Materials Procedures Committee Regular Meeting

Meeting Time/Date: 10:00am, May 17, 2023

Meeting Location: Technical Support Division (Conference Rm. Basement) - 1334 Smith St.

Online Meeting: Google Meet Video Conference

Online Link - (https://meet.google.com/apa-rvti-ndx?authuser=0)

Files Available on ProjectWise for DOT users – See Invite or Follow P/W path:

WVDOH ORGS\MCS&T (0077) - FM\Materials Procedure Committee\MP Committee Meeting Files\2023\2023 05 17

Files Available on Webpage:

https://transportation.wv.gov/highways/mcst/Pages/MP-Committee-Page.aspx

Materials Procedures approved at the last meeting (4/19/23)

1. 106.00.21 - Acceptance Procedure for Mash Compliant Roadside Safety Hardware
2. 700.00.53 - Acceptance Procedure for Evaluating Independent Assurance Samples with Samples Used for Acceptance
3. 604.02.40 - Inspection and Acceptance Procedures for Precast Concrete Products
4. 106.00.20 - West Virginia Acceptance Plan "a" Method of Estimating Percentage of Material of Construction That Will Fall Within Specification Limits
5. 710.01.40 - Acceptance Criteria to Designate a Wood Treatment Plant as an Approved Source of Wood Products

Materials Procedures - Old Business

Number	Champion	Title	Description
1 - 658.05.06*	Whitmore	Ancillary Structure Anchor Bolt Tightening	Ted making significant changes to update bolt tightening.
2 - 402.02.20*	Jobes	Rapid determination of the polish Susceptible Carbonate Particle Content in Aggregates	Formatting Updates and Revisions pertaining to the removal of the metric system
3 - 661.20.00*	Hanna	Procedure for Determining the Torque on Tamper Resistant Hardware	Updates to the handling of material that does not meet strength, or has other defects
4 - 700.00.01*	Brayack	Sampling and Testing of Materials at the Source (Coverage)	Minor edits, updating to common lingo.
5 - 700.00.54*	Farley	Procedure for Evaluating Quality Control Sample Test Results with	Significant updates to currently match computer system and practices

		Verification Sample Test Results	
6 - 711.00.22*	Preston	Quality Assurance Testing of Coating Products Listed on WVDOH Approved Product Lists (Apls)	New MP, Adds yearly testing for paint on the approved list. Comments have been addressed.
7 - 212.02.20*	Ross	Procedure For Determining a Reduced Unit Price to Be Paid for Select Material for Backfilling Which Does Not Conform to Grading Requirements of Governing Specifications	Section 6.1, discussion of DMIR for non-conforming material.
8 - 107.00.40*	Preston	Determination Criteria for Monitoring Ground Vibrations in Residential Areas	Reconfirmation with no content edits. MP should be deactivated.
9 - 701.01.11*	Preston	Determination of Chemical Constituents in Hydraulic Cements	Reconfirmation with no content edits. MP should be deactivated.
10 - 711.00.20*	Preston	Paint Testing Methods	Reconfirmation with no content edits. Comments have been addressed.

Materials Procedures - New Business

1 - 100.00.02&	Brayack	Method Of Evaluating of Non-Standard or Non-Conforming Materials in Construction Via St-1	Added 25mB limit, updated internal AWP process for ST1
2 - 100.00.03&	Brayack	Method Of Evaluation of Non-Standard or Non-Conforming Materials in Construction Via Dmir	Added 25mB limit, 1 file per submission
3 - 106.00.02&	Brayack	Procedure For Evaluating Products for Use in Highway Construction	Added review time frame, and time frame for non MCST entities
4 - 601.05.50&	Thapa	Quality Assurance Procedures for Portland Cement Concrete	Adds E-Ticketing Requirements
5 - 700.00.56&	Ross	Commercial And Potential Skid Resistant Aggregate Source Approval Procedures	Major Updates

