Oregon

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January 1, 2025

To: All Holders of the Manual of Field Test Procedures

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

Subject: 2025 Revision of the Manual of Field Test Procedures

Enclosed is the 2025 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 Specialists 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.

Note: The MFTP publication release date has changed to January 1. This replaces the previous December annual publication date. This 2025 edition covers updates for 2024-2025.

The following pages identify the appropriate add and remove sequence necessary to update the 2023 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

INTRODUCTION TAB

REMOVE	ADD	COMMENTS
Introduction (18) Pg. 1~4	Introduction (24) Pg. 1~4	See Change Sheet for Details

SECTION 1 TAB (Test Procedures)

REMOVE	ADD	COMMENTS
INDEX (23) Pg. 1 & 2	INDEX (24) Pg. 1 & 2	Updated for 2024 Procedures

ODOT TAB (Test Procedures)

REMOVE	ADD	COMMENTS
ODOT TM 323 (21) Pg. 1~5	ODOT TM 323 (24) Pg. 1~6	See Change Sheet for Details

AASHTO TAB (Test Procedures)

(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 19 (22) Pg. T19-1~T19-9	AASHTO T 19 (24) Pg. T19-1~T19-9	See Change Sheet for Details
AASHTO T 27/11 (23) Pg. 12-1~12-40	AASHTO T 27/11 (24) Pg. 12-1~12-40	“ “ “ “ “
AASHTO T 30 (23) Pg. 20-1~20-11	AASHTO T 30 (24) Pg. 20-1~20-11	“ “ “ “ “
AASHTO T 119 (23) Pg. 11-1~11-2	AASHTO T 119 (23) Pg. 11-1~11-2	“ “ “ “ “
AASHTO T 121 (23) Pg. 12-1~12-16	AASHTO T 121 (24) Pg. 12-1~12-16	“ “ “ “ “
AASHTO T 152 (23) Pg. 13-1~13-8	AASHTO T 152 (24) Pg. 13-1~13-8	“ “ “ “ “
AASHTO T 166 (23) Pg. 18-1~18-8	AASHTO T 166 (24) Pg. 18-1~18-8	“ “ “ “ “
AASHTO T 209 (23) Pg. 17-1~17-10	AASHTO T 209 (23) Pg. 17-1~17-10	“ “ “ “ “
AASHTO T 255/265 (23) Pg. 12-1~12-7	AASHTO T 255/265 (24) Pg. 12-1~8	“ “ “ “ “
AASHTO T 272 (21) Pg. 15-1~15-8	AASHTO T 272 (24) Pg. 15-1~15-8	“ “ “ “ “
AASHTO T 308 (23) Pg. 16-1~16-13	AASHTO T 308 (24) Pg. 16-1~16-14	“ “ “ “ “
AASHTO T 329 (23) Pg. 15-1~15-4	AASHTO T 329 (24) Pg. 15-1~15-4	“ “ “ “ “
AASHTO T 335 (23) Pg. 13-1~13-5	AASHTO T 335 (23) Pg. 13-1~13-6	“ “ “ “ “
AASHTO R 67 (20) Pg. R67-1~R67-5	AASHTO R 67 (24) Pg. R67-1~R67-5	“ “ “ “ “
AASHTO R 75 (16) Pg. 15-1~15-3	AASHTO R 75 (24) Pg. 14-1 & 14-2	“ “ “ “ “
APPENDIX “A” R 75 (16) Pg. 1-9	APPENDIX “A” R 75 (24) Pg. 1-9	Located after AASHTO R 75
AASHTO R 76 (23) Pg. 10-1~10-7	AASHTO R 76 (24) Pg. 10-1~10-8	See Change Sheet for Details
AASHTO R 97 (23) Pg. 13-1~13-7	AASHTO R 97 (23) Pg. 13-1~13-8	“ “ “ “ “
AASHTO R 100 (23) Pg. 14-1~14-6	AASHTO R 100 (23) Pg. 14-1~14-8	“ “ “ “ “

WAQTC TAB (Test Procedures)

REMOVE	ADD	COMMENTS
WAQTC TM 2 (21) Pg. 9-1~9-4	WAQTC TM 2 (21) Pg. 9-1~9- 4	See Change Sheet for Details

SECTION 2 TAB (QA Program)

REMOVE	ADD	COMMENTS
Cover Sheet & Table of Contents (23)	Cover Sheet & Table of Contents (24)	See Change Sheet for Details
QA Program (23) Pg. 1-27	QA Program (24) Pg. 1-27	" " " " "

SECTION IA TAB

REMOVE	ADD	COMMENTS
QA Program (23) Pg. 28-56	QA Program (24) Pg. 28-56	See Change Sheet for Details

SECTION 3 TAB (Report Forms & Examples)

REMOVE	ADD	COMMENTS
Lab Forms Intro. & Index (20) Pg. 1-4	Lab Forms Intro. & Index (24)	See Change Sheet for Details
Lab Forms Description (17) Pg. 1-6	Lab Forms Description (24) Pg. 1-6	" " " " "
734-1793 S (3-2023) & Examples	734-1793 S (11-2024) & Examples	" " " " "
734-1825 (10-2021) & Example	734-1825 (11-2024) & Examples	" " " " "
734-1825 C (10-2017) & Example	734-1825 C (11-2024) & Example	" " " " "
734-2277 (10-2018) & Examples	734-2277 (11-2024) & Examples	" " " " "
734-3468_FC (10-2012) & Example	734-3468_SR (12-2024) & Example	" " " " "
734-3573 (9-2023) & Example	734-3573 (11-2024) & Example	" " " " "
734-4000_C (3-2023) & Example	734-4000_C (11-2024) & Example	" " " " "

SECTION 4(D) TAB (Acceptance Guide)

REMOVE	ADD	COMMENTS
Guide Pages 1-64 (November 2023)	Guide Pages 1-65 (November 2024)	See Change Sheet for Details

SECTION 5 "Green" TAB (Acceptance Guide)

REMOVE	ADD	COMMENTS
Guide Pages 1~64 (November 2023)	Guide Pages 1-65 (November 2024)	See Change Sheet for Details

SECOND

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

AASHTO TAB

REMOVE	ADD	COMMENTS
Yellow Sheet T 27/11 (22)	Yellow Sheet T 27/11 (24)	See Change Sheet for Details
Yellow Sheet T 272 (22)	Yellow Sheet T 272 (24)	" " " " "
Yellow Sheet R 75 (16)	Yellow Sheet R 75 (24)	" " " " "

WAQTC TAB

REMOVE	ADD	COMMENTS
Yellow Sheet TM 2 (21)	-------------N/A---------------	See Change Sheet for Details

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.

SUMMARY OF CHANGES

Introduction – added “Source” to the list of “Acronyms and Definitions. Source – pit, quarry, material supplier or facility. Term also referenced in AASHTOWare.

Section 1 – Test Procedures Index

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

ODOT – TEST PROCEDURES

TM 323 (Determining the Asphalt Cement Content of Asphalt Concrete by the Ignition Method) – Under the “Summary of Test Method” section added the requirement of the CMDT to deliver batched virgin aggregate, anti-stripping additives, if applicable and sufficient asphalt cement to Quality Assurance and ODOT Central laboratories for independent calibration determination.

The following bullets identify additions, deletions, or modifications to the “Calibration Sample Preparation” section:

- Section 6.2, which discusses the preparation of six calibration mixture samples according to the JMF was modified and the following information added:

  Samples provided to the Quality Assurance and ODOT Central Laboratories shall not be mixed. The CMDT shall provide 6 individually batched virgin aggregate samples with the appropriate proportions of mineral filler, lime, fibers or other additive(s) included in the JMF. The CMDT shall also provide sufficient asphalt cement to batch 5 samples. The asphalt cement shall be supplied in 1 qt. containers.

  All sample portions shall be clearly labeled as follows:
- Aggregate Samples - JMF Lab Number and Nominal aggregate size.
- Asphalt Cement – with JMF Lab Number, Grade of cement and supplier.
- Hydrated Lime or anti-stripping additives - with JMF Lab Number and source of material.
- Mineral fillers, fibers or other additives - with JMF Lab Number.

Note: QA and the ODOT Central lab will mix and develop their own calibration samples for the 2025 construction season.

Minor formatting and editorial items were also addressed.

AASHTO – TEST PROCEDURES

All the FOPs (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 title.

T 19 (Bulk Density ("Unit Weight") and Voids in Aggregate) - The cover sheet has been updated to reflect the new 2024 version of the procedure. There were significant changes to the procedure.

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

- Section 1.2, last sentence was modified and the phrase "without combining values in any way was removed and a new sentence was added "Combining values from the two systems may result in non-conformance with the standard".
- Section 2, Referenced Documents, AASHTO Standards, the T 121 Density (Unit Weight) procedure was removed and T 255, Total Evaporable Moisture Content of Aggregate by Drying was added.
- Section 2, Reference Documents, ASTM Standards, D 123, Standard Terminology Relating to Textiles was removed.
- Section 3, Terminology, the following terms and definitions have been removed from the standard:
    - 3.1.1 – Bulk Density
    - 3.1.1.1 – Discussion regarding units of mass and forces of gravitation.
    - 3.1.2 – Unit Weight
    - 3.1.2.1 – Discussion of the term "weight" the force of gravity acting on the mass.
    - 3.1.3 – Weight
    - 3.1.3.1 – Discussion of weight and gravitational forces.

- Section 5, Apparatus, the following modifications have been made:
    - 5.1, Balance – changed the readability of 0.1 from percent to grams. Removed the existing last two sentences from the definition.
    - 5.2, Tamping Rod – a tolerance was added for the rod diameter and changed from +/- 5/8″ to 1/16″ and a tolerance was added to the length of the rod.
    - 5.3, Measure – the first sentence of the definition was adjusted to add language stating the measure must be constructed of steel or other suitable metal.
    - 5.3.1 – the existing section that referenced T 121 has been deleted.
    - The existing section 5.3.2 has been modified and the table reference removed. Now this section is 5.3.1.
    - 5.5.2, Grease – the language reference from Note 3 is now included. The note 3 reference has been removed and subsequent notes renumbered.

- Section 7, Sample, is now titled "Test Sample" and section 7.1, a definition for constant mass determination has been added for the drying process.
- Section 8, Calibration of Measure, is now titled "Determination of Volume of Measure".
    - 8.1, frequency of calibration has been changed to read "Determine the volume of the measure upon initial use and subsequently at a frequency not to exceed twelve months, or whenever accuracy is in question. If required, record and document according to R 18 standard".
- Section 9, Selection of Procedure, added a step 9.1 requiring the mass of the empty measure be determined.

- Section 10, Rodding Procedure, the title has been adjusted and given a “Method A” reference.
- Section 11, Jigging Procedure, the title has been adjusted and given a “Method B” reference.
- Section 12, Shoveling Procedure, the title has been adjusted and given a “Method C” reference.

Major formatting and editorial items were also addressed, due to the large number of changes.

T 27/11 (Sieve Analysis of Fine and Coarse Aggregates) – Under the Scope, updated the AASHTO reference year to 2024. The following bullets identify additions, deletions, or modifications to the procedure:

- Under the Apparatus section added a new Note 1, as follows:

“Sieves with a large sieving area, greater than 304.8 mm (12 in.) diameter may not be practical for all sizes of samples. The large sieving area needed for practical sieving of a large nominal size coarse aggregate could result in loss of a portion of the sample if used for a smaller sample of coarse aggregate or fine aggregate affecting final test results”.

This was added as a caution to users who may elect to utilize the larger screen configurations for acceptance testing. Due to the addition of note 1, subsequent notes have been renumbered.

- Under Apparatus, the existing Containers and utensils section was modified, and “utensils” was removed and placed under the Optional section and given a definition “device for agitating the sample during the washing procedure”.
- Under Apparatus, the Optional section, added a definition for Wetting Agent, if applicable.

Method A

- Under Procedure, step 1, removed 110 ±5ºC (230± 9ºF) requirement. The official AASHTO procedure has removed this restriction and now references T 255. This restriction has been removed from all Method’s (A, B & C).
- Under Procedure, step 2, removed mass determine to the nearest 0.1 percent. Mass determination will be to the nearest 0.1 gram.
- Under Procedure, step 5, added a sentence stating a utensil may be used for sample agitation.
- Under Procedure, step 7, added a sentence stating, if a utensil is used, it must be rinsed into the washed sample.

Method B

- Same changes that were identified in Method A.

Method C

- Same changes that were identified in Method A and Note 6 was deleted, because it’s already referenced in Note 3.
- Annex B, Overload Determination section, the last two bullets were moved and placed under Table B1.

Minor formatting and editorial items were also addressed.

- ❖ **T 27/11 (Yellow Sheet) –** Deleted the third bullet regarding drying temperature. AASHTO has removed the 110 ±5ºC (230± 9ºF) oven restriction.

T 30 (Mechanical Analysis of Extracted Aggregates) – Under the Scope, updated the AASHTO reference year to 2024.The following bullets identify additions, deletions, or modifications to the procedure:

- Under Apparatus, Balance, removed the "accurate to a 0.1 percent of the sample mass statement".
- Under Apparatus, Containers and utensils, removed utensils. This will be a standalone apparatus entry.
- Under Apparatus, added a new category, Utensil, and defined as "device for agitating the sample during the washing procedure".
- Under Procedure, step 5, added "use a utensil to aid in the agitation process" after the first sentence.
- Under Procedure, step 7, added a third sentence stating, "Rinse utensil into the washed sample".

Minor formatting and editorial items were also addressed.

T 119 (Slump of Hydraulic Cement Concrete) –The following bullets identify additions, deletions, or modifications to the procedure:

- Under Procedure, modified the 2nd sentence and added "remove the aggregate by sieving the concrete sample over a 37.5 mm (1 ½″) sieve in accordance with the Wet Sieving portion of the FOP". This just clarifies the plus 1 ½″ material must be removed by the wet sieving process.

Minor formatting and editorial items were also addressed. This change was deemed editorial, so the procedure date didn't change.

T 121 (Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete) - Under the Scope, updated the AASHTO reference year to 2024. The following bullets identify additions, deletions, or modifications to the procedure:

- Under Apparatus, Mallet, changed the English volume from 0.5 ft^3 to ½ ft^3 to match the rest of the procedure.

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 2024. The following bullets identify additions, deletions, or modifications to the procedure:

- Under Procedure, Sampling, modified the 2nd sentence and added "remove the aggregate by sieving the concrete sample over a 37.5 mm (1 ½″) sieve in accordance with the Wet Sieving portion of the FOP". This just clarifies the plus 1 ½″ material must be removed by the wet sieving process.
- Under Procedure, added a new step 7 as follows: "Jar the meter gently until all air is expelled from this same petcock". This was removed from the existing step 6 and given its own step. The subsequent steps were re-numbered.

Minor formatting and editorial items were also addressed.

T 166 (Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens) – Under the Scope, updated the AASHTO reference year to 2024. The following bullets identify additions, deletions, or modifications to the procedure:

Method A (Suspension)

- Under Apparatus, added a bullet and definition for Potable water. “Water that is suitable for drinking”.
- Under Apparatus, Water bath, added the following for the water in the bath: “Use potable water to fill the water bath. The water in the bath does not need to maintain a potable condition but must always remain clear”.
- Throughout the procedure any reference to “samples” has been changed to “Specimens”.

Method B (Volumeter)

- Under Apparatus Method B (Volumeter), added a bullet and definition for Potable water. “Water that is suitable for drinking”.
- Under Apparatus, Water bath, added the following for the water in the bath: “Use potable water to fill the water bath. The water in the bath does not need to maintain a potable condition but must always remain clear”.

Minor formatting and editorial items were also addressed.

T 209 (Theoretical Maximum Specific Gravity (G_{mm}) and Density of Asphalt Mixtures) –

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

- Under Standardization added the following sentence: “Record the standardized container mass for use in subsequent calculations”.

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 Procedure, step 1, placed mass of container for soil step under aggregate to follow the same sequence as determining the sample masses.
- Under Procedure, step 5, added the following: “Remove the lid, if used, and place in drying apparatus”. Removal of the lid is required for moisture evaporation, if the lid is utilized.

Minor formatting and editorial items were also addressed.

T 272 (One-Point Method for Determining Maximum Dry Density and Optimum Moisture)

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

- Throughout the procedure all the “family of curves” references have been changed to the new R 75 title “Soil Moisture-Density Relations”. AASHTO changed the title of R 75.

- The calculations section was re-formatted.

Minor formatting and editorial items were also addressed.

❖ **T 272 (Yellow Sheet) –** Under the 7th bullet, Corrected the "Family of Curves" reference to "Soil Moisture-Density Relations" based on the new procedure title.

T 308 (Determining the Asphalt Binder Content of Asphalt Mixtures by the Ignition Method) – Under the Scope, updated the AASHTO reference year to 2024.

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

- Under Sampling, changed the title to "Sample Preparation".

Formatting and editorial items were also addressed.

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

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

- Under Procedure, step 4, removed the "to the nearest 2º C (4º F) reference". There is no tolerance stated in the AASHTO procedure.

Formatting and editorial items were also addressed.

T 335 (Determining the Percentage of Fracture in Coarse Aggregate) –

Minor formatting and editorial items were addressed.

R 67 (Sampling Asphalt Mixtures after Compaction (Obtaining Cores) –

This was an AASHTO reconfirmation that contained minor formatting and editorial items.

R 75 (Developing Moisture-Density Relations) – Under the Scope, updated the AASHTO reference year to 2024.

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

- The title of the procedure has been changed from "Developing a Family of Curves" to "Developing Soil Moisture-Density Relations".
- Throughout the procedure all references to "family of curves" have been replaced with "Soil Moisture-Density relations".
- Throughout the procedure all references to "family" have been replaced with "group".
- The dashed line representing the 80% line was changed to a solid line. The AASHTO procedure depicts a solid line.
- Appendix "A" was updated with the new procedure title and will be replaced.

Minor formatting and editorial items were addressed.

❖ **R 75 (Yellow Sheet) –** updated bullet 1 with the new procedure title reference to appendix "A".

R 76 (Reducing Samples of Aggregate to Testing Size) – The following bullets identify additions, deletions, or modifications to the procedure:

- Throughout the procedure all references to “cone” have been replaced with “pile”.
- Under Procedure, Method B Sectoring, step 1, added “tarp” to the list of acceptable splitting surfaces.
- Under Procedure, Method B Sectoring, step 2, broke the existing language into two sub-steps (a & b). Due to the inclusion of the “tarp” the following language was added as sub-step b: “Pulling each corner of the tarp horizontally over the sample toward the opposite corner. After the final turn, form a conical pile”.

Minor formatting and editorial items were also addressed.

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

- Throughout the test procedure all references to “haul unit” has been replaced with “Transport Unit” based on the AASHTO procedure.

Minor formatting and editorial items were also addressed.

R 100 (Method of Making and Curing Concrete Test Specimens in the Field) – The following bullets identify additions, deletions, or modifications to the procedure:

- Under Casting Cylinders, added the following introduction: “There are two sizes for molding of compressive strength specimens, 150 mm (6″) by 300 mm (12″) and 100 mm (4″) by 200 mm (8″)”.
- Under Casting Cylinders, Rodding, added a title for 6″x 12″ and included all the required steps for cylinder fabrication to the point of initial curing.
- Under Casting Cylinders, Rodding, added a title for 4″x 8″ and included all the appropriate steps for cylinder fabrication to the point of initial curing.
- Under Casting Cylinders, Internal Vibration, added a title for 6″x 12″ and included all the required steps for cylinder fabrication to the point of initial curing.
- Under Casting Cylinders, Internal Vibration, added a title for 4″x 8″ and included all the appropriate steps for cylinder fabrication to the point of initial curing.

Minor formatting and editorial items were also addressed.

WAQTC TEST PROCEDURES

TM 2 (Sampling Freshly Mixed Concrete) – The following bullets identify additions, deletions, or modifications to the procedure:

- Under Procedure, step 5, added the following phrase to the beginning of the first sentence: “Combine sample or increments and remix….”.

Minor formatting and editorial items were also addressed.

❖ **TM 2 (Yellow Sheet)** – will be deleted. The M 92 reference in AASHTO refers to ASTM E 11, which is already cited in T 27/11, so the yellow sheet isn’t necessary.

SECTION 2 QA PROGRAM

Section I, Overview – Under Quality Control (QC) added the following to the bottom of the 2nd paragraph “The signature may be a “wet signature, handwritten” or digital signature encrypted with a digital certificate from a trust service provider (TSP).

Section II, Roles and Responsibilities – **No Changes**

Section III, Lab Certification Program, under section Laboratory Decertification – Minor formatting and editorial items were also addressed.

Section IV, Technician Certification Program, under section Certification Requirements – Minor formatting and editorial items were also addressed.

Section V, Quality Assurance Laboratory Proficiency Sample Program – Added the following to the proficiency test method table: “Incinerator Calibration Samples – ODOT TM 323”.

Section VI, Product Specific QC/QA Testing Plan –

- Under Concrete, Independent Assurance, 4th paragraph first sentence added QA in front of the “strength testing phrase”.
- Under Concrete, Independent Assurance, deleted the 7th paragraph that required QC to make a companion set of cylinders during the IA evaluation. *QC is no longer required to fabricate a set of cylinders for strength comparison.* The PM is still required to evaluate and resolve any strength failures under the Verification category, but the comparison statement has been removed.
- Under Base Aggregate, Aggregate Mixture added (Plant Mix) to the title. The aggregate mixture section is for plant mix aggregate base applications.

Minor formatting and editorial items were also addressed.

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 – modified the existing Family of Curves form to Soil Moisture-Density Relations based on test procedure title change.

Forms Description of Worksheet and Calculation Explanations – added description language under form 2277 based on the Latex addition to the form. Also, changed the Family of Curves reference to Soil Moisture-Density Relations based on test procedure title change.

Minor formatting and editorial items were also addressed.

The following forms have been modified:

- **734-1793 S (Nuclear Compaction Report for Soil)** – A formula was corrected, so the form identifier/footer has been updated to reflect the date of change.

- **734-1825 (Unit Weight and Specific Gravity W/S)** – corrected the significant digits for the volume of the measure. The volume of the measure only needs to be rounded to the nearest 0.001 ft^3, not 0.0001 ft^3.
- **734-1825 C (Bulk Density and Unit Weight Measure Calibration)** - corrected the significant digits for the volume of the measure calculation. The volume of the measure only needs to be rounded to the nearest 0.001 ft^3, not 0.0001 ft^3.
- **734-2277 (Field Worksheet for ACP (Plant Report)** – added calculations and a drop-down menu for "Antistrip" options. The form will now compute Lime and Latex percentages.
- **734-3468 SR (Soil Moisture-Density Relations)** – Title of the form has been changed based on the test procedure title change from "Family of Curves" to "Soil Moisture-Density Relations". Form number reference has also been changed from 734-3468 FC to 734-3468 SR (Soil Relations).
- **734-3573WS (Concrete Yield and W/C Ratio Worksheet)** – A new field has been for "Fibers" and the significant digits for the pot calibration has been set to 0.001 ft^3. This is now consistent with AASHTO T 121 requirements.
- **734-4000C (Sample Data Sheet for Concrete Cylinders)** – A new field has been for "Fibers" and the significant digits for the pot calibration has been set to 0.001 ft^3. This is now consistent with AASHTO T 121 requirements.

Section 4A Product Compliance – No Changes

Section 4(B) Small Quantity Guidelines – No Changes

Section 4(C) Laboratory Samples – No Changes

FIELD TESTED MATERIALS GUIDE – SECTION 4D

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

Types of Tests – No Changes

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

- **Section 00440**, Commercial Grade Concrete, added a "callout" for $^{(M)}$ Per Source to the sampling frequency. CGC supplied from each source will require testing per the sublot frequency.
- **Section 00459**, Cast-In-Place Concrete Pipe, this specification will be deleted from the acceptance guide. Deletion of this specification was requested by the specification owner during the 2021 standards release but was never shared with the SQAE for removal.
- **Section 00707**, Emulsified Asphalt Micro-Surfacing, this is a new specification section with the following additions:
  - An aggregate production section outlining product compliance requirements has been added with the following tests: Abrasion, Degradation, Soundness, Lightweight Pieces and Dry rodded unit weight.
  - Aggregate Quality Control tests have been added with a sublot frequency of 200 tons. This includes Quality Assurance testing at a 1 per 10 sublot frequency.

- Sampling of Asphalt Materials has also been added.

Minor formatting and editorial items were also addressed.

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

INSERT TAB

Introduction

Oregon Department of Transportation
Manual of Field Test Procedures
ODOT Quality Assurance Program / December 2024

INTRODUCTION

PURPOSE

This manual is designed to be used by Contractor and Agency technicians for the sampling and testing of construction materials, and to determine their conformance to ODOT specifications. Included herein are the Test Procedures, the Quality Assurance Program, report forms and examples, and the Field-Tested Materials Acceptance Guide, to be used by field personnel for guidance, reference and instruction.

FORMAT

This Manual is divided into four main sub-sections:

(1) Test Procedures
(2) Quality Assurance Program
(3) Report Forms and Examples
(4) Field Tested Materials Acceptance Guide

The process control and acceptance test procedures in this manual are to be used for testing construction materials on ODOT projects. English and Metric unit designations are not direct conversions, use the appropriate designation identified by the Project contract documents.

Test results and supporting data shall conform to the following rounding convention, based on the significant digit requirement of the contract specifications or test procedure reporting criteria.

- The final significant digit will not be changed when the succeeding digit is less than 5.
- The final significant digit will be increased by one when the succeeding digit is 5 or greater.

All field test procedures in this manual have ODOT, AASHTO or WAQTC references. Some field test procedures have been written as Field Operating Procedures, e.g. "FOP for AASHTO T-”. FOPs conform to the approved AASHTO or other test methods but may eliminate some of the verbiage and/or combine several test methods to help reduce testing time. If there is a conflict between the FOP and the AASHTO test procedure due to errors or omissions, the AASHTO test procedure will hold precedence over the FOP. The yellow sheet addendums included with the FOP’s are utilized to identify preferred methods or modifications observed by the Oregon Department of Transportation.

HOW TO USE THIS MANUAL

This *Manual of Field Test Procedures* is used in conjunction with the contract plans, specifications, and the Construction Manual. It defines the requirements of ODOT's Quality Assurance Program.

The sampling and testing requirements and test procedures for most work items can be found in this Manual. Testing requirements for other materials will be specified in the contract plans and specifications.

Section 1 – *Test Procedures:* This section includes procedures for all regular field test procedures required by the ODOT specifications.

Section 2 – *Quality Assurance Program:* This section includes ODOT's Quality Assurance Program Manual, which includes the Technician Certification and Laboratory Certification programs. It also includes information on Independent Assurance parameters, random sampling, sampling programs at commercial aggregate sources, and verifying Contractor Quality Control test results.

Section 3 – *Report Forms and Examples:* This section includes copies of ODOT forms that are used to submit samples to ODOT's Central Materials Laboratory (ODOT-CML), and forms that can be used for field test results. It also includes completed examples of the forms and instructions for obtaining electronic versions of the forms.

Section 4:

Subsection A – *Source Review/Product Compliance Testing Requirements:* This subsection describes the testing requirements and frequencies for raw and processed aggregate material. Specific test requirements are included in the Field-Tested Materials Acceptance Guide (FTMAG) in subsection 4(D).

Subsection B – *Small Quantity Schedule:* This subsection describes the criteria under which small amounts of materials can be accepted, without testing, upon satisfaction of the stated criteria.

