$$P_b = BC - MC - C_f{}^*$$

*If correction factor is not entered into the furnace controller

where:

P_b = the corrected asphalt binder content as a percent by mass of the asphalt mixture

BC = asphalt binder content shown on printed ticket

MC = moisture content of the companion asphalt mixture sample, percent, as determined by the FOP for AASHTO T 329 (if the specimen was oven-dried before initiating the procedure, MC=0)

C_f = correction factor as a percent by mass of the asphalt mixture sample

Procedure – Method B (External Balance)

1. Dry the sample to constant mass, according to the FOP for AASHTO T 329; or determine the moisture content of a companion sample in accordance with the FOP for AASHTO T 329.
2. Determine and record the mass of the sample basket assembly to the nearest 0.1 g.
3. Place the sample basket(s) in the catch pan. Evenly distribute the sample in the sample basket(s), taking care to keep the material away from the edges of the basket. Use a spatula or trowel to level the sample.
4. Determine and record the mass of the sample and sample basket assembly at room temperature to the nearest 0.1 g.
5. Calculate the initial mass of the sample by subtracting the mass of the sample basket from the mass of the sample and sample basket assembly and record to the nearest 0.1 g. Designate this mass as (M_i).
6. Record the correction factor for the specific asphalt mixture.
7. Open the chamber door and gently set the sample basket assembly in the furnace. Carefully position the sample basket assembly so it is not in contact with the furnace wall. Burn the asphalt mixture sample in the furnace for 45 minutes or the length of time determined in the "Correction Factors" section.
8. Open the chamber door, remove the sample basket assembly, and place on the cooling plate or block. Place the protective cage over the sample and allow it to cool to room temperature (approximately 30 min).

9. Determine and record the mass of the sample and sample basket assembly to the nearest 0.1 g.
10. Calculate the sample mass by subtracting the mass of the sample basket assembly from the mass of the sample and sample basket assembly and record to the nearest 0.1 g.
11. Place the sample basket assembly back into the furnace.
12. Burn the sample for at least 15 minutes after the furnace reaches the set temperature.
13. Open the chamber door, remove the sample basket assembly, and place on the cooling plate or block. Place the protective cage over the sample basket assembly and allow it to cool to room temperature (approximately 30 min.).
14. Determine and record the mass of the sample and sample basket assembly to the nearest 0.1 g.
15. Calculate the mass of the sample by subtracting the mass of the sample basket assembly from the mass of the sample and sample basket assembly and record to the nearest 0.1 g.
16. Determine percent change by subtracting the new mass determination (M_n) from the previous mass determination (M_p), dividing by the previous mass determination (M_p), and multiplying by 100.
17. If the percent change exceeds 0.01 percent of the previous sample mass, repeat Steps 11 through 16 until the percent change does not exceed 0.01 percent.

    Note 6: An ending mass loss percentage of 0.02 may be used, if allowed by the agency, when aggregate that exhibits an excessive amount of loss during ignition testing is used.

18. Determine and record the mass of the sample and sample basket assembly to the nearest 0.1 g.
19. Calculate the final sample mass by subtracting the mass of the sample basket assembly and sample and sample basket assembly and record to the nearest 0.1 g. Designate this mass as M_f.
20. Calculate the asphalt binder content of the sample.

Calculations

Constant Mass

Calculate %change:

$$\% \, Change = \frac{M_p - M_n}{M_p} \times 100$$

where:

M_p = sample mass after ignition

M_n = sample mass after 15 min. additional ignition

Example

Initial mass of sample and basket	= 5292.7 g
Mass of basket assembly	= 2931.5 g
M_i	= 2361.2 g
Sample mass and basket after first ignition	= 5154.4 g
Sample mass after first ignition	= 2222.9 g
Sample mass and basket after additional 15 min ignition	= 5154.2 g

Constant mass

Sample mass after additional 15 min ignition = 2222.7 g

$$\% change = \frac{2222.9 \, g - 2222.7 \, g}{2222.9 \, g} \times 100 = 0.009\%$$

%change is not greater than 0.01 percent, so $\mathbf{M_f}$ **=** 2222.7 g

Percent asphalt binder (P_b)

Calculate the asphalt binder content of the sample as follows:

$$P_b = \frac{M_i - M_f}{M_i} \times 100 - MC - C_f$$

where:

P_b = the corrected asphalt binder content as a percent by mass of the asphalt mixture sample

M_f = the final sample mass after ignition, g

M_i = the initial mass of the asphalt mixture sample before ignition, g

MC= moisture content of the companion asphalt mixture sample, percent, as determined by the FOP for AASHTO T 329 (if the specimen was oven-dried before initiating the procedure, MC = 0).

C_f = correction factor as a percent by mass of the asphalt mixture sample

Example

Correction factor	= 0.42%
Moisture content	= 0.04%
Initial mass of sample and basket	= 5292.7 g
Mass of basket assembly	= 2931.5 g
M_i	= 2361.2 g
M_f	= 2222.7 g

$$P_b = \frac{2361.2\ g - 2222.7\ g}{2361.2\ g} \times 100 - 0.04\% - 0.42\% = 5.41\%$$

P_b= 5.41%

Gradation

1. Empty contents of the basket(s) into a container, being careful to capture all material. Use a small wire brush to ensure all residual fines are removed from the baskets.

   Note 7: Particle masks are a recommended safety precaution.

2. Perform the gradation analysis in accordance with the FOP for AASHTO T 30.

Report

- On forms approved by the agency
- Sample ID
- Method of test (A or B)
- Corrected asphalt binder content, P_b, to the nearest 0.01 percent or per agency standard
- Correction factor, C_f , to the nearest 0.01 percent
- Temperature compensation factor (Method A only)
- Total percent loss
- Sample mass
- Moisture content to the nearest 0.01%
- Test temperature

Attach the original printed ticket with all intermediate values (continuous tape) to the report for furnaces with internal balances.

ANNEX – CORRECTION FACTORS

ASPHALT BINDER AND AGGREGATE

(Mandatory Information)

Asphalt binder content results may be affected by the type of aggregate in the mixture and by the ignition furnace. Asphalt binder and aggregate correction factors must, therefore, be established by testing a set of correction specimens for each Job Mix Formula (JMF) mix design. Each ignition furnace will have its own unique correction factor determined in the location where testing will be performed.

This procedure must be performed before any acceptance testing is completed, and repeated each time there is a change in the mix ingredients or design. Any changes greater than 5 percent in stockpiled aggregate proportions should require a new correction factor.

All correction samples will be prepared by a central / regional laboratory unless otherwise directed.

Asphalt binder correction factor: A correction factor must be established by testing a set of correction specimens for each Job Mix Formula (JMF). Certain aggregate types may result in unusually high correction factors (> 1.00 percent). Such mixes should be corrected and tested at a lower temperature as described below.

Aggregate correction factor: Due to potential aggregate breakdown during the ignition process, a correction factor will need to be determined for the following conditions:

a. Aggregates that have a proven history of excessive breakdown

b. Aggregate from an unknown source.

This correction factor will be used to adjust the acceptance gradation test results obtained according to the FOP for AASHTO T 30.

Procedure

1. Obtain samples of aggregate in accordance with the FOP for AASHTO R 90.
2. Obtain samples of asphalt binder in accordance with the FOP for AASHTO R 66.

   Note 8: Include other additives that may be required by the JMF.
3. Prepare an initial, or "butter," mix at the design asphalt binder content. Mix and discard the butter mix before mixing any of the correction specimens to ensure accurate asphalt content.
4. Prepare two correction specimens at the JMF design asphalt binder content. Aggregate used for correction specimens shall be sampled from material designated for use on the project. An agency approved method will be used to combine aggregate. An additional "blank" specimen shall be batched and tested for aggregate gradation in accordance with the FOP for AASHTO T 30. The gradation from the "blank" shall fall within the agency specified mix design tolerances.
5. Place the freshly mixed specimens directly into the sample basket assembly. If mixed specimens are allowed to cool before placement in the sample basket assembly, the

specimens must be dried to constant mass according to the FOP for AASHTO T 329. Do not preheat the sample basket assembly.

6. Test the specimens in accordance with Method A or Method B of the procedure.
7. Once both correction specimens have been burned, determine the asphalt binder content for each specimen by calculation or from the printed ignition furnace tickets, if available.
8. Calculate the difference between asphalt binder contents of the two specimens:
   a. If the difference between the asphalt binder contents of the two specimens does not exceed 0.15 percent, use these two results to determine the correction factor.
   b. If the difference between the asphalt binder contents of the two specimens exceeds 0.15 percent, repeat with two more specimens and, from the four results, discard the high and low results. Determine the correction factor from the two remaining results.
9. Calculate the difference between the actual and measured asphalt binder contents to 0.01 percent. The asphalt binder correction factor, C_f, is the average of the differences expressed as a percent by mass of asphalt mixture.
10. If the asphalt binder correction factor exceeds 1.00 percent, the test temperature must be lowered to 482 ± 5°C (900 ± 9°F) and new samples must be burned. If the correction factor is the same or higher at the lower temperature, it is permissible to use the higher temperature. The temperature for determining the asphalt binder content of asphalt mixture samples by this procedure shall be the same temperature determined for the correction samples.
11. For the direct IR irradiation-type burn furnaces, the **default** burn profile should be used for most materials. The operator may select burn-profile Option 1 or Option 2 to optimize the burn cycle. The burn profile for testing asphalt mixture samples shall be the same burn profile selected for correction samples.

    Option 1 is designed for aggregate that requires a large asphalt binder correction factor (greater than 1.00 percent) – typically very soft aggregate (such as dolomite).

    Option 2 is designed for samples that may not burn completely using the **default** burn profile.
12. Perform a gradation analysis on the residual aggregate in accordance with the FOP for AASHTO T 30, if required. The results will be utilized in developing an "Aggregate Correction Factor" and should be calculated and reported to 0.1 percent.
13. From the gradation results subtract the percent passing for each sieve, for each sample, from the percent passing each sieve of the "Blank" specimen gradation results from Step 4.
14. Determine the average difference of the two values. If the difference for any single sieve exceeds the allowable difference of that sieve as listed in Table 2, then aggregate gradation correction factors (equal to the resultant average differences) for all sieves shall be applied to all acceptance gradation test results determined by the FOP for AASHTO T 30. If the 75 µm (No. 200) is the only sieve outside the limits in Table 2, apply the aggregate correction factor to only the 75 µm (No. 200) sieve.

Table 2
Permitted Sieving Difference

Sieve	Allowable Difference
Sizes larger than or equal to 2.36 mm (No.8)	± 5.0%
Sizes larger than to 75 µm (No.200) and smaller than 2.36 mm (No.8)	± 3.0%
Sizes 75 µm (No.200) and smaller	± 0.5%

Examples:

Sieve Size mm (in.)	Correction Factor Blank Sample % Passing	Correction Factor Sample #1 % Passing	Correction Factor Sample #2 % Passing	Difference 1 / 2	Avg. Diff.	Sieves to adjust
19.0 (3/4)	100	100	100	0/0	0.0	
12.5 (1/2)	86.3	87.4	86.4	-1.1/-0.1	-0.6	
9.5 (3/8)	77.4	76.5	78.8	+0.9/-1.4	-0.3	
4.75 (No. 4)	51.5	53.6	55.9	-2.1/-4.4	-3.3	
2.36 (No. 8)	34.7	36.1	37.2	-1.4/-2.5	-2.0	
01.18 (No. 16)	23.3	25.0	23.9	-1.7/-0.6	-1.2	
0.600 (No. 30)	16.4	19.2	18.1	-2.8/-1.7	-2.3	
0.300 (No. 50)	12.0	11.1	12.7	+0.9/-0.7	+0.1	
0.150 (No. 100)	8.1	9.9	6.3	-1.8/+1.8	0.0	
75 µm (No. 200)	5.5	5.9	6.2	-0.4/-0.7	-0.6	**- 0.6**

In this example, all gradation test results performed on the residual aggregate (FOP for AASHTO T 30) would have an aggregate correction factor applied to the percent passing the 75 µm (No. 200) sieve. The correction factor must be applied because the average difference on the 75 µm (No. 200) sieve is outside the tolerance from Table 2.

In the following example, aggregate correction factors would be applied to each sieve because the average difference on the 4.75 mm (No. 4) is outside the tolerance from Table 2.

Sieve Size mm (in.)	Correction Factor Blank Sample % Passing	Correction Factor Sample #1 % Passing	Correction Factor Sample #2 % Passing	Difference 1 / 2	Avg. Diff.	Sieves to adjust
19.0 (3/4)	100	100	100	0/0	0.0	0.0
12.5 (1/2)	86.3	87.4	86.4	-1.1/-0.1	-0.6	**-0.6**
9.5 (3/8)	77.4	76.5	78.8	+0.9/-1.4	-0.3	**-0.3**
4.75 (No. 4)	51.5	55.6	57.9	-4.1/-6.4	-5.3	**-5.3**
2.36 (No. 8)	34.7	36.1	37.2	-1.4/-2.5	-2.0	**-2.0**
01.18 (No. 16)	23.3	25.0	23.9	-1.7/-0.6	-1.2	**-1.2**
0.600 (No. 30)	16.4	19.2	18.1	-2.8/-1.7	-2.3	**-2.3**
0.300 (No. 50)	12.0	11.1	12.7	+0.9/-0.7	+0.1	**+0.1**
0.150 (No. 100)	8.1	9.9	6.3	-1.8/+1.8	0.0	0.0
75 µm (No. 200)	5.5	5.9	6.2	-0.4/-0.7	-0.6	**-0.6**

Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures

AASHTO Designation: T 324-23

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MOISTURE CONTENT OF ASPHALT MIXTURES BY OVEN METHOD FOP FOR AASHTO T 329

Scope

This procedure covers the determination of moisture content of asphalt mixtures in accordance with AASHTO T 329-22.

Overview

Moisture content is determined by comparing the wet mass of a sample and the mass of the sample after drying to constant mass. The term constant mass is used to define when a sample is dry.

Constant mass – the state at which a mass does not change more than a given percent, after additional drying for a defined time interval, at a required temperature.

Apparatus

- Balance or scale: 2 kg capacity, readable to 0.1 g and conforming to AASHTO M 231.
- Forced draft, ventilated, or convection oven: Capable of maintaining the temperature surrounding the sample at 163 ±14°C (325 ±25°F).
- Container: Clean, dry, not affected by heat and of sufficient size to contain a test sample without danger of spilling.
- Thermometer or other suitable device with a temperature range of 50 to 200°C (122 to 392°F) and readable to the nearest 2°C (4°F).

Sample

The test sample shall be obtained in accordance with the FOP for AASHTO R 97 and reduced in accordance with the FOP for AASHTO R 47. The size of the test sample shall be a minimum of 1000 g.

Procedure

1. Preheat the oven to the Job Mix Formula (JMF) mixing temperature range. If the mixing temperature is not supplied, a temperature of 163 ±14ºC (325 ±25ºF) is to be used.
2. Determine and record the mass of the container, including release media, to the nearest 0.1 g.

   Note 1: When using paper or other absorptive material to line the container ensure it is dry before determining initial mass of container.
3. Place the wet sample in the container.
4. Determine and record the temperature of the sample to the nearest 2°C (4°F).
5. Determine and record the mass of the sample and container to the nearest 0.1 g.
6. Determine and record the wet mass (M_i) of the sample by subtracting the container mass determined in Step 2 from the mass of the sample and container determined in Step 5.

7. Place the sample and container in the oven and dry for 90 ±5 min.
8. Determine the mass of sample and container.
9. Determine and record the mass of the sample by subtracting the container mass determined in Step 2 from the mass of the sample and container determined in Step 8.
10. Return sample and container to the oven and dry for 30 ±5 min.
11. Determine the mass of sample and container.
12. Determine and record the mass of the sample by subtracting the container mass determined in Step 2 from the mass of the sample and container determined in Step 11.
13. Determine percent change by subtracting the new mass determination (M_n) from the previous mass determination (M_p), dividing by the previous mass determination (M_p), and multiplying by 100.
14. Continue drying, performing Steps 10 through 13, until there is less than 0.05 percent change after additional drying time.
15. Cool the sample and container to ±9°C (±15°F) of the temperature determined in Step 4.
16. Determine and record the dry mass of the sample and container to the nearest 0.1 g.
17. Determine and record the mass of dry sample (M_f) by subtracting the mass of the container determined in Step 2 from the dry mass of the sample and container determined in Step 16.

Note 2: Moisture content and the number of samples in the oven will affect the rate of drying at any given time. Placing wet samples in the oven with nearly dry samples could affect the drying process.

Calculations

Constant Mass:

Calculate constant mass using the following formula:

$$\% \, Change = \frac{M_p - M_n}{M_p} \times 100$$

Where:

M_p = previous mass measurement

M_n = new mass measurement

Example:

Mass of container and release media:	232.6 g
Initial mass of sample and container:	1367.5 g
Initial mass of sample (M_i):	1367.5 g – 232.6 g = 1134.9 g

Mass of sample and container after first drying cycle: 1361.8 g

Mass, M_p, of sample: 1361.8 g – 232.6 g = 1129.2 g

Mass of sample and container after second drying cycle: 1360.4 g

Mass, M_n, of sample: 1360.4 g – 232.6 g = 1127.8 g

$$\% \, Change = \frac{1129.2 \, g - 1127.8 \, g}{1129.2 \, g} \times 100 = 0.12\%$$

0.12 percent is not less than 0.05 percent, so continue drying the sample.

Mass of sample and container after third drying cycle: 1359.9 g

Mass, M_n, of sample: 1359.9 g – 232.6 g = 1127.3 g

$$\% \, Change = \frac{1127.8 \, g - 1127.3 \, g}{1127.8 \, g} \times 100 = 0.04\%$$

0.04 percent is less than 0.05 percent, so constant mass has been reached.

Moisture Content:

Calculate the moisture content, as a percent, using the following formula.

$$Moisture \, Content = \frac{M_i - M_f}{M_f} \times 100$$

Where:

M_i = initial, wet mass

M_f = final, dry mass

Example:

M_i = 1134.9 g

M_f = 1127.3 g

$$Moisture \, Content = \frac{1134.9 \, g - 1127.3 \, g}{1127.3 \, g} \times 100 = 0.674, \text{report } 0.67\%$$

Report

- On forms approved by the agency
- Sample ID
- Moisture content to the nearest 0.01 percent

DETERMINING THE PERCENTAGE OF FRACTURE IN COARSE AGGREGATE FOP FOR AASHTO T 335

Scope

This procedure covers the determination of the percentage, by mass, of a coarse aggregate (CA) sample that consists of fractured particles meeting specified requirements in accordance with AASHTO T 335-09.

In this FOP, a sample of aggregate is screened on the sieve separating CA and fine aggregate (FA). This sieve will be identified in the agency's specifications but might be the 4.75 mm (No. 4) sieve. CA particles are visually evaluated to determine conformance to the specified fractured criteria. The percentage of conforming particles, by mass, is calculated for comparison to the specifications.

Apparatus

- Balance or scale: Capacity sufficient for the principal sample mass, accurate to 0.1 percent of the sample mass or readable to 0.1 g and meeting the requirements of AASHTO M 231.
- Sieves: Meeting requirements of the FOP for AASHTO T 27/T 11.
- Splitter: Meeting the requirements of FOP for AASHTO R 76.

Terminology

1. Fractured criteria: The specified requirement for fractured particles determined by each agency.
2. Fractured face: An angular, rough, or broken surface of an aggregate particle created by crushing or by other means. A face is considered a "fractured face" whenever one-half or more of the projected area, when viewed normal to that face, is fractured with sharp and well-defined edges. This excludes small nicks.
3. Fractured particle: A particle of aggregate having at least the minimum number of fractured faces specified. (This is usually one or two.)

Sampling and Sample Preparation

1. Sample and reduce the aggregate in accordance with the FOPs for AASHTO R 90 and R 76.
2. When the specifications list only a total fracture percentage, the sample shall be prepared in accordance with Method 1. When the specifications require that the fracture be counted and reported on each sieve, the sample shall be prepared in accordance with Method 2.
3. Method 1 - Combined Fracture Determination
    a. Dry and cool the sample, if necessary, to sufficiently obtain a clean separation of FA and CA material in the sieving operation.

b. Sieve the sample in accordance with the FOP for AASHTO T 27/ T 11 over the 4.75 mm (No. 4) sieve, or the appropriate sieve listed in the agency's specifications for this material.

Note 1: Where necessary, wash the sample over the sieve designated for the determination of fractured particles to remove any remaining fine material, and dry to a constant mass in accordance with the FOP for AASHTO T 255.

c. Reduce the sample using Method A – Mechanical Splitter, in accordance with the FOP for AASHTO R 76, to the appropriate test size. This test size should be slightly larger than shown in Table 1, to account for loss of fines through washing if necessary.

TABLE 1
Sample Size
Method 1 (Combined Sieve Fracture)

Nominal Maximum Size* mm (in.)	Minimum Cumulative Sample Mass Retained on 4.75 mm (No. 4) Sieve g (lb)
37.5 (1 1/2)	2500 (6)
25.0 (1)	1500 (3.5
19.0 (3/4)	1000 (2.5)
12.5 (1/2)	700 (1.5)
9.5 (3/8)	400 (0.9)
4.75 (No. 4)	200 (0.4)

* One sieve larger than the first sieve to retain more than 10 percent of the material using an agency specified set of sieves based on cumulative percent retained. Where large gaps in specification sieves exist, intermediate sieve(s) may be inserted to determine nominal maximum size.

4. Method 2 – Individual Sieve Fracture Determination

a. Dry and cool the sample, if necessary, to sufficiently to obtain a clean separation of FA and CA material in the sieving operation. A washed sample from the gradation determination (the FOP for AASHTO T 27/T 11) may be used.

b. If not, sieve the sample in accordance with the FOP for AASHTO T 27 over the sieves listed in the specifications for this material.

Note 2: If overload (buffer) sieves are used the material from that sieve must be added to the next specification sieve.

c. The size of test sample for each sieve shall meet the minimum size shown in Table 2. Utilize the total retained sieve mass or select a representative portion from each sieve mass by splitting or quartering in accordance with the FOP for AASHTO R 76.

Note 3: Where necessary, wash the sample over the sieves designated for the determination of fractured particles to remove any remaining fine material, and dry to a constant mass in accordance with the FOP for AASHTO T 255.

TABLE 2
Sample Size
Method 2 (Individual Sieve Fracture)

Sieve Size mm (in.)	Minimum Sample Mass g (lb)
31.5 (1 1/4)	1500 (3.5)
25.0 (1)	1000 (2.2)
19.0 (3/4)	700 (1.5)
16.0 (5/8)	500 (1.0)
12.5 (1/2)	300 (0.7)
9.5 (3/8)	200 (0.5)
6.3 (1/4)	100 (0.2)
4.75 (No. 4)	100 (0.2)
2.36 (No. 8)	25 (0.1)
2.00 (No. 10)	25 (0.1)

Note 4: If fracture is determined on a sample obtained for gradation, use the mass retained on the individual sieves, even if it is less than the minimum listed in Table 2. If less than 5 percent of the total mass is retained on a single specification sieve, include that material on the next smaller specification sieve. If a smaller specification sieve does not exist, this material shall not be included in the fracture determination.

Procedure

1. After cooling, spread the dried sample on a clean, flat surface.
2. Examine each particle face and determine if the particle meets the fractured criteria.
3. Separate the sample into three categories:
   - Fractured particles meeting the criteria
   - Particles not meeting the criteria
   - Questionable or borderline particles
4. Determine the dry mass of particles in each category to the nearest 0.1 g.
5. Calculate the percent questionable particles to the nearest 1 percent.
6. Re-sort the questionable particles when more than 15 percent is present. Continue sorting until there is no more than 15 percent in the questionable category.
7. Calculate the percent fractured particles meeting criteria to nearest 0.1 percent. Report to 1 percent.

Calculation

Calculate the percent questionable particles to the nearest 1 percent using the following formula:

$$\%Q = \frac{Q}{F + Q + N} \times 100$$

Where:

%Q	=	Percent of questionable particles
F	=	Mass of fractured particles
Q	=	Mass of questionable or borderline particles
N	=	Mass of unfractured particles

Example:

$$\%Q = \frac{97.6\ g}{632.6\ g + 97.6\ g + 352.6\ g} \times 100 = 9\%$$

Given:

F	=	632.6 g
Q	=	97.6 g
N	=	352.6 g

Calculate the percent fractured particles to the nearest 0.1 percent using the following formula:

$$\mathrm{P} = \frac{\frac{Q}{2} + F}{F + Q + N} \times 100$$

Where:

P	=	Percent of fractured particles
F	=	Mass of fractured particles
Q	=	Mass of questionable particles
N	=	Mass of unfractured particles

Example:

$$P = \frac{\frac{97.6\ g}{2} + 632.6\text{ g}}{632.6\ g + 97.6\ g + 352.6\ g} \times 100 = 62.9\% \qquad \text{Report } 63\%$$

Given:

F	=	632.6 g
Q	=	97.6 g
N	=	352.6 g

Report

- On forms approved by the agency
- Sample ID
- Fractured particles to the nearest 1 percent.

REDUCING SAMPLES OF ASPHALT MIXTURES TO TESTING SIZE FOP FOR AASHTO R 47

Scope

This procedure covers sample reduction of asphalt mixtures to testing size in accordance with AASHTO R 47-23. The reduced portion is to be representative of the original sample.

Apparatus

- Thermostatically controlled oven capable of maintaining a temperature of at least 110°C (230°F) or high enough to heat the material to a pliable condition for splitting.
- Non-contact temperature measuring device.
- Metal spatulas, trowels, metal straightedges, drywall taping knives, or a combination thereof; for removing asphalt mixture samples from the quartering device, cleaning surfaces used for splitting, etc.
- Square-tipped, flat-bottom scoop, shovel, or trowel for mixing asphalt mixture before quartering.
- Miscellaneous equipment including hot plate, non-asbestos heat-resistant gloves or mittens, pans, buckets, and cans.
- Sheeting: Non-stick heavy paper or other material as approved by the agency.
- Agency-approved release agent, free of solvent or petroleum-based material that could affect asphalt binder.
- Mechanical Splitter Type B (Riffle): having a minimum of eight equal-width chutes discharging alternately to each side with a minimum chute width of at least 50 percent larger than the largest particle size. A hopper or straight-edged pan with a width equal to or slightly smaller than the assembly of chutes in the riffle splitter to permit uniform discharge of the asphalt mixture through the chutes without segregation or loss of material. Sample receptacles of sufficient width and capacity to receive the reduced portions of asphalt mixture from the splitter without loss of material.
- Quartering Template: formed in the shape of a 90- degree cross with equal sides that exceed the diameter of the flattened cone of material sufficient to allow complete separation of the quartered sample. The height of the sides must be sufficient to extend above the thickness of the flattened cone of the sample to be quartered. Manufactured of metal that will withstand heat and use without deforming.
- Non-stick mixing surface that is hard, heat-resistant, clean, level, and large enough to permit asphalt mixture samples to be mixed without contamination or loss of material.

Sampling

Obtain samples according to the FOP for AASHTO R 97.

Sample Preparation

The sample must be warm enough to separate. If not, warm in an oven until it is sufficiently soft to mix and separate easily. Do not exceed either the temperature or time limits specified in the test method(s) to be performed.

Selection of Procedure (Method)

Refer to agency requirements when determining the appropriate method(s) of sample reduction. In general, the selection of a particular method to reduce a sample depends on the initial size of the sample vs. the size of the sample needed for the specific test to be performed. It is recommended that, for large amounts of material, the initial reduction be performed using a mechanical splitter. This decreases the time needed for reduction and minimizes temperature loss. Further reduction of the remaining asphalt mixture may be performed by a combination of the following methods, as approved by the agency.

The methods for reduction are:

- Mechanical Splitter Type B (Riffle) Method
- Quartering and Sectoring Methods
  - Quartering
  - Sectoring
- Incremental Method

Procedure

When heating of the equipment is desired, it shall be heated to a temperature not to exceed the maximum mixing temperature of the job mix formula (JMF).

Mechanical Splitter Type B (Riffle) Method

1. Clean the splitter and apply a light coating of agency-approved release agent to the surfaces that will come in contact with asphalt mixture (hopper or straight-edged pan, chutes, receptacles).
2. Place two empty receptacles under the splitter.
3. Carefully empty the asphalt mixture from the agency-approved container(s) into the hopper or straight-edged pan without loss of material. Uniformly distribute from side to side of the hopper or pan.
4. Discharge the asphalt mixture at a uniform rate, allowing it to flow freely through the chutes.
5. Any asphalt mixture that is retained on the surface of the splitter shall be removed and placed into the appropriate receptacle.
6. Reduce the remaining asphalt mixture as needed by this method or a combination of the following methods as approved by the agency.

7. Using one of the two receptacles containing asphalt mixture, repeat the reduction process until the asphalt mixture contained in one of the two receptacles is the appropriate size for the required test.
8. After each split, remember to clean the splitter hopper and chute surfaces if needed.
9. Retain and properly identify the remaining unused asphalt mixture sample for further testing if required by the agency.

Quartering and Sectoring Methods

1. If needed, apply a light coating of agency-approved release agent to quartering template.
2. Place the sample from the agency approved container(s) into a conical pile on a hard, "non-stick," clean, level surface where there will be neither a loss of material nor the accidental addition of foreign material. The surface can be made non-stick by the application of an agency-approved release agent, or sheeting.
3. Mix the material thoroughly by turning the entire sample over a minimum of four times with a flat-bottom scoop; or by alternately lifting each corner of the sheeting and pulling it over the sample diagonally toward the opposite corner, causing the material to be rolled. Create a conical pile by either depositing each scoop or shovelful of the last turning on top of the preceding one or lifting both opposite corners.
4. Flatten the conical pile to a uniform diameter and thickness where the diameter is four to eight times the thickness. Make a visual observation to ensure that the material is homogeneous.
5. Divide the flattened cone into four equal quarters using the quartering template or straightedges assuring complete separation.
6. Reduce to appropriate sample mass by quartering or sectoring.

Quartering

a. Remove diagonally opposite quarters, including all the fine material, and place in a container to be retained.
b. Remove the quartering template, if used.
c. Combine the remaining quarters.
d. If further reduction is necessary, repeat Quartering Method Steps 3 through 6.
e. Repeat until appropriate sample mass is obtained. The final sample must consist of the two remaining diagonally opposite quarters.
f. Retain and properly identify the remaining unused portion of the asphalt mixture sample for further testing if required by the agency.

Sectoring

a. Using a straightedge, obtain a sector by slicing through a quarter of the asphalt mixture from the center point to the outer edge of the quarter.

b. Pull or drag the sector from the quarter with two straight edges or hold one edge of the straightedge in contact with quartering device.

c. Remove an approximately equal sector from the diagonally opposite quarter and combine.

d. If necessary, repeat until the appropriate sample mass has been obtained.

e. Continue sectoring with the unused portion of the asphalt mixture until samples have been obtained for all required tests.

f. Retain and properly identify the remaining unused portion of the asphalt mixture sample for further testing if required by the agency.

Incremental Method

1. Cover a hard, clean, level surface with sheeting. This surface shall be large enough that there will be neither a loss of material nor the accidental addition of foreign material.
2. Place the sample from the agency approved container(s) into a conical pile on that surface.
3. Mix the material thoroughly by turning the entire sample over a minimum of four times:
   a. Use a flat-bottom scoop; or
   b. Alternately lift each corner of the sheeting and pull it over the sample diagonally toward the opposite corner, causing the material to be rolled.
4. Create a conical pile by either depositing each scoop or shovelful of the last turning on top of the preceding one or lifting both opposite corners.
5. Grasp the sheeting and roll the conical pile into a cylinder (loaf), then flatten the top. Make a visual observation to determine that the material is homogenous.
6. Remove one quarter of the length of the loaf and place in a container to be saved by either:
   a. Pull sheeting over edge of counter and drop material into container.
   b. Use a straightedge at least as wide as the full loaf to slice off material and place into container.
7. Obtain an appropriate sample mass for the test to be performed; by either:
   a. Pull sheeting over edge of counter and drop cross sections of the material into container until proper sample mass has been obtained.
   b. Use a straightedge at least as wide as the full loaf to slice off cross sections of the material until proper sample mass has been obtained and place into container.

Note 1: When reducing the sample to test size it is advisable to take several small increments, determining the mass each time until the proper minimum size is achieved. Unless the sample size is grossly in excess of the minimum or exceeds the maximum test size, use the sample as reduced for the test.

8. Repeat Step 7 until all the samples for testing have been obtained or until the final quarter of the original loaf is reached.

9. Retain and properly identify the remaining unused portion of the asphalt mixture sample for further testing if required by the agency.

REDUCING SAMPLES OF AGGREGATE TO TESTING SIZE
FOP FOR AASHTO R 76

Scope

This procedure covers the reduction of samples to the appropriate size for testing in accordance with AASHTO R 76-23. Techniques are used that minimize variations in characteristics between test samples and field samples. Method A (Mechanical Splitter) and Method B (Quartering) are covered.

This FOP applies to fine aggregate (FA), coarse aggregate (CA), and combinations of the two (FA / CA) and may also be used on soils.

Terminology

Saturated Surface-Dry (SSD) – condition of an aggregate particle when the permeable voids are filled with water, but no water is present on exposed surfaces.

Note 1: As a quick approximation, if the fine aggregate will retain its shape when molded in the hand, it may be considered wetter than saturated surface-dry.

Apparatus

Method A – Mechanical Splitter

Splitter chutes:

- Even number of equal width chutes
- Discharge alternately to each side
- Minimum of 8 chutes total for CA and FA / CA, 12 chutes total for FA
- Width:
  - Minimum 50 percent larger than largest particle
  - Maximum chute width of 19 mm (3/4 in.) for fine aggregate passing the 9.5 mm (3/8 in.) sieve
- Feed Control:
  - Hopper or straightedge pan with a width equal to or slightly less than the overall width of the assembly of chutes
  - Capable of feeding the splitter at a controlled rate
- Splitter receptacles / pans:
  - Capable of holding two halves of the sample following splitting

The splitter and accessory equipment shall be so designed that the sample will flow smoothly without restriction or loss of material.

Method B – Quartering and Sectoring

- Straightedge scoop, shovel, or trowel
- Broom or brush
- Stick or pipe
- Tarp: A tear resistant rectangular tarp,, appropriate for the amount and size of the material being reduced.
- Quartering Template: Formed in the shape of a 90-degree cross with equal length sides that exceed the diameter of the flattened cone of material sufficient to allow complete separation of the quartered sample. The height of the sides must be sufficient to extend above the thickness of the flattened cone of the sample to be quartered.

Method Selection

Selecting the method of sample reduction depends on

- The type of material: fine aggregate (FA), coarse aggregate (CA), and combinations of the two (FA / CA)
- The moisture content: drier than saturated surface-dry (SSD), SSD, or wetter than SSD.

Note 2: To use Method A on samples of FA and CA/FA that are at SSD or wetter, the entire sample may be dried – using temperatures that do not exceed those specified for any of the tests contemplated – and then reduced.

Select from the following methods based on the material type and moisture condition.

Method A Mechanical

- CA
- FA/CA drier than SSD
- FA drier than SSD

Method B Quartering

- CA
- FA/CA
- FA at SSD or wetter

Method B Sectoring

- FA at SSD or wetter

Table 1

	Drier than SSD	**SSD or Wetter**
Fine Aggregate (FA)	Method A Mechanical	Method B Quartering Method B Sectoring
Mixture of FA/CA	Method A Mechanical Method B Quartering	Method B Quartering
Coarse Aggregate (CA)	Method A Mechanical Method B Quartering	Method A Mechanical Method B Quartering

Procedure

Method A – Mechanical Splitter

1. Place two clean empty receptacles under the splitter.
2. Empty the sample into the hopper or pan without loss of material.
3. Uniformly distribute the material in the hopper or pan from edge to edge so that approximately equal amounts flow through each chute.
4. Discharge the material at a uniform rate, allowing it to flow freely through the chutes.
5. Remove any material retained on the surface of the splitter and place into the appropriate receptacle.
6. Using one of the two receptacles containing material, repeat Steps 1 through 6 until the material in one of the two receptacles is the appropriate sample size for the required test.
7. Retain and properly identify the remaining unused sample for further testing if required.

Mechanical Splitter Check

- Determine the mass of each reduced portion. If the percent difference of the two masses is greater than 5 percent, corrective action must be taken.

Calculation

$$\frac{Smaller\ Mass}{Larger\ Mass} = Ratio \quad (1 - ratio) \times 100 = \%\ Difference$$

Splitter check: 5127 g total sample mass

Splitter pan #1: 2583 g

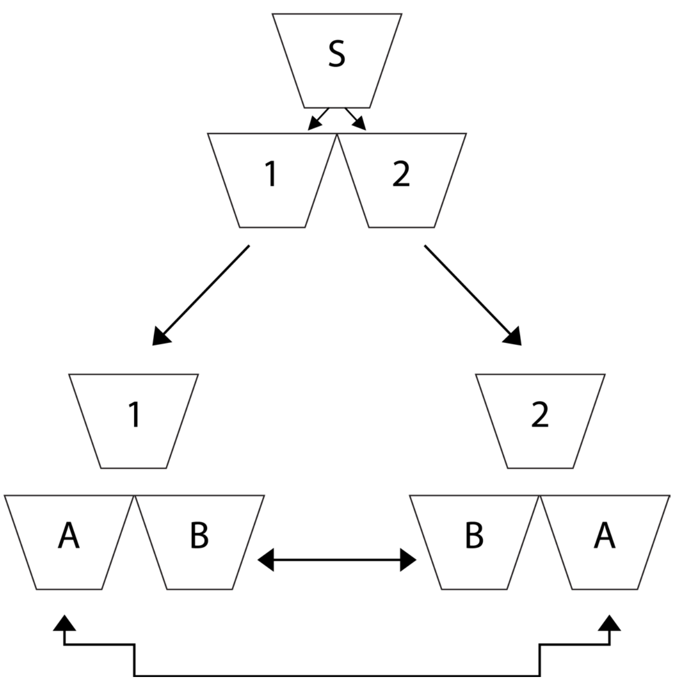
Splitter pan #2: 2544 g

$$\frac{2544\ \text{g}}{2583\ \text{g}} = 0.985 \qquad (1 - 0.985) \times 100 = 1.5\%$$

Alternative to Mechanical Splitter Check

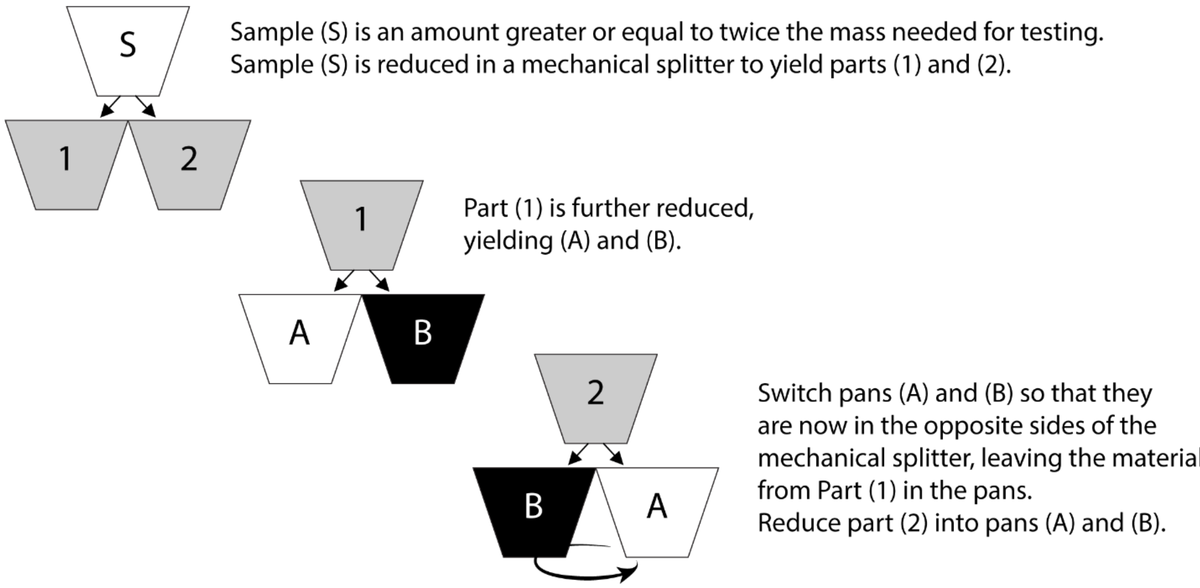
- In lieu of determining the mass of each reduced portion, use the method illustrated in Figure 1 or 2 during reduction.

Figure 1



- Sample (S) is an amount greater than or equal to twice the mass needed for testing. Sample (S) is reduced in a mechanical splitter to yield parts (1) and (2).
- Part (1) is further reduced yielding (A) and (B) while part (2) is reduced to yield (B) and (A).
- Final testing sample is produced by combining alternate pans, i.e. A/A or B/B only.

Figure 2



Method B

Method B Quartering

Use either of the following two procedures or a combination of both.

Surface

1. Place the sample on a hard, clean, level surface where there will be neither loss of material nor the accidental addition of foreign material.

2. Mix the material thoroughly by turning the entire sample over a minimum of four times. With the last turning, shovel the entire sample into a conical pile by depositing each shovelful on top of the preceding one.

3. Flatten the conical pile to a uniform thickness and diameter by pressing down with a shovel. The diameter should be four to eight times the thickness.