6 - 702.01.25&	Perrow	Method Of Test for Determining Mortar Strength	Adding and updating specs for testing
7 - 714.03.30&	Thaxton	Quality Assurance of Reinforced Concrete Culvert, Storm Drain, And Sewer Pipe	Refine the definition of "Days of Production"
8 - 700.00.50&	Jobes	Revisions Pertaining to The Removal of The Metric System	Small grammar changes, removed AASHTO R11 (inactive) and replaced with ASTM E29
9 - 700.03.50&	Jobes	Standard Method of Microscopic Determination of Air-Void Content	Added verbiage to accommodate the newer machines that run the modified point count automatically.
10 - 712.21.26&	Jobes	Procedure For Determining the Random Location of Compaction Tests	Corrected numbering (was out of order before) and removed metric examples, and updated the graphics in the examples, also a few small grammar edits.
11 - 207.06.20&	Preston	Chemical Analysis for pH of Soil	Reconfirmation with no content edits.
12 - 642.03.50&	Preston	Contractor's Quality Control for Surface Water and Sampling Procedures for Quality Determination	Reconfirmation with no content edits.
13 - 700.01.01&	Preston	Field Sampling and Testing of Surface Water for Quality Determination	Reconfirmation with no content edits.
14 - 601.03.20&	Preston	Chemical Determination of Cement Content in Hardened Concrete	Reconfirmation with no content edits.

Note 1: * Denotes this MP is up for Vote

Note 2: & Denotes this MP is not up for Vote

Comments

Comments due May 10th, so the Champion may review and address them. Submit comments to Adam Nester (Adam.W.Nester@wv.gov)

Next Meeting

New or Updated MPs due to the MP Chair 3-weeks before the next meeting: May 31st

Meeting Time/Date: 10:00 am, June 21, 2023

Meeting Location: MCST

Online Meeting: Google Meet Video Conference (Link TBD)

Additional MP Committee Meeting Information

For details of previous meetings, please visit the MCST MP Committee Webpage
https://transportation.wv.gov/highways/mcst/Pages/MP-Committee-Page.aspx

Tentative MP Committee Dates for 2023:

July 19, August 16, September 20

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

MATERIALS CONTROL, SOILS & TESTING DIVISION

MATERIALS PROCEDURE

ANCILLARY STRUCTURE ANCHOR BOLT TIGHTENING

1. PURPOSE

1.1 To establish equipment, procedure, documentation, and documentation transmittal requirements for the tightening of anchor bolt nuts associated with signing, signal, lighting, and intelligent transportation systems (ITS) related roadway ancillary structures.

1.1.1 This Materials Procedure is specifically focused on the procedure to be followed when tightening anchor bolt nuts and does not address all requirements and procedures pertaining to the installation of ancillary structures. Individual component pre-inspection and repair, structure pre-assembly, structure installation preparation, pre-application of protective coatings, overall installation procedure, and proper tightening of structural connection bolts are included as part of the Standard Specifications.

2. MATERIALS AND EQUIPMENT

2.1 The mandatory materials and equipment required to properly tighten the anchor bolts include lubricant, snug tightening wrenches, and a hydraulic fastener tightening wrench.

2.1.1 Wrenches used for a snug tightening are to have an appropriate handle length in order to achieve a level of initial snug tightening as predictable and uniform as possible. The handle length used for fasteners 3/4-inch to 1-1/4-inches in diameter is to be 23-inches. The handle length used for fasteners 1-1/2-inches to 2-1/4-inches in diameter is to be 36-inches.

2.1.2 Beeswax or toilet ring wax may be used as lubricant.

2.1.3 Hydraulic wrenches and accompanying documentation are to meet the requirements herein.

2.1.3.1 The wrenches are to be capable of generating the necessary torque in order to tighten the anchor bolt nuts as described herein.

2.1.3.2 The hydraulic wrench consists of a wrench and a hydraulic power pack to power and operate the wrench.

2.1.3.3 Hydraulic wrenches are to have the wrench and the pressure or torque readout gauge associated with the power pack calibrated regularly. Prior to the tightening of any anchor bolt nuts, the project Engineer is to be provided with separate calibration

certificates for the wrench and the gauge. The dates of the calibrations are to be one year or less prior to the date that the bolt tightening is performed. The certificates are to be from a calibration lab that is International Organization for Standardization (ISO) 17025 accredited, with the certificate indicating as such. The certificate for each is to display a serial number matching that shown on the wrench or gauge. If the gauge does not provide readings directly in torque values, the calibration certificate is to be accompanied by calibration charts which equate gauge pressure readings to torque values. Example calibration certificates and charts are included as part of attached ATTACHMENT 2.

