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Remarks and Instructions

The *Materials Manual* M 46-01 has been revised. Please remove and recycle the contents of the old *Materials Manual* M 46-01 and replace with the April 2018 revision.

The complete manual, revision packages, and individual chapters can be accessed at www.wsdot.wa.gov/publications/manuals/m46-01.htm.

For updating printed manuals, page numbers indicating portions of the manual that are to be removed and replaced are shown below.

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Please contact Kevin Burns at 360-709-5412 or mawdslr@wsdot.wa.gov with comments, questions, or suggestions for improvement to the manual.

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Approved By

Signature

Washington State
Department of Transportation

Materials Manual

M 46-01.30

April 2018

Engineering and Regional Operations
State Materials Laboratory

Americans with Disabilities Act (ADA) Information

English

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Spanish

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Aggregate				
Procedure Number	Owner	Field Use	In Manual	Test Method
T 2	WAQTC	✓	✓	FOP for AASHTO T 2, Sampling of Aggregates
T 11	AASHTO			Materials Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing
T 19	AASHTO	✓	✓	Bulk Density (“Unit Weight”) and Voids in Aggregate (Rodding Procedure Only) (Checklist Only)
T 21	AASHTO			Organic Impurities in Fine Aggregates for Concrete
T 27	AASHTO			Sieve Analysis of Fine and Coarse Aggregates
T 27_T 11	WAQTC	✓	✓	FOP for AASHTO T 27_T 11, Sieve Analysis of Fine and Coarse Aggregates
T 37	AASHTO			Sieve Analysis of Mineral Filler
R 76	AASHTO			Reducing Samples of Aggregate to Testing Size
R 76	WAQTC	✓	✓	FOP for AASHTO R 76, Reducing Samples of Aggregate to Testing Size
T 84	AASHTO			Specific Gravity and Absorption of Fine Aggregates
T 85	AASHTO			Specific Gravity and Absorption of Coarse Aggregate
T 85	WAQTC	✓	✓	FOP for AASHTO T 85, Specific Gravity and Absorption of Coarse Aggregate
T 96	AASHTO			Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
T 112	AASHTO		✓	Clay Lumps and Friable Particles in Aggregate
T 113	WSDOT		✓	Method of Test for Determination of Degradation Value
T 123	WSDOT	✓	✓	Method of Test for Bark Mulch
T 125	WSDOT		✓	Determination of Fiber Length Percentages in Wood Strand Mulch
T 126	WSDOT		✓	Determination of Fiber Length Percentages in Hydraulically-Applied Erosion Control Products
SOP 128	WSDOT	✓	✓	Sampling for Aggregate Source Approval
T 176	AASHT0			Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
T 176	WAQTC	✓	✓	FOP for AASHTO T 176, Plastic Fines in Graded Aggregates and Soils by the Use of the Sand Equivalent Test
T 255	AASHTO			Total Evaporable Moisture Content of Aggregate by Drying
T 255	WAQTC	✓	✓	FOP for AASHTO T 255, Total Evaporable Moisture Content of Aggregate by Drying
T 288	AASHTO		✓	Determining Minimum Laboratory Soil Resistivity (Checklist Only)
T 289	AASHTO			Determining pH of Soil for Use in Corrosion
T 304	WSDOT	✓	✓	FOP for AASHTO for Uncompacted Void Content of Fine Aggregate
T 335	AASHTO			Determining the Percentage of Fracture in Coarse Aggregate
T 335	WAQTC	✓	✓	FOP for AASHTO T 335, Determining the Percentage of Fracture in Coarse Aggregate
T 417	WSDOT		✓	Method of Test for Determining Minimum Resistivity and pH of Soil and Water
T 716	WSDOT	✓	✓	Method of Random Sampling for Locations of Testing and Sampling Sites

Bituminous Cement				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
R 28	AASHTO			Practice of Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel
R 29	AASHTO			Practice for Grading or Verifying the Performance Grade of an Asphalt Binder
T 44	AASHTO			Solubility of Bituminous Materials
T 48	AASHTO			Flash and Fire Points by Cleveland Cup
T 49	AASHTO			Penetration of Bituminous Materials
T 50	AASHTO			Float Test for Bituminous Materials
T 51	AASHTO			Ductility of Bituminous Materials
T 53	AASHTO			Softening Point of Bituminous (Ring and Ball Apparatus)
T 59	AASHTO			Emulsified Asphalts
R 66	WAQTC	✓	✓	FOP for AASHTO R 66, Sampling Asphalt Materials
E 70	ASTM			pH of Aqueous Solutions With the Glass Electrode
T 72	AASHTO			Saybolt Viscosity
T 228	AASHTO			Specific Gravity of Semi-Solid Bituminous Material
T 240	AASHTO			Effect of Heat and Air on a Moving Film of Asphalt Binder (Rolling Thin-Film Oven Test)
T 301	AASHTO			Elastic Recovery Test of Asphalt Materials by Means of a Ductilometer
T 313	AASHTO			Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)
T 315	AASHTO			Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)
T 316	AASHTO			Viscosity Determination of Asphalt Binder Using Rotational Viscometer
SOP 318	WSDOT		✓	Standard Operating Procedure for Melting of Flexible Bituminous Pavement Marker Adhesive for Evaluation
T 426	WSDOT		✓	Pull-Off Test for Hot Melt Traffic Button Adhesive
D 3111	ASTM			Standard Test Method for Flexibility Determination of Hot-Melt Adhesives by Mandrel Bend Test Method

Hot Mix Asphalt				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
R 30	AASHTO			Practice for Short and Long Term Aging of Hot Mix Asphalt (HMA)
T 30	AASHTO			Mechanical Analysis of Extracted Aggregate
T 30	WAQTC	✓	✓	FOP for AASHTO T 30, Mechanical Analysis of Extracted Aggregate
R 47	AASHTO			Standard Recommended Practice for Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size
R 47	WAQTC	✓	✓	FOP for AASHTO R 47, Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size
R 79	AASHTO			Vacuum Drying Compacted Asphalt Specimens
T 166	AASHTO			Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
T 166	WAQTC	✓	✓	FOP for AASHTO T 166, Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface Dry Specimens
T 168	AASHTO			Sampling Bituminous Paving Mixtures
T 168	WAQTC	✓	✓	FOP for AASHTO T 168, Sampling of Hot Mix Asphalt Paving Mixtures
T 209	AASHTO			Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt (HMA)
T 209	WAQTC	✓	✓	FOP for AASHTO T 209, Theoretical Maximum Specific Gravity (Gmm) and Density of Hot Mix Asphalt (HMA) Paving Mixtures
T 269	AASHTO			Percent Air Void in Compacted Dense and Open Asphalt Mixtures
T 308	AASHTO			Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
T 308	WAQTC	✓	✓	FOP for AASHTO T 308, Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
T 312	AASHTO			Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
T 312	WSDOT	✓	✓	FOP for AASHTO T 312, Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
T 324	AASHTO		✓	Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)
T 329	AASHTO			Moisture Content of Asphalt Mixtures by Oven Method
T 329	WAQTC	✓	✓	FOP for AASHTO T 329, Moisture Content of Asphalt Mixtures by Oven Method
T 331	WSDOT		✓	Bulk Specific Gravity (G_{mb}) and Density of Compacted Hot Mix Asphalt (HMA) Using Automatic Vacuum Sealing Method
T 355	WAQTC	✓	✓	FOP for AASHTO T 355, In-Place Density of Asphalt Mixtures by Nuclear Method
T 716	WSDOT	✓	✓	Method of Random Sampling for Locations of Testing and Sampling Sites
T 718	WSDOT		✓	Method of Test for Determining Stripping of Hot Mix Asphalt
T 720	WSDOT		✓	Method of Test for Thickness Measurement of Hot Mix Asphalt (HMA) Cores
SOP 723	WSDOT		✓	Standard Operating Procedure for Submitting Hot Mix Asphalt (HMA) Mix Designs for Verification
T 724	WSDOT	✓	✓	Method of Preparation of Aggregate for Hot Mix Asphalt (HMA) Mix Designs
T 726	WSDOT	✓	✓	Mixing Procedure for Hot Mix Asphalt (HMA)
SOP 728	WSDOT	✓	✓	Standard Operating Procedure for Determining the Ignition Furnace Calibration Factor (IFCF) for Hot Mix Asphalt (HMA)

Hot Mix Asphalt				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
SOP 729	WSDOT	✓	✓	Standard Operating Procedure for Determination of the Moving Average of Theoretical Maximum Density (TMD) for HMA
SOP 730	WSDOT	✓	✓	Standard Operating Procedure for Correlation of Nuclear Gauge Densities With Hot Mix Asphalt (HMA) Cores
SOP 731	WSDOT	✓	✓	Standard Operating Procedure for Determining Volumetric Properties of Hot Mix Asphalt
SOP 732	WSDOT	✓	✓	Standard Operating Procedure for Volumetric Design for Hot-Mix Asphalt (HMA)
SOP 733	WSDOT	✓	✓	Standard Operating Procedure for Determination of Pavement Density Differentials Using the Nuclear Density Gauge
SOP 734	WSDOT	✓	✓	Standard Operating Procedure for Sampling Hot Mix Asphalt After Compaction (Obtaining Cores)
SOP 735	WSDOT	✓	✓	Standard Operating Procedure for Longitudinal Joint Density
SOP 736	WSDOT		✓	In-Place Density of Bituminous Mixes Using Cores
SOP 737			✓	Procedure for the Forensic Testing of HMA Field Cores
D 6931	ASTM		✓	Standard Test Method for Indirect Tensile (IDT) Strength of Bituminous Mixtures

Cement				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
T 105	AASHTO			Chemical Analysis of Hydraulic Cement
T 106	AASHTO			Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
T 106	WSDOT	✓	✓	FOP for AASHTO for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
T 107	AASHTO			Autoclave Expansion of Portland Cement
T 129	AASHTO			Normal Consistency of Hydraulic Cement
T 131	AASHTO			Time of Setting of Hydraulic Cement by Vicat Needle
T 133	AASHTO			Density of Hydraulic Cement
T 137	AASHTO			Air Content of Hydraulic Cement Mortar
T 153	AASHTO			Fineness of Hydraulic Cement by Air Permeability Apparatus
T 162	AASHTO			Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
T 260	AASHTO			Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials
T 303	AASHTO			Accelerated Detection of Potentially Deleterious Expansion of Mortar Bars Due to Alkali-Silica Reaction
T 313	WSDOT		✓	Method of Test for Cement-Latex Compatibility
T 314	WSDOT		✓	Method of Test for Photovolt Reflectance
T 413	WSDOT		✓	Method of Test for Evaluating Waterproofing Effectiveness of Membrane and Membrane-Pavement Systems
D 562	ASTM			Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
T 813	WSDOT	✓	✓	Field Method of Fabrication of 2 in (50 mm) Cube Specimens for Compressive Strength Testing of Grouts and Mortars
T 814	WSDOT		✓	Method of Test for Water Retention Efficiency of Liquid Membrane-Forming Compounds and Impermeable Sheet Materials for Curing Concrete
C 939	WSDOT	✓	✓	FOP for ASTM for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)

Chemical				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
T 65	AASHTO			Mass (Weight) of Coating on Iron and Steel Articles With Zinc or Zinc-Alloy Coatings
T 267	AASHTO			Determination of Organic Content in Soils by Loss on Ignition
T 420	WSDOT	✓	✓	Test Method for Determining the Maturity of Compost (Solvita Test)
C 881	ASTM			Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
C 882	ASTM		✓	Bond Strength (Diagonal Shear) (Checklist Only)
C 1218	ASTM			Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
D 1429	ASTM			Standard Test Methods for Specific Gravity of Water and Brine
D 1475	ASTM			Test Method for Consistency of Paints Test Method for Density of Paint,
D 2628/ M 220	ASTM		✓	Test for High and Low Temperature Recovery of Elastomeric Joint Seals for Concrete Pavements
D 4758	ASTM			Test Method for Nonvolatile Contents of Latexes
D 5329	ASTM			Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements
D 7091	ASTM	✓	✓	Nondestructive Measurement of Thickness of Nonmagnetic Coatings on a Ferrous Base (Checklist Only)

Concrete				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
TM 2	WAQTC	✓	✓	FOP for WAQTC TM 2, Sampling Freshly Mixed Concrete
T 22	AASHTO			Compressive Strength of Cylindrical Concrete Specimens
T 22	WSDOT	✓	✓	FOP for AASHTO for Compressive Strength of Cylindrical Concrete Specimens
T 23	AASHTO			Making and Curing Concrete Test Specimens in the Field
T 23	WAQTC	✓	✓	FOP for AASHTO T 23, Making and Curing Concrete Test Specimens in the Field
T 24	AASHTO			Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
R 39	AASHTO			Making and Curing Concrete Test Specimens in the Laboratory
T 106	AASHTO			Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
T 106	WSDOT	✓	✓	FOP for AASHTO for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
T 119	AASHTO			Slump of Hydraulic Cement Concrete
T 119	WAQTC	✓	✓	FOP for AASHTO T 119, Slump of Hydraulic Cement Concrete
T 121	WAQTC	✓	✓	FOP for AASHTO T 121, Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C 140	ASTM			Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
T 141	AASHTO			Sampling Freshly Mixed Concrete
T 152	AASHTO			Air Content of Freshly Mixed Concrete by the Pressure Method
T 152	WAQTC	✓	✓	FOP for AASHTO T 152, Air Content of Freshly Mixed Concrete by the Pressure Method
T 196	AASHTO		✓	Air Content of Concrete (Volumetric Method) (Checklist Only)
T 197	AASHTO			Time of Setting of Concrete Mixtures by Penetration Resistance
T 198	AASHTO			Splitting Tensile Strength of Cylindrical Concrete Specimens
T 231	AASHTO			Capping Cylindrical Concrete Specimens
T 231	WSDOT	✓	✓	FOP for AASHTO for Capping Cylindrical Concrete Specimens
T 260	AASHTO			Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials
T 277	AASHTO			Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
T 309	AASHTO			Temperature of Freshly Mixed Portland Cement Concrete
T 309	WAQTC	✓	✓	FOP for AASHTO T 309, Temperature of Freshly Mixed Portland Cement Concrete
C 457	ASTM			Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
C 495	ASTM			Test Method for Compressive Strength of Lightweight Insulated Concrete
T 716	WSDOT	✓	✓	Method of Random Sampling for Locations of Testing and Sampling Sites
T 802	WSDOT	✓	✓	Method of Test for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
C 805	ASTM			Test Method for Rebound Number of Hardened Concrete
C 805	WSDOT	✓	✓	Rebound Hammer Determination of Compressive Strength of Hardened Concrete

Concrete				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
T 808	WSDOT	✓	✓	Method for Making Flexural Test Beams
T 810	WSDOT	✓	✓	Method of Test for Determination of the Density of Portland Cement Concrete Pavement Cores
T 812	WSDOT	✓	✓	Method of Test for Measuring Length of Drilled Concrete Cores
T 813	WSDOT	✓	✓	Field Method of Fabrication of 2 in (50 mm) Cube Specimens for Compressive Strength Testing of Grouts and Mortars
T 818	WSDOT		✓	Air Content of Freshly Mixed Self-Compacting Concrete by the Pressure Method
T 819	WSDOT		✓	Making and Curing Self-Compacting Concrete Test Specimens in the Field
C 939	ASTM			Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
C 939	WSDOT	✓	✓	FOP for ASTM for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
C 1218	ASTM			Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
D 1429	ASTM			Standard Test Methods for Specific Gravity of Water and Brine
C 1611	WSDOT	✓	✓	FOP for ASTM C 1611/C 1611M Standard Test Method for Slump Flow of Self-Consolidating Concrete
C 1621	WSDOT	✓	✓	FOP for ASTM C 1621/C 1621M Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring

Electrical and Traffic				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
IP 78-16	FHWA			Signal Controller Evaluation
T 257	AASHTO			Instrumental Photometeric Measurements of Retroreflectivie Material and Retroreflective
T 314	WSDOT		✓	Method of Test for Photovolt Reflectance
T 421	WSDOT		✓	Test Method for Traffic Controller Inspection and Test Procedure
T 422	WSDOT		✓	Test Method for Traffic Controller Transient Voltage Test (Spike Test) Procedure
T 423	WSDOT		✓	Test Method for Traffic Controller Conflict Monitoresting
T 424	WSDOT		✓	Test Method for Traffic Controller Power Interruption Test Procedure
T 425	WSDOT		✓	Test Method for Traffic Controller NEM and 170 Type Environmental Chamber Test
T 426	WSDOT		✓	Pull-Off Test for Hot Melt Traffic Button Adhesive
T 427	WSDOT		✓	Test Method for Loop Amplifier Testing Procedure
T 428	WSDOT		✓	Test Method for Traffic Controller Compliance Inspection and Test Procedure
SOP 429	WSDOT		✓	Methods for Determining the Acceptance of Traffic Signal Controller Assembly
DMCT 700	ATSI			Manual on Signal Controller Evaluation
PCMZ 2000	TS			Manual on Signal Controller Evaluation
D 4956	ASTM			Standard Specification for Retroreflective Sheeting for Traffic Control
TS1	NEMA			Signal Controller Evaluation Geotechnical – Soils

Geotechnical – Soils				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
R 58	AASHTO			Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
R 75	WAQTC	✓	✓	FOP for AASHTO R 75, Developing a Family of Curves
T 88	AASHTO			Particle Size Analysis of Soils
T 89	AASHTO		✓	Determining the Liquid Limit of Soils
T 90	AASHTO		✓	Determining the Plastic Limit and Plasticity Index of Soils (Checklist Only)
T 99	AASHTO			Moisture-Density Relations of Soils Using a 5.5 lb (2.5 kg) Rammer and a 12 in (305 mm) Drop
T 99	WAQTC	✓	✓	FOP for AASHTO T 99, Moisture-Density Relations of Soils Using a 5.5 lb (2.5 kg) Rammer and a 12 in (305 mm) Drop
T 100	AASHTO			Specific Gravity of Soil
T 180	AASHTO			Moisture-Density Relations of Soils Using a 10 lb (4.54 kg) Rammer and an 18 in (457 mm) Drop Checklist
T 180	WAQTC	✓	✓	FOP for AASHTO T 180, Moisture-Density Relations of Soils Using a 10 lb (4.54 kg) Rammer and an 18 in (457 mm) Drop
T 208	AASHTO			Unconfined Compressive Strength of Cohesive Soil
T 215	AASHTO			Permeability of Granular Soils (Constant Head)
T 216	AASHTO			One-Dimensional Consolidation Properties of Soils
T 236	AASHTO			Direct Shear Test of Soils Under Consolidated Drained Conditions
T 265	AASHTO			Laboratory Determination of Moisture Content of Soils
T 265	WAQTC	✓	✓	FOP for AASHTO T 255, Laboratory Determination of Moisture Content of Soils
T 296	AASHTO			Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression
T 297	AASHTO			Consolidated, Undrained Triaxial Compressive Test on Cohesive Soils Shear
D 2487	ASTM			Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
D 2488	ASTM			Practice for Description and Identification of Soils (Visual-Manual Procedure)
D 4186	ASTM			Standard Test Method for One-Dimensional Consolidation Properties of Saturated Cohesive Soils Using Controlled-Strain Loading
D 4644	ASTM			Standard Test Method for Slake Durability of Shales and Similar Weak Rocks
T 501	WSDOT		✓	Test Method to Determine Durability of Very Weak Rock
D 5084	ASTM			Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
D 5311	ASTM			Standard Test Method for Load Controlled Cyclic Triaxial Strength of Soil
D 5731	ASTM			Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications
D 6467	ASTM			Standard Test Method for Torsional Ring Shear Test to Determine Drained Residual Shear Strength of Cohesive Soils
D 6528	ASTM			Standard Test Method for Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils
D 7012	ASTM		✓	Standard Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens

Geotextile and Steel				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
A 143	ASTM			Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
T 244	AASHTO			Mechanical Testing of Steel Products
A 370	ASTM			Standard Test Methods and Definitions for Mechanical Testing of Steel Products
F 606	ASTM			Mechanical Properties: Steel Fasteners
T 914	WSDOT	✓	✓	Practice for Sampling of Geosynthetic Material for Testing
T 915	WSDOT		✓	Practice for Conditioning of Geotextiles for Testing
T 923	WSDOT		✓	Thickness Measurement of Geotextiles
T 925	WSDOT		✓	Standard Practice for Determination of Long-Term Strength for Geosynthetic Reinforcement
T 926	WSDOT		✓	Geogrid Brittleness Test
D 1683	ASTM			Sewen Seams (Geotextiles)
D 4355	ASTM			Standard Test Method for Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
D 4491	ASTM			Water Permeability (Geotextiles)
D 4533	ASTM			Tear Strength (Geotextiles)
D 4354	ASTM		✓	Standard Practice for Sampling of Geosynthetics for Testing
D 4595	ASTM			Wide Width Breaking Load (Geotextiles)
D 4632	ASTM			Grab Breaking Load (Geotextiles)
D 4751	ASTM			Apparent Opening Size (Geotextiles)
D 6241	ASTM			Puncture (Geotextiles)

Paint				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
D 185	ASTM			Standard Test Methods for Coarse Particles in Pigments, Pastes, and Paints
T 314	ASTM			Method of Test for Photovolt Reflectance
D 562	ASTM			Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D 1208	ASTM			Method for Determination of Loss on Ignition
D 1210	ASTM			Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
D 1475	ASTM			Test Method for Density of Paint and Related Products
D 2244	ASTM			Standard Practice for Calculation of Color Tolerances and Color Differences From Instrumentally Measured Color Coordinates
D 2369	ASTM			Method for Determination of Volatile and Nonvolatile Content (Ordinary Laboratory Oven)
D 2371	ASTM			Standard Test Method for Pigment Content of Solvent-Reducible Paints (Centrifuge)
D 2621	ASTM			Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints
D 2697	ASTM			Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings
3011	FTMS			Method for Determination of Condition in Container
D 3723	ASTM			Standard Test Method for Pigment Content of Water Emulsion Paints by Temperature Ashing
4053	FTMS			Method for Determination of Nonvolatile Vehicle Content
4061	FTMS			Method for Determination of Drying Time (Oil-Based Paints)
4122	FTMS			Method for Determination of Hiding Power (Contrast Ratio)
D 4505	ASTM			Standard Specification for Preformed Plastic Pavement Marking Tape for Extended Service Life Pavement Soils

Pavement Soils				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
T 242	AASHTO			Frictional Properties of Paved Surfaces Using a Full-Size Tire
T 272	AASHTO			One-Point Method for Determining Maximum Dry Density and Optimum Moisture
T 272	WAQTC	✓	✓	FOP for AASHTO T 272, One-Point Method for Determining Maximum Dry Density and Optimum Moisture
T 307	AASHTO		✓	Determining the Resilient Modulus of Soils and Aggregate Materials
T 310	WAQTC	✓	✓	FOP for AASHTO T 310, In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
T 606	WSDOT		✓	Method of Test for Compaction Control of Granular Materials
T 610	WSDOT		✓	Method of Test for the Capillary Rise of Soils
SOP 615	WSDOT	✓	✓	Determination of the % Compaction for Embankment & Untreated Surfacing Materials Using the Nuclear Moisture-Density Gauge
T 807	WSDOT	✓	✓	Method of Operation of California Profilograph and Evaluation of Profiles
D 4694	ASTM			Test Method for Deflections With Falling-eight Type Impulse Load Device

Standard Practice				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
QC 1	WSDOT		✓	Standard Practice for Cement Producers/Importers/Distributors That Certify Portland Cement and Blended Hydraulic Cement
QC 2	WSDOT		✓	Standard Practice for Asphalt Suppliers That Certify Performance Graded and Emulsified Asphalts
QC 3	WSDOT		✓	Quality System Laboratory Review
QC 4	WSDOT		✓	Standard Practice for Fly Ash Producers/Importers/Distributors That Certify Fly Ash
QC 5	WSDOT		✓	Standard Practice for Ground Granulated Blast-Furnace Slag Producers/ Importers/Distributors That Certify Ground Granulated Blast-Furnace Slag
QC 6	WSDOT		✓	Annual Prestressed Plant Review and Approval Process
QC 7	WSDOT		✓	Annual Precast Plant Review and Approval Process
QC 8	WSDOT		✓	Standard Practice for Approval of Hot Mix Asphalt Mix Designs for the Qualified Products List

Numerical Order				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
QC 1	WSDOT		✓	Standard Practice for Cement Producers/Importers/Distributors That Certify Portland Cement and Blended Hydraulic Cement
QC 2	WSDOT		✓	Standard Practice for Asphalt Suppliers That Certify Performance Graded and Emulsified Asphalts
QC 3	WSDOT		✓	Quality System Laboratory Review
QC 4	WSDOT		✓	Standard Practice for Fly Ash Producers/Importers/Distributors That Certify Fly Ash
QC 5	WSDOT		✓	Standard Practice for Ground Granulated Blast-Furnace Slag Producers/ Importers/Distributors That Certify Ground Granulated Blast-Furnace Slag
QC 6	WSDOT		✓	Annual Prestressed Plant Review and Approval Process
QC 7	WSDOT		✓	Annual Precast Plant Review and Approval Process
QC 8	WSDOT		✓	Standard Practice for Approval of Hot Mix Asphalt Mix Designs for the Qualified Products List
TS1	NEMA			Signal Controller Evaluation Geotechnical – Soils
T 2	WAQTC	✓	✓	FOP for AASHTO T 2, Sampling of Aggregates
TM 2	WAQTC	✓	✓	FOP for WAQTC TM 2, Sampling Freshly Mixed Concrete
T 11	AASHTO			Materials Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing
E 18	ASTM			Standard Test Methods for Rockwell Hardness of Metallic Materials
T 19	AASHTO	✓	✓	Bulk Density (“Unit Weight”) and Voids in Aggregate (Rodding Procedure Only) (Checklist Only)
T 21	AASHTO			Organic Impurities in Fine Aggregates for Concrete
T 22	AASHTO			Compressive Strength of Cylindrical Concrete Specimens
T 22	WSDOT	✓	✓	FOP for AASHTO for Compressive Strength of Cylindrical Concrete Specimens
T 23	AASHTO			Making and Curing Concrete Test Specimens in the Field
T 23	WAQTC	✓	✓	FOP for AASHTO T 23, Making and Curing Concrete Test Specimens in the Field
T 24	AASHTO			Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
T 27	AASHTO			Sieve Analysis of Fine and Coarse Aggregates
T 27_T 11	WAQTC	✓	✓	FOP for AASHTO T 27_T 11, Sieve Analysis of Fine and Coarse Aggregates
R 28	AASHTO			Practice of Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel
R 29	AASHTO			Practice for Grading or Verifying the Performance Grade of an Asphalt Binder
R 30	AASHTO			Practice for Short and Long Term Aging of Hot Mix Asphalt (HMA)
T 30	AASHTO			Mechanical Analysis of Extracted Aggregate
T 30	WAQTC	✓	✓	FOP for AASHTO T 30, Mechanical Analysis of Extracted Aggregate
T 37	AASHTO			Sieve Analysis of Mineral Filler
R 39	AASHTO			Making and curing Concrete Test Specimens in the Laboratory
T 44	AASHTO			Solubility of Bituminous Materials
R 47	AASHTO			Standard Recommended Practice for Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size
R 47	WAQTC	✓	✓	FOP for AASHTO R 47, Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size

Numerical Order				
Procedure Number	Owner	Field Use	In Manual	Test Method
T 48	AASHTO			Flash and Fire Points by Cleveland Cup
T 49	AASHTO			Penetration of Bituminous Materials
T 50	AASHTO			Float Test for Bituminous Materials
T 51	AASHTO			Ductility of Bituminous Materials
T 53	AASHTO			Softening Point of Bituminous (Ring and Ball Apparatus)
R 58	AASHTO			Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
T 59	AASHTO			Emulsified Asphalts
T 65	AASHTO			Mass (Weight) of Coating on Iron and Steel Articles With Zinc or Zinc-Alloy Coatings
R 66	WAQTC	✓	✓	FOP for AASHTO R 66, Sampling Asphalt Materials
E 70	ASTM			pH of Aqueous Solutions With the Glass Electrode
T 72	AASHTO			Saybolt Viscosity
R 75	WAQTC			FOP for AASHTO R 75, Developing a Family of Curves
R 76	AASHTO			Reducing Samples of Aggregate to Testing Size
R 76	WAQTC	✓	✓	FOP for AASHTO R 76, Reducing Samples of Aggregate to Testing Size
IP 78-16	FHWA			Signal Controller Evaluation
R 79	AASHTO			Vacuum Drying Compacted Asphalt Specimens
T 84	AASHTO			Specific Gravity and Absorption of Fine Aggregates
T 85	AASHTO			Specific Gravity and Absorption of Coarse Aggregates
T 85	WAQTC	✓	✓	FOP for AASHTO T 85, Specific Gravity and Absorption of Coarse Aggregate
T 88	AASHTO			Particle Size Analysis of Soils
T 89	AASHTO		✓	Determining the Liquid Limit of Soils
T 90	AASHTO		✓	Determining the Plastic Limit and Plasticity Index of Soils (Checklist Only)
T 96	AASHTO			Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
T 99	AASHTO			Moisture-Density Relations of Soils Using a 5.5 lb (2.5 kg) Rammer and a 12 in (305 mm) Drop
T 99	WAQTC	✓	✓	FOP for AASHTO T 99, Moisture-Density Relations of Soils Using a 5.5 lb (2.5 kg) Rammer and a 12 in (305 mm) Drop
T 100	AASHTO			Specific Gravity of Soil
T 105	AASHTO			Chemical Analysis of Hydraulic Cement
T 106	AASHTO			Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
T 106	WSDOT	✓	✓	FOP for AASHTO for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
T 107	AASHTO			Autoclave Expansion of Hydraulic Cement
T 112	AASHTO		✓	Clay Lumps and Friable Particles in Aggregate
T 113	WSDOT		✓	Method of Test for Determination of Degradation Value
T 119	AASHTO			Slump of Hydraulic Cement Concrete
T 119	WAQTC	✓	✓	FOP for AASHTO T 119, Slump of Hydraulic Cement Concrete
T 121	WAQTC	✓	✓	FOP for AASHTO T 121, Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
T 123	WSDOT	✓	✓	Method of Test for Bark Mulch
T 125	WSDOT		✓	Determination of Fiber Length Percentages in Wood Strand Mulch

