



# Oregon

Kate Brown, Governor

Department of Transportation  
Construction Section  
800 Airport Road SE  
Salem, OR 97301-4792  
Phone: (503) 986-3000  
Fax: (503) 986-3096

December 1, 2022

To: All Holders of the Manual of Field Test Procedures

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

**Subject: 2022 Revision of the Manual of Field Test Procedures**

Enclosed is the 2022 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.

The following pages identify the appropriate add and remove sequence necessary to update the 2021 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.



## MFTP 2022 Update

### Summary of Changes

#### Introduction – No Changes

#### Section 1 – Test Procedures Index

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

#### ODOT – Test Procedures

**TM 769 (Certification of Inertial Profiler Equipment)** – Only minor editorial and formatting issues were addressed. No content changes occurred.

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

- Under section 8, the Quality Assurance Check of project profiles will be at the discretion of the *Agency* and not the Project Manager.

Minor formatting and editorial items were also addressed.

#### **T 312 (Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyrotory Compactor) – T 312 is in the Annex A of TM 326.**

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

- The cover sheet has been updated to reflect the new 2022 version of the procedure.
- Under Section 2.1, AASHTO Standards, added M 339 Thermometer reference procedure (Thermometers Used in the Testing of Construction Materials) to the list.
- Under Section 2.1, AASHTO Standards, changed the test procedure title name for R 30 to Laboratory Conditioning of Asphalt Mixtures.
- *Under Section 2.2 (ASTM Standards), added the following references:*
  - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
  - E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
  - E2877, Standard Guide for Digital Contact Thermometers
- *Under Section 2.3 (International Electrotechnical Commission Standards), added the following references:*
  - IEC 60584-1: 2013 Thermocouples - Part 1: EMF Specifications and Tolerances
- Under Apparatus, section 4.4 Thermometers, added the following thermometer information and note reference: Thermometers for measuring temperature of aggregates, binder, and asphalt mixtures shall meet the requirements of M 339M/M 339 with a temperature range of at least 10 to 230°C, and an accuracy of ±2.5°C (±4.5°F) (see Note 3).

**Note 1**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E230/E230M thermocouple thermometer, Type J, any Class, or Type K, Class 1 or 2; IEC 60584 thermocouple thermometer, Type J, any Class, or Type K, Class 1 or 2; ASTM E2877 digital metal stem thermometer; or dial gauge metal stem (bi-metal) thermometer.

- Subsequent notes have been renumbered, due to the note 3 addition.
- Under Annex A, the following new reference has been added A2.5: Infrared Thermometer - For measuring the temperature of molds, end plates, and equipment, shall meet the requirements of M 339M/M 339 with a D:s ratio of 6:1.

## **AASHTO - Test Procedures**

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

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

**T 19 Bulk Density ("Unit Weight") and Voids in Aggregate** – The following subsections have been modified:

- The cover sheet has been updated to reflect the new 2022 version of the procedure.
- Under Section 2, Referenced Documents, added M 339 Thermometer reference procedure (Thermometers Used in the Testing of Construction Materials) to the list.
- Added the following ASTM Standards, section 2.2:
  - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
  - E230/E2230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized thermocouples
  - E2877, Standard Guide for Digital Contact Thermometers
- Added a new reference section "International Electrotechnical Commission Standard:
  - IEC 60584-1: -2013, Thermocouples – Part 1: EMF Specifications and Tolerances
- Under Section 5, Apparatus, added 5.5.3, Thermometer shall meet the requirements of M339.
- Added a new note 4: "Thermometer types suitable for use include ASTM E230 thermocouple thermometer, Type – T, Special Class; or IEC 60584 thermocouple thermometer, type T, Class1".
- Under section 7, Sample, added the following oven criteria: Oven(s) for heating and drying shall be capable of operation at the temperatures required, between 100 to 120°C (212 to 248°F), within ±5°C (±9°F), as corrected, if necessary, by standardization. More than one oven may be used, provided each is used within its proper operating temperature range. The thermometer for measuring the temperature shall meet the requirements of M 339M/M 339 with a temperature range of at least 90 to 130°C (194 to 266°F), and an accuracy of ±1.25°C (±2.25°F) (see Note 5).

- Added a new Note 5: “Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E2877 digital metal stem thermometer; ASTM E230/E230M thermocouple thermometer, Type J or K, Special Class, Type T any Class; IEC 60584 thermocouple thermometer, Type J or K, Class 1, Type T any Class; or dial gauge metal stem (bi-metal) thermometer”.
- Renumbered existing notes based on the new additions.