3. DOCUMENTATION

3.1 The tightening of all anchor bolt nuts is to be documented using the form "WVDOH ANCILLARY STRUCTURE ANCHOR BOLT TIGHTENING RECORD" (documentation form) attached as ATTACHMENT 1, and available at the MCS&T DOH Webpage.[1]

4. PROCEDURES

4.1 Install the top nuts and washers and snug tighten the top nuts using the appropriate handle length wrench. Snug tightening is to proceed from nut to nut in a star pattern and the specific sequence chosen is to be indicated on the base plate by numbering the sequence using a permanent marker (see Figures 1 and 2 below). Snug tightness is considered to be the tightness which exists due to the full effort of a person using a spud wrench with the appropriate length handle for the bolt being tightened.

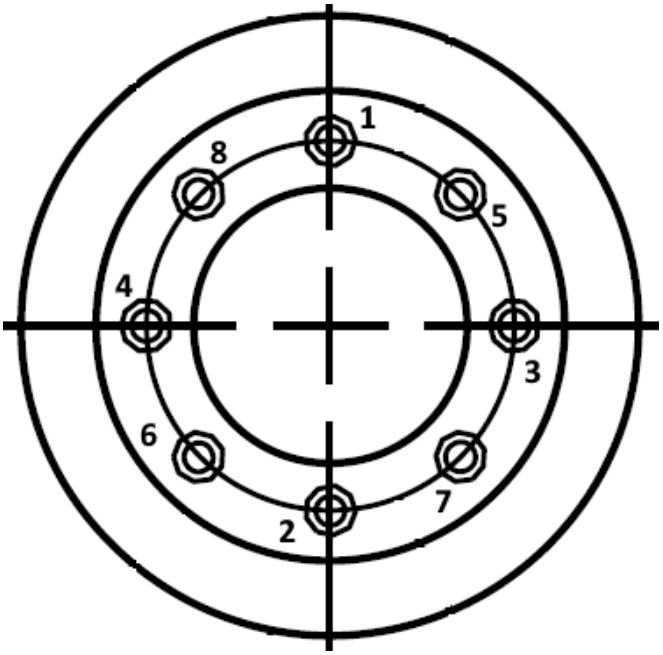


FIGURE 1 - EXAMPLE NUT TIGHTENING SEQUENCE FOR 8 BOLT BASE PLATE

[1] https://transportation.wv.gov/highways/mcst/Pages/tbox.aspx

FIGURE 2 -SNUG TIGHTENING SEQUENCE NUMBERING ON BASE PLATE

4.1.1 Snug tighten the leveling nuts following a star pattern.

4.2 After verifying that all nuts and washers have been brought into firm contact and the necessity or unnecessity for repeating the snug tightening procedure with beveled washers has been determined and performed if required, snug tight condition reference marks are to be placed on the nut and base plate using a permanent marker to prepare for the full tightening procedure(see Figure 3 below). One reference mark is to be placed on the top of the nut at one of the corners. One reference mark is to be placed on the base plate such that this reference mark and the reference mark on top of the nut will be aligned when the nut is rotated one half of the amount specified in Section 4.3.1. An additional reference mark is to be placed on the base plate such that this reference mark and the reference mark on top of the nut will be aligned when the nut is rotated the complete amount specified in Section 4.3.1. All reference marks are to be placed such that they will remain visible when the tightening wrench is placed on the nut.