Numerical Order				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
T 126	WSDOT		✓	Determination of Fiber Length Percentages in Hydraulically-Applied Erosion Control Products
T 127	WSDOT		✓	Preparation of Leachate Sample for Testing Toxicity of HECP Effluent
SOP 128	WSDOT	✓	✓	Sampling for Aggregate Source Approval
T 129	AASHTO			Normal Consistency of Hydraulic Cement
T 131	AASHTO			Time of Setting of Hydraulic Cement by Vicat Needle
T 133	AASHTO			Density of Hydraulic Cement
T 137	AASHTO			Air Content of Hydraulic Cement Mortar
C 140	ASTM			Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
T 141	AASHTO			Sampling Freshly Mixed Concrete
A 143	ASTM			Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
T 152	AASHTO			Air Content of Freshly Mixed Concrete by the Pressure Method
T 152	WAQTC	✓	✓	FOP for AASHTO T 152, Air Content of Freshly Mixed Concrete by the Pressure Method
T 153	AASHTO			Fineness of Hydraulic Cement by Air Permeability Apparatus
T 162	AASHTO			Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
T 166	AASHTO			Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens
T 166	WAQTC	✓	✓	FOP for AASHTO T 166, for Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface Dry Specimens
T 168	AASHTO			Sampling Bituminous Paving Mixtures
T 168	WAQTC	✓	✓	FOP for AASHTO T 168, Sampling of Hot Mix Asphalt Paving Mixtures
T 176	AASHTO			Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
T 176	WAQTC	✓	✓	FOP for AASHTO T 176, Plastic Fines in Graded Aggregates and Soils by the Use of the Sand Equivalent Test
T 180	AASHTO			Moisture-Density Relations of Soils Using a 10 lb (4.54 kg) Rammer and an 18 in (457 mm) Drop
T 180	WAQTC	✓	✓	FOP for AASHTO T 180, Moisture-Density Relations of Soils Using a 10 lb (4.54 kg) Rammer and an 18 in (457 mm) Drop
D 185	ASTM			Standard Test Methods for Coarse Particles in Pigments, Pastes, and Paints
T 196	AASHTO		✓	Air Content of Concrete (Volumetric Method) (Checklist Only)
T 197	AASHTO			Time of Setting of Concrete Mixtures by Penetration Resistance
T 198	AASHTO			Splitting Tensile Strength of Cylindrical Concrete Specimens
T 208	AASHTO			Unconfined Compressive Strength of Cohesive Soil
T 209	AASHTO			Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt (HMA)
T 209	WAQTC	✓	✓	FOP for AASHTO T 209, Theoretical Maximum Specific Gravity (Gmm) and Density of Hot Mix Asphalt (HMA) Paving Mixtures
T 215	AASHTO			Permeability of Granular Soils (Constant Head)
T 216	AASHTO			One-Dimensional Consolidation Properties of Soils
T 228	AASHTO			Specific Gravity of Semi-Solid Bituminous Material

Numerical Order				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
T 231	AASHTO			Capping Cylindrical Concrete Specimens
T 231	WSDOT	✓	✓	FOP for AASHTO for Capping Cylindrical Concrete Specimens
T 236	AASHTO			Direct Shear test of Soils Under Consolidated Drained Conditions
T 240	AASHTO			Effect of Heat and Air on a Moving Film of Asphalt Binder (Rolling Thin-Film Oven Test)
T 242	AASHTO			Frictional Properties of Paved Surfaces Using a Full-Size Tire
T 244	AASHTO			Mechanical Testing of Steel Products
T 255	AASHTO			Total Evaporable Moisture Content of Aggregate by Drying
T 255	WAQTC	✓	✓	FOP for AASHTO T 255, Total Evaporable Moisture Content of Aggregate by Drying
T 257	AASHTO			Instrumental Photometeric Measurements of Retroreflectivie Material and Retroreflective
T 260	AASHTO			Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials
T 265	AASHTO			Laboratory Determination of Moisture Content of Soils
T 265	WAQTC	✓	✓	FOP for AASHTO T 255, Laboratory Determination of Moisture Content of Soils
T 267	AASHTO			Determination of Organic Content in Soils by Loss on Ignition
T 269	AASHTO			Percent Air Void in Compacted Dense and Open Asphalt Mixtures
T 272	AASHTO			One-Point Method for Determining Maximum Dry Density and Optimum Moisture
T 272	WAQTC	✓	✓	FOP for AASHTO T 272, One-Point Method for Determining Maximum Dry Density and Optimum Moisture
T 277	AASHTO			Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
T 288	AASHTO		✓	Determining Minimum Laboratory Soil Resistivity (Checklist Only)
T 289	AASHTO			Determining pH of Soil for Use in Corrosion
T 296	AASHTO			Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression
T 297	AASHTO			Consolidated, Undrained Triaxial Compressive Test on Cohesive Soils Shear
T 301	AASHTO			Elastic Recovery Test of Asphalt Materials by Means of a Ductilometer
T 303	AASHTO			Accelerated Detection of Potentially Deleterious Expansion of Mortar Bars Due to Alkali-Silica Reaction
T 304	WSDOT	✓	✓	FOP for AASHTO for Uncompacted Void Content of Fine Aggregate
T 307	AASHTO		✓	Determining the Resilient Modulus of Soils and Aggregate Materials
T 308	AASHTO			Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
T 308	WAQTC	✓	✓	FOP for AASHTO T 308, Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
T 309	AASHTO			Temperature of Freshly Mixed Hydraulic Cement Concrete
T 309	WAQTC	✓	✓	FOP for AASHTO T309, Temperature of Freshly Mixed Portland Cement Concrete
T 310	WAQTC	✓	✓	FOP for AASHTO T 310, In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
T 312	AASHTO			Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor

Numerical Order				
Procedure Number	Owner	Field Use	In Manual	Test Method
T 312	WAQTC	✓	✓	FOP for AASHTO T 312, Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
T 313	AASHTO			Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)
T 313	WSDOT		✓	Method of Test for Cement-Latex Compatibility
T 314	WSDOT		✓	Method of Test for Photovolt Reflectance
T 315	AASHTO			Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)
T 316	AASHTO			Viscosity Determination of Asphalt Binder Using Rotational Viscometer
SOP 318	WSDOT		✓	Standard Operating Procedure for Melting of Flexible Bituminous Pavement Marker Adhesive for Evaluation
T 324	AASHTO		✓	Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)
T 329	AASHTO			Moisture Content of Asphalt Mixtures by Oven Method
T 329	WAQTC	✓	✓	FOP for AASHTO T 329, Moisture Content of Asphalt Mixture by Oven Method
T 331	WSDOT		✓	Bulk Specific Gravity (G_{mb}) and Density of Compacted Hot Mix Asphalt (HMA) Using Automatic Vacuum Sealing Method
T 335	AASHTO			Determining the Percentage of Fracture in Coarse Aggregate
T 335	WAQTC	✓	✓	FOP for AASHTO T 335, Determining the Percentage of Fracture in Coarse Aggregate
T 355	WAQTC	✓	✓	FOP for AASHTO T 355, In-Place Density of Asphalt Mixtures by Nuclear Method
A 370	ASTM			Standard Test Methods and Definitions for Mechanical Testing of Steel Products
T 413	WSDOT	✓	✓	Method of Test for Evaluating Waterproofing Efectiveness of Membrane and Membrane-Pavement Systems
T 417	WSDOT		✓	Method of Test for Determining Minimum Resistivily and pH of Soil and Water
T 420	WSDOT	✓	✓	Test Method for Determining the Maturity of Compost (Solvita Test)
T 421	WSDOT		✓	Test Method for Traffic Controller Inspection and Test Procedure
T 422	WSDOT		✓	Test Method for Traffic Controller Transient Voltage Test (Spike Test) Procedure
T 423	WSDOT		✓	Test Method for Traffic Controller Conflict Monitoresting
T 424	WSDOT		✓	Test Method for Traffic Controller Power Interruption Test Procedure
T 425	WSDOT		✓	Test Method for Traffic Controller NEM and 170 Type Environmental Chamber Test
T 426	WSDOT		✓	Pull-Off Test for Hot Melt Traffic Button Adhesive
T 427	WSDOT		✓	Test Method for Loop Amplifier Testing Procedure
T 428	WSDOT		✓	Test Method for Traffic Controller Compliance Inspection and Test Procedure
SOP 429	WSDOT		✓	Methods for Determining the Acceptance of Traffic Signal Controller Assembly
T 432	WSDOT		✓	Flexibility Test for Hot-Melt Adhesives
C 457	ASTM			Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
C 495	ASTM			Test Method for Compressive Strength of Lightweight Insulated Concrete

Numerical Order				
Procedure Number	Owner	Field Use	In Manual	Test Method
T 501	WSDOT		✓	Test Method to Determine Durability of Very Weak Rock
D 562	ASTM			Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
F 606	ASTM			Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets
T 606	WSDOT		✓	Method of Test for Compaction Control of Granular Materials
T 610	WSDOT		✓	Method of Test for the Capillary Rise of Soils
SOP 615	WSDOT	✓	✓	Determination of the % Compaction for Embankment and Untreated Surfacing Materials Using the Nuclear Moisture-Density Gauge
DMCT 700	ATSI			Manual on Signal Controller Evaluation
T 716	WSDOT	✓	✓	Method of Random Sampling for Locations of Testing and Sampling Sites
T 718	WSDOT		✓	Method of Test for Determining Stripping of Hot Mix Asphalt
T 720	WSDOT		✓	Method of Test for Thickness Measurement of Hot Mix Asphalt (HMA) Cores
SOP 723	WSDOT		✓	Standard Operating Procedure for Submitting Hot Mix Asphalt (HMA) Mix Designs for Verification
T 724	WSDOT	✓	✓	Method of Preparation of Aggregate for Hot Mix Asphalt (HMA) Mix Designs
T 726	WSDOT	✓	✓	Mixing Procedure for Hot Mix Asphalt (HMA)
SOP 728	WSDOT	✓	✓	Standard Operating Procedure for Determining the Ignition Furnace Calibration Factor (IFCF) for Hot Mix Asphalt (HMA)
SOP 729	WSDOT	✓	✓	Standard Operating Procedure for Determination of the Moving Average of Theoretical Maximum Density (TMD) for HMA
SOP 730	WSDOT	✓	✓	Standard Operating Procedure for Correlation of Nuclear Gauge Densities With Hot Mix Asphalt (HMA) Cores
SOP 731	WSDOT	✓	✓	Standard Operating Procedure for Determining Volumetric Properties of Hot Mix Asphalt
SOP 732	WSDOT	✓	✓	Standard Operating Procedure for Volumetric Design for Hot-Mix Asphalt (HMA)
SOP 733	WSDOT	✓	✓	Standard Operating Procedure for Determination of Pavement Density Differentials Using the Nuclear Density Gauge
SOP 734	WSDOT	✓	✓	Standard Operating Procedure for Sampling Hot Mix Asphalt After Compaction (Obtaining Cores)
SOP 735	WSDOT	✓	✓	Standard Operating Procedure for Longitudinal Joint Density
SOP 736	WSDOT		✓	In-Place Density of Bituminous Mixes Using Cores
SOP 737			✓	Procedure for the Forensic Testing of HMA Field Cores
T 802	WSDOT	✓	✓	Method of Test for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
C 805	ASTM			Test Method for Rebound Number of Hardened Concrete
C 805	WSDOT	✓	✓	Rebound Hammer Determination of Compressive Strength of Hardened Concrete
T 807	WSDOT	✓	✓	Method of Operation of California Profilograph and Evaluation of Profiles
T 808	WSDOT	✓	✓	Method for Making Flexural Test Beams
T 810	WSDOT	✓	✓	Method of Test for Determination of the Density of Portland Cement Concrete Pavement Cores
T 812	WSDOT	✓	✓	Method of Test for Measuring Length of Drilled Concrete Cores

Numerical Order				
Procedure Number	**Owner**	**Field Use**	**In Manual**	**Test Method**
T 813	WSDOT	✓	✓	Field Method of Fabrication of 2 in (50 mm) Cube Specimens for Compressive Strength Testing of Grouts and Mortars
T 814	WSDOT		✓	Method of Test for Water Retention Efficiency of Liquid Membrane-Forming Compounds and Impermeable Sheet Materials for Curing Concrete
T 818	WSDOT		✓	Air Content of Freshly Mixed Self-Compacting Concrete by the Pressure Method
T 819	WSDOT		✓	Making and Curing Self-Compacting Concrete Test Specimens in the Field
C 881	ASTM			Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
C 882	ASTM		✓	Bond Strength (Diagonal Shear) (Checklist Only)
T 914	WSDOT	✓	✓	Practice for Sampling of Geosynthetic Material for Testing
T 915	WSDOT		✓	Practice for Conditioning of Geotextiles for Testing
T 923	WSDOT		✓	Thickness Measurement of Geotextiles
T 925	WSDOT		✓	Standard Practice for Determination of Long-Term Strength for Geosynthetic Reinforcement
T 926	WSDOT		✓	Geogrid Brittleness Test
C 939	ASTM			Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
C 939	WSDOT	✓	✓	FOP for ASTM for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
D 1208	ASTM			Test Methods for Common Properties of Certain Pigments (Loss on Ignition)
D 1210	ASTM			Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
C 1218	ASTM			Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
D 1429	ASTM			Standard Test Methods for Specific Gravity of Water and Brine
C 1437	ASTM			Standard Test Method for Flow of Hydraulic Cement Mortar
D 1475	ASTM			Test Method for Consistency of Paints Test Method for Density of Paint, Varnish, Lacquer, and Related Products
C 1611	WSDOT	✓	✓	FOP for ASTM C 1611/C 1611M Standard Test Method for Slump Flow of Self-Consolidating Concrete
C 1621	WSDOT	✓	✓	FOP for ASTM C 1621/C 1621M Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring
D 1683	ASTM			Standard Test Method for Failure in Sewn Seams of Woven Apparel Fabrics
PCMZ 2000	TS			Manual on Signal Controller Evaluation
D 2240	ASTM			Standard Test Method for Rubber Property – Durometer Hardness
D 2244	ASTM			Standard Practice for Calculation of Color Tolerances and Color Differences From Instrumentally Measured Color Coordinates
D 2369	ASTM			Test Method for Volatile Content of Coatings (Ordinary Laboratory Oven)
D 2371	ASTM			Standard Test Method for Pigment Content of Solvent-Reducible Paints (Centrifuge)
D 2487	ASTM			Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
D 2488	ASTM			Practice for Description and Identification of Soils (Visual-Manual Procedure)
D 2621	ASTM			Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints
D 2628/ M 220	ASTM	✓	✓	Test for High and Low Temperature Recovery of Elastomeric Joint Seals for Concrete Pavements

Numerical Order				
Procedure Number	Owner	Field Use	In Manual	Test Method
D 2697	ASTM			Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings
3011	FTMS			Method for Determination of Condition in Container
D 3111	ASTM			Standard Test Method for Flexibility Determination of Hot-Melt Adhesives by Mandrel Bend Test Method
D 3723	ASTM			Standard Test Method for Pigment Content of Water Emulsion Paints by Temperature Ashing
4053	FTMS			Method for Determination of Nonvolatile Vehicle Content
4061	FTMS			Method for Determination of Drying Time (Oil-Based Paints)
4122	FTMS			Method for Determination of Hiding Power (Contrast Ratio)
D 4186	ASTM			Standard Test Method for One-Dimensional Consolidation Properties of Saturated Cohesive Soils Using Controlled-Strain Loading
D 4354	ASTM		✓	Standard Practice for Sampling of Geosynthetics for Testing
D 4355	ASTM			Standard Test Method for Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
D 4491	ASTM			Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D 4505	ASTM			Standard Specification for Preformed Plastic Pavement Marking Tape for Extended Service Life
D 4533	ASTM			Standard Test Method for Trapezoid Tearing Strength of Geotextiles
D 4595	ASTM			Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
D 4632	ASTM			Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
D 4644	ASTM			Standard Test Method for Slake Durability of Shales and Similar Weak Rocks
D 4694	ASTM			Test Method for Deflections With Falling-Eight Type Impulse Load Device
D 4751	ASTM			Test Method for Determining Apparent Opening Size of a Geotextile
D 4758	ASTM			Test Method for Nonvolatile Contents of Latexes
D 4956	ASTM			Standard Specification for Retroreflective Sheeting for Traffic Control
D 5084	ASTM			Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
D 5311	ASTM			Standard Test Method for Load Controlled Cyclic Triaxial Strength of Soil
D 5329	ASTM			Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements
D 5731	ASTM			Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications
D 6241	ASTM			Puncture (Geotextiles)
D 6467	ASTM			Standard Test Method for Torsional Ring Shear Test to Determine Drained Residual Shear Strength of Cohesive Soils
D 6528	ASTM			Standard Test Method for Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils
D 6931	ASTM		✓	Standard Test Method for Indirect Tensile (IDT) Strength of Bituminous Mixtures
D 7012	ASTM		✓	Standard Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens
D 7091	ASTM	✓	✓	Nondestructive Measurement of Thickness of Nonmagnetic Coatings on a Ferrous Base (Checklist Only)

WSDOT Standard Practice QC 6

Annual Prestressed Plant Review and Approval Process

1. Scope

This standard specifies requirements and procedures for WSDOT annual approval of all manufacturing facilities producing prestressed concrete girders or precast prestressed concrete members in accordance with WSDOT *Standard Specifications* Section 6-02.3(25). Standard Practice QC 6 also applies to precast concrete units that are prestressed as identified in WSDOT *Standard Specifications* Section 6-02.3(28).

