Materials Procedures Committee Meeting

Meeting Date: 5/28/20

WVDOH MCS&T
190 Dry Branch Drive

	MP Number	Champion	MP Title	Up for Vote?	Votes					
					MCST	CA	TED	OPP	EGR	Total
*1	**711.03.26**	Mike Mance	MAINTAINING SPECIFIED LEVELS OF STRENGHT IN PCC	y						0
*2	**109.20.00**	Kelly Chapman/Dan Brayack	CHARGES FOR TARDY OR NON-SUBMITTAL OF SAMPLING	y						0
3	**721.10.01**	John Cummings	LOCKWHEEL FRICTION	n						
4	**615.20.00**	George Hanna / Mark Ball	FIELD WELDING QUALIFICATIONS	n						
5	**106.00.03**	Dan Brayack	GUIDELINES FOR ESTABLISHING & MAINTAINING APPROVED PRODUCT LISTS OF MATERIALS, SYSTEMS AND SOURCES	n						
&6	**401.02.25**	Dan Phipps	CERTIFICATION OF ASPHALT SHIPPING TERMINALS	n						
&7	**604.02.40**	Suman Thapa	INSPECTION & ACCEPTANCE PROCEDURES FOR PRECAST PCC	n						

*Up for Vote

&New

Voting Members

OPP
MCST
CA
TED
ENGR

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

MAINTAINING SPECIFIED LEVEL OF STRENGTH IN PORTLAND CEMENT CONCRETE

1. PURPOSE

1.1 The purpose of this procedure is to set forth a method of adjusting the cement content of portland cement concrete so that a reasonable conformance with the specified level of strength may be assured.

2. SCOPE

2.1 The procedure shall apply to all classes of concrete.

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3. PROCEDURE

3.1 Initial Cement Requirement

3.1.1 "Initial Cement Requirement" is the cement requirement determined by the formal laboratory design method outlined in MP 711.03.23.

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3.2 Reevaluating Cement Requirement

3.2.1 A concrete mix design referred to herein means a combination of particular source and type of materials and a cement factor which satisfies the requirement of the governing specification, said combination of materials and cement factor being formulated for the express purpose satisfying the requirement of a particular class of concrete specified for the work. The cement factor in a particular mix design may be changed without invalidating the design. If source or type of materials in a mix design are changed, then the mix design is considered changed, and two or more mix designs would result from such change(s).

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Strength data which represents two cement factors in one mix design may be processed collectively in the derivation of statistical parameters, average and standard deviation, for example, if it is felt that such a treatment does not significantly affect the statistics.

3.2.2 For the various classes of concrete which are designed in conformance with MP 711.03.23, the first reevaluation of cement requirement shall be made after at least ten pieces of strength data are available to evaluate the adequacy of the mix design. Thereafter, a reevaluation of cement requirement shall be made at monthly intervals at which time, the evaluation shall be based on the strength data developed during the preceding two months or on the last ten pieces of data developed, whichever is greater.

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3.3 Method of Evaluating Cement Requirement

3.3.1 The cement requirement for all classes of concrete governed by this procedure shall be the quantity necessary to maintain the average strength of the concrete within the range of the Design Strength (f'_c) plus K_1 standard deviations and the Design Strength (f'_c) plus K_2 standard deviations $\{(f'_c + K_1\sigma) < \bar{X} < (f'_c + K_2\sigma)\}$. The average strength ($\bar{X}$) and the standard deviation (σ) shall be calculated using the strength data developed during the previous two months or the last ten pieces of strength data, whichever is greater.

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3.3.2 If the average strength of concrete can be maintained at a level which is equal to or greater than the Design Strength plus K_2 standard deviations $\bar{X} > (f'_c + K_2\sigma)$, then the cement factor which causes this level of average strength to be developed may be reduced as indicated in Article 3.3.4.3 except that in no instance shall the cement factor be reduced below a level of the target specified cement factor minus 47 lbs. of cement per cubic yard.

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3.3.3 If the average strength of the concrete is maintained below the level of the Design Strength plus K_1 standard deviations, $\bar{X} < (f'_c + K_1\sigma)$, then the cement factor which causes this level of average strength to be developed shall be increased as indicated in Article 3.3.4.2.

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3.3.4 The relationship between the level of concrete strength (considered to be the average of all data developed during the preceding two months or the average of the last ten pieces of strength data, whichever is greater, and represented by $\bar{X}$), and the action which must be taken regarding the cement factor is as follows:

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3.3.4.1 If the average strength is maintained at a level between the Design Strength plus K_1 standard deviations and the Design Strength plus K_2 standard deviations $\{(f'_c+K_1\sigma) < \bar{X} < (f'_c+K_2\sigma)\}$ the cement factor shall be maintained without change.

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3.3.4.2 If the average strength falls below the Design Strength, plus K_1 standard deviations $\{\bar{X} < (f'_c+K_1\sigma)\}$ the cement factor shall be increased in accordance with the following formula:

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$$C_i = \frac{(f'_c + K_1\sigma) - \bar{X}}{200}$$

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Where C_i = Number of 23.5 lb. increments of cement increase per cubic yard, rounded up to a whole number.

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f'_c = Design Strength
K_1 = Factor from Table 1
σ = Standard Deviation
$\bar{X}$ = Average Strength

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3.3.4.2.1 When the cement factor for a certain mix design, which contains a Supplementary Cementitious Material (SCM), is required to be increased, the Concrete Producer has two options to meet the cement factor increase requirement.

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Option 1: Make the cement factor increase entirely with cement.

Option 2: Make the cement factor increase with the same cement/SCM ratio that is used in the subject mix design. For example, if 20% of the cementitious material in the subject mix design is fly ash and 80% of the cementitious material in the subject mix design is cement, and the cement factor was required to be increased by 23.5 pounds, the cement factor increase would consist of an additional 5 lbs. of fly ash and an additional 19 pounds of cement. Fractions of a pound that are 0.5 and above shall be rounded up, and fractions of a pound that are below 0.5 shall be rounded down.

3.3.4.3 If the average strength falls above the Design Strength plus K_2 standard deviations $\{\bar{X} > (f'_c+K_2\sigma)\}$ the cement factor may be decreased in accordance with the following formula:

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$$Cd = \frac{\bar{X} - (f'_c + K_2\sigma)}{200}$$

Where C_d = Number of 23.5 lb. increments of cement to be decreased per cubic yard, rounded to the nearest whole number.

K_2 = Factor from Table 1

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3.3.4.3.1 When the cement factor for a certain mix design, which contains a SCM, is permitted to be decreased, and if the Concrete Producer elects to decrease that cement factor, the cement factor shall be decreased with the same cement/SCM ratio that is used in the subject mix design. For example, if 20% of the cementitious material in the subject mix design is fly ash and 80% of the cementitious material in the subject mix design is cement, and the cement factor was permitted to be decreased by 23.5 pounds, the cement factor decrease would consist of a reduction of 5 lbs. of fly ash and a reduction of 19 pounds of cement. Fractions of a pound that are 0.5 and above shall be rounded up, and fractions of a pound that are below 0.5 shall be rounded down.

3.4 Reporting

Once each month, the Materials Control, Soils and Testing Division will publish a list of concrete producers (Commercial Suppliers and/or Contractors), with all concrete mix designs for each concrete producer, and their corresponding cement factor, determined in conformance with this MP.

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3.5 Reevaluating Concrete Mix Design

A concrete mix design which is approved for a particular project will remain valid to the extent that it satisfies the requirement for that particular project for its duration.