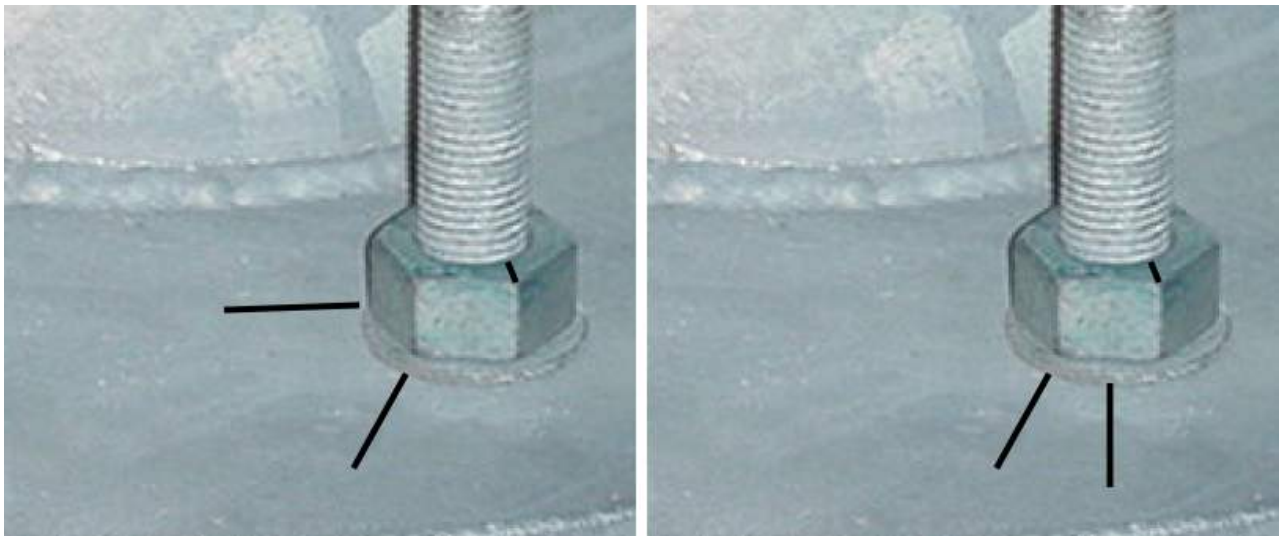


FIGURE 3 - SNUG TIGHT CONDITION REFERENCE MARKS FOR BOLTS 1-1/2" DIAMETER OR LESS (LEFT) AND BOLTS GREATER THAN 1-1/2" DIAMETER (RIGHT)

4.3 Fully tighten the top nuts using the hydraulic wrench.

4.3.1 Full tightness of each nut is achieved by rotating the nut a prescribed number of flats beyond the reference position. Rotation is to be 1/3 (2 flats) beyond the reference position for bolts 1-1/2-inches in diameter or less. Rotation is to be 1/6 (1 flat) beyond the reference position for bolts greater than-1-1/2 inches in diameter.

4.3.2 Tightening is to proceed from nut to nut in the same star pattern that was used for the snug tightening procedure and is to be achieved over two cycles. Using a structure with 2-inch anchor bolts as an example, each nut is to be tightened ½ flat. Each nut is to then be tightened an additional ½ flat. The amount of torque, as indicated on the power pack gauge, at the point when the full rotation of each nut is achieved is to be recorded on the documentation form. If the gauge associated with the power pack does not provide a torque readout, the pressure readout is to be recorded and the associated torque is to be determined from the power pack calibration charts and recorded on the documentation form.

4.4 Upon completion of the tightening of all nuts, a verification torque (Tv) is to be applied to each nut using the same hydraulic wrench and power pack that was used to tighten the nuts. This step is necessary to verify threads have not been stripped and is not intended to tighten the nuts further. The verification torque should be insufficient to

further turn and tighten the nuts. The required verification torque is to be calculated using the following formula and documented on the documentation form:

$$Tv = 0.12\ (Db)\ Fi$$

Where:

Tv = verification torque (inch-kips)
Db = nominal body diameter of the anchor bolt (inches)
Fi = 60% of the anchor bolt minimum tensile strength (kips.) For the commonly specified ASTM F1554 Grade 55 bolts, this calculated value is equal to 45
Multiply Tv by 83.3 to calculate Tv in ft-lbs

If the gauge associated with the power pack does not provide a torque readout, the pressure readout required to achieve the verification torque is to be determined from the power pack calibration charts.

4.4.1 The documentation form is to be marked where indicated to indicate that application of the verification torque did not result in further turning of each nut. If the application of the verification torque results in further turning of any nuts, the Traffic Engineering Division should be notified of this issue.

4.5 At least 48-hours after the tightening and verification torque procedures are completed, a torque equal to 110% of the Tv torque (1.10Tv) is to be applied to each nut using the same hydraulic wrench and power pack that was used to tighten the nuts. This step is necessary to verify threads have not been stripped and is not intended to tighten the nuts further. The 1.10Tv torque should be insufficient to further turn and tighten the nuts. If the gauge associated with the power pack does not provide a torque readout, the pressure readout required to achieve a torque of 1.10Tv is to be determined from the power pack calibration charts.

4.5.1 The documentation form is to be marked where indicated to indicate that application of the 1.10Tv torque did not result in further turning of each nut. If the application of the 1.10Tv torque results in further turning of any nuts, the Traffic Engineering Division should be notified of this issue.