Subsection C – *Material Sampling Requirements:* This subsection provides the requirements for sample sizes, types of containers, labeling, and other necessary information for samples that will be sent to the ODOT-CML or other laboratories for testing.

Subsection D – *Field Tested Materials Acceptance Guide:* This subsection lists the required tests that are to be performed for construction materials. It also outlines the frequencies at which the tests shall be performed, and the certified technician who shall perform them. The Definition of Visual field acceptance at the Project Managers level is also defined in this section.

ACRONYMS AND DEFINITIONS

Following are common acronyms and definitions found in this manual. Other acronyms and definitions may be found in Section 00110 of the Standard Specifications.

AASHTO - The American Association of State Highway and Transportation Officials

ACP - Asphalt Concrete Pavement, refers to either hot mix or warm mix asphalt concrete

ASTM - The American Society for Testing and Materials

ODOT-CML - The ODOT Central Materials Laboratory located at 800 Airport Road SE in Salem

Certified Laboratory - A Quality Control or Quality Assurance laboratory that possesses a valid certification, as described in Section 2 (Quality Assurance Program), issued by the ODOT-CML indicating that the laboratory had proper, calibrated equipment at the time of the inspection.

Certified Technician - A technician who is certified to perform a specific material test(s) and who possesses a valid certification, as described in Section 2 (Quality Assurance Program), issued by the ODOT-CML. The certification indicates their knowledge of, and ability to perform, the required test procedures, and to correctly prepare the test reports.

CGC - Commercial Grade Concrete (MSC – Minor Structure Concrete)

CAC - Certification Advisory Committee See Section 2 (Quality Assurance Program)

Density of Water - (62.4 lbs/ft³ (1000) kg/m³). Use the test procedure temperature correction table for AASHTO test method T 121.

Dispute Resolution Laboratory – Used for Third Party Testing, See Section 2 Quality Assurance Program for more details.

EAC - Emulsified Asphalt Concrete

FHWA - The Federal Highway Administration

FOP - Field Operating Procedure. FOPs conform to approved test methods but may eliminate some of the verbiage and/or combine several test methods to reduce testing time.

FTMAG - Field Tested Materials Acceptance Guide. See Section 4D

HMAC - Hot Mixed Asphalt Concrete or HMA (Hot Mixed Asphalt)

IA - Independent Assurance. See Section 2 (Quality Assurance Program)

JMF - Job Mix Formula for asphalt concrete

MDT - Maximum Density Test (Use 62.4 lbs/ft³ (1000) kg/m³ for unit conversion)

MSE - Mechanically Stabilized Earth

MFTP - Manual of Field Test Procedures (this manual)

MAMD - Moving Average Maximum Density

ODOT - The Oregon Department of Transportation

PCC - Portland Cement Concrete

PM - Project Manager (Agency/Owner's Contract Administrator)

QA - Quality Assurance - generally refers to the Quality Assurance Program (See Section 2).

QAC - Quality Assurance Coordinator. See Section 2 (Quality Assurance Program).

QAE - Quality Assurance Engineer

QAT - Quality Assurance Technician. See Section 2 (Quality Assurance Program).

QC - Quality Control

QCCS - Quality Control Compliance Specialist (Agency or Contract Administrator performing the role of the QCCS). See Section 2 (Quality Assurance Program).

QPL - Qualified Products List

RAM - Recycled Asphalt Material

Random Sample - A sample of construction material taken at a random time or location. The sampling shall be performed according to a random number scheme. See Section 2 (Quality Assurance Program) for further discussion.

Random Number - A randomly selected number used to calculate a sampling time or location. See Section 2 (Quality Assurance Program) for discussion on selection and usage.

RAP - Reclaimed Asphalt Concrete Pavement

RAS - Recycled Asphalt Shingles

Source - Pit, quarry, material supplier or facility. *Term also referenced in AASHTOWare.*

Specifications - Special Provisions, Plans & Drawings, Supplemental Specifications and Standard Specifications.

WAQTC - Western Alliance for Quality Transportation Construction

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SECTION 1
Test Procedures

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Revised December 2024

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* (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 323
DETERMINATION OF CALIBRATION FACTORS
For
DETERMINING THE ASPHALT CEMENT CONTENT OF ASPHALT CONCRETE PAVEMENT
BY THE
IGNITION METHOD

1. SCOPE

1.1 This test method covers the determination of a Calibration Factor (C_F) used in determining asphalt cement content of ACP paving mixtures with or without reclaimed asphalt pavement (RAP) or recycled asphalt shingles (RAS) by the ignition method according to AASHTO T308. This test method also includes determination of gradation correction factors.

1.2 The values stated in metric units are to be regarded as the standard.

1.3 This method may involve hazardous materials, operations, and equipment. This method does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this method to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. REFERENCED DOCUMENTS

AASHTO T308	Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method.
AASHTO T30	Mechanical Analysis of Extracted Aggregate

ODOT Contractor Mix Design Guidelines for Asphalt Concrete and Supplemental Test Procedures for ACP and EAC.

3. Terminology

Calibration Factor (C_F) - The average difference between the known (batched) asphalt binder content and calculated asphalt cement content from incineration results.

ACP - Asphalt Concrete Pavement

Reclaimed Asphalt Pavement (RAP) – removed and/or processed pavement materials containing asphalt binder and aggregate.

Recycled Asphalt Shingles (RAS) – tear-off or manufacturer waste shingle product materials containing asphalt and fine aggregate and fiberglass material.

Recycled Asphalt Material (RAM) – agency approved recycled asphaltic materials containing asphalt binder and aggregate. RAM may be RAP only or a combination of RAP and RAS for purposes of this test procedure. (Currently limited to RAP and RAS).

4. SUMMARY OF TEST METHOD

Four samples of ACP with a known asphalt content and gradation are batched. The asphalt cement in two, possibly four of the samples is incinerated according to AASHTO T308 and the asphalt binder content is calculated. The difference between the known batched asphalt binder content and the calculated asphalt cement content, from incineration result, is determined for each sample. The average of the difference is the Calibration Factor applied to production tests according to AASHTO T308. The gradations of the incinerated samples are determined and compared with a "blank" sample that has not been incinerated.

Establish a Calibration Factor for each JMF. This procedure must be performed for every ignition furnace on a project and for each JMF before any acceptance or verification testing is completed.

The CMDT, who develops the JMF for a project will deliver properly batched samples to each of the field QC laboratories for the CAT1 to use in calculating a Calibration Factor and gradation correction factors. The CMDT will also deliver batched virgin aggregate, anti-stripping additives, if required, and sufficient asphalt cement to the Quality Assurance and ODOT Central laboratories for independent calibration determination. An alternate CMDT may provide the required calibration samples, if approved by the Engineer.

A new calibration factor is required if the source or grade of the asphalt cement changes, if the source of virgin aggregate changes, if a different ignition furnace is used, or for a new JMF. A new calibration factor shall be determined for each JMF prior to its first use every calendar year. Calibration factors for a JMF may be "transferred" from project to project during a calendar year, unless one of the above conditions applies.

5. APPARATUS

Supply apparatus as required by AASHTO T308. Use the same ignition furnace for the calibration that will be used for production testing.

6. CALIBRATION SAMPLE PREPARATION

6.1 Sample the aggregate, mineral filler, lime, fibers, and other appropriate additives to be used for the calibration specimens from material designated for use on the project. Use the brand and grade of asphalt cement designated for the JMF.

6.2 Prepare six calibration mixture samples at the JMF asphalt cement content and gradation and with the appropriate proportions of mineral filler, lime, fibers or other additive included in the JMF. (For JMFs with RAM, RAP and/or RAS, batch the virgin aggregate to the JMF targets. The Recycled Asphalt Materials will not be used for batching Calibration Factor samples.)

Samples provided to the Quality Assurance and ODOT Central Laboratories shall not be mixed. The CMDT shall provide 6 individually batched virgin aggregate samples with the appropriate proportions of mineral filler, lime, fibers or other additive(s) included in the JMF. The CMDT shall also provide sufficient asphalt cement to batch 5 samples. The asphalt cement shall be supplied in 1 qt. containers.

All sample portions shall be clearly labeled as follows:

- Aggregate Samples - JMF Lab Number and Nominal aggregate size.
- Asphalt Cement – with JMF Lab Number, Grade of cement and supplier.
- Hydrated Lime or anti-stripping additives - with JMF Lab Number and source of material.
- Mineral fillers, fibers or other additives - with JMF Lab Number.

Batch the specimens according to standard industry procedures, modified as follows:

- Batch each sample separately and according to the tolerances in Section 6.4.

  If Lime is required by the JMF, add according to TM 316 also see note 1.

  (The amount of lime in a calibration sample can substantially affect the calibration factor, so extra care shall be taken to ensure the proper amount is batched).

- Before adding asphalt cement randomly select one sample and set it aside as the “blank” sample. See Section 6.3.
- Provide sample sizes meeting the requirements of AASHTO T 308.
- Mix and discard one of the remaining five samples. The purpose of this sample is to “butter” the mixing bowl.
- For the remaining four (or more) samples, tare the mixing bowl and weigh the mixing bowl again after the mixture is removed from the bowl. The empty bowl must be within ±1 gram of the previous tare weight.
- Individually identify each calibration sample and supply documentation showing the actual weights of aggregate, asphalt cement, mineral filler, lime, fibers or any other additive for each sample and resultant actual calculated asphalt cement content for each sample. Also provide documentation for each sample verifying that the empty bowl weight after mixing is within ±1 gram of the empty bowl weight prior to mixing. An example batch form (2327CB) is available under Section 3 of the MFTP.

Note 1: Errors in batching or failure to take great care in ensuring that all sample material is removed from the mixing bowl can result in significant errors in the Calibration Factor.

These errors can affect the statistical pay factor for the Contractor and the quantity of asphalt cement the Agency pays for. Every effort should be taken to ensure that batching and mixing errors are minimized.

6.3 The “blank” sample as selected in 6.2 shall have the same gradation, but no asphalt cement shall be added. This “blank” sample will be used to establish correction factors for the aggregate gradations. The “blank” sample is not burned.

6.4 Batch each sample according to the JMF target values within the following tolerances:

Batching Tolerances “Virgin Aggregate and Add Asphalt Cement”

Sieve Size	**Allowable Difference**
Larger than (No. 8)	±3.0%
Size (No. 8)	±2.0%
Larger than (No. 200) and smaller than (No. 8)	±1.0%
Size (No. 200) and smaller	±0.5%
Asphalt Cement	±0.10%

7. CALIBRATION PROCEDURE

7.1 Freshly mixed samples may be tested immediately. Cooled calibration samples must be preheated to (340±9°F) for 120±5 minutes to remove moisture.

7.2 Test two of the samples according to AASHTO T308 Method A or Method B (with a 60 minute burn time) to determine the cement content of each. **The method used for calibration must be used for production testing**. The incinerator shall be kept at 1000°F even if the correction factor exceeds 0.5%.

7.3 If the difference between the cement contents of the two samples exceeds 0.15 percent, perform two additional tests and, from the four tests, discard the high and low result. Determine the Calibration Factor from the two original or remaining results, as appropriate. Calculate the difference between the actual and measured cement contents for each sample.

The Calibration Factor (C_F) is the average of the differences expressed in percent by mass of the ACP mix. ***See Section 8 for example calculations.***

7.4 Perform sieve analysis on the residual aggregates from the incinerated samples used to calculate the Calibration Factor according to AASHTO T30. Average the two results. Perform sieve analysis on the “blank” sample according to AASHTO T30.

7.5 Determine the difference in gradation between the “blank” sample and the average of the two incinerated calibration samples.

The gradation correction factor for each sieve size is the difference between the result from the “blank” sample and the average of the two incinerated calibration samples to the nearest 0.1%. ***See Section 8 for example calculations.***

If the correction factor for any single sieve size exceeds the allowable difference for that sieve established in the following table, contact the Engineer. The Engineer will determine whether or not to apply the gradation correction factors for all sieves.

Gradation Difference Tolerances

Sieve	Allowable Difference
Sizes larger than (No. 8)	±5.0%
Size (No. 8)	±4.0%
Sizes larger than (No. 200) and smaller than (No. 8)	±2.0%
Size (No. 200) and smaller	±1.0%

8. CALCULATIONS

CALIBRATION FACTOR *(Section 7.3)*

$$C_F = \frac{[(D1 - P1) + (D2 - P2)]}{2}$$

D1, D2 = Total sample loss in percent in calibration samples 1 and 2.
P1, P2 = Actual asphalt cement (%) added in calibration samples 1 and 2.
C_F = Calibration Factor

IF: D1 = 6.52 %
D2 = 6.62 %

P1 and P2 = 6.20 %

THEN: C_F = 0.37 %

GRADATION CORRECTION FACTORS *(Section 7.5)*

Sieve Size	Blank Gradation %	Average of two Incinerated samples %	Correction Factor %
(3/4″)	**97.0**	**94.0**	**+3.0**
(1/2″)	**86.3**	**85.9**	**+0.4**
(3/8″)	**77.3**	**75.8**	**+1.5**
(No. 4)	**46.5**	**47.3**	**-0.8**
(No. 8)	**31.2**	**32.0**	**-0.8**
(No. 30)	**12.4**	**14.2**	**-1.8**
(No. 200)	**6.0**	**7.2**	**-1.2**

FINAL GRADATION CALCULATION *(Section 7.5)*

Sieve Size	**Incinerated Washed Gradation %**	**Correction Factor %**	**Final Gradation**
(3/4″)	**94.6**	**+3.0**	**98**
(1/2″)	**86.9**	**+0.4**	**87**
(3/8″)	**54.3**	**+1.5**	**56**
(No. 4)	**47.8**	**-0.8**	**47**
(No. 8)	**32.5**	**-0.8**	**32**
(No. 30)	**15.3**	**-1.8**	**14**
(No. 200)	**8.6**	**-1.2**	**7.4**

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AASHTO

Bulk Density (“Unit Weight”) and Voids in Aggregate

AASHTO Designation: T 19/T 19-24
ASTM Designation: C29/C 29M-07

AASHTO TEST METHODS CANNOT BE INCLUDED ON ODOT’S WEBSITE DUE TO COPYRIGHT INFRINGEMENT.

TO GET COPIES OF THE TEST METHODS, YOU CAN ORDER A HARD COPY OF ODOT’S **MANUAL OF FIELD TEST PROCEDURES** OR YOU CAN ORDER THE LATEST **STANDARD SPECIFICATIONS FOR TRANSPORTATION MATERIALS AND METHODS OF SAMPLING AND TESTING** FROM AASHTO.

To order ODOT’s *Manual of Field Test Procedures*, use the following web address:
https://www.oregon.gov/ODOT/Forms/2ODOT/7345110.pdf

To order AASHTO’s *Standard Specifications for Transportation Materials and Methods of Sampling and Testing*, visit the AASHTO Store website.

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 27-24 and materials finer than 75 µm (No. 200) in accordance with AASHTO T 11-24 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, 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

Note 1: Sieves with a large sieving area, greater than 304.8 mm (12 in.) diameter may not be practical for all sizes of samples. The large sieving area needed for practical sieving of a large nominal size coarse aggregate could result in loss of a portion of the sample if used for a smaller sample of coarse aggregate or fine aggregate affecting final test results.

- Suitable drying equipment (refer to FOP for AASHTO T 255)
- Containers: 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
  - Utensil: device for agitating the sample during the washing procedure.
  - Mechanical washing device
  - Mallet: With a rubber or rawhide head having a mass of 0.57 ±0.23 kg (1.25 ±0.5 lb)
  - Wetting Agent: A dispersing agent that will promote separation of the fine materials without degrading the aggregate. Any detergent used shall not leave a residue on the sample during the washing procedure.

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 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 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 2: 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. To aid in the agitation process, a utensil may be used. To avoid degradation of the sample when using a mechanical washing device do not exceed 10 minutes.
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 and repeat Step 5. Continue until the wash water is reasonably clear. Rinse utensil, if used, into the washed sample.
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 3: 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 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 4: 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 5: 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 6: 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 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 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 2: 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. To aid in the agitation process, a utensil may be used. To avoid degradation of the sample when using a mechanical washing device do not exceed 10 minutes.
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 and repeat Step 5. Continue until the wash water is reasonably clear. Rinse utensil, if used, into the washed sample.
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 3: 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 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 4: 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 5: 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 5.)
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
9.5 (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
9.5 (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
9.5 (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 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 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 2: 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 3: 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 4: 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.

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. To aid in the agitation process, a utensil may be used. To avoid degradation of the sample when using a mechanical washing device do not exceed 10 minutes.

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 and repeat Step 12. Repeat until the wash water is reasonably clear. Rinse utensil, if used, into the washed sample.

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 5: 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 according to the FOP for AASHTO T 255. Cool to room temperature.

20. Determine and record the dry mass, designate this mass as *dry mass before sieving*.

21. 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.

22. 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 6: Excessive shaking (more than 10 minutes) may result in degradation of the sample.

23. 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. See Note 3.

24. 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.

25. Calculate the Cumulative Percent Retained (CPR) and Percent Passing (PP) for the 4.75 mm (No. 4) and larger.

26. 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).

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

Method C Calculations

Check Sum

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

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

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
9.5 (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
			$\sum = 785$				$\sum = 278$
			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
- 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 percent passing to the nearest 1 percent except for the 75 µm (No. 200) sieve, report 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
- sieving the sample in multiple increments
- sieving the sample over a nest of sieves with a larger sieve-frame dimension.

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

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.

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 30-24. 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, 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: 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.
- Utensil: device for agitating the sample during the washing procedure.

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. Use a utensil to aid in the agitation process. To avoid degradation of the sample when using a mechanical washing device do not exceed 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. Rinse utensil into the washed sample.
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

$$Mass\ verification = \frac{2422.5\ g\ -\ 2422.3\ g}{2422.5\ g} \times\ 100\ = 0.0\%$$

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

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, remove the aggregate by sieving the concrete sample over a 37.5 mm (1½ in.) sieve 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 121-24. 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 (1/2 ft^3).

Table 1
Dimensions of Measures*

Capacity m^3 (ft^3)	Inside Diameter mm (in.)	Inside Height mm (in.)	Minimum Thicknesses mm (in.) Bottom	Wall	Nominal Maximum Size of Coarse Aggregate*** 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.
4. 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/m^3	(lb/ft^3)	°C	(°F)	kg/m^3	(lb/ft^3)
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

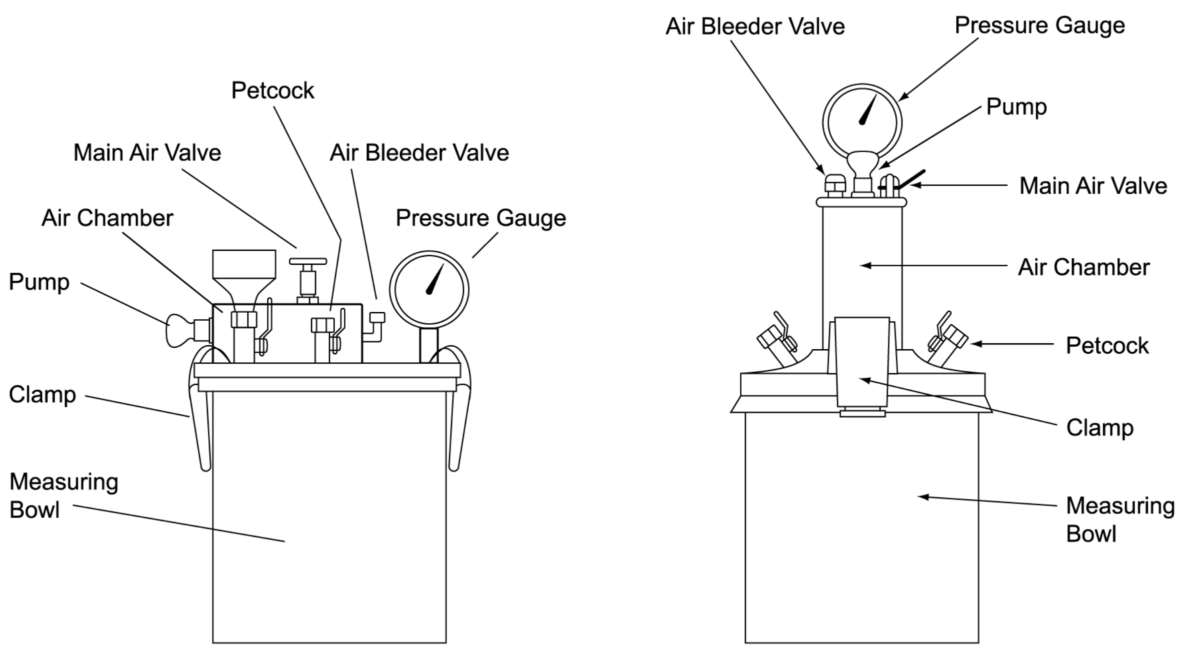
Scope

This procedure covers determination of the air content in freshly mixed Portland Cement Concrete containing dense aggregates in accordance with AASHTO T 152-24, 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.) 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.
- 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 0.6 ±0.25 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 37.5 mm (1½ in.) sieve, remove the aggregate by sieving the concrete sample over a 37.5 mm (1½ in.) sieve 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.
7. Jar the meter gently until all air is expelled from this same petcock.
8. Verify that water is present in both petcocks.
9. 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.
10. 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.
11. Close both petcocks.
12. Open the main air valve.
13. Tap the side of the measure smartly with the mallet.
14. 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.
15. Release or close the main air valve.
16. Open both petcocks to release pressure, remove the concrete, and thoroughly clean the cover and measure with clean water.
17. 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 166-24. 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.
- Potable water: Water that is suitable for drinking.
- 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. Use potable water to fill the water bath. The water in the bath does not need to maintain a potable condition but must remain clear at all times.

- 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 specimens 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 (126 ±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; specimen 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 specimen 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.
- Potable water: Water that is suitable for drinking.
- Water bath: For immersing the specimen in water, capable of maintaining a uniform temperature at 25 ± 1°C (77 ± 2°F). Use potable water to fill the water bath. The water in the bath does not need to maintain a potable condition but must remain clear at all times.
- Thermometer: Range of 15 to 45°C (59 to 113°F) and graduated in 0.1°C (0.2°F) subdivisions.
- Distilled water: Clear, distilled water for filling the volumeter.
- Volumeter: Calibrated to 1200 mL or appropriate capacity for specimen 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 specimen 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 specimens 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 (126 ±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; specimen 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; specimen 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.

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. Record the standardized container mass for use in subsequent calculations.

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 aggregate: the lid is optional unless drying with a microwave then a ventilated lid is required.
   b. For soils: the container includes the mass of the close-fitting lid.
2. Place the wet sample in the container.
3. Determine and record the total mass of the wet sample and container with lid, when used.
   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. Subtract the container mass determined in Step 1 from the mass of the container and sample determined in Step 3 and record the wet mass of the sample (M_W).
5. Remove the lid, if used, and 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 and lid, when used.
8. Subtract the container mass determined in Step 1 from the mass of the container and sample determined in Step 7 and record the mass of the sample.
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 with lid, if used.
11. Subtract the container mass determined in Step 1 from the mass of the container and sample determined in Step 10 and record the mass of the sample.
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 and container with lid, when used, to cool. Determine and record the total mass.
16. Subtract the mass of the container determined in Step 1 from the mass of the container and sample determined in Step 15 and record the dry mass of the sample (M_D).
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 Aggregate and Soils:

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

ONE-POINT METHOD FOR DETERMINING MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE
FOP FOR AASHTO T 272

Scope

This procedure provides for a rapid determination of the maximum dry density and optimum moisture content of a soil sample, using a one-point determination in accordance with AASHTO T 272-18. This procedure is related to the FOPs for AASHTO T 99/T 180 and R 75.

One-point determinations are made by compacting the soil in a mold of a given size with a specified rammer dropped from a specified height and then compared to an individual moisture-density curve (FOP for AASHTO T 99 or T 180) or soil density-relations group (FOP for AASHTO R 75). Four alternate methods – A, B, C, and D – are used and correspond to the methods described in the FOP for AASHTO T 99/T 180. The method used in AASHTO T 272 must match the method used for the reference curve or to develop the soil density-relations. For example, when moisture-density relationships as determined by T 99 – Method C are used to form the soil density-relations group or an individual moisture density curve, then T 99 – Method C must be used to for the one-point determination.

Apparatus

See the FOP for AASHTO T 99/T 180.

Sample

Sample size determined according to the FOP for AASHTO T 310. In cases where the existing individual curve or soil density-relations group cannot be used a completely new curve will need to be developed and the sample size will be determined by the FOP for AASHTO T 99/T 180.

1. If the sample is damp, dry it until it becomes friable under a trowel. Drying may be in air or by use of a drying apparatus maintained at a temperature not exceeding 60°C (140°F).
2. Thoroughly break up aggregations in a manner that avoids reducing the natural size of individual particles.
3. Pass the material through the appropriate sieve.

Procedure

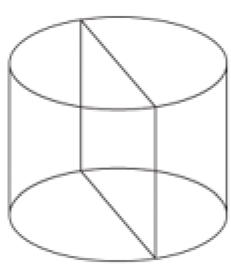
Use the method matching the individual curve or soil density-relations group. Refer to Table 1 of the FOP for AASHTO T 99 / T 180 for corresponding mold size, number of layers, number of blows, sieve size, and rammer specification for the various test methods.

1. Determine the mass of the clean, dry mold. Include the base plate but exclude the extension collar. Record the mass to the nearest 1 g (0.005 lb).
2. Thoroughly mix the sample with sufficient water to adjust moisture content to 80 to 100 percent of the anticipated optimum moisture.

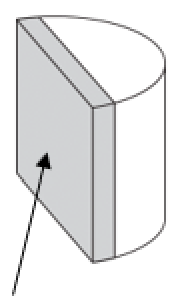
3. Form a specimen by compacting the prepared soil in the mold (with collar attached) in approximately equal layers. For each layer:
   a. Spread the loose material uniformly in the mold.

Note 1: It is recommended to cover the remaining material with a non-absorbent sheet or damp cloth to minimize loss of moisture.

   b. Lightly tamp the loose material with the manual rammer or other similar device, this establishes a firm surface.
   c. Compact each layer with uniformly distributed blows from the rammer.
   d. Trim down material that has not been compacted and remains adjacent to the walls of the mold and extends above the compacted surface.
4. Remove the extension collar. Avoid shearing off the sample below the top of the mold. The material compacted in the mold should not be over 6 mm (¼ in.) above the top of the mold once the collar has been removed.
5. Trim the compacted soil even with the top of the mold with the beveled side of the straightedge.
6. Clean soil from exterior of the mold and base plate.
7. Determine the mass of the mold and wet soil to the nearest 1 g (0.005 lb).
8. Determine the wet mass of the sample by subtracting the mass in Step 1 from the mass in Step 7.
9. Calculate the wet density (ρ_w) as indicated below under "Calculations."
10. Extrude the material from the mold. For soils and soil-aggregate mixtures, slice vertically through the center and remove one of the cut faces for a representative moisture content sample. For granular materials, a vertical face will not exist. Take a representative sample ensuring that all layers are represented. This sample must meet the sample size requirements of the test method used to determine moisture content.