**T 22 (Compressive Strength of Cylindrical Concrete Specimens)** – The following subsections have been modified:

- The cover sheet has been updated to reflect the new 2022 version of the procedure.
- Under Section 2, Referenced Documents added the following references:
  - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
  - E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
  - E2877, Standard Guide for Digital Contact Thermometers
- Added a new Reference section 2.3 - International Electrotechnical Commission Standard:
  - IEC 60584-1:2013 Thermocouples - Part 1: EMF Specifications and Tolerances
- A new terminology section has been added to the procedure as follows:

*Definitions of Terms Specific to This Standard.*

- *bearing block*—steel piece to distribute the load from the testing machine to the specimen.
- *lower bearing block*—steel piece placed under the specimen to distribute the load from the testing machine to the specimen.
- *Discussion*—The lower bearing block provides a readily machinable surface for maintaining the specified bearing surface. The lower bearing block may also be used to adapt the testing machine to various specimen heights. The lower bearing block is also referred to as *bottom block*, *plain block*, and *false platen*.
- *platen*—primary bearing surface of the testing machine.
- *Discussion*—The platen is also referred to as the testing machine *table*.
- *spacer*—steel piece used to elevate the lower bearing block to accommodate test specimens of various heights.
- *Discussion*—Spacers are not required to have hardened bearing faces because spacers are not in direct contact with the specimen or the retainers of unbonded caps.
- *upper bearing block*—steel assembly suspended above the specimen that is capable of tilting to bear uniformly on the top of the specimen.
- *Discussion*—The upper bearing block is also referred to as the *spherically seated block* and the *suspended block*.
- Under Section 6.1.1.1 the testing machine verification shall be “within 13 months of the last calibration”.
- Under Table 1, a new column has been added for the Max Dimensions of square Bearing Face in mm(in.).

- Under Section 7.4 added thermometer requirements according to the new temperature measuring specification M339. Also, added a new Note 11 in this section as follows:  
“Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E2877 digital metal stem thermometer; ASTM E230/E230M thermocouple thermometer, Type T, Special: or IEC 60584 thermocouple thermometer, Type T, Class 1”.
- *Added a new section 8.3.1 Stating “Unless otherwise specified by the specifier of tests, for this method, the test age shall start at the beginning of casting specimens”. This has been a question in the past regarding the timelines associated in Table 2 and the permissible tolerance allowances.*
- Under Section 9.1, Calculation of compressive strength, added a statement indicating to use at least five digits for the value of  $\pi$ , that is, use 3.1416 or a more precise value.
- Under Section 10, Reporting, added the following subsections:
  - 10.1.1 Specimen identification
  - 10.1.2 Serial number of delivery ticket, if available.

**T 27/11 (Sieve Analysis of Fine and Coarse Aggregates)** – Under the Scope, updated the AASHTO reference year to 2022. The following bullets identify additions, deletions, or modifications to the procedure:

- Under all three procedure methods (A, B and C) the drying time to constant mass for initial mass and washed samples has been changed to  $(110 \pm 5^\circ\text{C})$  ( $230 \pm 9^\circ\text{F}$ ) throughout the procedure.
- Throughout all three procedure methods changed the wording for “Check Sum” from “to within” to “is not more than 0.3 percent”. This is a comparison of the mass of material put on the sieves and the mass of material that is recovered. This language now match’s AASHTO T 27.
- Under Method A, the existing step 1 is now broken into two steps and the numbering has been adjusted. Step 1 dry the sample and cool. Step 2 determine the mass.

Minor formatting and editorial items were also addressed.

❖ **T 27/11 (Yellow Sheet)** – The following bullets identify additions, deletions, or modifications to the procedure:

- Added the following bullet reference: Under procedures (A, B and C) Delete the  $110 \pm 5^\circ\text{C}$  ( $230 \pm 9^\circ\text{F}$ ) temperature reference for drying. Now the procedure will send the user to T 255/265 for drying of the material.

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

- Under the Apparatus section, first bullet, added to the balance or scale requirements that the device must conform to AASHTO M 231.
- Under the Apparatus section, added wetting agent and defined as “any dispersing agent, such as dishwashing detergent, that will promote separation of the fine materials”.
- Under Procedure, step 4 and 9 removed detergent, dispersing agent and solution with wetting agent, based on new apparatus entry.

- Under Procedure, step 15 added the “check sum” language from T 27, which reads “is not more than 0.2 percent”. This change was made in several areas of the procedure.

Minor formatting and editorial items were also addressed.

**T 84 (Specific Gravity and Absorption of Fine Aggregate)** – Under the Scope, updated the AASHTO reference year to 2022. The following bullets identify additions, deletions, or modifications to the procedure:

- Under Section 2.1, Referenced Documents, added M 339 Thermometer reference procedure (Thermometers Used in the Testing of Construction Materials) to the list.
- Under Section 2.2 (ASTM Standards), added the following references:
  - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
  - E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
  - E2877, Standard Guide for Digital Contact Thermometers
- Added a new Reference section 2.3 - International Electrotechnical Commission Standard:
  - IEC 60584-1:2013 Thermocouples - Part 1: EMF Specifications and Tolerances.
- Added a new Reference section 2.4 – Other Document:
  - Kandhal, Prithvi S. and Dah-Yinn Lee. “An Evaluation of the Bulk Specific Gravity for Granular Materials” in *Highway Research Record No. 307: Synthetic Aggregates and Granular Materials*, 1970, p. 44. Available from <https://onlinepubs.trb.org/Onlinepubs/hrr/1970/307/307.pdf>
- Under Apparatus, section 5.5, added an oven requirement and a new note reference that meets the following conditions:
- **Oven**—An oven of appropriate size capable of maintaining a uniform temperature of 110 ± 5°C (230 ± 9°F). Oven(s) for heating and drying shall be capable of operation at the temperatures required, between 100 to 120°C (212 to 248°F), within ±5°C (±9°F), as corrected, if necessary, by standardization. More than one oven may be used, provided each is used within its proper operating temperature range. The thermometer for measuring the temperature, regardless of drying apparatus used, shall meet the requirements of M 339M/M 339 with a temperature range of at least 90 to 130°C (194 to 266°F), and an accuracy of ±1.25°C (±2.25°F) (see Note 1).
- **Note 2**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E2877 digital metal stem thermometer; ASTM E230/E230M thermocouple thermometer, Type J or K, Special Class, Type T any Class; IEC 60584 thermocouple thermometer, Type J or K, Class 1, Type T any Class; or dial gauge metal stem (bi-metal) thermometer.
- Under Apparatus, section 5.6, added a thermometer requirement and a new note reference that meets the following conditions:

**Thermometer**—A thermometer for measuring the temperature of water and materials in solution shall meet the requirements of M 339M/M 339 with a temperature range of at least 16 to 27°C (60 to 80°F), with an accuracy of ±0.5°C (±0.9°F) (see Note 2).

- **Note 3**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E2877 digital metal stem thermometer; ASTM E230/E230M thermocouple thermometer, Type T Special; or IEC 60584 thermocouple thermometer, Type T, Class 1.
- Existing note numbering has been adjusted for the new entries.

Minor formatting and editorial items were also addressed.

**T 85 (Specific Gravity and Absorption of Coarse Aggregate)** – Under the Scope, updated the AASHTO reference year to 2022.

Minor formatting, spelling and editorial items were also addressed.

**T 99/180 (Moisture-Density Relations of Soils)** – Under the Scope, updated the AASHTO reference year to 2022. The following bullets identify additions, deletions, or modifications to the procedure:

- Under the Apparatus section, Table 1 and 2, added the rammer drop tolerance. This was inadvertently left out during publication.
- Under Procedure, step 7, removed the “or better” phrase from the end of the sentence.
- Under Procedure, step 11, added the variable ( $w$ ) after “moisture content” in the sentence. This variable is used in the calculation to convert “wet density” to “dry density”.
- In Annex A, under the Density Correction Equation, the rho variable and the percentage of the fines were emphasized using font configurations of Italic for the rho variable ( $\rho_d$ ) and bold for the percentage of the fines ( $P_f$ ). Technicians often confuse the two variables because they look similar.

Minor formatting and editorial items were also addressed.

**T 119 (Slump of Hydraulic Cement Concrete)** – minor editorials as follows:

- Under Procedure, step 3, removed the redundant phrase “in order” from the sentence.
- Under Procedure, step 4, removed the redundant phrase “by depth” from the end of the sentence.
- Under Procedure, step 6, removed the redundant phrase “by depth” from the end of the sentence.
- Under Procedure, step 9, 4<sup>th</sup> sentence, added the word “amount” after excess.
- Under Procedure, a new step 13 has been created and labeled “Immediately measure the slump:”. 3 new steps have been created a thru c, which states invert the cone, lay tamping rod across mold and measure distance to the displaced center. The existing steps 14, 15 and 16 have been removed, but the last step “discard the tested sample” has a new step 14 reference.

Minor formatting and editorial items were also addressed.



## **T 152 (Air Content of Freshly Mixed Concrete by the Pressure Method) –**

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

- Under the Apparatus, a new figure for the Type B meter has been added, which depicts all the component parts of the gauge.
- Under Procedure, Strike-Off and Air Content section, Modified step 5 and added the following sentence: “Jar the meter gently until all air is expelled from this same petcock”.
- Deleted the existing step 6 language and replaced with the following: “Verify that water is present in both petcocks”.
- Under Annex A, step 5, removed the last sentence, “Rock the meter slightly until all air is expelled through the petcock”.

Minor formatting and editorial items were also addressed.

## **T 166 (Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens) –** Under Scope, updated the AASHTO reference year to 2022.

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

- Under Apparatus, 5<sup>th</sup> bullet oven, deleted the existing temperature requirements and added the following:  $52 \pm 3^{\circ}\text{C}$  ( $126 \pm 5^{\circ}\text{F}$ ).
- Under Apparatus, 7<sup>th</sup> bullet thermometer, deleted the existing temperature range and added the following: 15 to  $45^{\circ}\text{C}$  (59 to  $113^{\circ}\text{F}$ ).