5. DOCUMENTATION TRANSMITTAL

5.1 Upon completion of all procedures described herein and the documentation form being completed in its entirety, the Engineer is to transmit an electronic copy of the documentation form to the email address DOH.OS.AnchorNutTightening@wv.gov, which is established by the Traffic Engineering Division for this purpose. Prior to transmittal, the calibration certificates for the wrench and power pack pressure or torque readout gauge, as well as the calibration charts for the gauge, should be attached to the documentation form and included with the submittal. The subject line of the email should be named using the following format: D(*District Number*)-(*Contract ID Number*)-(*Sign, Signal, Lighting, or ITS*) Structure (*Structure Number as indicated on the project Plans*). Examples of this would be D4-2016000994-Sign Structure 6 and

D7-20060001093-Lighting Structure HML1. An example of all documents that should be included as part of a complete transmittal is attached as ATTACHMENT 2.

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

MP 658.05.06 Steward – Traffic Certification Section
RLS:W
ATTACHMENTS

Will add header after signatured (includes signature date)

WVDOH ANCILLARY STRUCTURE ANCHOR BOLT TIGHTENING RECORD

District: _____ State Project Number:_____

Contract ID number: _____ Federal Project Number:_____

Plan Assembly Number:_____

Structure Utility: __ Signing __Signal __Lighting __ITS

Structure Type: __ Cantilever __(Sign) Butterfly __(ITS) Butterfly __Span __Strain Pole
__Mast Arm __High Mast Tower __Conventional Light Pole

Anchor Diameter:_____inches Tv: _____foot-lbs = _____ PSI

1.10Tv:_____foot-lbs = _____ PSI

Wrench Serial Number: _____ Gauge Serial Number:_____

Diagram of Structure (Plan view of structure showing all base plates. Show and label diagram with base plate numbers and location/position of structure in relation to a reference feature)

Base Plate 1 Diagram (Plan view of base plate with anchor bolt locations. Number anchor bolts the same as the anchors are numbered and tightened. Label diagram to indicate orientation of base plate in relation to a reference feature)

Full Tightness Gauge Pressure and Torque Values (Pressure recording not necessary if readout of gauge is in torque)

	1	2	3	4	5	6	7	8
PSI								
foot-lbs								

Mark Each Box to Indicate Application of Tv did not Result in Further Turning of Nut

	1	2	3	4	5	6	7	8

Mark Each Box to Indicate Application of 1.10Tv did not Result in Further Turning of Nut

	1	2	3	4	5	6	7	8

Will add header after signatured (includes signature date)

Base Plate 2 Diagram

Full Tightness Gauge Pressure and Torque Values

	1	2	3	4	5	6	7	8
PSI								
foot-lbs								

Mark Each Box to Indicate Application of Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

Mark Each Box to Indicate Application of 1.10Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

Base Plate 3 Diagram

Full Tightness Gauge Pressure and Torque Values

	1	2	3	4	5	6	7	8
PSI								
foot-lbs								

Mark Each Box to Indicate Application of Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

Mark Each Box to Indicate Application of 1.10Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

Will add header after signatured (includes signature date)

Base Plate 4 Diagram

Full Tightness Gauge Pressure and Torque Values

	1	2	3	4	5	6	7	8
PSI								
foot-lbs								

Mark Each Box to Indicate Application of Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

Mark Each Box to Indicate Application of 1.10Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

_____ Date of Tightening

_____ Date of Application of 1.10Tv

_____ Installation Contractor

_____ Bolt Tightening WVDOH Rep. (Print)

_____ Contractor Rep. (Print)

_____ Application of 1.10Tv WVDOH Rep. (Print)

_____ Contractor Rep. (Signature)

_____ WVDOH Project Engineer (Print)

Will add header after signatured (includes signature date)

WVDOH ANCILLARY STRUCTURE ANCHOR BOLT TIGHTENING RECORD

District: _____ State Project Number:_____

Contract ID number: _____ Federal Project Number:_____

Plan Assembly Number:_____

Structure Utility: _X Signing __Signal __Lighting __ITS

Structure Type: __ Cantilever __(Sign) Butterfly __(ITS) Butterfly _XSpan __Strain Pole

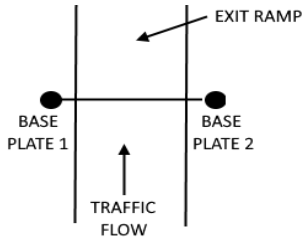
__Mast Arm __High Mast Tower __Conventional Light Pole