Extruded material



Representative moisture content sample

11. Determine the moisture content (w) of the sample in accordance with the FOP for AASHTO T 255 / T 265.

Calculations

Wet Density

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

Where:

ρ_w	=	wet density, kg/m^3 (lb/ft^3)
M_w	=	wet mass
V_m	=	volume of the mold, (FOP for AASHTO T 99/T 180)

Dry Density

$$\rho_d = \left(\frac{\rho_w}{w + 100}\right) \times 100 \quad or \quad \rho_d = \frac{\rho_w}{\left(\frac{w}{100}\right) + 1}$$

Where:

ρ_d	=	dry density, kg/m^3 (lb/ft^3)
w	=	moisture content, as a percentage

Example for 4-inch mold, Methods A or C

Wet mass, M_w	=	2.0055 kg (4.42 lb)
Moisture content, w	=	13.5%
Measured volume of the mold, V_m	=	0.0009469 m^3 (0.0334 ft^3)

Wet Density

$$\rho_w = \frac{2.0055\ kg}{0.0009469\ m^3} = 2118\ kg/m^3 \quad \rho_w = \frac{4.42\ lb}{0.0334\ ft^3} = 132.2\ lb/ft^3$$

Where:

ρ_w = Wet density, kg/m^3 (lb/ft^3)

Dry Density

$$\rho_d = \left(\frac{2118\, kg/m^3}{13.5 + 100}\right) \times 100 = 1866\ \ kg/m^3 \quad \rho_d = \left(\frac{132.2\, lb/ft^3}{13.5 + 100}\right) \times 100 = 116.5\, lb/ft^3$$

or

$$\rho_d = \left(\frac{2118\, kg/m^3}{\frac{13.5}{100} + 1}\right) = 1866\ \ kg/m^3 \quad \rho_d = \left(\frac{132.2\, lb/ft^3}{\frac{13.5}{100} + 1}\right) = 116.5\, lb/ft^3$$

ρ_d = Dry density, kg/m^3 (lb/ft^3)

Maximum Dry Density and Optimum Moisture Content Determination Using an Individual Moisture - Density Curve

1. The moisture content must be within 80 to 100 percent of optimum moisture of the reference curve. Compact another specimen, using the same material, at an adjusted moisture content if the one-point does not fall in the 80 to 100 percent of optimum moisture range.

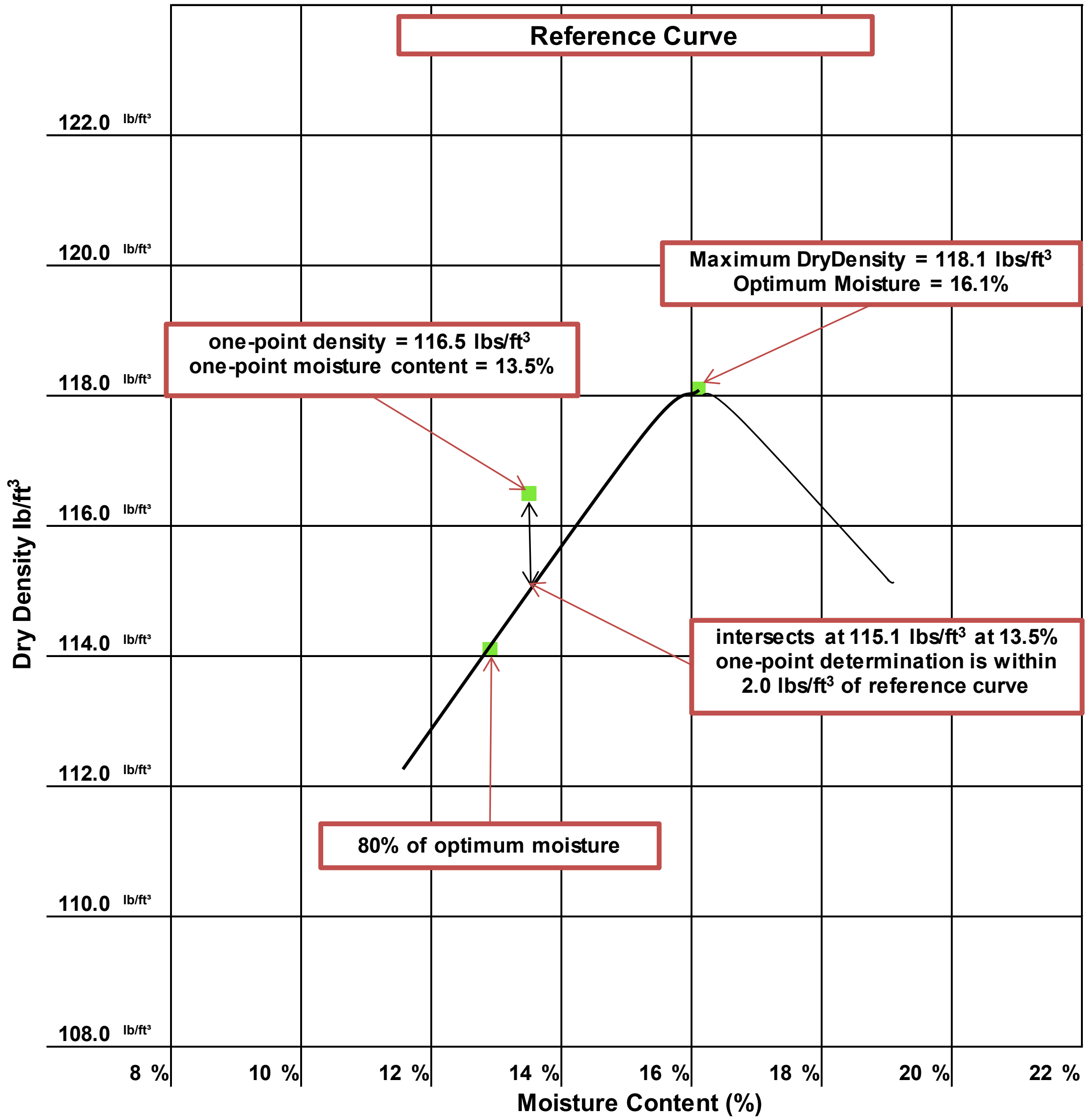
2. Plot the one-point, dry density on the vertical axis and moisture content on the horizontal axis, on the reference curve graph.

3. If the one-point falls on the reference curve or within ±2.0 lbs/ft^3, use the maximum dry density and optimum moisture content determined by the curve.

4. Use the FOP for AASHTO T 99/T 180 Annex A to determine corrected maximum dry density and optimum moisture content if oversize particles have been removed.

5. Perform a full moisture-density relationship if the one-point does not fall on or within ±2.0 lbs/ft^3 of the reference curve at 80 to 100 percent optimum moisture.

Example



The results of a one-point determination were 116.5 lb/ft^3 at 13.5 percent moisture. The point was plotted on the reference curve graph. The one-point determination is within 2.0 lb/ft^3 of the point on the curve that corresponds with the moisture content.

Maximum Dry Density and Optimum Moisture Content Determination Using Soil Moisture-Density Relations

1. Plot the one-point, dry density on the vertical axis and moisture content on the horizontal axis, on the reference soil density-relations graph.

2. If the moisture-density one-point falls on one of the curves in the soil density-relations, use the maximum dry density and optimum moisture content defined by that curve.

3. If the moisture-density one-point falls within the soil density-relations but not on an existing curve, draw a new curve through the plotted single point, parallel and in character with the nearest existing curve in the soil density-relations. Use the maximum dry density and optimum moisture content as defined by the new curve.

    a. The one-point must fall either between or on the highest or lowest curves. If it does not, then a full curve must be developed.

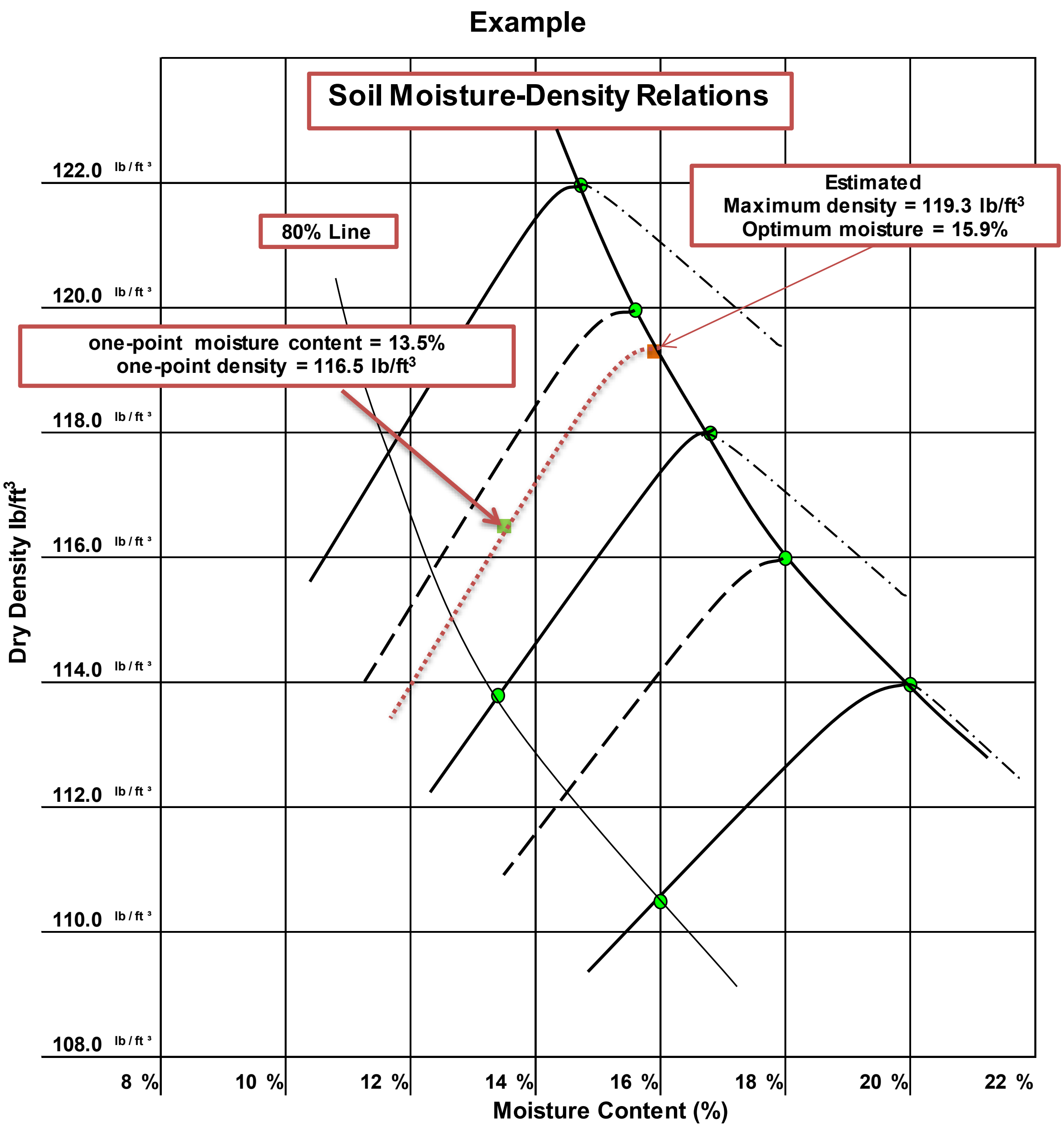
    b. If the one-point plotted within or on the soil density-relations group does not fall in the 80 to 100 percent of optimum moisture content, compact another specimen, using the same material, at an adjusted moisture content that will place the one point within this range.

4. Use the FOP for AASHTO T 99/T 180 Annex A to determine corrected maximum dry density and optimum moisture content if oversize particles have been removed.

5. If the new curve through a one-point is not well defined or is in any way questionable, perform a full moisture-density relationship to correctly define the new curve and verify the applicability of the soil density-relations.

Note 2: New curves drawn through plotted single point determinations shall not become a permanent part of the soil density-relations until verified by a full moisture-density procedure following the FOP for AASHTO T 99/T 180.

Example



The results of a one-point determination were 116.5 lb/ft^3 at 13.5 percent moisture. The point was plotted on the reference curve graph. The point was plotted on the appropriate group between two previously developed curves near and intermediate curve.

The "dotted" curve through the moisture-density one-point was sketched between the existing curves. A maximum dry density of 119.3 lb/ft^3 and a corresponding optimum moisture content of 15.9 percent were estimated.

Report

- On forms approved by the agency
- Sample ID
- Maximum dry density to the nearest 1 kg/m^3 ($0.1\ lb/ft^3$)
- Corrected maximum dry density (if applicable)
- Optimum moisture content to the nearest 0.1 percent
- Corrected optimum moisture content (if applicable)
- Reference curve or Soil Moisture-Density Relations used

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 308-24.

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.

Sample Preparation

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**

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.
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 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:

$$P = \frac{\frac{97.6\ g}{2} + 632.6\ \mathrm{g}}{632.6\ g + 97.6\ g + 352.6\ g} \times 100 = 62.9\% \qquad \text{Report } 63\%$$

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.

Sampling Asphalt Mixtures after Compaction (Obtaining Cores)

AASHTO Designation: R 67-24

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DEVELOPING SOIL MOISTURE-DENSITY RELATIONS FOP FOR AASHTO R 75

Scope

This procedure provides a method to develop soils density-relations in accordance with AASHTO R 75-24 using multiple moisture-density curves developed using the same method, A, B, C, or D, from the FOP for AASHTO T 99/T 180.

All curves used in a group must be developed using a single Method: A, B, C, or D of a procedure for AASHTO T 99 or T 180. See the FOP for AASHTO T 99/T 180.

Terminology

***soil moisture-density relations* —** a group of soil moisture-density relations (commonly known as a family of curves) determined using AASHTO T 99 or T 180, which reveal certain similarities and trends characteristic of the soil type and source.

***spine* —** smooth line extending through the point of maximum density and optimum moisture content of a group of moisture-density curves.

Procedure

1. Sort the curves by Method (A, B, C, or D of the FOP for T 99/T 180). At least three curves are required per group.
2. Select the highest and lowest maximum dry densities from those selected to assist in determining the desired scale of the subsequent graph.
3. Plot the maximum density and optimum moisture points of the selected curves on the graph.
4. Draw a smooth, "best fit," curved line through the points creating the spine of the soil moisture-density relations.
5. Remove maximum density and optimum moisture points that were not used to establish the spine.
6. Add the moisture-density curves associated with the points that were used to establish the spine. It is not necessary to include the portion of the curves over optimum moisture.

Note 1—Intermediate curves using slopes similar to those of the original moisture-density curves may be included when maximum density points are more than 2.0 lb/ft^3 apart. Intermediate curves are indicated by a dashed line.

7. Plot the 80 percent of optimum moisture range when desired:
   a. Using the optimum moisture of an existing curve, calculate 80 percent of optimum moisture and plot this value on the curve. Repeat for each curve in the group.
   b. Draw a smooth, "best fit," curved line connecting the 80 percent of optimum moisture points plotted on the curves that parallel the spine.

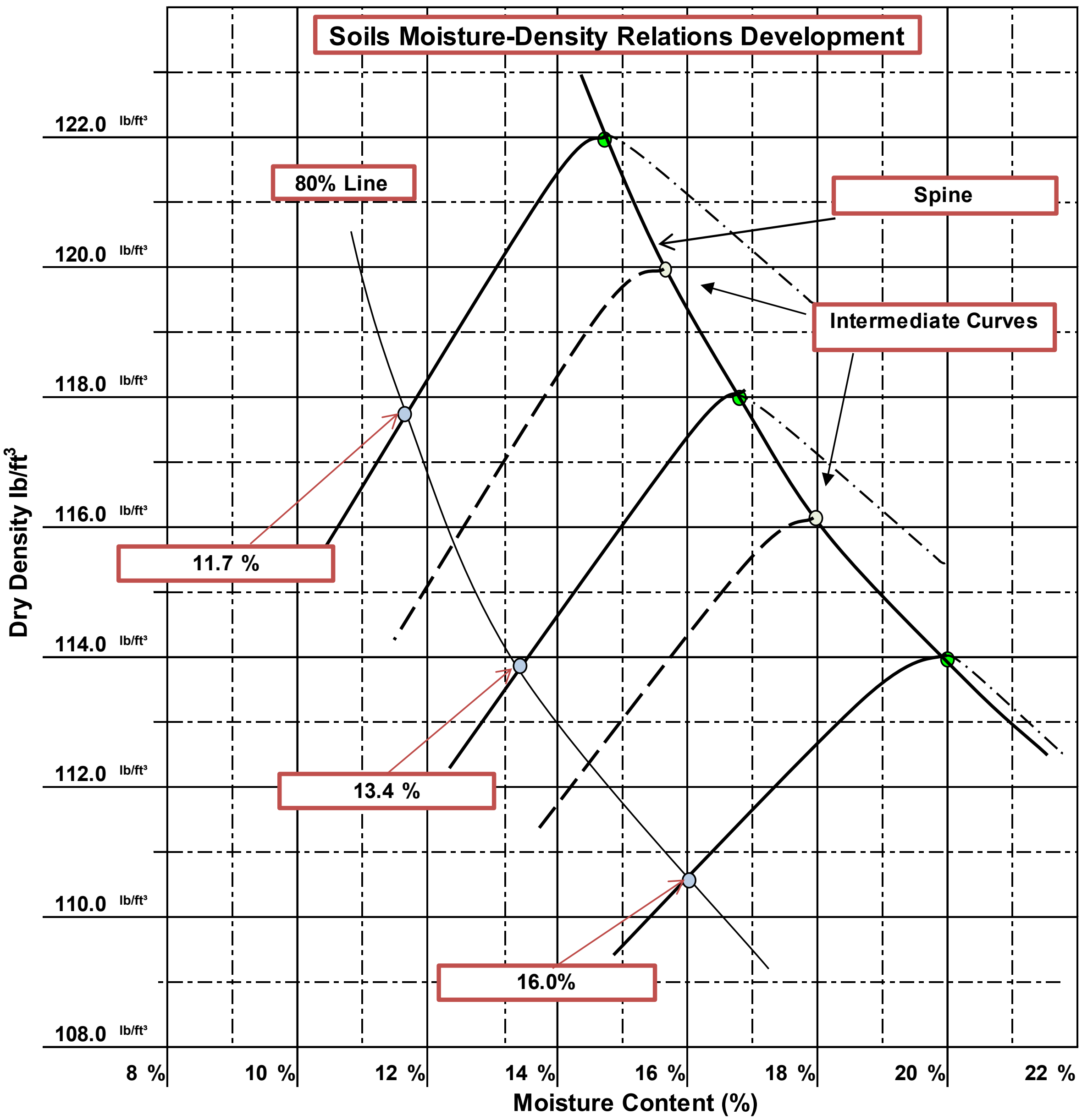
Calculations

Calculate 80 percent of optimum moisture of each curve:

Example:

Optimum moisture of the highest density curve = 14.6%

$$80\%\ point = \frac{80}{100} \times 14.6\% = 11.7\%$$



SOIL MOISTURE-DENSITY RELATIONS – DEVELOPMENT APPENDIX “A” FOP FOR AASHTO R 75

Significance

The purpose of the soil moisture-density relation of curves is to represent the average moisture-density characteristics of soils with similar geologic makeup. This should be based on moisture-density relationships which represent the widest possible range of soils which may be encountered on a project. If the soil types have moisture-density relationships that differ considerably and cannot be represented on one general relationship of curves; then multiple relationships may be developed. Also, moisture-density relationships for material of widely varying geologic origins should be carefully examined to determine if separate families are required.

Soils sampled from one source will have many different moisture-density relationships. If a group of these curves are plotted together, it reveals similarities of the material in relation to the soil type and source. Developing a soil moisture-density relationship of curves has the potential advantage of spanning a large number of different soil types with a minimal amount of laboratory work.

Scope

This procedure provides a process for developing a relationship of curves using multiple individual curves as the source of data. The individual curves are sorted according to type and plotted on a single sheet of paper. The individual curves are connected by a common line drawn through their maximum density/optimum moisture points forming a soil moisture-density relationship. A series of individual curves or a combination of curves are utilized as appropriate to create one or more relationships. This procedure is related to AASHTO T 99, and AASHTO T 180. The relationship of curves must match the method utilized during the single curve development. A minimum of 3 individual curves is required to form a single soil moisture-density relation.

Apparatus

See the FOP for AASHTO T 99 and T 180.

Sample

See the FOP for AASHTO T 99 and T 180.

Procedure

See the FOP for AASHTO T 99 and T 180.

Calculations

See the FOP for AASHTO T 99 and T 180.

Overview

- Sort the individual curves into groups based on method of development.
- Plot the point representing the maximum density and optimum moisture for each individual curve on a single sheet of graph paper. At least 3 curves are required to develop a soil moisture-density relationship.
- Draw a “best fit” smooth curve which closely connects all points.
- At 2.0 lbs/ft^3 increments draw complete moisture-density relationships using slopes closely matching those of the original moisture-density relationships.
- When a large number of similar single curves exists, the average values maybe used, if the difference between curves is less than 2.0 lbs/ft^3.

Developing a Soil Moisture-Density Relationship

1. Initially sort candidate curves by test method and use only those developed using the same procedure.

2. Review the curves and select the highest and lowest maximum dry densities. Select a vertical density scale that places the highest value in the top 1” portion of the graph. Select a dry density increment that places the lowest value approximately 3” from the bottom portion of the graph. Label the incremental areas between the highest and lowest maximum density values.

   Note 1*: An increment of 2.0 lbs/ft^3 per vertical inch is a recommended scale, but any increment can be used to accommodate the data plotting. It is preferable to use a scale that places whole numbers at the bold one-inch gridlines on the graph.*

3. Review the corresponding optimum moisture data for the upper and lower points used to establish the vertical dry density scale described in step 2. Select a horizontal moisture scale that places the high point about 3” from the left edge and the low point about 1” from the right edge of the graph. Label the incremental grids between the highest and lowest optimum moisture values.

   Note 2*: An increment of 2.0% per horizontal inch is a recommended scale, but any increment can be used to accommodate the data plotting. It is preferable to use a scale that places the whole numbers at the bold one-inch gridlines on the graph.*

4. Plot the maximum density and optimum moisture for each candidate curve to determine if they fit the desired pattern of a smooth curve that is slightly concave up and to the left. Eliminate points which do not fit this pattern. A minimum of three points is required to establish a soil moisture-density relationship.

5. Draw a smooth “best fit” curve through the points, creating a curve that is slightly concave, up and to the left.

Note 3*: The “best fit” curve (or spine) now defines the maximum density and optimum moisture content of the soils represented by this soil moisture-density relationship. A dry density or dry side, reference needs to be established for each individual curve and is created by replicating the original curve shape. Each individual curve has a unique shape towards the maximum density/optimum moisture point and needs to be plotted. This can be accomplished with tracing paper, a French curve or other objects that can mimic the shape. The only useable area on a soil moisture-density relation of curves is on the “dry” side of optimum moisture, therefore, we only need to apply one half of the moisture-density curve shape configuration to the soil moisture-density relation of curves spine.*

6. Mark each maximum density/optimum moisture point with a dry side arc of sufficient length to meet the dry side leg. This is accomplished by centering the template directly below and touching the maximum density/optimum moisture point. Initially mark lightly in pencil. The exact length of the arc will be determined when the dry side leg is drawn in tangent to this arc. This process is repeated for each original curve.

   Note 4*: To establish the “dry side” slope a single point near the bottom of the original curve is required. This point, when plotted, will be connected with the tangent on the arc using a straight line. This will complete the original individual curve or the dry half of the original curve. If the scale of the original curve is the same as the soil moisture-density relation then you should be able to overlay the relation with the original curve and when held to the light, the “dry sides” should match. The point selected on the dry side must accurately reflect the slope of the original curve if another scale is utilized. The point selected may be a data point from the original curve or it may be a point scaled off the graph of the original curve. This process is repeated for each original curve.*

7. Establish the 80% of Optimum Moisture Line at the bottom of the “dry side” legs. This provides a graphical guide for the Density Technician when using the soil moisture-density relation of curves in the field. Compute 80% of optimum moisture for each curve by multiplying the optimum moisture by 0.8. Lay a ruler vertically on the graph and at the 80% of optimum moisture calculated, make a tick mark where the ruler intercepts the “dry side” leg of that curve. This process is repeated for each original curve. Draw a smooth best-fit curve through the tick marks and label each end of the line with 80%.

8. At 2.0 lbs/ft^3 increments draw moisture-density relationships using slopes similar to those of the original moisture-density relationships.