A concrete mix design which is developed in accordance with MP 711.03.23 and maintained for a period of three years shall be re-approved in accordance with Section 6 of MP 711.03.23. It is the Contractor's responsibility to make adjustments to the design mix as necessary to maintain in the concrete proper placement properties, workability, finishability, yield, consistency, air content, and other requirements of the governing specification. The Contractor should be especially aware of this responsibility when the cement factor is changed in conformance with this procedure.

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Ronald L. Stanevich, P.E.
Director
Materials Control, Soils and Testing Division

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TABLE 1
VALUES OF "K" FACTORS

NUMBER OF PIECES OF DATA	K1	K2
10	1.604	3.615
11	1.588	3.510
12	1.576	3.429
13	1.565	3.365
14	1.557	3.313
15	1.549	3.270
16	1.543	3.233
17	1.538	3.202
18	1.533	3.175
19	1.528	3.151
20	1.525	3.130
21	1.521	3.112
22	1.518	3.096
23	1.515	3.081
24	1.513	3.067
25	1.511	3.055
26	1.508	3.044
27	1.507	3.034
28	1.505	3.024
29	1.503	3.016
30	1.501	3.008
Above 30	1.500	3.000

MP 109.20.00
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WEST VIRGINIA DEPARTMENT OF
TRANSPORTATION DIVISION OF HIGHWAYS
CONTRACT ADMINISTRATION DIVISION

MATERIALS PROCEDURE

BASIS FOR CHARGES FOR TARDY OR NON-SUBMITTAL OF SAMPLING AND TESTING DOCUMENTATION

1. PURPOSE

1.1 The purpose is to provide a unit cost per test to be assessed to the Contractor when testing is not submitted by the contractor in a timely manner. This includes documentation not submitted, and is not limited to those tests listed in Table 1 of this procedure.

2. SCOPE

2.1 This procedure is applicable to those circumstances where a construction item, by Specifications and Material Procedures is not properly tested or the documentation is not submitted in a timely manner of: seven (7) days for compaction, fourteen days (14) for gradations and thirty-five days (35) for concrete cylinder breaks.

2.2 This applies only to Quality Control testing, not to Quality Assurance testing.

3. GENERAL

3.1 As stated in Section 106.3.1.2 of the Standard Specifications, it is the intent of the specifications that lots and sublots of materials, products, items of construction or completed construction meet testing specification requirements at the time of submission. In this case submission refers to the time when the contractor has completed the work and offers the finished 'product' to the Division for final acceptance testing.

3.2 In the case where a test was not run or documentation was not submitted for material placed according to the required quality control, per the Specifications the price will be assessed in accordance with Table 1 and will include the cost of the material placed that the documentation was to represent if the material was left in place.

3.3 The signed test results may be emailed to the District Material Supervisor as a PDF to satisfy the time frames in Sub-section 2.1.

3.4 The project personnel shall also choose not to pay for the material placed if proper and or adequate testing was not performed on that material, pending a DMIR.

3.5 The contractor shall not be penalized for the Division failing to receive or process test results; the contract may challenge a price assessment by demonstrating a chain of communication.

Ronald L. Stanevich, PE
Director
Materials Control, Soils & Testing Division

TABLE 1

COST FOR FAILING TO TEST OR SUBMIT DOCUMENTATION FOR MATERIAL PLACED

ITEM#	TEST		COST
207	IN-PLACE DENSITY (5 TESTS)	$140.00 ea	$700.00
	GRADATION (EACH TEST)		$700.00
	PLASTIC INDEX, LIQUID LIMITS		$700.00
212	IN-PLACE DENSITY (5 TESTS)	$140.00 ea	$700.00
	GRADATION (EACH TEST)		$700.00
307 & 308	IN-PLACE DENSITY (5 TESTS)	$140.00 ea	$700.00
	GRADATION (EACH TEST)		$700.00
	PLASTIC INDEX, LIQUID LIMITS		
311	CRUSHED PARTICLE ANALYSIS		$700.00
	GRADATION (EACH TEST)		$700.00
401 & 402	CORING (EACH CORE) PWL		$700.00
	PAVEMENT SMOOTHNESS		$700.00
	(PER LANE MILE)		$700.00
	ASPHALT CONTENT FAILURES		$700.00
	AIR VOIDS FAILURES		$700.00
405	GRADATION (EACH TEST)		$700.00
495	GRADATION (EACH TEST)		$700.00
601	ABAR (EACH TEST)		$700.00
	CYLINDER BREAK REPORT		$700.00
	PERMABILITY		$700.00
	AIR AND SLUMP TESTS		$700.00
603	GROUT BREAK REPORT (EACH TEST)		$700.00
604	IN-PLACE DENSITY (5 TESTS)	$140.00 ea	$700.00
	GRADATIONS >60”		$700.00
606	GRADATION (EACH TEST)		$700.00
614	CONCRETE TESTING		$700.00
	CYLINDER BREAK REPORT		$700.00
	GROUT CUBE TESTING		$700.00
	GROUT STRENGTH REPORT		$700.00
626	IN-PLACE DENSITY (5 TESTS)	$140.00 ea	$700.00
	GRADATION (EACH TEST)		$700.00
	PLASTIC INDEX, LIQUID LIMITS		$700.00
720	FAILURE TO RUN PROFILER		$700.00

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE 721.10.01

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GUIDE FOR USING THE LOCKED-WHEEL FRICTION TESTER TO MEASURE FRICTIONAL PROPERTIES OF PAVEMENT

1. SCOPE

1.1 This procedure establishes a process for collecting friction data of roadways using a Locked-Wheel Friction Tester. Friction measurements are obtained by locking a test tire on a device-wetted surface while traveling at a specific speed (typically 40 mph).

1.2 Tests are conducted using rib-tread and smooth-tread test tires. Ribbed tires are used as an indicator of the micro-texture properties of pavement. Smooth tires are used as an indicator of the macro-texture properties of pavement.

1.3 The resulting Friction Number (FN) is non-dimensional value and represents the average coefficient of friction measured across a test interval.

2. PURPOSE

2.1 To establish a procedure for safe operation of a Locked-Wheel Friction Tester and the collection of quality pavement friction data for WVDOH.

3. REFERENCED DOCUMENTS

a. *AASHTO T 242: Frictional Properties of Paved Surfaces Using a Full-Scale Tire*
b. *AASHTO M 261: Rib-Tread Standard Tire for Special-Purpose Pavement Frictional-Property Test.*
c. *AASHTO M 286: Smooth-Tread Standard Tire for Special-Purpose Pavement Frictional-Property Test.*
d. WVDOT Skid Measurement System Evaluation, Report Number TRC-625
e. WVDOH Construction Manual

4. DEFINITIONS

4.1 Locked-Wheel Friction Tester: The entire apparatus, including Tow Vehicle, attached Locked-Wheel Skid Trailer, and all supporting components such as the on-board computer, force transducers, instrumentation, air, water and braking systems, etc.

4.2 Tow Vehicle: The automotive vehicle, capable of towing the Locked-Wheel Skid Trailer and maintaining constant speed within ±1 mph while the Test Tire is completely locked.

4.3 Locked-Wheel Skid Trailer: The two-wheel trailer, pulled behind the Tow Vehicle, and equipped with a Test Tire mounted on the left (driver's) side.

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4.4 Friction Number (FN): This represents the average coefficient of friction measured across a test interval. It is computed by the following formula:

$$\mathbf{FN} = 100 \times \mu = 100 \times (F / W)$$

Where:
FN = Friction Number at the measured speed
μ = Coefficient of friction
F = Tractive horizontal force applied to the tire, lbs.
W = Vertical load applied to the tire, lbs.