4. Divide the flattened pile into four approximately equal quarters with a shovel or trowel.

5. Remove two diagonally opposite quarters, including all fine material, and brush the cleared spaces clean.

6. Successively mix and quarter the remaining material until the sample is reduced to the desired size.

7. The final test sample consists of <u>two diagonally opposite</u> quarters.

Tarp

1. Place the sample on the tarp.

2. Mix the material thoroughly a minimum of four times by pulling each corner of the tarp horizontally over the sample toward the opposite corner. After the last turn, form a conical pile.

3. Flatten the conical pile to a uniform thickness and diameter by pressing down with a shovel. The diameter should be four to eight times the thickness.

4. Divide the flattened pile into four approximately equal quarters with a shovel or trowel or insert a stick or pipe beneath the tarp and under the center of the pile, then lift both ends of the stick, dividing the sample into two roughly equal parts. Remove the stick leaving a fold of the tarp between the divided portions. Insert the stick under the center of the pile at right angles to the first division and again lift both ends of the stick, dividing the sample into four roughly equal quarters.

5. Remove two diagonally opposite quarters, being careful to clean the fines from the tarp.

6. Successively mix and quarter the remaining material until the sample size is reduced to the desired size.

7. The final test sample consists of two diagonally opposite quarters.

Method B Sectoring

1. Place the sample on a hard, clean, level surface where there will be neither loss of material nor the accidental addition of foreign material.

2. Mix the material thoroughly by turning the entire sample over a minimum of four times. With the last turning, shovel the entire sample into a conical pile by depositing each shovelful on top of the preceding one.

3. Flatten the conical pile to a uniform thickness and diameter by pressing down with a shovel. The diameter should be four to eight times the thickness.

4. Divide the flattened cone into four approximately equal quarters using a quartering template, straightedge, shovel, or trowel, assuring complete separation.

5. Using a straightedge, obtain a sector by slicing through a quarter of the material from the center point to the outer edge of the quarter.

6. Pull or drag the sector from the quarter with two straight edges or hold one edge of the straightedge in contact with quartering device.

7. Remove an equal sector from the diagonally opposite quarter and combine to create the appropriate sample mass.

8. Continue obtaining sectors from diagonally opposite quarters until the required sample size has been obtained for all required tests.

SAMPLING ASPHALT MIXTURES
FOP FOR AASHTO R 97

Scope

This procedure covers sampling asphalt mixtures from plants, haul units, and roadways in accordance with AASHTO R 97-19. Sampling is as important as testing. Use care to obtain a representative sample. Avoid segregation and contamination of the material during sampling.

This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Apparatus

- Shovel or Metal Scoops, or Other Equipment: square-head metal shovels at least 125 mm (5.5 in.) wide.
- Sample containers: such as cardboard boxes, metal cans, stainless steel bowls, or other agency-approved containers
- Sampling plate: thick metal plate, minimum 8 gauge, sized to accommodate sample requirements, with a wire attached to one corner long enough to reach from the center of the paver to the outside of the farthest auger extension. A minimum of one hole 6 mm (0.25 in.) in diameter must be provided in a corner of the plate.
- Cookie cutter sampling device: formed steel angle with two 100 mm by 150 mm by 9 mm (4 in. by 6 in. by 3/8 in.) handles, sized to accommodate sample requirements. Minimum 50 mm (2 in.) smaller than the sampling plate when used together.

  Example: Sampling plate 380 mm (15 in.) square and a cookie cutter sampling device 330 mm (13 in.) square.
- Mechanical sampling device: a permanently attached device that allows a sample receptacle to pass perpendicularly through the entire stream of material or diverts the entire stream of material into the container by manual, hydraulic, or pneumatic operation.
- Agency approved release agent: a non-stick product that prevents the asphalt mixture from sticking to the apparatus and does not contain solvents or petroleum-based products that could affect asphalt binder properties.

Sample Size

Sample size depends on the test methods specified by the agency for acceptance. Check agency requirement for the size required.

Procedure

General

- Select sample locations using a random or stratified random sampling procedure, as specified by the agency. The material shall be tested to determine variations. The supplier/contractor shall provide equipment for safe and appropriate sampling, including sampling devices on plants when required.
- Ensure the container(s) and sampling equipment are clean and dry before sampling.
- For dense graded mixture samples use cardboard boxes, stainless steel bowls or other agency-approved containers.
- For hot open graded mixture samples use stainless steel bowls. Cardboard boxes can used if the sample has cooled to the point that asphalt binder will not migrate from the aggregate.

Attached Sampling Devices

These are normally permanently attached devices that allow a sample container to pass perpendicularly through the entire stream of material. Operation may be manual, pneumatic, or hydraulic and allow the sample container to pass through the stream twice without overfilling. A sampling device may also divert the entire stream into container.

1. Lightly coat the container attached to the sampling device with an agency-approved release agent or preheat it, or both, to approximately the same discharge temperature of the mix.
2. Pass the container twice, once in each direction, through the material perpendicularly without overfilling the container.
3. Transfer the asphalt mixture to an agency-approved container without loss of material.
4. Repeat until proper sample size has been obtained.
5. Combine the increments to form a single sample.

Conveyor Belts

1. Avoid sampling at the beginning or end of an asphalt mixture production run due to the potential for segregation.
2. Stop the belt containing asphalt mixture.
3. Set the sampling template into the asphalt mixture on the belt, avoiding intrusion by adjacent material.
4. Remove the asphalt mixture from inside the template, including all fines, and place in a sample container.
5. Repeat, obtaining equal size increments, until proper sample size has been obtained.
6. Combine the increments to form a single sample.

Haul Units

1. Visually divide the haul unit into approximately four equal quadrants.
2. Identify one sampling location in each quadrant.
3. Dig down and remove approximately 0.3 m (1 ft.) of material to avoid surface segregation. Obtain each increment from below this level.
4. Combine the increments to form a sample of the required size.

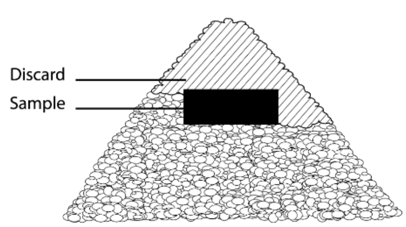
Paver Auger

1. Obtain samples from the end of the auger using a square head shovel.
2. Place the shovel in front of the auger extension, with the shovel blade flat upon the surface to be paved over.
3. Allow the front face of the auger stream to cover the shovel with asphalt mixture, remove the shovel before the auger reaches it by lifting as vertically as possible.
4. Place asphalt mixture in a sample container.
5. Repeat until proper sample size has been obtained.
6. Combine the increments to form a sample of the required size.

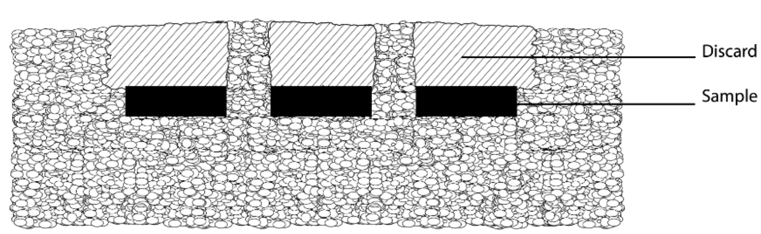
Note 1: First full shovel of material may be discarded to preheat and 'butter' the shovel.

Windrow

1. Obtain samples from the windrow of a transport unit. Avoid the beginning or the end of the windrow section.
2. Visually divide the windrow into approximately three equal sections.
3. Remove approximately 0.3 m (1 ft) from the top of each section.
4. Fully insert the shovel into the flat surface as vertically as possible, exclude the underlying material, roll back the shovel and lift the material slowly out of the windrow to avoid material rolling off the shovel.
5. Place in a sample container.
6. Repeat, obtaining equal size increments, in each of the remaining thirds.
7. Combine the increments to form a sample of the required size.



Windrow cross section



Windrow side view

Roadway before Compaction

There are two conditions that will be encountered when sampling asphalt mixtures from the roadway before compaction. The two conditions are:

- Laying asphalt mixture on grade or untreated base material requiring Method 1.
- Laying asphalt mixture on existing asphalt or laying a second lift of asphalt mixture allowing Method 2.

SAFETY:

Sampling is performed behind the paving machine, in front of the breakdown roller. For safety, the breakdown roller must remain at least 3 m (10 ft.) behind the sampling operation until the sample has been obtained and the hole filled with loose asphalt mixture.

Method 1 requires a plate to be placed in the roadway in front of the paving operation. There is always concern with moving, operating equipment. It is safest to stop the paving train while a plate is installed in front of the paver. When this is not possible the following safety rules must be followed.

1. The plate placing operation must be at least 3 m (10 ft.) in front of the paver or pickup device. The technician placing the plate must have eye contact and communication with the paving machine operator. If eye contact cannot be maintained at all times, a third person must be present to provide communication between the operator and the technician.
2. No technician is to be between the asphalt supply trucks and the paving machine. The exception to this rule is if the supply truck is moving forward creating a windrow, in which case the technician must be at least 3 m (10 ft.) behind the truck.

If at any time the Engineer feels that the sampling technique is creating an unsafe condition, the operation is to be halted until it is made safe, or the paving operation will be stopped while the plate is being placed.

Method 1 - Obtaining a Sample on Grade or Untreated Base (Plate Method)

1. Following the safety rules detailed above, the technician is to:
   a. Smooth out a location in front of the paver at least 0.5 m (2 ft.) inside the edge of the mat.
   b. Lay the plate down diagonally with the direction of travel, keeping it flat and tight to the base with the lead corner facing the paving machine.

   Note 2: The plate may be secured by driving a nail through the hole in the lead corner of the plate.
2. Pull the wire, attached to the outside corner of the plate, taut past the edge of the asphalt mixture mat and secure it. Let the paving operation pass over the plate and wire.
3. Using the exposed end of the wire, pull the wire up through the fresh asphalt mixture to locate the corner of the plate.

a. Plate only:

   i. Using a small square head shovel, scoop, or both, remove the full depth of the asphalt mixture from the plate. Take care to prevent sloughing of adjacent material.

   ii. Place asphalt mixture, including any material adhering to the plate and scoop or shovel in a sample container.

   iii. Remove the sample cutter from the roadway. The hole made from the sampling must be filled by the contractor with loose asphalt mixture.

b. "Cookie Cutter":

   i. Place the "cookie cutter" sample device, just inside the end of the wire; align the cutter over the plate. Press "cookie cutter" device down through the asphalt mixture to the plate.

   ii. Using a small square tipped shovel or scoop, or both, carefully remove all the asphalt mixture from inside of the cutter and place in a sample container.

   iii. Remove the sample cutter and the plate from the roadway. The hole made from the sampling must be filled by the contractor with loose asphalt mixture.

Method 2 - Obtaining a Sample on Asphalt Surface (Non-plate Method)

1. After the paving machine has passed the sampling point, immediately place the "cookie cutter" sampling device on the location to be sampled.
2. Push the cutter down through the asphalt mixture until it is flat against the underlying asphalt mat.
3. Using a small square tipped shovel, scoop, or both, carefully remove all the asphalt mixture from inside of the cutter and place in a sample container.
4. Remove the cutter from the roadway. The hole made from the sampling must be filled by the contractor with loose asphalt mixture.

Stockpiles

Remove at least 0.1 m (4 in.) from the surface before sampling; mixtures in a stockpile may develop an oxidized crust.

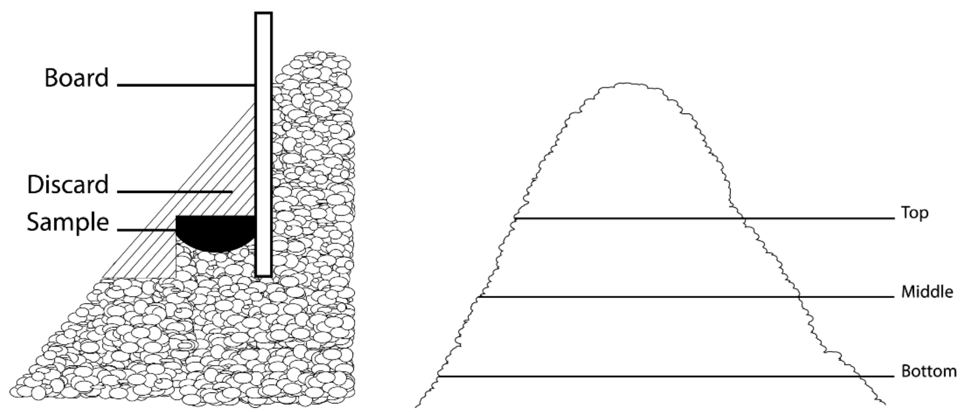
Method 1 – Loader

1. Direct the loader operator to enter the stockpile with the bucket at least 0.3 m (1 ft) above ground level without contaminating the stockpile.
2. Obtain a full loader bucket of the asphalt mixture; tilt the bucket back and up.
3. Form a small sampling pile at the base of the stockpile by gently rolling the asphalt mixture out of the bucket with the bucket just high enough to permit free flow of the mixture. Repeat as necessary.
4. Create a flat surface by having the loader "back-drag" the small pile.

5. Obtain approximately equal increments from at least three randomly selected locations on the flat surface at least 0.3 m (1 ft) from the edge.
6. Fully insert the shovel, exclude the underlying material, roll back the shovel and lift the asphalt mixture slowly out of the pile to avoid mixture rolling off the shovel.
7. Combine the increments to form a sample.

Method 2 – Stockpile Face

1. Create horizontal surfaces with vertical faces in the top, middle, and bottom third of the stockpile with a shovel or a loader if one is available.
2. Shove a flat board against the vertical face behind the sampling location to prevent sloughing of asphalt mixture. Discard the sloughed mixture to create the horizontal surface.
3. Obtain the sample from the horizontal surface as close as possible to the intersection of the horizontal and vertical faces.
4. Obtain at least one sample increment of equal size from each of the top, middle, and bottom thirds of the pile.
5. Combine the increments to form a single sample.



Identification and Shipping

1. Identify sample containers as required by the agency.
2. Ship samples in containers that will prevent loss, contamination, or damage.

Report

- On forms approved by the agency
- Sample ID
- Date
- Time
- Location
- Quantity represented

METHOD OF MAKING AND CURING CONCRETE TEST SPECIMENS IN THE FIELD FOP FOR AASHTO R 100

Scope

This practice covers the method for making, initially curing, and transporting concrete test specimens in the field in accordance with AASHTO R 100-23.

Warning—Fresh Hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.

Apparatus

- Concrete cylinder molds: Conforming to AASHTO M 205 with a length equal to twice the diameter. Standard specimens shall be 150 mm (6 in.) by 300 mm (12 in.) cylinders. Mold diameter must be at least three times the maximum aggregate size unless wet sieving is conducted according to the FOP for WAQTC TM 2. Agency specifications may allow cylinder molds of 100 mm (4 in.) by 200 mm (8 in.) when the nominal maximum aggregate size does not exceed 25 mm (1 in.).
- Beam molds: Rectangular in shape with ends and sides at right angles to each other. Must be sufficiently rigid to resist warpage. Surfaces must be smooth. Molds shall produce length no more than 1.6 mm (1/16 in.) shorter than that required (greater length is allowed). Maximum variation from nominal cross section shall not exceed 3.2 mm (1/8 in.). Ratio of width to depth may not exceed 1:5; the smaller dimension must be at least 3 times the maximum aggregate size. Standard beam molds shall result in specimens having width and depth of not less than 150 mm (6 in.). Agency specifications may allow beam molds of 100 mm (4 in.) by 100 mm (4 in.) when the nominal maximum aggregate size does not exceed 25 mm (1 in.). Specimens shall be cast and hardened with the long axes horizontal.
- Standard tamping rod: 16 mm (5/8 in.) in diameter and 400 mm (16 in.) to 600 mm (24 in.) long, having a hemispherical tip of the same diameter as the rod for preparing 150 mm (6 in.) x 300 mm (12 in.) cylinders.
- Small tamping rod: 10 mm (3/8 in.) diameter and 305 mm (12 in.) to 600 mm (24 in.) long, having a hemispherical tip of the same diameter as the rod for preparing 100 mm (4 in.) x 200 mm (8 in.) cylinders.
- Vibrator: At least 9000 vibrations per minute, with a diameter no more than ¼ the diameter or width of the mold and at least 75 mm (3 in.) longer than the section being vibrated.
- Scoop: a receptacle of appropriate size so that each representative increment of the concrete sample can be placed in the container without spillage.
- Trowel or float
- Mallet: With a rubber or rawhide head having a mass of 0.57 ±0.23 kg (1.25 ±0.5 lb.).

- Rigid base plates and cover plates: may be metal, glass, or plywood.
- Initial curing facilities: Temperature-controlled curing box or enclosure capable of maintaining the required range of 16 to 27°C (60 to 80°F) during the entire initial curing period (for concrete with compressive strength of 40 Mpa (6000 psi) or more, the temperature shall be 20 to 26°C (68 to 78°F). As an alternative, sand or earth for initial cylinder protection may be used provided that the required temperature range is maintained, and the specimens are not damaged.
- Thermometer: Capable of registering both maximum and minimum temperatures during the initial cure meeting the requirements for FOP for AASHTO T 309.

Consolidation Selection

There are two methods of consolidating the concrete – rodding and internal vibration. If the slump is greater than 25 mm (1 in.), consolidation may be by rodding or vibration. When the slump is 25 mm (1 in.) or less, consolidate the sample by internal vibration. Agency specifications may dictate when rodding or vibration will be used.

Procedure

Molding Specimens – General

1. Obtain the sample according to the FOP for WAQTC TM 2.
2. Wet Sieving per the FOP for WAQTC TM 2 is required for 150 mm (6 in.) diameter specimens containing aggregate with a nominal maximum size greater than 50 mm (2 in.); screen the sample over the 50 mm (2 in.) sieve.
3. Remix the sample after transporting to testing location.
4. Begin making specimens within 15 minutes of obtaining the sample.
5. Set molds upright on a level, rigid base in a location free from vibration and relatively close to where they will be stored.
6. Fill molds in the required number of layers, overfilling the mold on the final layer.

Casting Cylinders

Rodding

1. For the standard 150 mm (6 in.) by 300 mm (12 in.) specimen, fill each mold in three approximately equal layers, moving the scoop or trowel around the perimeter of the mold to evenly distribute the concrete. For the 100 mm (4 in.) by 200 mm (8 in.) specimen, fill the mold in two layers. When filling the final layer, slightly overfill the mold.
2. Consolidate each layer with 25 strokes of the appropriate tamping rod, using the rounded end. Distribute strokes evenly over the cross section of the concrete. Rod the first layer throughout its depth without forcibly hitting the bottom. For subsequent layers, rod the layer throughout its depth penetrating approximately 25 mm (1 in.) into the underlying layer.

3. After rodding each layer, tap the sides of each mold 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
4. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
5. Immediately begin initial curing.

Internal Vibration

1. Fill the mold in two layers.
2. Insert the vibrator at the required number of different points for each layer (two points for 150 mm (6 in.) diameter cylinders; one point for 100 mm (4 in.) diameter cylinders). When vibrating the bottom layer, do not let the vibrator touch the bottom or sides of the mold. When vibrating the top layer, penetrate into the underlying layer approximately 25 mm (1 in.)
3. Remove the vibrator slowly, so that no large air pockets are left in the material.

Note 1: Continue vibration only long enough to achieve proper consolidation of the concrete. Over vibration may cause segregation and loss of appreciable quantities of intentionally entrained air.

4. After vibrating each layer, tap the sides of each mold 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
5. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
6. Immediately begin initial curing.

Self-Consolidating Concrete

1. Use the scoop to slightly overfill the mold. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
2. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
3. Immediately begin initial curing.

Casting Flexural Beams

Rodding

1. Fill the mold in two approximately equal layers with the second layer slightly overfilling the mold.
2. Consolidate each layer with the tamping rod once for every 1300 mm^2 (2 in^2) using the rounded end. Rod each layer throughout its depth, taking care to not forcibly strike the bottom of the mold when compacting the first layer. Rod the second layer throughout its depth, penetrating approximately 25 mm (1 in.) into the lower layer.
3. After rodding each layer, strike the mold 10 to 15 times with the mallet and spade along the sides and end using a trowel.
4. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
5. Immediately begin initial curing.

Internal Vibration

1. Fill the mold to overflowing in one layer.
2. Consolidate the concrete by inserting the vibrator vertically along the centerline at intervals not exceeding 150 mm (6 in.). Take care to not over-vibrate and withdraw the vibrator slowly to avoid large voids. Do not contact the bottom or sides of the mold with the vibrator.
3. After vibrating, strike the mold 10 to 15 times with the mallet.
4. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
5. Immediately begin initial curing.

Initial Curing

- When moving cylinder specimens made with single use molds support the bottom of the mold with trowel, hand, or other device.
- For initial curing of cylinders, there are two methods, use of which depends on the agency. In both methods, the curing place must be firm, within ¼ in. of a level surface, and free from vibrations or other disturbances.
- Maintain initial curing temperature:
- 16 to 27°C (60 to 80°F) for concrete with design strength up to 40 Mpa (6000 psi).
- 20 to 26°C (68 to 78°F) for concrete with design strength of 40 Mpa (6000 psi) or more.
- Prevent loss of moisture.

Method 1 – Initial cure in a temperature-controlled chest-type curing box

1. Finish the cylinder using the tamping rod, straightedge, float, or trowel. The finished surface shall be flat with no projections or depressions greater than 3.2 mm (1/8 in.).
2. Place the mold in the curing box. When lifting light-gauge molds be careful to avoid distortion (support the bottom, avoid squeezing the sides).
3. Place the lid on the mold to prevent moisture loss.
4. Mark the necessary identification data on the cylinder mold and lid.

Method 2 – Initial cure by burying in earth or by using a curing box over the cylinder

Note 2: This procedure may not be the preferred method of initial curing due to problems in maintaining the required range of temperature.

1. Move the cylinder with excess concrete to the initial curing location.
2. Mark the necessary identification data on the cylinder mold and lid.
3. Place the cylinder on level sand or earth, or on a board, and pile sand or earth around the cylinder to within 50 mm (2 in.) of the top.

4. Finish the cylinder using the tamping rod, straightedge, float, or trowel. Use a sawing motion across the top of the mold. The finished surface shall be flat with no projections or depressions greater than 3.2 mm (1/8 in.).
5. If required by the agency, place a cover plate on top of the cylinder and leave it in place for the duration of the curing period, or place the lid on the mold to prevent moisture loss.

Transporting Specimens

- Initially cure the specimens for 24 to 48 hours. Transport specimens to the laboratory for final cure. Specimen identity will be noted along with the date and time the specimen was made and the maximum and minimum temperatures registered during the initial cure.
- Protect specimens from jarring, extreme changes in temperature, freezing, or moisture loss during transport.
- Secure cylinders so that the axis is vertical.
- Do not exceed 4 hours transportation time.

Final Curing

- Upon receiving cylinders at the laboratory, remove the cylinder from the mold and apply the appropriate identification.
- For all specimens (cylinders or beams), final curing must be started within 30 minutes of mold removal. Temperature shall be maintained at 23° ±2°C (73 ±3°F). Free moisture must be present on the surfaces of the specimens during the entire curing period. Curing may be accomplished in a moist room or water tank conforming to AASHTO M 201.
- For cylinders, during the final 3 hours before testing the temperature requirement may be waived, but free moisture must be maintained on specimen surfaces at all times until tested and ambient temperature is between 20 to 30°C (68 to 80°F).
- Final curing of beams must include immersion in lime-saturated water for at least 20 hours before testing.

Report

- On forms approved by the agency
- Pertinent placement information for identification of project, element(s) represented, etc.
- Sample ID
- Date and time molded.
- Test ages.
- Slump, air content, and density.
- Temperature (concrete, initial cure max. and min., and ambient).
- Method of initial curing.
- Other information as required by agency, such as: concrete supplier, truck number, invoice number, water added, etc.

INSERT TAB

SECTION 2
Quality Assurance Program

Oregon Department of Transportation

QUALITY ASSURANCE PROGRAM

(Revised December 2023)

TABLE OF CONTENTS

APPENDIXES

OREGON DEPARTMENT OF TRANSPORTATION
QUALITY ASSURANCE PROGRAM

I. OVERVIEW

The Oregon Department of Transportation (ODOT) has implemented a Quality Assurance (QA) Program approach that complies with the FHWA Guidelines for a QA program for construction projects on the National Highway System. This program defines the responsibilities of the Contractor and ODOT in order to satisfy the needs of the program. This program is currently used for all construction projects administered by ODOT or its consultants.

ODOT recognizes that there are other benefits of developing and implementing quality assurance specifications into its construction program. These benefits include:

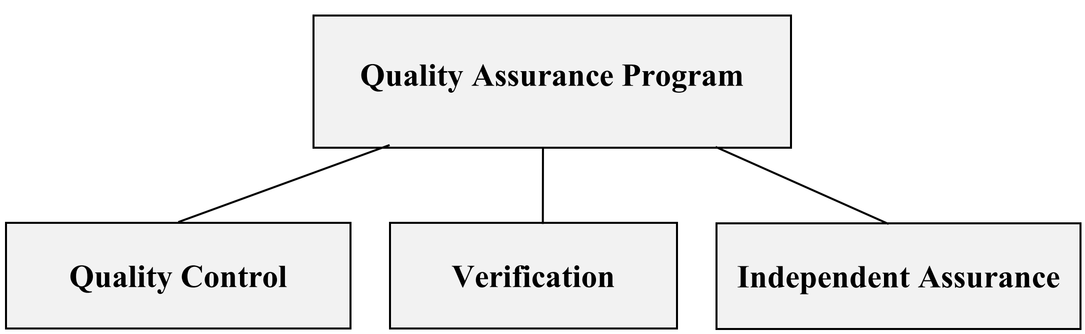
- To improve the overall quality of highway and bridge construction; and
- To place responsibility on the contractor for quality control in contracted work.

The success of the Agency's Quality Assurance Program is dependent on three primary features. The first is the Laboratory Certification Program, which is discussed in Section III of this document. The second is the Technician Certification Program, which is discussed in Section IV and the final feature is the specific product QC/QA testing plan detailed in Section VI of this document.

Quality Assurance (QA)

Quality assurance is defined as: *All those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality*.

ODOT has developed its QA Program, which includes three separate and distinct sub-programs as illustrated below:



Quality Control (QC)

Quality control is defined as: *All Contractor/vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements.*

The Contractor is responsible for providing quality control sampling and testing, furnishing material of the quality specified, and furnishing QL levels during aggregate production, when required. The Contractor's quality control technician must perform or observe the sampling operations. Testing operations shall be performed by technicians certified to run the respective tests. The certified technician, who performs the sampling and testing procedures, must sign the testing documentation.

Contractor quality control tests will be used for acceptance only if verified by tests performed by an independent group (region QA).

Small quantities of some materials may be accepted when requested by the Contractor and approved by the Project Manager (see Section 4(B) of MFTP).

ODOT will perform testing for all source/compliance tests and those non-field tested items associated with construction products (e.g. asphalts, emulsions, tack, etc.).

Verification

Verification is defined as*: Sampling and testing performed to validate the quality of the product.*

Verification samples are taken randomly (minimum ten-percent frequency of sublot quantity identified in Section 4(D) of the MFTP) and tested by an independent group (region QA) to verify that products meet required specification(s). All aggregate samples will be obtained from the stockpile. Material transported to the source of incorporation (e.g., concrete plant, ACP facility, pug mill etc.), may be subject to further testing. Quality control samples shall not be used for verification.

Independent Assurance (IA)

Independent assurance is defined as: *Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program.*

ODOT's Independent Assurance (IA) Program uses a combination approach requiring laboratory certification, technician certification, proficiency samples, and where possible, split samples of verification or QC tests. The Construction Section certifies quality control and quality assurance testing laboratories and technicians. Contractor's test results of split IA samples are compared to region QA test results for compliance using ODOT IA Parameters. The PM performs random inspections of QC laboratories and technicians for compliance. The quality of region QA test results are constantly monitored through the Quality Assurance Laboratory Proficiency Sample Program which is outlined in Section V.

Quality assurance testing (both verification and independent assurance) will be performed by a quality assurance laboratory designated by the Agency in compliance with 23 CFR 637.

Quality Assurance Program Components

Third-Party Resolution

Third-party resolution is used when the Agency's quality assurance test results conflict with ongoing quality control test results according to section VI (Product Specific QC/QA Testing Plan) and when the conflict cannot be resolved. Third-party resolution can be requested by either the Contractor or the Project Manager.

Third-party resolution testing shall be performed by a third-party resolution laboratory. The ODOT Construction Section's Central Materials Laboratory (ODOT-CML) performs third-party resolutions. This is normally done by testing quality control production backup samples, but may include other resolution techniques or procedures as determined by the Agency's technical expert for the corresponding specification section.

The test result(s) of the third-party resolution laboratory performing third-party resolution materials testing for any or all disputed test results will be considered the actual test results and will therefore be used for acceptance of the material.

Certification Advisory Committee (CAC)

The certification programs (both Technician and Laboratory Certifications) for ODOT's Quality Assurance Program will be overseen by a Certification Advisory Committee (CAC). The purpose of this committee is to review and provide general oversight to the certification programs. The committee will be responsible for establishing policy as related to the certification programs and will also be responsible for reviewing allegations concerning abuse by technicians. The CAC will perform other duties as required to successfully implement and continue the certification programs. A meeting of the CAC may be called at any time by the Chair of the Certification Advisory Committee or by written request of at least two members of the CAC. A majority of the members of the CAC shall be present for transaction of official business.

Membership

Membership of the Certification Advisory Committee will include the following:

ODOT Construction and Materials Engineer (Chair)
ODOT Pavements Services Engineer
ODOT State Quality Assurance Engineer
ODOT Structural Services Engineer
ODOT Laboratory Services Manager
APAO Executive Director or Representative
OCAPA Executive Director or Representative

AGC Heavy Highway Representative
Industry “At Large” Representative (appointed by CAC)

Random Samples

The Quality Assurance Program is based on theoretical conditions and the application of statistical acceptance procedures. Sampling shall be by simple random, stratified random or systematic means as specified.

To obtain a representative sample, a reliable system of random sampling shall be employed. Some work, like process control, lends itself quite well to the use of the Random Units Table and the Random Sample Location forms that ODOT has developed. ODOT TM 400, Determining Random Sampling and Testing Locations, is available to assist with random number determinations and test site locations. Random sampling is the preferred method to assure that the samples are representative and to eliminate sampling bias. In other work, like verification or independent assurance, it may be difficult to apply random numbers to sample selection. In this case, it is imperative that the samples are taken at locations or times, which do not have an identifiable pattern and are completely random, without bias.

ODOT Approved Aggregate Product Program (OAAPP)

The ODOT Quality Assurance Program allows some freedom for aggregate sources to establish their own quality control plan that is tailored to the operation of the specific source. The supplier is required to submit a written quality control plan to the appropriate region Senior Quality Assurance Coordinator (SQAC) for approval. All testing for the approved quality control plan is required to be performed by a certified technician in an ODOT certified laboratory. Specific details on the ODOT Approved Aggregate Product Program may be found in Appendix A.

II. ROLES AND RESPONSIBILITIES

Contractor

The Contractor's responsibilities are to:

- Furnish a written quality control plan (See Appendix B for minimum requirements);
- Furnish and incorporate materials/products which are of the quality specified;
- Provide ODOT certified technicians and laboratories;
- Perform quality control of all materials/products used on ODOT construction projects;
- Sample and test materials using appropriate devices and procedures;
- Furnish QLs when required;
- Provide extra testing or retesting according to section 00165.
- Sample and provide splits to ODOT upon request, witnessed by an Agency representative;
- Perform required tests on Contractor's split of IA samples;
- Properly document, sign and deliver test results as required, on ODOT forms according to Section 3 criteria; and
- Retain splits of all QC samples until the Project Manager (PM) determines that the split samples may be discarded.
- Retain all split portions of IA samples until notified in writing by the PM to discard.

Project Manager (PM)

The Project Manager has the authority and responsibility to enforce the provisions of the contract. The PM's Quality Control Compliance Specialist (QCCS) supports the project QA activities and is experienced and certified in all areas of field testing and documentation. The QCCS is required to maintain certification in CAgT, CEBT, CAT 1, CDT and QCT. Certification in CAT II, CCT and CMDT is recommended.

The Project Manager is responsible to ensure that:

- The project meets the requirements specified in the plans and specifications.
- All required tests are performed, documented, and submitted. The PM is also responsible for informing the SQAC of project schedules, current quantities, and anticipated sampling requirements, so verification testing can be accomplished.
- The Contractor's QC program meets required standards. This is accomplished by performing inspections of the Contractor's personnel, testing procedures and testing equipment.
- The Contractor and region quality assurance laboratory is notified in writing within 5 working days of an IA/Verification sample's completion, regarding which backup samples may be discarded or that an investigation is in progress. Upon the completion of an investigation inform the Contractor, in writing, as to which backup samples may be discarded. Written notification will identify the lot/sublots represented by the

IA/verification sample, include the IA test results and, if required, the resolution of an IA investigation.

Region Quality Assurance Team

The region quality assurance team consists of a Senior Quality Assurance Coordinator (SQAC), Quality Assurance Coordinator (QAC) and quality assurance technicians (QATs). They are resources for the PMs, inspectors, technicians, other agencies and contractors. They are also experienced in construction and design and certified in testing of construction materials.

Specific duties include, but are not limited to, the following:

- Maintain uniformity in construction and testing activities;
- Witness quality control technician sampling for IA and verification testing;
- Perform all required IA and verification testing;
- Properly document on ODOT forms according to Section 3 criteria;
- Calibrate or verify calibration of all nuclear moisture density gauges for ODOT, industry, and other agencies;
- Administer the region's radiation safety program;
- Troubleshoot construction problems related to materials;
- Recommend changes to mix designs;
- Assist in the technician certification program;
- Oversee region testing facilities;
- Inspect Contractor facilities and/or technicians; and
- Assist in QC laboratory certification.
- Retain IA/verification splits until notified by the PM.
- Administer the ODOT Approved Aggregate Product Program

Construction Section

The Construction Section's duties include:

- Support of the QA Program by coordinating training and certification for technicians and by certifying all testing labs associated with ODOT construction projects;
- Administer the proficiency sample program;
- Provide third-party resolution, according to the QA Program.
- Utilize the QA Steering Committee to establish and ensure statewide consistency in the QA Program.

III. LABORATORY CERTIFICATION PROGRAM

OVERVIEW

The Construction Section (CS) developed the Laboratory Certification Program to support the Oregon Department of Transportation's Quality Assurance Program for construction materials. The Laboratory Certification Program recognizes three categories of laboratories: quality control, quality assurance, and third-party resolution. To help ensure that laboratories provide consistent and accurate test results, laboratories that produce test results under the ODOT QA Program shall be certified according to this Laboratory Certification Program, as part of the Independent Assurance Program.

This laboratory certification process is designed to provide not only a "snapshot" of the quality of a laboratory, but also an evaluation of the laboratory's performance in maintaining quality and consistency. The ODOT Construction Section's Central Materials Laboratory (ODOT-CML), or its authorized representative, will examine the laboratory's conditions and testing equipment for accuracy and conformance to test procedure apparatus standards. If the laboratory's equipment is properly calibrated per the standards and the laboratory meets the specified conditions of the Laboratory Certification Program, ODOT will certify the laboratory.

Laboratory certifications are valid for one year, unless decertified by the Certification Advisory Committee or found to be deficient per the "Follow-Up On-site Inspection" criteria. If a laboratory's certification expires and the laboratory has a continued need to test materials for ODOT construction projects, the laboratory shall apply for and obtain recertification, prior to performing continued testing under the QA Program. An outline of the on-site inspection process and laboratory certification criteria is found under "On-Site Laboratory Inspection" below.

PROGRAM DESCRIPTION

Quality Control (QC) Laboratories

Quality control of construction materials is the responsibility of the Contractor. Laboratories performing quality control testing may be the Contractor's own, the material supplier's or an independent testing laboratory.

The ODOT-CML will certify all quality control laboratories for those test procedures and methods necessary to perform quality control tests of construction materials for ODOT construction projects. The QC laboratory is required to schedule laboratory inspection with the ODOT-CML to ensure certification prior to the performance of any tests under the ODOT QA Program.

Quality Assurance Laboratories

Quality assurance is the responsibility of ODOT. During the production of materials for ODOT contracts, quality assurance laboratories perform independent assurance (IA) tests in coordination with quality control laboratories and verification tests which may, or may not, be done in coordination with IA testing. These tests provide ODOT with an independent analysis of the quality control test results to help ensure that the results of quality control tests are valid.

Quality assurance laboratories will usually be ODOT region QA laboratories but may also be the ODOT Central Materials Laboratory or an ODOT contracted independent testing laboratory.

The ODOT-CML requires the certification of all quality assurance laboratories for those test methods necessary to perform quality assurance IA and verification testing. Region quality assurance laboratories are required to participate in the Quality Assurance Laboratory Proficiency Sample Program (see Section V). The ODOT-CML and/or ODOT contracted independent testing laboratories performing IA or verification testing will participate in the proficiency program, or other acceptable laboratory certification program (e.g. AMRL certification).

Third-Party Resolution Laboratories

When quality control and quality assurance test results conflict and the conflict cannot be resolved; a neutral third-party resolution laboratory will test the material in question. The test results of the third-party resolution laboratory will decide the dispute.

The ODOT-CML will perform all third-party resolutions unless a potential for conflict of interest exists. Any laboratory which has performed independent assurance, verification or quality control testing on the material under dispute is considered to have a conflict of interest and shall not perform third-party resolution testing. In this event, the third-party resolution duties will be performed by a certified laboratory meeting the requirements of CFR 0637.209 (a-4), accredited in the testing to be performed by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by FHWA.

ON-SITE LABORATORY INSPECTION CRITERIA FOR QUALITY CONTROL AND QUALITY ASSURANCE LABORATORIES

A laboratory needing information and/or an application package for ODOT laboratory certification may contact the ODOT Central Materials Laboratory at the following address:

Oregon Department of Transportation
Construction Section, Materials Laboratory
Attn: Lab Certification Coordinator
800 Airport Road SE
Salem, OR 97301-4798
Telephone: (503) 986-3087

Laboratories requesting ODOT certification shall make arrangements to receive an on-site inspection. Forms will be included in the application package to facilitate the laboratory's response to this requirement. These forms are available electronically at the following URL address:

https://www.oregon.gov/ODOT/Construction/Pages/Lab-Services.aspx

On-Site Inspection

The lab certification inspector will visit each laboratory whose application for certification has been accepted. The laboratory inspector will evaluate the laboratory using criteria A through G listed below. It is the responsibility of the requesting laboratory to have their lab clean, organized and in complete operating order at the time of inspection. All equipment must be readily available and accessible. The ODOT laboratory certification team does not search for stowed equipment. In addition, an authorized representative must be present at the time of inspection to answer questions and to identify and present equipment. Failure to meet these criteria may result in a canceled inspection.

A. The laboratory (fixed or mobile) shall maintain proper environmental controls**.** This criterion is used to evaluate the laboratory's physical ability to provide an appropriate environment in which to test materials. General requirements include: adequate power, water, lighting, floor space, temperature control, et cetera; and the capability of maintaining the proper environmental conditions that are specified in the test methods for which the laboratory is seeking certification.

B. The laboratory shall maintain facilities for proper storage, identification, handling, retaining, and conditioning of test specimens and samples. This criterion is used to evaluate a laboratory's physical ability, internal policies and procedures to store samples and keep them organized. The laboratory shall maintain separate areas on its premises to store samples and splits of samples in an organized manner so that samples are not lost or discarded and may be found at a future date. In addition, the laboratory shall have facilities for the conditioning of samples as required by any test method for which the laboratory seeks certification.

C. The laboratory shall use accredited calibration service providers. Calibration certificates held by laboratories shall meet the requirements of ISO/IEC 17025 and shall include appropriate statements of uncertainty. The laboratory shall maintain necessary calibration equipment and reference standards. A laboratory shall have on hand calibration and verification equipment necessary to ensure the accuracy of its equipment. Such equipment might include calibration weights for scales or balances, manometers for the verification of vacuum pumps, thermometers, etc.

D. The laboratory shall maintain equipment conforming to specification requirements necessary for the testing performed. This criterion is used to ensure that the laboratory's testing equipment conforms to the specifications listed in the test methods for which the laboratory is seeking certification.

E. The laboratory shall demonstrate adequate care when recording and processing data and test results. This criterion is used to evaluate the laboratory's ability to produce accurate test reports. The laboratory shall have procedures in place that facilitate the timely and accurate recording and submittal of data and the ultimate accuracy of its test reports.

F. The laboratory shall include the laboratory's name and address and the name(s) of the technician(s) performing the test(s) on their test reports. This criterion is used to ensure that the above information appears on the laboratory's test reports that are submitted to ODOT. In addition to the above, the technician(s) certification number shall be entered on all ODOT test reports.

G. The laboratory shall have on-site, at the time of inspection and during production operations, a copy of the current MFTP and all equipment, except items listed as mobile equipment, necessary to perform the test methods for which they have requested certification. The ODOT laboratory certification inspection team has a color coded tagging system, which identifies lab equipment that has met the certification criterion. The unique colored tag is valid for a 1 year period and starts from the date of the final report**.** Not all testing equipment is tagged; reference the appropriate test procedure to identify required equipment.

Mobile equipment for additional test procedures may be added at a later date provided the following conditions are met:

- The laboratory shall demonstrate adequate workspace and electrical system to operate required equipment.
- If equipment is new, provide copies of invoices that include the make, model and serial number of the equipment.
- If the equipment is rented or borrowed, it must come from another ODOT certified laboratory and provide the make, model and serial number as well as the number and color of the ODOT inspection tag.