2. Referenced Documents

2.1 Precast/Prestressed Concrete Institute Certification Program

2.2 WSDOT Qualified Products List

2.3 WSDOT Standard Specification

3. Terminology

3.1 Plant – Manufacturing facility producing prestressed concrete members with single plant location.

3.2. NRMCA – National Ready Mix Concrete Association

3.3 PCI – Precast/Prestressed Concrete Institute

3.4 RAM - Request for Approval of Material (WSDOT Form 350-071) document submitted by the plant, identifying their material sources for WSDOT approval.

3.5 Quality Control – Quality control inspection and documentation provided by the plant.

3.6 QPL – WSDOT Qualified Products List

3.7 WSDOT – Washington State Department of Transportation

3.8 WSDOT Annual Approval – The approval process defined in WSDOT Standard Practice QC 6.

3.9 WSDOT Fabrication Inspector – Quality Assurance inspector provided by the WSDOT Headquarters Materials Laboratory Materials and Fabrication Inspection Office.

4. Significance and Use

4.1 This Standard Practice specifies procedures for approving plants on an annual basis and maintaining a plant approval document reviewed annually. Submittal documents pre approve specific documentation identified in this Standard Practice; replacing the requirement for contract specific submittals. Modifications can be made to the plants submittal at any time during the annual approval period.

5. Annual Plant Approval Requirements

5.1 Plants shall be initially approved through the QPL or RAM approval process. Plants shall not begin fabricating prestress members prior to receiving WSDOT annual plant approval.

5.2 Maintain current PCI certification for the type of prestressed member being manufactured.

5.3 Maintain quality control staff meeting the training and certification requirements specified by the PCI plant certification program.

5.4 Submit and maintain an annual approval document detailed in Section 6. Plants must complete and maintain all submittal requirements to remain in active approval status.

5.5 Submit annually by December 1st a document identifying the plant has reviewed their annual approval document and identifies whether the plant approval document remains unchanged, or details any anticipated revisions.

5.6 Successful completion of initial WSDOT plant approval detailed in Section 7 or successful maintenance of annual approval status detailed in Section 10.

6. Plant Submittal Requirement

6.1 Plants shall initially submit a document for annual approval that covers the submittal requirements of this section starting with Section 6.1.1. The document may be submitted by mail or submitted electronically. Submit documents to the WSDOT Fabrication and Coatings Engineer.

6.1.1 Table of Contents

6.1.2 Table of Organization.

6.1.3 RAM documents. Submit RAM documents for the following materials.

- Concrete Ready Mix Batch Plant (as applicable)
- Epoxy Coated Reinforcing Steel
- Fabrication Facilities Manufacturing Welded Embeds and Fabricating Reinforcing Steel
- Prestress Strand
- Reinforcing Steel

6.1.4 Concrete mix designs. Submit mix designs on the latest revision of WSDOT Form 350-040. Mix designs are to be filled out completely. Aggregate, cement, slag, and admixtures must be from WSDOT approved sources. Mix design submittal shall include the following for each mix design;

- Compressive strength break history. A minimum of 15 sets (2 cylinders per set)
- Cement mill certification report
- Chloride Ion test results

6.1.5 Curing procedures. Submit the procedure that will be used to cure prestressed members. Identify whether accelerated curing will be used and detail the procedure for monitoring and documenting curing operations.

6.1.6 Fabrication procedures and drawings. This submittal is for standard fabrication procedures and specialized fabrication procedures. Specialized procedures may be added to the annual plant submittal as approved by the WSDOT Bridge and Structures Office, to facilitate fabrication of prestressed members. Examples of specialized procedures are as follows:

- Tensioning and Detensioning procedures
- Hold down devices
- Other procedures and drawings as determined by the Plant.

6.1.7 Weld procedures. Submit weld procedures for welding of embed plates or other structures as applicable to the plants manufacturing process.

6.1.8 Repair procedures. Submit repair procedures for anticipated repair scenarios. Approved repair procedures can be used during fabrication of prestressed members without further WSDOT engineering approval. Repair procedures must be detailed, including dimensional limits, and specific repair materials identified by material type, and brand name. Submittal shall include catalog cuts for repair materials.

6.1.9 Quality control plan. Submit quality control procedures and inspection forms. Inspection forms shall include information for the following.

- Pre Pour Inspection Report
- Wet Concrete Testing Report
- Stressing Record
- Compressive Strength Testing Report
- Non Conformance Report
- Post Pour Inspection Report

6.1.10 Ready mix batch plant NRMCA as applicable. Not required for plants in house batch plant.

6.1.11 Problem resolution form. Submit a plant specific problem resolution form. Appendix “B” has an example of the Problem Resolution Form. This form is used to expedite resolution of construction issues encountered during fabrication of prestressed concrete members.

6.1.12 Certificate of Compliance Document: Submit the form that will be used for the Certificate of Compliance document.

6.1.13 Final documentation package. Detail or outline the documents that will be provided to the WSDOT Materials and Fabrication Inspector prior to WSDOT final approval of prestressed members. Documents required in the final document package are as listed below.

- Pre Pour Inspection Report
- Wet Concrete Testing Report
- Compressive Strength Testing Report
- Post Pour Inspection Report
- Gradation Reports
- Cure Charts for accelerated curing
- Stressing Records
- Non Conformance Reports
- Problem Resolution documents
- Certificate of Compliance

- Certificate of Materials Origin (for projects with "Buy America" Requirement, WSDOT Form 350-109)
- Mill certs
  - Cement
  - Epoxy Coated Reinforcing Steel
  - Fly Ash
  - Micro Silica
  - Prestress Strand
  - Reinforcing Steel
  - Slag
  - Steel components

7. Initial Plant Approval Process

7.1 Upon receiving the plants initial submittal, WSDOT will review the contents of the submittal in preparation for WSDOT's initial plant approval meeting with representatives of the plant.

7.2 WSDOT will be allowed 90 days for review of the plants initial submittal document. Time for review will be longer if submittals are incomplete.

7.3 WSDOT review responsibilities.

7.3.1 WSDOT Fabrication and Coatings Engineer. Overall responsibility for annual approval and submittal review process. Coordinates all annual approval submittal activities. Reviews for acceptance all documentation with the exception of mix designs, specialized fabrication procedures, and repair procedures.

7.3.2 WSDOT Headquarters Materials Laboratory Fabrication Inspection Office. Responsible for review and acceptance of mix designs.

7.3.3 WSDOT Construction Office. Responsible for review and approval of repair procedures.

7.3.4 WSDOT Bridge and Structures Office. Responsible for approval of specialized fabrication procedures, and review and approval of welding procedures.

7.4 Review process.

7.4.1 The WSDOT Fabrication and Coatings Engineer will review portions of the plant submittal and will send specific sections referenced in Section 7.3 to the respective approving authorities.

7.4.2 Approving authorities will send reviewed documents back to the WSDOT Fabrication and Coatings Engineer.

7.4.3 The WSDOT Fabrication and Coatings Engineer will review the status of the submittals returned from the approving authorities and incorporate the documents into the annual plant approval document.

7.4.4 Submittal documents will be signed or stamped "Approved", "Approved as Noted", "Not Approved", or Accepted depending on their review status.

7.4.5 RAM documents will be coded with acceptance codes by the WSDOT Fabrication and Coatings Engineer. RAM codes for specific items are referenced in Appendix "C" of this Standard Practice.

7.4.6 The WSDOT Fabrication and Coatings Engineer will make an itemized list of review comments and action items and will place them at the front of the annual submittal document returned to the plant at the time of the initial plant approval meeting. If time allows, the Fabrication and Coatings Engineer will work directly with representatives from the plant to address review comments prior to the initial plant approval meeting.

7.4.7 The WSDOT Fabrication and Coatings Engineer will schedule the initial plant approval meeting and will send the plant a letter and email notifying them of the date and time WSDOT will be at the plant for the initial plant approval meeting.

7.4.8 WSDOT will perform a formal audit of the plants facility, and operating and quality control procedures prior to the initial plant approval meeting. WSDOT will contact the plant and inform them of the date and time a WSDOT inspector will be at the plant for an inspection audit. The audit will follow the outline detailed in Appendix A.

7.4.9 WSDOT will provide the plant with an electronic version of the reviewed annual approval document within 30 days following completion of the initial plant approval meeting.

8. Initial Plant Approval Meeting

8.1 Scheduling

8.1.1 An initial plant approval meeting will be scheduled after WSDOT has completed its review of the plants initial submittal. The meeting will be held at the plants physical location. WSDOT will notify the plant of the date and time the meeting will be held.

8.2 Attendees

8.2.1 WSDOT attendees will include at a minimum, the WSDOT Fabrication and Coatings Engineer and a supervising inspector from the Materials and Fabrication Inspection Office.

8.2.2 Attendees from the plant shall include at a minimum the plant manager, production manager, and quality control manager, or their respective representatives.

8.3 Meeting Agenda

8.3.1 The meeting agenda will focus on comments from WSDOT's review of the plants annual approval document submittal, and WSDOT's plant inspection audit completed prior to the meeting.

8.3.2 WSDOT will inform the plant of their approval status upon completion of the initial approval meeting. Any deficiencies that would prevent approval will be identified and discussed during the meeting.

9. Initial Plant Approval Status Notification

9.1 Within 30 days following the initial plant approval meeting, the WSDOT Fabrication and Coatings Engineer will send the plant a letter informing the plant of their approval status and the period of effectiveness. Any deficiencies identified during the annual plant review and audit that would prevent annual approval will be identified in the letter.

10. Maintenance of Plant Approval Status After Initial Approval

10.1 Annual approval documents will remain in affect indefinitely as long as the document is maintained each calendar year.

10.2 The WSDOT Fabrication and Coatings Engineer will send each plant a letter in October requesting a document identifying the plant has reviewed their annual approval document and identifies whether the plant approval documents remain unchanged, or details any anticipated revisions. The letter will also detail any changes to WSDOT's program that would affect the annual approval document. The document and any revisions ready for submittal shall be sent electronically to the WSDOT Fabrication and Coatings Engineer no later than December 1st.

10.3 Revisions to mix designs will be processed through the QPL or reviewed during WSDOT project specific work activities. WSDOT will provide plants with a cost estimate for review of mix designs submitted through the QPL process. Costs associated with mix design reviews for project specific work activities will be based on the same process for review through the RAM process. Only mix designs reviewed by the WSDOT Headquarters Materials Laboratory will be added to the annual plant approval document.

10.4 Revisions submitted by the plant will be reviewed as detailed in Section 7.4.1 through 7.4.5.

10.5 The WSDOT Fabrication and Coatings Engineer will review annual plant approval documents in December. Review comments will be provided to plants for their action by January 15th. Upon resolution of review comments, the WSDOT Fabrication and Coatings Engineer will document revisions to the annual approval document and will maintain revision control by adding "Approved", "Approved as Noted", "Not Approved", or "Accepted" revisions to the document and providing plants with an electronic version of the plants complete approval document. WSDOT will provide a revision control document at the front of the annual approval document, which details the changes from the previous version.

10.6 Onsite inspection audits will be performed by WSDOT when the plant starts its first project each calendar year. Audits will not be performed by WSDOT until there is work taking place. If a calendar year passes without an active project, WSDOT will perform an inspection audit when WSDOT project specific work starts. The audit will follow the outline detailed in Appendix A.

11. Annual Maintenance Approval Status Notification

11.1 Upon successful completion of WSDOT's annual plant approval document review and onsite plant inspection audit as applicable, the WSDOT Fabrication and Coatings Engineer will send the plant a letter informing the plant of their approval status and the period of effectiveness. Any deficiencies identified during the annual plant review that would prevent annual approval will be identified in the letter.

WSDOT Standard Practice QC 6

Appendix A Precast / Prestress Plant Inspection Audit

Plant: _____ Date: _____

Phone Number: _____ Contact Person: _____

Plant Reviewed by: _____

Review Results: Acceptable ☐ Unacceptable ☐

Materials

Concrete Cylinders

Is cylinder fabrication and testing in accordance with WSDOT test methods? ☐ Yes ☐ No

Does cylinder storage comply with specifications? ☐ Yes ☐ No

Is cylinder capping acceptable? ☐ Yes ☐ No

Method of capping: ☐ Sulphur ☐ Rubber caps ☐ Other _____

What types of molds are used? ☐ Paper ☐ Plastic ☐ Steel ☐ Securer

Is cylinder testing machine calibrated? ☐ Yes ☐ No

Comments: _____

Cement

Is cement from an approved source? ☐ Yes ☐ No

Are cement certifications available? ☐ Yes ☐ No

Is cement storage acceptable? ☐ Yes ☐ No

Comments: _____

Aggregate

Has aggregate source been approved by WSDOT? ☐ Yes ☐ No

Does plant use WSDOT grading? ☐ Yes ☐ No

Is aggregate sampled and tested prior to use? ☐ Yes ☐ No

Is aggregate storage acceptable? ☐ Yes ☐ No

Comments: _____

Reinforcing Steel

Are mill test certificates available? ☐ Yes ☐ No

Is fabrication acceptable? ☐ Yes ☐ No

Is storage acceptable? ☐ Yes ☐ No

Comments: _____

Forms

Are forms clean, straight and in good condition? ☐ Yes ☐ No

Are forms checked for dimensions prior to use? ☐ Yes ☐ No

Comments: _____

Batch Plant

Does batch plant meet the certification requirements of the WSDOT Std. Spec. ☐ Yes ☐ No

Date of scale calibration: _____

Comments: _____

Fabrication

Set up

Is reinforcing steel placed per contract ☐ Yes ☐ No

Is steel tied according to specifications and held in place during concrete placement? ☐ Yes ☐ No

Is the plant aware tack welding is not permitted? ☐ Yes ☐ No

Is there a Plant QC hold point for inspection prior to setting forms? ☐ Yes ☐ No

Comments: _____

Concrete Placement

Is concrete delivered in a timely manner? ☐ Yes ☐ No

Is plant using approved concrete mix design? ☐ Yes ☐ No

Is required concrete testing being done? ☐ Yes ☐ No

Is there adequate equipment for concrete placement in forms? ☐ Yes ☐ No

Is concrete placed per specifications? ☐ Yes ☐ No

Comments: _____

Curing

Is temperature measuring equipment acceptable? ☐ Yes ☐ No

Is product protected during curing? ☐ Yes ☐ No

Are test cylinders cured under same conditions as product? ☐ Yes ☐ No

What type of curing system is used?