### Procedure – Method B (Volumeter)

- Under Apparatus, 2<sup>nd</sup> bullet water bath, added the following: “For immersing the specimen in water, capable of maintaining a uniform temperature at  $25 \pm 1^{\circ}\text{C}$  ( $77 \pm 2^{\circ}\text{F}$ )”.
- Under Apparatus, bullet 3 Thermometer, removed the existing range language and replaced with the following: “15 to  $45^{\circ}\text{C}$  (59 to  $113^{\circ}\text{F}$ )”.
- Under Apparatus, 5<sup>th</sup> bullet oven, removed the existing temperature range and replaced with the following: “ $52 \pm 3^{\circ}\text{C}$  ( $126 \pm 5^{\circ}\text{F}$ )”.
- Under Procedure, step 3, added the following water bath temperature requirement: “ $25 \pm 1^{\circ}\text{C}$  ( $77 \pm 2^{\circ}\text{F}$ )”.
- Under Procedure, step 4, added the following phrase at the beginning of the first sentence “At the end of the ten-minute period....”).

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

- Added an Apparatus section for the oven as follows: “Oven: Capable of maintaining a temperature of  $110 \pm 5^{\circ}\text{C}$  ( $230 \pm 9^{\circ}\text{F}$ ) for drying the specimens to a constant mass.”.
- Under Procedure, step 4 deleted the existing language and replaced with the following: “Place in an oven at  $110 \pm 5^{\circ}\text{C}$  ( $230 \pm 9^{\circ}\text{F}$ )”.

Minor formatting and editorial items were also addressed.

❖ **T 166 (Yellow Sheet)** – The following bullets identify additions, deletions, or modifications to the procedure:

- Added the following bullet reference: Under Procedure – Method C (Rapid Test for Method A or B), delete step 4 and replace with the following: Place in the oven at a minimum of 105°C (221°F). Do not exceed the Job Mix Formula mixing temperature.

AASHTO removed the JMF language for drying under Method C section of the procedure, which would have caused a significant increase in drying time for a procedural step that requires the specimen to be broken apart and separated. If the temperature is at or below the JMF mixing temperature range the material shouldn't be impacted.

**T 176 (Plastic Fines in Graded Aggregates and Soils by the use of the Sand Equivalent Test)** – Under Scope, updated the AASHTO reference year to 2022.

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

- Under Apparatus section, added the title “Manual shaker” in front of the manually operated shaker language.
- Under Apparatus section, added the No. 4 sieve to the list of required equipment. This has been inadvertently left out.

Minor formatting and editorial items were also addressed.

❖ **T 176 (Yellow Sheet)** – the following bullets identify additions, deletions, or modifications to the yellow sheet entries:

- Added a following bullet reference: Under Materials, 2<sup>nd</sup> bullet, the use of potable water for the working solution is allowed, but the Agency may require distilled or demineralized water, if test results are in question or tap water is found detrimental to the test.

The procedure requires the use of demineralized water, so this addition will allow the use of potable water, if test results aren't impacted.

**T 196 (Air Content of Freshly Mixed Concrete by the Volumetric Method)** – The cover sheet has been updated to reflect the new 2022 version of the procedure.

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

- Under Section 2.1, AASHTO Standards, added M 339 Thermometer reference procedure (Thermometers Used in the Testing of Construction Materials) to the list.
- Under Section 2.2 (ASTM Standards), added the following references:
  - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
  - E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
  - E2877, Standard Guide for Digital Contact Thermometers
- Under Calibration, section 5.3 added a temperature tolerance to the water when determining the accuracy of the graduations on the neck of the top section. A temperature tolerance of  $\pm 2.0^{\circ}$  ( $\pm 3.6^{\circ}\text{F}$ ) is required.

- Also added the following thermometer requirements and note reference: The thermometer for measuring the temperature of the water shall meet the requirements of M 339M/M 339 with a temperature range of at least 19 to 23.5°C [66.4 to 74.6°F] and an accuracy of  $\pm 0.5^\circ\text{C}$  [ $\pm 0.9^\circ\text{F}$ ] (see Note 3).

**Note 4**—Thermometer types suitable for use include: ASTM E1 mercury thermometers that are submerged to their required immersion depths; ASTM E2877 digital metal stem thermometer; or ASTM E230/E230M thermocouple thermometer, Type T Special.

- All subsequent notes have been renumbered, due to the addition of note 3.

Minor formatting and editorial items were also addressed.

## **T 209 (Theoretical Maximum Specific Gravity ( $G_{mm}$ ) and Density of Asphalt Mixtures) -**

Under Scope, updated the AASHTO reference year to 2022.

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

- Under the Apparatus section, 5<sup>th</sup> bullet “vacuum pump”, changed the residual pressure requirement from 4.0 kPa to 3.4.
- Under the Apparatus section, 9<sup>th</sup> bullet “Thermometers”, removed the 0.5°C (1°F) and replaced with the following: “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).”.
- Under Test Sample Preparation, step 2, changed the allowance of two increment samples to have a specific gravity difference greater than 0.014 to 0.013.
- Under Test Sample Preparation, added a new step 3 as follows: “Plant-produced samples may be short-term conditioned according to AASHTO R 30 as specified by the agency.”.
- A new note 1 was added as follows: 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.
- Under Procedure General, step 9 deleted the existing  $15 \pm 2$  minutes and replaced with  $15 \pm 1$ .
- Under Annex A, Standardization of Bowl and Pycnometer or Volumetric Flask, the Bowl Check, step 7 has been added and reads as follows: “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.””.
- Under Annex A, Bowl check, also added a step 8 that reads as follows: “If the moving range exceeds 0.3 g at any time, take corrective action and perform the standardization procedure again.”.