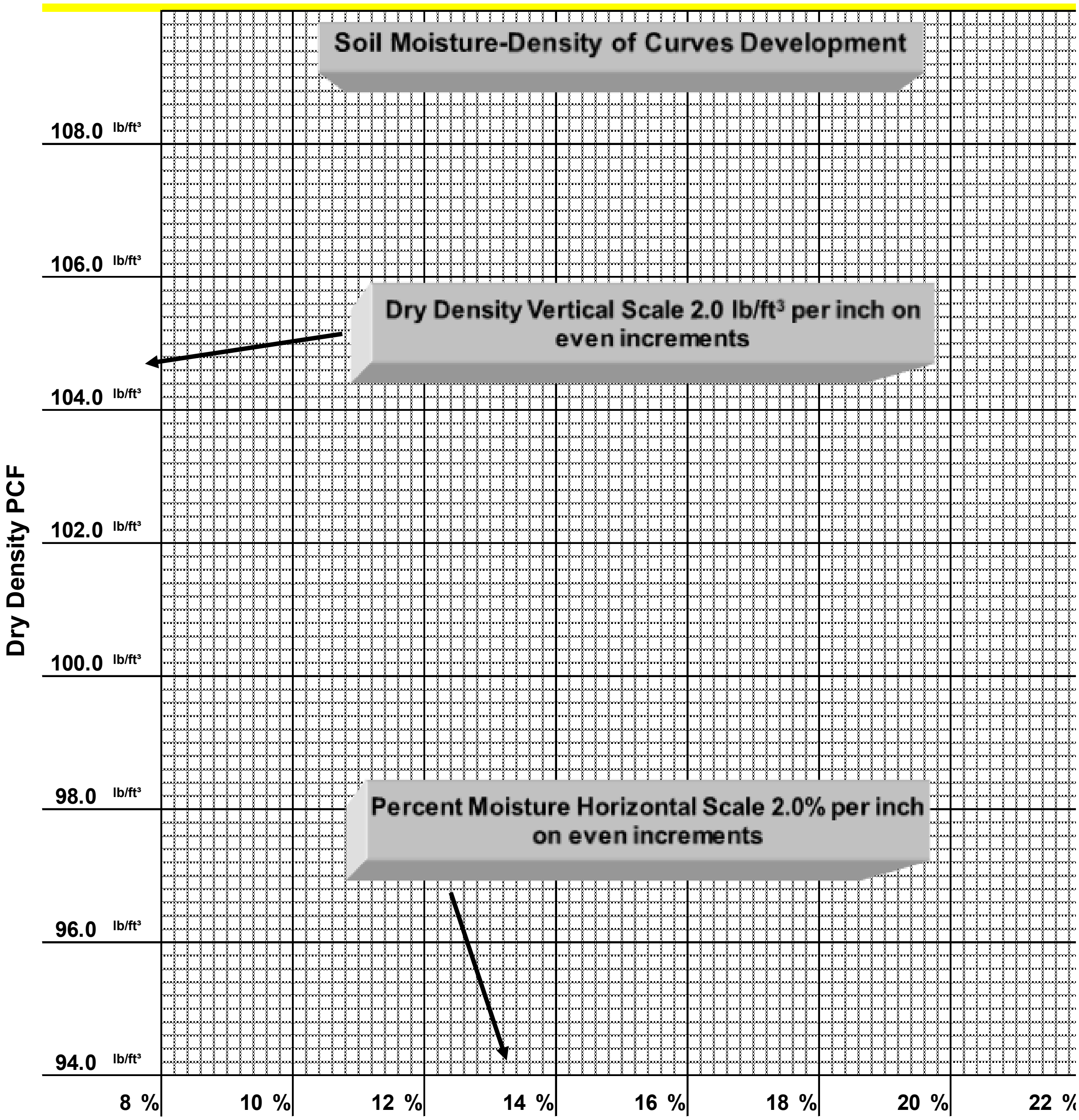
EXAMPLE OF SOIL MOISTURE-DENSITY RELATIONS DEVELOPMENT:

STEP 1:

- **Sort and only retain curves developed by the same procedure (e.g. T 99 method A.**

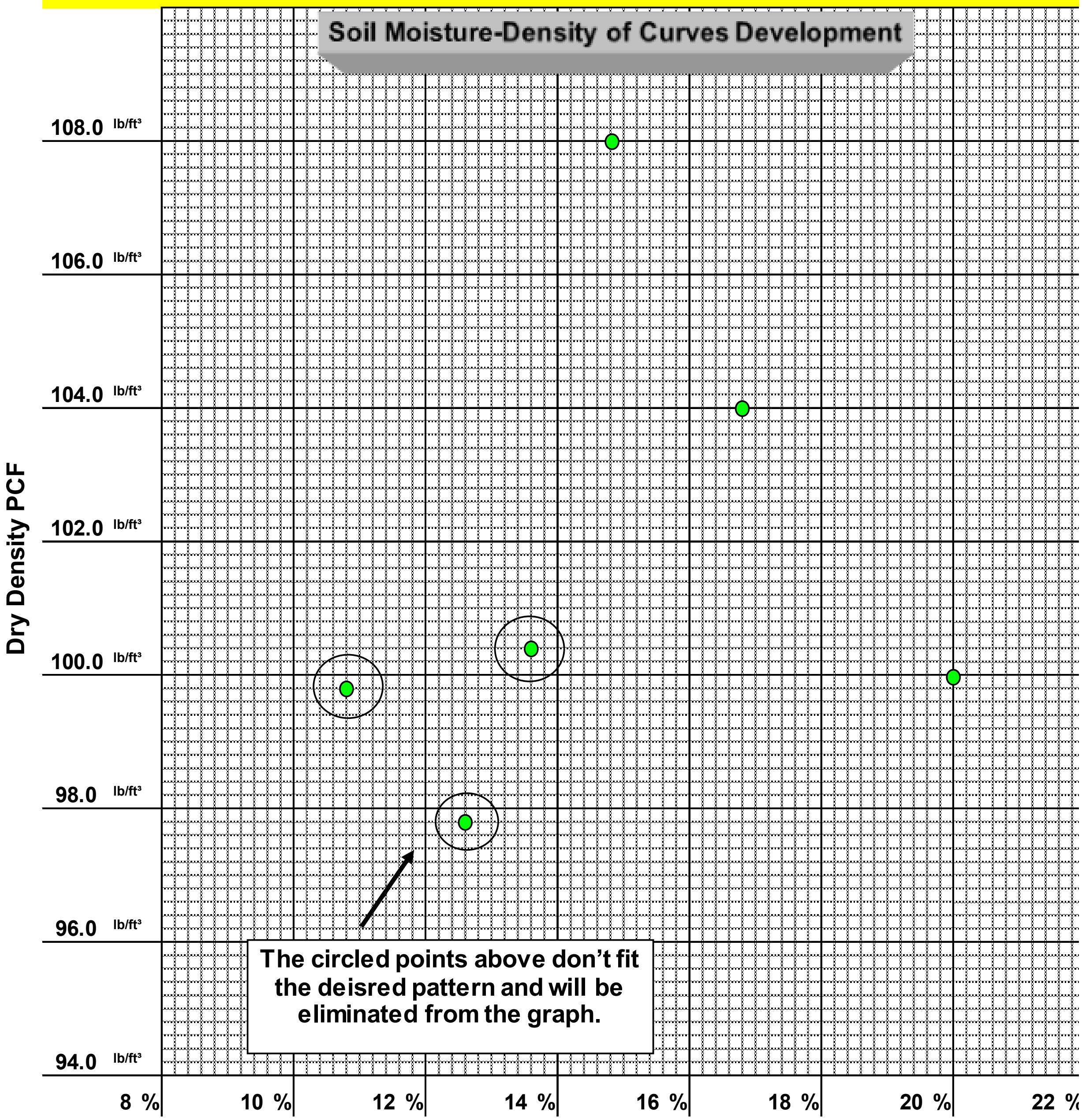
STEP 2 & 3:

- **Establish and label an appropriate dry density scale on the vertical axis and a percent moisture scale on the horizontal axis.**

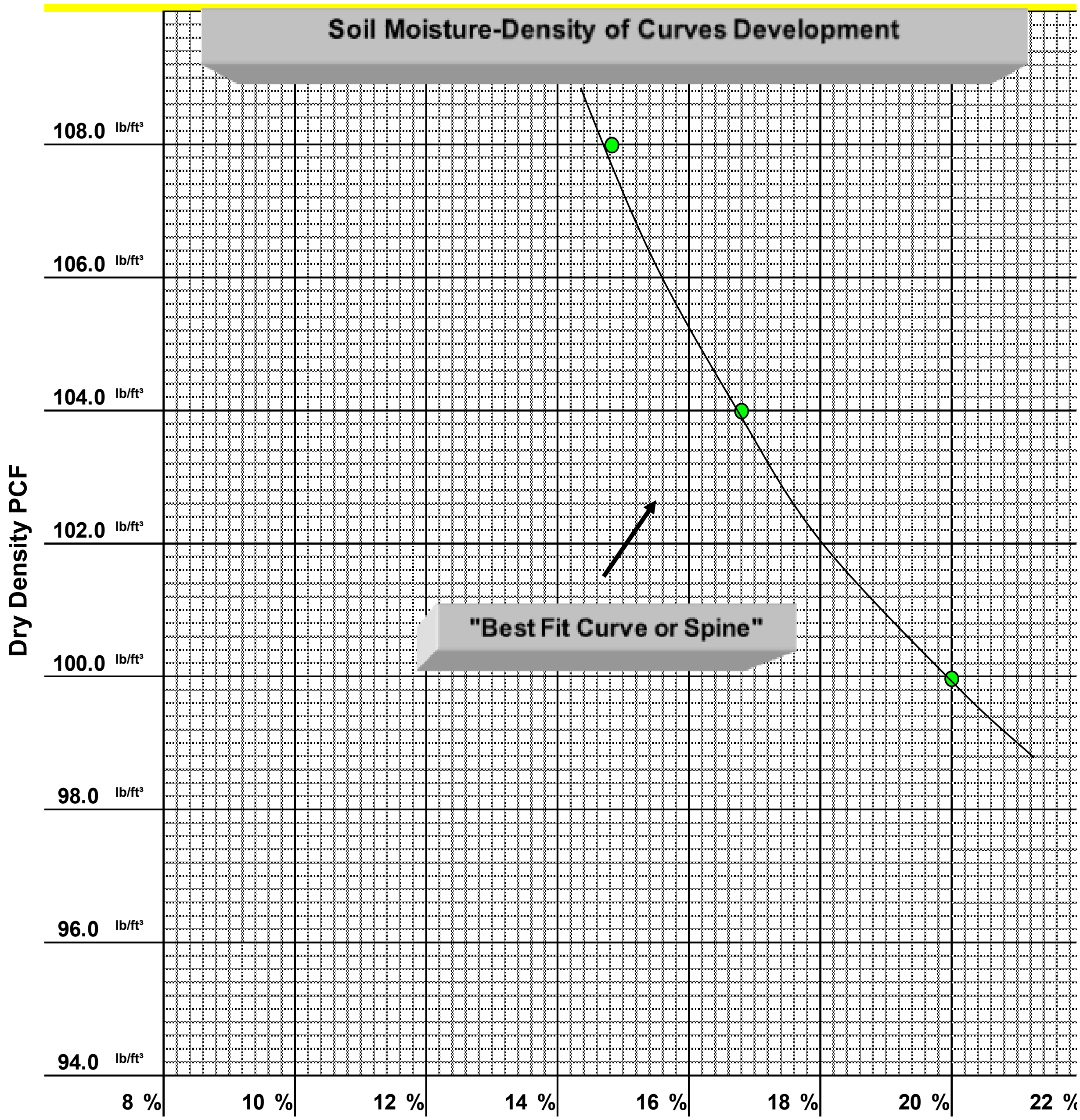


Step 4:

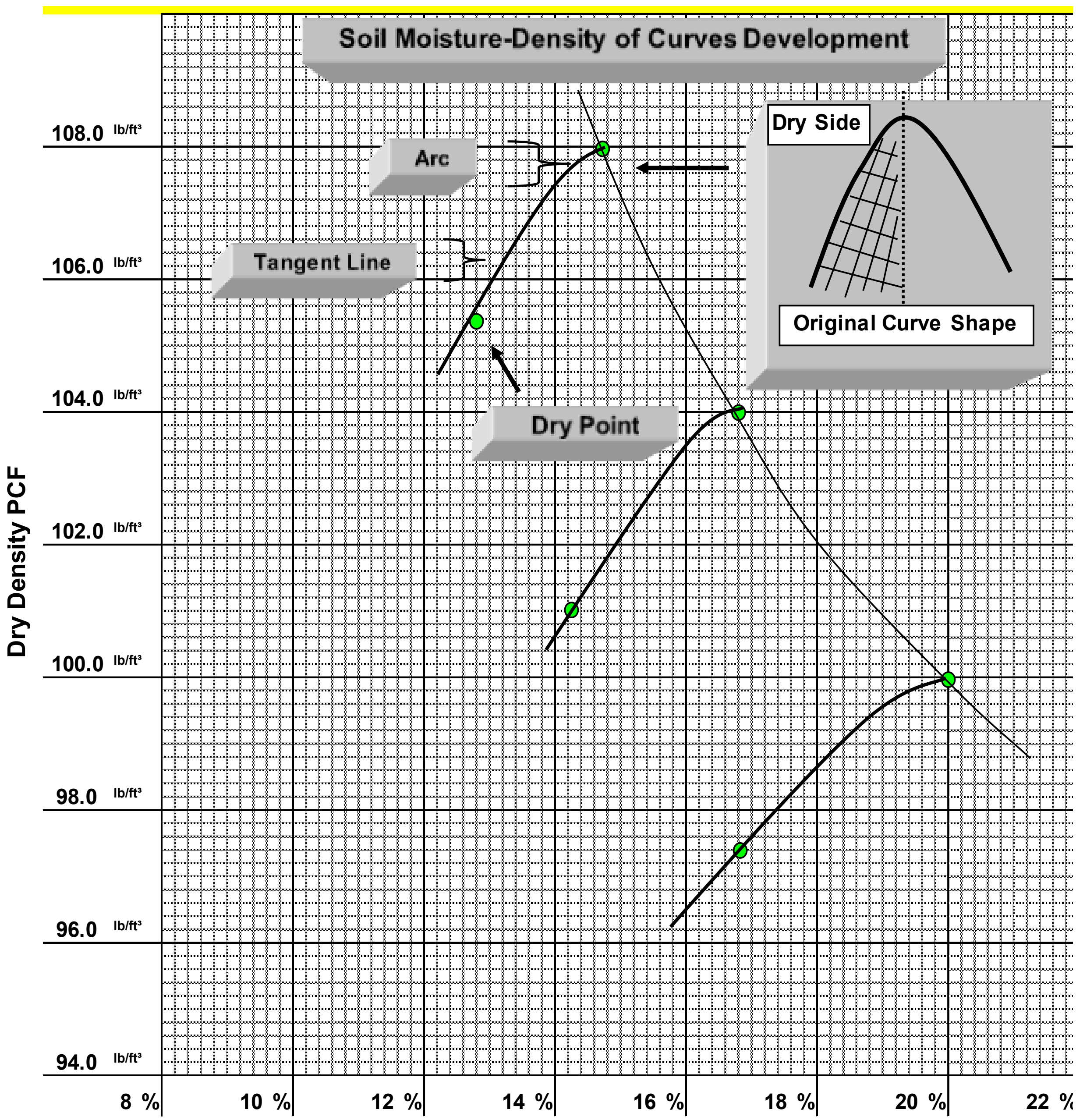
- **Plot only the points representing the maximum dry density and optimum moisture from the candidate curves.**



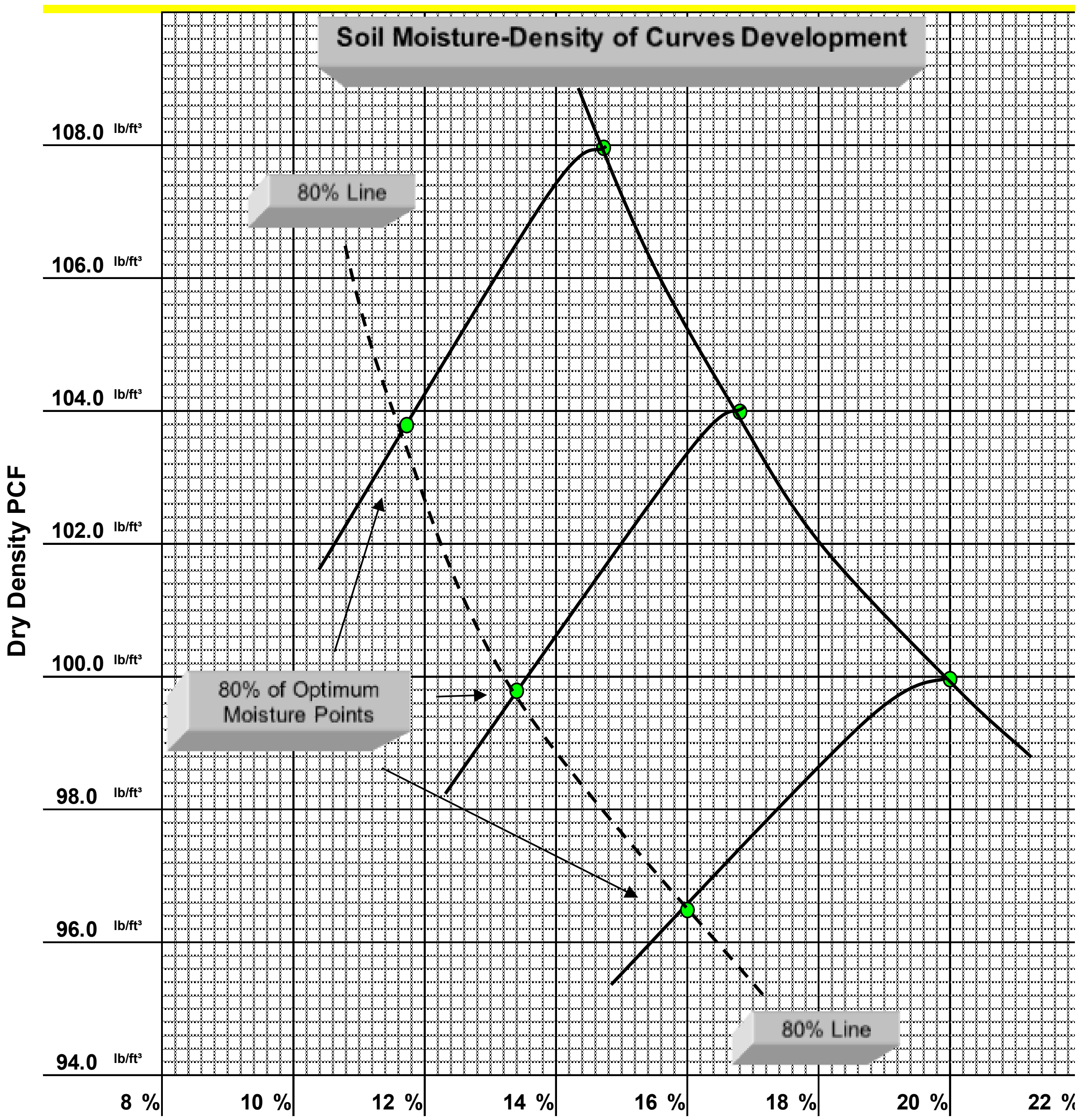
Step 5: Draw a smooth “best fit” curve through the points creating a curve that is slightly concave up and to the left.



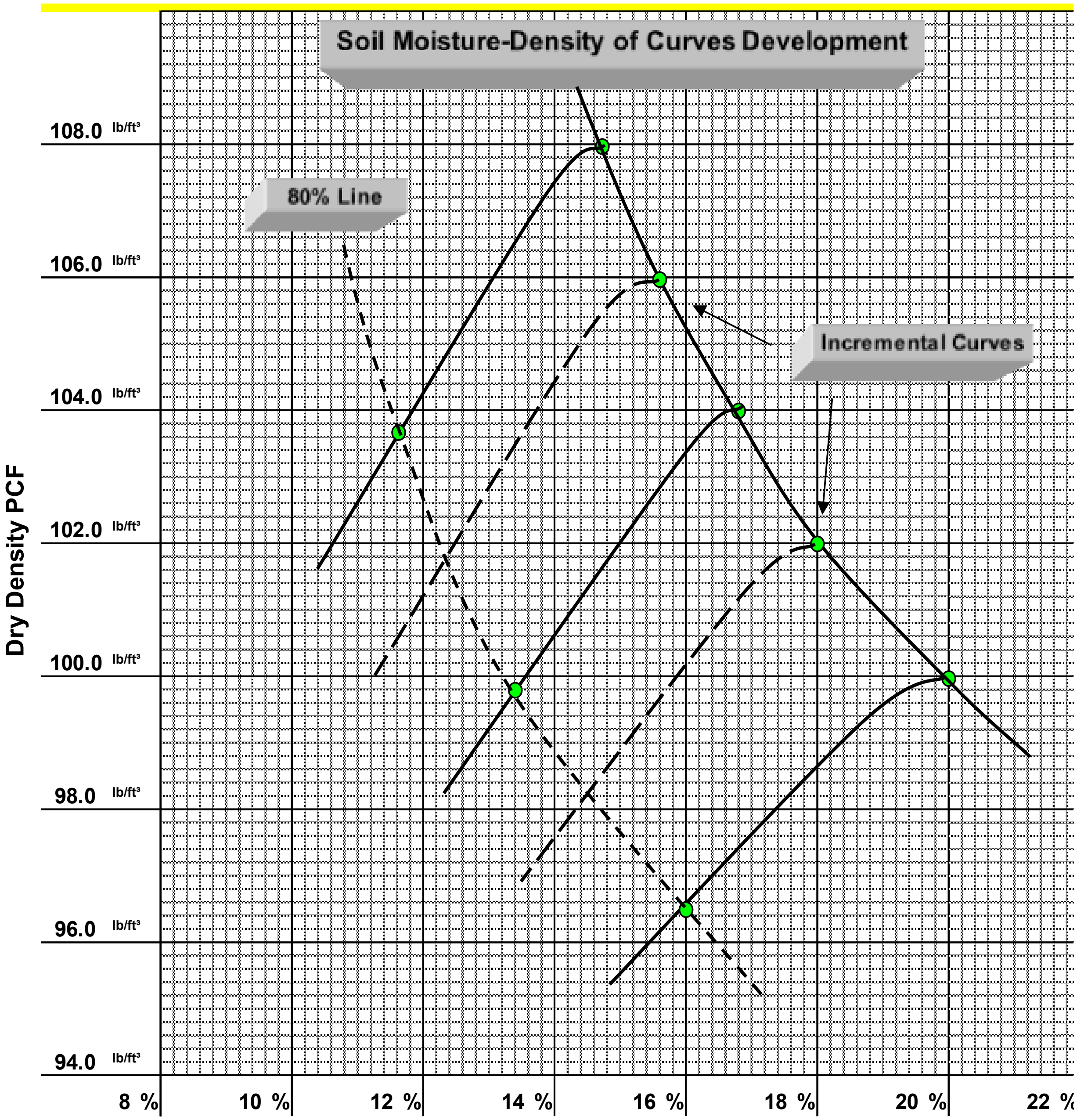
Step 6: Mark each maximum density-optimum moisture point with a dry side arc of sufficient length to meet the dry side leg. Plot a point on the "dry side" and connect the arc with the point using a tangent line.



Step 7: Establish the 80% of Optimum Moisture Line at the bottom of the “dry side” legs.



Step 8: At 2.0 lbs/ft3 increments draw moisture-density relationships using slopes similar to those of the original moisture-density relationships.



Report

- Include original curve data with soil moisture-density relation.
- Include Gsb & Absorption information of retained material, if available.

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 pile 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 pile 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

$$\frac{Smaller\ Mass}{Larger\ Mass} = Ratio \qquad (1 - ratio) \times 100 = \%\ Difference$$

Splitter check: 5127 g total sample mass

Splitter pan #1: 2583 g

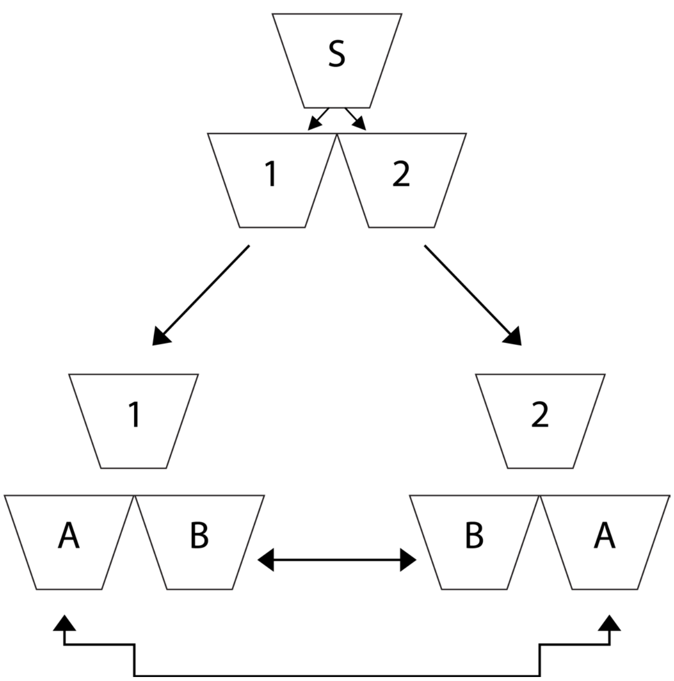
Splitter pan #2: 2544 g

$$\frac{2544\text{ g}}{2583\text{ g}} = 0.985 \qquad (1 - 0.985) \times 100 = 1.5\%$$

Alternative to Mechanical Splitter Check

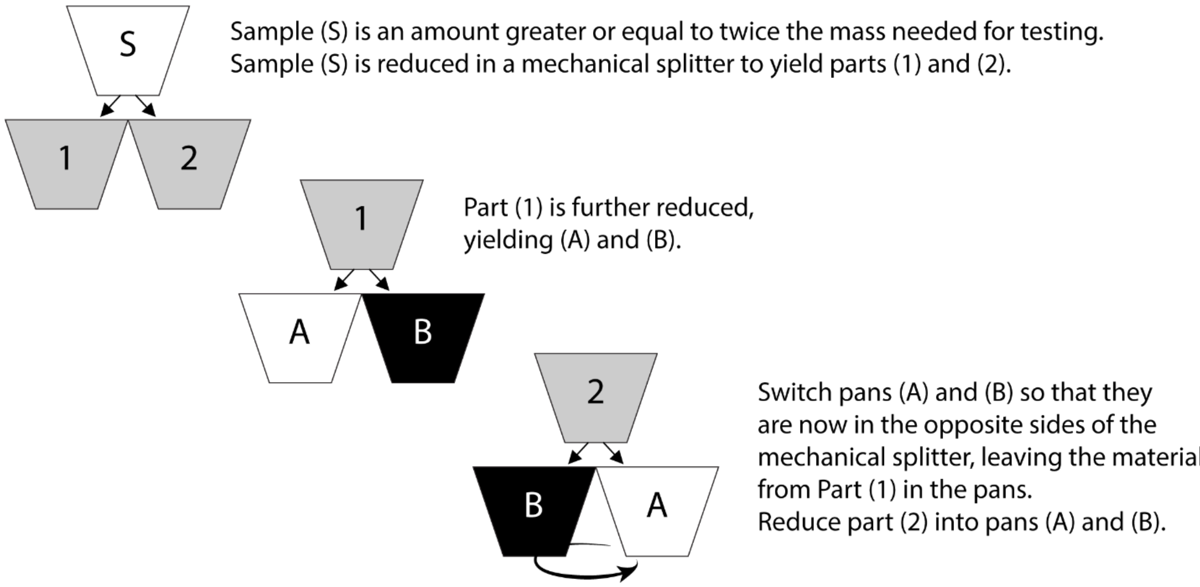
- In lieu of determining the mass of each reduced portion, use the method illustrated in Figure 1 or 2 during reduction.

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 or tarp where there will be neither loss of material nor the accidental addition of foreign material.

2. Mix the material thoroughly a minimum of four times by one of the following:

    a. Turning the entire sample over with a shovel or scoop. On the final turning, shovel the entire sample into a conical pile by depositing each shovelful on top of the preceding one.

    b. Pulling each corner of the tarp horizontally over the sample toward the opposite corner. After the final turn, form a conical pile.

3. Flatten the conical pile to a uniform thickness and diameter by pressing down with a shovel or scoop. The diameter should be four to eight times the thickness.

4. Divide the flattened pile 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, transport 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 be 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.

Transport Units

1. Visually divide the transport 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.

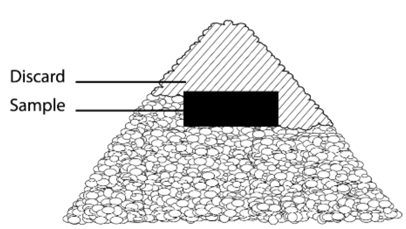
Paver Auger

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.

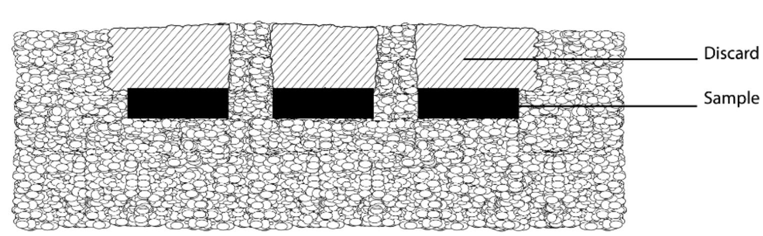
Note 1: First full shovel of material may be discarded to preheat and 'butter' the shovel.

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 three approximately 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 plate 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.

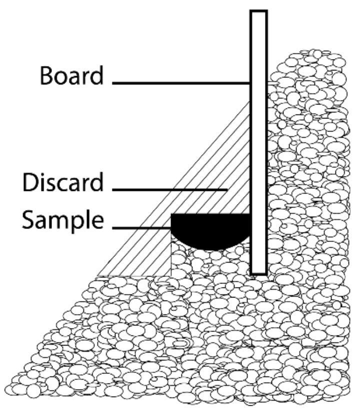
Method 1 – Loader

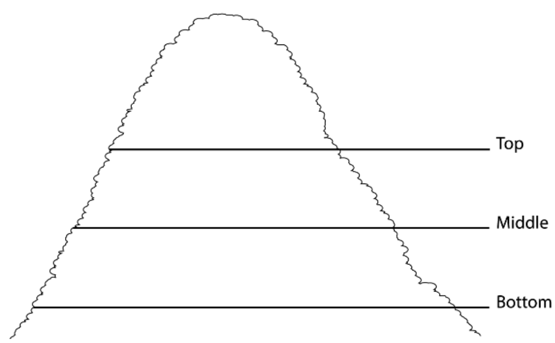
1. Direct the loader operator to enter the stockpile with the bucket at least 0.3 m (1 ft) above ground level without contaminating the stockpile.
2. Obtain a full loader bucket of the asphalt mixture; tilt the bucket back and up.
3. Form a small sampling pile at the base of the stockpile by gently rolling 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

There are two sizes for molding for compressive strength specimens, 150 mm (6 in.) by 300 mm (12 in.) and 100 mm (4 in.) by 200 mm (8 in.).