Mobile Equipment

1. Ignition Oven
2. Gyratory Compactor
3. Field concrete equipment

Preliminary Report

The ODOT lab certification inspector will prepare a preliminary report of findings and present it to the laboratory manager at the conclusion of the on-site inspection. The preliminary inspection report will list all discrepancies for each test method in which the laboratory has requested certification. The inspector will discuss each discrepancy found in the preliminary report with the laboratory manager in sufficient detail so that the laboratory manager understands the scope of the problem(s) and what corrective action is required in order to obtain certification for the test method(s) in question. When the inspector and the laboratory manager have covered all of the deficiencies, both parties will sign the preliminary report. These signatures indicate that both parties have read the report and understand its contents.
Within one business day, the ODOT lab certification inspector will deliver a copy of the report to the laboratory manager, or owner.

Laboratories are expected to correct all deficiencies within thirty days, so that a certification may be issued. If a laboratory needs more than thirty days to correct deficiencies, the laboratory shall notify the ODOT laboratory certification inspector, in writing, explaining why additional time is needed. The laboratory will not be certified until all deficiencies are corrected.

If no response to the preliminary report is received by the ODOT lab certification inspector within the thirty days allowed, the laboratory will immediately be decertified until the deficiencies are corrected, or a written response has been received.

Final Report

Once all of the deficiencies have been corrected, the ODOT lab certification inspector will prepare a final report of findings and send it to the laboratory.

Certificate of Laboratory Certification

The ODOT Central Materials Laboratory will prepare a certificate of laboratory certification for a laboratory when the laboratory has met the requirements listed in "On-Site Laboratory Inspection Criteria" and has corrected all deficiencies noted by the inspector. The certificate will be sent to the laboratory with the final report. The certificate will include the type of certification, laboratory name, test methods the laboratory has been certified to perform, color of the inspection tag and the Construction Section Manager's signature. Laboratory certifications are valid for one year from the date of the inspection. This certificate is proof of a laboratory's ODOT certification for the listed test methods and may be presented as such to any ODOT project manager.

Follow-Up On-Site Inspections

At any time during a laboratory's term of certification, if the Project Manager or QA personnel suspect that any of the certified laboratory's equipment, conditions outlined under Requirement G or the laboratory building itself are outside of specification, the Project Manager or QA personnel may request an additional on-site inspection. The Project Manager or QA personnel will contact the lab certification inspector and schedule the Follow-Up On-Site Inspection.

If the Follow-Up On-Site Inspection reveals that the laboratory is deficient in one or more areas, the laboratory inspector will immediately decertify the laboratory for those test methods affected by the deficient equipment or facilities. The laboratory inspector will recertify the laboratory following correction of all deficiencies. A laboratory shall not perform material tests using test methods for which it has been decertified.

Laboratory Decertification

A quality control or quality assurance laboratory may have its entire certification or its certification for specific test methods revoked by ODOT, if it is found to not conform to the specifications and standards of its ODOT certification. A laboratory that has had its certification revoked for a specific test method(s) shall not test materials that require the use of such revoked test method certification(s).

A laboratory that has had its entire certification revoked shall promptly cease testing materials for ODOT construction projects. A laboratory that has had its certification partially or entirely revoked may seek reinstatement by demonstrating conformance to the ODOT laboratory inspection requirements.

Any laboratory/company intentionally misrepresenting the status of their certification or falsifying test results will be subject to disciplinary action up to a one-year suspension of their certification. Any allegation regarding the practices of a certified laboratory will be made in writing to the Certification Advisory Committee (CAC). The CAC will investigate the complaint and take appropriate disciplinary action. In all cases, the parties involved in the complaint will be provided an opportunity to appear before the CAC.

IV. TECHNICIAN CERTIFICATION PROGRAM

INTRODUCTION / BACKGROUND

The Oregon Department of Transportation's Quality Assurance Program requires all personnel and laboratories performing testing on ODOT projects to be certified. The level of certification is dependent on the specific type of testing to be performed. The Certification Advisory Committee (CAC), described in Section I of the QA Program, will provide approval and general oversight for the certification programs. Specific direction and administration of the individual certifications will be provided by ODOT unless other groups are specifically referenced in the description of the individual certifications.

The Oregon Department of Transportation is a member of the Western Alliance for Quality Transportation Construction (WAQTC), which consists of the Western and Central Federal Lands Highway Divisions and 9 western states that are committed to the quality of our transportation systems. WAQTC has developed a technician training program, which is comprised of instructional and student modules used to assist in the training process of material field-tested procedures. ODOT has adopted the training packages for all certifications except for ODOT specific certifications and those controlled by entities other than WAQTC, such as QCT, CCT, CMDT and CAT II.

The purpose of the Technician Certification Program is to ensure technicians performing testing have a minimum level of knowledge in the area of certification.

Technician Certifications

Following is a summary of the approved technician certifications and the associated certification durations:

Certification Discipline	Initial Certification	Renewal of Certification
CSTT	5 years	5 years
CCT	3 years	5 years
CMDT	3 years	*3 years
CAT-II	3 years	5 years
CAgT	3 years	5 years
CEBT	3 years	5 years
CDT	3 years	5 years
CAT I	3 years	5 years
ACI Grade 1	5 years	5 years
QCT	Concurrent with ACI Grade 1	

*To be eligible for CMDT recertification by taking only the recertification exam, the technician must have:

- Submitted a minimum of one dense ACP mix design meeting the requirements of the Contractor Mix Design Guidelines and ODOT TM 330, for each year of certification and
- Participated in the CMDT Proficiency program for each year following the initial certification year.

Certified Aggregate Technician (CAgT):

A CAgT performs a variety of tests on soils and aggregates, including: sieve analysis, fracture, sand equivalency and other tests. A CAgT also performs other duties as required by current specifications for soils and aggregate materials.

Certified Embankment and Base Technician (CEBT):

The CEBT performs testing of soils and aggregates for establishing the relative maximum density and optimum moisture for use in compaction testing of subgrade soils and aggregate bases. A CEBT also determines the specific gravities of aggregate.

Certified Density Technician (CDT):

A CDT performs in-place density testing of soils, aggregates, and asphalt mixtures using the nuclear density gauge. In addition to certification, a CDT must be in compliance with state and federal training regulations, and state and federal regulations concerning radioactive materials as administered by their company's Radiation Safety Officer (RSO). For soil, soil aggregate mixtures, and aggregates, a CDT determines: percentages of coarse and fine material, performs one- point testing and related calculations.

Certified Asphalt Technician I (CAT I):

A CAT I performs sampling and testing for ACP and EAC mixtures, including: AC content, maximum specific gravity, sieve analysis, void measurements and other tests and duties as required by current specifications.

Certified Asphalt Technician II (CAT II):

A CAT II is responsible for managing the volumetric properties of asphalt mixes by controlling plant operations, for troubleshooting ACP sampling and testing processes, and for making appropriate adjustments to ACP production and lay down procedures. **Certification at the CAT II level is contingent on having successfully attained CAT I certification at least once.**

Certified Mix Design Technician (CMDT):

A CMDT is responsible for preparing ACP, PAC and EAC mix designs, including all material testing and data analysis necessary to properly complete a design. A CMDT prepares designs for both dense and open graded mixtures.

Quality Control Technician (QCT):

A QCT performs testing of fresh Portland cement concrete including: sampling, concrete temperature, slump, unit weight, air content, and fabrication of specimens for strength testing and performs other duties including calculating cement content and water-cement ratio as required by specifications. QCT certification is obtained through the ACI Concrete Field Testing Technician - Grade 1 certification program, with the Oregon written Supplemental test, conducted by the Oregon Concrete and Aggregate Producers Association (OCAPA). QCT is only valid while the ACI Concrete Field Testing Technician – Grade Level 1 is valid.

Concrete Control Technician (CCT):

A CCT is responsible for preparing concrete mix designs, proportioning concrete mixtures to meet job requirements and for making adjustments to the mix design, as necessary, to provide a concrete mixture of the quality required by specifications. A CCT certification is obtained through a training program conducted by OCAPA.

Concrete Strength Testing Technician (CSTT):

A CSTT is responsible for testing the compressive or flexural strength of hardened concrete cylinders or beams. The duties of a CSTT include proper capping of specimens (bonded and un-bonded), correct operation of breaking device and visual evaluation of broken specimens. Also, the CSTT is responsible to insure the proper handling, mold removal, logging and curing of field fabricated samples, upon arrival at the laboratory. A CSTT certification may be obtained through a program conducted by Oregon Chapter of the American Concrete Institute.

Who Must Be Certified?

For all projects for which the Quality Assurance Program applies, all personnel responsible for performing sampling and testing must be certified. All personnel performing the Quality Control Compliance Specialist duties of reviewing test reports whether working for ODOT, a contractor, a consultant or for local agencies, must be certified.

Certification Requirements

To obtain any of the above certifications, the technician will be required to pass a written and/or a practical test demonstrating a knowledge and understanding of how to perform the specific tests and the specifications that apply to the material being tested. All tests shall be administered and evaluated only by evaluators approved by the Certification Advisory Committee Chair or their designated representative.

To apply for the certification, the applicant will register either for one of the approved training classes, where the exam will be administered as part of the class or submit an application to challenge the exam. The challenge applications will be submitted through the approved training program to facilitate scheduling. Appropriate fees will be charged for the challenge exams to cover scheduling, overhead and facility use. Applicants will be scheduled for examination through a cooperative effort between ODOT and the appropriate training program service provider.

All certifications shall be contingent upon the technicians signing a rights and responsibilities agreement. This agreement outlines the technician’s rights and responsibilities along with the possible consequences of the abuse and/or neglect of these responsibilities. The technician will submit a signed agreement at the time they take the certification examination. The agency has the authority to require signing of modified Rights and Responsibilities agreements approved by the Certification Advisory Committee.

Examination Process

The Asphalt Paving Association of Oregon (APAO) and Oregon Concrete Aggregate Producers Association (OCAPA) currently perform the instructional phase, while ODOT maintains the certification and administration of the written and practical exam processes. The certification system is made up of three phases. Phase one - WAQTC written exam, phase two - ODOT written exam and phase three - combined ODOT and WAQTC performance exam.

During the exam process, only hand calculators are allowed, the use of computers is not permitted during any exam phase.

Challenge Process

A person may challenge the exam process if they feel that they have the knowledge and skills to be able to pass without attending formal training. If the person does not currently possess a certification for that specific discipline and fails any of the following mentioned examination events, then that person must attend the formal training for that certification. If the person currently possesses a certification for that specific discipline and fails any of the following mentioned examination events, then that person may challenge the failed examination event for that certification a second time. If the person fails the challenged event a second time, then the person must attend formal training for that specific discipline.

WAQTC Written Examination

a. Closed Book
b. Consists of multiple modules, depending on the needed certification.
c. Each module consists of 5 questions with multiple choice, true or false and required calculations.
d. Written exam timelines vary depending on the needed certification. 1 to 1 ½ hours is given to complete the exam.

ODOT Written Examination:

a. Open Book
b. Consists of multiple choice, true or false, and essay questions related to test procedures as well as specifications and completion of various ODOT forms.
c. Written exam timelines vary depending on the needed certification. 3 to 3 ½ hours is given to complete the exam.
d. For CMDT certification, the written exam covers dense ACP and EAC & PAC open graded mix design, as well as aggregate treatment applications (i.e., lime and latex) for mix design. 4 hours is given to complete the exam.

Note: 4 ½ hours will be allowed for the combined WAQTC and ODOT written exams.

ODOT /WAQTC Combined Performance Examination

a. Each participant will demonstrate proficiency in the designated test methods with prepared samples and will demonstrate the ability to apply specifications and ODOT specific requirements to the needed test and identify the quality of the material being tested.
b. The exam is open book but the technician may not use the performance exam checklist.
c. The performance examination for ODOT is performed in conjunction with the WAQTC performance exam. 4 ½ hours is given to complete the performance exam process with 4 hours actual lab time and ½ hour given to complete calculations. The performance exam answers are graded based on completion of the required tests, accuracy of computations, application of the correct specifications and the results of computations meeting the parameters set forth in the Independent Assurance Parameters section of the Quality Assurance Program.
d. During the performance exam the examinee may be asked to explain various steps of a procedure to reduce the full test time.
e. The performance exam checklist consists of yes and no blocks. In order to complete the checklist successfully, all of the yes blocks must be filled out.

   In the event, a participant fails the first attempt; a second attempt is given, if time permits and after the exam proctor explains the correct procedure. Anyone failing a test method on the performance exam may repeat that trial during the day of the performance exam, depending on the timelines and the type of test. Repeat trials will be allowed in not more than 50% of the total test methods in that performance exam. If the participant fails on the second attempt the performance exam will stop and the participant will have to re-take the exam at the scheduling convenience of the Agency.

Passing Score – Written

a. Initial exam (first attempt) WAQTC: An overall score of 70% with a minimum of 60% on any one-test method.
b. Re-exam (second attempt) WAQTC: An initial exam overall score below 70% will require a re-exam on all test methods. An initial exam score above 70% overall, but below 60% on one or more test methods, will require a re-exam on only those test methods. In the case of one test method comprising the re-exam, the examinee must receive a score of 70%. In the case of more than one test method comprising the re-exam, the examinee must receive an overall score of 70% with a minimum of 60% on any one-test method.
c. Initial exam (first attempt and second attempt) ODOT: An overall score of 70% is required to successfully complete the exam requirement.
d. Initial exam (first attempt) ODOT exam of:
   - QCT supplemental an overall score of 80% is required to successfully complete the exam requirement.
   - For the CCT and CMDT certification exams, an overall score of 75% is required to successfully complete the exam requirement.
   - Re-exam (second attempt) for the ODOT QCT, CMDT and CCT exam the participant must meet the same criteria as the initial exam first attempt.

Passing Score – Performance

a. All performance checklists must have 100% yes blanks checked, and each test method must be performed within the designated time limit. Each examinee is allowed two attempts to complete procedures if time allows.
b. First attempt: Performing all the required tests, application of correct specifications and meeting the Independent Assurance Parameters is required to receive a pass rating. The grading is based on pass/fail of all associated tests performed under the desired certification.
c. Second attempt: The same criteria as the Initial exam must be met.
d. For CMDT, an acceptable Level 2, 3 or 4 ACP design must be submitted along with verification materials, as described in Section 6 of the most recent edition of the "Contractor Mix Design Guidelines for Asphalt Concrete". A six-month period will be allowed for the mix design submittal from the date of the written exam.

Re-examination Policy – Written/Performance

Failure of any exam phase on a second attempt shall require attendance of the course for that qualification and passing the exam element failed on the second attempt if certification is still desired. In addition, on the date the certification exam was first taken a technician will have 120 days to complete the exam requirements for the desired certification. If the exam requirements are not met within the 120-day period and certification is still desired the technician will be required to perform the entire exam process again.

Applicants with Disabilities or Special Needs

Applicants with a disability or those having special needs should notify the Certification Advisory Committee Chair, or their designee, at the time application is made. This will allow time to plan for implementing necessary accommodations prior to the administration of the training and/or testing.

Disclaimer

Certification of an individual by the ODOT Technician Certification Program indicates only that the individual has demonstrated a certain level of competence on a written and/or practical examination in a selected field of activity. ODOT may require this certification of individuals performing activities specified in work contracts or other activities. ODOT and the Certification Advisory Committee make no claims regarding the abilities or competence of certified individuals. Each individual or organization utilizing certified individuals must make its own independent judgment of the competence of certified individuals. ODOT specifically disclaims any responsibility for the actions, or the failure to act, of individuals who have been certified through the ODOT Technician Certification Program.

To obtain certification may involve hazardous materials, operations and equipment. This program does not purport to address all safety or regulation concerns associated with the use of the procedures used. It is the responsibility of the users to use and establish appropriate safety and health practices and determine the applicability of regulatory limitations.

Documentation of Certification

Upon the successful completion of the examination(s), the participant's name, home address and/or company affiliation is registered in the official registry of certified technicians for the appropriate certification. ODOT Construction Section maintains the official registry. It is accessible on the internet at the following address:

http://highway.odot.state.or.us/cf/techcertdynamic/

It is anticipated that many technicians will hold multiple certifications. An official letter(s), indicating certification(s) held, will be provided after successful completion of the certification process.

Recertification

To remain current, a certified technician must obtain recertification before the expiration date of the certification. Recertification may only be obtained by passing the written and/or practical test required for that particular certification. A certified technician must apply for the individual certification for which they want to remain certified. The certified technician is responsible for scheduling his/her own written and/or practical comprehensive examination.

It should be noted that should a technician fail to successfully complete a certification renewal in a specialty area, the technician will be considered disqualified in that area only until the requirements for certification renewal have been successfully met, subject to the limitations set forth in this document.

Note: A certification extension may be provided upon written request to the SQAE. The request should contain the reason for the extension, desired certification and proof of future class attendance or challenge process through a registration of the training provider.

The length and conditions of any extension will vary and are at the discretion of ODOT.

Revocation or Suspension of Certification

The Certification Advisory Committee Chair, for just cause, may revoke technician Certifications at any time. Proposed revocations are sent to the individual in writing along with the individual's right to appeal the proposed revocation. A proposed revocation is effective upon receipt by the technician and will be affirmed, modified, or vacated following any appeal.

The reasons that certified technicians will be subject to revocation or suspension of their certifications are *negligence* or *abuse* of their responsibilities. The Certification Advisory Committee (CAC) may disqualify certified technicians for other reasons of just cause, which may or may not be specifically defined herein following the due process procedures outlined herein.

Negligence is unintentional deviations from approved procedures that may or may not cause erroneous results. The following penalties are guidelines for findings of *negligence*: The first finding of *negligence* will result in a letter of reprimand being sent to both the employee and the employer. Depending on the nature of the incident, the CAC could impose up to a 30-day suspension. The second significant incident during the certification period will result in the State Quality Assurance Engineer (SQAE) discussing the issue with the individual and their employer to establish a corrective action plan. Depending on the nature of the incident, the CAC could impose up to a 180-day suspension. The SQAE will also notify the entire ODOT Quality Assurance staff of the issue. A third instance of neglect may result in permanent revocation of the certification.

Abuse is knowingly deviating from approved procedures or when the technician should have known they were deviating from approved procedures. There are two levels of severity for *abuse*.

For level 1 *abuse*: The first finding may result in up to a 180-day suspension all of the certifications of the individual. A second instance (within the certification period) would result in a minimum of 180-day suspension of all certifications.

For level 2 *abuse*: the first finding will result in a 1-year suspension of all certifications of that individual. A second finding will result in permanent revocation of all certifications.

AASHTOWare Project™: *Sharing or unauthorized use of an individual's login credentials for electronic test data entry will be considered abuse and subject to a 60-day suspension of all Material Testing Certifications. The chair of the CAC will investigate if additional action is warranted during the 60-day suspension period.*

Revocations or suspensions for *abuse* or *negligence* in one certification area are considered revocations or suspensions in *all certifications* held by the technician.

Allegations of *negligence* or *abuse* are made to the State Quality Assurance Engineer (SQAE) in writing. The allegations will contain the name, address and signature of the individual(s) making the allegation. The SQAE will investigate all allegations. The SQAE will decide if the incident is significant to warrant review by the Certification Advisory Committee (CAC). If the incident is given to the CAC for review, then the accused and the individual(s) making the allegation are given the opportunity to appear before the CAC to present any appropriate information. Within a 60 day period, all involved parties will receive a report of the findings in writing. Any warranted penalties will be imposed in accordance with guidance contained herein and according to the guidelines outlined under the Technician Compliant Process. Decisions regarding allegations of *negligence* or *abuse* may be appealed in writing to the CAC Chair. The CAC Chair will independently consider such written appeals but may rely on the advice and counsel of the CAC.

In all cases, the CAC will conduct the investigation into the allegations and make a recommendation to the ODOT State Construction & Materials Engineer as to appropriate sanctions against the technician. All final decisions regarding suspension of certifications will be up to the ODOT Construction & Materials Engineer.

Since ODOT is a member of the Western Alliance for Quality Transportation Construction, the certifications are honored by other member states. The Certification Advisory Committee will notify the other members of the WAQTC, or other participants in the Transportation Technician Qualification Program (TTQP), of anyone having a certification revoked or suspended.

TECHNICIAN COMPLAINT PROCESS

The Oregon Department of Transportation's Technician Certification Program is intended to assure qualified personnel are performing all materials testing for ODOT construction projects. In addition to certified technicians, the department needs a means to address concerns that are raised regarding those technicians not following approved procedures. The Technician Complaint Process will provide guidance on how to deal with these concerns.

It should be understood that the intent of the process is to resolve differences of opinion on appropriate procedures at the lowest possible level. Technicians are encouraged to work together to resolve any differences they might have. Only when those issues cannot be resolved at the project level should they be raised to the level of filling an official complaint. It should be understood that in no way is the formal complaint process intended to remove any authority the Project Manager may have under an existing contract.

Any individual may file a complaint regarding testing procedures or practices. The first step when filing a complaint is to decide whether the issue is a case of "neglect" or "abuse". "Neglect" is unintentional deviations from approved procedures. "Abuse" is knowingly deviating from approved procedures or when the technician should have known they were deviating from approved procedures. The appropriate process for dealing with the issue is followed after a decision is made on the type of offence. The following pages outline the process for dealing with both neglect and abuse:

Complaint Process for Neglect

Again, neglect is much less severe than abuse and individuals are encouraged to resolve their differences at the project level so the project can continue forward in a positive fashion. The complaint process for neglect is intended primarily to allow a means of tracking the types of problems being encountered and also to look out for technicians who seem to have repeated instances of neglect.

Step 1: When an individual discovers a significant problem with a technician's procedures or testing process, that individual will personally point out the concern to the technician. The two individuals will work together to try to resolve the issue. They may need to refer to the Manual of Field Test Procedures or other contract documents to verify proper procedures.

If the two can agree on corrective action, the issue can be resolved at their level. If not, the region SQAC should be contacted for clarification. If discrepancies on correct procedures still exist, the issue will be brought to the ODOT State Quality Assurance Engineer (SQAE) for resolution.

Step 2: Once the problem is resolved, the individual who discovered the problem will send a short memo to the SQAE describing the issue and the resolution.

Depending on the severity of the issue, the SQAE may send a letter of reprimand to the technician and their employer, and the CAC could impose up to a 30-day suspension.

Step 3: If a second significant incident is reported within the certification period for a specific technician, the SQAE will discuss the issues with the technician and their employer and establish a corrective action plan to help the technician avoid further complaints. Depending on the nature of the incident, the CAC could impose up to a 180-day suspension. In addition, the CAC could require the technician to attend additional training and retake the particular certification exam before reinstatement as a certified technician. The SQAE will also send out notice to all ODOT quality assurance staff of the issue. This notification is intended to help put ODOT staff on notice of particular problems being encountered.

Step 4: If a third instance of neglect is reported within the certification period, the specific technician and his/her employer must meet with representatives from the Certification Advisory Committee (CAC) to discuss the issues.

The technician will be responsible for providing a plan of how they will correct their deficiencies and assure no further instances will occur. The CAC may gather further information to substantiate the claims. The CAC will review the information and could impose up to permanent revocation of the certification in question.

It should be noted that because of the potential for repeated offences of neglect, the CAC could at any point in the process make a determination that the successive instances no longer qualify as neglect, but because of the repeated nature of an offense, may become an instance of abuse. If this occurs, the issue would be dealt with through the complaint process for abuse.

Complaint Process for Abuse

Because abuse is defined as intentional, the process for dealing with instances of abuse will be more formal and penalties more severe than for instances of neglect.

Step 1: If abuse is suspected, the issue shall be raised immediately to the ODOT State Quality Assurance Engineer (SQAE). The SQAE will investigate the issue and make a preliminary determination on whether it actually is abuse or neglect. If the issue is determined to be abuse, move to step 2 below. If it is determined to actually be a case of neglect, move to step 1 of the process for dealing with neglect.

Step 2: The SQAE will gather information regarding the incident from both the technician involved as well as the individual filing the complaint. The SQAE will review the information and determine whether the incident is significant to warrant review by the Certification Advisory Committee (CAC). This review will be completed within 60 days of receipt of the complaint. If the incident is determined to be "significant" the issue will be put on the agenda for the next CAC meeting.

Both the technician and the individual filing the complaint may be invited to attend the meeting to present any appropriate information. Insignificant issues will be handled directly by the SQAE and a summary of the incident will be submitted to the CAC for their review.

Step 3: The CAC will determine the merits of the complaint and the severity level of the abuse. Abuse will be identified as one of two different levels of severity.

Level 1 being identified as the least severe form of abuse. This level is identified as knowingly deviating from approved procedures or when the technician should have known they were deviating from approved procedures. The key component for Level 1 Abuse is there is no misrepresentation the quality of material being incorporated in the project. This level of abuse could result in up to a 180-day suspension of all certifications held by the technician. The exact duration of the suspension will be set by the CAC depending on the circumstances encountered. A second instance (within the certification period) of Level 1 abuse would result in a minimum 180-day suspension of all certifications.

Level 2 abuse is much more severe. The distinguishing component of Level 2 abuse is misrepresentation of the quality of material being tested. This level of abuse will be dealt with by a 1-year suspension of all certifications for the technician. A second instance of level 2 abuse will result in permanent revocation of all certifications.

Record Retention

Investigations, supporting exhibits, letters of expectation, CAC recommendations and other investigative correspondence will be kept on file according to the following guidelines:

- Negligence – records will be kept for a 5-year period starting on the date of the investigation.
- Abuse – records will be kept permanently.

At any time retained records may be used to support further allegations of negligence or abuse.

V. *QUALITY ASSURANCE LABORATORY PROFICIENCY SAMPLE PROGRAM*

OREGON DEPARTMENT OF TRANSPORTATION
CONSTRUCTION SECTION

Proficiency sample testing is an additional factor used to evaluate the performance of a quality assurance (QA) laboratory and the quality assurance (QA) laboratory technicians. It provides information not otherwise available from the On-Site Laboratory Inspection (see Section III) and a means of continued monitoring of testing personnel and testing equipment. The ODOT Construction Section requires QA laboratories and QA laboratory technicians to participate in this QA Proficiency Sample Program. Participation includes testing all applicable samples, which are to be distributed and completed within the specified time frame. The resulting data is analyzed by the ODOT State Quality Assurance Engineer.

Proficiency samples are distributed by the Construction Section at annual intervals as outlined in the Proficiency Sample Testing Plan in Table 1 of this section. The Construction Section will distribute a minimum of one set of samples from each material test method listed in Table 1 for each of the QA laboratory technicians. The ODOT Central Materials Laboratory (ODOT-CML) and the QA laboratory technicians will perform the required testing listed in Table 1 on each set of samples. The distribution of proficiency samples is not intended to coincide with the on-site laboratory inspection. Proficiency Sample test results will be submitted to the State Quality Assurance Engineer within thirty days of receipt of the sample. The State QAE will tabulate all of the testing results from the ODOT-CML and the QA laboratory technicians and statistically evaluate if any of the technician results are more than two standard deviations beyond the grand mean for each test method.

When a QA laboratory technician's results are beyond two standard deviations of the grand means, the Senior Quality Assurance Coordinator (SQAC) will investigate the reason for the discrepancies and report the findings and actions taken to the State Quality Assurance Engineer (SQAE) within thirty days of issuance of a final report. The SQAE will determine whether or not the findings warrant further action to address the testing deviations and identify steps that need to be taken to ensure that the technician is correctly performing the test. The SQAE will be responsible for monitoring the technician testing results until there is confidence that the technician is following approved procedures.

When an ODOT-CML technician's results are beyond two standard deviations of the grand means, the ODOT Laboratory Services Manager shall investigate the reason for the discrepancies and report the findings and actions taken to the State Quality Assurance Engineer (SQAE) within thirty days of issuance of a final report. The SQAE will address the testing deviations, identify steps to be taken and be responsible for monitoring results in the same manner as for a QA laboratory technician.

If a QA laboratory technician or ODOT-CML technician exceeds the two standard deviation limit on the next year's proficiency samples for the same material test method and is not able to provide the SQAE with a satisfactory explanation for exceeding the limits; the technician will immediately perform a backup proficiency sample witnessed by the SQAE or designated representative. The SQAE will review the process that was followed from the previous year's investigation findings and make a determination if the technician is not following approved procedures. If the SQAE finds that the technician is not following approved procedures, the SQAE will immediately suspend the technician from performing any QA project work or third-party resolution work involving the test method that has been identified. The SQAE will identify what steps are necessary to allow the technician to resume testing for the failing test method.

TABLE 1 – PROFICIENCY SAMPLE TESTING PLAN

January Distribution

TEST METHOD
SOIL & Aggregate Sample
Bulk Specific Gravity – AASHTO T 85
Coarse Particle Correction – AASHTO T 99
Max. Density – AASHTO T 99 Aggregate Base
Max. Density – AASHTO T 99 Soil
Sieve Analysis – AASHTO T 27/11
Sand Equivalent – AASHTO T 176
Fracture – AASHTO T 335
Wood Particles – ODOT TM 225
Elongated Pieces – ODOT TM 229
ACP Mixture Sample
Bulk Specific Gravity – AASHTO T 166, Method A
Max. Specific Gravity – AASHTO T 209
AC Content by Incinerator – AASHTO T 308
Mechanical Analysis of Extracted Aggregate- AASHTO T 30
Fabrication of Gyratory Specimen – ODOT TM 326

A laboratory may obtain additional information on the Construction Section's Quality Assurance Laboratory Proficiency Sample Program by contacting the Construction Section at the following address:

Oregon Department of Transportation
Construction Section, Materials Laboratory
Attn: State Quality Assurance Engineer
800 Airport Road S.E.
Salem, OR 97301
Telephone (503) 986-3061

VI. *PRODUCT SPECIFIC QC/QA TESTING PLAN*

The Quality Assurance Program consists of three distinct sub-programs. The Quality Control Program, the Verification Program and the Independent Assurance Program. This section provides specific details on how these programs work together to assure specification materials are incorporated into ODOT projects. It also provides details on specific requirements of each of the programs for each of the materials, which are utilized on ODOT projects.

In general, the Contractor's quality control tests are obtained at the highest frequency. Agency verification tests are usually run on a minimum frequency of 10% of sublot quantities identified in section 4(D) of the MFTP. While the Independent Assurance program takes steps to assure the quality of both the QC and the verification test results.

ODOT will accept materials based on the contractors QC test results only if verified by the Agency verification testing. Verification of QC test results will require all of the following conditions to be met:

1. The Department's testing results show that the material meets the specified quality.
2. The split samples meet Independent Assurance Parameters.
3. The Department's verification test results compare reasonably to the ongoing quality control data.

If any of the above conditions are not met, an investigation will be conducted by the Project Manager to determine whether to reject the material or if the material is suitable for the intended purpose according to section 00150.25 and also what price adjustment may be applied. See Investigation Criteria for details and requirements.

Step 2 in the above conditions compares the Contractor's test results on the split IA sample to the Agency results. The Independent Assurance Parameters to be used for the comparison are listed in Table 1 of this section.

The following pages detail the Investigation Criteria, quality control, verification and independent assurance requirements for each of the specific materials used on ODOT projects.

Investigation Criteria

The intent of the investigation is to determine reasonable cause for the discrepancy and provide supporting documentation of materials failing to meet the conditions outlined for verification, independent assurance, and prior quality control testing. An investigation is required for all materials failing to meet these conditions because of the potential impact on the quality of the material produced or incorporated into the project.

Several resources are available to assist with the troubleshooting process and data collection. Appendix C (Troubleshooting Guide) provides some guidance through the evaluation phase based on material discipline and the associated tests. The guide is an evaluation tool and is not necessarily a complete listing of all potential areas to be investigated and the assistance of the region Sr. QAC, State QAE, Sr. QAE or other technical resources is encouraged.

The investigation and the resolution of the discrepancy shall be documented on form (734-4040) and at a minimum will contain the following information:

- Clearly explain the issue under investigation. Provide the bid item number, material description, test procedure or process in question, associated quality assurance testing references and date or timelines of the testing issue.

- Describe the steps taken to resolve the discrepancy and the associated information or test results gathered to support the findings.

- Provide a conclusion based on the findings.

- Describe recommendations or actions to be taken.

- Provide written notification to the region Sr. QAC and quality control entity upon completion of the investigation. Ensure a copy of the investigation is maintained in the project files.

INSERT TAB

SECTION IA
Parameters

TABLE 1
Independent Assurance Parameters
Maximum Allowable Differences

Gradation Sieve Sizes with Assigned Tolerances T 27, T 27/11 & T 30	
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 – T 308	0.40%
Fracture - T 335	5%
Wood Particles - TM 225	0.05%
Elongated Pieces – TM 229	
5:1 Ratio	2.0%
3:1 Ratio	4.0%
Sand Equivalent – T 176	8 points
Soil Curves – T 99/180 (ρ_f)	
Maximum Density	3.0 lbs. per ft³
Moisture	3.0%
Aggregate Base – T 99/180 (ρ_f)	
Maximum Density	3.0 lbs. per ft³
Moisture	2.0%
Plant Mixed Moisture Content	1%
Maximum Specific Gravity – Rice - T 209	
Standard G_{mm}	0.020
Dryback G_{SSD} (If required)	0.020
Bulk Specific Gravity of Lab fabricated specimens - T 166	0.032
Maximum Specific Gravity (G_{sb}) - T 85	0.032
Air Content of Concrete - T 152	0.5%
Slump of Concrete - T 119	1”
Temperature of Concrete - T 309	3°F
Unit Weight of Concrete - T 121	3.0 lbs. per ft³

AGGREGATE PRODUCTION

Quality Control	***Verification***	***Independent Assurance***
Required	**Required**	**Required**

Quality Control

The ODOT Central Materials Laboratory (ODOT-CML) 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 the *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 the 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 R 90 for the appropriate nominal maximum size aggregate.

Verification

QA 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 QA for testing.

If verification testing fails to meet the specifications, other than gradation, QA 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, QA 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 QA's test results are within IA parameters.

If the Contractor's test results and QA'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.

QA 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 QA's test results are within IA parameters.

If the Contractor's test results and QA'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

QA 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. QA 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 See Aggregate Production details, page 29. Not required for commercial grade concrete	**Required** See Aggregate Production details, page 29. Not required for commercial grade concrete	**Required** See Aggregate Production details, page 29. Not required for commercial grade concrete

MIXTURE

Quality Control	*Verification*	*Independent Assurance*
Required	**Required** 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 hours of 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

QA performs verification tests for strength, taken randomly, according to the Manual of Field Test Procedures Materials 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 ODOT-CML for further testing.

If verification strength testing fails to meet the specifications. 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. The sample may be taken by QC or independent samples may be taken by both QC and QA. When independent samples are taken, acquire portions as close as possible to each other. Concrete with Nominal Aggregate size of 1 ½" will often require individual samples taken by QC and QA, due to sample size(s) and wet sieving requirements.

This testing will be for plastic properties and strength testing. The QC technician shall immediately report the results of the plastic properties testing to QA. QA will verify that the contractor's plastic properties test results and QA's plastic properties test results are within IA parameters.

If the Contractor's plastic properties test results and QA's plastic properties test results for the verification sample are not within IA parameters, QA will evaluate the results, resolve the discrepancy and notify the PM of the resolution. If either parties' plastic properties test results are out of specification, then QC will follow the requirements of specification sections 00540.16 and 02001.50(b).

The QA 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 See Aggregate Production details, page 29.	**Required** See Aggregate Production details, page 29.	**Required** 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. QA 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 QA's test results are within IA parameters.

If the Contractor's test results and the QA'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

QA 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 QA'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

QA 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 density has been achieved.

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 See Aggregate Production details, page 29.	**Required** See Aggregate Production details, page 29.	**Required** 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 See Aggregate Production details, page 29.	**Required** See Aggregate Production details, page 29.	**Required** 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 R 90 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 the *ODOT Sample Data Sheet* (Form 734-4000) and deliver to the PM by the middle of the following work shift.

Verification

QA 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 QA for testing.

If verification testing fails to meet specifications, QA 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 QA's test results are within IA parameters.

If the Contractor's test results and QA'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 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 See Aggregate Production details, page 29.	**Required** See Aggregate Production details, page 29.	**Required** 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 (20 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 R 90 for the appropriate nominal maximum size aggregate can be used. If grade sampling is identified in the contract Special Provisions, QC will obtain an ACP sample and provide an ACP backup sample to the on-site agency representative. Label backup samples with the following information:

- Material
- Use of Material (i.e., “Level 3 ACP”)
- ODOT Mix Design Number
- Contract Number
- Date of sampling
- Bid Item, Lot and Sublot
- Location where sample was obtained.

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

QA 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 QA for testing.

If verification testing fails to meet the specifications, QA 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 QA's test results are within IA parameters.

If the Contractors test results and QA'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 Sr. 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: QA performs verification tests, taken randomly, according to the Manual of Field Test Procedures Acceptance Guide (Section 4(D)).

QA selects random numbers for the test locations within the Contractor's sublot size. If verification testing fails to meet the specifications, QA will immediately notify the PM.

Failing verification requires retesting an additional verification within the next 2 shifts to confirm density specification and to isolate the original failure.

The PM will initiate an investigation. If the investigation determines there is non-specification material, the PM will evaluate the test results using the Failing ACP Compaction Guidelines (located on the following page) and perform the 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 Sr. 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. PM will investigate and evaluate the material to determine if the material is suitable for the intended use per Section 00150.25.
    b. PM consults the Pavements Services and Quality Assurance Unit for recommendations on:
        - Methods of investigating, evaluating, and isolating non-specification material.
        - Application of appropriate corrective action and/or price adjustment for non-specification material.
    c. If the material is suitable for intended use the PM will apply the test results to acceptance procedures in accordance with Section 00165. The Contractor should take corrective action.
2. 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 QA for recommendations on:
        - Methods of investigating, evaluating, and isolating non-specification material
        - Application of appropriate corrective action and/or price adjustment for non-specification material

When cores are used, laboratory testing will be conducted by the ODOT Central Materials Laboratory. Third-party resolution 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 non-specification. Core density results or isolated non-specification material will be evaluated as a separate lot per section 165.40 or 165.50(c).

APPENDIX A

ODOT APPROVED AGGREGATE PRODUCT PROGRAM

A supplier may submit in writing a request for aggregate product(s) approval through the region SQAC. The State QAE and the region SQAC will review the request and, if it is a benefit to the Department, a product(s) may be put on the ODOT Approved Aggregate Product Program (OAAPP). The request shall include the following information for review:

- Production history or prior use on an ODOT project
- Location and Source Identification
- Intended use of supplied material(s)
- Quality Control Plan

The State QAE will notify the region SQAC of final approval of the Quality Control Plan. The region SQAC will notify the supplier of the approved products. The products covered by the approved Quality Control Plan are classified as ODOT Approved Aggregate Products.

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 SQAC.

The supplier shall obtain, under the supervision of the region SQAC, at the minimum required frequency as shown in Section 4A of the MFTP, samples for Product Compliance and then the region SQAC shall submit them for testing at the ODOT Central Materials Laboratory.

The supplier shall send requests to waive tests, as allowed by the FTMAG, to the region SQAC. The region SQAC will consult with the SQAE for any waivers to be granted. The region SQAC will notify the supplier 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 SQAC.

The supplier shall maintain files of all QC tests for each stockpile. It shall enter the test results into the ODOT StatSpec 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 SQAC may, with approval of the State 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 SQAC, copies of the ongoing sublot test results, along with the ongoing QL (quality levels).

The supplier shall keep the region SQAC 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 region SQAC may allow all backup QC samples prior to the verification sample to be discarded.

The region SQAC will randomly audit the QC files to verify that the quality levels reflect actual test results. The region SQAC will retain QL information for each stockpile along with verification and IA test results. When requested by the Project Manager, the region SQAC will send a memo to the PM verifying and identifying what materials were produced under the OAAPP 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 SQAC 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 SQAC will work with the supplier to resolve the problem.

The region SQAC will provide data to other regions that are using material considered ODOT Approved Aggregate Products.

The region SQAC may discontinue a supplier's approved aggregate product status for those product(s) affected based upon, but not limited to:

- The supplier not following their quality control plan,
- IA and/or verification issues,
- Product(s) failing to meet a product compliance testing requirement,
- The determination that an approved aggregate product(s) is no longer a benefit to the Agency under the program.

The approved aggregate product status may be returned upon approval of the State QAE and region SQAC.

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 (e.g. 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 SQAC 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 SQAC, their involvement can significantly reduce time spent troubleshooting and getting to resolution.

AGGREGATE TESTING

Gradation (AASHTO T 27 & T 27/11)

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 StatSpec mean values.

Woodwaste Test (ODOT TM 225)

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

Fracture Test (AASHTO T 335)

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(s) 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 & Elongated Test (ODOT TM 229)

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 (+ 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 (AASHTO T 176)

1. Compare sand reading, if significant differences present this is an indication a under sized tin or insufficient compacting effort when filling the 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 (AASHTO T 99, Methods A & D and ODOT TM 223)

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 # 4 or 3/4" material?
10. Have QC run a point at optimum moisture from their curve on the passing # 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 (AASHTO T 85)

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 G_{sa}? 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 # 4 sieve. Significant material passing the # 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 (AASHTO T 310 with T 99, T 255/265 (or T 217) & T 85 and T 272 & R 75 (Soils) or ODOT TM 223 (Aggregate Base))

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 AASHTO T 99, 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 the region QA lab.