Minor formatting and editorial items were also addressed.

❖ **T 217 (Yellow Sheet)** – the following bullets identify additions, deletions, or modifications to the yellow sheet entries:

- The second bullet, Moisture Determination, the addendum step reference was corrected. During the 2018 procedure update, step references were changed, but the yellow sheet wasn't updated to reflect the changes.

**T 255/265 (Total Evaporable Moisture Content of Aggregate by Drying and Laboratory Determination of Moisture Content of Soils)** – Under Scope, updated the AASHTO reference year to 2022.

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

- Under Apparatus, Heat source, added “thermostatically” in front of controlled and added the oven must be capable of maintaining  $110 \pm 5^{\circ}\text{C}$  ( $230 \pm 9^{\circ}\text{F}$ ).
- Under Apparatus, Heat source, uncontrolled, added the following statement: “for use when allowed by the agency, will not alter the material being dried, and close control of the temperature is not required.”.
- Under Sample Preparation, added a 2<sup>nd</sup> sentence indicating, if necessary, reduce the sample to moisture content sample size according to the FOP for AASHTO R 76.
- Table 1 changed the Nominal Maximum Size and corresponding Minimum Sample Mass from increasing to decreasing order.
- Table 2 changed the Maximum Particle Size and corresponding Minimum Sample Mass from increasing to decreasing order.
- Under Procedure, moved step 3 above the a. and b. references under step 2. Now step 2 reads “Place the wet sample in the container.” and step 3 has the a. and b. oven drying references.

Minor formatting and editorial items were also addressed.

**T272 (One-Point Method for Determining Maximum Dry Density and Optimum Moisture)** – Minor editorials as follows:

- Under Procedure, step 7, removed the term “or better” at the end of the sentence.
- Under Procedure, step 9, added the Rho variable ( $\rho_w$ ) after the term “wet density”.
- Under Procedure, step 11, added the variable ( $w$ ) after moisture content to line up with the calculations section.
- Under calculations section, added the Rho variable and defined as “Wet Density”.

Minor formatting and editorial items were also addressed.

**T 272 (Yellow Sheet)** – the following bullets identify additions, deletions, or modifications to the yellow sheet entries:

- Last Bullet, Changed page reference from “15-7” to “15-5”.

**T 283 (Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage)** – The cover sheet has been updated to reflect the new 2022 version of the procedure. There were significant changes to the procedure, due to the addition of new thermometer requirements (AASHTO M 339).

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

- Under Section 2.1, AASHTO Standards, added M 339 Thermometer reference procedure (Thermometers Used in the Testing of Construction Materials) to the list.
- Under Section 2.1, AASHTO Standards, changed the test procedure title name for R 30 to Laboratory Conditioning of Asphalt Mixtures.
- *Under Section 2.2 (ASTM Standards), added the following references:*
  - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
  - E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
  - E879, Standard Specification for Thermistor Sensors for General Purpose and Laboratory Temperature Measurements
  - E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers
  - E2877, Standard Guide for Digital Contact Thermometers
- *Under Section 2.3 (International Electrotechnical Commission Standards), added the following references:*
  - IEC 60584-1: 2013 Thermocouples - Part 1: EMF Specifications and Tolerances
  - IEC 60751: 2008 Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors

#### Apparatus Section

- Section 5.4 removed temperature reference and stated water baths shall be capable of maintaining a temperature as required.
- Added a new Section 5.4.1 and note reference as follows: Water bath of sufficient size, capable of maintaining a uniform temperature of  $60 \pm 1^{\circ}\text{C}$  ( $140 \pm 2^{\circ}\text{F}$ ). The thermometer for measuring the temperature of the water bath shall meet the requirements of M 339M/M 339 with a temperature range of at least 55 to  $65^{\circ}\text{C}$  ( $131$  to  $149^{\circ}\text{F}$ ) with an accuracy of  $\pm 0.25^{\circ}\text{C}$  ( $\pm 0.45^{\circ}\text{F}$ ) (see Note 1).

**Note 5**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E879 thermistor thermometer; ASTM E1137/E1137M Pt-100 RTD platinum resistance thermometer, Class A; or IEC 60751: 2008 Pt-100 RTD platinum resistance thermometer, Class AA.

- Added a new Section 5.4.2 and note reference as follows: Water bath of sufficient size, capable of maintaining a uniform temperature of  $25 \pm 0.5^{\circ}\text{C}$  ( $77 \pm 0.9^{\circ}\text{F}$ ).