Rodding

150 mm (6 in.) by 300 mm (12 in.)

1. Use the scoop to fill the mold approximately 1/3 full with concrete. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
2. Consolidate the layer with 25 strokes of the standard tamping rod (16 mm (5/8 in.)), 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.

3. Tap around the perimeter of the mold smartly 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds) to close voids and release trapped air.
4. Add the second layer, filling the mold about 2/3 full. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
5. Consolidate this layer with 25 strokes of the standard tamping rod, penetrating about 25 mm (1 in.) into the bottom layer.
6. Tap around the perimeter of the mold smartly 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
7. Add the final layer, slightly overfilling the mold. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
8. Consolidate this layer with 25 strokes of the tamping rod, penetrating about 25 mm (1 in.) into the second layer.
9. Tap around the perimeter of the mold smartly 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
10. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
11. Immediately begin initial curing.

100 mm (4 in.) by 200 mm (8 in.)

1. Use the scoop to fill the mold approximately 1/2 full with concrete. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
2. Consolidate the layer with 25 strokes of the small tamping rod (10 mm (3/8 in.)), 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.
3. Tap around the perimeter of the mold smartly 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds) to close voids and release trapped air.
4. Add the final layer, slightly overfilling the mold. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
5. Consolidate this layer with 25 strokes of the tamping rod, penetrating about 25 mm (1 in.) into the second layer.
6. Tap around the perimeter of the mold smartly 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
7. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
8. Immediately begin initial curing.

Internal Vibration

Casting a 150 mm (6 in.) by 300 mm (12 in.) cylinder

1. Use the scoop to fill the mold approximately 1/2 full with concrete. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
2. Insert the vibrator at two different points. Do not let the vibrator touch the bottom or side of the mold. 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.
3. Tap around the perimeter of the mold smartly 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
4. Use the scoop to fill the mold a bit over full. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
5. Insert the vibrator at two different points, penetrating the first layer approximately 25 mm (1 in.). Do not let the vibrator touch the side of the mold. 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.
6. Tap around the perimeter of the mold smartly 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
7. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
8. Immediately begin initial curing.

Casting a 100 mm (4 in.) by 200 mm (8 in.) cylinder

1. Use the scoop to fill the mold approximately 1/2 full with concrete. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
2. Insert the vibrator at one point. Do not let the vibrator touch the bottom or side of the mold. 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.
3. Use the scoop to fill the mold a bit over full. Evenly distribute the concrete in a circular motion around the inner perimeter of the mold.
4. Insert the vibrator at one point, penetrating the first layer approximately 25 mm (1 in.). Do not let the vibrator touch the side of the mold. 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.
5. Tap around the perimeter of the mold smartly 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
6. Strike off the surface of the molds with tamping rod, straightedge, float, or trowel.
7. 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

WAQTC

SAMPLING FRESHLY MIXED CONCRETE
WAQTC TM 2

Scope

This practice covers procedures for obtaining representative samples of fresh concrete delivered to the project site. The practice includes sampling from stationary, paving and truck mixers, and from agitating and non-agitating equipment used to transport central mixed concrete.

This practice also covers the removal of large aggregate particles by wet sieving.

Sampling concrete may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices.

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

Apparatus

- Receptacle: wheelbarrow, bucket or other suitable container that does not alter the properties of the material being sampled
- Sample cover (plastic, canvas, or burlap)
- Shovel
- Cleaning equipment, including scrub brush, rubber gloves, water
- Apparatus for wet sieving, including: a sieve(s), meeting the requirements of FOP for AASHTO T 27/T 11, minimum of 2 ft^2 (0.19 m^2) of sieving area, conveniently arranged and supported so that the sieve can be shaken rapidly by hand.

Procedure

1. Use every precaution in order to obtain samples representative of the true nature and condition of the concrete being placed being careful not to obtain samples from the very first or very last portions of the batch. The size of the sample will be 1.5 times the volume of concrete required for the specified testing, but not less than 0.03 m^3 (1 ft^3).
2. Dampen the surface of the receptacle just before sampling, empty any excess water.

Note 1: Sampling should normally be performed as the concrete is delivered from the mixer to the conveying vehicle used to transport the concrete to the forms; however, specifications may require other points of sampling, such as at the discharge of a concrete pump.

3. Use one of the following methods to obtain the sample:

   - **Sampling from stationary mixers**

     Obtain the sample after a minimum of 1/2 m^3 (1/2 yd^3) of concrete has been discharged. Perform sampling by passing a receptacle completely through the discharge stream, or by completely diverting the discharge into a receptacle. Take care not to restrict the flow of concrete from the mixer, container, or transportation unit so as to cause segregation. These requirements apply to both tilting and non-tilting mixers.

   - **Sampling from paving mixers**

     Obtain the sample after the contents of the paving mixer have been discharged. Obtain increments from at least five different locations in the pile and combine into one test sample. Avoid contamination with subgrade material or prolonged contact with absorptive subgrade. To preclude contamination or absorption by the subgrade, the concrete may be sampled by placing a shallow container on the subgrade and discharging the concrete across the container.

   - **Sampling from revolving drum truck mixers or agitators**

     Obtain the sample after a minimum of 1/2 m^3 (1/2 yd^3) of concrete has been discharged. Obtain sample after all of the water has been added to the mixer. Do not obtain sample from the very first or last portions of the batch discharge. Perform sampling by repeatedly passing a receptacle through the entire discharge stream or by completely diverting the discharge into a receptacle. Regulate the rate of discharge of the batch by the rate of revolution of the drum and not by the size of the gate opening.

   - **Sampling from open-top truck mixers, agitators, non-agitating equipment, or other types of open-top containers**

     Obtain the sample by whichever of the procedures described above is most applicable under the given conditions.

   - **Sampling from pump or conveyor placement systems**

     Obtain sample after a minimum of 1/2 m^3 (1/2 yd^3) of concrete has been discharged. Obtain sample after all of the pump slurry has been eliminated. Perform sampling by repeatedly passing a receptacle through the entire discharge system or by completely diverting the discharge into a receptacle. Do not lower the pump arm from the placement position to ground level for ease of sampling, as it may modify the air content of the concrete being sampled. Do not obtain samples from the very first or last portions of the batch discharge.

4. Transport sample to the testing location.
5. Combine sample or increments and remix with a shovel the minimum amount necessary to ensure uniformity. Protect the sample from direct sunlight, wind, rain, and sources of contamination.

6. Complete test for temperature and start tests for slump and air content within 5 minutes of obtaining the sample. Start molding specimens for strength tests within 15 minutes of obtaining the sample. Complete the test methods as expeditiously as possible.

Wet Sieving

When required due to oversize aggregate, the concrete sample shall be wet sieved, after transporting but prior to remixing, for slump testing, air content testing or molding test specimens, by the following:

1. Place the sieve designated by the test procedure over the dampened receptacle.
2. Pass the concrete over the designated sieve. Do not overload the sieve (one particle thick).
3. Shake or vibrate the sieve until no more material passes the sieve. A horizontal back and forth motion is preferred.
4. Discard oversize material including all adherent mortar.
5. Repeat until sample of sufficient size is obtained. Mortar adhering to the wet-sieving equipment shall be included with the sample.
6. Using a shovel, remix the sample the minimum amount necessary to ensure uniformity.

Note 2: Wet sieving is not allowed for samples being used for density determinations according to the FOP for AASHTO T 121.

Report

- On forms approved by the agency
- Sample ID
- Date
- Time
- Location
- Quantity represented

INSERT TAB

SECTION 2
Quality Assurance Program

Oregon Department of Transportation

QUALITY ASSURANCE PROGRAM

(Revised December 2024)

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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:

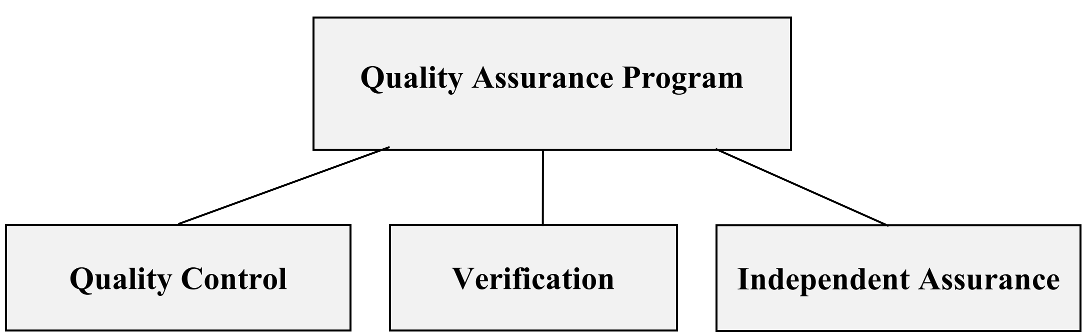
- To improve the overall quality of highway and bridge construction; and
- To place responsibility on the contractor for quality control in contracted work.

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. The signature may be a "wet signature, handwritten" or a digital signature encrypted with a digital certificate from a trust service provider (TSP).

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.

<u>Mobile Equipment</u>

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 to obtain certification for the test method(s) in question. When the inspector and the laboratory manager have covered all 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 follow 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 adjusting 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 ensure 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. 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 anyone-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 anyone-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 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 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 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 decide 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 is abuse or neglect. If the issue is determined to be abuse, move to step 2 below. If it is determined to 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 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
Incinerator Calibration Samples – ODOT TM 323

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 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 soil moisture-density relations 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 QA 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.

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 (PLANT MIX)

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 number 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 of material 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

SAMPLE AND TEST REPORT FORMS

This Section includes a sample of each of the ODOT forms used for submitting samples and reporting test results. The forms can accommodate two different formats, Metric and English. At the top of the form is an area that allows the user to switch between the different units. Examples of completed reports, in English are also included. Located after the table of contents section is a forms description document that outlines the functions and calculation abilities, if applicable, of the various forms. Each form has a unique number identifier that starts with 734-xxxx and the forms are arranged in numerical order, 734-1792, 734-1793A etc.

If a certified technician elects to use forms other than ODOT, then the modified form must contain the same information and be presented in a similar format to the existing ODOT form. The technician must obtain the approval of the Project Manager prior to using different forms. When submitting material for testing to the Salem Materials Laboratory, the appropriate ODOT form must be utilized.

These forms are available electronically. They may be downloaded from our webpage in FTP format.

The URL address is:

https://www.oregon.gov/odot/Construction/Pages/Forms.aspx

Submittals of form 734-4000, 734-4000C or 734-4000 NFTM requires properly completing the required information as outlined in Section 4 (C) of the MFTP. **If the information required in Section 4(C) is not included on the submitted forms the material will not be accepted for testing.**

A unique data sheet number is also required on the form that is referenced to a submitted sample in chronological order. The data sheet number is a unique value assigned by the submitting party. Example: F-40123-001, the F is generic on all form 4000's, the next set of numbers, in this example, is the technician's certification number and the last series of values indicates the sequential order of submitted samples, 001, 002, 003, etc. If a technician certification number is not available contact the Salem Materials Laboratory at (503-986-6626) and a unique number will be assigned to the user. This eliminates duplicate data sheet numbers, maintains the integrity of the data base and provides for efficient retrieval of information.

The Contractor shall submit copies of the test results to the specified ODOT personnel within the timeframes set forth in the QA program and the project contract. Either the copy of the results or a facsimile of the results will be accepted. The Contractor shall retain the original results for at least three years after ODOT formally accepts the project.

Oregon Department of Transportation
Field Tested Materials Forms and Examples

Soils	
ODOT Form Number	*Description*
734-1793 S	Nuclear Compaction Report For Soil
734-3468	Maximum Density of Construction Materials
734-3468 SR	Soil Moisture-Density Relations
Aggregate	
ODOT Form Number	*Description*
734-1792	Field Worksheet for Aggregate
734-1793 B	Nuclear Compaction Report For Base Aggregate
734-1825	Unit Weight and Specific Gravity W/S
734-1825 C	Bulk Density “Unit Weight” Measure Calibration
734-3468 B	Maximum Density of Aggregate Base Material
Asphalt Concrete Pavement (ACP)	
ODOT Form Number	*Description*
734-1793 A 734-1793 AR 734-1793 A10	Nuclear Compaction Report For ACP Nuclear Compaction Report For ACP with Random Location Nuclear Compaction Report For ACP, 10 shot locations
734-1972 A	Random Sample Locations for Density Testing of ACP
734-2043	Daily Asphalt Cement Report
734-2050	Specific Gravity and Maximum Density of ACP
734-2050 GV	Voids Worksheet Gyratory - Multiple
734-2050 GVS	Voids Worksheet Gyratory - Single
734-2050 TSR	Tensile Stripping Strength (TSR) Worksheet
734-2084	Control Strip Method of Compaction Testing
734-2084 T	Establishing Roller Pattern for Thin Lifts of ACP
734-2277	Field Worksheet for ACP (Plant Report)
734-2327	Nuclear-- Core Correlation Worksheet
734-2327 CB	Calibration Batch Form
734-2327 IC	ACP Incinerator Oven Calibration Worksheet

Asphalt Concrete Pavement (ACP)	
ODOT Form Number	*Description*
734-2401	Daily Asphalt Plant Production
734-2401 ACP	Daily Asphalt Plant Reconciliation ACP
734-5068	CAT II – MDV Startup Review
734-2560	CAT II – JMF Target Adjustment Summary
734-5069	CAT II – Density / Control Strip Reconciliation
Concrete	
ODOT Form Number	*Description*
734-3573 WS	Concrete Yield and WIC Ratio Worksheet
734-4000 C	Sample Data Sheet for Concrete Cylinders
Pavement Marking Retroreflectivity Testing	
ODOT Form Number	*Description*
734-4101	Pavement Marking Retroreflectivity Testing – General
734-4102	Pavement Marking Retroreflectivity Testing – Longitudinal Markings
734-4103	Pavement Marking Retroreflectivity Testing – Transverse Markings
734-4104	Pavement Marking Additional Testing Required - Longitudinal Lines
734-4105	Pavement Marking Additional Testing Required - Transverse Markings
Miscellaneous	
ODOT Form Number	*Description*
734-1972	Random Sample Locations by Station Random Units Table
734-4000	Sample Data Sheet
734-4000 NFTM	Sample Data Sheet for Non-Field Tested Materials
734-4040	QA/QC Testing Investigation
734-5072	Random Number Table
734-5189	Resin Bonded Anchor Pull Test
734-5292	Mechanical Anchor Pull Test

Note: These forms may be photocopied for your use. They are also available in Microsoft Excel file format on the Construction Section webpage at the following address:

https://www.oregon.gov/odot/Construction/Pages/Forms.aspx

To copy or move sheets within or between workbooks use the following procedure:

- Save desired forms from the address above and open all files intended for the workbook.
- Right click the work sheet tab to be moved or copied.
- From the pop-up window, left click "**Move or Copy…**"
- From the pop-up window, left click drop down button from the "**To Book:**" box.
- Select desired workbook or (new book).
- Select location in workbook to copy or move sheet in the "**Before sheet**" box.
- To keep a copy in the original book and move select "**Create copy**", otherwise leave blank.
- Click **OK**.

Description of Worksheet & Calculation Explanations

General Instructions

All forms, with the exception of the **1972 A**, **2327 IC**, **2401**, **2550, 4000**, **4000 NFTM** and **4040** forms, have an English (**E**) or Metric (**M**) toggle box in the upper right corner of the form. The default setting will show English units. For field use the forms may be printed in dual units by leaving the box blank, entering (**E**) for English units, or entering (**M**) Metric units. Computer generated forms must have either an (**E**) or (**M**) entered in the box. The forms will then convert to English or Metric and calculate accordingly.

Some forms have color shaded data entry cells. This is to give a visual check for the user to see if data may be missing on the form. These cells are auto-formatted and the shading will disappear when data is entered. If the cell is intentionally left blank or a zero value is in the cell the shading will be visible. If no shading is desired for printing the user can go to: file > page setup, select the sheet tab and check the print black and white box.

1792 FIELD WORKSHEET FOR AGGREGATES

Enter either (**E**) for English or (**M**) for Metric. Enter sieve weights from the PAN cell up for washed gradations and from the top down for dry gradations. This will allow .075mm (#200) specifications to be taken to one decimal place. For dry gradations enter the dry mass and pan in the after wash dry mass and pan cell for the sieve loss to calculate. Enter the specification for either Method 1 (Combined) or Method 2 (Individual) for Fracture to calculate. Manually enter Cumulative % Retained (100-% Passing) for Fineness Modulus to calculate. Enter dry mass of wood waste.

1793 A NUCLEAR COMPACTION TEST REPORT FOR ACP

Enter either (**E**) for English or (**M**) for Metric. Enter correlation factor from **Form 2327** in the core to nuclear correlation box if applicable, otherwise leave blank. Form will calculate percent compaction for each test and the average of the five tests.

1793 AR NUCLEAR COMPACTION TEST REPORT FOR ACP with RANDOM'S

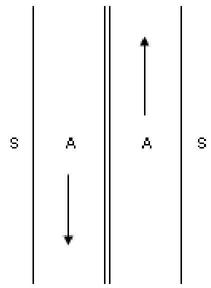
This form is the same as 1793 A except that it also has a section to calculate random testing locations and offsets. This form is an option for use in-lieu of the standard 1793 A form. The same directions apply as form 1793 A. For the yield calculation enter the MAMD, % compaction, panel depth and width, and sublot size. The random's can be set to auto-calculate, by entering an "X" in the auto-calc random's box, or manually by leaving blank. Enter an "X" in the checkbox to base random's on distance or tons. Enter an "X" in the appropriate box to calculate random's in ascending or descending order.

(See Next Sheet for Lane Configuration Examples and test site association)

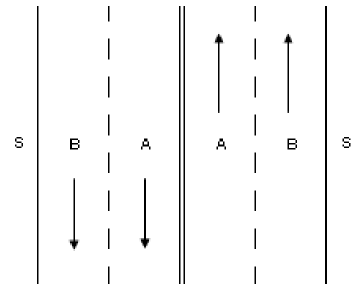
Description of Worksheet & Calculation Explanations

Form 1793 A & Form 1793 AR – (Example of Lane Designations and Test Site Location)

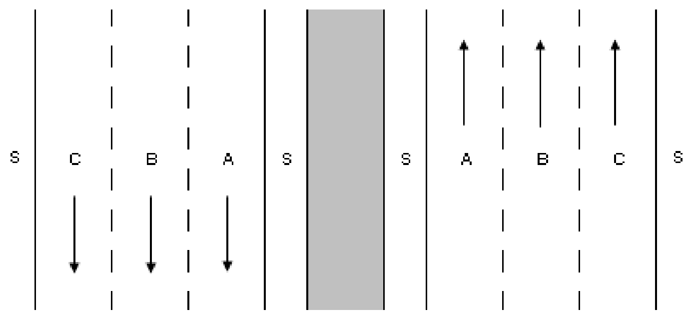
When a set of density tests are taken for a sublot, circle the appropriate direction and lane in which the test was taken. If testing is comprised of multiple lanes and/or ramps, note the test number and location in the remarks. Examples of lane designations are as follows:



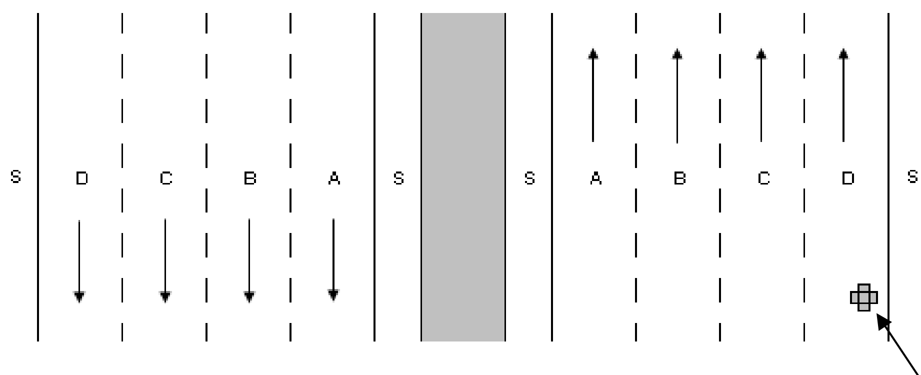
One Lane per Direction



Two Lanes per Direction

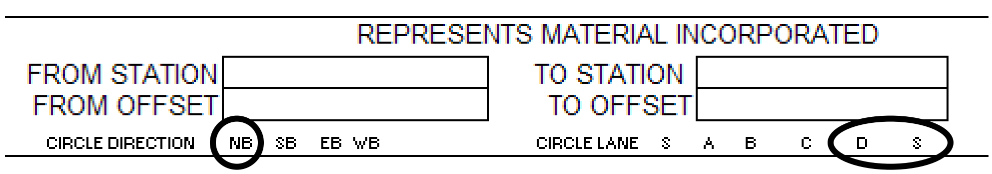


Three Lanes per Direction



Four Lanes per Direction TEST LOCATION

Example: Shoulder and D lane pulled in the same panel (test location shown above)



REPRESENTS MATERIAL INCORPORATED

FROM STATION | TO STATION

FROM OFFSET | TO OFFSET

CIRCLE DIRECTION NB SB EB WB CIRCLE LANE S A B C D S

Description of Worksheet & Calculation Explanations

1793 B NUCLEAR COMPACTION TEST REPORT FOR BASE

Enter either (**E**) for English or (**M**) for Metric. Enter shot data for wet densities and moistures. Form will average shots and compute dry density, percent moisture, and percent compaction for each individual test.

1793 S NUCLEAR COMPACTION TEST REPORT FOR SOIL

Enter either (**E**) for English or (**M**) for Metric. This form will auto-calculate. If an unscreened sample is used to verify gauge moisture enter the sample information in the appropriate boxes in the one-point section. If not the first one-point will be used to verify gauge moisture. Enter the appropriate mold factor. Enter the % Coarse (Pc) in the box from the Method "A" or "D" screening process. Enter curve data. The section of the form will auto-calculate.

1825 C BULK DENSITY "UNIT WEIGHT" MEASURE CALIBRATION

Enter either (**E**) for English or (**M**) for Metric. Enter mass (lbs for English or kg for Metric) in boxes "1" and "2". Box "A" will auto calculate. Enter Temperature of water (ºF for English or °C for Metric) and corresponding density in box "B" from water density table. Box "V" volume will auto calculate.

1825 UNIT WEIGHT AND SPECIFIC GRAVITY W/S

Enter either (**E**) for English or (**M**) for Metric. AASHTO T 19: Enter masses (lbs for English or kg for Metric) in boxes "A" and "B". Box "C" will auto calculate. Enter volume of measure (ft^3 for English or m^3 for Metric) from form 1825 C in box "D". Unit Weight will auto calculate. AASHTO T 85 and 84: Enter mass (grams) in boxes "A", "B", and "C". Specific gravity values and absorption will auto calculate.

1972 RANDOM SAMPLE LOCATIONS

Enter either (**E**) for English or (**M**) for Metric. This is not a calculating form.

1972 A RANDOM SAMPLE LOCATIONS FOR DENSITY TESTING OF ACP

The user can utilize either tonnage values or distance values for determining random sample locations. In most cases using tonnage values may simplify random sampling management. For the yield calculation enter the MAMD, % compaction, panel depth and width, and sublot size. The random's can be set to auto-calculate, by entering an "X" in the auto-calc random's box, or manually by leaving blank. Enter an "X" in the checkbox to base random's on distance or tons. Enter an "X" in the appropriate box to calculate random's in ascending or descending order.

2043 DAILY ASPHALT CEMENT REPORT

Enter either (**E**) for English or (**M**) for Metric. Some portions of this form are automatically calculated. Volumes in Tank and Temperature Corrections Factors need to be hand entered. The quantities will need to be carried forward to the next report in order to maintain a running total.

2050 SPECIFIC GRAVITY AND MAXIMUM DENSITY OF ACP

Enter either (**E**) for English or (**M**) for Metric. This form is designed for daily, first sample calculation of MAMD for compaction. The MAMD will not calculate but the MDT will self- calculate.

2050 GV VOIDS WORKSHEET GYRATORY

Enter either (**E**) for English or (**M**) for Metric. Enter Design Gsb and Asphalt Gb, test result P#200, test Pb, select dryback requirement according to AASHTO T209 yellow sheet requirements, and Specimen Height for each test sample. Enter previous form results for running average calculation.

2050 GVS VOIDS WORKSHEET GYRATORY

Enter either (**E**) for English or (**M**) for Metric. Enter design Gsb and Asphalt Gb, select dryback requirement according to AASHTO T209 yellow sheet requirements, test P#200, and test Pb in center of form. Enter previous form results and current test results at bottom for running average calculation.

2050 TSR TENSILE STRIPPING STRENGTH

Enter either (**E**) for English or (**M**) for Metric. In test condition cell enter Wet for saturated specimens and leave blank for dry specimens.

Description of Worksheet & Calculation Explanations

2084 CONTROL STRIP METHOD OF COMPACTION TESTING

Enter either (**E**) for English or (**M**) for Metric. This is not a calculating form.

2084T CONTROL STRIP METHOD OF COMPACTION FOR THIN LIFTS OF ACP (TM 301)

Enter either (**E**) for English or (**M**) for Metric. This is not a calculating form.
Enter the station and offsets of the two Evaluation points.

2277 FIELD WORKSHEET FOR ACP (PLANT REPORT)

Enter either (**E**) for English or (**M**) for Metric. Enter the exact term, **EAC** or **ACP** in the heading cell. Enter Sieves from the pan up. When applying correction factors for aggregate gradation and/or asphalt (**Cf**) from Form **2327 IC,** they should be entered as they appear on that form (e.g. + or –). Enter dry washed mass with pan tare for sieve loss calculation. The total asphalt **(O)** cell is the sub total multiplied by the asphalt meter correction cell, if needed. If the plant reads in Tons leave the asphalt meter correction blank. In the Antistrip field of the header section is a dropdown menu to select either "Latex" or "Lime". If Ultrapave (Latex) is used, convert to dry Tons/Mg and enter those values for beginning and ending antistrip. If Lime is used, ensure plant readings are in Tons and enter those values for beginning and ending antistrip.

2327 NUCLEAR - CORE CORRELATION WORKSHEET

Enter either (**E**) for English or (**M**) for Metric. This form calculates the information to the ratio used cells. Check the unwanted ratios and the form will automatically adjust the overall correlation.

2327 CB CALIBRATION BATCH FORM

Enter either (**E**) for English or (**M**) for Metric. Hand enter all information in heading block, JMF % Pass and RAP % Pass columns, all weights in Actual column, and Buttered Mixing Bowl & Spoon cell. All other cells will automatically calculate.

2327 IC ACPINCINERATOR OVEN CALIBRATION WORKSHEET

If the blank and RAP are combined prior to washing, enter the combined weights in the center of the form for wet, dry, and after washed dry masses. If performed separately, use the RAP sample section in the upper right portion of the form and use the center portion for the Blank only.