ACP TESTING

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

Ignition Oven – AC Content Test (AASHTO T 308)

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 has a clean burn? Sample achieved 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 (AASHTO T 209)

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 (AASHTO T 166)

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 (AASHTO T 355)

There is no 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 (ODOT TM 327)?
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 (according to specifications), to achieve compaction? Does compaction correlate with voids i.e. high voids low compaction?
6. Is the mix tender? Seek help from SQAC or ODOT Pavements.
7. Is rolling compacting the whole panel, not just the center? Consistent with the 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 SQAC 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 (AASHTO 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 retained 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 (at least 3")?
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.

INSERT TAB

SECTION 3
Report Forms & Examples

FIELD WORKSHEET FOR AGGREGATE

E English (E) or Metric (M)

PROJECT NAME (SECTION)		CONTRACT NUMBER
CONTRACTOR OR SUPPLIER	PROJECT MANAGER	BID ITEM NUMBER
SOURCE NAME	SOURCE NUMBER	MATERIAL SIZE

TEST NO.	DATE	TIME	SAMPLED AT	TO BE USED IN

SIEVE SIZE	SPECS. LIMITS	SIEVE ANALYSIS AASHTO T27/11 MASS 1	MASS 2	MASS 3	MASS 4	TOTAL MASS	% RET	% PASS	FM CUMULATIVE % RETAINED
PAN	---								

B = INITIAL DRY MASS: **D** =MASS AFTER SIEVING:

SIEVE SIZE	SPECS. LIMITS	FRACTURE % METHOD 2 AASHTO T 335 FRAC MASS (**F**)	QUESTIONABLE MASS (**Q**)	NON FRAC MASS (**N**)	INDIVIDUAL FRAC %	ELONGATED PIECES TEST MASS	ELONG MASS

SE T 176

1	2	3	Sample
			Clay
			Sand
			S.E.
AVG.		SPEC	

PAN TARE	
WET MASS & PAN	
DRY MASS & PAN	
AFTER WASH DRY MASS & PAN	

C = AFTER WASH DRY MASS & PAN - PAN **B** = DRY MASS & PAN - PAN

A = WET MASS & PAN - PAN

DRY WET WAQTC AASHTO T-27/T11

Round Square Rectangle Size

	RESULT	SPEC
Fracture % Method 1 T 335		
Wood Waste TM225	%	
CleannessValue TM 227		
Flat & Elongated TM 229		
Fineness Modulus T 27/T11		
MOISTURE %={(A-B) / B} X 100		
SIEVE LOSS %={(C-D) / C} X 100		
(№10 / 1/4") x 100		

REMARKS

QUALITY CONTROL VERIFICATION INDEPENDENT ASSURANCE

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

734-1792 (06-2023)

FIELD WORKSHEET FOR AGGREGATE

E English (E) or Metric (M)

PROJECT NAME (SECTION)	CONTRACT NUMBER
US97: Lower Bridge Rd (Terrebonne)	C15123

CONTRACTOR OR SUPPLIER	PROJECT MANAGER	BID ITEM NUMBER
Hooker Creek	Earl Mershon	420
SOURCE NAME	SOURCE NUMBER	MATERIAL SIZE
Red Rock Quarry	04-32-01	#4 -#8

TEST NO.	DATE	TIME	SAMPLED AT	TO BE USED IN
IA-4	6/29/2023	10am	Belt	ACP

SIEVE SIZE	SPECS. LIMITS	SIEVE ANALYSIS AASHTO T27/11 MASS 1	MASS 2	MASS 3	MASS 4	TOTAL MASS	% RET	% PASS	FM CUMULATIVE % RETAINED
						0.0	0.0	100	
						0.0	0.0	100	
1"		0.0	0.0			0.0	0.0	100	
3/4"	99-100	0.0	0.0			0.0	0.0	100	
1/2"	85-95	338.0	105.2			443.2	12.1	88	
3/8"	39-55	1115.2	396.4			1511.6	41.4	47	
1/4"		911.7	553.9			1465.6	40.1	6	
#4	0-11	68.4	68.7			137.1	3.8	3	
#8	0-7	7.4	28.0			35.4	1.0	2	
#16		0.2	3.6			3.8	0.1	2	
#30	0-6	0.1	1.8			1.9	0.1	1	
#50		0.1	1.6			1.7	0.0	1	
#100		0.1	2.2			2.3	0.1	1	
#200	0.1-2.1	0.1	4.0			4.1	0.1	1.2	
PAN	---	1.4	1.3			2.7	0.1		

B = INITIAL DRY MASS: 3653.5 **D** =MASS AFTER SIEVING: 3609.4

SIEVE SIZE	SPECS. LIMITS	FRACTURE % METHOD 2 AASHTO T 335 FRAC MASS (**F**)	QUESTIONABLE MASS (**Q**)	NON FRAC MASS (**N**)	INDIVIDUAL FRAC %	ELONGATED PIECES TEST MASS	ELONG MASS
1/2"	75%	443.2	0.0	0.0	100%		
3/8"	----						
1/4"	----						
#4	75%	3114.3	0.0	0.0	100%	1188.4	30.0
#8	75%	<5%					

SE T 176			
1	2	3	Sample
			Clay
			Sand
			S.E.
AVG.		SPEC	

PAN TARE	1330.5
WET MASS & PAN	5032.5
DRY MASS & PAN	4984.0
AFTER WASH DRY MASS & PAN	4940.5

C = AFTER WASH DRY MASS & PAN - PAN   **B** = DRY MASS & PAN - PAN   **A** = WET MASS & PAN - PAN

☐ DRY ☒ WET   WAQTC AASHTO T-27/T11

☒ Round ☐ Square ☐ Rectangle   12" Size

		RESULT	SPEC
Fracture % Method 1	T 335		
Wood Waste TM225	3.2	0.09 %	0.10%
CleannessValue	TM 227		
Flat & Elongated	TM 229	2.5%	10.0%
Fineness Modulus	T 27/T11		
MOISTURE %={(A-B) / B} X 100		1.3%	
SIEVE LOSS %={(C-D) / C} X 100		0.0%	<0.3%
(№10 / 1/4") x 100			

REMARKS

☐ QUALITY CONTROL ☒ VERIFICATION ☒ INDEPENDENT ASSURANCE

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Josh Huber #42332	ODOT Region 1 QA		6/29/2023

FIELD WORKSHEET FOR AGGREGATE

E English (E) or Metric (M)

PROJECT NAME (SECTION): Forms Example			CONTRACT NUMBER: 12345
CONTRACTOR OR SUPPLIER: ODOT Forms		PROJECT MANAGER: Sean Parker	BID ITEM NUMBER: 123
SOURCE NAME: Good Rock Bar		SOURCE NUMBER: 10-123-3	MATERIAL SIZE: 3/4"-0

TEST NO.	DATE	TIME	SAMPLED AT	TO BE USED IN
1	6/29/2023	7:30am	Final Belt	Base Aggregate

SIEVE ANALYSIS AASHTO T27/11

SIEVE SIZE	SPECS. LIMITS	MASS 1	MASS 2	MASS 3	MASS 4	TOTAL MASS	% RET	% PASS	FM CUMULATIVE % RETAINED
1"	100	0.0	0.0			0.0	0.0	100	
3/4"	90-100	88.3	170.2			258.5	4.8	95	
1/2"	---	446.3	381.5			827.8	15.4	80	
3/8"	55-75	223.8	247.7			471.5	8.8	71	
1/4"	40-60	311.8	347.5			659.3	12.3	59	
#4	---	252.7	193.6			446.3	8.3	50	
#6	---	298.8	165.1			463.9	8.7	42	
#10	---	287.4	222.1			509.5	9.5	32	
PAN	---	864.8	857.5			1722.3	32		

B = INITIAL DRY MASS: 5361.1 **D** =MASS AFTER SIEVING: 5359.1

SIEVE SIZE	SPECS. LIMITS	FRACTURE % METHOD 2 AASHTO T 335: FRAC MASS (**F**)	QUESTIONABLE MASS (**Q**)	NON FRAC MASS (**N**)	INDIVIDUAL FRAC %	ELONGATED PIECES: TEST MASS	ELONG MASS
1"		0.0	0.0	0.0			
3/4"		248.1	0.0	10.4			
1/2"		765.7	0.0	62.1			
3/8"		436.9	0.0	34.6			
1/4"		659.5	0.0	0.0			

SE T 176

1	2	3	Sample
6.9	6.7	6.4	Clay
3.4	3.4	3.3	Sand
50	51	52	S.E.
AVG.	51	SPEC	30

PAN TARE	2516.3
WET MASS & PAN	8145.4
DRY MASS & PAN	7877.4
AFTER WASH DRY MASS & PAN	7877.4

C = AFTER WASH DRY MASS & PAN - PAN **B** = DRY MASS & PAN - PAN **A** = WET MASS & PAN - PAN

[X] DRY [ ] WET WAQTC AASHTO T-27/T11

[X] Round [ ] Square [ ] Rectangle 12" Size

		RESULT	SPEC
Fracture % Method 1	T 335	95%	70-100%
Wood Waste TM225		%	
CleannessValue	TM 227		
Flat & Elongated	TM 229		
Fineness Modulus	T 27/T11		
MOISTURE %={(A-B) / B} X 100		5.0%	
SIEVE LOSS %={(C-D) / C} X 100		0.0%	0.3 Max
(№10 / 1/4") x 100		54%	40-60

REMARKS

[X] QUALITY CONTROL [ ] VERIFICATION [ ] INDEPENDENT ASSURANCE

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT Region 3 QA Unit		6/29/2023

FIELD WORKSHEET FOR AGGREGATE

E English (E) or Metric (M)

PROJECT NAME (SECTION)		CONTRACT NUMBER
Forms Example		12345
C0NTRACTOR OR SUPPLIER	PROJECT MANAGER	BID ITEM NUMBER
ODOT Forms	Sean Parker	123
SOURCE NAME	SOURCE NUMBER	MATERIAL SIZE
Good Rock Bar	10-123-3	#4-0

TEST NO.	DATE	TIME	SAMPLED AT	TO BE USED IN
1	6/29/2023	7:30am	Stockpile	PCC Fine Aggregate

SIEVE ANALYSIS AASHTO T27/11

SIEVE SIZE	SPECS. LIMITS	MASS 1	MASS 2	MASS 3	MASS 4	TOTAL MASS	% RET	% PASS	FM CUMULATIVE % RETAINED
						0.0	0.0	100	
						0.0	0.0	100	
						0.0	0.0	100	
						0.0	0.0	100	
						0.0	0.0	100	
						0.0	0.0	100	
3/8	100	0.0				0.0	0.0	100	
#4	90-100	1.3				1.3	0.1	100	0
#8	70-100	133.7				133.7	12.8	87	13
#16	50-85	192.4				192.4	18.5	69	31
#30	25-60	281.9				281.9	27.1	42	58
#50	5-30	260.9				260.9	25.0	17	83
#100	0-10	104.4				104.4	10.0	7	93
#200	0.0-3.0	38.9				38.9	3.7	2.8	
PAN	---	3.5				3.5	0.3		

B = INITIAL DRY MASS: 1041.8 **D** =MASS AFTER SIEVING: 1017.0

SIEVE SIZE	SPECS. LIMITS	FRACTURE % METHOD 2 AASHTO T 335 FRAC MASS (**F**)	QUESTIONABLE MASS (**Q**)	NON FRAC MASS (**N**)	INDIVIDUAL FRAC %	ELONGATED PIECES TEST MASS	ELONG MASS

SE T 176

1	2	3	Sample
4.5	4.6		Clay
3.5	3.6		Sand
78	79		S.E.
AVG.	79	SPEC	75

PAN TARE	1303.4
WET MASS & PAN	2418.0
DRY MASS & PAN	2345.2
AFTER WASH DRY MASS & PAN	2320.4

C = AFTER WASH DRY MASS & PAN - PAN   B = DRY MASS & PAN - PAN

A = WET MASS & PAN - PAN

☐ DRY X WET   WAQTC AASHTO T-27/T11

X Round ☐ Square ☐ Rectangle 12" Size

		RESULT	SPEC
Fracture % Method 1	T 335		
Wood Waste TM225		%	
CleannessValue	TM 227		
Flat & Elongated	TM 229		
Fineness Modulus	T 27/T11	2.78	2.60-3.00
MOISTURE %={(A-B) / B} X 100		7.0%	
SIEVE LOSS %={(C-D) / C} X 100		0.0%	0.3 Max
(№10 / 1/4”) x 100			

REMARKS

X QUALITY CONTROL ☐ VERIFICATION ☐ INDEPENDENT ASSURANCE

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT Region 3 QA Unit		6/29/2023

FIELD WORKSHEET FOR AGGREGATE

M English (E) or Metric (M)

PROJECT NAME (SECTION)		CONTRACT NUMBER
Forms Example		12345
C0NTRACTOR OR SUPPLIER: ODOT Forms	PROJECT MANAGER: Sean Parker	BID ITEM NUMBER: 123
SOURCE NAME: Good Rock Bar	SOURCE NUMBER: 10-123-3	MATERIAL SIZE: 3/4"-#4

TEST NO.	DATE	TIME	SAMPLED AT	TO BE USED IN
1	6/29/2023	7:30am	Final Belt	PCC Coarse Aggregate

SIEVE SIZE	SPECS. LIMITS	SIEVE ANALYSIS AASHTO T27/11 MASS 1	MASS 2	MASS 3	MASS 4	TOTAL MASS	% RET	% PASS	FM CUMULATIVE % RETAINED
						0.0	0.0	100	
						0.0	0.0	100	
						0.0	0.0	100	
						0.0	0.0	100	
1	100	0.0	0.0			0.0	0.0	100	
3/4	90-100	10.5	27.6			38.1	0.7	99	
1/2	---	747.1	927.2			1674.3	30.1	69	
3/8	20-55	751.3	792.9			1544.2	27.8	41	
1/4	---	990.4	1040.7			2031.1	36.6	5	
#4	0-10	91.7	58.0			149.7	2.7	2	
#6	---	22.1	18.9			41.0	0.7	1	
#8	0-5	5.4	6.9			12.3	0.2	1	
#30	---	3.3	8.0			11.3	0.2	1	
#200	0.0-1.0	2.3	8.3			10.6	0.2	0.8	
PAN	---	1.7	3.5			5.2	0.1		

B = INITIAL DRY MASS: 5555.1 **D** =MASS AFTER SIEVING: 5517.8

SIEVE SIZE	SPECS. LIMITS	FRACTURE % METHOD 2 AASHTO T 335 FRAC MASS (**F**)	QUESTIONABLE MASS (**Q**)	NON FRAC MASS (**N**)	INDIVIDUAL FRAC %	ELONGATED PIECES TEST MASS	ELONG MASS

SE T 176 1	2	3	Sample
			Clay
			Sand
			S.E.
AVG.		SPEC	

PAN TARE	1329.3
WET MASS & PAN	7060.6
DRY MASS & PAN	6884.4
AFTER WASH DRY MASS & PAN	6848.2

C = AFTER WASH DRY MASS & PAN - PAN **B** = DRY MASS & PAN - PAN

A = WET MASS & PAN - PAN

☐ DRY ☒ WET WAQTC AASHTO T-27/T11

☒ Round ☐ Square ☐ Rectangle 12" Size

		RESULT	SPEC
Fracture % Method 1	T 335		
Wood Waste TM225	0.8	0.01 %	0.05%
CleannessValue	TM 227		
Flat & Elongated	TM 229		
Fineness Modulus	T 27/T11		
MOISTURE %={(A-B) / B} X 100		3.2%	
SIEVE LOSS %={(C-D) / C} X 100		0.0%	0.3 Max
(2.00 / 6.3) x 100			

REMARKS: Woodwaste = 0.8 grams

☒ QUALITY CONTROL ☐ VERIFICATION ☐ INDEPENDENT ASSURANCE

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT Region 3 QA Unit		6/29/2023

734-1792 (6-2023)

NUCLEAR COMPACTION TEST REPORT

PROJECT NAME (SECTION)				CONTRACT NUMBER
CONTRACTOR OR SUPPLIER		PROJECT MANAGER		BID ITEM NUMBER
TEST LOCATION (STATION)		OFFSET (DISTANCE FROM CENTERLINE)		SOURCE POSITION
TEST NUMBER	DISTANCE BELOW GRADE	LIFT	LIFT THICKNESS	DATE

CODES FOR ROLLER TYPES	ROLLER TYPE AND DESCRIPTION (MANUFACTURE, WEIGHT, ETC)
SDV-SINGLE DRUM VIBRATORY SF- SHEEP FOOT DDV-DOUBLE DRUM VIBRATORY GR - GRID ROLLER	

REPRESENTS MATERIAL / AREA INCORPORATED

FROM: STATION		**OFFSET**		**DIST. BELOW GRADE**	
TO: STATION		**OFFSET**		**DIST. BELOW GRADE**	

CHECK BOX ☐ **DEFLECTION OBSERVED UNDER LOADED EQUIP.** ☐ **NO DEFLECTION OBSERVED UNDER LOADED EQUIP.**

☐ **MOISTURE IS NOT WITHIN SPECIFICATION** ☐ **MOISTURE IS WITHIN SPECIFICATION**

AASHTO T 310	Wet Density	Moisture	**Dry Density**	**Percent Moisture**
Shot 1			WD - M	(M / DD) X 100
Shot 2				
Average	**WD**	**M**	**DD**	**%M %**

shots within 2 lb/ft³

(Pc)

AASHTO T 99	**A**	№4	COARSE		FINE		**% Coarse**	
	D	¾"	COARSE		FINE		**% Coarse**	

MASS OF MOLD AND MATERIALS	MASS OF MOLD	MASS OF WET MATERIAL **(M)**	WET DENSITY **(A)**	SPEEDY MOISTURE % WET **(B)**	SPEEDY MOISTURE % DRY **(C)**	AASHTO T 255 / T 265 MOISTURE % WET **(a)**	DRY **(b)**	% M **(C)**	DRY DENSITY **(D)**
UNSCREENED COMBINED IN-PLACE MOISTURE →									

WD (A) = (M) X (MF)MOLD FACTOR

MOLD FACTOR **(MF)**

4 inch MOLD (MF) = 0.066144

6 inch MOLD (MF) = 0.02939

SPEEDY MOISTURE % $(C) = \frac{(B)}{100 - (B)} \times 100$

T 255 / T 265 MOISTURE % $(C) = \frac{(a) - (b)}{(b)} \times 100$

DRY DENSITY $(D) = \frac{(A)}{(C) + 100} \times 100$

Pc (from A or D above)	**Pf** (Pf = 100 - Pc)	**CURVE NO.**	DRY DENSITY ρ_f	OPTIMUM MOISTURE **MCf**	**k** (Gsb x 62.4)	**MCc**

COMBINED IN-PLACE MOISTURE

(C) = unaltered one-point moisture

Within 1% of T 310 % Moisture?

(If not Correct T 310 DD)

$W = ((C)P_f + MC_cP_c) / 100$

[ ][ ] + [ ][ ] /100

W= [ ]

COMBINED OPTIMUM MOISTURE

(MCT)

(Based on Curve Info.)

$MC_T = (MC_fP_f + MC_cP_c) / 100$

[ ][ ] + [ ][ ] /100

MC_T= [ ]

RELATIVE MAXIMUM DRY DENSITY (lb/ft³)

$$\rho_d = \frac{100}{\frac{Pf}{\rho_f} + \frac{Pc}{k}}$$

ρ_d [ ] = $\frac{100}{[\ ]/[\ ] + [\ ]/[\ ]}$

CORRECTED DRY DENSITY

DD = WD / (1+(**W**/100))

DD		**WD**		**1+(W/100)**
	=		/	

PERCENT COMPACTION

Original or Corrected (DD / ρ_d) x 100

Percent Required [ ] PERCENT OBTAINED [ ]

REMARKS	

☐ QUALITY CONTROL ☐ VERIFICATION **TYPE GAUGE-SERIAL NUMBER:**

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

734-1793_S (03-2023)

NUCLEAR COMPACTION TEST REPORT

PROJECT NAME (SECTION)		CONTRACT NUMBER
Forms Example		12345
CONTRACTOR OR SUPPLIER: ODOT Forms	PROJECT MANAGER: Sean Parker	BID ITEM NUMBER: 123
TEST LOCATION (STATION): 65+15	OFFSET (DISTANCE FROM CENTERLINE): 15' Rt.	SOURCE POSITION: 8"
TEST NUMBER: 1-1 / DISTANCE BELOW GRADE: Subgrade	LIFT: N/A / LIFT THICKNESS: N/A	DATE: 6/29/23

CODES FOR ROLLER TYPES
SDV-SINGLE DRUM VIBRATORY — SF- SHEEP FOOT
DDV-DOUBLE DRUM VIBRATORY — GR - GRID ROLLER

ROLLER TYPE AND DESCRIPTION (MANUFACTURE, WEIGHT, ETC): CAT CF 560 SDV

REPRESENTS MATERIAL / AREA INCORPORATED

	STATION	OFFSET	DIST. BELOW GRADE
FROM:	62+00	CL	Subgrade
TO:	75+00	20' Rt.	Subgrade

CHECK BOX
- [ ] DEFLECTION OBSERVED UNDER LOADED EQUIP.
- [X] NO DEFLECTION OBSERVED UNDER LOADED EQUIP.
- [ ] MOISTURE IS NOT WITHIN SPECIFICATION
- [X] MOISTURE IS WITHIN SPECIFICATION

AASHTO T 310	Wet Density lb/ft³	Moisture lb/ft³	Dry Density	Percent Moisture
Shot 1	150.2	10.1	WD - M	(M / DD) X 100
Shot 2	150.9	10.3		
Average	WD 150.6	M 10.2	DD 140.4	%M 7.3 %

(shots within 2 lb/ft³)

AASHTO T 99			COARSE	FINE		(Pc)
A	№4	COARSE	4582.0	FINE 5939.0	% Coarse	44
D	¾"	COARSE	845.0	FINE 9691.0	% Coarse	8

MASS OF MOLD AND MATERIALS	MASS OF MOLD	MASS OF WET MATERIAL (M)	WET DENSITY (A)	SPEEDY MOISTURE % WET (B)	SPEEDY MOISTURE % DRY (C)	AASHTO T 255 / T 265 MOISTURE % WET (a)	DRY (b)	% M (C)	DRY DENSITY (D)
UNSCREENED COMBINED IN-PLACE MOISTURE →						2005.2	1850.1	8.4	
10317	5655.5	4661.5	137.0			1097.7	1065.3	3.0	133.0
10491.8	5655.5	4836.3	142.1			1044.7	991.1	5.4	134.8

WD (A) = (M) X (MF)MOLD FACTOR

MOLD FACTOR (MF): 0.02939

4 inch MOLD (WD) = (M) x 0.06614

6 inch MOLD (WD) = (M) x 0.02939

SPEEDY MOISTURE %: $(C) = \frac{(B)}{100 - (B)} \times 100$

T 255 / T 265 MOISTURE %: $(C) = \frac{(a) - (b)}{(b)} \times 100$

DRY DENSITY: $(D) = \frac{(A)}{(C)+100} \times 100$

Pc (from A or D above)	Pf (Pf = 100 - Pc)	CURVE NO.	DRY DENSITY ρ_f	OPTIMUM MOISTURE MCf	k (Gsb x 62.4) or (Gsb x 1000)	MCc
8	92	Exit 99-03	139.0	8.5	165	2.2

COMBINED IN-PLACE MOISTURE
(C) = unaltered one-point moisture

W = ((C)Pf + MCcPc) / 100

[ ] [ ] + [ ] [ ] /100

Within 1% of T 310 % Moisture?
(If not Correct T 310 DD)

W= 8.4

COMBINED OPTIMUM MOISTURE (MCT)
(Based on Curve Info.)

MCT = (MCfPf + MCcPc) / 100

[ ] [ ] + [ ] [ ] /100

MCT= 8.5

RELATIVE MAXIMUM DRY DENSITY

$\rho_d = \frac{100}{\frac{Pf}{\rho_f} + \frac{Pc}{k}}$ lb/ft³

ρ_d = 139.0

CORRECTED DRY DENSITY

DD = WD / (1+(**W**/100))

DD		WD		1+(W/100)
138.9	=	150.6	/	1.084

PERCENT COMPACTION

Original or Corrected (DD / ρ_d) x 100

Percent Required: **95**

PERCENT OBTAINED: **100**

REMARKS

- [ ] QUALITY CONTROL
- [X] VERIFICATION

TYPE GAUGE-SERIAL NUMBER: **Troxler 16029**

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Zoid #40001	ODOT		6/29/2023

734-1793_S (03-2023)

NUCLEAR COMPACTION TEST REPORT

PROJECT NAME (SECTION)			CONTRACT NUMBER
Forms Example			12345
CONTRACTOR OR SUPPLIER: ODOT Forms	PROJECT MANAGER: Sean Parker		BID ITEM NUMBER: 123
TEST LOCATION (STATION): 117+17	OFFSET (DISTANCE FROM CENTERLINE): 16' Lt.		SOURCE POSITION: 8"
TEST NUMBER: 1-1 / DISTANCE BELOW GRADE: 7 ft.	LIFT: 3 rd	LIFT THICKNESS: 12"	DATE: 6/29/23

CODES FOR ROLLER TYPES
SDV-SINGLE DRUM VIBRATORY — SF- SHEEP FOOT
DDV-DOUBLE DRUM VIBRATORY — GR - GRID ROLLER

ROLLER TYPE AND DESCRIPTION (MANUFACTURE, WEIGHT, ETC): CAT CF 460 SF

REPRESENTS MATERIAL / AREA INCORPORATED

	STATION	OFFSET	DIST. BELOW GRADE
FROM:	115+25	15' Lt.	8'
TO:	200+25	20' Rt.	7'

CHECK BOX
- [ ] DEFLECTION OBSERVED UNDER LOADED EQUIP.
- [X] NO DEFLECTION OBSERVED UNDER LOADED EQUIP.
- [ ] MOISTURE IS NOT WITHIN SPECIFICATION
- [X] MOISTURE IS WITHIN SPECIFICATION

AASHTO T 310	Wet Density lb/ft³	Moisture lb/ft³	Dry Density	Percent Moisture
Shot 1	121.8	5.4	WD - M	(M / DD) X 100
Shot 2	121.5	5.5		
Average	WD 121.7	M 5.5	DD 116.2	%M 4.7 %

(shots within 2 lb/ft³)

AASHTO T 99		COARSE	FINE	% Coarse (Pc)
A	№4	2789.1	14947	16
D	¾"	1829.1	15906.9	10

MASS OF MOLD AND MATERIALS	MASS OF MOLD	MASS OF WET MATERIAL (M)	WET DENSITY (A)	SPEEDY MOISTURE % WET (B)	SPEEDY MOISTURE % DRY (C)	AASHTO T 255 / T 265 MOISTURE % WET (a)	DRY (b)	% M (C)	DRY DENSITY (D)
UNSCREENED COMBINED IN-PLACE MOISTURE →									
5941.1	4223.7	1717.4	113.6			110.6	103	7.4	105.8
6101.5	4223.7	1877.8	124.2			165.9	147.5	12.5	110.4

WD (A) = (M) X (MF)MOLD FACTOR

MOLD FACTOR (MF): 0.06614

4 inch MOLD (WD) = (M) x 0.06614

6 inch MOLD (WD) = (M) x 0.02939

SPEEDY MOISTURE %: $(C) = \frac{(B)}{100 - (B)} \times 100$

T 255 / T 265 MOISTURE %: $(C) = \frac{(a) - (b)}{(b)} \times 100$

DRY DENSITY: $(D) = \frac{(A)}{(C) + 100} \times 100$

Pc (from A or D above)	Pf (Pf = 100 - Pc)	CURVE NO.	DRY DENSITY ρ_f	OPTIMUM MOISTURE MCf	k (Gsb x 62.4)	MCc
16	84	Exit 19-1	111.4	14.1	138	4.8

COMBINED IN-PLACE MOISTURE
(C) = unaltered one-point moisture

W = ((C)Pf + MCcPc) / 100

(7.4 × 84 + 4.8 × 16) /100

W= 7.0

Within 1% of T 310 % Moisture?
(If not Correct T 310 DD)

COMBINED OPTIMUM MOISTURE (MCT)
(Based on Curve Info.)

MCT = (MCfPf + MCcPc) / 100

(14.1 × 84 + 4.8 × 16) /100

MCT= 12.6

RELATIVE MAXIMUM DRY DENSITY

$$\rho_d = \frac{100}{\frac{Pf}{\rho_f} + \frac{Pc}{k}} \quad \text{lb/ft}^3$$

$$\rho_d = 114.9 = \frac{100}{\frac{84}{111.4} + \frac{16}{138}}$$

CORRECTED DRY DENSITY

DD = WD / (1+(**W**/100))

DD		WD		1+(W/100)
113.7	=	121.7	/	1.07

PERCENT COMPACTION

Original or Corrected (DD / ρ_d) x 100

Percent Required: **95**

PERCENT OBTAINED: **99**

REMARKS

- [ ] QUALITY CONTROL
- [X] VERIFICATION

TYPE GAUGE-SERIAL NUMBER: **Troxler 16029**

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Zoid #40001	ODOT		6/29/2023

734-1793_S (03-2023)

NUCLEAR COMPACTION TEST REPORT FOR BASE AGGREGATE

PROJECT NAME (SECTION)			CONTRACT NUMBER
C0NTRACTOR OR SUPPLIER		PROJECT MANAGER	BID ITEM NUMBER
PANEL WIDTH	LIFT THICKNESS	TYPE GAUGE-SERIAL NUMBER	MIX NOMINAL SIZE

ROLLER TYPE AND DESCRIPTION (MANUFACTURE, WEIGHT, ETC)

TEST NUMBER						
DATE OF TEST						
TEST LOCATION (STATION)						
DISTANCE LT. OR RT. OF CENTERLINE (FEET)						
SOURCE POSITION						
LIFT / DIST BELOW GRADE						
WET DENSITY	1D					
MAX DIFFERENCE 2 lb/ft³	2D					
MOISTURE	1M					
	2M					
AVE. WET DENSITY	AD					
AVE. MOISTURE	AM					
DRY DENSITY (AD-AM)	DD					
% MOISTURE (AM / DD) x 100	%M					
Curve #						
Source #						
RELATIVE MAXIMUM DRY DENSITY	ρ_d					
Combined Optimum Moisture						
% COMPACTION FOR INDIVIDUAL TESTS (DD / ρ_d) X 100	% REQ					

CHECK APPROPRIATE ☐ MATERIAL DEFLECTED UNDER LOADED EQUIPMENT ☐ MATERIAL DID NOT DEFLECT UNDER LOADED EQUIPMENT

REPRESENTS MATERIAL INCORPORATED

FROM STATION		TO STATION	
FROM OFFSET		TO OFFSET	

REMARKS

☐ QUALITY CONTROL ☐ VERIFICATION

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

NUCLEAR COMPACTION TEST REPORT FOR BASE AGGREGATE

PROJECT NAME (SECTION)		CONTRACT NUMBER
Forms Example		12345
CONTRACTOR OR SUPPLIER: ODOT Forms	PROJECT MANAGER: Sean Parker	BID ITEM NUMBER: 123
PANEL WIDTH: 13 Ft. / LIFT THICKNESS: 6"	TYPE GAUGE-SERIAL NUMBER: Troxler 3430 #11111	MIX NOMINAL SIZE: 3/4"-0

ROLLER TYPE AND DESCRIPTION (MANUFACTURE, WEIGHT, ETC)

Ingersoll Rand - SDV - 10 Ton

TEST NUMBER		1	2	3	4	5
DATE OF TEST		10/9/2020	10/9/2020	10/9/2020	10/9/2020	10/9/2020
TEST LOCATION (STATION)		135+15	142+50	148+30	155+45	161+00
DISTANCE LT. OR RT. OF CENTERLINE (FEET)		5' Rt	2' Rt	10' Rt	9' Rt	3' Rt
SOURCE POSITION		6"	6"	6"	6"	6"
LIFT / DIST BELOW GRADE		1st 6"	1st 6"	1st 6"	1st 6"	1st 6"
WET DENSITY	**1D**	144.4	145.6	147.0	146.5	145.7
MAX DIFFERENCE 2 lb/ft³	**2D**	143.8	145.3	147.2	146.5	145.9
MOISTURE	**1M**	7.2	7.9	8.1	7.4	7.6
	2M	7.1	7.7	8.3	7.3	7.7
AVE. WET DENSITY	**AD**	144.1	145.5	147.1	146.5	145.8
AVE. MOISTURE	**AM**	7.2	7.8	8.2	7.4	7.7
DRY DENSITY (AD-AM)	**DD**	136.9	137.7	138.9	139.1	138.1
% MOISTURE (AM / DD) x 100	**%M**	5.3%	5.7%	5.9%	5.3%	5.6%
Curve #		#1	#1	#1	#1	#1
Source #		10-001-3	10-001-3	10-001-3	10-001-3	10-001-3
RELATIVE MAXIMUM DRY DENSITY	ρ_d	135.4	135.4	135.4	135.4	135.4
Combined Optimum Moisture		7.3%	7.3%	7.3%	7.3%	7.3%
% COMPACTION FOR INDIVIDUAL TESTS (DD / ρ_d) X 100	% REQ	**101%**	**102%**	**103%**	**103%**	**102%**

CHECK APPROPRIATE [ ] MATERIAL DEFLECTED UNDER LOADED EQUIPMENT [X] MATERIAL DID NOT DEFLECT UNDER LOADED EQUIPMENT

REPRESENTS MATERIAL INCORPORATED

FROM STATION	**120+00**	TO STATION	**162+00**
FROM OFFSET	**Centerline**	TO OFFSET	**13' Rt.**

REMARKS

[X] QUALITY CONTROL [ ] VERIFICATION

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT	Scott Aker	10/9/2020

CONCRETE YIELD AND W/C RATIO WORKSHEET

PROJECT NAME (SECTION)					CONTRACT NUMBER
C0NTRACTOR		PROJECT MANAGER			BID ITEM NUMBER
CONCRETE SUPPLIER		SUBMITTED BY			QUANTITY REPRESENTED yd³
CONCRETE FOR USE IN (LOCATION OR PLACEMENT)		BRIDGE NUMBER	SPECIFIED STRENGTH PSI @ DAYS		
DATA SHEET NUMBER	SET NUMBER	DATE	INVOICE NUMBER	BATCH SIZE	TRUCK NO & DRIVER

CONCRETE BATCH TICKET AND FIELD TEST DATA

CEMENTITIOUS MATERIAL

CEMENT ______ lb
SLAG ______ lb
FLYASH ______ lb
SILICA FUME ______ lb
TOTAL CEMENT ______ **lb**

AGGREGATES

______ #1 ______ lb
______ #2 ______ lb
______ #3 ______ lb
FINE AGG (SAND) #4 ______ lb
TOTAL AGG ______ **lb**

AGG % FREE MOISTURE

______ %
______ %
______ %
______ %

ADMIXTURES

______ 1 ______ oz
______ 2 ______ oz
______ 3 ______ oz
______ 4 ______ oz
TOTAL ADMIXTURES ______ oz
TOTAL ADMIXTURES ______ **lb**

ADD WATER

BATCHED ______ lb
JOBSITE ______ lb
TOTAL WATER ______ **lb**

CONVERSIONS

WATER
Gal x 8.34 = lb
Admixtures
oz / 16 = lb

TOTAL BATCH MASS ______ **lb**

PLASTIC PROPERTIES

TIME CYLINDERS CAST ______ **AMBIENT** ______ °F **SLUMP** ______ in

CONCRETE ______ °F **AIR** ______ %

DENSITY

CONCRETE + POT ______ lb
\- POT MASS ______ lb
CONCRETE MASS= ______ lb ÷ POT CALIBRATION = ______ lb/ft³

YIELD TOTAL BATCH MASS / lb/ft³ x 27 = ______ = ______ yd³

CEMENT CONTENT CEMENT, FLYASH & SILICA / YIELD = ______ = ______ lb/yd³

WATER CEMENT RATIO A. AGGREGATE FREE WATER (FREE MOISTURE FACTOR = % FREE MOISTURE DIVIDED BY 100. EG. : 5.5% = 0.055)

BATCH MASS - $\left(\frac{\text{BATCH MASS}}{\text{(1+ FREE MOISTURE FACTOR)}} \right)$ =AGG. FREE WATER

W/C RATIO= $\frac{\text{TOTAL FREE WATER (A+B+C)}}{\text{TOTAL CEMENT \& FLYASH}}$

#1 ______ - (______ / 1+ ______) = ______ lb
#2 ______ - (______ / 1+ ______) = ______ lb
#3 ______ - (______ / 1+ ______) = ______ lb
FINE AGG (SAND) #4 ______ - (______ / 1+ ______) = ______ lb

A. AGGREGATE FREE WATER TOTAL = ______ lb
B. WATER ADDED AT PLANT&JOBSITE = ______ lb
C. ADMIXTURES ADDED = ______ lb

______ lb / lb = ______ **= W/C RATIO**

☐ QUALITY CONTROL ☐ VERIFICATION

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

734-3573 (9-2023)

CONCRETE YIELD AND W/C RATIO WORKSHEET

PROJECT NAME (SECTION)			CONTRACT NUMBER
Forms Example			12345

CONTRACTOR	PROJECT MANAGER	BID ITEM NUMBER
ODOT Forms	Sean Parker	123
CONCRETE SUPPLIER	**SUBMITTED BY**	**QUANTITY REPRESENTED**
The Best Ready Mix	Scott Aker	150 yd³

CONCRETE FOR USE IN (LOCATION OR PLACEMENT)	BRIDGE NUMBER	SPECIFIED STRENGTH
Deck	1234a	5000 PSI @ 28 DAYS

DATA SHEET NUMBER	SET NUMBER	DATE	INVOICE NUMBER	BATCH SIZE	TRUCK NO & DRIVER
F-43048-001	1	10/10/12	123456	9.00yd3	#21 T. Driver

CONCRETE BATCH TICKET AND FIELD TEST DATA

CEMENTITIOUS MATERIAL

CEMENT	4735	lb
SLAG	165	lb
FLYASH	2000	lb
SILICA FUME	288	lb
TOTAL CEMENT	**7188**	**lb**

AGGREGATES

				AGG % FREE MOISTURE	
3/4" Round	#1	17600	lb	0.30	%
	#2		lb		%
	#3		lb		%
FINE AGG (SAND)	#4	10080	lb	7.90	%
TOTAL AGG		**27680**	**lb**		

ADMIXTURES

Rheobuild	1	580	oz
997	2	512	oz
AE-90	3	64	oz
	4		oz
TOTAL ADMIXTURES		1156	oz
TOTAL ADMIXTURES		**72**	**lb**

ADD WATER

BATCHED	1186	lb
JOBSITE		lb
TOTAL WATER	**1186**	**lb**

CONVERSIONS

WATER
Gal x 8.34 = lb
Admixtures
oz / 16 = lb

TOTAL BATCH MASS **36126** **lb**

PLASTIC PROPERTIES

TIME CYLINDERS CAST 11:30 AM

AMBIENT 40.5 °F **SLUMP** 6 1/2 in

CONCRETE 61 °F **AIR** 4.9 %

DENSITY

CONCRETE + POT	43.90	lb
- POT MASS	7.68	lb
CONCRETE MASS=	36.22	lb

÷ POT CALIBRATION 0.249900 = **144.9** lb/ft³

YIELD TOTAL BATCH MASS / lb/ft³ x 27 = 36126 / 3912.30 = **9.23** yd³

CEMENT CONTENT CEMENT, FLYASH & SILICA / YIELD = 7188 / 9.23 = **779** lb/yd³

WATER CEMENT RATIO

A. AGGREGATE FREE WATER (FREE MOISTURE FACTOR = % FREE MOISTURE DIVIDED BY 100. EG. : 5.5% = 0.055)

BATCH MASS - (BATCH MASS / (1+ FREE MOISTURE FACTOR)) =AGG. FREE WATER

W/C RATIO= TOTAL FREE WATER (A+B+C) / TOTAL CEMENT & FLYASH

3/4" Round	#1	17600	- (	17600	/ 1+	0.0030	) =	53 lb
	#2		- (		/ 1+		) =	lb
	#3		- (		/ 1+		) =	lb
FINE AGG (SAND)	#4	10080	- (	10080	/ 1+	0.0790	) =	738 lb

A. AGGREGATE FREE WATER TOTAL = 791 lb

B. WATER ADDED AT PLANT&JOBSITE = 1186 lb

C. ADMIXTURES ADDED = 72 lb

2049 lb / 7188 lb = **0.29** **= W/C RATIO**

☐ QUALITY CONTROL ☐ VERIFICATION

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

SAMPLE DATA SHEET FOR CONCRETE CYLINDERS

* CON NO. & EA	* DATA SHEET NUMBER	LABORATORY REPORT NUMBER
	F - -	

PROJECT NAME (SECTION)	CONTRACT NUMBER

C0NTRACTOR	PROJECT MANAGER	BID ITEM NUMBER
CONCRETE SUPPLIER	* SUBMITTED BY	QUANTITY REPRESENTED yd³

CONCRETE FOR USE IN (LOCATION OR PLACEMENT)	BRIDGE NUMBER	* SPECIFIED STRENGTH PSI DAYS

REPRESENTED BY NO. OF CYLS.	SET NUMBER	* DATE CAST	DATE SHIPPED	CYLINDER SIZE	INVOICE NUMBER

* TEST SPECIMENS AT DAYS INDICATED								YIELD
A.	B.	C.	D.	E.	F.	G.	H.	yd³

* MIX DESIGN	* ODOT LAB / MIX DESIGN NUMBER	* CONCRETE SUPPLIER MIX DESIGN NUMBER	* DESIGN CEMENTITIOUS MATERIAL CONTENT	* FREE (SURFACE) MOISTURE			
				* COARSE #1	* COARSE #2	* COARSE #3	* SAND
			lb/yd³	%	%	%	%

* AMBIENT TEMP.	* CONCRETE TEMP	* SLUMP	* AIR CONTENT	* UNIT WEIGHT	* CEMENTITIOUS MAT. CONTENT	* FIELD W/C RATIO
°F	°F	in	%	lb/yd³	lb/yd³	BY WT.