4.5 Test Site: The location of the pavement to be tested, including all traffic lanes, defined by the beginning and ending mileposts of the project.

5. EQUIPMENT REQUIREMENTS

5.1 All electronic and mechanical components of the Locked-Wheel Friction Tester shall be adequately designed and built to meet or exceed the requirements set forth in AASHTO T 242 Section 4.

6. SAFETY PRECAUTIONS

6.1 The Locked-Wheel Friction Tester shall comply with all applicable State and Federal Laws. Additional precautions shall be taken beyond those imposed by law to ensure the safety of all personnel and the general public. At minimum the following conditions must be followed when testing with a Locked-Wheel Friction Tester:

a. Test lanes must be free of debris and obstructions.

b. Heavy acceleration and deceleration should be avoided while testing.

c. Test lanes may remain open to traffic unless deemed unsafe.

d. Testing shall only be conducted at speeds recommended by the manufacturer.

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7. CALIBRATION AND CORRELATION

7.1 The Locked-Wheel Friction Tester shall be calibrated and correlated annually at a federally recognized Evaluation and Field Test Center.

7.2 During calibration, the Locked-Wheel Friction Tester shall undergo, at minimum, the following tests to verify the systems are working properly:

a. Water delivery system
b. Speed measuring system
c. Distance measuring system
d. Force and load transducer measuring system
e. Ability of the brake to completely lock the test wheel

7.3 The Evaluation and Field Test Center maintains a Locked-Wheel Friction Test System which is considered a Skid Measurement Standard and is validated annually. During

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correlation, the Locked-Wheel Friction Tester is operated on three separate test surfaces along with the Standard System. Statistical analysis is then performed on the test data to produce correlation equations. These equations are used to adjust future test results, allowing old and new data, as well as data from different systems to be compared.

7.4 An example of the calibration and correlation procedure of the Locked-Wheel Friction Test System is described in the referenced "WVDOT Skid Measurement System Evaluation, Report Number TRC-625".

7.5 Modifications and/or changes to the electrical or mechanical components will require the system to be re-calibrated and re-correlated.

8. DATA COLLECTION

8.1 Data is collected at the time of testing by the system computer. The data collected by the computer includes the location, speed and the calculated Friction Number (FN).

8.2 Do not test pavement if ambient and/or surface temperature is less than 45° F.

8.3 Do not test pavement if debris or standing water is present.

8.4 Pavement test sites shall be tested with both the Rib-Tread and Smooth-Tread tire. High Friction Surface Treatment locations shall be tested with the Rib-Tread tire only.

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Commented [JZ2]: is there a time limit between the testing with the two tires?

9. PRE-TEST INSPECTION

9.1 Prior to testing, inspect all cable and hose connections from test vehicle to trailer. Ensure all fittings are secure, not leaking, worn, or dragging the ground.

9.2 Check safety lighting and ensure it is working properly. Inspect the test tires according to the referenced *AASHTO M 261* and *AASHTO M 286.*

9.3 Inspect the pavement surface for changes in texture, segregation, polishing, pushing or other issues which may affect friction. Areas of inconsistency shall be noted and explained in the Materials Inspection Report.

10. POSITION OF TESTS

Commented [JZ3]: Should specify lane for multilane highways.

10.1 Testing shall be conducted in the left wheel path of each lane of the test site.

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11. TEST SPEED

Commented [DB4]: Still some confusion on this, please update.

Something needs to change here, maybe change test-site to "project" and treat it like the smoothness.

11.1 All reasonable efforts shall be made to perform tests at 40±1 mph. Tests conducted at less than 39 mph or greater than 41 mph will typically be considered invalid and will not be included when calculating the average friction values of the project.

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11.2 If speed cannot be maintained at 40±1 mph due to safety or traffic conditions, the Engineer may approve testing at a different speed. In this case, the following formula is to be used to adjust the resulting Friction Number results:

FN (40) = FN (speed) – 0.5 * (40 – speed)

Where: FN (speed) = Friction Number from test at (speed) mph

FN (40) = Friction Number adjusted to 40 mph

12. NUMBER AND FREQUENCY OF TESTS

12.1 A minimum of five (5) tests shall be conducted with each tire in each lane-mile of each test site. Except for High Friction Surface Treatment locations which shall be tested with only the Rib-Tread tire as stated in 8.4.

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12.2 Tests shall be spaced evenly throughout the test site, as safety and traffic conditions permit.

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13. REPORTING OF TEST RESULTS

13.1 A Materials Inspection Report shall be submitted to the requesting agency.

13.2 The Report shall include the location, speed and calculated Friction Numbers from each test, as well as the average Friction Number for each lane at each test site.

13.3 The report shall also include weather conditions, areas of inconsistency in the pavement and general observations of the test site.

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Ronald L. Stanevich, P.E.
Director
Materials Control, Soils and Testing Division

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

FIELD (JOB SITE) WELDER QUALIFICATION PROCEDURES FOR SHIELDED METAL ARC WELDING, FLUX CORED ARC WELDING, AND GAS METAL ARC WELDING

Commented [DB1]: Comment from Steve B – check spec to see if we need to do an update there, AWS, standards, just make sure we have some references there to keep and make sure they comply to projects

1. PURPOSE

1.1 To establish a uniform procedure for testing and qualification of welders who will perform work under the jurisdiction of the Division of Highways.

1.2 To establish an effective means for identifying and recognizing those individuals that possess the knowledge and ability to produce acceptable welds.

1.3 To make available to the appropriate Division of Highways personnel a list of qualified welders.

2. SCOPE AND LIMITATIONS

2.1 Welders qualified under the provisions of this Materials Procedure are qualified to weld steel sheet, plate, bars, and structural sections as documented and approved by the American Welding Society Structural Welding Code D1.1 as amended by the governing specifications. This procedure does not apply to the qualification of welders to weld pressure vessel or pressure piping.

2.2 Welding performed by welders qualified under the provisions of this Materials Procedure is limited to steel meeting the following specification requirements: AASHTO M-183 (ASTM A-36), AASHTO M-188 (ASTM A-441), AASHTO M- 223 (ASTM A-572), Grades 42, 45, and 50 only, AASHTO M-222 (ASTM A- 588). Should the occasion arise to weld grades of steel other than those listed above, the Materials Control, Soils and Testing Division should be consulted for proper welder qualification procedures

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2.3 The provisions of this Materials Procedure apply to welder qualification tests for the following welding processes only:

Shielded Metal Arc Welding (SMAW) Gas Metal Arc Welding (GMAW)

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Gas metal arc welding are considered semi- automatic welding processes.

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2.4 Welders qualified for groove welding under the provisions of this Materials Procedure are qualified to weld only groove welds that will be welded from both sides or groove to be welded from one side against a steel back bar.

2.5 Qualification tests for vertical positions welds are administered with the direction of welding as vertical up. Should it become necessary for the welder to be weld vertical down, a re-qualification is necessary.

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3. REQUEST FOR TESTS

3.1 Welder qualification tests are administered by appointment only. Contact appropriate personnel within the Materials Control, Soils and Testing Division for a test date and test time.

3.2 Requests for welder qualification test for personnel employed, or to be employed, by Contractors should be made by the Contractor or by the Division of Highways District Materials Section personnel.

3.3 Requests will also be honored from trade unions and individuals, but every effort should be made to make requests as outlined in paragraph 3.2 above.

3.4 Testing arrangements for Division of Highway personnel should be made by the District Materials Section.

3.4.1 Regardless of the origin of the request for testing, the following information must be supplied by the person making test arrangements: Name of individual to be tested.