2401 DAILY ASPHALT PLANT PRODUCTION

Enter the exact term **EAC** or **ACP** in the material type cell. The form assumes that Antistrip is incorporated before the aggregate inclined belt scale therefore including the mass of Antistrip in the total dry aggregate for proper calculations. If Antistrip is added after the aggregate inclined belt scale the mass of Antistrip will not be included in the total dry aggregate and will erroneously affect subsequent calculations. Contact the Region QAC for assistance on how to properly account for Antistrip for plants setup in this fashion. The asphalt deductions box (**k**) is only for material removed from the oil tank during production and not incorporated into the mix (material removed and used for other purposes). It is not to be used to deduct asphalt in mix waste based on the 2043 form. For plants that meter RAS and RAP as a combined product the meter readings should be entered in the "RAP/RAM" block of the meter readings section. For plants that meter RAS and RAP separately the individual RAS and RAP meter reading should be entered in their respective locations. For Asphalt and Antistrip meter readings supplied in tons enter 1.0 in the correction box cell. If a multiplier is necessary to convert meter readings to Tons enter the appropriate value in the correction box cell.

2550 CAT II – MDV STARTUP REVIEW

Enter MDV test data and evaluate according to Section 00745.16(b)(c)1-6. Check appropriate box (1-6) to identify step of MDV Startup Process review represents. This is a not a calculating form.

Description of Worksheet & Calculation Explanations

2560 CAT II – JMF TARGET ADJUSTMENT SUMMARY

Enter either (**E**) for English or (**M**) for Metric. Enter JMF adjustments made in column under "ADJUSTMENT #" box. Detail justification and obtain Engineers approval as required for each adjustment made. Enter in the "sublot" box, the sublot number for which the adjustment becomes effective.

2584 CAT II – DENSITY / CONTROL STRIP RECONCILIATION

Enter either (**E**) for English or (**M**) for Metric. Enter data supplied from CAT-I and CDT in the appropriate boxes for "Quality Control Lab Results" and "Control Strip Results". Identify if results reconcile by checking "YES" or "NO" box. Detail any corrective action taken or method of resolution as appropriate.

3468 MAXIMUM DENSITY OF CONSTRUCTION MATERIALS

Enter either (**E**) for English or (**M**) for Metric. This form has a Material Description box in the heading area to give a visual description (dark brown, gravely clay). The companion form will compute the coarse particle corrections based on the rules established under T 99/180.The mold factor must be manually entered in the "Mold Standardization Block". This value is determined on each mold used and is calibrated annually per AASHTO T-19M/T.

3468 B MAXIMUM DENSITY OF AGGREGATE BASE MATERIALS

Enter either (**E**) for English or (**M**) for Metric. This form is intended for use in conjunction with AASHTO T 99 "Method A" as required for test method ODOT TM 223. Enter the statspec stockpile mean for the material **retained** (100 - % passing) on the #4 (4.75mm) sieve in the "Pc" box. The scales for density and moisture on the graph auto calculate however the formulas are not protected. If either scale does not fit the data from the points, they can be manually overwritten. Enter the mass for "mold and materials" and "mold" in grams. The "mass of mold" entered for point #1 will auto insert for subsequent points.

3468 SR SOIL MOISTURE-DENSITY RELATIONS

Enter either (**E**) for English or (**M**) for Metric. This is not a calculating form.

3573 WS CONCRETE YIELD AND W/C RATIO WORKSHEET

Enter either (**E**) for English or (**M**) for Metric. The pot calibration is a divisor number, not a multiplier. The number for ¼ cubic foot pots should resemble 0.2497 for English and 0.007070 for Metric.

4000 SAMPLE DATA SHEET

In the Data Sheet Number cell the "**F**" number is the card number and one plus number of data sheets submitted prior to it. Also remember to include your Phone Number.

4000 C SAMPLE DATA SHEET FOR CONCRETE CYLINDERS

Enter either (**E**) for English or (**M**) for Metric. This form does the same calculations the **3573wc** form. The NET WEIGHT is the weight of the concrete only and does not include the weight of the pot. In the slots with the capitol letters "A through H" there should be a number to represent the number of days for the break. The "F" number is the card number and one plus number of data sheets submitted prior to it. Also remember to include your Phone Number.

4000 NFTM SAMPLE DATA SHEET FOR NON-FIELD TESTED MATERIALS

This form is for submittals of materials not field tested and includes items like steel, bolts, washers etc.

4040 QA/QC TESTING INVESTIGATION

This form is for data collection during the investigation phase outlined in the Quality Assurance Program under Appendix C. Remember to submit copies of the report according to the distribution list.

Description of Worksheet & Calculation Explanations

4101-4105 PAVEMENT MARKINGS RETROREFLECTIVITY TESTING

These forms are used to document the Retroreflectivity of Longitudinal and Transverse pavement markings for durable and high performance applications. The forms also include areas for bead embedment estimates. Follow the test procedure for the proper completion of these forms.

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)**	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)

$$W = ((C)P_f + MC_cP_c) / 100$$

W=

COMBINED OPTIMUM MOISTURE (MCT)

(Based on Curve Info.)

$$MC_T = (MC_fP_f + MC_cP_c) / 100$$

MC_T=

RELATIVE MAXIMUM DRY DENSITY (lb/ft³)

$$\rho_d = \frac{100}{\frac{Pf}{\rho_f} + \frac{Pc}{k}}$$

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

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	DISTANCE BELOW GRADE	LIFT	LIFT THICKNESS	DATE
1-1	Subgrade	N/A	N/A	6/29/24

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	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							**(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 %: $(C) = \frac{(B)}{100 - (B)} X100$

T 255 / T 265 MOISTURE %: $(C) = \frac{(a) - (b)}{(b)} X100$

DRY DENSITY: $(D) = \frac{(A)}{(C)+100} X100$

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 **W = ((C)Pf + MCcPc) / 100**

(C) = unaltered one-point moisture

Within 1% of T 310 % Moisture?
(If not Correct T 310 DD)

W= **8.4**

COMBINED OPTIMUM MOISTURE (MCT) **MCT = (MCfPf + MCcPc) / 100**

(Based on Curve Info.)

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		6/29/2024

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	DISTANCE BELOW GRADE	LIFT	LIFT THICKNESS	DATE
1-1	7 ft.	3 rd	12"	6/29/24

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							(Pc)
A	№4	COARSE	2789.1	FINE	14947	% Coarse	16
D	¾"	COARSE	1829.1	FINE	15906.9	% Coarse	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		6/29/2024

734-1793_S (11-2024)

UNIT WEIGHT AND SPECIFIC GRAVITY W/S

E — English (**E**) or Metric (**M**)

PROJECT NAME (SECTION)						CONTRACT NUMBER
C0NTRACTOR OR SUPPLIER				PROJECT MANAGER		BID ITEM NUMBER
TEST NO.	DATE	TIME	SAMPLED AT	MATERIAL DESCRIPTION	TO BE USED IN	

BULK DENSITY ("UNIT WEIGHT") AND VOIDS IN AGGREGATE AASHTO T 19

SOURCE NAME				
SOURCE NUMBER				
MATERIAL SIZE				
A	MEASURE + AGGREGATE lb			
B	EMPTY MEASURE lb			
C	MASS OF AGGREGATE A-B lb			
D	VOLUME OF MEASURE ft³			
UNIT WEIGHT	C / D lb/ft³			

SPECIFIC GRAVITY AND ABSORPTION OF COARSE AGGREGATE AASHTO T 85

SOURCE NAME				
SOURCE NUMBER				
MATERIAL SIZE				
A	MASS OF DRY SAMPLE g			
B	MASS OF SSD SAMPLE g			
C	WEIGHT IN WATER g			
Gsb	A / (B - C)			
Gsb ssd	B / (B - C)			
Gsa	A / (A - C)			
Absorption	[(B - A) / A] X 100			

SPECIFIC GRAVITY AND ABSORPTION OF FINE AGGREGATE AASHTO T 84

PYCNOMETER METHOD				**LeCHATELIER FLASK METHOD**			
SOURCE NAME				**SOURCE NAME**			
SOURCE NUMBER				**SOURCE NUMBER**			
MATERIAL SIZE				**MATERIAL SIZE**			
S	MASS OF SSD SAMPLE g			**S_1**	SSD MATERIAL IN FLASK (55±5) g		
A	MASS OF DRY SAMPLE g			**S**	SEPARATE SSD SAMPLE (500±10) g		
B	MASS OF PYC + WATER g			**R_1**	INITIAL FLASK READING ml		
C	PYCN + WATER + SAMPLE g			**R_2**	FINAL FLASK READING ml		
Gsb	A / (B + S - C)			**A**	MASS OF DRY SAMPLE g		
Gsb ssd	S / (B + S - C)			**Gsb**	$[S_1(A / S] / [0.9975 (R_2 - R_1)]$		
Gsa	A / (B + A - C)			**Gsb ssd**	S1 / [0.9975 (R2 - R1)]		
Absorption	[(S - A) / A] X 100			**Absorption**	[(S - A) / A] X 100		

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

UNIT WEIGHT AND SPECIFIC GRAVITY W/S

E English (E) or Metric (M)

PROJECT NAME (SECTION) Forms Example						CONTRACT NUMBER 12345
CONTRACTOR OR SUPPLIER Super Concrete Ready Mix				PROJECT MANAGER Sean Parker		BID ITEM NUMBER 123
TEST NO. 07-1	DATE 10/5/2024	TIME 10:00am	SAMPLED AT Stockpile	MATERIAL DESCRIPTION Round/Crushed Blend	TO BE USED IN PCC Coarse Aggregate	

BULK DENSITY ("UNIT WEIGHT") AND VOIDS IN AGGREGATE AASHTO T 19

	SOURCE NAME	Best Rock	Best Rock	Best Rock
	SOURCE NUMBER	12-123-3	12-123-3	12-123-3
	MATERIAL SIZE	85% 3/4 Rnd - 15% 1/2 Cr	3/4" - #4 round	1/2" - #4 Crushed
A	MEASURE + AGGREGATE lb	70.76	70.90	70.12
B	EMPTY MEASURE lb	19.12	19.12	19.12
C	MASS OF AGGREGATE A-B lb	51.64	51.78	51.00
D	VOLUME OF MEASURE ft³	0.500	0.500	0.500
	UNIT WEIGHT C / D lb/ft³	103.0	104.0	102.0

SPECIFIC GRAVITY AND ABSORPTION OF COARSE AGGREGATE AASHTO T 85

	SOURCE NAME	Best Rock	Best Rock	Best Rock
	SOURCE NUMBER	12-123-3	12-123-3	12-123-3
	MATERIAL SIZE	85% 3/4 Rnd - 15% 1/2" Cr	3/4" - #4 Round	1/2" - #4 Crushed
A	MASS OF DRY SAMPLE g	3059.6	3101.5	2235.1
B	MASS OF SSD SAMPLE g	3108.7	3145.6	2275.9
C	WEIGHT IN WATER g	1954.1	1985.4	1425.1
Gsb	A / (B - C)	2.650	2.673	2.627
Gsb ssd	B / (B - C)	2.692	2.711	2.675
Gsa	A / (A - C)	2.768	2.779	2.759
Absorption	[(B - A) / A] X 100	1.6	1.4	1.8

SPECIFIC GRAVITY AND ABSORPTION OF FINE AGGREGATE AASHTO T 84

PYCNOMETER METHOD				**LeCHATELIER FLASK METHOD**			
	SOURCE NAME	Best Rock			**SOURCE NAME**	Best Rock	
	SOURCE NUMBER	12-123-3			**SOURCE NUMBER**	12-123-3	
	MATERIAL SIZE	#4-0			**MATERIAL SIZE**	#4-0	
S	MASS OF SSD SAMPLE g	504.9		**S_1**	SSD MATERIAL IN FLASK (55±5) g	55.1	
A	MASS OF DRY SAMPLE g	485.6		**S**	SEPARATE SSD SAMPLE (500±10) g	504.9	
B	MASS OF PYC + WATER g	4298.0		**R_1**	INITIAL FLASK READING ml	0.3	
C	PYCN + WATER + SAMPLE g	4622.5		**R_2**	FINAL FLASK READING ml	20.0	
Gsb	A / (B + S - C)	2.692		**A**	MASS OF DRY SAMPLE g	485.6	
Gsb ssd	S / (B + S - C)	2.799		**Gsb**	$[S_1(A / S] / [0.9975 (R_2 - R_1)]$	2.697	
Gsa	A / (B + A - C)	3.014		**Gsb ssd**	S1 / [0.9975 (R2 - R1)]	2.804	
Absorption	[(S - A) / A] X 100	4.0		**Absorption**	[(S - A) / A] X 100	4.0	

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT Region 3 QA Unit		10/5/2024

BULK DENSITY "UNIT WEIGHT" MEASURE CALIBRATION

E English (**E**) or Metric (**M**)

PROJECT NAME (SECTION)		CONTRACT NUMBER
C0NTRACTOR OR SUPPLIER	PROJECT MANAGER	BID ITEM NUMBER

BULK DENSITY ("UNIT WEIGHT") AND VOIDS IN AGGREGATE AASHTO T 19

WATER DENSITY TABLE

°F	lb/ft³	°c	kg/m³	°F	lb/ft³	°c	kg/m³	°F	lb/ft³	°c	kg/m³
60.0	62.366	15.6	999.01	68.5	62.312	20.3	998.14	77.0	62.243	25.0	997.04
60.5	62.363	15.8	998.96	69.0	62.308	20.6	998.08	77.5	62.239	25.3	996.97
61.0	62.360	16.1	998.91	69.5	62.305	20.8	998.02	78.0	62.234	25.6	996.90
61.5	62.357	16.4	998.87	70.0	62.301	21.1	997.97	78.5	62.230	25.8	996.82
62.0	62.354	16.7	998.82	70.5	62.297	21.4	997.90	79.0	62.225	26.1	996.75
62.5	62.351	16.9	998.77	71.0	62.293	21.7	997.84	79.5	62.221	26.4	996.68
63.0	62.348	17.2	998.72	71.5	62.289	21.9	997.78	80.0	62.216	26.7	996.59
63.5	62.345	17.5	998.67	72.0	62.285	22.2	997.71	80.5	62.211	26.9	996.53
64.0	62.342	17.8	998.63	72.5	62.281	22.5	997.65	81.0	62.206	27.2	996.45
64.5	62.339	18.1	998.58	73.0	62.277	22.8	997.58	81.5	62.201	27.5	996.37
65.0	62.336	18.3	998.54	73.5	62.273	23.1	997.52	82.0	62.196	27.8	996.29
65.5	62.333	18.6	998.47	74.0	62.269	23.3	997.46	82.5	62.191	28.1	996.21
66.0	62.329	18.9	998.42	74.5	62.265	23.6	997.39	83.0	62.186	28.3	996.13
66.5	62.326	19.2	998.36	75.0	62.261	23.9	997.32	83.5	62.181	28.6	996.05
67.0	62.322	19.4	998.30	75.5	62.257	24.2	997.26	84.0	62.176	29.2	995.97
67.5	62.319	19.7	998.25	76.0	62.252	24.4	997.18	84.5	62.171	29.2	995.89
68.0	62.315	20.0	998.19	76.5	62.248	24.7	997.11	85.0	62.166	29.4	995.83

CALIBRATION OF MEASURE

RECALIBRATE ANNUALLY OR WHEN IN QUESTION

DATE								
SERIAL NUMBER								
1	MEASURE + GLASS + WATER	lb						
2	EMPTY MEASURE + GLASS	lb						
A	MASS OF WATER (1 - 2)	lb						
	TEMPERATURE OF WATER	°F						
B	DENSITY OF WATER	ft³						
V	VOLUME OF MEASURE (A / B)	ft³						

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

BULK DENSITY "UNIT WEIGHT" MEASURE CALIBRATION

E English (**E**) or Metric (**M**)

PROJECT NAME (SECTION)		CONTRACT NUMBER
Form Example		12345
C0NTRACTOR OR SUPPLIER	PROJECT MANAGER	BID ITEM NUMBER
ODOT Forms	Sean Parker	123

BULK DENSITY ("UNIT WEIGHT") AND VOIDS IN AGGREGATE AASHTO T 19

WATER DENSITY TABLE

°F	lb/ft³	°c	kg/m³	°F	lb/ft³	°c	kg/m³	°F	lb/ft³	°c	kg/m³
60.0	62.366	15.6	999.01	68.5	62.312	20.3	998.14	77.0	62.243	25.0	997.04
60.5	62.363	15.8	998.96	69.0	62.308	20.6	998.08	77.5	62.239	25.3	996.97
61.0	62.360	16.1	998.91	69.5	62.305	20.8	998.02	78.0	62.234	25.6	996.90
61.5	62.357	16.4	998.87	70.0	62.301	21.1	997.97	78.5	62.230	25.8	996.82
62.0	62.354	16.7	998.82	70.5	62.297	21.4	997.90	79.0	62.225	26.1	996.75
62.5	62.351	16.9	998.77	71.0	62.293	21.7	997.84	79.5	62.221	26.4	996.68
63.0	62.348	17.2	998.72	71.5	62.289	21.9	997.78	80.0	62.216	26.7	996.59
63.5	62.345	17.5	998.67	72.0	62.285	22.2	997.71	80.5	62.211	26.9	996.53
64.0	62.342	17.8	998.63	72.5	62.281	22.5	997.65	81.0	62.206	27.2	996.45
64.5	62.339	18.1	998.58	73.0	62.277	22.8	997.58	81.5	62.201	27.5	996.37
65.0	62.336	18.3	998.54	73.5	62.273	23.1	997.52	82.0	62.196	27.8	996.29
65.5	62.333	18.6	998.47	74.0	62.269	23.3	997.46	82.5	62.191	28.1	996.21
66.0	62.329	18.9	998.42	74.5	62.265	23.6	997.39	83.0	62.186	28.3	996.13
66.5	62.326	19.2	998.36	75.0	62.261	23.9	997.32	83.5	62.181	28.6	996.05
67.0	62.322	19.4	998.30	75.5	62.257	24.2	997.26	84.0	62.176	29.2	995.97
67.5	62.319	19.7	998.25	76.0	62.252	24.4	997.18	84.5	62.171	29.2	995.89
68.0	62.315	20.0	998.19	76.5	62.248	24.7	997.11	85.0	62.166	29.4	995.83

CALIBRATION OF MEASURE

RECALIBRATE ANNUALLY OR WHEN IN QUESTION

DATE			10/22/2007				
SERIAL NUMBER			R3QA-1				
1	MEASURE + GLASS + WATER	lb	53.18				
2	EMPTY MEASURE + GLASS	lb	22.02				
A	MASS OF WATER (1 - 2)	lb	31.16				
	TEMPERATURE OF WATER	°F	71.0				
B	DENSITY OF WATER	ft³	62.293				
V	VOLUME OF MEASURE (A / B)	ft³	0.500				

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT Region 3 QA Unit		10/10/2024

FIELD WORKSHEET FOR ACP (PLANT REPORT)

PROJECT NAME (SECTION)			ODOT MIX DESIGN NO.	TEST NO.	CONTRACT NUMBER
C0NTRACTOR OR SUPPLIER		PROJECT MANAGER	DATE	AMOUNT REPRESENTED	BID ITEM NUMBER
SOURCE NAME		SOURCE NUMBER	TIME	(EAC OR ACP)	MIX NOMINAL SIZE
PLANT / MODEL	TYPE	SIZE	TO BE USED IN	SAMPLED AT	ANTISTRIP

JMF MIX TEMP.	MIX TEMP

SIEVE SIZE	SIEVE ANALYSIS MASS 1	MASS 2	TOTAL MASS	% RET	% PASS	INCINERATOR CORR. FACTOR	CORRECTED % PASSING	JOB MIX FORMULA TARGET	TOLERANCE	SIEVE SIZE
										0
										0
										0
										0
										0
										0
										0
										0
										0
										0
										0
										0
										0
										0
Pan					% AC, Pb					
INITIAL DRY MASS										

COLD FEED MOISTURE

PAN TARE	(T)	
WET MASS + PAN	(A)	
DRY MASS + PAN	(B)	
%M ={(A-B)/ (B-T)} X 100=		

MIX MOISTURE

TEMP A		TEMP B
PAN TARE	(T)	
WET MASS + PAN	(A)	
DRY MASS + PAN	(B)	
%M = [(A-B)/(B-T)] X 100=		

RAP MOISTURE

PAN TARE	(T)	
WET MASS + PAN	(A)	
DRY MASS + PAN	(B)	
%M = [(A-B)/(B-T)] X 100=		

RAS MOISTURE

PAN TARE	(T)	
WET MASS + PAN	(A)	
DRY MASS + PAN	(B)	
%M = [(A-B)/(B-T)] X 100=		

SIEVE LOSS

PAN TARE	(T)	
DRY WASHED MASS	(C)	
Mass After Sieve	(D)	
SL %={(C-T-D)/C-T)}X 100=		

METER READINGS

	ASPHALT	WET AGG	WET RAP	WET RAS	ANTISTRIP	FILLER	FIBER
BEGINING							
ENDING							
SUB TOTAL							
MOISTURE		%	%	%	0 %		
TOTAL	O Tons	A Tons	B Tons	C Tons	D Tons	E Tons	F

ASPHALT METER CORRECTION

% VIRGIN AC (G) $= \frac{O}{O+A+B+C}$ X100=

% FILLER $= \frac{E}{A+B+C+E}$ X100=

PLANT DRY & MOISTURE SETTINGS

	←AGG→	
	←RAP→	
	←RAS→	
%m AGG	%m RAP	%m RAS

% RAM $= \frac{B+C}{A+B+C}$ X100=

% FIBER $= \frac{F}{O+A+B+C+E+F}$ X100=

% RAS $= \frac{C}{A+B+C}$ X100=

% ASPHALT= EAC $\frac{O}{A}$ X100=

% BINDER REPLACEMT $\frac{H-G}{H}$ X100=

% ANTISTRIP $\frac{D}{A-D}$ X100=

T-308 METHOD A or B

BASKET TARE	T	
MIX MASS & BASKET	A	
AGG MASS & BASKET	B	
COOL AGG & BASKET		
MIX MOISTURE	%M	

(Mi) =(A-T)/(1+%M/100) (Mf) = (B - T)

TEMP A		Mi	
TEMP B		Mf	

%I = [(Mi -Mf) / (Mi)] x 100

% INCINERATED	%I	
CORRECTION FACTOR	Cf	

% AC, Pb=(% I - Cf)

% AC, Pb = (H)

REMARKS:

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

☐ QUALITY CONTROL
☐ VERIFICATION
☐ INDEPENDENT ASSURANCE

734-2277 (11-2024)

FIELD WORKSHEET FOR ACP (PLANT REPORT)

PROJECT NAME (SECTION): US26: Pothole way - Rut Blvd		ODOT MIX DESIGN NO.: 24-MD9999	TEST NO.: 1	CONTRACT NUMBER: 12345
CONTRACTOR OR SUPPLIER: Smoothest Paving	PROJECT MANAGER: Bid Item Bob	DATE: 7/28/2024	AMOUNT REPRESENTED: 1000	BID ITEM NUMBER: 1234
SOURCE NAME: no name	SOURCE NUMBER: 00-000-0	TIME: 10:00 AM	(EAC OR ACP): ACP	MIX NOMINAL SIZE: 1/2"

PLANT / MODEL	TYPE	SIZE	TO BE USED IN	SAMPLED AT	ANTISTRIP	JMF MIX TEMP.	MIX TEMP
CMI 10X	Drum	400 TPH	Wearing Course	Discharge		320-332	325

SIEVE ANALYSIS

SIEVE SIZE	MASS 1	MASS 2	TOTAL MASS	% RET	% PASS	INCINERATOR CORR. FACTOR	CORRECTED % PASSING	JOB MIX FORMULA TARGET	JOB MIX FORMULA TOLERANCE	SIEVE SIZE
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
3/4"				0.0	100.0		**100**	100	**95-100**	3/4"
1/2"	66.7		66.7	4.0	96.0		**96**	97	**90-100**	1/2"
3/8"	173.4		173.4	10.4	85.6		**86**			3/8"
1/4"	227.4		227.4	13.6	72.0		**72**			1/4"
#4	153.9		153.9	9.2	62.8		**63**	61	**56-66**	#4
#8	359.2		359.2	21.6	41.2		**41**	41	**37-45**	#8
#30	369.3		369.3	22.2	19.0		**19**	18	**14-22**	#30
#200	181.8		181.8	10.9	8.1		**8.1**	7.4	**5.4-9.4**	#200
Pan	32.6		32.6	2.0			**% AC, Pb**	5.50	**5.0-6.0**	
INITIAL DRY MASS			1666.4							

COLD FEED MOISTURE

PAN TARE	(T)	1216.6
WET MASS + PAN	(A)	3409.4
DRY MASS + PAN	(B)	3378.9
%M ={(A-B)/ (B-T)} X 100=		**1.4**

MIX MOISTURE

TEMP A	160	
TEMP B	161	
PAN TARE	(T)	458.5
WET MASS + PAN	(A)	1675.7
DRY MASS + PAN	(B)	1673.1
%M = [(A-B)/(B-T)] X 100=		**0.21**

RAP MOISTURE

PAN TARE	(T)	390.9
WET MASS + PAN	(A)	1544.4
DRY MASS + PAN	(B)	1526.4
%M = [(A-B)/(B-T)] X 100=		**1.6**

RAS MOISTURE

PAN TARE	(T)	
WET MASS + PAN	(A)	
DRY MASS + PAN	(B)	
%M = [(A-B)/(B-T)] X 100=		

SIEVE LOSS

PAN TARE	(T)	0.0
DRY WASHED MASS	(C)	1564.4
Mass After Sieve	(D)	1564.3
SL %={(C-T-D)/C-T)}X 100=		**0.0**

REMARKS:

METER READINGS

	ASPHALT	WET AGG	WET RAP	WET RAS	ANTISTRIP	FILLER	FIBER
BEGINING	28.79	498.96	228.54				
ENDING	31.39	543.76	249.05				
SUB TOTAL	2.60	44.80	20.51				
MOISTURE		**1.4** %	**1.6** %	%	**0** %		

	O	A	B	C	D	E	F
TOTAL	2.60 Tons	44.18 Tons	20.19 Tons	Tons	Tons	Tons	

ASPHALT METER CORRECTION

% VIRGIN AC (G) = O / (O+A+B+C) X100= **3.88**

% FILLER = E / (A+B+C+E) X100=

% RAM = (B+C) / (A+B+C) X100= **31.4**

% FIBER = F / (O+A+B+C+E+F) X100=

% RAS = C / (A+B+C) X100=

% ASPHALT= EAC = O / A X100=

% BINDER REPLACEMT = (H-G) / H X100= **30.5**

% ANTISTRIP = D / (A-D) X100=

PLANT DRY & MOISTURE SETTINGS

491.10	←AGG→	535.20
220.60	←RAP→	240.40
	←RAS→	
%m AGG	%m RAP	%m RAS
1.6	3.6	

T-308 METHOD A or B: A

BASKET TARE	T	3340.6
MIX MASS & BASKET	A	5114.1
AGG MASS & BASKET	B	5007.0
COOL AGG & BASKET		5007.0
MIX MOISTURE	%M	0.21

(Mi) =(A-T)/(1+%M/100) (Mf) = (B - T)

TEMP A	160	Mi	1769.8
TEMP B	155	Mf	1666.4

%I = [(Mi -Mf) / (Mi)] x 100

% INCINERATED	%I	5.84
CORRECTION FACTOR	Cf	**0.26**

% AC, Pb=(% I - Cf)

% AC, Pb = (H) $\boxed{5.58}$

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE	
Tester Tim #40000	Asphalt Inc.			X QUALITY CONTROL VERIFICATION INDEPENDENT ASSURANCE

734-2277 (11-2024)

