

MATERIALS TESTING MANUAL TABLE OF CONTENTS

[Introduction](#) (November 2, 2016)

[Glossary of Terms](#) (July 15, 2005)

The following methods shall be performed in accordance with the respective designation:

SERIES 100 SAMPLING (December 4, 2015)

ARIZ 103b	Sampling Bituminous Materials
ARIZ 104e	Sampling Bituminous Mixtures
ARIZ 105f	Sampling Soils and Aggregates
ARIZ 108	Sampling Hydrated Lime and Lime Products
ARIZ 109	Sampling Metallic Materials
ARIZ 110	Sampling Miscellaneous Materials

AASHTO procedures commonly used in this series are shown below:

R 60	Sampling Freshly Mixed Concrete
T 127	Sampling and Amount of Testing of Hydraulic Cement
T 248	Reducing Samples of Aggregate to Testing Size

SERIES 200 SOILS AND AGGREGATES (November 2, 2016)

ARIZ 201d	Sieving of Coarse and Fine Graded Soils and Aggregates
ARIZ 205c	Composite Grading
ARIZ 210c	Specific Gravity and Absorption of Coarse Aggregate
ARIZ 211e	Specific Gravity and Absorption of Fine Aggregate
ARIZ 212f	Percentage of Fractured Coarse Aggregate Particles
ARIZ 220	Determination of Cement Content Required for Cement Treated Mixtures
ARIZ 221	Moisture-Density Relations of Cement Treated Mixtures
ARIZ 222b	Rock Correction Procedure for Maximum Density Determination of Cement Treated Mixtures
ARIZ 223	Field Density of Cement Treated Mixtures by Sand Cone Method or by Rubber Balloon Method
ARIZ 225b	Maximum Dry Density and Optimum Moisture of Soils by Proctor Method A
ARIZ 226	Maximum Density and Optimum Moisture of Soils – Methods C and D
ARIZ 227d	Rock Correction Procedure for Maximum Dry Density and Optimum Moisture Content Determination

Materials Testing Manual

Table of Contents

March 31, 2017

Page 2

ARIZ 229a	Calibration of Standard Sand and Sand Cone
ARIZ 230a	Field Density by the Sand Cone Method
ARIZ 232b	Moisture-Density Relationship Using Typical Moisture-Density Curves (One Point Proctor) Method A
ARIZ 233d	Flakiness Index of Coarse Aggregate
ARIZ 235	Density and Moisture Content of Soil and Soil-Aggregate Mixtures by the Nuclear Method
ARIZ 236d	Determining pH and Minimum Resistivity of Soils and Aggregates
ARIZ 237b	Determining pH and Soluble Salts of Soils
ARIZ 238a	Percent Carbonates in Aggregate
ARIZ 240a	Sieve Analysis and Separation of Salvaged AC Pavement Particles for Recycled Asphaltic Concrete
ARIZ 241a	Compressive Strength of Molded Cement Treated Base or Soil-Cement Specimens
ARIZ 242a	Sand Equivalent Test for Mineral Aggregate for Asphaltic Concrete Friction Course
ARIZ 244	Artificial Grading of Mineral Aggregate
ARIZ 245a	Maximum Dry Density and Optimum Moisture of Soils by Proctor Alternate Method D
ARIZ 246b	Moisture-Density Relationship using Typical Moisture-Density Curves (One Point Proctor) Alternate Method D
ARIZ 247b	Particle Shape and Texture of Fine Aggregate Using Uncompacted Void Content
ARIZ 248	Alternate Procedures for Sieving of Coarse and Fine Graded Soils and Aggregates
ARIZ 249	Remolded Ring Samples for Direct Shear, Swell, and Consolidation
ARIZ 251a	Combined Coarse and Fine Aggregate Specific Gravity and Absorption

AASHTO procedures commonly used in this series are shown below:

R 58	Dry Preparation of Disturbed Soil and Soil-Aggregate Samples for Test
T 19	Unit Weight and Voids in Aggregate
T 89	Determining the Liquid Limit of Soils
T 90	Determining the Plastic Limit and Plasticity Index of Soils
T 96	Resistance to Abrasion of Small Size Coarse Aggregate by use of the Los Angeles Machine
T 104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
T 135	Wetting-and-Drying Test of Compacted Soil-Cement Mixtures
T 136	Freezing-and-Thawing Tests of Compacted Soil-Cement Mixtures
T 176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
T 190	Resistance to R-Value and Expansion Pressure of Compacted Soils

T 217	Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Moisture Tester
T 220	Determination of Strength of Soil-Lime Mixtures
T 248	Reducing Field Samples of Aggregates to Testing Size
T 255	Total Moisture Content of Aggregate by Drying
T 265	Laboratory Determination of Moisture Content of Soils

SERIES 300 CONCRETE (November 2, 2016)