Radiant _____
Hot air _____
Convection _____
Conducted Steam _____
Other _____

Comments: _____

Stripping Procedures

Are concrete cylinders for verification of stripping strength representative of the product? ☐ Yes ☐ No

Is required stripping strength being verified with cylinder breaks prior to stripping? ☐ Yes ☐ No

Comments: _____

Inspection

Does plant inspection staff have a good understanding of their job responsibilities? ☐ Yes ☐ No

Does plant inspection staff have adequate Training? ☐ Yes ☐ No

Is plant inspection staff familiar with the WSDOT Annual Approval process and procedures? ☐ Yes ☐ No

Are approved shop drawings, plans, and calculations available? ☐ Yes ☐ No

Are quality control procedures being followed? ☐ Yes ☐ No

Are quality control reports being filled out Properly? ☐ Yes ☐ No

Has the plant quality control department verified product repairs, workmanship, and finish are acceptable? ☐ Yes ☐ No

Comments: _____

Product Handling and Storage

Are products handled and stored properly? ☐ Yes ☐ No

Comments: _____

Overall Review Comments

Review Attendees

Name	Job Description	Phone/Email

Appendix B Manufacturers Name Precast Problem Resolution Request

Date: _____

Submitted To: _____

WSDOT Construction Engineer Email: PrecastPRR@wsdot.wa.gov

Contractor _____

Fax: _____/Email: _____

WSDOT Contract No: _____

Project Name: _____

Company Name: _____

Submitted By (Contact Person): _____

Telephone No: _____ Fax No: _____

Email: _____

Priority: ☐ High ☐ Medium ☐ Low

Request Response Time: _____

Description of Problem:

Proposed Resolution:

WSDOT Fabrication Inspector's Name and Signature:

_____ _____

Name Signature

Appendix C RAM Acceptance Codes

Products	RAM Code
Concrete Ready Mix Batch Plant	8
Epoxy Coated Reinforcing Steel	2, 5, 6
Fabrication Facilities (Steel Embeds & Fabricating Rebar)	8
Prestress Strand	1, 2, 6
Reinforcing Steel	2, 6

RAM Acceptance Action Codes

1) Acceptance based upon 'Satisfactory' Test Report for samples of materials to be incorporated into the project.
2) Mfg. Cert. of Compliance for 'Acceptance' prior to use of material.
3) Catalog Cuts for 'Acceptance' prior to use of material.
4) Not Listed (No relevance to annual submittal process)
5) Only Materials Tagged 'Approved for Shipment'
6) Submit Certificate of Materials Origin to Project Engineer Office.(Only for projects with "Buy America" requirement.
7) Not Listed (No relevance to annual submittal process)
8) Source Approved
9) Approval Withheld; submit samples for preliminary evaluation
10) Approval Withheld
11) Miscellaneous Acceptance Criteria

WSDOT Standard Practice QC 7

Annual Precast Plant Review and Approval Process

1. Scope

This standard specifies requirements and procedures for WSDOT annual approval of all manufacturing facilities producing precast concrete structures in accordance with WSDOT *Standard Specification* Section 6-02.3(28).

2. Referenced Documents

3. WSDOT Qualified Products List

3.1 WSDOT Standard Specification

4. Terminology

4.1 Plant – Manufacturing facility producing precast concrete structures with single plant location.

4.2 NRMCA – National Ready Mix Concrete Association

4.3 ICBO – International Congress Building Officials

4.4 ICC-ES – International Code Council Evaluation Services

4.5 PCI – Precast/Prestressed Concrete Institute

4.6 NPCA – National Precast Concrete Association

4.7 RAM - Request for Approval of Material (WSDOT Form 350-071) submitted by the plant, identifying their material sources for WSDOT approval.

4.8 Quality Control – Quality control inspection and documentation provided by the plant.

4.9 QPL – WSDOT Qualified Products List

4.10 WSDOT – Washington State Department of Transportation

4.11 WSDOT Annual Approval – The certification process defined in WSDOT Standard Practice QC 7.

4.12 WSDOT Fabrication Inspector – Quality Assurance inspector provided by the WSDOT Headquarters Materials Laboratory Materials and Fabrication Inspection Office.

5. Significance and Use

5.1 This Standard Practice specifies procedures for approving plants on an annual basis and maintaining a plant approval document reviewed annually. Submittal documents pre approve specific documentation identified in this Standard Practice; replacing the requirement for contract specific submittals. Modifications can be made to the plants submittal at any time during the annual approval period.

6. Annual Plant Approval Requirements

6.1 Plants shall be initially approved through the QPL or RAM approval process. Plants shall not begin fabricating precast members prior to receiving WSDOT annual plant approval.

6.2 Maintain current PCI, or NPCA certification, or maintain current status as a recognized fabricator by ICBO or ICC-ES.

6.3 Maintain quality control staff meeting the training and certification requirements specified by the certifying organization.

6.4 Submit and maintain an annual approval document detailed in Section 6. Plants must complete and maintain all submittal requirements to remain in active approval status.

6.5 Submit annually by December 1st a document identifying the plant has reviewed their annual approval document and identifies whether the plant approval document remains unchanged, or details any anticipated revisions.

6.6 Successful completion of initial WSDOT plant approval detailed in Section 7 or successful maintenance of annual approval status detailed in Section 10.

7. Plant Submittal Requirement

7.1 Plants shall initially submit a document for annual approval that covers the submittal requirements of this section starting with section 6.1.1. The document may be submitted by mail or submitted electronically. Submit documents to the WSDOT Fabrication and Coatings Engineer.

7.1.1 Table of Contents

7.1.2 Table of Organization.

7.1.3 RAM documents. Submit RAM documents for the following materials.

- Concrete Ready Mix Batch Plant (as applicable)
- Epoxy Coated Reinforcing Steel
- Fabrication Facilities Manufacturing Welded Embeds and Fabricating Reinforcing Steel
- Reinforcing Steel

7.1.4 Concrete mix designs. Submit mix designs on the latest revision of WSDOT Form 350-040. Mix designs are to be filled out completely. Aggregate, cement, slag, and admixtures must be from WSDOT approved sources.

Mix design submittal shall include the following for each mix design;

- Compressive strength break history. A minimum of 15 sets (2 cylinders per set)
- Cement mill certification report
- Chloride Ion test results
- Self-compacting concrete test data

7.1.5 Curing procedures. Submit the procedure that will be used to cure precast members. Identify whether accelerated curing will be used and detail the procedure for monitoring and documenting curing operations.

7.1.6 Fabrication procedures and drawings. This submittal is for standard fabrication procedures and specialized fabrication procedures. Specialized procedures may be added to the annual plant submittal as approved by the WSDOT Bridge and Structures Office, to facilitate fabrication of precast structures. This is the section to add lower stripping strength approvals per Standard Specification section 6-02.3(28)B.

7.1.7 Weld procedures. Submit weld procedures for welding of embed plates or other structures as applicable to the plants manufacturing process.

7.1.8 Repair procedures. Submit repair procedures for anticipated repair scenarios. Approved repair procedures can be used during fabrication of precast members without further WSDOT engineering approval. Repair procedures must be detailed, including dimensional limits, and specific repair materials identified by material type, and brand name. Submittal shall include catalog cuts for repair materials.

7.1.9 Quality control plan. Submit quality control procedures and inspection forms. Inspection forms shall include information for the following.

- Pre Pour Inspection Report
- Wet Concrete Testing Report
- Compressive Strength Testing Report
- Non Conformance Report
- Post Pour Inspection Report

7.1.10 Ready mix batch plant NRMCA certification documentation as applicable. Not required for plants in house batch plant.

7.1.11 Problem resolution form. Submit a plant specific problem resolution form. Appendix "B" has an example of the Problem Resolution Form. This form is used to expedite resolution of construction issues encountered during fabrication of precast concrete structures.

7.1.12 Certificate of Compliance Document: Submit the form that will be used for the Certificate of Compliance document.

7.1.13 Final documentation package. Detail or outline the documents that will be provided to the WSDOT Materials and Fabrication Inspector prior to WSDOT final approval of precast members. Documents required in the final document package are as listed below.

- Pre Pour Inspection Report
- Wet Concrete Testing Report
- Compressive Strength Testing Report
- Post Pour Inspection Report
- Gradation Reports
- Cure Charts for accelerated curing
- Non Conformance Reports
- Problem Resolution documents
- Certificate of Compliance
- Certificate of Materials Origin (for projects with "Buy America" Requirement, WSDOT Form 350-109)
- Mill certs
  - Cement
  - Epoxy Coated Reinforcing Steel
  - Fly Ash
  - Micro Silica
  - Reinforcing Steel
  - Slag
  - Steel components

8. Initial Plant Approval Process

8.1 Upon receiving the plants initial submittal, WSDOT will review the contents of the submittal in preparation for WSDOT's initial plant approval meeting with representatives of the plant.

8.2 WSDOT will be allowed 90 days for review of the plants initial submittal document. Time for review will be longer if submittals are incomplete.

8.3 WSDOT review responsibilities.

8.3.1 WSDOT Fabrication and Coatings Engineer. Overall responsibility for annual approval and submittal review process. Coordinates all annual approval submittal activities. Reviews for acceptance all documentation with the exception of mix designs, specialized fabrication procedures, and repair procedures.

8.3.2 WSDOT Headquarters Materials Laboratory Fabrication Inspection Office. Responsible for review and acceptance of mix designs.

8.3.3 WSDOT Construction Office. Responsible for review and approval of repair procedures.

8.3.4 WSDOT Bridge and Structures Office. Responsible for approval of specialized fabrication procedures, and review and approval of welding procedures.

8.4 Review process.

8.4.1 The WSDOT Fabrication and Coatings Engineer will review portions of the plant submittal and will send specific sections referenced in Section 7.3 to the respective approving authorities.

8.4.2 Approving authorities will send reviewed documents back to the WSDOT Fabrication and Coatings Engineer.

8.4.3 The WSDOT Fabrication and Coatings Engineer will review the status of the submittals returned from the approving authorities and incorporate the documents into the annual plant approval document.

8.4.4 Submittal documents will be signed or stamped "Approved", "Approved as Noted", "Not Approved", or "Accepted" depending on their review status.

8.4.5 RAM documents will be coded with acceptance codes by the WSDOT Fabrication and Coatings Engineer. RAM codes for specific items are referenced in Appendix "C" of this Standard Practice.

8.4.6 The WSDOT Fabrication and Coatings Engineer will make an itemized list of review comments and action items and will place them at the front of the annual submittal document returned to the plant at the time of the initial plant approval meeting. If time allows, the Fabrication and Coatings Engineer will work directly with representatives from the plant to address review comments prior to the initial plant approval meeting.

8.4.7 The WSDOT Fabrication and Coatings Engineer will schedule the initial plant approval meeting and will send the plant a letter and email notifying them of the date and time WSDOT will be at the plant for the initial plant approval meeting.

8.4.8 WSDOT will perform a formal audit of the plants facility, and operating and quality control procedures prior to the initial plant approval meeting. WSDOT will contact the plant and inform them of the date and time a WSDOT inspector will be at the plant for an inspection audit. The audit will follow the outline detailed in Appendix "A".

8.4.9 WSDOT will provide the plant with an electronic version of the reviewed annual approval document within 30 days following completion of the initial plant approval meeting.

9. Initial Plant Approval Meeting

9.1 Scheduling

9.1.1 An initial plant approval meeting will be scheduled after WSDOT has completed its review of the plants initial submittal. The meeting will be held at the plants physical location. WSDOT will notify the plant of the date and time the meeting will be held.

9.2 Attendees

9.2.1 WSDOT attendees will include at a minimum, the WSDOT Fabrication and Coatings Engineer and a supervising inspector from the Materials and Fabrication Inspection Office.

9.2.2 Attendees from the plant shall include at a minimum the plant manager, production manager, and quality control manager, or their respective representatives.

9.3 Meeting Agenda

9.3.1 The meeting agenda will focus on comments from WSDOT's review of the plants annual approval document submittal, and WSDOT's plant inspection audit completed prior to the meeting.

9.3.2 WSDOT will inform the plant of their approval status upon completion of the initial approval meeting. Any deficiencies that would prevent approval will be identified and discussed during the meeting.

10. Initial Plant Approval Status Notification

10.1 Within 30 days following the initial plant approval meeting, the WSDOT Fabrication and Coatings Engineer will send the plant a letter informing the plant of their approval status and the period of effectiveness. Any deficiencies identified during the annual plant review audit that would prevent annual approval will be identified in the letter.

11. Maintenance of Plant Approval Status After Initial Approval

11.1 Annual approval documents will remain in affect indefinitely as long as the document is maintained each calendar year.

11.2 The WSDOT Fabrication and Coatings Engineer will send each plant a letter in October requesting a document identifying the plant has reviewed their annual approval document and identifies whether the plant approval documents remain unchanged, or details any anticipated revisions. The letter will also detail any changes to WSDOT's program that would affect the annual approval document. The document and any revisions ready for submittal shall be sent electronically to the WSDOT Fabrication and Coatings Engineer no later than December 1st.

11.3 Revisions to mix designs will be processed through the QPL or reviewed during WSDOT project specific work activities. WSDOT will provide plants with a cost estimate for review of mix designs submitted through the QPL process. Costs associated with mix design reviews for project specific work activities will be based on the same process for review through the RAM process. Only mix designs reviewed by the WSDOT Headquarters Materials Laboratory will be added to the annual plant approval document.

11.4 Revisions submitted by the plant will be reviewed as detailed in Section 7.4.1 through 7.4.5.

11.5 The WSDOT Fabrication and Coatings Engineer will review annual plant approval documents in December. Review comments will be provided to plants for their action by January 15th. Upon resolution of review comments, the WSDOT Fabrication and Coatings Engineer will document revisions to the annual approval document and will maintain revision control by adding "Approved", "Approved as Noted", "Not approved", or "Accepted" revisions to the document and providing plants with an electronic version of the plants complete approval document. WSDOT will provide a revision control document at the front of the annual approval document, which details the changes from the previous version.

11.6 Onsite inspection audits will be performed by WSDOT when the plant starts its first project each calendar year. Audits will not be performed by WSDOT until there is work taking place. If a calendar year passes without an active project, WSDOT will perform an inspection audit when WSDOT project specific work starts. The audit will follow the outline detailed in Appendix A.

12. Annual Maintenance Approval Status Notification

12.1 Upon successful completion of WSDOT's annual plant approval document review and onsite plant inspection as applicable, the WSDOT Fabrication and Coatings Engineer will send the plant a letter informing the plant of their approval status and the period of effectiveness. Any deficiencies identified during the annual plant review that would prevent annual approval will be identified in the letter.