FIELD WORKSHEET FOR ACP (PLANT REPORT)

PROJECT NAME (SECTION): US26: Pothole way - Rut Blvd		ODOT MIX DESIGN NO.: 24-MD9999	TEST NO.: 1	CONTRACT NUMBER: 12345
CONTRACTOR OR SUPPLIER: Smoothest Paving	PROJECT MANAGER: Bid Item Bob	DATE: 7/28/2024	AMOUNT REPRESENTED: 1000	BID ITEM NUMBER: 1234
SOURCE NAME: no name	SOURCE NUMBER: 00-000-0	TIME: 10:00 AM	(EAC OR ACP): ACP	MIX NOMINAL SIZE: 1/2"

PLANT / MODEL	TYPE	SIZE	TO BE USED IN	SAMPLED AT	ANTISTRIP	JMF MIX TEMP.	MIX TEMP
CMI 10X	Drum	400 TPH	Wearing Course	Discharge	Lime	320-332	325

SIEVE ANALYSIS

SIEVE SIZE	MASS 1	MASS 2	TOTAL MASS	% RET	% PASS	INCINERATOR CORR. FACTOR	CORRECTED % PASSING	JOB MIX FORMULA TARGET	JOB MIX FORMULA TOLERANCE	SIEVE SIZE
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
3/4"				0.0	100.0		**100**	100	**95-100**	3/4"
1/2"	66.7		66.7	4.0	96.0		**96**	97	**90-100**	1/2"
3/8"	173.4		173.4	10.4	85.6		**86**			3/8"
1/4"	227.4		227.4	13.6	72.0		**72**			1/4"
#4	153.9		153.9	9.2	62.8		**63**	61	**56-66**	#4
#8	359.2		359.2	21.6	41.2		**41**	41	**37-45**	#8
#30	369.3		369.3	22.2	19.0		**19**	18	**14-22**	#30
#200	181.8		181.8	10.9	8.1		**8.1**	7.4	**5.4-9.4**	#200
Pan	32.6		32.6	2.0			**% AC, Pb**	5.50	**5.0-6.0**	
INITIAL DRY MASS			1666.4							

COLD FEED MOISTURE

PAN TARE	(T)	1216.6
WET MASS + PAN	(A)	3409.4
DRY MASS + PAN	(B)	3378.9
%M ={(A-B)/ (B-T)} X 100=		**1.4**

MIX MOISTURE

TEMP A: 160	TEMP B: 161	
PAN TARE	(T)	458.5
WET MASS + PAN	(A)	1675.7
DRY MASS + PAN	(B)	1673.1
%M = [(A-B)/(B-T)] X 100=		**0.21**

RAP MOISTURE

PAN TARE	(T)	390.9
WET MASS + PAN	(A)	1544.4
DRY MASS + PAN	(B)	1526.4
%M = [(A-B)/(B-T)] X 100=		**1.6**

RAS MOISTURE

PAN TARE	(T)	
WET MASS + PAN	(A)	
DRY MASS + PAN	(B)	
%M = [(A-B)/(B-T)] X 100=		

SIEVE LOSS

PAN TARE	(T)	0.0
DRY WASHED MASS	(C)	1564.4
Mass After Sieve	(D)	1564.3
SL %={(C-T-D)/C-T)}X 100=		**0.0**

METER READINGS

	ASPHALT	WET AGG	WET RAP	WET RAS	ANTISTRIP	FILLER	FIBER
BEGINING	28.79	498.96	228.54		5.3		
ENDING	31.39	543.76	249.05		5.8		
SUB TOTAL	2.60	44.80	20.51		0.4		
MOISTURE		**1.4** %	**1.6** %	%	**0** %		
	O	**A**	**B**	**C**	**D**	**E**	**F**
TOTAL	2.60 Tons	44.18 Tons	20.19 Tons	Tons	0.44 Tons	Tons	

ASPHALT METER CORRECTION

% VIRGIN AC (G) = $\frac{O}{O+A+B+C}$ X100= **3.88**

% FILLER = $\frac{E}{A+B+C+E}$ X100=

% RAM = $\frac{B+C}{A+B+C}$ X100= **31.4**

% FIBER = $\frac{F}{O+A+B+C+E+F}$ X100=

% RAS = $\frac{C}{A+B+C}$ X100=

% ASPHALT= EAC $\frac{O}{A}$ X100=

% BINDER REPLACEMT $\frac{H-G}{H}$ X100= **30.5**

% ANTISTRIP $\frac{D}{A-D}$ X100= **1.0**

PLANT DRY & MOISTURE SETTINGS

491.10	←AGG→	535.20
220.60	←RAP→	240.40
	←RAS→	
%m AGG	%m RAP	%m RAS
1.6	3.6	

T-308 METHOD A or B: A

BASKET TARE	T	3340.6
MIX MASS & BASKET	A	5114.1
AGG MASS & BASKET	B	5007.0
COOL AGG & BASKET		5007.0
MIX MOISTURE	%M	0.21

(Mi) =(A-T)/(1+%M/100) (Mf) = (B - T)

TEMP A	160	Mi	1769.8
TEMP B	165	Mf	1666.4

%I = [(Mi -Mf) / (Mi)] x 100

% INCINERATED	%I	5.84
CORRECTION FACTOR	Cf	**0.26**

% AC, Pb=(% I - Cf)

% AC, Pb = (H) $\boxed{5.58}$

REMARKS:

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE	
Tester Tim #40000	Asphalt Inc.			X QUALITY CONTROL VERIFICATION INDEPENDENT ASSURANCE

734-2277 (11-2024)

FIELD WORKSHEET FOR ACP (PLANT REPORT)

PROJECT NAME (SECTION): US26: Pothole way - Rut Blvd	ODOT MIX DESIGN NO.: 24-MD9999	TEST NO.: 1	CONTRACT NUMBER: 12345
CONTRACTOR OR SUPPLIER: Smoothest Paving; PROJECT MANAGER: Bid Item Bob	DATE: 7/28/2024	AMOUNT REPRESENTED: 1000	BID ITEM NUMBER: 1234
SOURCE NAME: no name; SOURCE NUMBER: 00-000-0	TIME: 10:00 AM	(EAC OR ACP): ACP	MIX NOMINAL SIZE: 1/2"
PLANT / MODEL: CMI 10X; TYPE: Drum; SIZE: 400 TPH; TO BE USED IN: Wearing Course; SAMPLED AT: Discharge	ANTISTRIP: Latex	JMF MIX TEMP.: 320-332	MIX TEMP: 325

SIEVE ANALYSIS

SIEVE SIZE	MASS 1	MASS 2	TOTAL MASS	% RET	% PASS	INCINERATOR CORR. FACTOR	CORRECTED % PASSING	JOB MIX FORMULA TARGET	JOB MIX FORMULA TOLERANCE	SIEVE SIZE
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
				0.0	100.0		**100**			0
3/4"				0.0	100.0		**100**	100	**95-100**	3/4"
1/2"	66.7		66.7	4.0	96.0		**96**	97	**90-100**	1/2"
3/8"	173.4		173.4	10.4	85.6		**86**			3/8"
1/4"	227.4		227.4	13.6	72.0		**72**			1/4"
#4	153.9		153.9	9.2	62.8		**63**	61	**56-66**	#4
#8	359.2		359.2	21.6	41.2		**41**	41	**37-45**	#8
#30	369.3		369.3	22.2	19.0		**19**	18	**14-22**	#30
#200	181.8		181.8	10.9	8.1		**8.1**	7.4	**5.4-9.4**	#200
Pan	32.6		32.6	2.0			**% AC, Pb**	5.50	**5.0-6.0**	
INITIAL DRY MASS			1666.4							

COLD FEED MOISTURE

PAN TARE	(T)	1216.6
WET MASS + PAN	(A)	3409.4
DRY MASS + PAN	(B)	3378.9
%M ={(A-B)/ (B-T)} X 100=		**1.4**

MIX MOISTURE

TEMP A	160	TEMP B 161
PAN TARE	(T)	458.5
WET MASS + PAN	(A)	1675.7
DRY MASS + PAN	(B)	1673.1
%M = [(A-B)/(B-T)] X 100=		**0.21**

RAP MOISTURE

PAN TARE	(T)	390.9
WET MASS + PAN	(A)	1544.4
DRY MASS + PAN	(B)	1526.4
%M = [(A-B)/(B-T)] X 100=		**1.6**

RAS MOISTURE

PAN TARE	(T)	
WET MASS + PAN	(A)	
DRY MASS + PAN	(B)	
%M = [(A-B)/(B-T)] X 100=		

SIEVE LOSS

PAN TARE	(T)	0.0
DRY WASHED MASS	(C)	1564.4
Mass After Sieve	(D)	1564.3
SL %={(C-T-D)/C-T)}X 100=		**0.0**

REMARKS:

METER READINGS

	ASPHALT	WET AGG	WET RAP	WET RAS	ANTISTRIP	FILLER	FIBER
BEGINING	28.79	498.96	228.54		0.0835		
ENDING	31.39	543.76	249.05		0.1010		
SUB TOTAL	2.60	44.80	20.51		0.0175		
MOISTURE		**1.4** %	**1.6** %	%	**0** %		

	O	A	B	C	D	E	F
TOTAL	2.60 Tons	44.18 Tons	20.19 Tons	Tons	0.0175 Tons	Tons	

ASPHALT METER CORRECTION

% VIRGIN AC (G) $= \frac{O}{O+A+B+C} \times 100 =$ **3.88**

% FILLER $= \frac{E}{A+B+C+E} \times 100 =$

% RAM $= \frac{B+C}{A+B+C} \times 100 =$ **31.4**

% FIBER $= \frac{F}{O+A+B+C+E+F} \times 100 =$

% RAS $= \frac{C}{A+B+C} \times 100 =$

% ASPHALT= EAC $\frac{O}{A} \times 100 =$

% BINDER REPLACEMENT $= \frac{H-G}{H} \times 100 =$ **30.5**

% ANTISTRIP $= \frac{D}{A-D} \times 100 =$ **0.0396**

PLANT DRY & MOISTURE SETTINGS

491.10	←AGG→	535.20
220.60	←RAP→	240.40
	←RAS→	
%m AGG	%m RAP	%m RAS
1.6	3.6	

T-308 METHOD A or B: A

BASKET TARE	T	3340.6
MIX MASS & BASKET	A	5114.1
AGG MASS & BASKET	B	5007.0
COOL AGG & BASKET		5007.0
MIX MOISTURE	%M	0.21

(Mi) =(A-T)/(1+%M/100) (Mf) = (B - T)

TEMP A	160	Mi	1769.8
TEMP B	165	Mf	1666.4

%I = [(Mi -Mf) / (Mi)] x 100

% INCINERATED	%I	5.84
CORRECTION FACTOR	Cf	**0.26**

% AC, Pb=(% I - Cf)

% AC, Pb = (H) **5.58**

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE	
Tester Tim #40000	Asphalt Inc.			X QUALITY CONTROL VERIFICATION INDEPENDENT ASSURANCE

734-2277 (11-2024)

Soil Moisture-Density Relations

E English (**E**) Metric (**M**)

PROJECT NAME (SECTION)		CONTRACT NUMBER
CONTRACTOR OR SUPPLIER	PROJECT MANAGER	BID ITEM NUMBER

lb/ft³
lb/ft³
lb/ft³
lb/ft³
lb/ft³
lb/ft³
lb/ft³
lb/ft³

% % % % % % % %

Gsb (k) = Gsb x 62.4	
MCc = Absorption or Moisture	

AASHTO T-99 **Method A** ☐ **Method D** ☐

Coarse-Grained
- Sandy-Gravel ☐
- Silty-Gravel ☐
- Clayey-Gravel ☐

Fine-Grained
- Sand ☐
- Silt ☐
- Clay ☐

Color
- Light Brown ☐
- Med Brown ☐
- Dark Brown ☐
- Redish Brown ☐

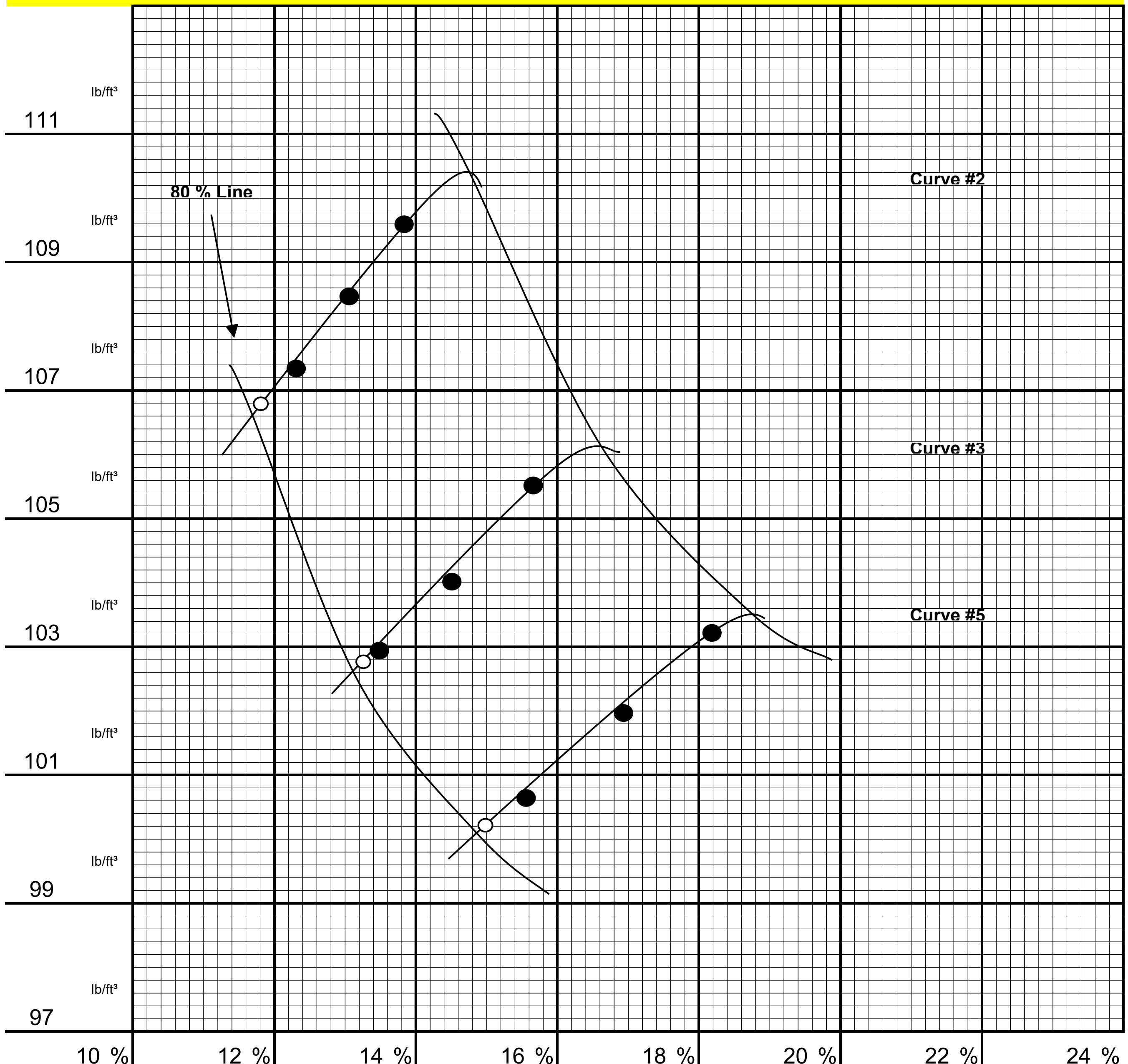
Comments:

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

Soil Moisture-Density Relations

E — English (**E**) Metric (**M**)

PROJECT NAME (SECTION)		CONTRACT NUMBER
Forms Example		12345
CONTRACTOR OR SUPPLIER	PROJECT MANAGER	BID ITEM NUMBER
ODOT Forms	Sean Parker	123



Gsb (k) = Gsb x 62.4	**164.0**
MCc = Absorption or Moisture	**2.2%**

AASHTO T-99 **Method A** [x] **Method D** [ ]

Coarse-Grained		**Fine-Grained**		**Color**	
Sandy-Gravel	x	Sand		Light Brown	
Silty-Gravel		Silt		Med Brown	x
Clayey-Gravel		Clay		Dark Brown	
				Redish Brown	

Comments:

CERTIFIED TECHNICAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43048	ODOT		10/10/2024

734-3468_SR (12-2024)

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**

Fiber ______ **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**

TIME CYLINDERS CAST ______

AMBIENT ______ °F
CONCRETE ______ °F

SLUMP ______ in
AIR ______ %

DENSITY

CONCRETE + POT ______ lb
\- POT MASS ______ lb
CONCRETE MASS= ______ lb ÷ POT CALIBRATION = lb/ft³

YIELD $\frac{\text{TOTAL BATCH MASS}}{\text{lb/ft}^3 \times 27}$ = ______ = yd³

CEMENT CONTENT $\frac{\text{CEMENT, FLYASH \& SILICA}}{\text{YIELD}}$ = ______ = ______ 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

$\frac{\_\_\_\_\_\_ \text{ lb}}{\text{lb}}$ = ______ **= W/C RATIO**

☐ QUALITY CONTROL ☐ VERIFICATION

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE

734-3573 (11-2024)

CONCRETE YIELD AND W/C RATIO WORKSHEET

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
DATA SHEET NUMBER 43408-001	SET NUMBER 1	DATE 10/25/24	INVOICE NUMBER 123456	BATCH SIZE 9.5	TRUCK NO & DRIVER 1234/Tom

CONCRETE BATCH TICKET AND FIELD TEST DATA

CEMENTITIOUS MATERIAL			*AGGREGATES*			AGG % FREE MOISTURE	
CEMENT	4430	lb	1.5" - 3/4" #1	7000	lb	2.00	%
SLAG		lb	3/4" - 3/8" #2	10500	lb	4.23	%
FLYASH	2270	lb	Utelite #3	3500	lb	2.00	%
SILICA FUME	300	lb	FINE AGG (SAND) #4	7190	lb	11.00	%
TOTAL CEMENT	**7000**	**lb**	**TOTAL AGG**	**28190**	**lb**		

ADMIXTURES				
Master Air AE90	1	100	oz	
PS 1466	2	520	oz	
MasterSet Delvo	3	600	oz	
VMA 358	4	140	oz	
TOTAL ADMIXTURES		1360	oz	
TOTAL ADMIXTURES		**85**	**lb**	

Fiber 45 **lb**

ADD WATER		
BATCHED	1230	lb
JOBSITE		lb
TOTAL WATER	**1230**	**lb**

CONVERSIONS
WATER
Gal x 8.34 = lb
Admixtures
oz / 16 = lb

TOTAL BATCH MASS **36550** **lb**

TIME CYLINDERS CAST 7:30 AM

AMBIENT 41 °F **SLUMP** 6 1/2 in

CONCRETE 61 °F **AIR** 4.9 %

DENSITY

CONCRETE + POT	42.36	lb				
- POT MASS	7.46	lb				
CONCRETE MASS=	34.90	lb	÷ POT CALIBRATION 0.250	=	**139.6**	lb/ft³

YIELD TOTAL BATCH MASS / lb/ft³ x 27 = 36550 / 3769.20 = **9.70** yd³

CEMENT CONTENT CEMENT, FLYASH & SILICA / YIELD = 7000 / 9.70 = **722** 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

1.5" - 3/4"	#1	7000	- (7000	/ 1+ 0.0200	) =	137	lb
3/4" - 3/8"	#2	10500	- (10500	/ 1+ 0.0423	) =	426	lb
Utelite	#3	3500	- (3500	/ 1+ 0.0200	) =	69	lb
FINE AGG (SAND)	#4	7190	- (7190	/ 1+ 0.1100	) =	713	lb

A. AGGREGATE FREE WATER TOTAL = 1345 lb

B. WATER ADDED AT PLANT&JOBSITE = 1230 lb

C. ADMIXTURES ADDED = 85 lb

2660 lb / 7000 lb = **0.38** **= W/C RATIO**

☐ QUALITY CONTROL ☒ VERIFICATION

CERTIFIED TECHNICIAN (PLEASE PRINT) AND CARD NUMBER	COMPANY NAME	SIGNATURE	DATE
Scott Aker #43408	ODOT		10/26/2024

734-3573 (11-2024)

SAMPLE DATA SHEET FOR CONCRETE CYLINDERS

* CON NO. & EA: CON01234	* DATA SHEET NUMBER: F - 43408 - 001	LABORATORY REPORT NUMBER:		
PROJECT NAME (SECTION): Forms Example			CONTRACT NUMBER: 12345	
CONTRACTOR: 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: 10/25/24	DATE SHIPPED: 10/26/24	CYLINDER SIZE: 6" X 12"
INVOICE NUMBER: 123456				

* TEST SPECIMENS AT DAYS INDICATED								YIELD
A. 7	B. 14	C. 28	D. 28	E. 28	F.	G.	H.	9.70 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	2.00 %	4.23 %	2.00 %	11.00 %

* 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 %	139.6 lb/yd³	722 lb/yd³	0.38 BY WT.

* ADDITIVES	* CEMENT	* FLYASH	* SLAG	* SILICA	* WATER BATCHED	* NET WEIGHT	* POT CALIBRATION
1360 oz	4430 lb	2270 lb	0 lb	300 lb	1230 lb	34.90	0.250

* AGGREGATE #1	* AGGREGATE #2	* AGGREGATE #3	* FINE AGG (SAND)	* WATER AT JOB	FIBER	CURING	CAPPING
7000 lb	10500 lb	3500 lb	7190 lb	0 lb	45 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

☐ 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		10/25/24

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	11/01/24	7	118170	28.27	4180	60	Shear	
B	11/08/24	14	133910	28.27	4737	60	Shear	
C	11/22/24	28	156530	28.27	5537	60	Cone	
D	11/22/24	28	158310	28.27	5600	60	Shear	
E	11/22/24	28	71860	28.27	2542	60	Shear	
F								
G								
H								

AVE 28 DAY 5620 ☒ 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
Scott Aker #43048	ODOT		

SAMPLE DATA SHEET FOR CONCRETE CYLINDERS

* CON NO. & EA		* DATA SHEET NUMBER F - -		LABORATORY REPORT NUMBER			
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 yd³	
A.	B.	C.	D.	E.	F.	G.	H.

* 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	FIBER	CURING	CAPPING
lb	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 28 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

INSERT TAB

SECTION 4(D)
Field Tested Materials
Guide

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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*				
	Soil Moisture-Density Relations			*R 75*	*3468SR*				
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 yd^2 or yd^3	Over 3500 yd^2 or yd^3
Existing Ground Surface	1 test per 1000 yd^2	1 test per 3000 yd^2
Embankments	1 test per 500 yd^3	1 test per 3000 yd^3
Excavations and Finished Subgrade	1 test per 1000 yd^2	1 test per 3000 yd^2

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.								
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 2024)

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 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 2024)

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

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 00360 - Drainage Blankets									
						A sublot equals 1000 Tons			
Granular Drainage Blanket	*Sampling Aggregates*			*R 90*		*1/sublot minimum 1/Source per Project*			
	Reducing Aggregates			*R 76*					
	Sieve Analysis			*T 27/T 11*	*1792*				
Sand Drainage Blanket	*Sampling Aggregates*			*R 90*					
	Reducing Aggregates			*R 76*					
	Sieve Analysis			*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	*TM 158*			*1793S*	*See Table 00360-1 Below*		*1 Test per 10 QC Tests per Table 00360-1*	
	Nuclear Density Soils/Aggregates			*T 310*					
	Coarse Particle Correction			*T 99*	*1793S*				

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 2024)

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 00390 - RIPRAP PROTECTION									
Fill Material & Riprap									
Gradation *See 00390.11(c-1)*							*Visual*		
	Degradation	*TM 208*							
	Soundness			*T 104*	*4000*	*See Section 4A*	*Submit To Lab*		*See Section 4A*
[1] *Apparent Specific Gravity and Absorption*	*Specific Gravity of Coarse Aggregates*			[1] *T 85*	*1825*				
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 4A*	*Submit to Lab*		*See Section 4A*
Portland Cement	*Material must meet the requirements of Section 02010*								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 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		1/Sublot		1 per 10 Sublots	
	Reducing Aggregates			R 76					
	(2)(3) Sieve Analysis			T 27/T 11	1792				
	(3) Fineness Modulus			T 27/T 11					
(2) Coarse Aggregate (See Section 02690.20)	(1)(2) Wood Particles	TM 225							
	(3) Sand Equivalent			T 176					
(3) Fine Aggregate (See Section 02690.30)	Soundness			T 104	4000	See Section 4A	Submit to Central Lab		See Section 4A
	Abrasion			T 96					
	Degradation	TM 208							
	Lightweight Pieces			T 113					
	Organics			T 21					
	(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				
	(3) Specific Gravity of Fine Aggregate			T 84					
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 00396.16) (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 2024)

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 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 Coarse Particle Correction*			*T 310* *T 99*	*1793S*	*1 Test per 300 ft. of Trench*			

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 2024)						Same Frequency for all Tests (Minimums)			
						QUALITY ASSURANCE			
		TEST METHOD					Independent Assurance/Verification		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	ODOT	WAQTC	AASHTO	FORM 734-	Contractor Quality Control	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*		

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 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*	*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-	Contractor Quality Control (Same Frequency for all Tests (Minimums); QUALITY ASSURANCE)	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: 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.								

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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 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*	*(M) 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								
(M) Per Source									

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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 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)*								

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Oregon Department of Transportation (Revised November 2024)

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 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-	Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE: Contractor Quality Control	Independent Assurance/Verification: Project Manager	Region Quality Assurance	Materials Laboratory
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 November2024)						Same Frequency for all Tests (Minimums)			
						QUALITY ASSURANCE			
		TEST METHOD					Independent Assurance/Verification		
MATERIAL AND OPERATION	DESCRIPTION OF TEST	ODOT	WAQTC	AASHTO	FORM 734-	Contractor Quality Control	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	*Density Curve*			(2) *T 99*	*3468*	*1/Soil type or Aggregate Gradation*			
(2) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Specific Gravity of Coarse Aggregates* *Coarse Particle Correction*			*T 85* *T 99*	*3468*				
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 November2024)						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.								

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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 00512 - DRILLED SHAFTS									
Aggregate Production						A Sublot equals 1,000 Tons			
(1) *QAE may waive after 5 sublots/shifts*	*Sampling Aggregates*			*R 90*					
	Reducing Aggregates			*R 76*					
(2) *Perform a minimum of 3 tests, QL's required*	(2)(3)(4) *Sieve Analysis*			*T 27/T 11*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
	(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*					
	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-	Contractor Quality Control (Same Frequency for all Tests (Minimums); QUALITY ASSURANCE)	Independent Assurance/Verification: Project Manager	Independent Assurance/Verification: Region Quality Assurance	Independent Assurance/Verification: Materials Laboratory
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*								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						Same Frequency for all Tests (Minimums)			
						QUALITY ASSURANCE			
MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	Contractor Quality Control	Independent Assurance/Verification		
		ODOT	ASTM	AASHTO			Project Manager	Region Quality Assurance	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.								