3.4.2 Welding process to be tested.

3.4.3 Nature of test requested; first test, re-test or re-certification.

3.4.4 Type of test requested; groove weld plate qualification test for plate of unlimited thickness; groove weld plate qualification test for plate of limited thickness; or fillet welds only.

3.4.5 Position of test welds.

3.4.6 AWS classification of electrode to be used in test.

4. TESTING LOCATION

4.1 Welder qualification test are administered at the Division of Highways, Materials Control, Soils and Testing Division Laboratory, 190 Dry Branch Drive, Charleston, WV 25306. The testing laboratory is located just off Michigan Avenue, approximately two blocks east of the State Capitol Complex.

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4.2 Qualification test can be arranged at other locations provided a minimum of four (4) welders are to be tested at one time. Facilities for testing in this case are to be the responsibility of the agency requesting the testing and are subject to approval of the Materials Control, Soils and Testing Division. Welding test plates and shielded metal arc welding electrodes will be provided by the Materials Control, Soils and Testing Division. All other facilities, supplies, and equipment must be provided by the agency requesting the tests.

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5. TESTING COSTS

5.1 All applicants requesting qualification testing will be charged $120.00 per test. This fee is determined by Materials Control, Soils and Testing Division.

5.2 Current fees of $120.00 will be provided upon request by the Materials Control, Soils and Testing Division.

5.3 The Division of Highways personnel will not be charged for welding test. All others must be paid prior to the test being administered. Payment shall be check or money order, made payable to WV Division of Highways. Cash or credit card will not be accepted under circumstances.

6. TEST EQUIPMENT AND MATERIALS

6.1 The following welding equipment and supplies are available at the Materials Control, Soils and Testing Division laboratory for conduct of a welder qualification test for the shielded metal arc welding process:

6.1.1 Welding Machine: 275amp D.C. Lincoln Welder.

6.1.2 All test plates required for limited practice and the performance test.

6.1.3 Welding hood, slag chipping hammer, ice pick, wire brush and miscellaneous hand tools. The use of power tools for cleaning welds between weld passes is will be permitted.

6.1.4 Sufficient stock of 2.4 mm, (3/32") 3.2 mm, (1/8") and 4.0 mm, (5/32") shielded metal arc welding electrodes, AWS class E 7018.

6.2 Welding equipment is not available for the conduct of welder qualification tests in the flux cored welding process. Prospective welders requesting a test in these processes must provide suitable welding equipment and welding consumables.

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7. TESTING PROCEDURE

7.1 Limitations of Variables

7.1.1 The qualification tests described below are specially devised tests to determine the welder's ability to produce sound welds. The qualification tests are not intended to be used as a guide for welding during actual construction.

7.1.2 Qualification established with any one of the steels listed in paragraph 2.2 shall be considered as qualification to weld or tack weld any of the other steels. Qualification tests are currently conducted utilizing AASHTO M-183 (ASTM A-36) grade steel.

7.1.3 A welder must successfully complete a test in each welding process for which qualification is requested. Qualification in one welding process as described by paragraph 2.3 does not qualify the welder for the other process listed.

7.1.4 A welder qualified for shielded metal arc welding with an electrode identified in the following table shall be considered qualified to weld or tack weld with any other electrode in the same group designation and with any electrode listed in a numerically lower group designation:

Group Designation	AWS Electrode Classification*
F4	EXX15, EXX16, EXX18
F3	EXX10, EXX11
F2	EXX12, EXX13, EXX14
F1	EXX20, EXX24, EXX27, EXX28

*The letters 'XX' used in the classification designations in this table represent the various strength levels (60, 70, 80, 90, 100, and 120) of deposited weld metal.

7.1.5 A welder qualified with an approved electrode and shielding medium combination shall be considered qualified to weld or tack weld with any other approved electrode and shielding medium combination for the process used in the qualification test.

7.1.6 A change in the position of welding to one for which the welder is not already qualified shall require re-qualification.

7.1.7 Vertical position qualification tests are administered with the direction of welding as vertical up. When a specific need arises for vertical down welding on the construction site, the welder must be qualified with the direction of welding as vertical down and all qualification documents noted accordingly.

8. QUALIFICATION TESTS REQUIRED

8.1 The welder qualification tests for manual and semi-automatic welding shall be as follows:

8.1.1 Groove Weld Plate Qualification Test for Plate of Unlimited Thickness

The joint detail shall be as follows: 25.4 mm plate, single V-groove, 45 degree included angle, 6.4 mm root opening with backing bar, (See Fig. 7.2.1a). For horizontal position qualification tests the joint detail will be as follows: Single-bevel groove, 45 degree angle, 6.4 mm root opening with backing (See Fig. 7.2.1b) Backing will be 9.5 mm by 75 mm. The length of the welding groove will be 175 mm.

8.1.2 Groove Weld Plate Qualification Test for Plate of Limited Thickness

The joint detail shall be as follows: 9.5 mm plate, Single V-groove, 45 degree included angle, 6.4 mm root opening with backing bar (See Fig. 7.2.2a). For horizontal position qualification tests the joint detail will be as follows: Single-bevel-groove, 45 degree angle, 6 mm root opening with backing (See Fig. 7.2.2b). Backing will be 9.5 mm by 75 mm. The length of the welding groove will be 175 mm.

8.1.3 Fillet Weld Qualification Test for Fillet Welds Only

For fillet weld qualifications only, the welder shall weld a T-test plate in accordance with Fig. 7.2.3.

8.2 Position of Test Welds (See Table 7.3)

8.2.1 Groove Plate Test Welds:

(a) Qualification in the 1G (flat) position qualifies for flat position groove welding of plate and flat and horizontal position fillet welding of plate.

(b) Qualification in the 3G (vertical) position qualifies for flat, horizontal and vertical position groove and flat, horizontal and vertical position fillet of welding plate.

(c) Qualification for the 4G (overhead) position qualifies for flat and overhead position groove and flat horizontal and overhead position fillet welding of plate.

8.2.2 Fillet Weld Tests:

(d) Qualification in the 1F (flat) position qualifies for flat position fillet welding of plate.

(e) Qualification in the 3F (vertical) position qualifies for flat, horizontal, and vertical position fillet welding of plate.

8.3 Test Joint Welding Procedure

8.3.1 The welder shall follow a joint welding procedure applicable to the joint details being welded in the performance test. Electrode size, selection, current, voltage, travel speed, type of bead, electrode manipulation, etc. are at the welder's discretion and should be chosen considering best known practice so as to provide the most acceptable weld joint possible under the testing conditions.

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8.3.2 Weld cleaning shall be done with the test plates in the same position as the welding position being qualified. Weld cleaning must be accomplished utilizing the normal hand tools provided. The use of the power chisels, scalers, chipping hammers, brushes or grinders is not allowed for weld cleaning.

8.4 Test Specimens: Number, Type, Preparation

8.4.1 The type and number of test specimens that must be tested to qualify a welder by mechanical testing together with the range of thickness that is qualified for use in construction based on the thickness of the test plate used in making qualification. Radiographic testing of the test weld may be used at the Division of Highways option in lieu of mechanical testing.

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8.4.2 Guided bend test specimens shall be prepared by cutting the test plate as applicable to form specimens approximately rectangular in cross section. The specimens shall be prepared for testing in accordance with as applicable of the AWS Structural Welding Code D1.1.

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8.4.3 The fillet weld break and macrotech test specimens shall be cut for the test joint. The end of the macrotech specimen shall be smooth for etching.