Appendix A Precast / Prestress Plant Inspection Audit

Plant: _____ Date: _____

Phone Number: _____ Contact Person: _____

Plant Reviewed by: _____

Review Results: Acceptable ☐ Unacceptable ☐

Materials

Concrete Cylinders

Is cylinder fabrication and testing in accordance with WSDOT test methods? ☐ Yes ☐ No

Does cylinder storage comply with specifications? ☐ Yes ☐ No

Is cylinder capping acceptable? ☐ Yes ☐ No

Method of capping: ☐ Sulphur ☐ Rubber caps ☐ Other _____

What types of molds are used? ☐ Paper ☐ Plastic ☐ Steel ☐ Securer

Is cylinder testing machine calibrated? ☐ Yes ☐ No

Comments: _____

Cement

Is cement from an approved source? ☐ Yes ☐ No

Are cement certifications available? ☐ Yes ☐ No

Is cement storage acceptable? ☐ Yes ☐ No

Comments: _____

Aggregate

Has aggregate source been approved by WSDOT? ☐ Yes ☐ No

Does plant use WSDOT grading? ☐ Yes ☐ No

Is aggregate sampled and tested prior to use? ☐ Yes ☐ No

Is aggregate storage acceptable? ☐ Yes ☐ No

Comments: _____

Reinforcing Steel

Are mill test certificates available? ☐ Yes ☐ No

Is fabrication acceptable? ☐ Yes ☐ No

Is storage acceptable? ☐ Yes ☐ No

Comments: _____

Forms

Are forms clean, straight and in good condition? ☐ Yes ☐ No

Are forms checked for dimensions prior to use? ☐ Yes ☐ No

Comments: _____

Batch Plant

Does batch plant meet the certification requirements of the WSDOT Std. Spec. ☐ Yes ☐ No

Date of scale calibration: _____

Comments: _____

Fabrication

Set Up

Is reinforcing steel placed per contract ☐ Yes ☐ No

Is steel tied according to specifications and held in place during concrete placement? ☐ Yes ☐ No

Is the plant aware tack welding is not permitted? ☐ Yes ☐ No

Is there a Plant QC hold point for inspection prior to setting forms? ☐ Yes ☐ No

Comments: _____

Concrete Placement

Is concrete delivered in a timely manner? ☐ Yes ☐ No

Is plant using approved concrete mix design? ☐ Yes ☐ No

Is required concrete testing being done? ☐ Yes ☐ No

Is there adequate equipment for concrete placement in forms? ☐ Yes ☐ No

Is concrete placed per specifications? ☐ Yes ☐ No

Comments: _____

Curing

Is temperature measuring equipment acceptable? ☐ Yes ☐ No

Is product protected during curing? ☐ Yes ☐ No

Are test cylinders cured under same conditions as product? ☐ Yes ☐ No

What type of curing system is used?

Radiant _____
Hot air _____
Convection _____
Conducted Steam _____
Other _____

Comments: _____

Stripping Procedures

Are concrete cylinders for verification of stripping strength representative of the product? ☐ Yes ☐ No

Is required stripping strength being verified with cylinder breaks prior to stripping? ☐ Yes ☐ No

Comments: _____

Inspection

Does plant inspection staff have a good understanding of their job responsibilities? ☐ Yes ☐ No

Does plant inspection staff have adequate Training? ☐ Yes ☐ No

Is plant inspection staff familiar with the WSDOT Annual Approval process and procedures? ☐ Yes ☐ No

Are approved shop drawings, plans, and calculations available? ☐ Yes ☐ No

Are quality control procedures being followed? ☐ Yes ☐ No

Are quality control reports being filled out Properly? ☐ Yes ☐ No

Has the plant quality control department verified product repairs, workmanship, and finish are acceptable? ☐ Yes ☐ No

Comments: _____

Product Handling and Storage

Are products handled and stored properly? ☐ Yes ☐ No

Comments: _____

Overall Review Comments

Review Attendees

Name	Job Description	Phone/Email

Appendix B Manufacturers Name Precast Problem Resolution Request

Date: _____

Submitted To: _____

WSDOT Construction Engineer Email: PrecastPRR@wsdot.wa.gov

Contractor _____

Fax: _____/Email: _____

WSDOT Contract No: _____

Project Name: _____

Company Name: _____

Submitted By (Contact Person): _____

Telephone No: _____ Fax No: _____

Email: _____

Priority: ☐ High ☐ Medium ☐ Low

Request Response Time: _____

Description of Problem:

Proposed Resolution:

WSDOT Fabrication Inspector's Name and Signature:

_____ _____

Name Signature

Appendix C AM Acceptance Codes

Products	RAM Code
Concrete Ready Mix Batch Plant	8
Epoxy Coated Reinforcing Steel	2, 5, 6
Fabrication Facilities (Steel Embeds & Fabricating Rebar)	8
Reinforcing Steel	2, 6

RAM Acceptance Action Codes

1) Acceptance based upon 'Satisfactory' Test Report for samples of materials to be incorporated into the project.
2) Mfg. Cert. of Compliance for 'Acceptance' prior to use of material.
3) Catalog Cuts for 'Acceptance' prior to use of material.
4) Not Listed (No relevance to annual submittal process)
5) Only Materials Tagged 'Approved for Shipment'
6) Submit Certificate of Materials Origin to Project Engineer Office. (Only for projects with "Buy America" requirement.
7) Not Listed (No relevance to annual submittal process)
8) Source Approved
9) Approval Withheld; submit samples for preliminary evaluation
10) Approval Withheld
11) Miscellaneous Acceptance Criteria

WSDOT Errata to FOP for AASHTO T 2

Sampling of Aggregates

WAQTC FOP for AASHTO T 2 has been adopted by WSDOT with the following changes:

Procedure – General

TABLE 1 Recommended Sample Sizes – *Shall conform to the following table and note.*

Nominal Maximum Size*in (mm)		Minimum Mass lb (kg)	
US No. 4	(4.75)	5	(2)
¼	(6.3)	10	(4)
⅜	(9.5)	10	(4)
½	(12.5)	20	(8)
⅝	(16.0)	20	(8)
¾	(19.0)	30	(12)
1	(25.0)	55	(25)
1¼	(31.5)	70	(30)
1½	(37.5)	80	(36)
2	(50)	90	(40)
2½	(63)	110	(50)
3	(75)	140	(60)
3½	(90)	180	(80)

Note: For an aggregate specification having a generally unrestrictive gradation (i.e., wide range of permissible upper sizes), where the source consistently fully passes a screen substantially smaller than the maximum specified size, the nominal maximum size, for the purpose of defining sampling and test specimen size requirements may be adjusted to the screen, found by experience to retain no more than 5 percent of the materials.

Procedure – Specific Situations

Roadways

Method A (Berm or Windrow) – *Method not recognized by WSDOT.*

Method B (In-Place) – *Method not recognized by WSDOT.*

FOP for AASHTO T 2

Sampling of Aggregates

Scope

This procedure covers sampling of coarse, fine, or a combination of coarse and fine aggregates (CA and FA) in accordance with AASHTO T 2-91. Sampling from conveyor belts, transport units, roadways, and stockpiles is covered.

Apparatus

- Shovels or scoops, or both
- Sampling tubes of acceptable dimensions
- Mechanical sampling systems: normally a permanently attached device that allows a sample container 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
- Belt template
- Sampling containers

Procedure – General

Sampling is as important as testing. The technician shall use every precaution to obtain samples that are representative of the material. Determine the time or location for sampling in a random manner.

1. Wherever samples are taken, obtain multiple increments of approximately equal size.
2. Mix the increments thoroughly to form a field sample that meets or exceeds the minimum mass recommended in Table 1.

Table 1 Recommended Sample Sizes

Nominal Maximum Size* mm (in)		Minimum Mass g (lb)	
90	(3½)	175,000	(385)
75	(3)	150,000	(330)
63	(2½)	125,000	(275)
50	(2)	100,000	(220)
37.5	(1½)	75,000	(165)
25.0	(1)	50,000	(110)
19.0	(¾)	25,000	(55)
12.5	(½)	15,000	(35)
9.5	(⅜)	10,000	(25)
4.75	(No. 4)	10,000	(25)
2.36	(No. 8)	10,000	(25)

*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. Maximum size is one size larger than nominal maximum size.

Note 1: Sample size is based upon the test(s) required. As a general rule, the field sample size should be such that, when split twice will provide a testing sample of proper size. For example, the sample size may be four times that shown in Table 2 of the FOP for AASHTO T 27/T 11, if that mass is more appropriate.

Procedure – Specific Situations

Conveyor Belts

Avoid sampling at the beginning or end of the aggregate run due to the potential for segregation. Be careful when sampling in the rain. Make sure to capture fines that may stick to the belt or that the rain tends to wash away.

Method A (From the Belt)

1. Stop the belt.
2. Set the sampling template in place on the belt, avoiding intrusion by adjacent material.
3. Remove the material from inside the template, including all fines.
4. Obtain at least three approximately equal increments.
5. Combine the increments to form a single sample.

Method B (From the Belt Discharge)

1. Pass a sampling device through the full stream of the material as it runs off the end of the conveyor belt. The sampling device may be manually, semi-automatic or automatically powered.
2. The sampling device shall pass through the stream at least twice, once in each direction, without overfilling while maintaining a constant speed during the sampling process.
3. When emptying the sampling device into the container, include all fines.
4. Combine the increments to form a single sample.

Transport Units

1. Visually divide the unit into four 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 single sample.

Roadways

Method A (Berm or Windrow)

1. Obtain sample before spreading.
2. Take the increments from at least three random locations along the fully-formed windrow or berm. Do not take the increments from the beginning or the end of the windrow or berm.
3. Obtain full cross-section samples of approximately equal size at each location. Take care to exclude the underlying material.
4. Combine the increments to form a single sample.

Note 2: Obtaining samples from berms or windrows may yield extra-large samples and may not be the preferred sampling location.

Method B (In-Place)

1. Obtain sample after spreading and before compaction.
2. Take the increments from at least three random locations.
3. Obtain full-depth increments of approximately equal size from each location. Take care to exclude the underlying material.
4. Combine the increments to form a single sample.

Stockpiles

Method A– Loader sampling

1. Direct the loader operator to enter the stockpile with the bucket at least 150 mm (6 in) above ground level without contaminating the stockpile.
2. Discard the first bucketful.
3. Have the loader re-enter the stockpile and obtain a full loader bucket of the material, tilt the bucket back and up.
4. Form a small sampling pile at the base of the stockpile by gently rolling the material out of the bucket with the bucket just high enough to permit free-flow of the material. (Repeat as necessary.)
5. Create a flat surface by having the loader back drag the small pile.
6. Visually divide the flat surface into four quadrants.
7. Collect an increment from each quadrant by fully inserting the shovel into the flat pile as vertically as possible, take care to exclude the underlying material, roll back the shovel and lift the material slowly out of the pile to avoid material rolling off the shovel.

Method B – Stockpile Face Sampling

1. Create horizontal surfaces with vertical faces in the top, middle, and bottom third of the stockpile with a shovel or loader.
2. Prevent continued sloughing by shoving a flat board against the vertical face. Sloughed material will be discarded to create the horizontal surface.
3. Obtain sample from the horizontal surface as close to the intersection as possible of the horizontal and vertical faces.
4. Obtain at least one 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.

Method C – Alternate Tube Method (Fine Aggregate)

1. Remove the outer layer that may have become segregated.
2. Using a sampling tube, obtain one increment of equal size from a minimum of five random locations on the pile.
3. Combine the increments to form a single sample.

Note 3: Obtaining samples at stockpiles should be avoided whenever possible due to problems involved in obtaining a representative gradation of material.

Report

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

Performance Exam Checklist

FOP for AASHTO T 2
Sampling of Aggregates

Participant Name _____ Exam Date _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

Procedure Element	Trial 1	Trial 2
Conveyor Belts – Method A (From the Belt)		
1. Belt stopped?		
2. Sampling template set on belt, avoiding intrusion of adjacent material?		
3. Sample, including all fines, scooped off?		
4. Samples taken in at least three approximately equal increments?		
Conveyor Belts – Method B (From the Belt Discharge)		
5. Sampling device passed through full stream of material twice (once in each direction) as it runs off end of belt?		
Transport Units		
6. Unit divided into four quadrants?		
7. Increment obtained from each quadrant, 0.3 m (1 ft) below surface?		
8. Increments combined to make up the sample?		
Roadways Method A (Berm or Windrow)		
9. Sample taken prior to spreading?		
10. Full depth of material taken?		
11. Underlying material excluded?		
12. Samples taken in at least three approximately equal increments?		
Roadways Method B (In-place)		
13. Sample taken after spreading?		
14. Full depth of material taken?		
15. Underlying material excluded?		
16. Samples taken in at least three approximately equal increments?		

Procedure Element	Trial 1	Trial 2
Stockpile Method A– (Loader sampling)		
17. Loader operator directed to enter the stockpile with the bucket at least 150 mm (6 in) above ground level without contaminating the stockpile?	_____	_____
18. First bucketful discarded?	_____	_____
19. The loader re-entered the stockpile and obtained a full loader bucket of the material with the bucket tilted back and up?	_____	_____
20. A small sampling pile formed at the base of the stockpile by gently rolling the material out of the bucket with the bucket just high enough to permit free-flow of the material?	_____	_____
21. A flat surface created by the loader back dragging the small pile?	_____	_____
22. Increment sampled from each quadrant by fully inserting the shovel into the flat pile as vertically as possible, care taken to exclude the underlying material?	_____	_____
Stockpile Method B (Stockpile Face)		
23. Created horizontal surfaces with vertical faces?	_____	_____
24. At least one increment taken from each of the top, middle, and bottom thirds of the stockpile.	_____	_____
Stockpile Method C – Alternate Tube Method (Fine Aggregate)		
25. Outer layer removed?	_____	_____
26. Increments taken from at least five locations with a sampling tube?	_____	_____
General		
27. Increments mixed thoroughly to form sample?	_____	_____

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner _____ WAQTC #:_____

Comments:

Performance Exam Checklist (Oral)

FOP for AASHTO T 2
Sampling of Aggregates

Participant Name _____ Exam Date _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

Procedure Element	Trial 1	Trial 2
1. How is a sample obtained from a conveyor belt using Method A?		
a) Stop the belt.		
b) Set the sampling template on belt, avoiding intrusion of adjacent material.		
c) All the material is removed from belt including all fines.		
d) Take at least approximately three equal increments.		
2. How is a sample obtained from a conveyor belt using Method B?		
a) Pass the sampling device through a full stream of material as it runs off the end of the belt.		
b) The device must be passed through at least twice (once in each direction).		
3. How is a sample obtained from a Transport Unit?		
a) Divide the unit into four quadrants.		
b) Dig 0.3 m (1 ft.) below surface.		
c) Obtain an increment from each quadrant.		
4. Describe the procedure for sampling from roadways Method A (Berm or Windrow).		
a) Sample prior to spreading		
b) Sample the material full depth without obtaining underlying material.		
c) Take at least three approximately equal increments.		
5. Describe the procedure for sampling from roadway Method B (In-place).		
a) Sample after spreading, prior to compaction.		
b) Sample the material full depth without obtaining underlying material.		
c) Take at least three approximately equal increments.		
6. Describe the procedure for sampling a stockpile Method A (Loader Sampling).		
a) Loader creates sampling pile with a flat surface.		
b) Divide the flat surface into four quadrants.		
c) Take an approximately equal increment from each quadrant, excluding the underlying material.		