The thermometer for measuring the temperature of the water bath shall meet the requirements of M 339M/M 339 with a temperature range of at least 20 to  $30^{\circ}\text{C}$  ( $68$  to  $86^{\circ}\text{F}$ ) with an accuracy of  $\pm 0.13^{\circ}\text{C}$  ( $\pm 0.22^{\circ}\text{F}$ ) (see Note 2).

**Note 6**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E879 thermistor thermometer; ASTM E1137/E1137M Pt-100 RTD platinum resistance thermometer, Special order; or IEC 60751: 2008 Pt-100 RTD platinum resistance thermometer, Special order.

- Modified section 5.5 and added the following requirements and note reference: The thermometer for measuring the temperature of the freezer shall meet the requirements of M 339M/M 339 with a temperature range of at least  $-25$  to  $-10^{\circ}\text{C}$  ( $-13$  to  $14^{\circ}\text{F}$ ) with an accuracy of  $\pm 0.75^{\circ}\text{C}$  ( $\pm 1.35^{\circ}\text{F}$ ) (see Note 3).

**Note 7**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E2877 digital metal stem thermometer; ASTM E230/E230M thermocouple thermometer, Type T, Special Class; or IEC 60584 thermocouple thermometer, Type T, Class 1.

- Modified section 5.10 and added the following requirements and note reference: More than one oven may be used, provided each is used within its proper operating temperature range. Thermometer for measuring the temperature of materials shall meet the requirements of M 339M/M 339 with a temperature range of at least 25 to 185°C (77 to 365°F), and an accuracy of  $\pm 0.75^\circ\text{C}$  (see Note 4).

**Note 8**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E230/E230M thermocouple thermometer, Type T, Special Class; or IEC 60584 thermocouple thermometer, Type T, Class 1.

- Subsequent note references have been changed, due to the new notes added in the apparatus section.

Formatting and editorial items were also addressed.

### **T 308 (Determining the Asphalt Binder Content of Asphalt Mixtures by the Ignition Method) - Under Scope, updated the AASHTO reference year to 2022.**

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

- Under the Apparatus section, Ignition Furnace, 2<sup>nd</sup> sentence added the following: 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  $\pm 5^\circ\text{C}$  ( $\pm 9^\circ\text{F}$ ). The existing temperature reference has been deleted. Also, removed the existing Note 2 reference and placed the language into the Ignition Furnace section.

#### Procedure – Method A (Internal Balance)

- Under step 5, removed the first sentence and created a new step 6 with the same language. Now step 5 states to determine and record the sample and assembly and step 6 states to calculate the initial mass of sample, subtract mass of the assembly from the sample and sample basket and record to nearest 0.1g.
- All subsequent steps have been renumbered, due to the new step addition.
- A new note 3 was added after step 10 and reads as follows: 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.
- All subsequent notes have been renumbered, due to the new note addition.
- Modified step 14 to read as follows: Determine and record the mass of the sample and sample basket assembly after ignition to the nearest 0.1 g.
- Deleted the existing step 13 language, which is the new step 15 and added the following: 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  $M_r$ .

## Procedure – Method B (External Balance)

- Took the existing step 5 and create two steps (step 5 and step 6). Step 5 now reads “Determine and record the mass of the sample and sample basket assembly at room temperature to the nearest 0.1 g.
- Step 6 now reads as follows: 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 ( $M_i$ ).
- Modified the existing step 9, which is now step 11 to reads as follows: 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.
- Modified the existing step 13, which is now step 16 to reads as follows: 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.
- Modified the existing step 15, which is now step 19 to reads as follows: 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  $M_f$ .
- Under the reporting section, added clarification for reporting of binder content. It now states to the nearest 0.01 percent or per agency.

Formatting and editorial items were also addressed.

**T 309 (Temperature of Freshly Mixed Portland Cement Concrete)** - Under Scope, updated the AASHTO reference year to 2022.

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

- Under the Apparatus section, removed the existing language and replaced with the following: Thermometer: Capable of measuring the temperature of the concrete throughout the temperature range likely to be encountered, at least  $-18$  to  $50^{\circ}\text{C}$  ( $0$  to  $120^{\circ}\text{F}$ ), and readable to  $\pm 0.5^{\circ}\text{C}$  ( $\pm 1^{\circ}\text{F}$ ) or smaller.  
Also, added a new Note 1: Thermometer types suitable for use include ASTM E1 mercury thermometer or ASTM E2251 Low Hazard Precision Liquid-in-glass thermometer; ASTM E2877 digital metal stem thermometer; or thermocouple thermometer ASTM E230, Type T Special or IEC 60584 Type T, Class 1.
- Under the Apparatus section, removed the existing third bullet, which discussed “Reference Temperature measuring device”.
- The existing title “Calibration of Temperature Measuring Device” has been changed to “Standardization of Thermometer”.
- All “temperature measuring device” have been changed to “thermometer” throughout the test procedure. Also, changed “Calibration” to “Standardization”.

Formatting and editorial items were also addressed.

**T 310 (In-Place Density and Moisture Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth))** – Under Scope, updated the AASHTO reference year to 2022.