Anchor Diameter:_____2_____inches Tv: ____900___foot-lbs = ___2,787__ PSI

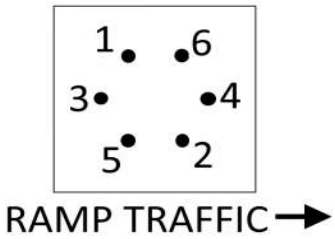
1.10Tv:____990____foot-lbs = ___3,110__ PSI

Wrench Serial Number: ___0916506063__ Gauge Serial Number:_____353228_____

Diagram of Structure (Plan view of structure showing all base plates. Show and label diagram with base plate numbers and location/position of structure in relation to a reference feature)



Base Plate 1 Diagram (Plan view of base plate with anchor bolt locations. Number anchor bolts the same as the anchors are numbered and tightened. Label diagram to indicate orientation of base plate in relation to a reference feature)



Full Tightness Gauge Pressure and Torque Values (Pressure recording not necessary if readout of gauge is in torque)

	1	2	3	4	5	6	7	8
PSI	3350	3347	3354	3362	3343	3351		
foot-lbs	1064	1064	1066	1068	1062	1065		

Mark Each Box to Indicate Application of Tv did not Result in Further Turning of Nut

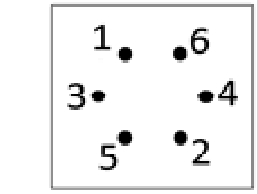
1	2	3	4	5	6	7	8
x	x	x	x	x	x		

Mark Each Box to Indicate Application of 1.10Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8
x	x	x	x	x	x		

Will add header after signatured (includes signature date)

Base Plate 2 Diagram



←RAMP TRAFFIC

Full Tightness Gauge Pressure and Torque Values

	1	2	3	4	5	6	7	8
PSI	3370	3338	3360	3372	3325	3341		
foot-lbs	1071	1061	1068	1072	1056	1062		

Mark Each Box to Indicate Application of Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8
x	x	x	x	x	x		

Mark Each Box to Indicate Application of 1.10Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8
x	x	x	x	x	x		

Base Plate 3 Diagram

Full Tightness Gauge Pressure and Torque Values

	1	2	3	4	5	6	7	8
PSI								
foot-lbs								

Mark Each Box to Indicate Application of Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

Mark Each Box to Indicate Application of 1.10Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

Will add header after signatured (includes signature date)

Base Plate 4 Diagram

Full Tightness Gauge Pressure and Torque Values

	1	2	3	4	5	6	7	8
PSI								
foot-lbs								

Mark Each Box to Indicate Application of Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

Mark Each Box to Indicate Application of 1.10Tv did not Result in Further Turning of Nut

1	2	3	4	5	6	7	8

_____ Date of Tightening

_____ Date of Application of 1.10Tv

_____ Installation Contractor

_____ Bolt Tightening WVDOH Rep. (Print)

_____ Contractor Rep. (Print)

_____ Application of 1.10Tv WVDOH Rep. (Print)

_____ Contractor Rep. (Signature)

_____ WVDOH Project Engineer (Print)

EXAMPLE WRENCH CALIBRATION CERTIFICATE

CERTIFICATE INDICATES LAB IS ISO 17025 ACCREDITED

CERTIFICATE OF CALIBRATION

CERTIFICATE # TW-01193

[redacted] certifies that the instrument below has been calibrated in accordance with [redacted] calibration procedures under the conditions noted below using laboratory standards which are traceable to SI units.

The uncertainty represents an expanded uncertainty at approximately the 95% confidence level using a coverage factor of k=2.

The information on this certificate applies only to the identified instrument and may not be reproduced, except in full, without the written consent of [redacted]

WRENCH MODEL AND SERIAL NUMBER

MODEL	2503MFRMH
SERIAL #	0916506063
TYPE	Click
CAL DATE	9/2/2021
CAL DUE	9/2/2022
ACCURACY	(+/-) 4%
RANGE MAX	260
RANGE MIN	48

Customer	[redacted]
Address	[redacted]

Tech:	Temp (°F)	RH %
[redacted]	75.2	52
Test Method:	TI-CAL-1	

CALIBRATION DATE

AS FOUND			
PERCENT OF RANGE	WRENCH SETTING	AS FOUND	TOLERANCE
100%	250 FTLB	251.56 FTLB	(+/-) 4%
60%	150 FTLB	147.14 FTLB	(+/-) 4%
20%	50 FTLB	47.596 FTLB	(+/-) 4%