* ADDITIVES	* CEMENT	* FLYASH	* SLAG	* SILICA	* WATER BATCHED	* NET WEIGHT	* POT CALIBRATION
oz	lb	lb	lb	lb	lb		

* AGGREGATE #1	* AGGREGATE #2	* AGGREGATE #3	* FINE AGG (SAND)	* WATER AT JOB	* CURING	* CAPPING
lb	lb	lb	lb	lb		

* PROJECT CONTACT PERSON	* CONTACT PHONE NUMBER	* TIME CYL CAST	* LOW TEMP.	* HIGH TEMP.
			°F	°F

FIELD REMARKS

☐ QUALITY CONTROL ☐ VERIFICATION ☐ INFO *** PHONE No.**

R 100 CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

LAB USE ONLY BELOW

CYLINDER ID	DATE OF BREAK	AGE DAYS	MAXIMUM LOAD	CYLINDER AREA	STRENGTH PSI	COMPOUND TYPE / PAD DUROMETER	BREAK TYPE	REMARKS
A								
B								
C								
D								
E								
F								
G								
H								

AVE ______ DAY ☐ ☐ PASS ☐ FAIL

COMMENTS (WHEN MATERIAL ,CYLINDERS OR DATA RECEIVED)

☐ QUALITY CONTROL ☐ VERIFICATION CYLINDERS REC'D DATA SHEET RECD

T 22 CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

Note: * Required information. If this information is missing, testing will be delayed.

SAMPLE DATA SHEET FOR CONCRETE CYLINDERS

* CON NO. & EA	CON01234
* DATA SHEET NUMBER	F - 43048 - 001
LABORATORY REPORT NUMBER	
PROJECT NAME (SECTION)	Forms Example
CONTRACT NUMBER	12345
C0NTRACTOR	ODOT Forms
PROJECT MANAGER	Sean Parker
BID ITEM NUMBER	123
CONCRETE SUPPLIER	The Best Ready Mix
* SUBMITTED BY	Scott Aker
QUANTITY REPRESENTED	150 yd³
CONCRETE FOR USE IN (LOCATION OR PLACEMENT)	Deck
BRIDGE NUMBER	1234a
* SPECIFIED STRENGTH	5000 PSI 28 DAYS
REPRESENTED BY NO. OF CYLS.	5
SET NUMBER	1
* DATE CAST	5/5/23
DATE SHIPPED	5/6/23
CYLINDER SIZE	4" X 8"
INVOICE NUMBER	123456

*** TEST SPECIMENS AT DAYS INDICATED**

A.	B.	C.	D.	E.	F.	G.	H.	YIELD
7	14	28	28	28				9.23 yd³

* MIX DESIGN	* ODOT LAB / MIX DESIGN NUMBER	* CONCRETE SUPPLIER MIX DESIGN NUMBER	* DESIGN CEMENTITIOUS MATERIAL CONTENT	* FREE (SURFACE) MOISTURE: * COARSE #1	* COARSE #2	* COARSE #3	* SAND
	08-0001	BRMHPC5000FM	780 lb/yd³	0.30 %	%	%	7.90 %

* AMBIENT TEMP.	* CONCRETE TEMP	* SLUMP	* AIR CONTENT	* UNIT WEIGHT	* CEMENTITIOUS MAT. CONTENT	* FIELD W/C RATIO
41 °F	61 °F	6 1/2" in	4.9 %	144.9 lb/yd³	779 lb/yd³	0.29 BY WT.

* ADDITIVES	* CEMENT	* FLYASH	* SLAG	* SILICA	* WATER BATCHED	* NET WEIGHT	* POT CALIBRATION
1156 oz	4735 lb	2165 lb	lb	288 lb	1186 lb	36.22	0.2499

* AGGREGATE #1	* AGGREGATE #2	* AGGREGATE #3	* FINE AGG (SAND)	* WATER AT JOB	* CURING	* CAPPING
17600 lb	0 lb	0 lb	10080 lb	0 lb	Tank	Pad

* PROJECT CONTACT PERSON	* CONTACT PHONE NUMBER	* TIME CYL CAST	* LOW TEMP.	* HIGH TEMP.
John Consultant	123-123-1234	7:30 AM	65 °F	75 °F

FIELD REMARKS

[X] QUALITY CONTROL [ ] VERIFICATION [ ] INFO *** PHONE No.** 123-123-1234

R 100 CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT		5/5/23

LAB USE ONLY BELOW

CYLINDER ID	DATE OF BREAK	AGE DAYS	MAXIMUM LOAD	CYLINDER AREA	STRENGTH PSI	COMPOUND TYPE / PAD DUROMETER	BREAK TYPE	REMARKS
A	05/12/23	7	52500	12.56	4180	60	Shear	
B	05/19/23	14	59500	12.56	4740	60	Shear	
C	06/02/23	28	69540	12.56	5540	60	Cone	
D	11/07/12	28	70330	12.56	5600	60	Shear	
E	11/07/12	28	71850	12.56	5720	60	Shear	
F								
G								
H								

AVE 28 DAY 5620 [X] PASS [ ] FAIL

COMMENTS (WHEN MATERIAL ,CYLINDERS OR DATA RECEIVED)

[X] QUALITY CONTROL [ ] VERIFICATION CYLINDERS REC'D 5/6/2023 DATA SHEET RECD 5/6/2023

T 22 CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT		6/3/2023

Note: *** Required information. If this information is missing, testing will be delayed.**

734-4000_C (03-2023)

INSERT TAB

SECTION 4(C)
Laboratory Samples

SAMPLES FOR SUBMITTAL TO MATERIALS LABORATORY

General

When sampling materials for transmittal to a laboratory, place the samples in proper, secure containers with adequate labeling and submit with the appropriate paperwork.

Please use the following guidelines for samples that are submitted to the ODOT Central Materials Laboratory.

Although these guidelines are established for the ODOT Materials Laboratory, they are probably also appropriate for samples submitted to other laboratories.

Documentation

Submit a properly completed Sample Data Sheet (Form 734-4000) with all samples that are delivered to the ODOT Materials Laboratory. There are three different types of Sample Data Sheets: 734-4000 (Aggregates & Oil), 734-4000C (Concrete) and 734-4000NFTM (Non Field Tested Materials). The appropriate Sample Data Sheet must be used for the appropriate sample. Each sample should have its own Sample Data Sheet. **Do not** submit two types of samples (i.e. .¾"- ¼" and ¼"-0") on one Sample Data Sheet. The Sample Data Sheet must be completed properly. Below is a list of information that must be included on the form for different types of samples. **If this information is missing the sample will not be accepted.**

Required on all Sample Data Sheets:

- Valid Expenditure Account (EA) or Con Number
- Class of Sample (i.e. "Source/Product Compliance")
- Submitted by name and contact number
- Appropriate Project contact person and number (not the Project Manager)

Sample Data Sheet - (Form 734-4000)

- o Used for submitting aggregate, asphalt/emulsion, and ACP samples

Aggregate Samples:

- Aggregate size (i.e. ¾"- ¼")
- Source Number
- Use of material (i.e. "Base Rock")

Asphalt/Emulsion Liquid Oil Samples:

- Grade of material (i.e. "PG 64-22")
- Name of the oil manufacturer (i.e. "McCall")
- Lot and Sublot number (i.e. "1-1" or "1-5")

ACP Samples:

- Material
- Use of Material (i.e., "Level 3 ACP")
- Mix Design Number (include in "Remarks/Special Requirements" section)
- Contract Number
- Date of sampling
- Bid Item, Lot and Sublot
- Location where sample was obtained.

Sample Data Sheet for Concrete Cylinders - (Form 734-4000C)

- Used for submitting concrete cylinder samples

- Specified strength (i.e., "3300 psi")
- Number of days to break the concrete cylinders (i.e., "7 days" or "28 days")
- Date the concrete cylinders were cast (i.e., "September 30, 2015")
- Field test results, including curing and capping methods

Sample Data Sheet (Non Field-Tested Materials) – (Form 734-4000NFTM)

- Used for submitting non-field tested materials (Rebar, wire, etc.)

- Certificate of Origin of Steel Materials (CMO) (for steel items only)
- Test Result certificate (for steel items only)
- Quality Compliance certificate (for steel items only)

Sample Containers

Securely attach an identification label to each sample or container which shows:

-Contract Number
-Sample Data Sheet (Form 734-4000) Number
-Source of Material

It is also helpful to place a second identifying label inside of the container (bag or bucket) of aggregates or similar material, in the event that the outside label is lost. Do not place the Sample Data Sheet in the bag.

Aggregate Sample Containers

-Use canvas or other tear-proof bags. Fabric mesh must contain the fine materials in the sample.

-5 gallon plastic buckets are also acceptable containers. Be sure that the lids are securely attached.

-The maximum weight of each sample container is 50 lb. Use additional containers if a larger quantity is being submitted. Properly label each container.

-Secure or tie bags with cord or strong string. **Do not use wire**.

Asphalt Cement Containers

- Use 1 qt. wide-mouth plastic containers with tight lids for emulsified asphalt cements. Tape the lid onto the container to prevent leakage.

- Use 1 qt. metal containers with tight lids for other asphalt cements.

Note: Ensure containers are labeled with the following information: Contract #, CON #, Date sample was obtained, Grade of Oil & Supplier and Lot and Sublot the sample represents.

Other Sample Containers

For other samples, use containers that will adequately contain the enclosed sample and will protect the sample from weather or other elements if needed.

REQUIRED SAMPLE SIZES

MATERIALS AND CONSTITUENTS	MIX DESIGN	QUALITY CONTROL OR PRODUCT COMPLIANCE
SOIL		
TOPSOIL		20 lbs. - 1 bag
BASE AGGREGATE		
AGGREGATE		100 lbs. - 2 bags
SUB-BASE AGGREGATE		100 lbs. - 2 bags
CEMENT TREATED BASE		
AGGREGATE	250 lbs. - 5 bags	
ROCK GABIONS & RIPRAP		
AGGREGATE		150 lbs. - 3 bags ***[Maximum size of individual pieces 9"].***
MSE WALL BACKFILL MATERIAL (ALL TYPES)		150 lbs. - 3 bags

NOTE: Submit a completed Sample Data Sheet (Form 734-4000) with each sample. **Include all the required information or the sample will not be accepted.** (Properly label each container).

See Section 4(A) for samples to be submitted for source/product compliance testing.

REQUIRED SAMPLE SIZES

MATERIALS AND CONSTITUENTS	VERIFICATION OF CONTRACTOR MIX DESIGN	QUALITY CONTROL OR PRODUCT COMPLIANCE
ASPHALT CONCRETE PAVEMENT	**If JMF verification is requested by ODOT, submit samples to the ODOT Materials Laboratory in Salem according to the guidelines set forth in the current "Contractor Mix Design Guidelines for Asphalt Concrete". Use the guideline version that coincides with the date the contract was advertised.** **This document can be found on the ODOT website.**	
ASPHALT CEMENT		2 - 1 qt. metal containers
ACP (OPEN GRADED) or POROUS ASPHALT CONCRETE (PAC)		
ASPHALT CEMENT		2 - 1 qt. metal containers
EAC PAVEMENT		
EMULSIFIED ASPHALT CEMENT		2 - 1 qt. wide mouth plastic containers
CONCRETE CURING COMPOUND		2 - 1 qt. wide mouth plastic containers

NOTE: Submit a completed Sample Data Sheet (Form 734-4000) with each sample. **Include all the required information or the sample will not be accepted.** (Properly label each container).

See Section 4(A) for samples to be submitted for source/product compliance testing

INSERT TAB

SECTION 4(D)
Field Tested Materials Guide

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD: ODOT	TEST METHOD: WAQTC	TEST METHOD: AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)): Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00330 - EARTHWORK									
Establishing Maximum Density (for Compaction)	*Density Curve*			*T 99*	*3468*	*1/Soil type*		*1/Project*	
	Specific Gravity of Coarse Aggregates			*T 85*	*3468*				
	Family of Curves			*R 75*	*3468FC*				
Compaction	*Deflection Testing*	*TM 158*			*1793S*	*1 test per 3 ft. in depth*		*1 test per 10 QC Tests per Table 00330-1*	
	Nuclear Density Soils/Aggregates			*T 310*	*1793S*	*See Table 00330-1 Below*			
	Coarse Particle Correction			*T 99*					
	Deflection Testing	*TM 158*			*1793S*				

TABLE 00330-1 Frequency of Quality Control Testing (English)

Individual Areas	Under 3500 yd² or yd³	Over 3500 yd² or yd³
Existing Ground Surface	1 test per 1000 yd²	1 test per 3000 yd²
Embankments	1 test per 500 yd³	1 test per 3000 yd³
Excavations and Finished Subgrade	1 test per 1000 yd²	1 test per 3000 yd²

MATERIAL AND OPERATION	DESCRIPTION OF TEST	ODOT	WAQTC	AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
Stone Embankment Material (See Sec. 330.16(a))	*Gradation*						*Visual See Section 00330.16(b)*		
Compaction	*Deflection Testing*	*TM 158*			*1793S*	*1 per Layer*			

Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.

MATERIAL AND OPERATION	DESCRIPTION OF TEST	ODOT	WAQTC	AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
Topsoil (See Section 01040.14)	*Particle Size Analysis*			*T 88*	*4000*	*See Section 4C 1/Source & 1/Type of Soil*	*Submit to Lab*		
	Organic Content								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)) Contractor Quality Control	Independent Assurance/Verification Project Manager	Independent Assurance/Verification Region Quality Assurance	Independent Assurance/Verification Materials Laboratory
SECTION 00331 - SUBGRADE STABILIZATION									
Aggregate backfill	*Material must meet the requirements of Section 00331.10*						*Visual*		
Water	*Material must meet the requirements of Section 00340*								
Compaction	*Material must meet the requirements of Section 00331*						*Visual*		
SECTION 00332 - SURFACING STABILIZATION									
Aggregate Base	*Material must meet the requirements of Section 00332.10*						*Visual*		
Compaction	*Material must meet the requirements of Section 00332*						*Visual*		
SECTION 00333 - AGGREGATE DITCH LINING									
Aggregate	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*1/Project or 1/Source*			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00344 -TREATED SUBGRADE						Same Frequency for all Tests (Minimums)			
Granular Quicklime	*Sieve Analysis* *Calcium Hydroxide Content in lime*			*T 27* *T 219*	*4000*	*1/Project or 1/Source*	*Submit to Lab*		*1/Project or 1/Source*
Hydrated Lime Calcium Chloride Sodium Chloride	*Materials must meet the requirements of Section 00344.10 and Test Results Certificate provided according to Section 00165.35(a)*								
Portland Cement	*Material must meet the requirements of Section 02010*								
Water	*Material must meet the requirements of Section 00340*								
Establishing Maximum Density	*Density Curve*			*T 99*	*3468*	*See Table 00344-1 Below for Testing Frequency*		*1/Project and 1 Test per 10 QC tests per Table 00344-1*	
Compaction	*Deflection Testing*	*TM 158*			*1793S*				
	Deflection Testing *Nuclear Density* *Soils/Aggregates*	*TM 158*		*T 310*	*1793S*				
	Coarse Particle Correction			*T 99*					

TABLE 00344-1 Frequency of Quality Control Testing

Individual Areas	Under 3500 yd²	Over 3500 yd²
Finished Subgrade	1 test per 1000 yd²	1 test per 3000 yd²

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD: ODOT	TEST METHOD: WAQTC	TEST METHOD: AASHTO	FORM 734-	QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
						Same Frequency for all Tests (Minimums)			
SECTION 00360 - Drainage Blankets									
						A sublot equals 1000 Tons			
Granular Drainage Blanket	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*1/sublot minimum* *1/Source per Project*			
Sand Drainage Blanket	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*				
Establishing Maximum Density	*Density Curve*			*T 99*	*3468*	*1/Source and Type*		*1/Project*	
	Specific Gravity of Coarse Aggregates			*T 85*	*3468*				
Compaction	*Deflection Testing*	*TM 158*			*1793S*	*1 test per 3 ft. in depth*			
	Deflection Testing *Nuclear Density Soils/Aggregates* *Coarse Particle Correction*	*TM 158*		*T 310* *T 99*	*1793S* *1793S*	*See Table 00360-1 Below*		*1 Test per 10 QC Tests per Table 00360-1*	

TABLE 00360-1 Frequency of Quality Control Testing

Individual Areas	Under 3500 yd^2	Over 3500 yd^2
Existing Ground Surface	1 test per 1000 yd^2	1 test per 3000 yd^2
Finished Surfaces	1 test per 1000 yd^2	1 test per 3000 yd^2

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums)			
						QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00390 - RIPRAP PROTECTION									
Fill Material & Riprap									
Gradation *See 00390.11(c-1)*							*Visual*		
[1] *Apparent Specific Gravity and Absorption*	*Degradation* *Soundness* *Specific Gravity of Coarse Aggregates*	*TM 208*		*T 104* [1] *T 85*	*4000* *1825*	*See Section 4(A)*	*Submit To Lab*		*See Section 4(A)*
Filter Blanket									
Gradation *See 00390.13*							*Visual*		
Grouted Riprap									
Sand	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*1/Project*			
	Soundness *Lightweight Pieces*			*T 104* *T 113*	*4000*	*See Section 4(A)*	*Submit to Lab*		*See Section 4(A)*
Portland Cement	*Material must meet the requirements of Section 02010*								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						QUALITY ASSURANCE – Same Frequency for all Tests (Minimums)	Independent Assurance/Verification		
SECTION 00396 - SHOTCRETE SLOPE STABILIZATION									
Aggregate Production and Mixture						*A Sublot equals 1000 Tons*			
[1] *QAE may waive after 5 sublots/shifts*	*Sampling Aggregates*			*R 90*					
	Reducing Aggregates			*R 76*					
[2] *Coarse Aggregate (See Section 02690.20)*	[2][3] *Sieve Analysis*			*T 27/T 11*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
	[3] *Fineness Modulus*			*T 27/T 11*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
	[1][2] *Wood Particles*	*TM 225*			*1792*	*1/Sublot*		*1 per 10 Sublots*	
	[3] *Sand Equivalent*			*T 176*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
[3] *Fine Aggregate (See Section 02690.30)*	*Soundness*			*T 104*	*4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4(A)*
	Abrasion			*T 96*	*4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4(A)*
	Degradation	*TM 208*			*4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4(A)*
	Lightweight Pieces			*T 113*	*4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4(A)*
	Organics			*T 21*	*4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4(A)*
	[2] *Dry Rodded Unit Weight*			*T 19*	*1825 1825C*	*Start of Production and when changes in aggregate occurs*			
	[2] *Specific Gravity of Coarse Aggregate*			*T 85*	*1825*	*Start of Production and when changes in aggregate occurs*			
	[3] *Specific Gravity of Fine Aggregate*			*T 84*	*1825*	*Start of Production and when changes in aggregate occurs*			
Portland Cement	*Material must meet the requirements of Section 02010*					*Start of Production and when changes in aggregate occurs*			
Admixtures	*Material must meet the requirements of Section 02040*								
Mixing Water	*Material must meet the requirements of Section 02020*								
Production Testing (See Section 00396.16) [S] 3 Cores minimum per Panel	[S] *Test Panel*					*Two Test Panels per Mix Design & Two Panels per days Production See Section 00396.16(a)2*			
Compression Test Cores	*Strength*			*T 22*	*4000C*	*1/Set Cores per Test panel*	*Submit to Central Lab*		

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
						Same Frequency for all Tests (Minimums)			
SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL									
TRENCH FOUNDATION (Excavation Below Grade Only) (See Section 405.44)									
Selected general backfill	*Material must meet the requirements of Section 00330.13*						*Visual*		
Selected granular backfill	*Material must meet the requirements of Section 00330.14*						*Visual*		
Selected stone backfill	*Material must meet the requirements of Section 00330.15*						*Visual*		
Other approved material	*Material must meet the requirements of Section 00405.11*						*Visual*		
Establishing Maximum Density	*Density Curve*			*T 99*	*3468*	*1/Soil Type or Aggregate Gradation*			
	Specific Gravity of Coarse Aggregates			*T 85*	*3468*				
	Family of Curves			*R 75*	*3468FC*				
Compaction	*Nuclear Density Soils/Aggregates*			*T 310*	*1793S*	*1 Test per 300 ft. of Trench*			
	Coarse Particle Correction			*T 99*					

Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	QUALITY ASSURANCE Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL (CONTINUED)									
Bedding 3/8" - 0 PCC fine aggregate (See Section 02690.30(h))	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*1/Source or Aggregate Gradation*			
Commercial 3/4" - 0 Aggregate							*Visual*		
No. 10 - 0 Sand drainage blanket material (See Section 00360.10)	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*1/Source or Aggregate Gradation*			
Reasonably well graded sand, maximum 3/8" to dust							*Visual*		
Commercial available 3/8"-0 or No.10 - 0 sand							*Visual*		
Continuous cradle of Commercial Grade Concrete	*Material must meet the requirements of Section 00440*						*Visual*		

Same Frequency for all Tests (Minimums)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL (CONTINUED)						Same Frequency for all Tests (Minimums)			
Pipe Zone Material Flexible Pipe	*Use the Listed Material requirements under Bedding*								
Rigid Pipe: Aggregate Base 1" - 0 or 3/4" - 0 Aggregate (See Section 02630.10)	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27*	 *1792*	*1/Source or Gradation*			
Rigid Pipe: Commercial 1"- 0 or 3/4" - 0 Aggregate							*Visual*		
Establishing Maximum Density (Flexible and Rigid Pipe) (1) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Density Curve* *Specific Gravity of Coarse Aggregates* *Coarse Particle Correction*			(1) *T 99* *T 85* (1) *T 99*	*3468* *3468*	*1/Source or Aggregate Gradation*			
Compaction	*Nuclear Density Soils/Aggregates*			*T 310*	*1793B*	*1 Test per 300 ft. of Trench and every 1.5 ft. of Fill*			
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.								

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL (CONTINUED)									
Trench Backfill									
Class A Backfill - Native or common Material	*Material must meet the requirements of Section 00330.43*								
Class B Backfill - 1"-0 or 3/4"-0 Granular Material	*Material must meet the requirements of Section 00641*								
Class C Backfill - Clean sand with 100% minus 1/4" material							*Visual*		
Class D Backfill - Pit run or bar run material with 3" maximum dimension and well graded from coarse to fine							*Visual*		
Class E Backfill - Controlled Low Strength Material (CLSM)	*Material must meet the requirements of Section 00442*								
Establishing Maximum Density (1) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Density Curve* *Specific Gravity of Coarse Aggregates* *Family of Curves*			*(1) T 99* *T 85* *R 75*	*3468* *3468* *3468FC*	*1/Soil Type or Aggregate Gradation*			
Compaction (C) Density testing is based on cumulative lineal feet of pipe placement.	*Nuclear Density Soils/Aggregates* *Coarse Particle Correction*			*T 310* *T 99*	*1793S* *or* *1793B*	*(C) 1 test per 300 ft. of Trench and every 1.5 ft. of Fill*			
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)			
MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
		ODOT	WAQTC	AASHTO		Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00430 - SUBSURFACE DRAINS									
Granular Drain Backfill Material						A Sublot equals 1000 Tons			
	Sampling Aggregates *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27*	*1792*	1/Sublot (Minimum 1/ Project)			
	Abrasion *Degradation*	*TM 208*		*T 96*	*4000*	See Section 4A	Submit To Lab		See Section 4A
Special Filter Material See Section 00430.46(a)	*Compaction*	See section 405 for compaction requirements							
SECTION 00440 - COMMERCIAL GRADE CONCRETE									
Mixture					*A Sublot Equals 20 yd*^{3}				
	Sampling Concrete *Air Content of Concrete* *Density (Unit Weight) of Concrete* *Yield* *Slump of Concrete* *Concrete Temperature*		*TM 2*	*T 152* *T 121* *T121* *T 119* *T 309*	*3573WS or 4000 C*	*1 per Sublot, maximum of 1 per day*			
	Fabrication of Concrete Cylinders/Beams *Compressive Strength of Concrete* (S)			*R 100* *T 22*	*4000C*				
(S) *ASTV based on a minimum of 3 Cylinders*									
Cement Chemical Admixtures Supplementary Cementitious Materials	Materials listed on batch ticket must match approved design								

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00445 - SANITARY, STORM, CULVERT, SIPHON, AND IRRIGATION PIPE - INCLUDED WITH SECTION 00405									
Trench Work									
Excavation, bedding, pipe zone and trench backfill	See Section 00405 for pipes less than 72"								
Excavation, bedding, pipe zone and trench backfill	See Section 00510 for pipes greater than 72"								
Concrete Blocks	Material must meet the requirements of Section 00440								
SECTION 00450 - STRUCTURAL PLATE SHAPED STRUCTURES									
Commercial Grade Concrete in appurtenances	*Material must meet the requirements of Section 00440*								
Trench Work									
Excavation and Backfill	*Operations must meet the requirements of Section 00510*								
Trenches in Unstable Areas									
Granular Structural Backfill	*Material must meet the requirements of Section 00510*								
Establishing Maximum Density [1] Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Density Curve* *Specific Gravity of Coarse Aggregates* *Coarse Particle Correction*	*TM 223*		[1] *T 99* *T 85*	*3468 B*	*1/Aggregate Gradation and Source*			
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793 B*	*1 Test per 100 ft. and 1 ft. of fill*			
Structure Backfill (Section 00450.46)	*Material and Operation must meet the requirements of Section 00510.48(d)*								

Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE: Contractor Quality Control; Independent Assurance/Verification: Project Manager, Region Quality Assurance, Materials Laboratory

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
						Contractor Quality Control	Independent Assurance/Verification		
		ODOT	WAQTC	AASHTO			Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00459 - CAST IN PLACE CONCRETE									
Concrete	*Material must meet the requirements of Section 00540, with acceptance in accordance with Section 00540.17*								
Backfill Material	*Material must meet the requirements of Section 00405.14 and be incorporated into the project in accordance with Section 00405.46*								
SECTION 00460 - PAVED CULVERT END SLOPES									
Commercial Grade Concrete	*Material must meet the requirements of Section 00440*								
SECTION 00470 - MANHOLES, CATCH BASINS AND INLETS									
Commercial Grade Concrete	*Material must meet the requirements of Section 00440*								
Base Drain Backfill	*Material must meet the requirements of Section 00470.17*								
Excavation, Backfill and Foundation Stabilization	*Material must meet the requirements of Section 00405*								
SECTION 00480 - DRAINAGE CURBS									
Commercial Grade Concrete	*Material must meet the requirements of Section 00440*								
Dense Graded ACP Mixture	*Material must meet the requirements of Section 00740*								

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00490 - WORK ON EXISTING SEWERS AND STRUCTURES									
Commercial Grade Concrete	*Material must meet the requirements of Section 00440*								
High Early Strength Concrete	*Material must meet the requirements of Section 00440, but cement contents adjusted according to 00490.11*								
Backfill Operations	*Backfill Excavations according to section 405*								
Filling Abandoned Pipes, Manholes and Catch Basins (See section 00490.44)									
Backfill Operations (Roadway)	*Material must meet the requirements of Section 2630*								
Establishing Maximum Density (1) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Density Curve* *Specific Gravity of Coarse Aggregates Coarse Particle Correction*	*TM 223*		*(1) T 99* *T 85*	*3468 B*	*1/Aggregate Gradation and Source*			
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793B*	*1 Test per 100 ft. and every 1.5' of Fill*			
Backfill Operations Landscaped or Unimproved Roadways	*Material must meet the requirements of Section 00330.13*								
Top 1.0' of Backfill Region	*Material must meet the requirements of Section 00330.11*								
SECTION 00495 - TRENCH RESURFACING									
Resurfacing Materials	*See Section 00495.40 for Material Requirements*								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November2023)						Same Frequency for all Tests (Minimums)			
MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
		ODOT	WAQTC	AASHTO		Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00510 - STRUCTURE EXCAVATION AND BACKFILL									
Soils, Soil/Aggregate Mixtures and Graded Aggregates						A Sublot equals 1,000 Tons			
Granular Structure Backfill (See Section 02630.10) (1) *Perform a minimum of 3 tests QL's required*	*Sampling Aggregates* *Reducing Aggregates* (1) *Sieve Analysis* *Fracture (Method 1)* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 335* *T 176*	*1792*	*1/Sublot (Minimum 1/Project)*			
Product Compliance	*Abrasion* *Degradation* *Plasticity Index* *Sieve Analysis*	*TM 208*		*T 96* *T 90* *T 11*	*4000*	*See Section 4C 1/Source*	*Submit to Lab*		*Minimum 1/Project or 1/Source*
Establishing Maximum Density (2) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Density Curve* *Specific Gravity of Coarse Aggregates* *Coarse Particle Correction*			(2) *T 99* *T 85* *T 99*	*3468* *3468*	*1/Soil type or Aggregate Gradation*			
Compaction	*Nuclear Density Soils/Aggregates*			*T 310*	*1793B*	*1/100 yd^3 minimum 1/project*			
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November2023)						Same Frequency for all Tests (Minimums)			
MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
		ODOT	WAQTC	AASHTO		Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00510 - STRUCTURE EXCAVATION AND BACKFILL (CONTINUED)									
Soils, Soil/Aggregate Mixtures and Graded Aggregates						A Sublot equals 1,000 Tons			
Granular Wall Backfill (See Section 02630.11) (1) *Perform a minimum of 3 tests QL's required*	*Sampling Aggregates* *Reducing Aggregates* (1) *Sieve Analysis* *Fracture (Method 2)*			*R 90* *R 76* *T 27* *T 335*	*1792*	*1/Sublot (Minimum 1/Project)*			
Product Compliance	*Abrasion Degradation*	*TM 208*		*T 96*	*4000*	*See Section 4C 1/Source*	*Submit to Lab*		*Minimum 1/Project or 1/Source*
(2) Compaction **Note: Compaction must meet the requirements of section 00330.43c**	(2) *Deflection Testing*	*TM 158*			*1793B*	*1/Sublot (Minimum 1/Project)*			
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November2023)						Same Frequency for all Tests (Minimums)			
MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
		ODOT	WAQTC	AASHTO		Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00512 - DRILLED SHAFTS									
Aggregate Production						A Sublot equals 1,000 Tons			
	Sampling Aggregates			*R 90*					
(1) QAE may waive after 5 sublots/shifts	*Reducing Aggregates*			*R 76*					
	(2)(3)(4) Sieve Analysis			*T 27/T 11*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
	(4) Fineness Modulus			*T 27/T 11*					
(2) Perform a minimum of 3 tests, QL's required	*(1)(3) Wood Particles*	*TM 225*							
	(4) Sand Equivalent			*T 176*	*1792*				
(3) Coarse Aggregate (See Section 02690.20)	*Soundness*			*T 104*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4(A)*
	Abrasion			*T 96*					
	Degradation	*TM 208*							
	Lightweight Pieces			*T 113*					
(4) Fine Aggregate (See Section 02690.30)	*Organics*			*T 21*	*4000*				
	(3) Dry Rodded Unit Weight			*T 19*	*1825 1825C*	*Start of production and when changes in aggregate occurs*			
	(3) Specific Gravity of Coarse Aggregate			*T 85*	*1825*				
	(4) Specific Gravity of Fine Aggregate			*T 84*					

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
						Same Frequency for all Tests (Minimums)			
SECTION 00512 - DRILLED SHAFTS (CONTINUED)									
Portland Cement Concrete					A Sublot equals 100 yd^3				
	Sampling Concrete		*TM 2*						
	Slump of Concrete *Concrete Temperature* *Density (Unit Weight) of Concrete* *Yield* *Water/Cement Ratio*			*T 119* *T 309* *T 121* *T121* *T 121*	*3573WS or 4000C*	*1 per Sublot, minimum 1 per mix design & shaft*		*1 per 5 Sublots, minimum 1 per mix design*	
	Fabrication of Concrete Cylinders/Beams *Compressive Strength of Concrete* (S)			*R 100* *T 22*	*4000C*				
(S) ASTV based on a minimum of 3 Cylinders									
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials	*Materials listed on batch ticket must match approved design*								

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD ASTM	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)): Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00535 - POST-INSTALLED ANCHOR SYSTEMS									
Resin Bonded Anchor System						A Sublot equals 50 Anchors			
Anchor Bolts, reinforcing steel and resin (Polyester, vinyl ester or epoxy)	*Materials must meet the requirements of Section 00535.10(a)*								
Anchor Installation									
Demonstration Testing (See Section 00535.45(a))	*Strength of Anchors in Concrete Elements*		*E 488*		*5189*	*One demonstration Test includes 3 anchors (Resin shall be from same lot)*	*Visual*		
Production Testing (See Section 00535.45(b))	*Strength of Anchors in Concrete Elements*		*E 488*		*5189*	[(A)] *1 Anchor/Sublot or portion thereof (Minimum 1/Shift)*	*Visual per Sublot*		

[(A)] ***Anchor testing is required per critical element identified in the Special Provisions or Plan Drawings.***

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)			
						QUALITY ASSURANCE			
		TEST METHOD					Independent Assurance/Verification		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	ODOT	ASTM	AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00535 - POST-INSTALLED ANCHOR SYSTEMS (continued)									
Mechanical Anchor System									
						A Sublot equals 50 Anchors			
Mechanical Anchors	*Materials must meet the requirements of Section 00535.10(b)*								
Anchor Installation									
Demonstration Testing (See Section 00535.45(a))	*Strength of Anchors in Concrete Elements*		*E 488*		*5292*	*One demonstration Test includes 3 anchors*	*Visual*		
Production Testing (See Section 00535.45(b))	*Strength of Anchors in Concrete Elements*		*E 488*		*5292*	[A] *1 Anchor/Sublot or portion thereof (Minimum 1/Shift)*	*Visual per Sublot*		
	[A] ***Anchor testing is required per critical element identified in the Special Provisions or Plan Drawings.***								

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD: ODOT	TEST METHOD: WAQTC	TEST METHOD: AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)): Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00540 - STRUCTURAL CONCRETE									
Aggregate Production						A Sublot equals 1,000 Tons			
(1) QAE may waive after 5 sublots/shifts	Sampling Aggregates			R 90		1/Sublot		1 per 10 Sublots	
	Reducing Aggregates			R 76					
	(2)(3)(4) Sieve Analysis			T 27/T 11	1792				
(2) Perform a minimum of 3 tests, QL's required	(4) Fineness Modulus			T 27/T 11					
	(1)(3) Wood Particles	TM 225							
	(4) Sand Equivalent			T 176	1792				
(3) Coarse Aggregate (See Section 02690.20)	Soundness			T 104	4000	See Section 4A	Submit To Lab		See Section 4A
	Abrasion			T 96					
(4) Fine Aggregate (See Section 02690.30)	Degradation	TM 208							
	Lightweight Pieces			T 113					
	Organics			T 21	4000				
	(3) Dry Rodded Unit Weight			T 19	1825 1825C	Start of production and when changes in aggregate occurs			
	(3) Specific Gravity of Coarse Aggregate			T 85	1825				
	(4) Specific Gravity of Fine Aggregate			T 84					

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD: ODOT	TEST METHOD: WAQTC	TEST METHOD: AASHTO	FORM 734-	Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE			
SECTION 00540 - STRUCTURAL CONCRETE (CONTINUED)									
Portland Cement Concrete					A Sublot equals 100 yd³				
(1) AASHTO T 196 required for lightweight concrete	*Sampling Concrete*		*TM 2*			*1 per Sublot per Mix Design, minimum 1 per day*		*1 per 5 Sublots, minimum 1 per mix design*	
	(1) Air Content of Concrete			*T 152*	*3573WS or 4000C*				
	Slump of Concrete			*T 119*					
	Concrete Temperature			*T 309*					
	Density (Unit Weight) of Concrete			*T 121*					
	Yield			*T 121*					
	Water/Cement Ratio			*T 121*					
	Fabrication of Concrete Cylinders/Beams			*R 100*	*4000C*				
	Compressive Strength of Concrete (S)			*T 22*					
(S) ASTV based on a minimum of 3 Cylinders									
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials Synthetic Fiber Reinforcing	*Materials listed on batch ticket must match approved design*								

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) – QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00556 - MULTI-LAYER POLYMER CONCRETE OVERLAY									
Aggregate Production									
	Moisture Content of Aggregate & Soil			*T 255/265*	*1792*	*At time of mixing the polymer resin. See 00556.10-b*			
Polymer Resin	*Material must meet the requirements of section 00556.10*								

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00557 - PREMIXED POLYMER CONCRETE OVERLAYS									
Resin Primer	*Material must meet the requirements of section 00557.10*								
Polyester Resin Binder Including (Initiator, Accelerators & Inhibitors)	*Material must meet the requirements of section 00557.12 (a-c)*								
Aggregate Production *Product Compliance* (Submitt 2- 50 lb. samples of blended aggregate (00557.02)during the trial overlay)	*Specific Gravity of Coarse Aggregate*			*T 85*	*4000*	*1/Project and Source*	*Submit to Lab*		*See Section 00557.12(d)*
	Specific Gravity of Fine Aggregate			*T 84*					
	Sieve Analysis			*T 27/11*					
	Moisture Content of Aggregate & Soil			*T 255/265*					
	Fracture (Method 1)			*T 335*					
	Moisture Content of Aggregate & Soils			*T 255/265*	*1792*	*During the Trial Overlay Strip*			
	Sieve Analysis			*T 27/11*					
(1) See Section 00557.12(d)	*(1) Moisture Content* of Aggregate & Soils			*T 255/265*		*During Production*			
Surface Texture Sand (see section 00557.12(e))	Sieve Analysis			T 27/11	*1792*	*1/Project and Source*			
Premixed Polymer Concrete									
	Density (Unit Weight) of Concrete			*T 121*	*3573WS*	*(B) 1/Batch*			
	Static Modulus of Elasticity	*TM 759*			*4000C*	*(M) Minimum 1 set/batch*			
(M) 1 set Represents a minimum of 3 (4"x8") cylinders cast per 00557.44(e)						*1 set per 10 batches placed or minimum 1 set/day*	*Submit to Lab*		See section 00557.44(e)
(B) Batch is defined "Per Mixer or Portion placed".									

Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE: Contractor Quality Control; Independent Assurance/Verification: Project Manager, Region Quality Assurance, Materials Laboratory.