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

- Under Procedure, step 1, added an extra step and new note 2 reference as follows: d. Correct for trench wall effect according to manufacturer's correction procedures if the test site is closer than 600mm (24 in.) to vertical projection. See Note 2.

Note 2: To perform moisture and density tests in a trench or against a large solid object, it is necessary to perform a trench offset correction to adjust the gauge, or it may read a falsely high moisture content. Moisture present in the walls can thermalize neutrons which return to the gauge and are read as moisture by the detector in the gauge.

- Under Percent Compaction, changed the WSDOT's TM 606 reference to WAQTC TM 15.

Minor formatting and editorial items were also addressed.

**T 324 (Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures)** – The cover sheet has been updated to reflect the new 2022 version of the procedure. There were significant changes to the procedure, due to the addition of new thermometer requirements (AASHTO M 339).

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

- Under Section 2.1, AASHTO Standards, added M 339 Thermometer reference procedure (Thermometers Used in the Testing of Construction Materials) to the list.
- Under Section 2.1, AASHTO Standards, changed the test procedure title name for R 30 to Laboratory Conditioning of Asphalt Mixtures.
- *Under Section 2.2 (ASTM Standards), added the following references:*
  - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
  - E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
  - E879, Standard Specification for Thermistor Sensors for General Purpose and Laboratory Temperature Measurements
  - E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers
  - E2877, Standard Guide for Digital Contact Thermometers
- *Under Section 2.3 (International Electrotechnical Commission Standards), added the following references:*
  - IEC 60584-1: 2013 Thermocouples - Part 1: EMF Specifications and Tolerances
  - IEC 60751: 2008 Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors
- Under Apparatus, section 5.2, Temperature Control System, added the following thermometer requirements and a new Note 2 reference:

The thermometer for measuring the temperature of the water bath shall meet the requirements of M 339M/M 339 with a temperature range of at least 20 to 75°C (68 to 167°F), and an accuracy of  $\pm 0.25^{\circ}\text{C}$  ( $\pm 0.45^{\circ}\text{F}$ ) (see Note 2).



**Note 9**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E879 thermistor thermometer; ASTM E1137/E1137M Pt-100 RTD platinum resistance thermometer, Class A; or IEC 60751: 2008 Pt-100 RTD platinum resistance thermometer, Class AA.

- Under Apparatus, section 5.8, Ovens, added the following oven requirements and a new Note 4 reference:

For heating aggregate and asphalt binders to their appropriate mixing temperature. Oven(s) for heating shall be properly standardized and capable of operation at the temperatures required, between 100 to 175°C (212 to 347°F), within ±5°C (±9°F), as corrected, if necessary, by calibration. More than one oven may be used, provided each is used within its proper operating temperature range. The thermometer for measuring the temperature of materials shall meet the requirements of M 339M/M 339 with a temperature range of at least 140 to 175°C (284 to 347°F), and an accuracy of ± 1.25°C (±2.25°F) (see Note 4).

**Note 10**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E230/E230M thermocouple thermometer, Type T, Special Class; or IEC 60584 thermocouple thermometer, Type T, Class 1.

- All note references throughout the procedure have been renumbered, due to the new note references under the apparatus section.

Formatting and editorial items were also addressed.

**T 329 (Moisture Content of Asphalt Mixtures by Oven Method)** – Under Scope, updated the AASHTO reference year to 2022.

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

- Under Apparatus, 4<sup>th</sup> bullet Thermometer, removed the existing thermometer temperature range and replaced with the following: 50 to 200°C (122 to 392°F) and readable to the nearest 2°C (4°F).

Minor formatting and editorial items were also addressed.

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

- Under Terminology section a new term was introduced. Fractured criteria: Determined by the agency to define a fractured particle.

Minor formatting and editorial items were also addressed.

**R 76 (Reducing Samples of Aggregate to Testing Size)** - Under Scope, updated the AASHTO reference year to 2022.

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

- Under Method B, Quartering, third bullet, added the term “Tarp” and provided a geometric configuration “square” to the definition.
- All references to “canvas, plastic sheet or sheet” have been changed to “Tarp”.

Minor formatting and editorial items were also addressed.

**R 90 (Sampling of Aggregate Products)** – The following bullets identify additions, deletions, or modifications to the procedure:

- For all steps in the procedure that required combining multiple increments the following phrase was added: “and mix thoroughly” after the term increments.

Minor formatting and editorial items were also addressed.

**R 100 (Method of Making and Curing Concrete Test Specimens in the Field)** – Under Scope, updated the AASHTO reference year to 2022.

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

- Under the Apparatus section, Beam Molds, corrected the 4 in. x 4 in. beam mold nominal maximum aggregate size from 38 mm (1.5 in.) to 25 mm (1.0 in.).
- Under the Apparatus section, Vibrator, removed the following reference from the end of the sentence: “...for use with low slump concrete”.
- Under the Apparatus section, Thermometer, added the following statement to the end of the sentence: “...meeting the requirements for FOP AASHTO T 309.”.
- Under Final Curing, 3<sup>rd</sup> bullet, added the following ambient temperature requirement during the final 3 hours of curing: “...and ambient temperature is between 20 to 30°C (68 to 80°F).”.