Procedure Element	**Trial 1**	**Trial 2**
7. Describe the procedure for sampling a stockpile Method B (Stockpile Face Sampling).	_____	_____
a) Create horizontal surfaces with vertical faces and at least one increment taken from each of the top, middle, and bottom thirds of the stockpile.	_____	_____
8. Describe the procedure for sampling a stockpile Method C – Alternate Tube Method (Fine Aggregate).	_____	_____
a) Remove the outer layer and increments taken from at least five locations.	_____	_____
9. After obtaining the increments what should you do before performing R 76?	_____	_____
a) Increments mixed thoroughly to form sample.	_____	_____

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner _____ WAQTC #:_____

Comments:

WSDOT Errata to FOP for AASHTO T 168

Sampling of Bituminous Paving Mixtures

WAQTC FOP for AASHTO T 168 has been adopted by WSDOT with the following changes:

Sample Size

For Acceptance sampling and testing only: WSDOT requires a minimum of two times the amount required for testing. This should be 60 lbs.

For Acceptance and Conformation sampling and testing: WSDOT requires a minimum of four times the amount required for testing. This should be approximately 120 lbs. (See WSDOT *Construction Manual* Section 9-3.7 for Conformation sampling frequency)

Sampling

General

Include the steps below:

- Immediately upon obtaining a sample, using a verified thermometer, check and record temperature of the sample.
- The material shall be tested to determine variations. The supplier/contractor shall sample the HMA mixture in the presence of the Project Engineer. The supplier/contractor shall provide one of the following for safe and representative sampling:
  a. A mechanical sampling device installed between the discharge of the silo and the truck transport that is approved by the Regional Materials Engineer.
  b. Platforms or devices to enable sampling from the truck transport without entering the truck transport for sampling HMA.

Attached Sampling Devices

Sampling from Roadway Prior to Compaction (Plate Method)

Method 1 - Obtaining a Sample on Untreated Base: - *Method not recognized by WSDOT*.

Method 2 - Obtaining a Sample on Asphalt Surface: - *Method not recognized by WSDOT*.

FOP for AASHTO T 168

Sampling of Bituminous Paving Mixtures

Scope

This procedure covers the sampling of bituminous paving mixtures from HMA plants, haul units, and roadways in accordance with AASHTO T 168-03. Sampling is as important as testing, and every precaution must be taken to obtain a truly representative sample.

Apparatus

- Shovel
- Sample containers: such as cardboard boxes, metal cans, stainless steel bowls, or other agency-approved containers
- Scoops, trowels, or other equipment to obtain mix
- 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. Holes ¼ in in diameter should be provided in each corner.
- 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 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

Sample Size

Sample size depends on the test methods specified by the agency for acceptance. Check agency requirement for the size required.

Sampling

General

- 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.
- 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. Do not put open graded mixture samples in boxes until they have cooled to the point that bituminous material will not migrate from the aggregate.

Attached Sampling Devices

Some agencies require mechanical sampling devices for hot mix asphalt (HMA) and cold feed aggregate on some projects. These are normally permanently attached devices that allow a sample container to pass perpendicularly through the entire stream of material or divert the entire stream of material into the container. Operation may be hydraulic, pneumatic, or manual and allows the sample container to pass through the stream twice, once in each direction, without overfilling. Special caution is necessary with manually operated systems since a consistent speed is difficult to maintain and non-representative samples may result. Check agency requirements for the specifics of required sampling systems.

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 through the material perpendicularly without overfilling the container.
3. Repeat until proper sample size has been obtained.
4. Transfer the HMA to an agency-approved container without loss of material.

Sampling from Haul Units

1. Visually divide the haul unit into approximately four equal quadrants.
2. Identify one sampling location in each quadrant.
3. Dig down and remove approximately 0.3 m (1 ft) of material to avoid surface segregation. Obtain each increment from below this level.
4. Combine the increments to form a sample of the required size.

Sampling from Roadway Prior to Compaction (Plate Method)

Plate method using the “cookie cutter” sampling device.

There are two conditions that will be encountered when sampling hot mix asphalt (HMA) from the roadway prior to compaction. The two conditions are:

- Laying HMA on grade or untreated base material requires Method 1.
- Laying HMA on existing asphalt or laying a second lift of HMA requires Method 2.

SAFETY

Sampling is performed behind the paving machine and in front of the breakdown roller. For safety, the roller must remain at least 3 m (10 ft) behind the sampling operation until the sample has been taken and the hole filled with loose HMA.

Method 1 requires a plate to be placed in the roadway in front of the paving operation and therefore 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 time, 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 Untreated Base:

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.
2. Secure the plate in place by driving a nail through the hole in the lead corner of the plate.
3. Pull the wire, attached to the outside corner of the plate, taut past the edge of the HMA mat and secure with a nail.
4. Let the paving operation proceed over the plate and wire. Immediately proceed with the sampling.
5. Using the exposed end of the wire, pull the wire up through the fresh HMA to locate the corner of the plate. 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 HMA to the plate.
6. Using a small square tipped shovel or scoop, or both, carefully remove all the HMA from inside of the cutter and place in a sample container. Care shall be taken to prevent contamination of bituminous mixes by dust or other foreign matter, and to avoid segregation of aggregate and bituminous materials.
7. Remove the sample cutter and the plate from the roadway. The hole made from the sampling must be filled by the contractor with loose HMA.

Method 2 - Obtaining a Sample on Asphalt Surface:

1. After the paving machine has passed the sampling point, immediately place the “cookie cutter” sampling device on the location to be sampled. Push the cutter down through the HMA until it is flat against the underlying asphalt mat.
2. Using a small square tipped shovel or scoop, or both, carefully remove all the HMA from inside of the cutter and place in a sample container. The hole made from the sampling must be filled by the contractor with loose HMA.

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

Performance Exam Checklist

FOP For AASHTO T 168
SAMPLING BITUMINOUS PAVING MIXTURES

Participant Name _____ Exam Date _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

Procedure Element	Trial 1	Trial 2
1. Was sample taken with an attached sampling device correctly?		
a. Container coated or preheated or both?		
b. Sampling device passed through stream twice perpendicular to material?		
c. Sampling device not over filled?		
2. Samples from truck transports taken from four quadrants at required depth of 300 mm (12 in)?		
3. Samples from roadway taken correctly with plate(s).		
a. When on untreated base plate placed well in front of paver?		
b. Wire pulled to locate plate corner?		
c. Cookie cutter placed on asphalt and pushed through to plate?		
d. All material removed from inside the cutter?		
4. Sample placed in appropriate container.		
5. Sample size meets agency requirements?		
6. Sample identified as required?		

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner _____ WAQTC #:_____

Comments:

Performance Exam Checklist (Oral)

FOP For AASHTO T 168
SAMPLING BITUMINOUS PAVING MIXTURES

Participant Name _____ Exam Date _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

Procedure Element	Trial 1	Trial 2
1. At the hot plant how must a sample be obtained using an attached sampling device?		
a. Coat or preheat sample container.		
b. Sampling device passed through stream twice perpendicular to material.		
c. The sampling device cannot be overfilled.		
2. What must be done to sample from transport units?		
a. Divide the unit into four quadrants.		
b. Obtain increments from each quadrant, 300 mm (12 in) below surface.		
3. Describe how to take samples from the roadway using a plate.		
a. Place the plate well in front of the paver.		
b. Pull the wire to locate the corner of the plate.		
c. Place the cutter on the HMA above the plate and push it down to the plate.		
d. Collect all the material inside the cutter.		
4. What types of containers can be used?		
a. Cardboard boxes, stainless steel bowls, or other agency approved containers.		
5. What dictates size of sample?		
a. Agency requirements.		
b. Specified by test method.		

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner _____ WAQTC #:_____

Comments:

WSDOT Errata to FOP for AASHTO T 310

In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

WAQTC FOP for AASHTO T 310 has been adopted by WSDOT with the following changes:

Procedure

Replace step 1 with below:

1. WSDOT requires test location selected per WSDOT SOP 615.

6. Place the gauge on the prepared surface so the source rod can enter the hole without disturbing loose material.

Include note below:

Note: For alignment purposes, the user may expose the source rod for a maximum of ten seconds.

10. Perform one of the following methods, per agency requirements:
    a. Method A Single Direction: - Method not recognized by WSDOT.
11. Step not required by WSDOT.
12. Step not required by WSDOT.

Percent Compaction

Determined using WSDOT SOP 615.

FOP for AASHTO T 310

In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Scope

This procedure covers the determination of density, moisture content, and relative compaction of soil, aggregate, and soil-aggregate mixes in accordance with AASHTO T 310-13. This field operating procedure is derived from AASHTO T 310. The nuclear moisture-density gauge is used in the direct transmission mode.

Apparatus

- Nuclear density gauge with the factory matched standard reference block.
- Drive pin, guide/scraper plate, and hammer for testing in direct transmission mode.
- Transport case for properly shipping and housing the gauge and tools.
- Instruction manual for the specific make and model of gauge.
- Radioactive materials information and calibration packet containing:
  - Daily Standard Count Log.
  - Factory and Laboratory Calibration Data Sheet.
  - Leak Test Certificate.
  - Shippers Declaration for Dangerous Goods.
  - Procedure Memo for Storing, Transporting and Handling Nuclear Testing Equipment.
  - Other radioactive materials documentation as required by local regulatory requirements.
- Sealable containers and utensils for moisture content determinations.

Radiation Safety

This method does not purport to address all of the safety problems associated with its use. This test method involves potentially hazardous materials. The gauge utilizes radioactive materials that may be hazardous to the health of the user unless proper precautions are taken. Users of this gauge must become familiar with the applicable safety procedures and governmental regulations. All operators will be trained in radiation safety prior to operating nuclear density gauges. Some agencies require the use of personal monitoring devices such as a thermoluminescent dosimeter or film badge. Effective instructions together with routine safety procedures such as source leak tests, recording and evaluation of personal monitoring device data, etc., are a recommended part of the operation and storage of this gauge.

Calibration

Calibrate the nuclear gauge as required by the agency. This calibration may be performed by the agency using manufacturer's recommended procedures or by other facilities approved by the agency. Verify or re-establish calibration curves, tables, or equivalent coefficients every 12 months.

Standardization

1. Turn the gauge on and allow it to stabilize (approximately 10 to 20 minutes) prior to standardization. Leave the power on during the day's testing.
2. Standardize the nuclear gauge at the construction site at the start of each day's work and as often as deemed necessary by the operator or agency. Daily variations in standard count shall not exceed the daily variations established by the manufacturer of the gauge. If the daily variations are exceeded after repeating the standardization procedure, the gauge should be repaired and/or recalibrated.
3. Record the standard count for both density and moisture in the Daily Standard Count Log. The exact procedure for standard count is listed in the manufacturer's Operator's Manual.

   Note 1: New standard counts may be necessary more than once a day. See agency requirements.

Overview

There are two methods for determining in-place density of soil/soil aggregate mixtures. See agency requirements for method selection.

- Method A Single Direction
- Method B Two Direction

Procedure

1. Select a test location(s) randomly and in accordance with agency requirements. Test sites should be relatively smooth and flat and meet the following conditions:
   a. At least 10 m (30 ft) away from other sources of radioactivity
   b. At least 3 m (10 ft) away from large objects
   c. The test site should be at least 150 mm (6 in) away from any vertical projection, unless the gauge is corrected for trench wall effect.
2. Remove all loose and disturbed material, and remove additional material as necessary to expose the top of the material to be tested.
3. Prepare a flat area sufficient in size to accommodate the gauge. Plane the area to a smooth condition so as to obtain maximum contact between the gauge and the material being tested. For Method B, the flat area must be sufficient to permit rotating the gauge 90 or 180 degrees about the source rod.
4. Fill in surface voids beneath the gauge with fines of the material being tested passing the 4.75 mm (No. 4) sieve or finer. Smooth the surface with the guide plate or other suitable tool. The depth of the filler should not exceed approximately 3 mm (⅛ in).
5. Make a hole perpendicular to the prepared surface using the guide plate and drive pin. The hole shall be at least 50 mm (2 in) deeper than the desired probe depth, and shall be aligned such that insertion of the probe will not cause the gauge to tilt from the plane of the prepared area. Remove the drive pin by pulling straight up and twisting the extraction tool.
6. Place the gauge on the prepared surface so the source rod can enter the hole without disturbing loose material.

7. Insert the probe in the hole and lower the source rod to the desired test depth using the handle and trigger mechanism.
8. Seat the gauge firmly by partially rotating it back and forth about the source rod. Ensure the gauge is seated flush against the surface by pressing down on the gauge corners, and making sure that the gauge does not rock.
9. Pull gently on the gauge to bring the side of the source rod nearest to the scaler/detector firmly against the side of the hole.
10. Perform one of the following methods, per agency requirements:
    a. Method A Single Direction: Take a test consisting of the average of two, one-minute readings, and record both density and moisture data. The two wet density readings should be within 32 kg/m^3 (2.0 lb/ft^3) of each other. The average of the two wet densities and moisture contents will be used to compute dry density.
    b. Method B Two Direction: Take a one-minute reading and record both density and moisture data. Rotate the gauge 90 or 180 degrees, pivoting it around the source rod. Reseat the gauge by pulling gently on the gauge to bring the side of the source rod nearest to the scaler/detector firmly against the side of the hole and take a one-minute reading. (In trench locations, rotate the gauge 180 degrees for the second test.) Some agencies require multiple one-minute readings in both directions. Analyze the density and moisture data. A valid test consists of wet density readings in both gauge positions that are within 50 kg/m^3 (3.0 lb/ft^3). If the tests do not agree within this limit, move to a new location. The average of the wet density and moisture contents will be used to compute dry density.
11. If required by the agency, obtain a representative sample of the material, 4 kg (9.0 lb) minimum, from directly beneath the gauge full depth of material tested. This sample will be used to verify moisture content and/or identify the correct density standard. Immediately seal the material to prevent loss of moisture.

    The material tested by direct transmission can be approximated by a cylinder of soil approximately 300 mm (12 in) in diameter directly beneath the centerline of the radioactive source and detector. The height of the cylinder will be approximately the depth of measurement. When organic material or large aggregate is removed during this operation, disregard the test information and move to a new test site.
12. To verify the moisture content from the nuclear gauge, determine the moisture content with a representative portion of the material using the FOP for AASHTO T 255/T 265 or other agency approved methods. If the moisture content from the nuclear gauge is within ± 1 percent, the nuclear gauge readings can be accepted. Moisture content verification is gauge and material specific. Retain the remainder of the sample at its original moisture content for a one-point compaction test under the FOP for AASHTO T 272, or for gradation, if required.

    Note 2: Example: A gauge reading of 16.8 percent moisture and an oven dry of 17.7 percent are within the ± 1 percent requirements. Moisture correlation curves will be developed according to agency guidelines. These curves should be reviewed and possibly redeveloped every 90 days.

13. Determine the dry density by one of the following.

    a. From nuclear gauge readings, compute by subtracting the mass (weight) of the water (kg/m^3 or lb/ft^3) from the wet density (kg/m^3 or lb/ft^3) or compute using the percent moisture by dividing wet density from the nuclear gauge by 1 + moisture content expressed as a decimal.

    b. When verification is required and the nuclear gauge readings cannot be accepted, the moisture content is determined by the FOP for AASHTO T 255/T 265 or other agency approved methods. Compute dry density by dividing wet density from the nuclear gauge by 1 + moisture content expressed as a decimal.

Percent Compaction

- Percent compaction is determined by comparing the in-place dry density as determined by this procedure to the appropriate agency density standard. For soil or soil-aggregate mixes, these are moisture-density curves developed using the FOP for AASHTO T 99/T 180. When using maximum dry densities from the FOP for AASHTO T 99/T 180 or FOP for AASHTO T 272, it may be necessary to use the Annex in the FOP for T 99/T 180 to determine corrected maximum dry density and optimum moisture content.