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00559 - STRUCTURAL CONCRETE OVERLAYS									
Aggregate Production						A Sublot equals 500 Tons. A minimum one per shift, whichever results in the greatest sampling frequency. (For preproduced aggregates, 1 shift shall mean 500 Tons.)			
[1] QAE may waive after 5 sublots/shifts	Sampling Aggregates			R 90				1 per 10 Sublots	
	Reducing Aggregates			R 76					
	[2][3][4] Sieve Analysis			T 27/T 11	1792	1/Sublot			
[2] Perform a minimum of 3 tests, QL's required	[4] Fineness Modulus			T 27/T 11					
	[4] Sand Equivalent			T 176	1792				
[3] Coarse Aggregate (See Section 02690.20)	[1][3] Wood Particles	TM 225			1792	1/5 Sublots			
[4] Fine Aggregate (See Section 02690.30)	Abrasion			T 96	4000	See Section 4(A)	Submit to Central Lab		See Section 4(A)
	Degradation	TM 208							
	Soundness			T 104					
	Lightweight Pieces			T 113					
	Organics			T 21	4000				
	[3] Dry Rodded Unit Weight			T 19	1825 1825C	Start of production and when changes in aggregate occurs			
	[3] Specific Gravity of Coarse Aggregate			T 85	1825				
	[4] Specific Gravity of Fine Aggregate			T 84					

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)) Contractor Quality Control	Independent Assurance/Verification Project Manager	Independent Assurance/Verification Region Quality Assurance	Independent Assurance/Verification Materials Laboratory
SECTION 00559 - STRUCTURAL CONCRETE OVERLAYS (CONTINUED)									
Portland Cement Concrete					A sublot equals 20 yd^3				
(1) AASHTO T 196 required for lightweight concrete (S) ASTV based on a Minimum of 3 Cylinders	*Sampling Concrete* *(1) Air Content of Concrete* *Slump of Concrete* *Concrete Temperature* *Density (Unit Weight) of Concrete* *Yield* *Water/Cement Ratio*		*TM 2*	*T 152* *T 119* *T 309* *T 121* *T 121* *T 121*	*3573WS or 4000 C*	*1 per Sublot per mix design, minimum 1 per day*		*1 per 5 Sublots, minimum 1 per mix design*	
	Fabrication of Concrete Cylinders/Beams *Compressive Strength of Concrete (S)*			*R 100* *T 22*	*4000C*				
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials Synthetic Fiber Reinforcing	*Materials listed on batch ticket must match approved design*								

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)) Contractor Quality Control	Independent Assurance/Verification Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00590 - POLYMER MEMBRANE									
Broadcast Aggregate									
	Moisture Content of Aggregates & Soils			*T 255/265*	*1792*	*Test at time of packaging and shipment. See Section 00590.10-c*			
	Moisture Content of Aggregates & Soils			*T 255/265*	*1792*	*Field Test at time of Mixing Polymer Resin. See Section 00590.10-c*			

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)): Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00596A - MECHANICALLY STABILIZED EARTH RETAINING WALLS									
Aggregate Production									
Gravel Leveling Pads Backfill *(See Section 02630.10)*	*Abrasion* *Degradation*	*TM 208*		*T96*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
					A Sublot equals 1,000 Tons Minimum 1/Project				
	Sampling Aggregates *Reducing Aggregates* *Sieve Analysis* *Un-washed* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*1/Sublot*			
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*			
					Testing Frequency for Product Compliance per Source 1/5,000 Tons Minimum 1/Project				
[3] *Modular Block Core and Backfill (Product Compliance)* [3] *(See Section 2690.20(a) thru 2690.20(d) & 2690.20(f)*	*Soundness* *Abrasion* *Degradation* *Lightweight Pieces*	*TM 208*		*T 104* *T 96* *T 113*	*4000* *4000*	*See Section 4C & 02690*	*Submit To Lab*		*See Section 4C*
					A Sublot equals 1,000 Tons				
[3] *Modular Block Core and Drainage Backfill* [1] *QAE may waive after 5 sublots/shifts* [2] *Perform a minimum of 3 tests, QL's required*	*Sampling Aggregates* *Reducing Aggregates* [2] *Sieve Analysis* [1] *Wood Particles* *Fracture (Method 2)* *Elongated Pieces*	 *TM 225* *TM 229*		*R 90* *R 76* *T 27/T 11* *T 335*	 *1792* *1792*	*1/Sublot*			
Pipe Drain Backfill (Product Compliance) (See Section 00430.11)	*Abrasion* *Degradation*	*TM 208*		*T 96*	*4000*	*See Section 4C*	*Submit To Lab*		*See Section 4C*
	Sieve Analysis *Un-washed*			*T27*	*4000*	*1/Sublot*			

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00596A - MECHANICALLY STABILIZED EARTH RETAINING WALLS									
Aggregate Production					Testing Frequency for Product Compliance per Source 1/5,000 Tons Minimum 1/Project				
Gabion Basket Fill *(Product Compliance)* *(See Section 00390.11(b))*	*Degradation*	*TM 208*			*4000*	*See Section 4C*	*Submit to Lab*		*See Section 4C*
	Soundness			*T 104*					
	Specific Gravity of Coarse Aggregates			(1) *T 85*	*1825*				
	Gradation						*Visual*		

(1) *Apparent Specific Gravity and Absorption*

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD: ODOT	TEST METHOD: WAQTC	TEST METHOD: AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)): Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00596A - MSE RETAINING WALLS									
Aggregate Production					Testing Frequency for Product Compliance per Source 1/5,000 Tons Minimum 1/Project				
MSE Granular Wall Backfill *(Product Compliance)* *(Also reference 02630.10)*	*Abrasion* *Degradation* *Sieve Analysis* *Plasticity Index* *pH of Soil* *Soil Resistivity* *Organic Content*	*TM 208* (Degradation)		*T96* (Abrasion) *T 11* (Sieve Analysis) *T 90* *T 289* *T 288* *T 267*	*4000* *4000*	*See Section 4C*	*Submit to Central Lab*		*See Section 4C*
					A Sublot Equals 2,000 Tons				
MSE Granular Wall Backfill (1) *Perform a minimum of 3 tests, QL's required*	*Sampling Aggregates* *Reducing Aggregates* (1) *Sieve Analysis Un-Washed* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*1/Sublot*			
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*			
Placement Establishing Maximum Density (2) *Method A*	*Density Curve* *Specific Gravity of Coarse Aggregates* *Agg. Base Coarse Particle Correction*	*TM 223* (Agg. Base Coarse Particle Correction)		(2) *T 99* (Density Curve) *T 85* (Specific Gravity)	*3468* *3468*	*1/Aggregate Gradation/Per Source*			
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793B*	*1/ 100 yd3 (Minimum 1/day)*	(3) Visual		
	Deflection Testing	*TM 158*			*1793B*	*1 per layer*			
(3) See Section 00596A.47(c-5)	***Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.***								

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD: ODOT	TEST METHOD: WAQTC	TEST METHOD: AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00596B - PREFABRICATED MODULAR RETAINING WALLS									
Aggregate Production									
Gravel Leveling Pads Backfill (See Section 02630.10)	*Abrasion Degradation*	*TM 208*		*T96*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
					A Sublot equals 1,000 Tons Minimum 1/Project				
	Sampling Aggregates Reducing Aggregates Sieve Analysis Un-Washed Sand Equivalent			*R 90 R 76 T 27 T 176*	*1792*	*1/Sublot*			
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*			
					Testing Frequency for Product Compliance per Source 1/5,000 Tons Minimum 1/Project				
[3] Modular Block Core and Backfill (Product Compliance)	*Soundness Abrasion Degradation Lightweight Pieces*	*TM 208*		*T 104 T 96 T 113*	*4000 4000*	*See Section 4C & 02690*	*Submit To Lab*		*See Section 4C*
[3] (See Section 2690.20(a) thru 2690.20(d) & 2690.20(f)					A Sublot equals 1,000 Tons				
[3] Modular Block Core and Drainage Backfill [1] QAE may waive after 5 sublots/shifts [2] Perform a minimum of 3 tests, QL's required	*Sampling Aggregates Reducing Aggregates [2] Sieve Analysis [1] Wood Particles Fracture (Method 2) Elongated Pieces*	*TM 225 TM 229*		*R 90 R 76 T 27/T 11 T 335*	*1792 1792*	*1/Sublot*			
Pipe Drain Backfill (Product Compliance) (See Section 00430.11)	*Abrasion Degradation*	*TM 208*		*T 96*	*4000*	*See Section 4C*	*Submit To Lab*		*See Section 4C*
	Sieve Analysis Un-Washed			*T27*	*4000*	*1/Sublot*			

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums)			
						QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00596B - PREFABRICATED MODULAR RETAINING WALLS									
Aggregate Production					Testing Frequency for Product Compliance per Source 1/5,000 Tons Minimum 1/Project				
Gabion Basket Fill (Product Compliance) (See Section 00390.11(b))	*Degradation*	*TM 208*			*4000*	*See Section 4C*	*Submit to Lab*		*See Section 4C*
	Soundness			*T 104*					
	Specific Gravity of Coarse Aggregates			(1) *T 85*	*1825*				
	Gradation						*Visual*		

(1) *Apparent Specific Gravity and Absorption*

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
		ODOT	WAQTC	AASHTO		Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00596B - PREFABRICATED MODULAR RETAINING WALLS									
Aggregate Production					Testing Frequency for Product Compliance per Source 1/5,000 Tons Minimum 1/Project				
Retaining Wall Granular Backfill (Product Compliance) (Also reference 02630.10)	*Abrasion*			*T96*	*4000*	*See Section 4C*	*Submit to Central Lab*		*See Section 4C*
	Degradation	*TM 208*							
	Sieve Analysis			*T 11*					
	Plasticity Index			*T 90*	*4000*				
					A Sublot Equals 2,000 Tons				
Retaining Wall Granular Backfill	*Sampling Aggregates*			*R 90*					
	Reducing Aggregates			*R 76*					
(1) *Perform a minimum of 3 tests, QL's required*	(1) *Sieve Analysis Un-Washed*			*T 27*	*1792*	*1/Sublot*			
	Sand Equivalent			*T 176*					
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*			
Placement									
Establishing Maximum Density (2) *Method A*	*Density Curve*			(2) *T 99*	*3468*	*1/Aggregate Gradation/Per Source*			
	Specific Gravity of Coarse Aggregates			*T 85*					
	Agg. Base Coarse Particle Correction	*TM 223*			*3468*				
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793B*	*1/ 100 yd3 (Minimum 1/day)*			
	Deflection Testing	*TM 158*			*1793B*	*1 per layer*	(3) Visual		
(3) See Section 00596B.47(b-6)	***Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.***								

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00596C - CAST-IN-PLACE CONCRETE RETAINING WALLS									
Aggregate Production									
Pipe Drain Backfill (Product Compliance) (See Section 00430.11)	*Abrasion Degradation*	*TM 208*		*T 96*	*4000*	*See Section 4C*	*Submit To Lab*		*See Section 4C*
	Sampling Aggregates Reducing Aggregates Sieve Analysis Un-Washed			*R 90 R 76 T27*	*4000*	*1/Sublot*			
Retaining Wall Granular Backfill					Testing Frequency for Product Compliance per Source 1/5,000 Tons Minimum 1/Project				
Retaining Wall Granular Backfill (Product Compliance) (Also reference 02630.10)	*Abrasion Degradation Sieve Analysis Plasticity Index*	*TM 208*		*T96 T 11 T 90*	*4000 4000*	*See Section 4C*	*Submit to Central Lab*		*See Section 4C*
					A Sublot Equals 2,000 Tons				
Retaining Wall Granular Backfill (1) Perform a minimum of 3 tests QL's required	*Sampling Aggregates Reducing Aggregates (1) Sieve Analysis Un-Washed*			*R 90 R 76 T 27*	*1792*	*1/Sublot*			
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*			

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)) Contractor Quality Control	Independent Assurance/Verification Project Manager	Independent Assurance/Verification Region Quality Assurance	Independent Assurance/Verification Materials Laboratory
SECTION 00596C - CAST-IN-PLACE CONCRETE RETAINING WALLS									
Placement									
Retaining Wall Granular Backfill									
Establishing Maximum Density	*Density Curve*			*[1] T 99*	*3468*	*1/Aggregate Gradation/Per Source*			
[1] Method A	*Specific Gravity of Coarse Aggregates*			*T 85*					
	Agg. Base Coarse Particle Correction	*TM 223*			*3468*				
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793B*	*1/ 100 yd3 (Minimum 1/day)*			
[2] See Section 00596C.42(f)	*Deflection Testing*	*TM 158*			*1793B*	*1 per layer*	[2] Visual		

Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) – QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00635 - GRID-ROLLED AGGREGATE SUBBASE									
Aggregate Subbase					*A Sublot equals 1000 Tons*				
Grading *(See 00635.10)*	*Abrasion*			*T 96*	*4000*	*1/Source*	*Submit To Central Lab*		*See Section 4(A)*
	Sampling Aggregates			*R 90*		*1/Sublot*			
	Reducing Aggregates			*R 76*					
	Sieve Analysis Un-Washed			*T 27*	*1792*				
	Sand Equivalent			*T 176*					

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00641 - AGGREGATE SUBBASE, BASE, AND SHOULDERS									
Aggregate Production Aggregate Subbase	*Abrasion*			*T 96*	*4000*	*See Sec. 4A*	*Submit To Central Lab*		*See Section 4(A)*
Grading *(See 00641.10(b))*	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis* *Un-Washed* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*1/Project or 1/Source*	*Visual*		
Aggregate Base and Shoulders	*Abrasion* *Degradation*	*TM 208*		*T96*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
					A Sublot equals 2000 Tons				
Grading *Aggregate Base (See 02630)* *Aggregate Shoulder (See 02640)* *Open Graded Aggregate Base* *(See 02630.11)*	*Sampling Aggregates* *Reducing Aggregates* [(1)] *Sieve Analysis* *Un-Washed* [(2)] *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
[(1)] *Perform at least 3 tests* [(2)] *May be waived by QAE*	*Fracture (Method 1)*			*T 335*	*1792*	*1/5 Sublots*			
Placement Aggregate Base *Plant Mix Applications Only*					*A Sublot equals 2000 Tons*				
Aggregate (Mixture)	*Sampling Aggregates* *Reducing Aggregates* *Moisture Content of Aggregates & Soils*			*R 90* *R 76* *T 255/265*	*1792*	*1/Sublot or minimum 1/Day*		*1 per 10 Sublots*	
Establishing Maximum Density & Optimum Moisture (Mix Design) [(3)] *Method A*	*Density Curve* *Agg. Base Coarse Particle Correction* *Specific Gravity of Coarse Aggregates*	*TM 223*		[(3)] *T 99* *T 85*	*3468 B* *3468 B*	*Each Size per Source*		*1/Project*	
Compaction					*A Compaction Sublot Equals 400 Tons*				
[(D)] **(Individual tests must meet Specification)**	*Deflection Testing* *Nuclear Density of Soils/Aggregates*	*TM 158*		*T 310*	*1793B*	[(D)] *1 per Sublot*		[(D)] *1 (5 Tests) per 50 Sublots (Minimum 5 tests)*	

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
		ODOT	WAQTC	AASHTO		Contractor Quality Control	Independent Assurance/Verification		
							Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00641 - AGGREGATE SUBBASE, BASE, AND SHOULDERS (Continued)									
Placement Aggregate Subbase									
Compaction	*Deflection Testing*	*TM 158*			*1793 B*	*1 per Layer*	*Visual*		

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD: ODOT	TEST METHOD: WAQTC	TEST METHOD: AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)): Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00680 - STOCKPILED AGGREGATES									
Aggregate Base and Shoulders *(See Section 00641)*	*Abrasion*			*T 96*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
	Degradation	*TM 208*							
					A Sublot equals 2,000 Tons				
(1) Perform at least 3 tests, QL's required	*Sampling Aggregates*			*R 90*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
	Reducing Aggregates			*R 76*					
	(1) Sieve Analysis Un-Washed			*T 27*					
	(2) Sand Equivalent			*T 176*	*1792*				
(2) May be waived by QAE	*Fracture (Method 1)*			*T 335*	*1792*	*1/5 Sublots*			
Aggregate (Sanding Aggregate)					A Sublot equals 1000 Tons				
	Sampling Aggregates			*R 90*		*1/Sublot*		*1 per 10 Sublots*	
	Reducing Aggregates			*R 76*					
	Sieve Analysis Un-Washed			*T 27*	*1792*				
(1) May be waived by QAE	*(1) Cleanness Value*	*TM 227*							
	Abrasion			*T 96*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
	Degradation	*TM 208*							
	Lightweight Pieces			*T 113*	*4000*				
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*		*1 per 10 Sublots*	
	Elongated Pieces	*TM 229*							
	Wood Particles	*TM 225*			*1792*				

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00680 - STOCKPILED AGGREGATES (CONTINUED)									
Emulsified AC Aggregate Aggregate Production					*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency* (Same Frequency for all Tests (Minimums))				
(See Sections 00705, 00706, 00710, 00711, 00712 and 00715) *[(1)] QAE may waive after 5 sublots/shifts*	*Abrasion* *Degradation* *Soundness* *Lightweight Pieces* *Dry Rodded Unit Weight*	*TM 208*		*T 96* *T 104* *T 113* *T 19*	*4000* *4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
[(2)] Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated *[(3)] May be waived by QAE*	*Sampling Aggregates* *Reducing Aggregates* *[(5)] Fracture (Method 1)* *[(1)] Wood Particles* *[(1)(4)] Elongated Piece* *[(2)] Sieve Analysis* *[(3)] Cleanness Value*	*TM 225* *TM 229* *TM 227*		*R 90* *R 76* *T 335* *T27/T 11*	*1792* *1792*	*1/Sublot*		*1 per 10 Sublots*	
[(4)] Not required for Dry Key Material *[(5)] 1/5 Sublots & Start of Production*	*Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*			
Aggregate (Other)		*Use sampling and testing frequencies required for proposed end product use*							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE (Same Frequency for all Tests (Minimums)): Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00705 - EMULSIFIED ASPHALT PRIME COAT and EMULSIFIED ASPHALT FOG COAT									
Aggregate Production						*A sublot equals 1000 Tons. A minimum 1 per shift*			
Aggregate Cover Material	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis Un-Washed*			*R 90* *R 76* *T 27*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
Asphalt Prime and Fog Coat *Asphalt Cement (Emulsion)*	*Sampling Asphalt Materials*			*R 66*	*4000*	*See Section 4C 1/50 Tons (Submit All)*	*Submit to Central Lab*		*1/5 QC Samples (Random)*
SECTION 00706 - EMULSIFIED ASPHALT SLURRY SEAL SURFACING									
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift whichever results in the greatest sampling frequency*			
(1) Perform at least 3 tests, QL's required	*Sampling Aggregates* *Reducing Aggregates* *(1) Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*1/Sublot*			
Emulsified Asphalt Cement *Emulsified Asphalt* *Polymer Modified Emulsion*	*Sampling Asphalt Materials*			*R 66*	*4000*	*See Section 4C 1/50 Tons (Submit All)*	*Submit to Central Lab*		*1/5 QC Samples (Random)*
Additives *Mineral Filler*	*Material must meet the requirements of Section 00706.13*								
Mixture	*Material must meet the requirements of Section 00706.16*								

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						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00710 - SINGLE APPLICATION EMULSIFIED ASPHALT SURFACE TREATMENT									
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*			
	Abrasion			*T 96*	*4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4A*
	Degradation	*TM 208*							
	Soundness			*T 104*					
	Lightweight Pieces			*T 113*					
	Dry Rodded Unit Weight			*T 19*	*4000*				
(1) QAE may waive after 5 sublots/shifts	*Sampling Aggregates*			*R 90*		*1/Sublot*		*1 per 10 Sublots*	
	Reducing Aggregates			*R 76*					
(2) Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated	*(5) Fracture (Method 1)*			*T 335*	*1792*				
	(1) Wood Particles	*TM 225*							
	(1)(4) Elongated Piece	*TM 229*							
	(2) Sieve Analysis			*T27/T 11*					
	(3) Cleanness Value	*TM 227*			*1792*				
(3) May be waived by QAE	*Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*			
(4) Not required for Dry Key Material									
(5) 1/5 Sublots & Start of Production									
Asphalt Cement (Emulsion)	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/50 Tons Submit All*	*Submit to Lab*		*1/5 QC Samples (Random)*

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00710.10 and 710.15, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00710.10 and 710.15 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 2500 Tons".
b. One Per sublot means "One Set of Tests Per 500 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00711 - PRE-COATED AGGREGATE ASPHALT SURFACE TREATMENT									
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift whichever results in the greatest sampling frequency*			
	Abrasion			*T 96*	*4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4A*
	Degradation	*TM 208*							
	Soundness			*T 104*					
	Lightweight Pieces			*T 113*					
	Dry Rodded Unit Weight			*T 19*	*4000*				
(1) QAE may waive after 5 sublots/shifts	*Sampling Aggregates*			*R 90*		*1/Sublot*		*1 per 10 Sublots*	
	Reducing Aggregates			*R 76*					
(2) Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated	*(5) Fracture (Method 1)*			*T 335*	*1792*				
	(1) Wood Particles	*TM 225*							
	(1)(4) Elongated Piece	*TM 229*							
	(2) Sieve Analysis			*T27/T 11*					
	(3) Cleanness Value	*TM 227*			*1792*				
(3) May be waived by QAE	*Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*			
(4) Not required for Dry Key Material									
(5) 1/5 Sublots & Start of Production									
Asphalt Cement	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/50 Tons Submit All*	*Submit to Lab*		*1/5 QC Samples (Random)*

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00711.10 and 711.15, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00711.10 and 711.15 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 2500 Tons".
b. One Per sublot means "One Set of Tests Per 500 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00711 - PRE-COATED AGGREGATE ASPHALT SURFACE TREATMENT (CONTINUED)									
Mixture Acceptance						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*			
Meter Method [(1)] ***ACP Plant Calibration Required at start of production and if meters fail to meet specification***	*Readings backed by Tank Measure & Production Records Daily*	*TM 321* [(1)] *TM 322*			*2277*	*1/Sublot or Min. 1/Day*			
					2043 & 2401	*Daily Production*			
	Cold Feed Moisture			T 255/265	*2277*	*1/Sublot or Min. 1/Day*			
Plant Discharge Moisture	*ACP Moisture Content*			*T 329*	*2277*	*1/Sublot*			
Asphalt Cement	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/50 Tons Submit All*	*Submit to Lab*		*1/5 QC Samples (Random)*

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00712 - DRY KEY EMULSIFIED ASPHALT SURFACE TREATMENT									
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*			
	Abrasion *Degradation* *Soundness* *Lightweight Pieces* *Dry Rodded Unit Weight*	*TM 208*		*T 96* *T 104* *T 113* *T 19*	*4000* *4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4A*
(1) QAE may waive after 5 sublots/shifts *(2) Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated*	*Sampling Aggregates* *Reducing Aggregates* *(5) Fracture (Method 1)* *(1) Wood Particles* *(1)(4) Elongated Piece* *(2) Sieve Analysis* *(3) Cleanness Value*	*TM 225* *TM 229* *TM 227*		*R 90* *R 76* *T 335* *T 27/T 11*	*1792* *1792*	*1/Sublot*		*1 per 10 Sublots*	
(3) May be waived by QAE *(4) Not required for Dry Key Material* *(5) 1/5 Sublots & Start of Production*	*Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*			
Asphalt Cement (Emulsion)	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/50 Tons Submit All*	*Submit to Lab*		*1/5 QC Samples (Random)*

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00712.10 and 712.15, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00712.10 and 712.15 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 2500 Tons".
b. One Per sublot means "One Set of Tests Per 500 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00715 - MULTIPLE APPLICATION EMULSIFIED ASPHALT SURFACE TREATMENT						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE — Independent Assurance/Verification			
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*			
	Abrasion *Degradation* *Soundness* *Lightweight Pieces* *Dry Rodded Unit Weight*	 *TM 208*		*T 96* *T 104* *T 113* *T 19*	*4000* *4000*	*See Section 4A*	*Submit to Central Lab*		*See Section 4A*
(1) *QAE may waive after 5 sublots/shifts* (2) *Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated*	*Sampling Aggregates* *Reducing Aggregates* (5) *Fracture (Method 1)* (1) *Wood Particles* (1)(4) *Elongated Piece* (2) *Sieve Analysis* (3) *Cleanness Value*	 *TM 225* *TM 229* *TM 227*		*R 90* *R 76* *T 335* *T 27/T 11*	 *1792* *1792*	*1/Sublot*		*1 per 10 Sublots*	
(3) *May be waived by QAE* (4) *Not required for Dry Key Material* (5) *1/5 Sublots & Start of Production*	*Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*			
Asphalt Cement (Emulsion)	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/50 Tons Submit All*	*Submit to Lab*		*1/5 QC Samples (Random)*

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00715.10 and 715.15, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00715.10 and 715.15 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 2500 Tons".
b. One Per sublot means "One Set of Tests Per 500 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00720 - COLD IN-PLACE RECYCLED ASPHALT CONCRETE PAVEMENT (CIR)									
SECTION 00721 - COLD RECYCLED EMULSIFIED ASPHALT CONCRETE PAVEMENT (CRP)									
Asphalt Cement (Emulsified Recycling Agent)	*Sampling Asphalt Materials*			*R 66*	*4000* *4000*	*See Section 4C 1/50 Tons (Submit All)*	*Submit to Central Lab*		*1/5 QC Samples (Random)*
Water	*Compliance*					*See Sec.00340.10*			
					A Sublot equals 1000 Tons				
Aggregate Production Choke Aggregate (See 00705)	*Sampling Aggregates Reducing Aggregates Sieve Analysis Un-Washed*			*R 90* *R 76* *T 27*	*1792*	*1/Sublot*		*Minimum 1/Project*	
SECTION 00725 - HOT IN-PLACE RECYCLED (HIR) ASPHALT CONCRETE PAVEMENT									
	The type of recycling agent will be listed in the Special Provisions								
Recycling Agent (See 00745.11)	*Sampling Asphalt Materials*			*R 66*	*4000*	*See Section 4C*	*Submit to Lab*		*1/5 QC Samples (Random)*
Recycling Agent	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/50 Tons*	*Submit to Lab*		
Asphalt Concrete Mixture	*New Asphalt Concrete mixture will meet the requirements of Section 00744*								
SECTION 00730 - ASPHALT TACK COAT									
Tack	*Sampling Asphalt Materials*			*R 66*	*4000*	*See Section 4C 1/50 Tons*	*Submit to Lab*		*1/50 Tons or All QC Samples*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)			
MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
		ODOT	WAQTC	AASHTO		Contractor Quality Control	Independent Assurance/Verification		
							Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00735 - EMULSIFIED ASPHALT CONCRETE PAVEMENT									
Aggregate production									
	Abrasion			*T 96*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
	Degradation	*TM 208*							
	Soundness			*T 104*					
	Lightweight Pieces			*T 113*	*4000*				
					A Sublot equals 1000 Tons. A minimum one per shift, whichever results in the greatest sampling frequency. (For preproduced aggregates, 1 shift shall mean 1000 Tons				
(1) Perform at least 3 tests, QL's required									
	Sampling Aggregates			*R 90*					
	Reducing Aggregates			*R 76*					
	(1) Sieve Analysis			*T 27/T 11*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
(2) May be waived by QAE	*(2) Cleanness Value*	*TM 227*							
	Fracture (Method 1 & 2)			*T 335*					
(3) QAE may waive after 5 sublots/shifts	*(3) Elongated Pieces*	*TM 229*							
	(3) Wood Particles	*TM 225*			*1792*				
Choke Aggregate	*Sieve Analysis*			*T 27*	*1792*	*1/Sublot*		*1/Project*	
	Un-Washed								

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						QUALITY ASSURANCE – Same Frequency for all Tests (Minimums)	Independent Assurance/Verification		
SECTION 00735 - EMULSIFIED ASPHALT CONCRETE PAVEMENT (CONTINUED)									
Mixture Acceptance					*A Sublot equals 1000 Tons of Mixture*				
% Emulsified Asphalt	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis* *Moisture Content of Aggregate & Soil* *Meter*	*TM 321*		*R 90* *R 76* *T 27/T 11* *T 255/265*	*2277*	*1/Sublot*		*1 per 10 Sublots*	
% Emulsified Asphalt ***(1) ACP Plant Calibration Required at start of production and if meters fail to meet specification***	*Readings backed by Tank Measure & Production Records Daily*	*TM 321* *(1) TM 322*			*2401 & 2043*	*Daily Production*			
Emulsified Asphalt Cement	*Sampling Asphalt Materials*			*R 66*	*4000*	*See Section 4C 1/Sublot (Submit All)*	*Submit to Lab*	*1 per 10 Sublots*	*1/5 QC Samples (Random)*
SECTION 00740 - COMMERCIAL ASPHALT CONCRETE PAVEMENT (CACP)									
	See Specifications when Testing is Required by Agency								

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00743 - POROUS ASPHALT CONCRETE (PAC)									
Aggregate Production									
	Soundness			*T 104*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
	Abrasion			*T 96*					
	Degradation	*TM 208*							
	Lightweight Pieces			*T 113*					
	Plasticity Index			*T 90*	*4000*				
(1) *QAE may waive after 5 sublots/shifts*						*A Sublot equals 1000 Tons. A minimum one per shift whichever results in the greatest sampling frequency*			
(2) *Not required for ATPB Mix*	*Sampling Aggregates*			*R 90*		*1/Sublot*			
(3) *Coarse Agg (+ No. 4)*	*Reducing Aggregates*			*R 76*					
	(3)(4) *Sieve Analysis*			*T 27/T 11*	*1792*				
(4) *Fine Agg (- No. 4)*	(1)(4) *Sand Equivalent*			*T 176*					
	(1)(2)(3) *Elongated Pieces*	*TM 229*				*1/5 Sublots*			
	(3)(4) *Fracture (Method 2)*			*T 335*	*1792*				
	(1)(2)(3) *Wood Particles*	*TM 225*							

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00743.10 Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00743.10 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 5000 Tons".
b. One Per sublot means "One Set of Tests Per 1000 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums)			
						QUALITY ASSURANCE			
							Independent Assurance/Verification		
SECTION 00743 - POROUS ASPHALT CONCRETE (PAC) (CONTINUED)									
Mixture Acceptance - PAC with RAP									
Gradation				*A Sublot equals 1000 Tons*					
Ignition method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*			
Ignition method	*Sampling (ACP)* *Reducing (ACP)*			*R 97* *R 47*		*1/Sublot or Min. 1/Day*			
(Residual aggregate from AASHTO T 308)	*Sieve Analysis of Extracted Aggregate*			*T 30*	*2277*	*1/Sublot or Min. 1/day*			
[1] Submit Samples a minimum of 2 Days Prior to ACP Production									
Asphalt Content				*A Sublot equals 1000 Tons*					
Ignition Method		*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*			
Ignition Method	*Sampling (ACP)* *Reducing (ACP)* *Asphalt Content*			*R 97* *R 47* *T 308*	*2277*	*1/Sublot or Min. 1/day*			
Meter Method	*Readings backed by Tank Measure & Production Records Daily*	*TM 321* *[2] TM 322*			*2277*	*1/Sublot or Min. 1/day*			
[2] ACP Plant Calibration Required at start of production and if meters fail to meet specification					*2043 & 2401*	*Daily Production*			
Meter Method is required for PAC even when acceptance is by Ignition Method									

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00743 - POROUS ASPHALT CONCRETE (PAC) (CONTINUED)									
Mixture Acceptance - PAC without RAP									
Gradation				*A Sublot equals 1000 Tons*					
Cold Feed Method	*Sampling Aggregates Reducing Aggregates Sieve Analysis*			*R 90 R 76 T 27/T 11*	*2277*	*1/Sublot or Min. 1/Day*			
Ignition method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*			
Ignition method ***[1] Not required if Asphalt Content Accepted by Meter***	*Sampling (ACP) Reducing (ACP)*			*R 97 R 47*		*1/Sublot or Min. 1/Day*			
(Residual aggregate from AASHTO T 308) *[1] Submit Samples a minimum of 2 Days Prior to ACP Production*	*Sieve Analysis of Extracted Aggregate*			*T 30*	*2277*	*1/Sublot or Min. 1/day*			
Asphalt Content				*A Sublot equals 1000 Tons*					
Ignition Method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*			
Ignition Method ***[2] ACP Plant Calibration Required at start of production and if meters fail to meet specification***	*Sampling (ACP) Reducing (ACP) Asphalt Content*			*R 97 R 47 T 308*	*2277*	*1/Sublot or Min. 1/day*			
Meter Method ***Meter Method is required for PAC even when acceptance is by Ignition Method***	*Readings backed by Tank Measure & Production Records Daily*	*TM 321 [2] TM 322*			*2277* *2043 and 2401*	*1/Sublot or Min. 1/day* *Daily Production*			

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE			
SECTION 00743 - POROUS ASPHALT CONCRETE (PAC) (CONTINUED)									
Mixture Acceptance - PAC with and without RAP									
Mix Design Verification Testing				*A Sublot equals 1000 Tons*					
	Cold Feed Moisture			*T255/T265*	*2277*	*1/Sublot or Min. 1/Day*			
Plant Discharge Moisture	*ACP Moisture Content*			*T 329*	*2277*	*1/Sublot or Min. 1/Day*			
[(1)] RAP Percentage *[(1)] If applicable*	*[(1)] RAP Moisture*			*T 329*	*2277*	*1/Sublot or Min. 1/Day*			
	Readings backed by Tank Measure & Production Records Daily	*TM321* *[(2)] TM 322*			*2401 & 2043*	*Daily Production*			
Asphalt Cement	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/Sublot - See section 4C*	*Submit to Lab*		*1/5 QC Samples (Random)*
[(2)] ACP Plant Calibration Required at start of production and if meters fail to meet specification									

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00744 - ASPHALT CONCRETE PAVEMENT									
Aggregate Production		*See Specifications when Aggregate Testing is Required by the Agency*							
Mixture Acceptance									
Gradation				*A Sublot equals 1000 Tons*					
Ignition method	*[(1)] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*			
Ignition method	*Sampling (ACP) Reducing (ACP)*			*R 97 R 47*		*1/Sublot or Min. 1/Day*			
(Residual aggregate from AASHTO T 308)	*Sieve Analysis of Extracted Aggregate*			*T 30*	*2277*	*1/Sublot or Min. 1/Day*			
[(1)] Submit Samples a minimum of 2 Days Prior to ACP Production									
Asphalt Content				*A Sublot equals 1000 Tons*					
Ignition Method	*[(1)] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*			
Ignition Method	*Sampling (ACP) Reducing (ACP)*			*R 97 R 47*		*1/Sublot or Min. 1/day*			
	Asphalt Content			*T 308*	*2277*				
Mix Design Verification Testing				*A Sublot equals 1000 Tons*					
Plant Discharge Moisture	*ACP Moisture Content*			*T 329*	*2277*	*1/Sublot*			
Maximum Density Test G_{mm}	*Max. Specific Gravity MAMD*	*TM 305*		*T 209*	*2050*	1st Sublot Daily or Min. 1/Day			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)			
MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
						Contractor Quality Control	Independent Assurance/Verification		
		ODOT	WAQTC	AASHTO			Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00744 - ASPHALT CONCRETE PAVEMENT (CONTINUED)									
Compaction [D] *See T 355 Yellowsheet for Density Test Locations*	*Nuclear Density of ACP*			*T 355*	*1793A*	[D] *Average 10 tests per Sublot or Min. 10/Day, See Section 00744.49*			

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) – QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE									
Aggregate Production	*Soundness*			*T 104*	*4000*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
	Abrasion			*T 96*					
	Degradation	*TM 208*							
(1) QAE may waive after 5 sublots/shifts	*Lightweight Pieces*			*T 113*					
	Plasticity Index			*T 90*	*4000*				
(2) Perform a minimum of 3 tests QL's required						*A Sublot equals 1000 Tons. A minimum one per shift whichever results in the greatest sampling frequency*			
	Sampling Aggregates			*R 90*					
	Reducing Aggregates			*R 76*		*1/Sublot*		*1 per 10 Sublots*	
(3) Coarse Agg (+ No. 4)	*(2)(3)(4) Sieve Analysis*			*T 27/T 11*	*1792*				
(4) Fine Agg (- No. 4)	*(1)(4) Sand Equivalent*			*T 176*					
Note: Sample Aggregate before Lime Treatment	*(1)(3) Elongated Pieces*	*TM 229*							
	(3)(4) Fracture (Method 2)			*T 335*	*1792*	*1/5 Sublots*			
	(1)(3) Wood Particles	*TM 225*							
RAS Production *(Reclaimed Asphalt Shingles)*	*Sieve Analysis Un-Washed*			*T 27*	*4000*	*1 / 500 Tons*	Submit to Lab		
	Deleterious Materials	*TM 335*							
	Sampling Aggregates			*R 90*		*1 / 50 Tons*			
	Reducing Aggregates			*R 76*					
	Sieve Analysis Un-Washed			*T 27*	*1792*				
	Deleterious Materials	*TM 335*							

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00745.10 Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00745.10 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 5000 Tons".
b. One Per sublot means "One Set of Tests Per 1000 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) – QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE (CONTINUED)									
Mixture Acceptance - ACP " With and Without RAP"				*A Sublot equals 1000 Tons*					
Gradation									
Ignition method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*		*1/JMF & Each Calendar Year.*	
Ignition method *(Residual aggregate from AASHTO T 308)*	*Sampling (ACP)* *Reducing (ACP)* *Sieve Analysis of Extracted Aggregate*			*R 97* *R 47* *T 30*	*2277*	*1/Sublot*		*1 per 10 Sublots*	
[1] Submit Samples a minimum of 2 Days Prior to ACP Production									
Asphalt Content				*A Sublot equals 1000 Tons*					
Ignition Method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*		*1/JMF & Each Calendar Year.*	
Ignition Method	*Sampling (ACP)* *Reducing (ACP)* *Asphalt Content*			*R 97* *R 47* *T 308*	*2277*	*1/Sublot or Min. 1/day*		*1 per 10 Sublots*	
[2] RAP and RAS Percentage *[2] If Applicable*	*Meter Method*	*TM 321* *[3] TM 322*			*2277*	*1/Sublot or Minimum 1/Day*		*1 per 10 Sublots*	
[3] ACP Plant Calibration Required at start of production and if meters fail to meet specification	*[2] RAP and RAS Moisture* *Cold Feed Moisture*			*T 329* *T255/T265*	*2277*				
Meter Method is required for ACP even when acceptance is by Ignition Method	*Readings backed by Tank Measure & Production Records Daily*	*TM 321* *[3] TM 322*			*2401 ACP*	*Daily Production*			

MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE (CONTINUED)									
Mixture Acceptance - ACP "With and Without RAP"				A Sublot equals 1000 Tons					
Mix Design Verification Testing									
Fabrication	*Gyratory Specimen*	TM 326			2050GV	*1/Sublot & according to Section 00745.16 (b)-1-c*		*1 per 10 Sublots*	
Maximum Density Test	*Max. Specific Gravity of ACP*			T 209	2050 *5068				
Determination of G_{mb}	*Bulk Specific Gravity of Compacted ACP*			T 166	*2560 *5069				
Stripping Susceptibility	*Tensile Strength Ratio*			T 283	2050tsr	*1/JMF See Section 00745.16 (b)-1-e*			
**Cat-II complete & submit as required, See Section 745.16(b)*									
Plant Discharge Moisture	*ACP Moisture Content*			T 329	2277	*1/Sublot or Min. 1/Day*			
Maximum Density Test G_{mm}	*Max. Specific Gravity of ACP*			T 209	2050	*1st Sublot Daily or Min. 1/Day*			
	MAMD	TM 305							
Performing Control Strip	*Control Strip*	TM 306			2084 *5069	*Develop Rolling Pattern See*			
Compaction	*Nuclear Density of ACP*			T 355	1793A	(D) *Average 5 tests per Sublot or Min. 1/Day, See Section 00745.49 (b)-2*		(D) *1 per 10 Sublots*	
Asphalt Cement	*Sampling Asphalt Materials*			R 66	4000	*1/Sublot See Section 4C*	*Submit to Lab*	*1 per 10 Sublots*	*1/5 QC Samples (Random)*

(D) *See T 355 Yellowsheet for Density Test Locations*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums)	QUALITY ASSURANCE – Independent Assurance/Verification		
SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE (CONTINUED)									
Mixture Acceptance - ACP "With and Without RAP"				*A Sublot equals 1000 Tons*					
Mix Design Verification Testing									
Lime	*Material must meet the requirements of Section 2090*								
Latex	*See Special Provisions for Latex Requirements*								
Lime or Latex Treatment of Aggregate (Stockpile or Mixture Production)	(1) *% Hydrated Lime*	*TM 321* (2) *TM 322*			*2277* *2277*	*1/Sublot*		*1 per 10 Sublots*	
(2) ***ACP Plant Calibration Required at start of production and if meters fail to meet specification*** (1) *If Applicable* (1) *See JMF for Details*	*Readings backed by Tank Measure & Production Records Daily*				*2401 ACP*	*Daily Production*			
Smoothness									
Certification of Profiler Equipment		*TM 769*				*See Special Provisions*			
Determining International Roughness Index (IRI)		*TM 772*							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
SECTION 00754 - PLAIN CONCRETE PAVEMENT REPAIR **SECTION 00755 - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT** **SECTION 00756 - PLAIN CONCRETE PAVEMENT** **SECTION 00758 - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT REPAIR**									
Aggregate Production					*A Sublot equals 1000 Tons*				
(1) *QAE may waive after 5 sublots/shifts*	*Sampling Aggregates*			*R 90*					
	Reducing Aggregates			*R 76*					
	(2)(3)(4) *Sieve Analysis*			*T 27/T 11*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
	(4) *Fineness Modulus*								
(2) *Perform a minimum of 3 tests, QL's required*	(4) *Sand Equivalent*			*T 176*	*1792*				
(3) *Coarse Aggregate (See Section 02690.20)*	(1)(3) *Wood Particles*	*TM 225*			*1792*	*1/5 Sublots*			
	(3) *Fracture (Method 2)*			*T 335*					
	(1)(3) *Elongated Pieces*	*TM 229*			*1792*				
(4) *Fine Aggregate (See Section 02690.30)*	*Abrasion*			*T 96*	*4000*	*See Section 4A & 02690*	*Submit to Central Lab*		*See Section 4A*
	Degradation	*TM 208*							
	Soundness			*T 104*					
	Lightweight Pieces			*T 113*					
	Organics			*T 21*	*4000*				
	(3) *Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*			
	(3) *Specific Gravity of Coarse Aggregate*			*T 85*	*1825*				
	(4) *Specific Gravity of Fine Aggregate*			*T 84*					

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums)	QUALITY ASSURANCE – Independent Assurance/Verification		
SECTION 00754 - PLAIN CONCRETE PAVEMENT REPAIR **SECTION 00755 - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT** **SECTION 00756 - PLAIN CONCRETE PAVEMENT** **SECTION 00758 - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT REPAIR** **(CONTINUED)**									
Portland Cement Concrete						*A Sublot equals 350 yd³ of slip formed pavement or 100 yd³ of non-slip formed PCC*			
(S) ASTV based on a minimum of 3 Cylinders	*Sampling Concrete* *Air Content of Concrete* *Slump of Concrete* *Density (Unit Weight) of Concrete* *Yield* *Water/Cement Ratio* *Concrete Temperature*		*TM 2*	*T 152* *T 119* *T 121* *T 121* *T 121* *T 309*	*3573WS or 4000C*	*1 per Sublot per mix Design, minimum 1 per day*		*1 per 10 Sublots, minimum 1 per mix design*	
	Fabrication of Concrete Cylinders/Beams *Compressive Strength of Concrete (S)*			*R 100* *T 22*	*4000C*				
Cement Chemical Admixtures Supplementary Cementitious Materials	*Materials listed on batch ticket must match approved design*								
Smoothness									
Certification of Profiler Equipment		*TM 769*				*See Special Provisions*			
Determining International Roughness Index (IRI)		*TM 772*							
Thickness of Pavement	*Sticking Measure*	*TM 775*				*See Specs*			

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
SECTION 00850 - COMMON PROVISIONS FOR PAVEMENT MARKINGS									
Placement Evaluation "Retroreflectivity"									
In-Place *Procedure evaluates Durable and High Performance Pavement Markings*	*Evaluation of Retroreflectivity*	*TM 777*			*4101 thru 4105*	*See Special Provisions and Test Procedure for Testing Frequency*			