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MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD ODOT	TEST METHOD ASTM	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 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-	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 00540 - STRUCTURAL CONCRETE									
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 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	Project Manager	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
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*								

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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 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* *Specific Gravity of Fine Aggregate* *Sieve Analysis* *Moisture Content of Aggregate & Soil* *Fracture (Method 1)*			*T 85* *T 84* *T 27/11* *T 255/265* *T 335*	*4000*	*1/Project and Source*	*Submit to Lab*		*See Section 00557.12(d)*
	Moisture Content of Aggregate & Soils Sieve Analysis			*T 255/265* *T 27/11*	*1792*	*During the Trial Overlay Strip*			
[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".*									

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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 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*					
	Reducing Aggregates			*R 76*					
	[2][3][4] Sieve Analysis			*T 27/T 11*	*1792*	*1/Sublot*		*1 per 10 Sublots*	
[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*								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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*			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						Same Frequency for all Tests (Minimums)			
MATERIAL AND OPERATION	DESCRIPTION OF TEST	TEST METHOD			FORM 734-	QUALITY ASSURANCE			
						Contractor	Independent Assurance/Verification		
		ODOT	WAQTC	AASHTO		Contractor Quality Control	Project Manager	Region Quality Assurance	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)	*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*			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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*				
(1) *Apparent Specific Gravity and Absorption*									
	Gradation						*Visual*		

FIELD TESTED MATERIALS ACCEPTANCE GUIDE

(Revised November 2024)

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 - 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*		*T96* *T 11* *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	*Sampling Aggregates* *Reducing Aggregates*			*R 90* *R 76*		*1/Sublot*			
[(1)] *Perform a minimum of 3 tests, QL's required*	[(1)] *Sieve Analysis Un-Washed* *Sand Equivalent*			*T 27* *T 176*	*1792*	*1/Sublot*			
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*			
Placement Establishing Maximum Density	*Density Curve*			[(2)] *T 99*	*3468*	*1/Aggregate Gradation/Per Source*			
[(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 yd3 (Minimum 1/day)*			
	Deflection Testing	*TM 158*			*1793B*	*1 per layer*	[(3)] Visual		
[(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.***								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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*			

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 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*				
(1) Apparent Specific Gravity and Absorption									
	Gradation						*Visual*		

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 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 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	*Sampling Aggregates Reducing Aggregates*			*R 90 R 76*					
(1) Perform a minimum of 3 tests, QL's required	*(1) Sieve Analysis Un-Washed Sand Equivalent*			*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*		*(2) T 99 T 85*	*3468 3468*	*1/Aggregate Gradation/Per Source*			
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.***								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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*	*TM 208*		*T96*	*4000*	*See Section 4C*	*Submit to Central Lab*		*See Section 4C*
	Sieve Analysis Plasticity Index			*T 11 T 90*	*4000*				
					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*			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						Same Frequency for all Tests (Minimums)			
						QUALITY ASSURANCE			
		TEST METHOD					Independent Assurance/Verification		
MATERIAL AND OPERATION	**DESCRIPTION OF TEST**	**ODOT**	**WAQTC**	**AASHTO**	**FORM 734-**	**Contractor Quality Control**	**Project Manager**	**Region Quality Assurance**	**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.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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 4A*
	Sampling Aggregates *Reducing Aggregates* *Sieve Analysis* *Un-Washed* *Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*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 00641 - AGGREGATE SUBBASE, BASE, AND SHOULDERS									
Aggregate Production Aggregate Subbase	*Abrasion*			*T 96*	*4000*	*See Sec. 4A*	*Submit To Central Lab*		*See Section 4A*
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)*	

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 00641 - AGGREGATE SUBBASE, BASE, AND SHOULDERS (Continued)									
Placement									
Aggregate Subbase									
Compaction	*Deflection Testing*	*TM 158*			*1793 B*	*1 per Layer*	*Visual*		

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 Degradation	TM 208		T 96	4000	See Section 4A	Submit to Lab		See Section 4A
					A Sublot equals 2,000 Tons				
(1) Perform at least 3 tests, QL's required	Sampling Aggregates Reducing Aggregates (1) Sieve Analysis Un-Washed			R 90 R 76 T 27	1792	1/Sublot		1 per 10 Sublots	
(2) May be waived by QAE	(2) Sand Equivalent			T 176	1792				
	Fracture (Method 1)			T 335	1792	1/5 Sublots			
Aggregate (Sanding Aggregate)					A Sublot equals 1000 Tons				
	Sampling Aggregates Reducing Aggregates Sieve Analysis Un-Washed			R 90 R 76 T 27	1792	1/Sublot		1 per 10 Sublots	
(1) May be waived by QAE	(1) Cleanness Value	TM 227							
	Abrasion Degradation Lightweight Pieces	TM 208		T 96 T 113	4000 4000	See Section 4A	Submit to Lab		See Section 4A
	Fracture (Method 1) Elongated Pieces Wood Particles	TM 229 TM 225		T 335	1792 1792	1/5 Sublots		1 per 10 Sublots	

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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*	*See Section 4A*	*Submit to Lab*		*See Section 4A*
	Degradation	*TM 208*							
(1) QAE may waive after 5 sublots/shifts	*Soundness*			*T 104*					
	Lightweight Pieces			*T 113*					
	Dry Rodded Unit Weight			*T 19*	*4000*				
	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) 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*			
(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*							

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 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*								

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 00707 - EMULSIFIED ASPHALT MICRO-SURFACING									
Aggregate Production						*A sublot equals 200 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* *(3) Fracture (Method 1)* *(1) Wood Particles* *(1) Elongated Pieces* *(2) Sieve Analysis* *Sand Equivalent*	*TM 225* *TM 229*		*R 90* *R 76* *T 335* *T27/T 11* *T 176*	*1792* *1792*	*1/Sublot*		*1 per 10 Sublots*	
(3) 1/5 Sublots	*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 00707.10 and 00707.14, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00707.10 and 00707.14 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 1000 Tons".
b. One Per sublot means "One Set of Tests Per 200 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 2024)

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 00710 - SINGLE APPLICATION EMULSIFIED ASPHALT SURFACE TREATMENT						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE			
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	WAQTC	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 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 Pieces [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	
[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	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.

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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 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*			
(1) ***ACP Plant Calibration Required at start of production and if meters fail to meet specification***					*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	ODOT	WAQTC	AASHTO	FORM 734-	Contractor Quality Control	Project Manager	Region Quality Assurance	Materials Laboratory
		TEST METHOD				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			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			T 27/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 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
						Same Frequency for all Tests (Minimums) — QUALITY ASSURANCE	Independent Assurance/Verification		
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 *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 Pieces* *(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	*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 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 2024)

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 2024)

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 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*		*1/Sublot*		*1 per 10 Sublots*	
	Reducing Aggregates			*R 76*					
	(1) Sieve Analysis			*T 27/T 11*	*1792*				
(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 Un-Washed*			*T 27*	*1792*	*1/Sublot*		*1/Project*	

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 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								

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)									
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*							
	(3)(4) Fracture (Method 2)			*T 335*	*1792*	*1/5 Sublots*			
	(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.

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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 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									

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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)	*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 ***(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*			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE

(Revised November 2024)

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 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) Asphalt Content*			*R 97 R 47 T 308*	*2277*	*1/Sublot or Min. 1/day*			
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 2024)						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*			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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*		*1/Sublot*		*1 per 10 Sublots*	
(3) Coarse Agg (+ No. 4)	*Reducing Aggregates*			*R 76*					
	(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*			*1792*	*1/5 Sublots*			
	(3)(4) Fracture (Method 2)			*T 335*					
	(1)(3) Wood Particles	*TM 225*							
RAS Production *(Reclaimed Asphalt Shingles)*	*Sieve Analysis*			*T 27*	*4000*	*1 / 500 Tons*	Submit to Lab		
	Un-Washed								
	Deleterious Materials	*TM 335*							
	Sampling Aggregates			*R 90*		*1 / 50 Tons*			
	Reducing Aggregates			*R 76*					
	Sieve Analysis			*T 27*	*1792*				
	Un-Washed								
	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.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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*			*T 329*					
	Cold Feed Moisture			*T255/T265*	*2277*				
<u>Meter Method is required for ACP even when acceptance is by Ignition Method</u>	*Readings backed by Tank Measure & Production Records Daily*	*TM 321* *[3] TM 322*			*2401 ACP*	*Daily Production*			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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*				
Maximum Density Test	*Max. Specific Gravity of ACP*			*T 209*	*2050* **5068*	*1/Sublot & according to Section 00745.16 (b)-1-c*		*1 per 10 Sublots*	
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									

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***	*Readings backed by Tank Measure & Production Records Daily*				*2401 ACP*	*Daily Production*			
[1] *If Applicable* [1] *See JMF for Details*									
Smoothness									
Certification of Profiler Equipment		*TM 769*				*See Special Provisions*			
Determining International Roughness Index (IRI)		*TM 772*							

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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	Region Quality Assurance	Materials Laboratory
						Same Frequency for all Tests (Minimums)			
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*		*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*								
	[(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 yd^3 of slip formed pavement or 100 yd^3 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*			

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*			

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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									
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] *Perform a minimum of 3 tests, QL's required*	[2][3][4] *Sieve Analysis*			*T 27/T 11*	*1792*				
	[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*					
	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*					

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 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 2024)

MATERIAL AND OPERATION	DESCRIPTION OF TEST	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 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*			
	Soil Moisture-Density Relations			*R 75*	*3468SR*		*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							

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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 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*

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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 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 yd²	Over 3500 yd²
Finished Subgrade	1 test per 1000 yd²	1 test per 3000 yd²

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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 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

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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 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*				
(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*			*R 90* *R 76*		*1/Project*	*Visual*	
	Sieve Analysis			*T 27/T 11*	*1792*			
	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 2024)

<table>
<tr><th rowspan="3">MATERIAL
AND
OPERATION</th><th rowspan="3">DESCRIPTION
OF
TEST</th><th colspan="3">Test Method</th><th rowspan="3">FORM
734-</th><th colspan="3">Same Frequency for all Tests (Minimums)</th></tr>
<tr><th rowspan="2">ODOT</th><th rowspan="2">WAQTC</th><th rowspan="2">AASHTO</th><th colspan="2">Quality Control</th><th>Quality Assurance</th></tr>
<tr><th>Contractor Quality Control Type D</th><th>Contractor Quality Control Type E</th><th>Project Manager Type D & E</th></tr>
</table>

SECTION 00396 -SHOTCRETE SLOPE STABILIZATION								
Aggregate Production and Mixture						*A Sublot equals 1000 Tons*		
	Sampling Aggregates			*R 90*		*1/Sublot*	*Provide History of Passing Tests*	*Review Documentation for Acceptance*
(1) QAE may waive after 5 sublots/shifts	*Reducing Aggregates*			*R 76*				
	(2)(3) Sieve Analysis			*T 27/T 11*	*1792*			
	(3) Fineness Modulus			*T 27/T 11*				
(2) Coarse Aggregate (See Section 02690.20)	*(1)(2) Wood Particles*	*TM 225*						
	(3) Sand Equivalent			*T 176*				
(3) Fine Aggregate (See Section 02690.30)	*Soundness*			*T 104*	*4000*	*Contractor Furnished Testing*	*Provide History of Passing Tests*	
	Abrasion			*T 96*				
	Degradation	*TM 208*						
	Lightweight Pieces			*T 113*				
	Organics			*T 21*				
	(2) Dry Rodded Unit Weight			*T 19*		*Start of production and when changes in aggregate occurs*	*Start of production and when changes in aggregate occurs*	
	(2)(3) Bulk Specific Gravity & Absorption			*(3) T 84 & (2) T 85*				
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) 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*	
(S) 3 Cores minimum per Panel								
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 2024)

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								*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*	*Visual*	*Review Documentation for Acceptance*
	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.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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*

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 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.							

Same Frequency for all Tests (Minimums)

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*			[1] *T 99*	*3468*	*1/Soil Type or Aggregate Gradation*	*Visual*	
	Specific Gravity of Coarse Aggregates			*T 85*	*3468*			
	Family of Curves			*R 75*	*3468FC*			
Compaction	*Nuclear Density Soils/Aggregates*			*T 310*	*1793S* or	[C] *1 test per 100 ft. of Trench and every 2.0 ft. of Fill*	*Visual*	*Review Documentation for Acceptance*
	Coarse Particle Correction			*T 99*	*1793B*			
[C] Density testing is based on cumulative lineal meters or feet of pipe placement.	***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*	*(M) 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
(M) Per Source								

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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 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							

Same Frequency for all Tests (Minimums)

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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*				
(1) *Method "A"*	*Specific Gravity of Coarse Aggregates Coarse Particle Correction*	*TM 223*		*T 85*	*3468 B*	*Contractor Provided Testing*	*Visual*	
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)*							

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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
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*	*3468 B*			
(1) *Method "A"*	*Specific Gravity of Coarse Aggregates Coarse Particle Correction*	*TM 223*		*T 85*				
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
					Same Frequency for all Tests (Minimums)			
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)	*Sampling Aggregates*			*R 90*			***Requires Signed and Notarized Statement of Compliance From Contractor For All Items Under Section 00500***	*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*		*1/Sublot (Minimum 1/Project)*		
	(1) *Sieve Analysis*			*T 27*	*1792*			
(1) *Perform a minimum of 3 tests QL's required*	*Fracture (Method 1)*			*T 335*				
	Sand Equivalent			*T 176*				
Product Compliance	*Abrasion*			*T 96*	*4000*	*Contractor Provided Testing*	*Minimum 1 per Project*	
	Degradation	*TM 208*						
	Plasticity Index			*T 90*				
	Sieve Analysis			*T 11*				
Establishing Maximum Density	*Density Curve*			(2) *T 99*	*3468*	*1/Soil type or Aggregate Gradation*	*Visual*	
(2) Method "A" & ODOT TM 223 for Dense Graded Base Aggregate	*Specific Gravity of Coarse Aggregates*			*T 85*				
	Coarse Particle Correction			*T 99*	*3468*			
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.							

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 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)*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
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] Perform a minimum of 3 tests QL's required	[2][3][4] Sieve Analysis			T 27/T 11	1792			
	[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	
	[3] Specific Gravity of Coarse Aggregate			T 84	1825			
	[4] Specific Gravity of Fine Aggregate			T85				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 00512 - DRILLED SHAFTS (CONTINUED)								
Portland Cement Concrete					A Sublot equals 100 yd3			
	Sampling Concrete		*TM 2*					
	Slump of Concrete			*T 119*				
	Concrete Temperature			*T 309*				
	Density (Unit Weight) of Concrete			*T 121*	*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*
	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*

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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 00535 - POST-INSTALLED ANCHOR SYSTEMS						Same Frequency for all Tests (Minimums)		
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 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 00535 - POST-INSTALLED ANCHOR SYSTEMS (continued)						Same Frequency for all Tests (Minimums)		
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.***

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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)						Same Frequency for all Tests (Minimums)		
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-	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 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*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)						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 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)	*Material must meet the requirements of section 00557.12 (a-c)*							
Product Compliance *(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*

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								
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			
	(4) Fineness Modulus			T 27/T 11				
(3) Coarse Aggregate (See Section 02690.20)	(4) Sand Equivalent			T 176	1792			
(4) Fine Aggregate (See Section 02690.30)	(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				

Same Frequency for all Tests (Minimums)

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 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*	

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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 - MECHANICALLY STABILIZED EARTH RETAINING WALLS								
Aggregate Production								
Gravel Leveling Pads Backfill *(See Section 02630.10)*	*Abrasion*			*T 96*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
					A Sublot equals 1,000 Tons Minimum 1/Project			
	Sampling Aggregates			*R 90*		*1/Sublot*	*Visual*	*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*				
	Sieve Analysis Un-washed			*T 27*	*1792*			
	Sand Equivalent			*T 176*				
	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*			*T 104*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Abrasion			*T 96*				
	Degradation	*TM 208*						
	Lightweight Pieces			*T 113*	*4000*			
[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*	*Sampling Aggregates*			*R 90*		*1/Sublot or Minimum 1 Per Project*	*Visual*	*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*				
	[2] *Sieve Analysis*			*T 27/T 11*	*1792*			
[1] *QAE may waive after 5 sublots/shifts*	[1] *Wood Particles*	*TM 225*						
	Fracture (Method 2)			*T 335*				
	Elongated Pieces	*TM 229*			*1792*			
[2] *Perform a minimum of 3 tests, QL's required*								
Pipe Drain Backfill (Product Compliance) (See Section 00430.11)	*Abrasion*			*T 96*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Degradation	*TM 208*						
	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						Same Frequency for all Tests (Minimums)		
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

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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
						Same Frequency for all Tests (Minimums)		
SECTION 00596B - PREFABRICATED MODULAR RETAINING WALLS								
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			*R 90*		*1/Sublot*	*Visual*	*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*				
	Sieve Analysis Un-Washed			*T 27*	*1792*			
	Sand Equivalent			*T 176*				
	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)	*Soundness*			*T 104*	*4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
	Abrasion			*T 96*				
	Degradation	*TM 208*						
	Lightweight Pieces			*T 113*	*4000*			
(3) (See Section 2690.20(a) thru 2690.20(d) & 2690.20(f)								
					A Sublot equals 1000 Tons			
(3) Modular Block Core and Backfill	*Sampling Aggregates*			*R 90*		*1/Sublot (Minimum 1 Per Project)*	*Visual*	*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*				
	(2) Sieve Analysis			*T 27/T 11*	*1792*			
(1) QAE may waive after 5 sublots/shifts	*(1) Wood Particles*	*TM 225*						
	Fracture (Method 2)			*T 335*				
	Elongated Pieces	*TM 229*			*1792*			
(2) Perform a minimum of 3 tests, QL's required								
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*	

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 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*	*1825*			
(1) Apparent Specific Gravity and Absorption	*Specific Gravity of Coarse Aggregates*			*(1) T 85*				
	Gradation					*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			
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 yd³ (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.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 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* *Sieve Analysis* *Plasticity Index*	*TM 208*		*T96* *T 11* *T 90*	*4000* *4000*	*Contractor Provided Testing*	*Minimum 1 Per Project*	*Review Documentation for Acceptance*
					A Sublot Equals 2000 Tons			
Retaining Wall Granular Backfill	*Sampling Aggregates* *Reducing Aggregates*			*R 90* *R 76*				*Review Documentation for Acceptance*
(1) Perform a minimum of 3 tests, QL's required	*(1) Sieve Analysis* *Un-Washed*			*T 27*	*1792*	*1/Sublot*	*Visual*	
	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 yd³ (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.

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 00635 - GRID-ROLLED AGGREGATE SUBBASE								
Aggregate Subbase							***Requires Signed and Notarized Statement of Compliance From Contractor For All Items Under Section 00600***	
Grading *(See 00635.10)*	Abrasion			*T 96*	*4000*	*Contractor Provided Testing*		*Review Documentation for Acceptance*
	Sampling Aggregates			*R 90*		*Contractor Provided Testing*		*Review Documentation for Acceptance*
	Reducing Aggregates			*R 76*				
	Sieve Analysis Un-Washed			*T 27*	*1792*			
	Sand Equivalent			*T 176*				

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
SECTION 00641 - AGGREGATE SUBBASE, BASE, AND SHOULDERS						Same Frequency for all Tests (Minimums)		
Aggregate Production	Abrasion			T 96	4000	Contractor Provided Testing	Submit Required Documentation	Review Documentation for Acceptance
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 2024)						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 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 2024)						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 00680 - STOCKPILED AGGREGATES								
Aggregate Base and Shoulders								
(See Section 00641)	*Abrasion* *Degradation*	*TM 208*		*T 96*	*4000*	*Minimum 1 per Source/Project*	*Visual*	*Review Documentation for Acceptance*
					A Sublot equals 2,000 Tons			
[(1)] Perform at least 3 tests [(2)] *May be waived by QAE*	*Sampling Aggregates* *Reducing Aggregates* *[(1)] Sieve Analysis Un-Washed* *[(2)] Sand Equivalent*			*R 90* *R 76* *T 27* *T 176*	*1792*	*Contractor Provided Testing*	*Visual*	*Review Documentation for Acceptance*
	Fracture (Method 1)			*T 335*	*1792*	*1/5 Sublots*	Visual	
Aggregate (Sanding Aggregate)								
					A Sublot equals 1000 Tons			
[(3)] *May be waived by QAE*	*Sampling Aggregates* *Reducing Aggregates* *[(1)] Sieve Analysis Un-Washed* *[(3)] Cleanness Value*	*TM 227*		*R 90* *R 76* *T 27*	*1792*	*Contractor Provided Testing*	*Visual*	*Review Documentation for Acceptance*
	Abrasion *Degradation* *Lightweight Pieces*	*TM 208*		*T 96* *T 113*	*4000* *4000*	*Minimum 1 per Source/Project*	Visual	
	Fracture (Method 1) *Elongated Pieces* *Wood Particles*	*TM 229* *TM 225*		*T 335*	*1792* *1792*	*1/5 Sublots & Start of Production*	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 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-	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 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
						Same Frequency for all Tests (Minimums)		
SECTION 00707 - EMULSIFIED ASPHALT MICRO-SURFACING								
Aggregate Production						*A sublot equals 200 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*				
	(3) Fracture (Method 1)			*T 335*	*1792*			
	(1) Wood Particles	*TM 225*						
	(1) Elongated Pieces	*TM 229*						
	(2) Sieve Analysis			*T27/T 11*				
	Sand Equivalent			*T 176*	*1792*			
(3) 1/5 Sublots	*Dry Rodded Unit Weight*			*T 19*	*1825* *1825C*	*Start of production and when changes in aggregate occurs*	Visual	
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 00707.10 and 707.14, Aggregate Production.
2. Furnish records of testing for the entire stockpile according to Section 00707.10 and 707.14 Aggregate Production except change the sampling frequency to the following:

a. One Per 5 sublots means "One Set of Tests Per 1000 Tons".
b. One Per sublot means "One Set of Tests Per 200 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 2024)

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 2024)

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								
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.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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 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 2024)

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 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* (Same Frequency for all Tests (Minimums))		
	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 2024)

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						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 *Degradation* *Soundness* *Lightweight Pieces* *Dry Rodded Unit Weight*	*TM 208*		*T 96* *T 104* *T 113* *T 19*	*4000* *4000*	Contractor Provided Testing	Contractor Provided Testing Minimum 1 per Project	*Review Documentation for Acceptance*
(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* *(3) May be waived by QAE*	*Sampling Aggregates* *Reducing Aggregates* *(5) Fracture* *(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 per Sublot*	*Visual*	
(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*	Visual	*Review Documentation for Acceptance*
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 2024)

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 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 2024)						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								
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*	

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 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*	*2277*	*Provide Process Control*	*Visual*	*Review Documentation for Acceptance*
% 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 2024)

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.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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)						Same Frequency for all Tests (Minimums)		
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								

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)						Same Frequency for all Tests (Minimums)		
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 & Production Records*	*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	*Daily*				*2043 and 2401*	*Daily Production*	*Production Control Testing*	*Review Documentation for Acceptance*

FIELD TESTED MATERIALS ACCEPTANCE GUIDE (Revised November 2024)

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)						Same Frequency for all Tests (Minimums)		
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) If applicable*	*(1) RAP Moisture*			*T 329*	*2277*	*1/Sublot or Min. 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
	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 2024)

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 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 2024)						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 2024)

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 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE								
Aggregate Production	*Soundness*			*T 104*	*4000*	*Contractor Provided Testing Minimum 1 per Project*	*Contractor Provided Testing Minimum 1 per Project*	*Review Documentation for Acceptance*
	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*		*1/Sublot*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
(3) Coarse Agg (+ No. 4)	*Reducing Aggregates*			*R 76*				
	(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*			*1792*	*1/5 Sublots*	*Contractor Provided Testing*	*Review Documentation for Acceptance*
	(3)(4) Fracture (Method 2)			*T 335*				
	(1)(3) Wood Particles	*TM 225*						
	Sieve Analysis			*T 27*	*4000*	*Contractor Provided Testing 1/500 Tons*	Contractor Provided Testing	*Review Documentation for Acceptance*
	Un-Washed							
RAS Production *(Reclaimed Asphalt Shingles)*	*Deleterious Materials*	*TM 335*						
	Sampling Aggregates			*R 90*		*1 / 50 Tons*		
	Reducing Aggregates			*R 76*				
	Sieve Analysis			*T 27*	*1792*			
	Un-Washed							
	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.

FIELD TESTED MATERIALS ACCEPTANCE GUIDE

(Revised November 2024)

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 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*	*Meter Method*	*TM 321* (3) *TM 322*			*2277*	*1/Sublot or Minimum 1/Day*	*Production Control Testing*	*Review Documentation for Acceptance*
(2) If Applicable	(2) *RAP and RAS*			*T 329*				
(3) ***ACP Plant Calibration Required at start of Production and if Meters fail to meet Specification***	*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 2024)

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 *Maximum Density Test* *Determination of G_{mb}*	*Gyratory Specimen* *Max. Specific Gravity of ACP* *Bulk Specific Gravity of Compacted ACP*	*TM 326*		*T 209* *T 166*	*2050GV* *2050* **5068* **2560* **5069*	*1/Sublot & according to Section 00745.16 (b)-1-c*	*Production Control Testing*	*Review Documentation for Acceptance*
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)						Same Frequency for all Tests (Minimums)		
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*						

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 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 2024)

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 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 *Air Content of Concrete* *Slump of Concrete* *Density (Unit Weight) of Concrete* *Yield* *Concrete Temperature* *Water/Cement Ratio* *Batching*		*TM 2* .	*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 2024)						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 2024)

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						Same Frequency for all Tests (Minimums)		
Aggregate Production						A Sublot equals 1,000 Tons		
[1] QAE may waive after 5 sublots/shifts	*Sampling Aggregates*			*R 90*				*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*	*Contractor Provided Testing*	*Contractor Provided Testing*	
	[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*	*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 2024)						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 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

Oregon

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October 31, 2024

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO T 27/11**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- **Under procedure Method A, step 1, the initial dry mass of the sample may be determined utilizing a companion moisture sample (this is an option not a requirement).**
- **Perform the moisture test according to T 255/ T 265.**
- **Shaking time for all methods will be a minimum of 10 minutes.**
- **Use the following formula to adjust the wet mass of the sample to the initial dry mass:**

Initial Dry Mass = $$\left\{ \frac{WM}{1 + \left(\frac{\%M}{100} \right)} \right\}$$

Where: WM = Initial Wet Mass of T 27/11 sample.
%M = Moisture content of companion moisture sample.

- **Document the Initial Wet Mass of the sample when utilizing a companion moisture.**

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October 31, 2024

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO T 272**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- **AASHTO T 99 (Methods B & C) are not allowed on ODOT contracts.**
- **Use AASHTO T 99 (Methods A or D) based on the following criteria:**
- **The moisture content of the one point may be determined according to AASHTO T 217.**
- **The moisture content of the one point must be determined according to AASHTO T 255/265 for Method D applications.**
- **Under the calculations section, add the following: Wet density may be determined according to T 99 - Yellow Sheet, using a "Mold Factor".**
- **Delete Section "Maximum Dry Density and Optimum Moisture Content Determination Using an Individual Moisture / Density Curve".**
- **Under Section Maximum Dry Density and Optimum Moisture Content Determination Using a Soil Moisture-Density Relations, if the one-point plot doesn't meet the requirements of this section (steps 2, 3, & 5), then a full curve must be developed or the guidelines for Selecting a Single Curve (Appendix A) located at the end of AASHTO T 272.**
- **Delete the Individual Moisture / Density Curve figure and example on page E&B/ID 15-5.**

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November 30, 2024

To: All Holders of the Manual of Field Test Procedures

Section: **Test Procedure AASHTO R 75**

The Oregon Department of Transportation has specified method(s) for this Test Procedure. Please observe the following for our projects:

- Supplemental information for Soil Moisture-Density Relations Development, Appendix A, is located at the end of R 75.