  For coarse granular materials, the density standard may be density-gradation curves developed using a vibratory method such as AKDOT&PF's ATM 212, ITD's T 74, WSDOT's TM 606, or WFLHD's Humphres.

See appropriate agency policies for use of density standards.

Calculation

Wet density readings from gauge: 1963 kg/m^3 (121.6 lb/ft^3)
1993 kg/m^3 (123.4 lb/ft^3)

Avg: 1978 kg/m^3 (122.5 lb/ft^3)

Moisture readings from gauge: 14.2% and 15.4% = Avg 14.8%

Moisture content from the FOP's for AASHTO T 255/ T 265: 15.9%

Moisture content is greater than 1 percent different so the gauge moisture cannot be used.

Calculate the dry density as follows:

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

Where:

ρ_d = Dry density, kg/m^3 (lb/ft^3)
ρ_w = Wet density, kg/m^3 (lb/ft^3)
w = Moisture content from the FOP's for AASHTO T 255/T 265, as a percentage

$$\rho_d = \left(\frac{1978\,kg/m^3\ or\ 122.5\ lb/ft^3}{15.9 + 100}\right) \times 100 \quad \rho_d = \left(\frac{1978\,kg/m^3\ or\ 122.5\ lb/ft^3}{\frac{15.9}{100} + 1}\right)$$

Corrected for moisture Dry Density: 1707 kg/m^3 (105.7 lb/ft^3)

Calculate percent compaction as follows:

$$\% \text{ Compaction} = \frac{\rho_d}{Agency\ density\ standard} \times 100$$

Example:

$$\% \ Compaction = \frac{105.7\ lb/ft^3}{111.3\ lb/ft^3} \times 100 = 95\%$$

Where:

ρ_d = Dry density, kg/m^3 (lb/ft^3)
Agency density standard = Corrected maximum dry density from the FOP from T 99/T 180 Annex

Report

- Results on forms approved by the agency
- Sample ID
- Location of test, elevation of surface, and thickness of layer tested.
- Visual description of material tested.
- Make, model and serial number of the nuclear moisture-density gauge.
- Wet density to 0.1 lb/ft^3.
- Moisture content as a percent, by mass, of dry soil mass to 0.1 percent.
- Dry density to 0.1 lb/ft^3.
- Density standard to 0.1 lb/ft^3.
- Percent compaction.
- Name and signature of operator.

Performance Exam Checklist

FOP for AASHTO T 310
In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Participant Name _____ Exam Date _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

Procedure Element	Trial 1	Trial 2
1. Gauge turned on 10 to 20 minutes before use?		
2. Calibration verified?		
3. Standard count taken and recorded in accordance with manufacturer's instructions?		
4. Test location selected appropriately 10 m (30 ft) from other radioactive sources, 3 m (10 ft) from large objects, 150 mm (6 in) away from vertical projections?		
5. Loose, disturbed material removed?		
6. Flat, smooth area prepared?		
7. Surface voids filled with native fines (-No. 4) to 3 mm (⅛ in) maximum thickness?		
8. Hole driven 50 mm (2 in) deeper than probe depth?		
9. Gauge placed, probe placed, and source rod lowered without disturbing loose material?		
10. Method A:		
a. Gauge firmly seated, and gently pulled back so that the source rod is against the side of the hole toward the scaler/detectors?		
b. Two, one-minute reading taken; wet density within 32 kg/m^3 (2.0 lb/ft^3)?		
c. Density and moisture data averaged?		
11. Method B:		
a. Gauge firmly seated, and gently pulled back so that the source rod is against the side of the hole toward the scaler/detectors?		
b. A minimum of a one-minute reading taken; density and moisture data recorded?		
c. Gauge turned 90° or 180° (180° in trench)?		
d. Gauge firmly seated, and gently pulled back so that the source rod is against the side of the hole toward the scaler/detectors?		
e. A minimum of a one-minute reading taken; density and moisture data recorded?		
f. Wet densities within 50 kg/m^3 (3.0 lb/ft^3)?		
g. Density and moisture data averaged?		

Procedure Element	Trial 1	Trial 2
12. Representative sample (4 kg or 9 lb) obtained from test location?	_____	_____
13. Sample sealed immediately to prevent moisture loss?	_____	_____
14. Moisture content correctly determined using other means than the nuclear density gauge reading?	_____	_____
15. Dry Density calculated using proper moisture content?	_____	_____
16. Percent compaction calculated correctly?	_____	_____

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner _____ WAQTC #:_____

Comments:

WSDOT Errata to FOP for AASHTO T 312

Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor

WAQTC FOP for AASHTO T 312 has been adopted by WSDOT with the following changes:

Equipment Preparation

Replace the eighth bullet with below:

- Pre-heat molds and plates in the oven set no more than 25° F above the compaction temperature shown on the mix design report.

Sample Preparation

Plant Produced Asphalt Mixtures

Replace step 3 with below:

3. Place in the oven until the material is 5° F above the compaction temperature shown on the mix design report.

Compaction Procedure

Replace step 3 with below:

3. Remove the pan of HMA from the oven and in one motion invert the pan onto the construction paper, vinyl mat, etc. Quickly remove any material that remains in the pan and include it with the HMA sample to be compacted. Grasp opposing edges of the paper and roll them together to form the HMA into a cylindrical shape. Insert one end of the paper roll into the bottom of the compaction mold and remove the paper as the HMA slides into the mold. This process needs to be accomplished in approximately 60 seconds. Place the mixture into the mold in one lift. Care should be taken to avoid segregation in the mold.

FOP for AASHTO T 312

Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor

Scope

This procedure covers preparing specimens, using samples of plant produced asphalt mixtures, for determining the mechanical and volumetric properties of asphalt mixtures in accordance with AASHTO T 312-15.

Apparatus

- Superpave Gyratory Compactor (SGC) meeting the requirements of AASHTO T 312
- Molds meeting the requirements of AASHTO T 312
- Chute, mold funnel or both (Optional)
- Scale meeting the requirements of AASHTO M 231 Class G 5
- Oven, thermostatically controlled, capable of maintaining set temperature within ± 3°C (± 5°F)
- Thermometers accurate to ± 1°C (± 2°F) between 10 and 232°C (50 - 450°F)

  Note 1: Non-Contact thermometers are not acceptable.
- Miscellaneous pans, spoons, spatulas, hot pads, gloves, paper discs, markers, etc.

Equipment Requirements

The calibration shall be performed on the SGC per the Manufacturer's instructions. See agency requirements for the calibration frequency.

The mold and base plate dimensions shall be checked every twelve months or 80 hours of operation to determine that they are within the tolerances listed in AASHTO T 312.

Equipment Preparation

Prepare the equipment in accordance with manufacturer's recommendations. At a minimum preparation includes:

- Warm-up gyratory compactor
- Verify machine settings
- Internal Angle: 1.16 ± 0.02°
- Ram Pressure: 600 kPa ± 18 kPa
- Number of gyrations

  Note 2: The number of gyrations (N_{des}) is obtained from the Job Mix Formula (JMF).
- Lubricate bearing surfaces
- Prepare recording device as required
- Pre-heat molds and plates at the compaction temperature range (minimum of 30 min) or before reuse reheat (minimum of 5 min)

  Note 3: The use of multiple molds will speed up the compaction process.
- Pre-heat chute, mold funnel, spatulas, and other apparatus (not to exceed the maximum compaction temperature)

Sample Preparation

Laboratory Prepared Asphalt Mixtures

This is a sample produced during the Mix Design process using aggregate and binder that is combined in the laboratory. When designing asphalt mixtures using the gyratory compactor refer to AASHTO T 312.

Plant Produced Asphalt Mixtures

- Determine initial sample size, number of gyrations (N_{des}), and compaction temperature range from the Job Mix Formula (JMF).
- Obtain the sample in accordance with the FOP for AASHTO T 168.
- Reduce the sample in accordance with the FOP for AASHTO R 47.
- The sample size should be such that it results in a compacted specimen that is 115 ± 5mm at the desired number of gyrations.

Note 4: Replicate specimens are generally prepared. Refer to agency requirements.

If the material is not in the compaction temperature range:

1. Place the appropriate sample mass into a container.
2. Spread to a depth of 1 to 2 in for even heating of mixture.
3. Place in the oven until the material is within the compaction temperature range.

Note 5: The material properties may be altered when the times of delivery of the test sample and the placement of the material on the roadway are different.

Compaction Procedure

Follow the manufacturer's recommended loading procedure. This may require the steps below to be performed in a different order. Steps 1 through 8 must be performed before the sample and mold cools below minimum compaction temperature.

1. Remove pre-heated mold and plate(s) from the oven (verify mold and plate(s) has been cleaned if previously used).
2. Place the base plate and paper disc in bottom of mold.
3. Place the mix into the mold in a single lift (care should be taken to avoid segregation or loss of material).
4. Level the mix in the mold.
5. Place a paper disc and the heated upper plate (if required) on top of the leveled sample.
6. Load the mold into the compactor; check settings.
7. Start the compaction process.
    a. Check the pressure (600 ± 18 kPa).
    b. Check the angle (1.16 ± 0.02°).
8. Upon completion of the compaction process, record the number of gyrations and specimen height.

Note 6: If the specimen is not 115 ± 5mm follow agency requirements.

9. Extrude the specimen from the mold; a brief cooling period may be necessary before fully extruding some specimens to ensure the specimens are not damaged.

   Note 7: Clean molds after each use.

10. Carefully remove the paper discs.
11. Cool the compacted specimen to room temperature.
12. Identify the specimen with chalk or other marker.

Report

- On forms approved by the agency
- Sample ID
- Number of gyrations
- Specimen height

Performance Exam Checklist

FOP for AASHTO T 312
Gyratory Compaction of Asphalt Mixtures

Participant Name _____ Exam Date _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

	Procedure Element	Trial 1	Trial 2
1.	Angle, pressure and number of gyrations set?		
2.	Bearing surfaces, rotating base surface, and rollers lubricated?		
3.	Representative sample obtained according to the FOP for AASHTO T 168?		
4.	Sample reduced according to FOP AASHTO R 47?		
5.	Asphalt mixture heated to compaction temperature range?		
6.	Mold, base plate, and upper plate heated to compaction temperature range?		
7.	Mold, base plate, and upper plate (if required) removed from oven and paper disk placed on bottom of mold?		
8.	Mix placed into mold in one lift without segregation?		
9.	Paper disk placed on top of the asphalt mixture?		
10.	Mold placed into compactor and upper plate clamped into place?		
11.	Pressure applied at 600 kPa ± 18 kPa?		
12.	Specified number of gyrations applied?		
13.	Proper angle confirmed from display?		
14.	Compacted specimen removed from mold, paper disc(s) removed, and allowed to cool to room temperature?		
15.	Asphalt mixture sample measured to a height of 115 ± 5 mm at required gyrations?		

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner _____ WAQTC #:_____

Comments:

WSDOT Errata to AASHTO T 324

Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)

AASHTO T 324 has been adopted by WSDOT with the following changes:

7. Determining Air Void Content

7.3. Determine the air void content of the specimens in accordance with T 269. The recommended target air void content is 7.0 ± 1.0 percent for laboratory-compacted SGC cylindrical specimens and 7.0 ± 1.0 percent for laboratory-compacted slab specimens. Field specimens may be tested at the air void content at which they are obtained.

8. Procedure

8.6.1. Select a test temperature of 50° C.

Tester Qualification Practical Exam Checklist

Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)
FOP for AASHTO T 324

Participant Name _____ Exam Date _____

	Procedure Element	Yes	No
1.	The tester has a copy of the current procedure on hand?	☐	☐
2.	All equipment is functioning according to the test procedure, and if required, has the current calibration/verification tags present?	☐	☐
3.	Specimen height is 62 ± 1.0 mm (2.44 ± 0.04 in.) or 38.1 mm (1.5 inch) minimum for cores?	☐	☐
4.	Specimen meets air void tolerance of 7.0 + 1.0 %?	☐	☐
5.	Specimens placed in molds and loaded into trays with a maximum gap of 7.5 mm between molds?	☐	☐
6.	Tray mounted in machine and securely fastened?	☐	☐
7.	Sample data and testing parameters entered into computer? (e.g., sample name, agg source, wheel speed, maximum rut depth, number of passes, and water temperature)	☐	☐
8.	Wheels gently lowered and samples allowed to soak at testing temperature for 45 minutes?	☐	☐
9.	Wheel tracking device shut off when test parameters are reached?	☐	☐
10.	Test data obtained for charting and analysis?	☐	☐

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner

Comments:

Washington State Department of Transportation

WSDOT SOP 738

Establishing Maximum Field Density for Recycled Concrete Aggregates by Test Point Evaluation

1. Scope

1.1 This test method describes the procedure for determining the maximum test point density that can be achieved with a controlled group of compaction equipment on a consistent thickness of recycled concrete aggregate. The density of the material will be determined by a nuclear density gauge using either backscatter or thin layer method. Compactive effort will be applied incrementally and density readings taken after each pass of the roller until the point where additional compactive effort ceases to increase the density of the material. Once the maximum density has been achieved, the compactive effort will be recorded and repeated unless one of the parameters changes. Parameters would include: lift thickness, compaction equipment, moisture content, material source or gradation.

2. Referenced Documents

2.1 AASHTO Standards

T 310 In-place Density and Moisture Content of Soil and Soil-aggregate by Nuclear Methods (Shallow Depth)

2.2 WSDOT Standards

M 41 *Standard Specifications*

M 46 *Materials Manual*

3. Significance

3.1 A section of roadway or fill is compacted. After each increment or roller pass (a pass is defined as one time being from the start of the test strip to its end) the material is tested for density by the use of the nuclear density gauge. The density is recorded after each increment until the maximum density has been achieved.

4. Apparatus

4.1 Equipment and nuclear density/moisture gauge required to perform a moisture/density determination according to AASHTO T 310.

4.2 Standardize the gauge according to AASHTO T 310.

5. Test Site Location

5.1 At the beginning of placement, choose a uniform section large enough to perform the test point evaluation. The test point evaluation area needs to be representative of the placement area and approximately 100 feet long. Equipment other than that required to compact the material should be kept off the evaluation area during testing.

6. Procedure

6.1 Test the first lift of material at or near optimum moisture after performing the first pass with the roller or compactor.

6.2 Take a one minute reading with the nuclear gauge in the test location.

6.3 Record wet density results (lb/ft^3) for each location of the report form.

6.4 Clearly mark the test location (if using paint, do not paint the gauge).

6.5 All subsequent density determinations must be in the same location and the same gauge orientation as the first test.

6.6 Make another pass with the roller or compactor over the entire test area.

6.7 Repeat density reading. Record on report form.

6.8 Continue compacting and testing, maintaining moisture content, until the density readings level off or start to drop. This indicates the relative density has reached its maximum with the compaction equipment being used.

Note: A slight decrease in density may be observed before maximum density is achieved. If suspected, examine the material, and if no fracture of the material is visible, continue the rolling/density testing process until maximum density is achieved.

6.9 Once the relative density has reached its maximum, the test point evaluation will be considered complete and the compaction method shall be repeated on subsequent aggregate placement and compaction.

6.10 Moisture content should be monitored regularly (at least daily) with the use of the nuclear gage to ensure the material is at or near the optimum moisture content. If the moisture content is more than two points below the optimum moisture content the test point evaluation will be considered invalid.

7. Report

- Contract number
- Compaction equipment type
- Material type and source
- Lift thickness

DOT Form 350-070, gauge number, , and on the Test Point Evaluation Report Form