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
SECTION 00921 - MAJOR SIGN SUPPORT DRILLED SHAFTS									
Aggregate Production									
						A Sublot equals 1,000 Tons			
[1] QAE may waive after 5 sublots/shifts	Sampling Aggregates			R 90		1/Sublot		1 per 10 Sublots	
	Reducing Aggregates			R 76					
	[2][3][4] Sieve Analysis			T 27/T 11	1792				
	[4] Fineness Modulus			T 27/T 11					
[2] Perform a minimum of 3 tests, QL's required	[1][3] Wood Particles	TM 225							
	[4] Sand Equivalent			T 176	1792				
[3] Coarse Aggregate (See Section 02690.20)	Soundness			T 104	4000	See Section 4(A)	Submit to Lab		See Section 4(A)
	Abrasion			T 96					
	Degradation	TM 208							
[4] Fine Aggregate (See Section 02690.30)	Lightweight Pieces			T 113					
	Organics			T 21	4000				
	[3] Dry Rodded Unit Weight			T 19	1825 1825C	Start of production and when changes in aggregate occurs			
	[3] Specific Gravity of Coarse Aggregate			T 85	1825				
	[4] Specific Gravity of Fine Aggregate			T 84					

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD WAQTC	TEST METHOD AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums)	QUALITY ASSURANCE – Independent Assurance/Verification		
SECTION 00921 - MAJOR SIGN SUPPORT DRILLED SHAFTS									
Portland Cement Concrete					A Sublot equals 100 yd³				
(S) ASTV based on a minimum of 3 Cylinders	*Sampling Concrete* *Slump of Concrete* *Concrete Temperature* *Density (Unit Weight) of Concrete* *Yield* *Water/Cement Ratio*		*TM 2*	 *T 119* *T 309* *T 121* *T 121* *T 121*	*3573WS or 4000C*	*1 per Sublot, minimum 1 per mix design & shaft*		*1 per 5 Sublots, minimum 1 per mix design*	
	Fabrication of Concrete Cylinders/Beams *Compressive Strength of Concrete* (S)			*R 100* *T 22*	*4000C*				
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials	*Materials listed on batch ticket must match approved design*								

INSERT TAB

SECTION 5
Field Tested Materials
Guide (Type D&E Projects)

FIELD TESTED MATERIALS ACCEPTANCE GUIDE

(Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00330-EARTHWORK								
(See Sec. 330.16(a)) Soil and Soil/Aggregate Mixtures	*Gradation*					*Contractor Furnished Testing*	***Requires Signed and Notarized Statement of Compliance From Contractor For All Items Under Section 00300***	*Review Documentation for Acceptance*
Establishing Maximum Density (for Compaction)	*Density Curve*			*T 99*	*3468*	*1/Soil type*		
	Specific Gravity of Coarse Aggregates			*T 85*	*3468*			
	Family of Curves			*R 75*	*3468FC*		*Visual*	
Compaction	*Deflection Testing*	*TM 158*			*1793S*	*1 Test per 3 ft. in depth*		
	Nuclear Density Soils/Aggregates			*T 310*	*1793S*	*See Table 00330-1 Below*		*Review Documentation for Acceptance*
	Coarse Particle Correction			*T 99*				
	Deflection Testing	*TM 158*			*1793S*		*Visual*	

TABLE 00330-1 Frequency of Quality Control Testing

Individual Areas	Under 3500 yd² or yd³	Over 3500 yd² or yd³
Existing Ground Surface	1 test per 1000 yd²	1 test per 3000 yd²
Embankments	1 test per 500 yd³	1 test per 3000 yd³
Excavations and Finished Subgrade	1 test per 1000 yd²	1 test per 3000 yd²

MATERIAL AND OPERATION	DESCRIPTION OF TEST	ODOT	WAQTC	AASHTO	FORM 734-	Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
Stone Embankment Material (See Sec. 330.16(a))	*Gradation*					*Contractor Furnished Testing*	*Visual*	*Review Documentation for Acceptance*
Compaction	*Deflection Testing*	*TM 158*			*1793S*	*1 per Layer*		
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.							
Topsoil (See Section 01040.14)	*Particle Size Analysis*			*T 88*	*4000*	*Contractor Testing 1/Source & 1/Soil type*	*Visual*	*Review Documentation for Acceptance*
	Organic Content							

FIELD TESTED MATERIALS ACCEPTANCE GUIDE

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00331 - SUBGRADE STABILIZATION								*Review Documentation for Acceptance*
Aggregate backfill	*Material must meet the requirements of Section 00331.10*					*Contractor Testing*	*Visual*	
Water	*Material must meet the requirements of Section 00340*					*Contractor Testing*		
Compaction	*Material must meet the requirements of Section 00331*					*Visual*		
SECTION 00332 - SURFACING STABILIZATION								
Aggregate Base	*Material must meet the requirements of Section 00332.10*					*Visual*	*Visual*	
Compaction	*Material must meet the requirements of Section 00332*							
SECTION 00333 - AGGREGATE DITCH LINING								
Aggregate	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*1/Project or 1/Source*	*Visual*	*Review Documentation for Acceptance*

Same Frequency for all Tests (Minimums)

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) — Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00344 -TREATED SUBGRADE								
Granular Quicklime	*Sieve Analysis* *Calcium Hydroxide Content in lime*			*T 27* *T 219*	*4000*	*Contractor Testing 1/Source*	*Manufacture Compliance Statement*	*Review Documentation for Acceptance*
Hydrated Lime Calcium Chloride Sodium Chloride	*Materials must meet the requirements of Section 00344.10 and Test Results Certificate provided according to Section 00165.35(a)*						*Manufacture Compliance Statement*	
Portland Cement	*Material must meet the requirements of Section 02010*							
Water	*Material must meet the requirements of Section 00340*							
Establishing Maximum Density (for Compaction)	*Density Curve*				*3468*	*See Special Provisions and Table 00344-1 Below*	*Visual*	*Review Documentation for Acceptance*
Compaction	*Deflection Testing*	*TM 158*			*1793S*			
	Deflection Testing *Nuclear Density Soils/Aggregates*	*TM 158*		*T 310*	*1793S*			
	Coarse Particle Correction			*T 99*				

TABLE 00344-1 Frequency of Quality Control Testing

Individual Areas	Under 3500 yd^2	Over 3500 yd^2
Finished Subgrade	1 test per 1000 yd^2	1 test per 3000 yd^2

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00360 - Drainage Blankets								
						A sublot equals 1000 Tons		
Granular Drainage Blanket	*Sampling Aggregates* *Reducing Aggregates* *Gradation*			*R 90* *R 76* *T 27/T 11*	*1792*	*1/sublot minimum 1/Source per Project*	*Visual*	*Review Documentation for Acceptance*
Sand Drainage Blanket	*Sampling Aggregates* *Reducing Aggregates* *Gradation*			*R 90* *R 76* *T 27/T 11*	*1792*			
Establishing Maximum Density (for Compaction)	*Density Curve* *Specific Gravity of Coarse Aggregates*			*T 99* *T 85*	*3468*	*1/Source and Type*		
Compaction	*Deflection Testing*	*TM 158*			*1793S*	*1 Test per 3 ft. in depth*		
	Deflection Testing *Nuclear Density Soils/Aggregates* *Coarse Particle Correction*	*TM 158*		*T 310* *T 99*	*1793S* *1793S*	*See Table 00360-1 Below*	*Visual*	*Review Documentation for Acceptance*

TABLE 00360-1 Frequency of Quality Control Testing

Individual Areas	Under 3500 yd²	Over 3500 yd²
Existing Ground Surface	1 test per 1000 yd²	1 test per 3000 yd²
Finished Surfaces	1 test per 1000 yd²	1 test per 3000 yd²

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00390 - RIPRAP PROTECTION								
Fill Material & Riprap	*Gradation* *See 00390.11(c)1*					*Contractor Furnished Testing*	*Visual*	*Review Documentation for Acceptance*
	Degradation	*TM 208*			4000	*Contractor Furnished Testing*	*Provide History of Passing Tests*	
	Soundness			*T 104*	4000			
(1) *Apparent Specific Gravity and Absorption*	*Specific Gravity of Coarse Aggregates*			(1) *T 85*	1825			
Filter Blanket	*Gradation* *See 00390.13*					*Contractor Testing When Required*	*Visual*	
Grouted Riprap								
Sand	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	1792	*1/Project*	*Visual*	
	Soundness *Lightweight Pieces*			*T 104* *T 113*	4000	*Contractor Furnished Testing*	*Provide History of Passing Tests*	
Portland Cement	*Material must meet the requirements of Section 02010*							*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00396 -SHOTCRETE SLOPE STABILIZATION								
Aggregate Production and Mixture						A Sublot equals 1000 Tons		
(1) QAE may waive after 5 sublots/shifts	Sampling Aggregates Reducing Aggregates			R 90 R 76				Review Documentation for Acceptance
(2) Coarse Aggregate (See Section 02690.20)	(2)(3) Sieve Analysis (3) Fineness Modulus (1)(2) Wood Particles (3) Sand Equivalent	TM 225		T 27/T 11 T 27/T 11 T 176	1792	1/Sublot	Provide History of Passing Tests	
(3) Fine Aggregate (See Section 02690.30)	Soundness Abrasion Degradation Lightweight Pieces Organics	TM 208		T 104 T 96 T 113 T 21	4000	Contractor Furnished Testing	Provide History of Passing Tests	
	(2) Dry Rodded Unit Weight (2)(3) Bulk Specific Gravity & Absorption			T 19 (3) T 84 & (2) T 85		Start of production and when changes in aggregate occurs	Start of production and when changes in aggregate occurs	
Portland Cement	Material must meet the requirements of Section 02010							
Admixtures	Material must meet the requirements of Section 02040							
Mixing Water	Material must meet the requirements of Section 02020							
Production Testing (See Section 00396.14) (S) 3 Cores minimum per Panel	(S) Test Panel					Two Test Panels per Mix Design & Two Panels per days Production See Section 00396.14(a)2	Two Test Panels per Mix Design & Two Panels per days Production See Section 00396.14(a)2	
Compression Test Cores	Strength			T 22	4000C	1/Set Cores per Test panel	1/Set Cores per Test panel	Review Documentation for Acceptance

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) – Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL								*Review Documentation for Acceptance*
TRENCH FOUNDATION (Excavation Below Grade Only) (See Section 405.44)							***Requires Signed and Notarized Statement of Compliance From Contractor For All Items Under Section 00400***	
Selected general backfill	*Material must meet the requirements of Section 00330.13*					*Contractor Furnished Testing*		
Selected granular backfill	*Material must meet the requirements of Section 00330.14*							
Selected stone backfill	*Material must meet the requirements of Section 00330.15*							
Other approved material	*Material must meet the requirements of Section 00405.11*						*Visual*	
Establishing Maximum Density	*Density Curve*			*T 99*	*3468*	*1/Soil Type or Aggregate Gradation*	*Visual*	
	Specific Gravity of Coarse Aggregates			*T 85*				
	Family of Curves			*R 75*	*3468FC*			
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793S*	*1 Test per 300 ft. of Trench*		
	Coarse Particle Correction			*T 99*			*Visual*	*Review Documentation for Acceptance*

Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL (CONTINUED)								
Bedding 3/8" - 0 PCC fine aggregate (See Section 02690.30(h))	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*Contractor Provided Testing*	*Visual*	*Review Documentation for Acceptance*
Commercial 3/4" - 0 Aggregate						*Contractor Provided Testing*	*Visual*	
No. 10 - 0 Sand drainage blanket material (See Section 00360.10)	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*Contractor Provided Testing*	*Visual*	
Reasonably well graded sand, maximum 3/8" to dust						*Contractor Provided Testing*	*Visual*	
Commercial available 3/8"-0 or No.10 - 0 sand						*1 per Sublot*	*Visual*	
Continuous cradle of Commercial Grade Concrete	*Material must meet the requirements of Section 00440*					*Contractor Provided Testing*	*Visual*	*Review Documentation for Acceptance*

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL (CONTINUED)								
Pipe Zone Material Flexible Pipe	*Use the Listed Material requirements under Bedding*							
Rigid Pipe: Aggregate Base 1" - 0 or 3/4" - 0 Aggregate (See Section 02630.10)	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27*	*1792*	*Contractor Provided Testing*	Visual	*Review Documentation for Acceptance*
Rigid Pipe: Commercial 1"- 0 or 3/4" - 0 Aggregate						*Contractor Provided Testing*	*Visual*	
Establishing Maximum Density (Flexible and Rigid Pipe) (1) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Density Curve* *Specific Gravity of Coarse Aggregates* *Coarse Particle Correction*			(1) *T 99* *T 85* *T 99*	*3468* *3468*	*1/Source or Aggregate Gradation*	*Visual*	
Compaction	*Nuclear Density Soils/Aggregates*			*T 310*	*1793B*	*1 test per 100 ft. of Trench and every 2.0 ft. of Fill*	*Visual*	*Review Documentation for Acceptance*
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.							

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL (CONTINUED)								
Trench Backfill Class A Backfill - Native or common Material	*Material must meet the requirements of Section 00330.43*					*Contractor Provided Testing*	*Visual*	*Review Documentation for Acceptance*
Class B Backfill - 1"-0 or 3/4"-0 Granular Material	*Material must meet the requirements of Section 00641*							
Class C Backfill - Clean sand with 100% minus 1/4" material								
Class D Backfill - Pit run or bar run material with 3" maximum dimension and well graded from coarse to fine								
Class E Backfill - Controlled Low Strength Material (CLSM)	*Material must meet the requirements of Section 00442*					*Contractor Provided Testing*		
Establishing Maximum Density (1) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Density Curve* *Specific Gravity of Coarse Aggregates* *Family of Curves*			*(1) T 99* *T 85* *R 75*	*3468* *3468* *3468FC*	*1/Soil Type or Aggregate Gradation*	*Visual*	
Compaction (C) Density testing is based on cumulative lineal meters or feet of pipe placement.	*Nuclear Density Soils/Aggregates* *Coarse Particle* Correction			*T 310* *T 99*	*1793S* *or* *1793B*	*(C) 1 test per 100 ft. of Trench and every 2.0 ft. of Fill*	*Visual*	*Review Documentation for Acceptance*
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00430 - SUBSURFACE DRAINS								
Granular Drain Backfill Material						A Sublot equals 1000 Tons		
	Sampling Aggregates *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27*	*1792*	*Contractor Provided Testing*	*Visual*	Review Documentation for Acceptance
	Abrasion Degradation	*TM 208*		*T 96*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	
Special Filter Material See Section 00430.46(a)	*Compaction*	See section 405 for compaction requirements						
SECTION 00440 - COMMERCIAL GRADE CONCRETE								
Portland Cement Concrete						*A Sublot Equals 20 yd^3*		
	Sampling Concrete *Air Content of Concrete* *Density (Unit Weight) of Concrete* *Yield* *Slump of Concrete*		*TM 2*	*T 152* *T 121* *T 119* *T 309*	*3573WS or 4000C*	*1 per Sublot, maximum of 1 per day*	*Contractor Provided Testing*	
Cement Chemical Admixtures Supplementary Cementitious Materials	*Material listed on batch ticket must match approved design*						*Manufacture Compliance Statement*	
(S) *ASTV based on a minimum of 3 Cylinders*	*Fabrication of Concrete Cylinders/Beams* *Compressive Strength of Concrete* (S)			*R 100* *T 22*	*4000C*	*1 per Sublot, maximum of 1 per day*	*Contractor Provided Testing*	Review Documentation for Acceptance

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00445 - SANITARY, STORM, CULVERT, SIPHON, AND IRRIGATION PIPE - INCLUDED WITH SECTION 00405								
Trench Work								
Excavation, bedding, pipe zone and trench backfill	See Section 00405 for pipes less than 72"					*Contractor Provided Testing*	*Contractor Provided Testing*	Review Documentation for Acceptance
Excavation, bedding, pipe zone and trench backfill	See Section 00510 for pipes greater than 72"							
Concrete Blocks	Material must meet the requirements of Section 00440							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00450 - STRUCTURAL PLATE PIPE, PIPE ARCH AND ARCH								
Commercial Grade Concrete in appurtenances	*Material must meet the requirements of Section 00440*					*Contractor Provided Testing*	*Contractor Provided Testing*	Review Documentation for Acceptance
Trench Work								
Excavation and Backfill	*Operations must meet the requirements of Section 00510*							
Trenches in Unstable Areas								
Granular Structural Backfill	*Material must meet the requirements of Section 00510*						*Visual*	
Establishing Maximum Density	*Density Curve*			[1] *T 99*	*3468 B*	*Contractor Provided Testing*	*Visual*	
[1] *Method "A"*	*Specific Gravity of Coarse Aggregates*			*T 85*				
	Coarse Particle Correction	*TM 223*						
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793 B*	*Contractor Provided Testing*	*Visual*	Review Documentation for Acceptance
Structure Backfill (Section 00450.46)	*Material and Operation must meet the requirements of Section 00510.48(d)*							
SECTION 00459 - CAST IN PLACE CONCRETE								
Concrete	*Material must meet the requirements of Section 00540, with acceptance in accordance with Section 00540.17*					*Contractor Provided Testing*	*Contractor Provided Testing*	Review Documentation for Acceptance
Backfill Material	*Material must meet the requirements of Section 00405.14 and be incorporated into the project in accordance with Section 00405.46*					*Contractor Provided Testing*	*Visual*	

Same Frequency for all Tests (Minimums)

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
						Quality Control		Quality Assurance
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
		ODOT	WAQTC	AASHTO				
SECTION 00460 - PAVED CULVERT END SLOPES								
Commercial Grade Concrete	*Material must meet the requirements of Section 00440*					*Contractor Provided Testing*	*Contractor Provided Testing*	Review Documentation for Acceptance
SECTION 00470 - MANHOLES, CATCH BASINS AND INLETS								
Commercial Grade Concrete	*Material must meet the requirements of Section 00440*					*Contractor Provided Testing*	*Visual*	Review Documentation for Acceptance
Base Drain Backfill	*Material must meet the requirements of Section 00470.17*							
Excavation, Backfill and Foundation Stabilization	*Material must meet the requirements of Section 00405*							
SECTION 00480 - DRAINAGE CURBS								
Commercial Grade Concrete	*Material must meet the requirements of Section 00440*					*Contractor Provided Testing*	*Visual*	Review Documentation for Acceptance
Dense Graded HMAC Mixture	*Material must meet the requirements of Section 00740*							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
						Same Frequency for all Tests (Minimums)		
SECTION 00490 - WORK ON EXISTING SEWERS AND STRUCTURES								
Commercial Grade Concrete	*Material must meet the requirements of Section 00440*					*Contractor Provided Testing*	*Visual*	Review Documentation for Acceptance
High Early Strength Concrete	*Material must meet the requirements of Section 00440, but cement contents adjusted according to 00490.11*							
Backfill Operations	*Backfill Excavations according to section 405*							
Filling Abandoned Pipes, Manholes and Catch Basins (See section 00490.44)								
Backfill Operations (Roadway)	*Material must meet the requirements of Section 2630*					*Contractor Provided Testing*	*Visual*	Review Documentation for Acceptance
Establishing Maximum Density	*Density Curve*			(1) *T 99*				
(1) *Method "A"*	*Specific Gravity of Coarse Aggregates Coarse Particle Correction*	*TM 223*		*T 85*	*3468 B*			
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793B*	*1 Test per 100 ft. and every 1.5' of Fill*	*Visual*	
Backfill Operations Landscaped or Unimproved Roadways	*Material must meet the requirements of Section 00330.13*					Contractor Provided Testing	*Visual*	Review Documentation for Acceptance
Top 1.0' of Backfill Region	*Material must meet the requirements of Section 00330.11*							
SECTION 00495 - TRENCH RESURFACING								
Resurfacing Materials	*See Section 00495.40 for Material Requirements*					Contractor Provided Testing	*Visual*	Review Documentation for Acceptance

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00510 - STRUCTURE EXCAVATION AND BACKFILL								
Soils, Soil/Aggregate Mixtures and Graded Aggregates								
					A Sublot equals 1000 Tons			
Granular Structure Backfill (See Section 02630.10) (1) *Perform a minimum of 3 tests QL's required*	*Sampling Aggregates* *Reducing Aggregates* (1) *Sieve Analysis* *Fracture (Method 1)* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 335* *T 176*	*1792*	*1/Sublot (Minimum 1/Project)*	***Requires Signed and Notarized Statement of Compliance From Contractor For All Items Under Section 00500***	*Review Documentation for Acceptance*
Product Compliance	*Abrasion* *Degradation* *Plasticity Index* *Sieve Analysis*	*TM 208*		*T 96* *T 90* *T 11*	*4000*	*Contractor Provided Testing*	*Minimum 1 per Project*	
Establishing Maximum Density (2) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Density Curve* *Specific Gravity of Coarse Aggregates* *Coarse Particle Correction*			(2) *T 99* *T 85* *T 99*	*3468* *3468*	*1/Soil type or Aggregate Gradation*	*Visual*	
Compaction	*Nuclear Density Soils/Aggregates*			*T 310*	*1793B*	*Min of 1 per lift*	*Visual*	*Review Documentation for Acceptance*
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00510 - STRUCTURE EXCAVATION AND BACKFILL (CONTINUED)								
Soils, Soil/Aggregate Mixtures and Graded Aggregates						A Sublot equals 1,000 Tons		
Granular Wall Backfill (See Section 02630.11)	*Sampling Aggregates* *Reducing Aggregates* *(1) Sieve Analysis* *Fracture (Method 2)*			*R 90* *R 76* *T 27* *T 335*	*1792*	*1/Sublot (Minimum 1/Project)*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
(1) Perform a minimum of 3 tests QL's required								
Product Compliance	*Abrasion* *Degradation*	*TM 208*		*T 96*	*4000*	*Contractor Provided Testing*	*Minimum 1 per Project*	
(2) Compaction	*(2) Deflection Testing*	*TM 158*			*1793B*	*1/Sublot (Minimum 1/Project)*	*Visual*	*Review Documentation for Acceptance*
Note: Compaction must meet the requirements of section 00330.43c	***Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.***							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
						Same Frequency for all Tests (Minimums)		
SECTION 00512 - DRILLED SHAFTS								
Aggregate Production								
					A Sublot equals 1000 Mg or 1000 Tons			
[1] QAE may waive after 5 sublots/shifts	Sampling Aggregates			R 90		Contractor Provided Testing	Contractor Provided Testing	Review Documentation for Acceptance
	Reducing Aggregates			R 76				
	[2][3][4] Sieve Analysis			T 27/T 11	1792			
[2] Perform a minimum of 3 tests QL's required	[4] Fineness Modulus			T 27/T 11				
	[1][3] Wood Particles	TM 225						
	[4] Sand Equivalent			T 176				
[3] Coarse Aggregate (See Section 02690.20)	Soundness			T 104	4000	Contractor Provided Testing	Contractor Provided Testing	
	Abrasion			T 96				
	Degradation	TM 208						
[4] Fine Aggregate (See Section 02690.30)	Lightweight Pieces			T 113				
	Organics			T 21	4000			
	[3] Dry Rodded Unit Weight			T 19	1825 1825C	Minimum of 1 per Project	Minimum of 1 per Project	Review Documentation for Acceptance
	[3] Specific Gravity of Coarse Aggregate			T 84	1825			
	[4] Specific Gravity of Fine Aggregate			T85				

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
					Same Frequency for all Tests (Minimums)			
SECTION 00512 - DRILLED SHAFTS (CONTINUED)								
Portland Cement Concrete					*A Sublot equals 100 yd3*			
	Sampling Concrete		*TM 2*					
	Slump of Concrete			*T 119*	*3573WS or 4000C*	*1 per Sublot, minimum 1 per mix design & shaft*	*1 per Sublot, minimum 1 per mix design & shaft*	*Review Documentation for Acceptance*
	Concrete Temperature			*T 309*				
	Density (Unit Weight) of Concrete			*T 121*				
	Yield			*T 121*				
	Water/Cement Ratio			*T 121*				
(S) ASTV based on a minimum of 3 Cylinders	*Fabrication of Concrete Cylinders/Beams*			R 100	*4000C*			
	Compressive Strength of Concrete (S)			T22				
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials	*Materials listed on batch ticket must match approved design*							*Review Documentation for Acceptance*

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: ASTM	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00535 - POST-INSTALLED ANCHOR SYSTEMS								
Resin Bonded Anchor System						A Sublot equals 50 Anchors		
Anchor Bolts, reinforcing steel and resin (Polyester, vinyl ester or epoxy)	*Materials must meet the requirements of Section 00535.10*							
Anchor Installation								
Demonstration Testing (See Section 00535.45(a))	*Strength of Anchors in Concrete Elements*		*E 488*		*5189*	*One demonstration Test includes 3 anchors (Resin shall be from same lot)*		*Visual*
Production Testing (See Section 00535.45(b))	*Strength of Anchors in Concrete Elements*		*E 488*		*5189*	*(A) 1 Anchor/Sublot or portion thereof (Minimum 1/Shift)*		*Visual per Sublot*

(A) ***Anchor testing is required per critical element identified in the Special Provisions or Plan Drawings.***

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method ASTM	Test Method AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) – Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00535 - POST-INSTALLED ANCHOR SYSTEMS (continued)								
Mechanical Anchor System						A Sublot equals 50 Anchors		
Mechanical Anchors	*Materials must meet the requirements of Section 00535.10(b)*							
Anchor Installation								
Demonstration Testing (See Section 00535.45(a))	*Strength of Anchors in Concrete Elements*		*E 488*		*5292*	*One demonstration Test includes 3 anchors*		*Visual*
Production Testing (See Section 00535.45(b))	*Strength of Anchors in Concrete Elements*		*E 488*		*5292*	*(A) 1 Anchor/Sublot or portion thereof (Minimum 1/Shift)*		*Visual per Sublot*

(A) ***Anchor testing is required per critical element identified in the Special Provisions or Plan Drawings.***

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
					Same Frequency for all Tests (Minimums)			
SECTION 00540 - CONCRETE BRIDGES								
Aggregate Production								
					A Sublot equals 1000 Mg or 1000 Tons			
(1) QAE may waive after 5 sublots/shifts (2) Perform a minimum of 3 tests	*Sampling Aggregates* *Reducing Aggregates* (2)(3)(4) *Sieve Analysis* (4) *Fineness Modulus* (1)(3) *Wood Particles* (4) *Sand Equivalent*	*TM 225*		*R 90* *R 76* *T 27/T 11* *T 27/T 11* *T 176*	*1792*	*Contractor Provided Testing*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
(3) *Coarse Aggregate (See Section 02690.20)* (4) *Fine Aggregate (See Section 02690.30)*	*Soundness* *Abrasion* *Degradation* *Lightweight Pieces* *Organics*	*TM 208*		*T 104* *T 96* *T 113* *T 21*	*4000*	*Minimum 1 per Project*	*Minimum 1 per Project*	
	(3) *Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Contractor Provided Testing Minimum 1 per Project*	*Contractor Provided Testing Minimum 1 per Project*	
	(3) *Specific Gravity of Coarse Aggregate* (4) *Specific Gravity of Fine Aggregate*			*T 85* *T 84*	*1825*			*Review Documentation for Acceptance*

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00540 - CONCRETE BRIDGES (CONTINUED)								
Portland Cement Concrete								
					A Sublot equals 100 yd³			
[1] AASHTO T 196 required for lightweight concrete	*Sampling Concrete* *[1] Air Content of Concrete* *Slump of Concrete* *Concrete Temperature* *Density (Unit Weight) of Concrete* *Yield* *Water/Cement Ratio*		*TM 2*	*T 152* *T 119* *T 309* *T 121* *T 121* *T 121*	*3573WS or 4000C*	*1 per Sublot per Mix Design, minimum 1 per day*	*1 per Sublot per Mix Design, minimum 1 per day*	*Review Documentation for Acceptance*
[S] ASTV based on a minimum of 3 Cylinders	*Fabrication of Concrete Cylinders/Beams* *Compressive Strength of Concrete [S]*			*R 100* *T22*	*4000C*			
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials Synthetic Fiber Reinforcing	*Materials listed on batch ticket must match approved design*							*Review Documentation for Acceptance*

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
						Same Frequency for all Tests (Minimums)		
SECTION 00556 - MULTI-LAYER POLYMER CONCRETE OVERLAY								
Aggregate Production								
	Moisture Content of Aggregate & Soil			*T 255/265*	*1792*	*At time of mixing the polymer resin. See 00556.10-b.*		
						Contractor Provided Testing	*Contractor Provided Testing*	*Review Documentation for Acceptance*
Polymer Resin	*Material must meet the requirements of section 00556.10*							*Review Documentation for Acceptance*

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00557 - PREMIXED POLYMER CONCRETE OVERLAYS								
Resin Primer	*Material must meet the requirements of section 00557.10*					*Contractor Provided Testing*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
Polyester Resin Binder Including (Initiator, Accelerators & Inhibitors) Product Compliance	*Material must meet the requirements of section 00557.12 (a-c)*							
(Submitt 2- 50 lb. samples of blended aggregate (00557.02)during the trial overlay). See Section 00557.12(d)	*Specific Gravity of Coarse Aggregate* *Specific Gravity of Fine Aggregate* *Sieve Analysis* *Moisture Content of Aggregate & Soil* *Fracture (Method 1)*			*T 85* *T 84* *T 27/T 11* *T 255/265* *T 335*	*4000*	*1/Project or Source*	*1/Project or Source*	
	Moisture Content Sieve Analysis			*T 255/265* *T 27/11*	*1792*	*During the Trial Overlay Strip*	*During the Trial Overlay Strip*	
(1) See Section 00557.12(d)	*(1) Moisture Content* of Aggregate & Soils			*T 255/265*		*During Production*		*Review Documentation for Acceptance*
Surface Texture Sand (see section 00557.12(e))	Sieve Analysis			T 27/11	*1792*	*Contractor Provided Testing*	*Contractor Provided Testing*	
Premixed Polymer Concrete	*Density (Unit Weight) of Concrete*			*T 121*	*3573WS*	*(B) 1/Batch*	*(B) 1/Batch*	
	Static Modulus of Elasticity	*TM 759*			*4000C*	*(M) Minimum 1 set/batch*	*(M) Minimum 1 set/batch*	
(M) 1 set Represents a minimum of 3 (4"x8") cylinders cast per 00557.44(e). *(2) Submit to ODOT - CML* *(B) Batch is defined "Per Mixer or Portion placed".*						*(2) 1 set per 10 batches placed or minimum 1 set/day*	*(2) 1 set per 10 batches placed or minimum 1 set/day*	*Review Documentation for Acceptance*

Same Frequency for all Tests (Minimums)

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00559 - STRUCTURAL CONCRETE OVERLAYS								
Aggregate Production					A Sublot equals 500 Tons. A minimum one per shift, whichever results in the greatest sampling frequency. (For preproduced aggregates, 1 shift shall mean 500 Tons.)			
[1] *QAE may waive after 5 sublots/shifts*	*Sampling Aggregates*			*R 90*		*Contractor Provided Testing*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*				
[2] *Perform a minimum of 3 tests, QL's required*	[2][3][4] *Sieve Analysis*			*T 27/T 11*	*1792*			
[3] *Coarse Aggregate (See Section 02690.20)*	[4] *Fineness Modulus*			*T 27/T 11*				
[4] *Fine Aggregate (See Section 02690.30)*	[4] *Sand Equivalent*			*T 176*	*1792*			
	[1][3] *Wood Particles*	*TM 225*			*1792*			
	Abrasion			*T 96*	*4000*	*Minimum 1 Per Project*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
	Soundness			*T 104*				
	Lightweight Pieces			*T 113*				
	Organics			*T 21*	*4000*			
	[3] *Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*	*Start of production and when changes in aggregate occurs*	*Review Documentation for Acceptance*
	[3] *Specific Gravity of Coarse Aggregate*			*T 85*	*1825*			
	[4] *Specific Gravity of Fine Aggregate*			*T 84*				

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00559 - STRUCTURAL CONCRETE OVERLAYS (CONTINUED)								
Portland Cement Concrete					A sublot equals 20 yd3			
[1] *AASHTO T 196 required for lightweight concrete*	*Sampling Concrete* [1] *Air Content of Concrete* *Slump of Concrete* *Concrete Temperature* *Density (Unit Weight) of Concrete* *Yield* *W/C Ratio*		*TM 2*	*T 152* *T 119* *T 309* *T 121* *T 121* *T 121*	*3573WS or 4000 C*	*1 per Sublot per mix design, minimum 1 per day*	*1 per Sublot per mix design, minimum 1 per day*	*Review Documentation for Acceptance*
(S) ASTV based on a Minimum of 3 Cylinders	*Fabrication of Concrete Cylinders/Beams* *Compressive Strength of Concrete* (S)			*R 100* *T 22*	*4000C*			*Review Documentation for Acceptance*
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials Synthetic Fiber Reinforcing	*Materials listed on batch ticket must match approved design*							*Review Documentation for Acceptance*
SECTION 00590 - POLYMER MEMBRANE								
Broadcast Aggregate	*Moisture Content of Aggregates & Soils*			*T 255/265*	*1792*	*Test at time of packaging and shipment. See Section 00590.10-c*	*Test at time of packaging and shipment. See Section 00590.10-c*	*Review Documentation for Acceptance*
	Moisture Content of Aggregates & Soils			*T 255/265*	*1792*	*Field Test at time of Mixing Polymer Resin. See Section 00590.10-c*	*Field Test at time of Mixing Polymer Resin. See Section 00590.10-c*	

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
						Same Frequency for all Tests (Minimums)		
SECTION 00596A - MECHANICALLY STABILIZED EARTH RETAINING WALLS								
Aggregate Production								
Gravel Leveling Pads Backfill *(See Section 02630.10)*	*Abrasion* *Degradation*	*TM 208*		*T 96*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
					A Sublot equals 1,000 Tons Minimum 1/Project			
	Sampling Aggregates *Reducing Aggregates* *Sieve Analysis* *Un-washed* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*1/Sublot*	*Visual*	*Review Documentation for Acceptance*
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*		
					Testing Frequency for Product Compliance per Source 1/5,000 Tons Minimum 1/Project			
[3] Modular Block Core and Drainage *Backfill* *(Product Compliance)*	*Soundness* *Abrasion* *Degradation* *Lightweight Pieces*	*TM 208*		*T 104* *T 96* *T 113*	*4000* *4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
[3] (See Section 2690.20(a) thru 2690.20(d) & 2690.20(f)								
					A Sublot equals 1,000 Tons			
[3] Modular Block Core and Backfill *[1] QAE may waive after 5 sublots/shifts* *[2] Perform a minimum of 3 tests, QL's required*	*Sampling Aggregates* *Reducing Aggregates* *[2] Sieve Analysis* *[1] Wood Particles* *Fracture (Method 2)* *Elongated Pieces*	*TM 225* *TM 229*		*R 90* *R 76* *T 27/T 11* *T 335*	*1792* *1792*	*1/Sublot or Minimum 1 Per Project*	*Visual*	*Review Documentation for Acceptance*
Pipe Drain Backfill *(Product Compliance)* *(See Section 00430.11)*	*Abrasion* *Degradation*	*TM 208*		*T 96*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Sieve Analysis *Un-washed*			*T 27*	*4000*	*1/Sublot*	*Visual*	

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00596A - MECHANICALLY STABILIZED EARTH RETAINING WALLS								
Aggregate Production						Testing Frequency for Product Compliance per Source 1/5000 Tons Minimum 1/Project		
Gabion Basket Fill *(Product Compliance)* *(See Section 00390.11(b))*	*Degradation* *Soundness* *Specific Gravity of Coarse Aggregates*	*TM 208*		*T 104* [(1)] *T 85*	*4000* *1825*	*Contractor Provided Testing*	*Minimum 1 per Project*	*Review Documentation for Acceptance*
	Gradation					*1/Sublot (Minimum 1/Project)*	*Visual*	

[(1)] *Apparent Specific Gravity and Absorption*

Same Frequency for all Tests (Minimums)

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
					Same Frequency for all Tests (Minimums)			
SECTION 00596A - MSE RETAINING WALLS								
Aggregate Production					Testing Frequency for Product Compliance per Source 1/5000 Tons Minimum 1/Project			
MSE Granular Wall Backfill *(Product Compliance)* *(Also reference 02630.10)*	*Abrasion* *Degradation* *Sieve Analysis* *Plasticity Index* *pH of Soil* *Soil Resistivity* *Organic Content*	*TM 208*		*T96* *T 11* *T 90* *T 289* *T 288* *T 267*	*4000* *4000*	*Contractor Provided Testing*	*Minimum 1 per Project*	*Review Documentation for Acceptance*
					A Sublot Equals or 2000 Tons			
MSE Granular Wall Backfill [(1)] *Perform a minimum of 3 tests, QL's required*	*Sampling Aggregates* *Reducing Aggregates* [(1)] *Sieve Analysis Un-Washed* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*1/Sublot (Minimum 1/Project)*	*Visual*	*Review Documentation for Acceptance*
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*	*Visual*	
Placement Establishing Maximum Density [(2)] Method A	*Density Curve* *Specific Gravity of Coarse Aggregates* *Agg. Base Coarse Particle Correction*	*TM 223*		[(2)] *T 99* *T 85*	*3468* *3468*	*1/Aggregate Gradation/Per Source*	*Visual*	
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793B*	*1/100 yd^3 (Minimum 1/day)*	*Visual*	*Review Documentation for Acceptance*
	Deflection Testing	*TM 158*			*1793B*	*1 per layer*	*Visual*	
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00596B - PREFABRICATED MODULAR RETAINING WALLS						Same Frequency for all Tests (Minimums)		
Aggregate Production								
Gravel Leveling Pads Backfill (See Section 02630.10)	Abrasion Degradation	TM 208		T96	4000	Contractor Provided Testing	Minimum 1 Per Project	Review Documentation for Acceptance
						A Sublot equals 1000 Tons Minimum 1/Project		
	Sampling Aggregates Reducing Aggregates Sieve Analysis Un-Washed Sand Equivalent			R 90 R 76 T 27 T 176	1792	1/Sublot	Visual	Review Documentation for Acceptance
	Fracture (Method 1)			T 335	1792	1/5 Sublots	Visual	
						Testing Frequency for Product Compliance per Source 1/5000 Tons Minimum 1/Project		
(3) Modular Block Core and Backfill (Product Compliance) (3) (See Section 2690.20(a) thru 2690.20(d) & 2690.20(f)	Soundness Abrasion Degradation Lightweight Pieces	TM 208		T 104 T 96 T 113	4000 4000	Contractor Provided Testing	Minimum 1 Per Project	Review Documentation for Acceptance
						A Sublot equals 1000 Tons		
(3) Modular Block Core and Backfill (1) QAE may waive after 5 sublots/shifts (2) Perform a minimum of 3 tests, QL's required	Sampling Aggregates Reducing Aggregates (2) Sieve Analysis (1) Wood Particles Fracture (Method 2) Elongated Pieces	 TM 225 TM 229		R 90 R 76 T 27/T 11 T 335	 1792 1792	1/Sublot (Minimum 1 Per Project)	Visual	Review Documentation for Acceptance
Pipe Drain Backfill (Product Compliance) (See Section 00430.11)	Abrasion Degradation	TM 208		T 96	4000	Contractor Provided Testing	Minimum 1 Per Project	Review Documentation for Acceptance
	Sieve Analysis Un-Washed			T27	4000	1/Sublot	Visual	

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00596B - PREFABRICATED MODULAR RETAINING WALLS								
Aggregate Production					Testing Frequency for Product Compliance per Source 1/5000 Tons Minimum 1/Project			
Gabion Basket Fill *(Product Compliance)* *(See Section 00390.11(b))*	*Degradation*	*TM 208*			*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Soundness			*T 104*				
	Specific Gravity of Coarse Aggregates			[(1)] *T 85*	*1825*			
[(1)] *Apparent Specific Gravity and Absorption*								
	Gradation					*1/Sublot*	*Visual*	

Same Frequency for all Tests (Minimums)

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) — Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00596B - PREFABRICATED MODULAR RETAINING WALLS								
Aggregate Production					Testing Frequency for Product Compliance per Source 1/5000 Tons Minimum 1/Project			
Retaining Wall Granular Backfill *(Product Compliance)* *(Also reference 02630.10)*	*Abrasion*			*T96*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
	Sieve Analysis			*T 11*				
	Plasticity Index			*T 90*	*4000*			
					A Sublot Equals 2000 Tons			
Retaining Wall Granular Backfill	*Sampling Aggregates*			*R 90*		1/Sublot (Min. 1 Per Project)	*Visual*	*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*				
(1) Perform a minimum of 3 tests, QL's required	*(1) Sieve Analysis Un-Washed*			*T 27*	*1792*			
	Sand Equivalent			*T 176*				
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*	*Visual*	
Placement								
Establishing Maximum Density	*Density Curve*			*(2) T 99*	*3468*	*1/Aggregate Gradation/Per Source*	*Visual*	*Review Documentation for Acceptance*
(2) Method A	*Specific Gravity of Coarse Aggregates*			*T 85*				
	Agg. Base Coarse Particle Correction	*TM 223*			*3468*			
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793B*	*1/100 yd^3 (Minimum 1/day)*	*Visual*	
	Deflection Testing	*TM 158*			*1793B*	*1 per layer*	*Visual*	
	Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.							