ARIZ 308a	Method of Adjusting Concrete Mixes for Variations in Moisture Content
ARIZ 309a	Testing Impervious Materials and Compounds for Curing Concrete
ARIZ 310a	Measuring Texture Depth of Portland Cement Concrete with Metal Tine Finish
ARIZ 311a	Method of Test for Flow of Grout Mixtures (Flow Cone Method)
ARIZ 314c	Compressive Strength of Cylindrical Concrete Specimens
ARIZ 315	Precast Mortar Blocks Test
ARIZ 317a	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ARIZ 318a	Estimating the Development of Concrete Strength by the Maturity Method

AASHTO procedures commonly used in this series are shown below:

T 22	Compressive Strength of Cylindrical Concrete Specimens
T 23	Making and Curing Test Specimens in the Field
T 97	Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
T 119	Slump of Portland Cement Concrete
T 121	Weight per Cubic Foot, Yield, and Air Content (Gravimetric) of Concrete
T 126	Making and Curing Concrete Test Specimens in the Laboratory
T 152	Air Content of Freshly Mixed Concrete by the Pressure Method
T 231	Capping Cylindrical Concrete Specimens

ASTM procedures commonly used in this series are shown below:

C 39	Compressive Strength of Cylindrical Concrete Specimens
C 1064	Temperature of Freshly Mixed Concrete

SERIES 400 BITUMINOUS MIXTURES (December 4, 2015)

ARIZ 406d	Moisture Content of Bituminous Mixtures
ARIZ 410f	Compaction and Testing of Bituminous Mixtures Utilizing Four Inch Marshall Apparatus
ARIZ 411a	Determination of Bituminous Distributor Truck Transverse Spread Rate
ARIZ 412b	Density of Compacted Bituminous Mixtures by the Nuclear Method

ARIZ 413	Extraction of Asphalt from Bituminous Mixtures by Soxhlet Extraction
ARIZ 415d	Bulk Specific Gravity and Bulk Density of Compacted Bituminous Mixtures
ARIZ 416e	Preparing and Splitting Field Samples of Bituminous Mixtures for Testing
ARIZ 417e	Maximum Theoretical Specific Gravity and Density of Field Produced Bituminous Mixtures (Rice Test)
ARIZ 421	Bituminous Material Content of Asphaltic Concrete Mixtures by the Nuclear Method
ARIZ 422	Compaction and Testing of Bituminous Mixtures Utilizing 152.4 mm (Six Inch) Marshall Apparatus
ARIZ 424d	Determination of Air Voids in Compacted Bituminous Mixtures
ARIZ 427a	Asphalt Binder Content of Asphaltic Concrete Mixtures by the Ignition Furnace Method
ARIZ 428	Asphalt Binder Content of Asphaltic Concrete Mixtures Containing Reclaimed Asphalt Pavement (RAP) by the Ignition Furnace Method

AASHTO procedures commonly used in this series are shown below:

T 164	Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt (HMA)
T 312	Preparing and Determining the Density of Asphalt Mixture Specimens by Means of Superpave Gyrotory Compactor

SERIES 500 BITUMINOUS MATERIALS (December 4, 2015)

ARIZ 502b	Percentage of Uncoated Particles Using Asphalt Emulsions
ARIZ 504	Vacuum Recovery of Asphalt Emulsion Residue
ARIZ 505a	Asphalt Rejuvenating Agent Residue Insoluble in Petroleum Ether
ARIZ 509a	Rapid Determination of Asphaltenes and Chemical Reactivity of Asphalts
ARIZ 511	Recovery of Asphalt from Extraction Solution
ARIZ 512b	Residue by Evaporation

AASHTO procedures commonly used in this series are shown below:

M 82	Cutback Asphalt (Medium-Curing Type)
M 320	Performance Graded Asphalt Binder
R 28	Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)
T 44	Solubility of Bituminous Materials
T 48	Flash and Fire Points by Cleveland Open Cup
T 49	Penetration of Bituminous Materials
T 50	Float Test for Bituminous Materials
T 51	Ductility of Bituminous Materials
T 53	Softening Point of Bitumen (Ring and Ball Apparatus)
T 55	Water in Petroleum Products and Bituminous Materials by Distillation

T 59	Testing Emulsified Asphalts
T 72	Saybolt Viscosity
T 78	Distillation of Cut-Back Asphaltic (Bituminous) Products
T 79	Flash Point with Tag Open-Cup Apparatus for Use with Material Having a Flash Less Than 93.3 °C (200 °F)
T 102	Spot Test of Asphaltic Materials
T 201	Kinematic Viscosity of Asphalts
T 202	Viscosity of Asphalts by Vacuum Capillary Viscometer
T 228	Specific Gravity of Semi-Solid Bituminous Materials
T 240	Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test)
T 301	Elastic Recovery Test of Bituminous Materials by Means of a Ductilometer
T 313	Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)
T 314	Determining the Fracture Properties of Asphalt Binder in Direct Tension (DT)
T 315	Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)
T 316	Viscosity Determination of Asphalt Binder Using Rotational Viscometer

ASTM procedures commonly used in this series are shown below:

D 2007	Characteristic Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method
D 5546	Viscosity Determination of Asphalt Binder Using Rotational Viscometer

SERIES 600 CEMENT AND RELATED MATERIALS (July 15, 2005)

AASHTO procedures commonly used in this series are shown below:

T 21	Organic Impurities in Fine Aggregates for Concrete
T 71	Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
T 105	Chemical Analysis of Hydraulic Cement
T 106	Compressive Strength of Hydraulic Cement Mortar (Using 50 mm or 2-in. Cube Specimens)
T 107	Autoclave Expansion of Portland Cement
T 129	Normal Consistency of Hydraulic Cement
T 131	Time of Setting of Hydraulic Cement by Vicat Needle
T 133	Density of Hydraulic Cement
T 137	Air Content of Hydraulic Cement Mortar
T 153	Fineness of Portland Cement by Air Permeability Apparatus
T 162	Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency

ASTM procedures commonly used in this series are shown below:

C 25	Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
C 110	Physical Testing of Quicklime, Hydrated Lime, and Limestone

SERIES 700 CHEMICAL AND SPECIALTY (December 4, 2014)

ARIZ 702a	Testing of Paint, Varnish, Lacquer, and Related Material
ARIZ 714b	Sampling and Sieving of Crumb Rubber
ARIZ 719c	Heating and Drying Materials in Microwave Oven
ARIZ 725a	Tensile Proof Dowel Test
ARIZ 726a	Reflectance, Dry Opacity, and Yellowness Index of Traffic Paint
ARIZ 727a	Chloride in Hardened Concrete
ARIZ 729b	Exchangeable Sodium in Topsoil
ARIZ 732a	Calcium Carbonate in Topsoil (Neutralization Potential of Topsoil)
ARIZ 733b	Sulfate in Soils
ARIZ 734	Determination of Portland Cement Content in Cement Treated Base Material
ARIZ 735a	Testing of Thermoplastic Pavement Marking Material
ARIZ 736b	Chloride in Soils
ARIZ 738	Chloride in Concrete Admixtures
ARIZ 742	Mean Macrotexure Depth of Milled Pavement
ARIZ 743	Titanium Dioxide in Paints and Thermoplastics
ARIZ 744	Rock Salt in Crash Barrel Sand

AASHTO procedures commonly used in this series are shown below:

T 26	Quality of Water To Be Used in Concrete
T 42	Preformed Expansion Joint Filler for Concrete Construction
T 65	Mass (Weight) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
T 244	Mechanical Testing of Steel Products

AASHTO procedures commonly used in this series are shown below:

D 1155	Roundness of Glass Spheres
D 2240	Rubber Properties - Durometer Hardness
D 4491	Water Permeability of Geotextiles by Permittivity
E 18	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

SERIES 800 DESIGN (March 31, 2017)

ARIZ 801a	Evaluation of Profiles
---------------------------	------------------------

ARIZ 802h	Effect of Water on Strength of Compacted Bituminous Mixtures (Immersion Compression Test)
ARIZ 805b	Centrifuge Kerosene Equivalent of Aggregate, Including K-Factor
ARIZ 806e	Maximum Theoretical Specific Gravity of Laboratory Prepared Bituminous Mixtures (Rice Test)
ARIZ 807	Design of Slurry Seal
ARIZ 814b	Design of Asphaltic Concrete Friction Course
ARIZ 815d	Marshall Mix Design Method for Asphaltic Concrete
ARIZ 819a	Design of Exposed Aggregate Seal Coats
ARIZ 822	Determination of Additive or Asphalt Blend Required for Modification of Asphalt Viscosity
ARIZ 825a	Method of Test for Determining the Quantity of Asphalt Rejuvenating Agent Required for an Asphaltic Pavement
ARIZ 829a	Evaluation of Pavement Smoothness
ARIZ 832a	Marshall Mix Design Method for Asphaltic Concrete (Asphalt-Rubber) [AR-AC]
ARIZ 833	Marshall Mix Design Method for Asphaltic Concrete with Reclaimed Asphalt Pavement (RAP)

SERIES 900 MATERIALS QUALITY ASSURANCE PROGRAM (January 17, 2014)

QA Program	Materials Quality Assurance Program (January 17, 2014)
Appendix A	Arizona Department of Transportation Local Public Agency Certification Acceptance Quality Assurance Requirements
Appendix B	Final Certification of Materials for Consultant Administered Projects
Appendix C	Sampling Guide Schedule (March 31, 2017)
Appendix D	Code of Federal Regulations (23 CFR 637, Subpart B) “Quality Assurance Procedures for Construction”

SERIES 1000 CERTIFICATES (November 2, 2016)

Certificates	Certificate Requirements (November 2, 2016)
------------------------------	---

APPENDIX

Appendix A1	Rounding Procedure (December 4, 2015)
Appendix A2	Metric Guide (July 15, 2005)
Appendix A3	Equipment Calibration and Verification (September 28, 2012)