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8.4.4 When radiographic testing is used in lieu of the prescribed bend test, the weld reinforcement need not be ground or otherwise smoothed for inspection unless its surface irregularities or juncture with the base metal would cause objectionable weld defects to be obscured in the radiograph. The backing need not be removed prior to radiographic testing.

8.5 Method of Testing Specimens

8.5.1 Root, Face, or Side-Bend Specimens

Root, face and side-bend specimens shall be tested in accordance with paragraph 5.27.1 of the AWS Structural Welding Code D1.1 Rev. 1-76.

8.5.2 Fillet - Weld - Break Test

The fillet-weld-break test specimens shall be tested in accordance with paragraph 5.27.2 of the AWS Structural Welding Code D1.1

8.5.3 Macrotech Test

The macrotech test specimens shall be tested in accordance with paragraph 5.27.3 of the AWS Structural Welding Code D1.1

8.6 Test Results Required

8.6.1 Root, Face, or Side - Ben Specimens

Root, face, and side - bend specimens, after testing, shall meet the requirements of paragraph 5.28.2 of the AWS Structural Welding Code D1.1 Rev. 1-76.

8.6.2 Fillet - Weld - Break

After testing, the fillet - weld - break test specimens shall meet the requirements of paragraph 5.28.2 of the AWS Structural Welding Code D1.1 Rev. 1-76.

8.6.3 Macrotech Test

After preparation, the macrotech test specimen shall meet the requirements of paragraph 5.28.3 of the AWS Structural Welding Code D1.1 Rev. 1-76.

8.6.4 Visual Inspection

For acceptable qualification, the welded test plates, when inspected visually shall conform to the requirements for visual inspection as contained in paragraph 9.25.1 of the AWS Structural Welding Code D1.1 Rev. 2-77 as revised and/or amended by the AASHTO Standard Specification for Welding of Structural Steel Highway Bridges - 1977, and as may be further revised and/or amended by the Division of Highways Standard Specifications or Special Provisions in effect at the time the welder qualification test administered.

9. RE-TESTS

9.1 In case a welder fails to meet the requirements of one or more test welds, immediate re-test, subject to scheduling limitations. All re-test specimens shall meet all the specified requirements.

9.2 If a welder fails one or more of the test plates as specified in paragraph 8.1 above, he will be required to wait thirty (30) days before being eligible for a second re-test. The intent of this waiting period is to provide the prospective welder ample time to obtain

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The radiographic procedure and technique shall be in accordance with the requirements of Part B, Section 6 of the AWS Structural Welding Code D1.1-¶
75. Only the center half of the length of the test plate will be evaluated for rejectable discontinuities.¶

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To qualify, the weld, as revealed by the radiograph, shall conform to the requirements of paragraph 9.25 of the AWS Structural Welding Code D1.1 Rev. 2-77 as revised and/or amended by the AASHTO Standard Specifications for Welding of Structural Steel Highway Bridges - 1977, and as may be further revised and/or amended by the Division of Highways Standard Specifications, Supplemental Specifications or Special Provisions in effect at the time the welder qualification test is administered. The welder qualification test will be evaluated for quality based on the standards required for welds subject to tensile stress under any condition of loading…

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additional training as may be necessary. After expiration of the thirty (30) day waiting period, the second re-test shall consist of a single specimen test weld in the appropriate welding position.

9.3 If a welder fails the second re-test as specified in paragraph 8.2 above, he will be required to wait one (1) year before being eligible for further re-testing. A welder failing the second re-test unsuccessfully and obviously is in need of considerable additional welding skill training. The one year waiting period is designed to provide the welder the opportunity to obtain this training and experience.

9.4 If a welder is found to be welding his or her test plates in a different position than he or she is attempting to become certified in, that welder's test plates will be discarded and he or she will not be allowed to re-test for a period of one (1) year. If a welder is found to be welding out of position a second time, that welder will become permanently ineligible to re-test. Thus forfeiting their right to weld for the Division of Highways.

10. PERIOD OF EFFECTIVENESS

10.1 Once qualified, the welder's qualification shall be considered as remaining in effect for a period of four years from the date of test.

10.2 Should a situation arise wherein the welder does not produce acceptable welds on the project site, or there is any reason to question the welders ability after qualification, the Division of Highways may require the welder to re-qualify by taking all, or a portion of the welder qualification test. Should the welder not successfully complete these re-qualification tests, his qualification will be revised accordingly or revoked as determined by the results of the re-testing. Administration of such tests will be at no expense to the welder. Successful completion of these tests will not extend the welder's qualification beyond the original expiration date.

11. DOCUMENTATION AND RECORDS

11.1 Form ST-6 (copy attached) will be used to document all data with regard to the welder qualification test. The welder will complete the personal data at the top of the form. All further entries will be made by Materials Control, Soils and Testing Division personnel and are self-explanatory. The ST-6 form will be signed, in the space provided, by the person administering the test. An identification number will be assigned and will serve as identification for the testing process.

11.2 Those welders who undergo the test will sign a blank Welder Qualification Card, Form ST-5 (copy attached) and will be photographed. Upon successful completion of the test, the Welder Qualification Card will be completed by the Materials Control, Soils and Testing Division and forwarded to the welder as his identification and proof of qualification. This card, Form ST-5 will provide sufficient personal data to establish proper identification. The card will also contain information relative to the welder's qualification such as welding process, welding positions qualified, type of welding qualified (groove and/or fillet), thickness limitations, and welding electrode limitations including the qualification expiration date.

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11.3 In addition to the Welder Qualification Card, identification of qualified welders will be included in the List of Qualified Welders. The list contains necessary identification information as well as data relative to the Welders qualification limitations.

11.4 Welder Qualification Test Records (Form ST-6) and all other data relative to the welder's qualification test will be maintained in the Materials Control, Soils and Testing Division files for a period of one (1) year after expiration of the qualification.

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These records are available for review by any person authorized to do so by applying in person to the Materials Control, Soils and Testing Division. Welding test plates and test specimens are not retained after testing is complete.

RLS:Hb

Ronald L. Stanevich, P.E.
Director
Materials Control, Soils and Testing Division

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

GUIDELINES FOR ESTABLISHING AND MAINTAINING APPROVED PRODUCT LISTS OF MATERIALS, SYSTEMS AND SOURCES

1. PURPOSE

1.1 To establish general guidelines for establishing and maintaining approved product/producers lists of material producers, distributors and sources, commonly known as the Approved Product List (APL), which have been used frequently on WVDOH projects.

1.2 This Materials Procedure (MP) is distinguished from MP 106.00.02 "Procedure for Evaluating Products/Processes for Use in Highway Construction" which outlines the procedure for considering completely new products that have not yet been specified, consider in construction plans, notes, or other construction documents. This MP outlines the creation of an APL for a material which has already had significant usage on construction projects and have been accepted using other methods as defined further in this document.

2. SCOPE

2.1 This procedure shall apply to all sources and materials that are suitable for acceptance with a reduced testing frequency. Because of the uniqueness or complexity of some products, additional Materials Procedures may be necessary to supersede the requirements to this procedure.

3. REFERENCED DOCUMENTS

3.1 West Virginia Division of Highways Standard Specifications, Roads and Bridges.

3.2 Materials Procedure 106.00.02 - Procedure for Evaluating Products/Processes for Use in Highway Construction.

4. DEFINITIONS

4.1 Champion: This is typically the appropriate Materials Control Soils and Testing (MCS&T) Division Group Supervisor or their designee shall put forth and recommend the new APL to the Director of MCS&T or their designee (henceforth referred to as Director.)