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00596C - CAST-IN-PLACE CONCRETE RETAINING WALLS								
Aggregate Production								
Pipe Drain Backfill (Product Compliance) (See Section 00430.11)	*Abrasion Degradation*	*TM 208*		*T 96*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Sampling Aggregates Reducing Aggregates			*R 90 R 76*				
	Sieve Analysis Un-Washed			*T27*	*4000*	*1/Sublot*	*Visual*	
Retaining Wall Granular Backfill					Testing Frequency for Product Compliance per Source 1/5000 Tons Minimum 1/Project			
Retaining Wall Granular Backfill *(Product Compliance) (Also reference 02630.10)*	*Abrasion Degradation*	*TM 208*		*T96*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Sieve Analysis Plasticity Index			*T 11 T 90*	*4000*			
					A Sublot Equals 2000 Tons			
Retaining Wall Granular Backfill	*Sampling Aggregates Reducing Aggregates*			*R 90 R 76*		*1/Sublot*	*Visual*	*Review Documentation for Acceptance*
(1) Perform a minimum of 3 tests, QL's required	*(1) Sieve Analysis Un-Washed*			*T 27*	*1792*			
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*	*Visual*	

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00596C - CAST-IN-PLACE CONCRETE RETAINING WALLS								
Placement								
Retaining Wall Granular Backfill								
Establishing Maximum Density	*Density Curve*			*[1] T 99*	*3468*	*1/Aggregate Gradation/Per Source*	*Visual*	*Review Documentation for Acceptance*
[1] Method A	*Specific Gravity of Coarse Aggregates*			*T 85*				
	Agg. Base Coarse Particle Correction	*TM 223*			*3468*			
Compaction	*Nuclear Density of Soils/Aggregates*			*T 310*	*1793B*	*1/100 yd^3 (Minimum 1/day)*	*Visual*	*Review Documentation for Acceptance*
	Deflection Testing	*TM 158*			*1793B*	*1 per layer*	*Visual*	

Contractor must demonstrate, by compaction testing or acceptable visual means, that the material, equipment, and process used for compaction achieves the specification requirements. If the material, equipment, or process changes, or if other conditions indicate a non-specification product, the Contractor must re-demonstrate that specification requirements are being achieved.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00635 - GRID-ROLLED AGGREGATE SUBBASE								
Aggregate Subbase Grading *(See 00635.10)*	Abrasion			*T 96*	*4000*	*Contractor Provided Testing*	***Requires Signed and Notarized Statement of Compliance From Contractor For All Items Under Section 00600***	*Review Documentation for Acceptance*
	Sampling Aggregates *Reducing Aggregates* *Sieve Analysis* *Un-Washed* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*Contractor Provided Testing*		*Review Documentation for Acceptance*

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) – Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00641 - AGGREGATE SUBBASE, BASE, AND SHOULDERS								*Review Documentation for Acceptance*
Aggregate Production	*Abrasion*			*T 96*	*4000*	*Contractor Provided Testing*	Submit Required Documentation	
Aggregate Subbase *Grading* *(See 00641.10(b))*	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis Un-Washed* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*Contractor Provided Testing*	Submit Required Documentation	*Review Documentation for Acceptance*
Aggregate Base and Shoulders	*Abrasion* *Degradation*	*TM 208*			*4000*	*Minimum 1 per Project*	Submit Required Documentation	*Review Documentation for Acceptance*
					A Sublot equals 2000 Tons			
Grading *Aggregate Base (See 02630)* *Aggregate Shoulder (See 02640)* *Open Graded Aggregate Base (See 02630.11)*	*Sampling Aggregates* *Reducing Aggregates* *(1) Sieve Analysis Un-Washed* *(2) Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*Contractor Provided Testing*	Submit Required Documentation	*Review Documentation for Acceptance*
(1) Perform at least 3 tests *(2) May be waived by QAE*	*Fracture (Method 1)*			*T 335*	*1792*	*Contractor Provided Testing*		*Review Documentation for Acceptance*
PLACEMENT Aggregate Base *Plant Mix Applications Only*					*A Sublot equals 2000 Tons*			
Aggregate (Mixture)	*Sampling Aggregates* *Reducing Aggregates* *Moisture Content of Aggregates & Soils*			*R 90* *R 76* *T 255 &* *T 265*	*1792*	*1/Sublot or minimum 1per day*	*Visual*	*Review Documentation for Acceptance*
Establishing Maximum Density & Optimum Moisture (Mix Design) (3) Method A	*Density Curve* *Agg. Base Coarse Particle Correction* *Specific Gravity of Coarse Aggregates*	*TM 223*		*(3) T 99* *T 85*	*3468*	*Each Size Per Source*	*Visual*	*Review Documentation for Acceptance*
Compaction					*A Compaction Sublot Equals 400 Tons*			
(D) **(Individual tests must meet Specification)**	*Deflection Testing* *Nuclear Density of Soils/Aggregates*	*TM 158*		*T310*	*1793B*	*(D) 1 per Sublot*	*Visual*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00641 - AGGREGATE SUBBASE, BASE, AND SHOULDERS (Continued)								
Placement								
Aggregate Subbase								
Compaction	*Deflection Testing*	*TM 158*			*1793 B*	*1 per Layer*	*Visual*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
						Same Frequency for all Tests (Minimums)		
SECTION 00680 - STOCKPILED AGGREGATES								
Aggregate Base and Shoulders *(See Section 00641)*	*Abrasion*			*T 96*	*4000*	*Minimum 1 per Source/Project*	*Visual*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
					A Sublot equals 2,000 Tons			
(1) Perform at least 3 tests	*Sampling Aggregates*			*R 90*		*Contractor Provided Testing*	*Visual*	*Review Documentation for Acceptance*
(2) May be waived by QAE	*Reducing Aggregates*			*R 76*				
	(1) Sieve Analysis Un-Washed			*T 27*	*1792*			
	(2) Sand Equivalent			*T 176*				
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*	Visual	
Aggregate (Sanding Aggregate)								
					A Sublot equals 1000 Tons			
	Sampling Aggregates			*R 90*		*Contractor Provided Testing*	*Visual*	*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*				
	(1) Sieve Analysis Un-Washed			*T 27*	*1792*			
(3) May be waived by QAE	*(3) Cleanness Value*	*TM 227*						
	Abrasion			*T 96*	*4000*	*Minimum 1 per Source/Project*	Visual	
	Degradation	*TM 208*						
	Lightweight Pieces			*T 113*	*4000*			
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots & Start of Production*	Visual	*Review Documentation for Acceptance*
	Elongated Pieces	*TM 229*						
	Wood Particles	*TM 225*			*1792*			

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00680 - STOCKPILED AGGREGATES (CONTINUED)								
Emulsified AC Aggregate								
Aggregate Production					*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*			
(See Sections 00705, 00706, 00710, 00711, 00712 and 00715)	*Abrasion*			*T 96*	*4000*	*Minimum 1 per Source/Project*	Visual	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
	Soundness			*T 104*				
	Lightweight Pieces			*T 113*				
[1] QAE may waive after 5 sublots/shifts	*Dry Rodded Unit Weight*			*T 19*	*4000*			
	Sampling Aggregates			*R 90*		*Contractor Provided Testing*	Visual	
	Reducing Aggregates			*R 76*				
[2] QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated	*[5] Fracture*			*T 335*	*1792*			
	[1] Wood Particles	*TM 225*						
	[1][4] Elongated Piece	*TM 229*						
	[2] Sieve Analysis			*T27/T 11*				
[3] May be waived by QAE	*[3] Cleanness Value*	*TM 227*			*1792*			
	Dry Rodded Unit Weight			*T 19*	1825 1825C	*Start of production and when changes in aggregate occurs*	Visual	*Review Documentation for Acceptance*
[4] Not required for Dry Key Material								
[5] 1/5 Sublots & Start of Production								
Aggregate (Other)		*Use sampling and testing frequencies required for proposed end product use*						

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) — Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00705 - ASPHALT PRIME COAT and EMULSIFIED ASPHALT FOG COAT								
Aggregate Production						*A sublot equals 1000 Tons. A minimum 1 per shift*		
Aggregate Cover Material	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis* *Un-Washed*			*R 90* *R 76* *T 27*	*1792*	*Provide Process Control*	***Requires Signed and Notarized Statement of Compliance From Contractor For All Items Under Section 00700***	*Review Documentation for Acceptance*
Asphalt Prime and Fog Coat Asphalt Cement *(Emulsion)*	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*		*Review Documentation for Acceptance*
SECTION 00706 - EMULSIFIED ASPHALT SLURRY SEAL SURFACING								
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*		
	Sampling Aggregates *Reducing Aggregates* [(1)] *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*1792*	*Provide Process Control*	*Visual*	*Review Documentation for Acceptance*
Emulsified Asphalt Cement *Emulsified Asphalt* *Polymer Modified Emulsion*	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Visual*	
Additives *Mineral Filler*	*Material must meet the requirements of Section 00706.13*						*Visual*	
Mixture	*Material must meet the requirements of Section 00706.16*						*Visual*	*Review Documentation for Acceptance*

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00710 - SINGLE APPLICATION EMULSIFIED ASPHALT SURFACE TREATMENT						Same Frequency for all Tests (Minimums)		
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*		
	Abrasion			*T 96*	*4000*	*Contractor Provided Testing*	*Contractor Provided Testing Minimum 1 per Project*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
	Soundness			*T 104*				
	Lightweight Pieces			*T 113*				
	Dry Rodded Unit Weight			*T 19*	*4000*			
(1) QAE may waive after 5 sublots/shifts	*Sampling Aggregates*			*R 90*		*1 per Sublot*	*Visual*	*Review Documentation for Acceptance*
(2) Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated	*Reducing Aggregates*			*R 76*				
	(5) Fracture			*T 335*	*1792*			
	(1) Wood Particles	*TM 225*						
	(1)(4) Elongated Piece	*TM 229*						
	(2) Sieve Analysis			*T27/T 11*				
(3) May be waived by QAE	*(3) Cleanness Value*	*TM 227*			*1792*			
	Dry Rodded Unit Weight			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*	Visual	
(4) Not required for Dry Key Material *(5) 1/5 Sublots & Start of Production*								
Asphalt Cement *(Emulsion)*	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00710.10 and 710.15, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00710.10 and 710.15 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 2500 Tons".
b. One Per sublot means "One Set of Tests Per 500 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00711 - PRE-COATED AGGREGATE ASPHALT SURFACE TREATMENT								
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*		
	Abrasion			*T 96*	*4000*	*Contractor Provided Testing*	*Contractor Provided Testing Minimum 1 per Project*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
	Soundness			*T 104*				
	Lightweight Pieces			*T 113*				
	Dry Rodded Unit Weight			*T 19*	*4000*			
(1) QAE may waive after 5 sublots/shifts	*Sampling Aggregates*			*R 90*		*1 per Sublot*	*Visual*	*Review Documentation for Acceptance*
(2) Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated	*Reducing Aggregates*			*R 76*				
	(5) *Fracture*			*T 335*	*1792*			
	(1) *Wood Particles*	*TM 225*						
	(1)(4) *Elongated Piece*	*TM 229*						
	(2) *Sieve Analysis*			*T 27/T 11*				
(3) May be waived by QAE	(3) *Cleanness Value*	*TM 227*			*1792*			
	Dry Rodded Unit Weight			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*	Visual	
(4) Not required for Dry Key Material								
(5) 1/5 Sublots & Start of Production								
Asphalt Cement *(Emulsion)*	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00711.10 and 711.15, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00711.10 and 711.15 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 2500 Tons".
b. One Per sublot means "One Set of Tests Per 500 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
						Same Frequency for all Tests (Minimums)		
SECTION 00711 - PRE-COATED AGGREGATE ASPHALT SURFACE TREATMENT (CONTINUED)								
Mixture Acceptance						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*		
Meter Method	*Readings backed by Tank Measure & Production Records Daily*	*TM 321* *(1) TM 322*			*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
					2043 and 2401	*Daily Production*	*Production Control Testing*	
(1) ACP Plant Calibration Required at start of Production and if Meters Fail to meet Specification	*Cold Feed Moisture*			T 255/265	*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	
Plant Discharge Moisture	*ACP Moisture Content*			*T 329*	*2277*	*1/Sublot*	*Production Control Testing*	
Asphalt Cement	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/50 Tons Submit All*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	WAQTC	AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00712 - DRY KEY EMULSIFIED ASPHALT SURFACE TREATMENT						Same Frequency for all Tests (Minimums)		
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*		
	Abrasion			*T 96*	*4000*	*Contractor Provided Testing*	*Contractor Provided Testing Minimum 1 per Project*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
	Soundness			*T 104*				
	Lightweight Pieces			*T 113*				
	Dry Rodded Unit Weight			*T 19*	*4000*			
(1) QAE may waive after 5 sublots/shifts	*Sampling Aggregates*			*R 90*		*1 per Sublot*	*Visual*	*Review Documentation for Acceptance*
(2) Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated	*Reducing Aggregates*			*R 76*				
	(5) Fracture			*T 335*	*1792*			
	(1) Wood Particles	*TM 225*						
	(1)(4) Elongated Piece	*TM 229*						
	(2) Sieve Analysis			*T 27/T 11*				
(3) May be waived by QAE	*(3) Cleanness Value*	*TM 227*			*1792*			
	Dry Rodded Unit Weight			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*	Visual	
(4) Not required for Dry Key Material								
(5) 1/5 Sublots & Start of Production								
Asphalt Cement *(Emulsion)*	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00712.10 and 712.15, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00712.10 and 712.15 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 2500 Tons".
b. One Per sublot means "One Set of Tests Per 500 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00715 - MULTIPLE APPLICATION EMULSIFIED ASPHALT SURFACE TREATMENT								
Aggregate Production						*A sublot equals 500 Tons. A minimum 1 per shift, whichever results in the greatest sampling frequency*		
	Abrasion			*T 96*	*4000*	*Contractor Provided Testing*	*Contractor Provided Testing Minimum 1 per Project*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
	Soundness			*T 104*				
	Lightweight Pieces			*T 113*				
	Dry Rodded Unit Weight			*T 19*	*4000*			
(1) QAE may waive after 5 sublots/shifts	*Sampling Aggregates*			*R 90*		*1 per Sublot*	*Visual*	
(2) Perform at least 3 tests (QL's required), QAE may waive wet sieve after 5 sublots/shifts if a correlation to dry sieve can be demonstrated	*Reducing Aggregates*			*R 76*				
	(5) Fracture			*T 335*	*1792*			
	(1) Wood Particles	*TM 225*						
	(1)(4) Elongated Piece	*TM 229*						
	(2) Sieve Analysis			*T27/T 11*				
(3) May be waived by QAE	*(3) Cleanness Value*	*TM 227*			*1792*			
	Dry Rodded Unit Weight			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*	Visual	*Review Documentation for Acceptance*
(4) Not required for Dry Key Material								
(5) 1/5 Sublots & Start of Production								
Asphalt Cement *(Emulsion)*	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*
Preproduced Aggregate								

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00715.10 and 715.15, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00715.10 and 715.15 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 2500 Tons".
b. One Per sublot means "One Set of Tests Per 500 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00720 - COLD IN-PLACE RECYCLED ASPHALT CONCRETE PAVEMENT (CIR)								
SECTION 00721 - COLD RECYCLED EMULSIFIED ASPHALT CONCRETE PAVEMENT (CRP)								
Asphalt Cement (Emulsified Recycling Agent)	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*
Water	*Material must meet the requirements of Section 00340.10*						*Visual*	*Review Documentation for Acceptance*
						A Sublot equals 1000 Tons		
Aggregate Production Choke Aggregate *(See 00705)*	*Sampling Aggregates Reducing Aggregates Sieve Analysis Un-Washed*			*R 90 R 76 T 27*	*1792*	*Provide Process Control*	*Visual*	*Review Documentation for Acceptance*
SECTION 00725 - HOT IN-PLACE RECYCLED (HIR) ASPHALT CONCRETE PAVEMENT								
	The type of recycling agent will be listed in the Special Provisions							
Recycling Agent *(See 00745.11)*	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*
Recycling Agent	*Sampling Asphalt Materials*			*R 66*	*4000*			
Asphalt Concrete Mixture	*New Asphalt Concrete mixture will meet the requirements of Section 00744*							
SECTION 00730 - ASPHALT TACK COAT								
Tack	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
		Test Method				Quality Control		Quality Assurance
MATERIAL AND OPERATION	DESCRIPTION OF TEST	ODOT	WAQTC	AASHTO	FORM 734-	Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00735 - EMULSIFIED ASPHALT CONCRETE PAVEMENT								
Aggregate production								
	Abrasion *Degradation* *Soundness* *Lightweight Pieces*	*TM 208*		*T 96* *T 104* *T 113*	*4000* *4000*	*Contractor Provided Testing Minimum 1 per Project*	*Contractor Provided Testing Minimum 1 per Project*	*Review Documentation for Acceptance*
						A Sublot equals 1000 Tons. A minimum one per shift, whichever results in the greatest sampling frequency. (For preproduced aggregates, 1 shift shall mean 1000 Tons)		
(1) Perform at least 3 tests, QL's required *(2) May be waived by QAE* *(3) QAE may waive after 5 sublots/shifts*	*Sampling* *Reducing* *(1) Sieve Analysis* *(2) Cleanness Value* *Fracture* *(3) Elongated Pieces* *(3) Wood Particles*	 *TM 227* *TM 229* *TM 225*		*R 90* *R 76* *T 27/T 11* *T 335*	 *1792* *1792*	*1/Sublot*	*Visual*	*Review Documentation for Acceptance*
Choke Aggregate	*Sieve Analysis* *Un-Washed*			*T 27*	*1792*	*Provide Process Control*	*Visual*	

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00735 - EMULSIFIED ASPHALT CONCRETE PAVEMENT (CONTINUED)								
Mixture Acceptance						*A Sublot equals 1000 Tons of Mixture*		
	Sampling Aggregates *Reducing Aggregates* *Sieve Analysis* *Moisture Content of Aggregate & Soil*			*R 90* *R 76* *T 27/T 11* *T 255*	*2277*	*Provide Process Control*	*Visual*	*Review Documentation for Acceptance*
% Emulsified Asphalt	*Meter*	*TM 321*						
% Emulsified Asphalt [(1)] ***ACP Plant Calibration Required at start of Production and if Meters Fail to meet Specification***	*Readings backed by Tank Measure & Production Records Daily*	*TM 321* [(1)] *TM 322*			*2401 & 2043*	*Daily Production*	*Visual*	
Emulsified Asphalt Cement	*Sampling Asphalt Materials*			*R 66*	*4000*	*Provide Suppliers Certificate of Compliance*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*
SECTION 00740 - COMMERCIAL ASPHALT CONCRETE PAVEMENT (CACP)								
	See Specifications when Testing is Required by Agency					*Provide Process Control*	*Visual*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00743 - POROUS ASPHALT CONCRETE (PAC)								
Aggregate Production								
	Soundness *Abrasion* *Degradation* *Lightweight Pieces* *Plasticity Index*	*TM 208*		*T 104* *T 96* *T 113* *T 90*	*4000* *4000*	*Contractor Provided Testing Minimum 1 per Project*	*Contractor Provided Testing Minimum 1 per Project*	*Review Documentation for Acceptance*
[(1)] QAE may waive after 5 sublots/shifts						*A Sublot equals 1000 Tons. A minimum one per shift whichever results in the greatest sampling frequency*		
[(2)] Not required for ATPB Mix *[(3)] Coarse Agg (+ No. 4)* *[(4)] Fine Agg (- No. 4)*	*Sampling Aggregates* *Reducing Aggregates* *[(3)(4)] Sieve Analysis* *[(1)(4)] Sand Equivalent*			*R 90* *R 76* *T 27/T 11* *T 176*	*1792*	*1/Sublot*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
	[(1)(2)(3)] Elongated Pieces *[(3)(4)] Fracture (Method 2)* *[(1)(2)(3)] Wood Particles*	*TM 229* *TM 225*		*T 335*	*1792*	*1/5 Sublots*	*Contractor Provided Testing*	*Review Documentation for Acceptance*

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00743.10 Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00743.10 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 5000 Tons".
b. One Per sublot means "One Set of Tests Per 1000 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00743 - POROUS ASPHALT CONCRETE (PAC) (CONTINUED)								
Mixture Acceptance - PAC with RAP								
Gradation				A Sublot equals 1000 Tons				
Ignition method	*(1) Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*	*Production Control Testing*	*Review Documentation for Acceptance*
Ignition method	*Sampling (ACP) Reducing (ACP)*			*R 97 R 47*		*1/Sublot or Min. 1/Day*		
(Residual aggregate from AASHTO T 308)	*Sieve Analysis of Extracted Aggregate*			*T 30*	*2277*	*1/Sublot or Min. 1/day*		
(1) Submit Samples a minimum of Days Prior to ACP Production								
Asphalt Content				A Sublot equals 1000 Tons				
Ignition Method	*(1) Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*	*Production Control Testing*	*Review Documentation for Acceptance*
Ignition Method	*Sampling (ACP) Reducing (ACP)*			*R 97 R 47*		*1/Sublot or Min. 1/day*		
	Asphalt Content			*T 308*	*2277*			
Meter Method	*Readings backed by Tank Measure & Production Records Daily*	*TM 321 (2) TM 322*			*2277*	*1/Sublot or Min. 1/day*		
(2) ACP Plant Calibration Required at start of Production and if Meters fail to meet Specification					*2043 and 2401*	*Daily Production*	*Production Control Testing*	
Meter Method is required for PAC even when acceptance is by Ignition Method								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00743 - POROUS ASPHALT CONCRETE (PAC) (CONTINUED)								
Mixture Acceptance - PAC without RAP								
Gradation				*A Sublot equals 1000 Tons*				
Cold Feed Method	*Sampling Aggregates* *Reducing Aggregates* *Sieve Analysis*			*R 90* *R 76* *T 27/T 11*	*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
Ignition method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*	*Production Control Testing*	
Ignition method ***[1] Not required if Asphalt Content Accepted by Meter***	*Sampling (ACP)* *Reducing (ACP)*			*R 97* *R 47*		*1/Sublot or Min. 1/Day*	*Production Control Testing*	
(Residual aggregate from AASHTO T 308) *[1] Submit Samples a minimum of 2 Days Prior to ACP Production*	*Sieve Analysis of Extracted Aggregate*			*T 30*	*2277*	*1/Sublot or Min. 1/day*	*Production Control Testing*	*Review Documentation for Acceptance*
Asphalt Content				*A Sublot equals 1000 Tons*				
Ignition Method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*	*Production Control Testing*	*Review Documentation for Acceptance*
Ignition Method ***[2] ACP Plant CalibrationRequired at start of production and if meters fail to meet specification***	*Sampling (ACP)* *Reducing (ACP)* *Asphalt Content*			*R 97* *R 47* *T 308*	*2277*	*1/Sublot or Min. 1/day*	*Production Control Testing*	
Meter Method	*Readings backed by Tank Measure &*	*TM 321* *[2] TM 322*			*2277*	*1/Sublot or Min. 1/day*	*Production Control Testing*	
Meter Method is required for PAC even when acceptance is by Ignition Method	*Production Records Daily*				*2043 and 2401*	*Daily Production*	*Production Control Testing*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00743 - POROUS ASPHALT CONCRETE (PAC) (CONTINUED)								
Mixture Acceptance - PAC with and without RAP								
Mix Design Verification Testing				A Sublot equals 1000 Tons				
	Cold Feed Moisture			*T255/T265*	*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
Plant Discharge Moisture	*ACP Moisture Content*			*T 329*	*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	
(1) RAP Percentage	*(1) RAP Moisture*			*T 329*	*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
(1) If applicable	*Readings backed by Tank Measure & Production Records Daily*	*TM321 (2) TM 322*			*2401 & 2043*	*Daily Production*	*Production Control Testing*	
Asphalt Cement	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/Sublot See Section 4C*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*
(2) ACP Plant CalibrationRequired at start of production and if meters fail to meet specification								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00744 - ASPHALT CONCRETE PAVEMENT								
Aggregate Production	*See Specifications when Aggregate Testing is Required by Agency*					*Provide Process Control*	*Visual*	*Review Documentation for Acceptance*
Mixture Acceptance								
Gradation				*A Sublot equals 1000 Tons*				
Ignition method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*	*Production Control Testing*	*Review Documentation for Acceptance*
Ignition method	*Sampling (ACP)* *Reducing (ACP)*			*R 97* *R 47*		*1/Sublot or Min. 1/Day*	*Production Control Testing*	
(Residual aggregate from AASHTO T 308)	*Sieve Analysis of Extracted Aggregate*			*T 30*	*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
[1] Submit Samples a minimum of Days Prior to ACP Production								
Asphalt Content				*A Sublot equals 1000 Tons*				
Ignition Method	*[1] Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*	*Production Control Testing*	*Review Documentation for Acceptance*
Ignition Method	*Sampling (ACP)* *Reducing (ACP)*			*R 97* *R 47*		*1/Sublot or Min. 1/day*	*Production Control Testing*	
	Asphalt Content			*T 308*	*2277*			
Mix Design Verification Testing				*A Sublot equals 1000 Tons*				
Plant Discharge Moisture	*ACP Moisture Content*			*T 329*	*2277*	*1/Sublot*	*Production Control Testing*	*Review Documentation for Acceptance*
Maximum Density Test G_{mm}	*Max. Specific Gravity* *MAMD*	*TM 305*		*T 209*	*2050*	1st Sublot Daily or Min. 1/Day		

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00744 - ASPHALT CONCRETE PAVEMENT (CONTINUED)								
Compaction *(D) See T 355 Yellowsheet for Density Test Locations*	*Nuclear Density*			*T 355*	*1793A*	*(D) Average 10 tests per Sublot or Min. 10/Day, See Section 00744.49*	*Production Control Testing*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE						Same Frequency for all Tests (Minimums)		
Aggregate Production	Soundness Abrasion Degradation Lightweight Pieces Plasticity Index	 TM 208		T 104 T 96 T 113 T 90	4000 4000	*Contractor Provided Testing Minimum 1 per Project*	*Contractor Provided Testing Minimum 1 per Project*	*Review Documentation for Acceptance*
(1) QAE may waive after 5 sublots/shifts *(2) Perform a minimum of 3 tests QL's required*						*A Sublot equals 1000 Tons. A minimum one per shift whichever results in the greatest sampling frequency*		
(3) Coarse Agg (+ No. 4) *(4) Fine Agg (- No. 4)*	Sampling Aggregates Reducing Aggregates (2)(3)(4) Sieve Analysis (1)(4) Sand Equivalent			R 90 R 76 T 27/T 11 T 176	1792	*1/Sublot*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
Note: Sample Aggregate before Lime Treatment	(1)(3) Elongated Pieces (3)(4) Fracture (Method 2) (1)(3) Wood Particles	TM 229 TM 225		 T 335	1792	*1/5 Sublots*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
RAS Production *(Reclaimed Asphalt Shingles)*	Sieve Analysis Un-Washed Deleterious Materials	 TM 335		T 27	4000	*Contractor Provided Testing 1/500 Tons*	Contractor Provided Testing	*Review Documentation for Acceptance*
	Sampling Aggregates Reducing Aggregates Sieve Analysis Un-Washed Deleterious Materials	 TM 335		R 90 R 76 T 27	1792	*1 / 50 Tons*		

Preproduced Aggregate

Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this contract will be determined by the following:

1. Continuing production records meeting the above requirements of Section 00745.10 Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00745.10 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 5000 Tons".
b. One Per sublot means "One Set of Tests Per 1000 Tons" with a minimum of 3 sets of Sieve Analysis tests per project.
c. Provide one stockpile sample for each set of tests required above.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE (CONTINUED)								
Mixture Acceptance - ACP "With and Without RAP"				*A Sublot equals 1000 Tons*				
Gradation								
Ignition method	*(1) Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*	*Production Control Testing*	*Review Documentation for Acceptance*
Ignition method	*Sampling (ACP)* *Reducing (ACP)*			*R 97* *R 47*		*1/Sublot*		
(Residual aggregate from AASHTO T 308)	*Sieve Analysis of Extracted Aggregate*			*T 30*	*2277*			
(1) Submit Samples a minimum of Days Prior to ACP Production								
Asphalt Content				*A Sublot equals 1000 Tons*				
Ignition Method	*(1) Calibrate Incinerator*	*TM 323*			*2327IC*	*1/JMF & Each Calendar Year.*	*Production Control Testing*	*Review Documentation for Acceptance*
Ignition Method	*Sampling (ACP)* *Reducing (ACP)*			*R 97* *R 47*		*1/Sublot or Min. 1/day*		
	Asphalt Content			*T 308*	*2277*			
(2) RAP and RAS Percentage *(2) If Applicable*	*Meter Method*	*TM 321* *(3) TM 322*			*2277*	*1/Sublot or Minimum 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
(3) ACP Plant Calibration Required at start of Production and if Meters fail to meet Specification	*(2) RAP and RAS*			*T 329*				
	Moisture *Cold Feed Moisture*			*T255/T265*	*2277*			
Meter Method is required for ACP even when acceptance is by Ignition Method	*Readings backed by Tank Measure & Production Records Daily*	*TM 321* *(3) TM 322*			*2401 ACP*	*Daily Production*	*Production Control Testing*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE

(Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method ODOT	Test Method WAQTC	Test Method AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE (CONTINUED)								
Mixture Acceptance - ACP "With and Without RAP"				*A Sublot equals 1000 Tons*				
Mix Design Verification Testing								
Fabrication	*Gyratory Specimen*	*TM 326*			*2050GV*	*1/Sublot & according to Section 00745.16 (b)-1-c*	*Production Control Testing*	*Review Documentation for Acceptance*
Maximum Density Test	*Max. Specific Gravity of ACP*			*T 209*	*2050* **5068*			
Determination of G_{mb}	*Bulk Specific Gravity of Compacted ACP*			*T 166*	**2560* **5069*			
Stripping Susceptibility **Cat-II complete & submit as required, See Section 745.16(b)*	*Tensile Strength Ratio*			*T 283*	*2050tsr*	*1/JMF See Section 00745.16 (b)-1-e*	*Production Control Testing*	*Review Documentation for Acceptance*
Plant Discharge Moisture	*ACP Moisture Content*			*T 329*	*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
Maximum Density Test G_{mm}	*Max. Specific Gravity* *MAMD*	*TM 305*		*T 209*	*2050*	*1st Sublot Daily or Min. 1/Day*		
Performing Control Strip	*Control Strip*	*TM 306*			*2084* **5069*	*Develop Rolling Pattern See Specs.*	*Production Control Testing*	*Review Documentation for Acceptance*
Compaction	*Nuclear Density of ACP*			*T 355*	*1793A*	*(D) Average 5 tests per Sublot or Min. 1/Day, See Section 00745.49 (b)-2*		
Asphalt Cement *(D) See T 355 Yellowsheet for Density Test Locations*	*Sampling Asphalt Materials*			*R 66*	*4000*	*1/Sublot See Section 4C*	*Provide Suppliers Certificate of Compliance*	*Review Documentation for Acceptance*

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE (CONTINUED)								
Mixture Acceptance - ACP "With and Without RAP"				A Sublot equals 1000 Tons				
Mix Design Verification Testing								
Lime	*Material must meet the requirements of Section 2090*						*Production Control Testing*	*Review Documentation for Acceptance*
Latex	*See Special Provisions for Latex Requirements*							
Lime or Latex Treatment of Aggregate (Stockpile OR Mixture Production)	(1) *% Hydrated Lime*	*TM 321* (2) *TM 322*			*2277* *2277*	*1/Sublot*	*Production Control Testing*	*Review Documentation for Acceptance*
(2) ***ACP Plant Calibration Required at start of Production and if meters fail to meet***	*Readings backed by Tank Measure & Production Records Daily*				*2401 ACP*	*Daily Production*	*Production Control Testing*	*Review Documentation for Acceptance*
(1) *If Applicable*								
(1) *See JMF for Details*								
Smoothness								
Certification of Profiler Equipment		*TM 769*				*See Special Provisions*	*Production Control Testing*	*Review Documentation for Acceptance*
Determining International Roughness Index (IRI)		*TM 772*						

Same Frequency for all Tests (Minimums)

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00754 - PLAIN CONCRETE PAVEMENT REPAIR **SECTION 00755 - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT** **SECTION 00756 - PLAIN CONCRETE PAVEMENT** **SECTION 00758 - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT REPAIR**								
Aggregate Production					*A Sublot equals 1000 Tons*			
(1) QAE may waive after 5 sublots/shifts *(2) Perform a minimum of 3 tests, QL's required*	*Sampling Aggregates* *Reducing Aggregates* *(2)(3)(4) Sieve Analysis* *(4) Fineness Modulus* *(4) Sand Equivalent*	*holder*		*R 90* *R 76* *T 27/T 11* *T 176*	*1792* *1792*	*Contractor Provided Testing*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
(3) Coarse Aggregate (See Section 02690.20)	*(1)(3) Wood Particles* *(3) Fracture (Method 2)* *(1)(3) Elongated Pieces*	*TM 225* *TM 229*		*T 335*	*1792* *1792*	*Contractor Provided Testing 1/5 Sublots*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
(4) Fine Aggregate (See Section 02690.30)	*Abrasion* *Degradation* *Soundness* *Lightweight Pieces* *Organics*	*TM 208*		*T 96* *T 104* *T 113* *T 21*	*4000* *4000*	*Minimum 1 per Project*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
	(3) Dry Rodded Unit Weight *(3) Specific Gravity of Coarse Aggregate* *(4) Specific Gravity of Fine Aggregate*			*T 19* *T 85* *T 84*	*1825* *1825C* *1825*	*Start of production and when changes in aggregate occurs*	*Contractor Provided Testing*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Same Frequency for all Tests (Minimums) — Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00754 - PLAIN CONCRETE PAVEMENT REPAIR **SECTION 00755 - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT** **SECTION 00756 - PLAIN CONCRETE PAVEMENT** **SECTION 00758 - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT REPAIR** **(CONTINUED)**								
Portland Cement Concrete					*A Sublot equals 350 yd^3 of slip formed pavement or 100 yd^3 of non-slip formed PCC*			
	Sampling Concrete		*TM 2*					
	Air Content of Concrete *Slump of Concrete* *Density (Unit Weight) of Concrete* *Yield* *Concrete Temperature* *Water/Cement Ratio* *Batching*			*T 152* *T 119* *T 121* *T 121* *T 309* *T 121*	*3573WS or 4000C*	*1 per Sublot per Mix Design, minimum 1 per day*	*1 per Sublot per Mix Design, minimum 1 per day*	*Review Documentation for Acceptance*
(S) ASTV based on a minimum of 3 Cylinders	*Fabrication of Concrete Cylinders/Beams* *Compressive Strength of Concrete (S)*			R 100 *T22*	*4000C*			
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials	*Materials listed on batch ticket must match approved design*							*Review Documentation for Acceptance*
Smoothness								
Certification of Profiler Equipment *Determining IRI with an Inertial Laser Profiler*		*TM 769* *TM 772*				*See Special Provisions*	*Production Control Testing*	*Review Documentation for Acceptance*
Thickness of Pavement	*Sitcking Measure*	*TM 775*				*See Specs*	*Visual*	

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)						Same Frequency for all Tests (Minimums)		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method			FORM 734-	Quality Control		Quality Assurance
		ODOT	WAQTC	AASHTO		Contractor Quality Control Type D	Contractor Quality Control Type E	Project Manager Type D & E
SECTION 00850 - COMMON PROVISIONS FOR PAVEMENT MARKINGS								
Placement Evaluation "Retroreflectivity"								
In-Place *Procedure evaluates Durable and High Performance Pavement Markings*	*Evaluation of Retroreflectivity*	*TM 777*			*4101 thru 4105*	*See Special Provisions and Test Procedure for Testing Frequency*	*Visual*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
SECTION 00921 - MAJOR SIGN SUPPORT DRILLED SHAFTS								
Aggregate Production								
					A Sublot equals 1,000 Tons			
	Sampling Aggregates			*R 90*		*Contractor Provided Testing*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
[1] QAE may waive after 5 sublots/shifts	*Reducing Aggregates*			*R 76*				
	[2][3][4] Sieve Analysis			*T 27/T 11*	*1792*			
	[4] Fineness Modulus			*T 27/T 11*				
[2] Perform a minimum of 3 tests, QL's required	*[1][3] Wood Particles*	*TM 225*						
	[4] Sand Equivalent			*T 176*	*1792*			
[3] Coarse Aggregate (See Section 02690.20)	*Soundness*			*T 104*	*4000*	*Contractor Provided Testing*	*Contractor Provided Testing*	
	Abrasion			*T 96*				
	Degradation	*TM 208*						
[4] Fine Aggregate (See Section 02690.30)	*Lightweight Pieces*			*T 113*				
	Organics			*T 21*	*4000*			
	[3] Dry Rodded Unit Weight			*T 19*	*1825* *1825C*	*Minimum of 1 per Project*	*Minimum of 1 per Project*	
	[3] Specific Gravity of Coarse Aggregate			*T 85*	*1825*			
	[4] Specific Gravity of Fine Aggregate			*T 84*				*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2023)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	Test Method: ODOT	Test Method: WAQTC	Test Method: AASHTO	FORM 734-	Quality Control: Contractor Quality Control Type D	Quality Control: Contractor Quality Control Type E	Quality Assurance: Project Manager Type D & E
						Same Frequency for all Tests (Minimums)		
SECTION 00921 - MAJOR SIGN SUPPORT DRILLED SHAFTS								
Portland Cement Concrete								
					A Sublot equals 100 yd³			
	Sampling Concrete		*TM 2*		*3573WS or 4000C*	*1 per Sublot, minimum 1 per mix design & shaft*	*1 per Sublot, minimum 1 per mix design & shaft*	*Review Documentation for Acceptance*
	Slump of Concrete			*T 119*				
	Concrete Temperature			*T 309*				
	Density (Unit Weight) of Concrete			*T 121*				
	Yield			*T 121*				
	Water/Cement Ratio			*T 121*				
	Fabrication of Concrete Cylinders/Beams			R 100	*4000C*			
(S) ASTV based on a minimum of 3 Cylinders	*Compressive Strength of Concrete* (S)			*T 22*				
Aggregates Cement Chemical Admixtures Supplementary Cementitious Materials	*Materials listed on batch ticket must match approved design*							

INSERT TAB

Yellow Sheets

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October 31, 2023

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO T 30**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- **Delete Mass Verification Section**
- **Under Procedure step 2 – delete this step.**
- **Under Procedure step 4 – Dispersing agents or wetting solutions are optional.**
- **Under Procedure step 9 – delete this step**
- **Under Procedure step 14 - Shaking time will be a minimum of 10 minutes.**
- **Under Procedure step 18 – Aggregate Correction Factors are at the option of the Engineer.**
- **Under Reporting section, 3rd bullet - Aggregate Correction Factors are at the option of the Engineer.**

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October 31, 2023

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO T 310**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- **ODOT TM-158 shall be satisfied prior to performing AASHTO T 310.**
- **Document results of ODOT TM 158.**
- **Under Calibration add; Comply with ODOT TM 304.**
- **Under Procedure, use Method A.**
- **The backscatter/air-gap ratio method is not allowed on ODOT contracts.**

Earthwork:

- **Under Procedure, step 5, if the drive pin encounters material that prevents hole fabrication, then another test site within the random area shall be selected. If the new location still prevents hole fabrication, then the CDT should contact the field inspector, if available, for verification. Document in the remarks on form 734-1793S that the area was too rocky to test and if available, the inspector's name. Also, note if a field inspector wasn't available to witness the hole fabrication.**
- **Under Procedure, Steps 11, 12, and 13 are required**
- **Under Procedure, Step 12, moisture content other method allowed is AASHTO T 217**

Crushed Processed Aggregate:

- **AASHTO T 272 is not required**
- **Under Procedure, Steps 11, 12 & 13 are not required.**

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October 31, 2023

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO T 329**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- **Under test procedure, step 15, delete the ±9ºC (15ºF) reference and replace with ±10ºC (25ºF).**
- **RAP and RAS moisture content shall be determined by this test method.**
- **Report RAP and RAS moisture content to the nearest 0.1%.**

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October 31, 2023

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO T 355**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- **Under Calibration: ODOT requires calibration verified according to TM 304.**
- **Under Procedure, Step 2, a filler material is defined as material passing the No. 8 or finer sieve and from the aggregate source used to produce the Job Mix Formula.**
- **Under Procedure, use Method A for density determinations. Method B is not allowed.**
- **Delete Appendix – Correlation with Cores**
- **For Core Correlation use ODOT TM-327 and utilize form 734-2327 for reporting.**

Density testing of ACP shall conform to the following:

- **Select 5 longitudinal test locations in a stratified random pattern in accordance with ODOT TM 400.**

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October 31, 2023

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO R 66**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- **Under Procedure, step 3 first bullet, delete the following from the sentence: "or from the delivery truck". Sampling from the oil delivery truck is not allowed.**

- **Sample asphalt binder at the plant using an in-line sampling device or samples may be obtained from the storage tank, according to AASHTO R 66-16 (2020) procedure, section 7.1.1 and 7.2, when mechanical or other circumstances temporarily prohibit the use of the in-line device.**

  Note: Sampling from the storage tank is only permitted to complete the production shift.

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October 31, 2023

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO R 100**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- **Under Procedure - Initial Curing, Use Method 1, cure in a cooler with controlled water temperature. See test procedure for temperature requirements.**

- **Use a high/low temperature-recording device to monitor the water temperature during curing process. Record the high/low temperature range during the cure process on agency approved form.**

- **Under Procedure - Transporting Specimens, Delete Bullet 4 and replace with the following:**

  - **For concrete cylinders that are not able to be placed in final cure at the site where the compression testing will be performed, within 48 hours, a "temporary final cure" environment will be provided and maintained. Cylinders placed into this "temporary final cure" environment will then be transported to the final cure location within 12 days of casting. Temporary final cure is defined as;**

  - **Temporary final cure –An environment that meets the temperature and moisture requirements of bullet 2 under "Final Curing". Curing may be accomplished in a moist room or water tank conforming to AASHTO M201. Molds do not have to be removed for Cylinders in Temporary final cure**

- **Under Procedure – Casting Cylinders, Rodding step 3, the use of a mallet meeting the requirements under apparatus may be used for single-use plastic molds conforming to AASHTO M-205.**