Minor formatting and editorial items were also addressed.

❖ **R 100 (Yellow Sheet)** – the following bullets identify additions, deletions, or modifications to the yellow sheet entries:

- The second bullet, first sentence, was modified to indicate the high/low temperature-recording device is required to monitor the water medium and not the air remaining in the cooler.

## **WAQTC Test Procedures**

### **No Changes**

### **Section 2 QA Program**

#### **Section I, Overview –**

- Under the Verification section, page 2, added the following requirement: “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”.
- Under Quality Assurance Program Components, Third-Party Resolution, modified the first sentence to read as follows: “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.

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

**Section III, Lab Certification Program –** Under Section III “Laboratory Certification Program”, Third-Party Laboratories, added the following requirement in the 2<sup>nd</sup> paragraph, 2<sup>nd</sup> sentence: “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.”.

The last sentence “The ODOT-CML shall certify third-party resolution laboratories, other than the ODOT-CML” has been deleted.

During ODOT’s last FHWA review, Federal Highway indicated a certification criterion was required for Third-Party Laboratories.

## **Section IV, Technician Certification Program –**

Modified the certification duration table to show renewal of Cat-II and CCT is now good for a 5-year period.

Under Section IV “Technician Certification Program”, Complaint Process for Abuse, modified step 2 to indicate the technician and the individual filing the complaint “may” be invited to attend the meeting, instead of “will”.

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

### **Section VI, Product Specific QC/QA Testing Plan**

#### **Table 1 IA parameters – No Changes**

**Under the Concrete section, Mixture -** added the following sentence under the Independent Assurance category: “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.”

**Appendix A, ODOT Approved Aggregate Product Program –** The third paragraph has been removed stating “The State QAE may allow minimum testing frequency to be altered after the supplier submits a written proposal to the regional SQAC. The written proposal shall detail the proposed sampling and testing frequencies and shall describe how uniformity of production will be assured.”

The program’s intent is QC will follow the acceptance guide frequency requirements under section 4D and only QA frequency of testing may be altered.

Minor formatting and editorial items were also addressed.

#### **Appendix B, Contractor Quality Control Plan – No Changes**

#### **Appendix C, Troubleshooting Guide – Only minor editorial/grammatical changes.**

## **Section 3 Report Forms and Examples**

**Forms Index and Introduction – No Changes**

**Forms Description of Worksheet and Calculation Explanations – No Changes**

The following forms have been modified:

- **734-1793B (Nuclear Compaction Test Report for Base Materials)** – In the header section removed the field labeled “Control Strip No.”. Control Strip isn’t applicable to base aggregate placement.
- **734-1793S (Nuclear Compaction Test Report)** – Under the AASHTO T 99 area of the form extended the statement “Unscreened Combined In-Place Moisture “to cover the “Wet and Dry” areas under Speedy Moisture. If a companion moisture is utilized than it won’t be screened and the speedy moisture procedure can’t, be utilized.
- **734-3573 (Concrete Yield and W/C Ratio Worksheet)** – Added a field for “Time of Cast”. The new T 22 test procedure for “Compressive Strength of Cylinders” requires the cure time to start based on time of cylinder cast, instead of initial set.

**Section 4A Product Compliance – No Changes**

**Section 4(B) Small Quantity Guidelines** – Removed sections 00345, 00346, 00395 and 00642 from the table. These section references are no longer applicable and have been removed from the Standard Specifications.

**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** - *Note, throughout the acceptance guide most of the “Start of Production” references have been removed from the “Aggregate Production” category. Start of production testing for concrete and chip seal aggregates will remain in the document, e.g., Dry Rodded Unit Weight and Specific Gravity testing.*

*“Start of Production” references have been removed because initial crusher setup falls under the responsibility of the contractor/supplier and isn’t applicable to statistical evaluation according to section 00165.*

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

- *The revision date has been updated to 2022 for the entire guide, due to multiple modifications in the document.*
- **Section 00405**, Pipe Zone Material, added “Flexible and Rigid Pipe” under the “Establishing Maximum Density” category. This was added to show both pipe configurations require a maximum density curve and density testing.

- **Section 00540**, Structural Concrete, added a reference for Lightweight Concrete as follows: “AASHTO T 196 required for lightweight concrete”.
- **Section 00559, Structural Concrete Overlays**, Portland Cement Concrete, added a reference for Lightweight Concrete as follows: “AASHTO T 196 required for lightweight concrete”.
- **Section 00745**, Asphalt Concrete Pavement – Statistical Acceptance, Smoothness, removed TM 770 (Determining Profile Index). TM 770 is no longer used under this specification.

**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

### 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-". FOP's 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/ft<sup>3</sup> (1000) kg/m<sup>3</sup>). 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. FOP's 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/ft<sup>3</sup> (1000) kg/m<sup>3</sup> 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**

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

**WAQTC** - Western Alliance for Quality Transportation Construction