4.2 ST-1: Special Testing Form 1, this is the acceptance method for a material which does not otherwise have an acceptance method such as being on an Approved Product List, be designate by the Specifications, or a MP.

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4.3 Historic Usage: Documentation of a positive acceptance record of the product via the usage of ST-1.

5. REQUISITES FOR THE CREATION OF AN NEW APPROVED LIST

5.1 A clear acceptance criterion, such as those listed in the following sections shall be established to govern the acceptance of the product. In order for a product or system to be considered as a candidate for a new APL, one or more of the following acceptance criteria shall be met:

5.1.1 WVDOH Specifications, Materials Procedures or other State Acceptance Criteria.

5.1.2 Approval by a WVDOH Committee, such as the "Roadside Departure Committee" or "Construction Safety Committee."

5.1.3 Testing and or approval via information gathered from national agencies such as NTPEP, ASSHTO, APEL etc.

5.1.4 Historic usage and approval on state projects by ST-1s, special provisions, etc.

5.1.5 Consistent satisfactory compliance of the product with the WVDOH Specifications.

6. APPROVED CRITERIA

6.1 Approval shall be granted by the Director of MCS&T, or their designee to a material or source providing at least one of the following criteria are met:

6.1.1 The manufacturer of the material has developed and operates under a Division approved Quality Control Plan that sufficiently controls the quality of the material to the extent that the possibility of a substandard material being produced and shipped is substantially reduced if not eliminated.

6.1.2 The record of specification compliance of the material or source is satisfactory to the Division.

6.1.3 The manufacturer has successfully undergone an evaluation of manufacturing and quality control processes that has led to certification or accreditation by a Division recognized accreditation agency.

6.1.4 Acceptance or approval of a particular material by an AASHTO national and/or regional test program.

6.1.5 Acceptable evaluation by field-testing of a material or product design analysis.

6.2 Unless otherwise directed by the Director, acceptance criteria shall be documented and maintained by the Materials Lab Coordinator, or Materials Control Group. This acceptance criteria shall be available in the MCS&T ProjectWise folder in the event of employee turnover so other employees will be able to consistently duplicate approval process.

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6.2.1 A sample of APL acceptance documentation is attached and the current version of this file is available on the WVDOH MCS&T webpage toolbox.[1]

7. RETENTION OF APPROVED STATUS

7.1 All approved materials or sources shall be subject to validation through periodic inspection and/or review to determine if the approved product(s) are maintaining the same characteristics and quality as those originally approved.

7.1.1 This inspection and validation shall be performed at least once every two years. Once the process has been completed, each re-approved source shall retain its issued approval/lab number unless the product has changed from its original state enough to warrant a new number (For example, a new, updated version of the product.)

7.1.2 Re-approval verification shall be based on one or more of the following criteria:

7.1.2.1 Satisfactory results from testing random samples collected at the source, supplier or from a Division project.

7.1.2.2 Re-inspection of the manufacturing and quality control processes.

7.1.2.3 Satisfactory statistical evaluation of routine quality control test data supplied by the manufacturer.

7.1.2.4 Certified statement from the manufacturer that the approved product is being manufactured under the same design, formulation, manufacturing process and/or quality control processes that were in effect when product or source was originally approved.

7.1.2.5 Continued presence on an accepted national/regional program such as NTPEP or ASSHTO etc.

8. DOCUMENTATION AND AVAILABILITY OF APLS

8.1 The new or updated APL shall be submitted to the Director for approval. Once approved, the APL will be uploaded to the MCS&T Webpage[2] and distributed to the District Materials Supervisors and any other interested parties.

8.1.1 All manufacturers or distributors of approved materials shall be required to reference their approval/lab number on the shipping documents (typically invoices) that accompany the approved material to the project.

Ronald L. Stanevich, P.E.
Director

[1] https://transportation.wv.gov/highways/mcst/Pages/tbox.aspx
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DB response – they already do put this approval number on their invoice, we are just reminding everyone of that here. I'm not sure where is says that, but they LOVE telling folks what their approval number is.

Materials Control, Soils & Testing Division

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION
MATERIALS PROCEDURE

CERTIFICATION OF ASPHALT SHIPPING TERMINALS

1. PURPOSE

1.1 To establish procedures and conditions for certifying asphalt shipping terminals and to establish inspection and shipping procedures for certified terminals.

2. SCOPE

2.1 This procedure applies to liquid asphalt products furnished to state projects and purchase orders for use in highway construction and maintenance. However, Materials Control, Soils and Testing (MCS&T) may elect to use other control procedures when special conditions dictate the need for more stringent control.

3. GENERAL

3.1 This standard may involve hazardous materials, operations and equipment. It does not address all of the safety problems associated with their use. The user of this standard will be responsible for appropriate safety and health practices.

3.2 The materials covered by this Material Procedure and the applicable specification requirements are as follows:

Material	Division Standard Specification Section	Applicable AASHTO Specification
Performance Graded Asphalt Binders	705.5	AASHTO M-332
Asphalt Emulsions (Anionic)	705.4	AASHTO M 140
Asphalt Emulsions (Cationic)	705.11 and 705.12	AASHTO M 208 and M 316
Asphalt Plastic Cement	708.9	None

4. TERMINOLOGY

4.1 AASHTO - The American Association of State Highway and Transportation Officials.

4.2 AASHTO:resource - The AASHTO Materials Reference Laboratory formerly AMRL.

4.3 COA – Certificate of Analysis.

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4.4 HMA – Hot Mix Asphalt.

4.5 Lot – A batch of material produced.

4.6 MCS&T – Materials Control, Soils and Testing.

4.7 MP – Material Procedure.

4.8 WVDOH - West Virginia Department of Highways

5. SIGNIFICANCE AND USE

5.1 This Material Procedure (MP) sets forth a method for the quality control of liquid asphalt products. This is accomplished by a certification system that uses test data from both the supplier and the Division.

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5.2 This MP provides information on the following activities:

5.2.1 General requirements that the supplier must satisfy for approval under the certification program.

5.2.2 Minimum requirements to be included in the Supplier's quality control plan.

5.2.3 Procedures for shipping asphalt.

5.2.4 Procedure for MCS&T monitoring of the system.

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5.2.5 Procedure for evaluating monitor, supplier, and field sample test data.

6. PROCEDURE

6.1 QUALITY CONTROL PLAN - The supplier will submit a quality control plan, to ensure that the material in stock complies with AASHTO:resource specification requirements. The plan will include the following:

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6.1.1 Facility type (refinery, terminal, in-line blending, or HMA plant, etc.), location, person responsible for quality control at the facility.

6.1.2 The tests to be conducted, the name and location of the laboratory, or laboratories conducting the tests and the frequency at which the tests are to be conducted. The supplier will include test data that will be sent to Materials Control, Soil and Testing (MCS&T), and how often it is to be submitted. Suggested frequency is weekly, or monthly, during the time when the terminal is in operation.

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6.2 LABORATORY - The supplier will provide a laboratory with the necessary test equipment and personnel to test the asphalt for specification compliance. The testing may be done at more than one location, for example: terminal laboratory and refinery laboratory and the supplier may elect to have all or part of the tests conducted by a commercial laboratory.

6.2.1 The principal laboratory must be accredited by the AASHTO:resource, or have applied for such inspection and shall participate in the AASHTO:resource Proficiency Sample Testing Program. Exceptions will be made for those materials for which AASHTO:resource does not provide accreditation or a proficiency sample testing program. In such cases MCS&T may conduct its own inspection as a substitute for the AASHTO:resource inspection.

7. SAMPLING AND TESTING

7.1 Sampling and testing shall consist of Quality Control tests by the supplier and testing of monitor samples and field samples by MCS&T. MCS&T field samples, when available, will also be used in the evaluation.

7.2 The supplier will obtain samples of all materials to be shipped to West Virginia Department of Highway (WVDOH) projects, at a minimum sampling frequency of one sample each time the tank is filled, or new material is added. All tests required by the specifications will be conducted on each batch.

7.3 The supplier will evaluate the test results. If any lot of asphalt does not meet specifications, it must be reworked or reblended until it does meet specifications, or that lot (batch) of material must not be shipped to WVDOH projects. The test data will be submitted to MCS&T.

7.4 MCS&T will obtain and test monitor samples, of all materials to be shipped to WVDOH projects. An MCS&T inspector or consultant will visit each supplier approximately three times per year for the purpose of collecting liquid asphalt samples. The inspector or consultant will obtain samples of each material for which the supplier is certified, or wishes to become certified, and has in stock. Additional visits to obtain samples may be made if additional data is needed to evaluate a specific material. These samples will be tested for compliance with all requirements of the governing specifications. Suppliers must include a Certificate of Analysis (COA) for all materials certified at the time of sampling.

7.5 MCS&T will evaluate the Quality Control data, monitor sample data and any field sample data that may have been obtained, at intervals of approximately 30 days. If the asphalt does not meet the required criteria, a review will be made of the entire system. This may include sampling and testing procedures, and resampling and testing of both Quality Control and MCS&T samples. If this does not resolve the problem and the asphalt still does not meet the criteria, future shipments of that asphalt must be made using the procedure given for Level Two, in Section 8.3 of this MP, until the criteria is met.

7.5.1 If the material continues to not meet specifications or if the supplier has not manufactured a certified material or materials for a maximum of 2 years, then MCS&T retains the right to remove the certification from that material(s).

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7.6 Performance Graded Binders, Asphalt Emulsions and Asphalt Plastic Cement shall adhere to the West Virginia Division of Highways Standard Specifications for Roads and Bridges, Section 705 and/or AASHTO:resource.

7.7 FIELD SAMPLES - Field samples will be tested for compliance with the governing specifications. If the material does not meet these criteria, it will not be shipped under Level Two procedures until the criteria is met.

7.8 The percent within tolerance for field samples is defined as the percent of the material statistically predicted to be within the specification limits. It may be based on either the normal distribution, or the t-distribution, as applicable for the sample size. The minimum number of samples for statistical evaluation is four. For fewer samples the evaluation of failing samples will be made on an individual basis.

7.9 When the requirements for certification have been met, the Division will notify the supplier. Shipments may then be made using the procedure given for Level One Quality Procedure, in Section 8.1 of this MP.

8. SHIPPING PROCEDURES

8.1 LEVEL ONE - To qualify for Level One shipment, the material must be from a certified terminal, or refinery, and must be included on the current list of approved Bituminous Materials. Shipments may be made at any time.

8.2 The supplier will prepare a shipping invoice containing the following information: name and location of company, type and grade of asphalt, quantity and date shipped, and a statement that the asphalt meets specifications. In addition, for material shipped by tanker, the invoice will contain a statement that the transport vehicle has been inspected for contamination and has been found to be acceptable for the type of material being shipped.

8.3 LEVEL TWO - Level Two shipments will consist of shipments of asphalt that are not included in the current list of Certified Bituminous Materials, or shipments that are made from unapproved terminals.

8.4 Each lot will be sampled by MCS&T or its consultant. The quantity represented by the sample will be the quantity in the storage tank at the time the sample is taken. A new sample must be taken when new material is added to the tank. In the case of materials stored in drums, or pails, the quantity represented by the sample will be the quantity of that lot on hand when the sample was taken.

8.5 If the sample meets specifications, shipments may be made until the entire lot has been shipped, or in the case of materials stored in tanks, until new material is added to the tank.

8.6 Shipments may be made in accordance with paragraph 8.2 of this MP, except that the specific lot of material must have been tested and must meet specifications. The

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Asphalt Plastic Cement - Percent Nonvolatile Matter ¶

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following additional information is required with the invoice: lot or tank number, date shipped and destination.

8.7 Asphalt that does not meet specifications may not be shipped until it has been reworked or reblended and meets specifications.

Ron Stanevich, P.E.
Director of Materials Control, Soils and Testing

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

INSPECTION AND ACCEPTANCE PROCEDURES FOR PRECAST CONCRETE PRODUCTS

1. PURPOSE

1.1 To set forth procedures for the inspection and acceptance of precast concrete products, including inlets, manholes, box culverts, 3-sided bridge units, retaining wall panels, headwalls, wingwalls, lagging, junction boxes, and any other precast products, and the approval of the plants at which they are fabricated.

2. SCOPE

2.1 This procedure will apply to all precast concrete products supplied for use on West Virginia Division of Highways projects and to all precast concrete product fabricators that supply material for use on West Virginia Division of Highways projects.

2.2 For prestressed concrete members refer to MP 603.10.40 “Inspection and Acceptance Procedure for Prestressed Concrete Bridge Beams.”

3. FABRICATOR APPROVAL

3.1 All precast concrete product fabricators (hereafter referred to as the Fabricator) shall be approved by Materials Control Soils and Testing MCS&T Division prior to the start of any work for the WVDOH. If not listed on the WVDOH Approved List of Precast Concrete Fabricators, a Fabricator shall contact MCS&T Division a minimum of six weeks prior to the planned date on which fabrication is to begin to initiate the approval process.

3.2 In order for a Fabricator to be approved and listed on the WVDOH Approved List of Precast Concrete Fabricators, they must be NPCA (National Precast Concrete Association) certified, QCAST (American Concrete Pipe Association) Certified, or have an equivalent type of certification.

3.3 The process for approving a Fabricator shall include, but not be limited to, an on-site visit to the fabrication plant by a WVDOH representative from MCS&T Division.

During this visit, the WVDOH Quality Assurance (QA) personnel shall inspect the fabrication facility and Quality Control (QC) lab, meet with QC and other key personnel from the Fabricator, and sample component materials which will be used in the fabrication of precast items.

3.3.1 Sampling and testing of component materials shall be done in accordance with MP 603.02.10. Copies of recent component delivery tickets should be presented on the day of sampling. All component materials must be approved prior to the start of fabrication.

3.3.1.1 Any Fabricator which does not produce for the WVDOH for a period of 2 years shall be removed from the Approved Fabricator list. After removal from the approved list, before a Fabricator can again produce for the WVDOH, they must repeat the approval process. Sampling of component materials will not continue when the plant is not listed on the Approved Fabricator list.

3.3.2 Personnel from the Fabricator required to be present during the initial on-site visit and meeting between WVDOH and Fabricator shall include representatives from Production and Quality Control. Any questions and concerns regarding WVDOH requirements, including applicable Specifications, Materials Procedure (MP's), Standard Details, and QC/QA Inspections shall be addressed at this meeting.

3.3.3 The Fabricator must submit the Quality Control Manual/Plan for review at this meeting.

3.4 All Concrete Mix Designs which will be used on products fabricated for the WVDOH must be submitted for review & approval, prior to the start of fabrication. All design mixes with aggregates that have reactivity classes R1, R2, and R3, as shown as in Approved Aggregates Source List, shall be developed in accordance with subsection 601.3.1.1. If an aggregate Source is not listed on the Approved Aggregates Source List, the Division will test the fine and coarse aggregate from the Source, in accordance with AASHTO T 303, to determine the reactivity class of the aggregate prior to its use on any WVDOH project. The Division will inform the Fabricator of the reactivity class of aggregates that they are proposing to use. If a cement Source and/or a SCM Source are not listed on the Approved Source List, the Division will test cement and/or SCM from that Source prior to its use on any WVDOH project.

3.5 The Fabrication Plant QC Personnel, as a minimum, shall be a certified ACI Grade I Concrete Field Testing Technician and/or a WVDOH PCC Inspector.

4. FABRICATION & INSPECTION OF PRODUCTS

4.1 Prior to beginning fabrication of any precast concrete products, the Fabricator shall provide written or email notification to MCS&T Division at least one calendar week in advance of the date on which fabrication is to begin.

4.1.1 Depending upon the precast items being fabricated, MCS&T Division may choose to monitor fabrication. Fabrication of structurally significant products such as box culverts and 3-sided bridge units shall be monitored. Other items may be monitored at the discretion of MCS&T.

4.1.2 After fabrication has begun, the Fabricator shall keep MCS&T Division and the Inspector (whether a WVDOH employee or a contract employee representing the WVDOH) informed in advance of the days on which fabrication will take place.

4.2 Shop Drawings must be approved by the West Virginia Division of Highways prior to the start of any work by the Fabricator. The Inspector must have a copy of these approved shop drawings prior to start of any work by the Fabricator.

4.3 Concrete cylinders shall be made for compressive strength testing with 6-inch by 12-inch (150 mm by 300 mm) or 4-inch by 8-inch (100 mm by 200 mm) molds. The cylinders are to be cured in the same area as the products for which they represent (Field Cured as outlined in AASHTO T23) until tested to create a curing environment similar to the product that they represent. A compressive strength test shall consist of the average result of a set of cylinders, which is at least two cylinders. Form removal isn't to be allowed until concrete has reached 50% of the design strength, unless otherwise specified. If forms are stripped from box culverts at 50% of the design strength, another curing method from section 601.12, or AASHTO M259, or M273 (whichever is applicable) must be used until 70% of the design strength is obtained.

4.3.1 For both conventional concrete and SCC mixes, a minimum of one set of compressive strength cylinders shall be fabricated from every 7 yards of concrete, or fraction thereof, with a minimum of one set per day per mix design. Both the form removal strength and the 28-day strength must be confirmed by a set of cylinders. Cylinders shall be the same size as those used in the initial approved mix design. For conventional concrete, slump, temperature, and air content tests shall be conducted on the first batch of concrete each day and every time that cylinders are fabricated. For SCC mixes, spread, temperature, and air content tests shall be conducted on every batch. For all types of concrete, unit weight and yield tests shall be conducted on the first batch of concrete

each day and thereafter as deemed necessary by Quality Control and Quality Assurance Personnel.

4.4 When required, absorption tests are to be conducted in accordance with ASTM C642-13, and tests should be conducted on a weekly basis for each mix design used, at a minimum, unless otherwise specified.

4.5 Unless otherwise specified, plastic concrete shall have an air content measured at 7 ± 2%.

4.5.1 Prior to the use of Self-Consolidating Concrete in precast items all mix designs must be submitted to MCS&T for approval and meet the requirements of the following table. Test results from trial batches produced by the laboratory which designed it shall be included in the submittal. The compressive strength of the design mix shall be at least 15% above the specified design strength.

Table 4.5.1 - SCC Mix Design Acceptance

Fresh Property	**Mix Design Batch Acceptance Criteria**
Air Content	7± 1.5%
Spread (ASTM C1611)	Target ± 1.5 inches (38 mm) 2 seconds ≤T_{50}≤ 7 seconds Visual Stability Index ≤1.0
Passing Ability (ASTM C1621)	J-Ring Value ≤1 inch (25 mm)
Segregation Resistance (ASTM C1610)	Segregation ≤ 12%
Unit Weight and Yield	±2% of Theoretical

4.5.2 The following table lists the criteria for SCC production.

Table 4.5.2 - SCC Production Acceptance

Fresh Property	**Production Acceptance Criteria**
Air Content	7± 2%
Spread (ASTM C1611)	Target ± 2 inches (50 mm) 2 seconds ≤T_{50}≤ 7 seconds Visual Stability Index ≤1.0

Concrete Temperature	<90°F (32°C)
Unit Weight and Yield	±2% of Theoretical

4.5.3 SCC should only be given minimal vibration; and shall not be dropped from a distance greater than 4 feet relative to the top of the form.

5. FINAL INSPECTION

5.1 After fabrication is completed and prior to shipment, the precast items will be stored on dunnage. The Fabricator shall provide MCS&T Division with a written or email request for final inspection a minimum of one calendar week prior to the desired date of inspection. Effective communication from the Fabricator to MCS&T Division and Consultant Inspection Agency is the key to avoiding any scheduling conflicts regarding final inspection.

5.2 At the final inspection, the fabricator shall provide the inspector with documentation of required data pertinent to the product(s) being produced. Attached to this document is a sample inspection sheet to be used as a guide for presenting this information. This documentation is also available on the MCS&T Division Website[1].

5.2.1 For the final inspection, the Inspector may witness compressive strength tests if required, inspect repairs as needed, and conduct a thorough visual examination of each member. A copy of the Inspector's daily reports, a copy of the final inspection report, and all other pertinent information provided to the Inspector by the Fabricator shall be kept on file by MCS&T Division.

5.2.2 For box culverts, trial fitting of adjacent pieces, prior to shipping, will be required as part of the final inspection process. Each adjacent box culvert will be stacked in pairs vertically; the gaps between each pair will be measured, and dunnage will be placed below the bottom culvert to prevent damage. The maximum gap between the adjacent pieces shall not exceed ½ inch (13 mm), unless otherwise stated in the construction plans.

6. ACCEPTANCE & REJECTION

6.1 Upon completion of final inspection, if a precast product meets all specification requirements and does not contain any defects, the Inspector will stamp the precast

[1] https://transportation.wv.gov/highways/mcst/Pages/WVDOH-Materials-Procedures.aspx

product as accepted by MCS&T Division and provide a 7-digit Laboratory Reference Number for shipment.

6.2 If, however, the precast product does not meet all specification requirements due to damage, defect, or dimensional tolerance, the product must be further evaluated before potential acceptance by the MCS&T Division or the District for which the product was produced, as discussed further in the next sections.

6.2.1 Minor damage and/or defects may be repaired in accordance with the pre-approved repair procedures which should be incorporated within the Fabricator QC Plan. For cracks 4 mils (.1 mm) or less a silane treatment may be used. Cracks between 4 mils (0.1 mm) and 16 mils (0.4 mm) shall be repaired by epoxy injection in accordance with Section 603.10.2. Products with cracks exceeding 16 mils (4 mm) shall be rejected by MCS&T. If repairs appear satisfactory and all other specifications are met, the Inspector shall stamp the product as approved for shipment. MCS&T Division will issue a 7-digit Laboratory Reference Number for acceptance.

6.2.2 Major damage and/or defects shall be evaluated on a case-by-case basis. If a product is approved for repair and if repairs appear satisfactory, the Inspector shall stamp the product as approved for shipment.

6.2.3 If a product does not meet specification requirements due to dimensional measurements not within tolerance, the product must be evaluated by the contractor and or District as to its potential acceptance. If the decision is made to accept the product, acceptance shall be provided by the District through a DMIR. If, however, the product will not be accepted, the Inspector will reject the product, and MSC&T Division will apply a Laboratory Reference Number documenting the rejected product.

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Ronald L Stanevich, P. E.
Director
Materials Control, Soils and Testing Division

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ATTACHMENT