AS LEFT			
PERCENT OF RANGE	WRENCH SETTING	AS LEFT	TOLERANCE
100%	250 FTLB	248.38 FTLB	(+/-) 4%
60%	150 FTLB	147.98 FTLB	(+/-) 4%
20%	50 FTLB	48.286 FTLB	(+/-) 4%

STANDARDS USED FOR CALIBRATION

MODEL USED	MFGR	SERIAL #	CERT #	EXPIRES	RANGE
MTMDP-4L-100	AWS	10963-1	25500-1	7/23/2022	10-100 IN-LBS
MTMDP-4L-500	AWS	10963-2	25501-1	7/23/2022	50-500 IN-LBS
MTMDP-4L-250	AWS	10963-3	25502-1	7/23/2022	25-250 FT-LBS
MTMDP-4L-750	AWS	10963-4	25503-1	7/23/2022	75-750 FT-LBS

Expanded Uncertainty	
Range	k=2
10-100 inlb	1.08 inlb
50-500 inlb	4.98 inlb
25-250 ftlb	7.44 ftlb
75-750 ftlb	8.86 ftlb

9/2/2021

SIGNATURE DATE

EXAMPLE GAUGE CALIBRATION CERTIFICATE AND CHARTS

CERTIFICATE INDICATES LAB IS ISO 17025 ACCREDITED

Certificate of Calibration

CERTIFICATE # 14-03066

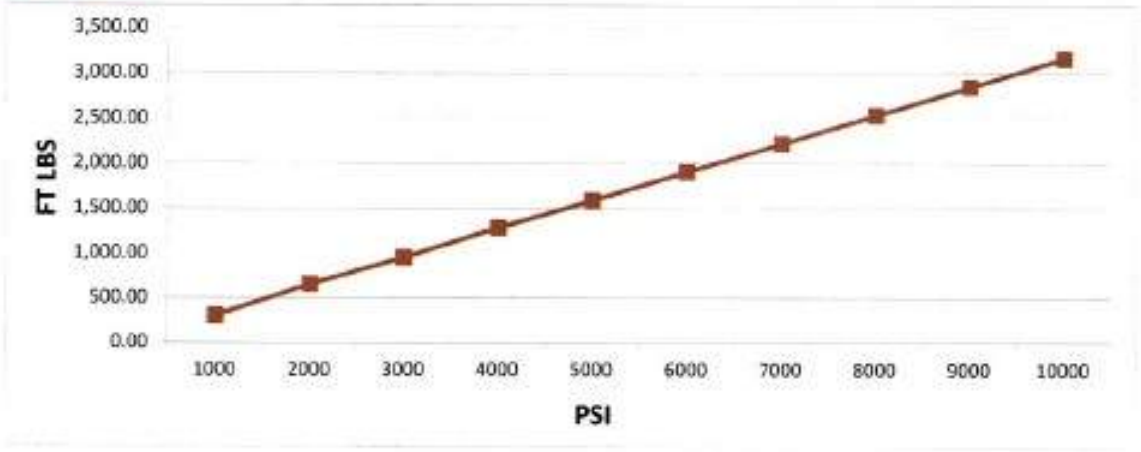
Calibration Date:	August 18, 2021
Calibration Due:	February 18, 2022
Temperature (F):	74.3
Relative Humidity(%):	57
Test Method:	TI-CAL-7, TI-CAL-8

Model Number:	3MD
Serial Number:	353228
Type:	Hydraulic
Technician:	[redacted]
Signature:	

Customer:	[redacted]
Address:	[redacted]

GAUGE MODEL AND SERIAL NUMBER

CALIBRATION DATE



TEST EQUIPMENT

Manufacturer	AKO	AKO
Model Number	TSD20011	TSD10KPT
Serial Number	6240	127064
Accuracy (+/-)	0.5%	0.1%
Calibration Certificate #	21238-1	21239-1
Calibration Due Date	10/15/2021	10/15/2021

CALIBRATION CHART

ANAB ACCREDITED CALIBRATION LABORATORY

Calibration Date:	8/18/2021	Model Number:	3MD
Calibration Due:	2/18/2022	Serial Number:	353228

PSI	FT/LBS	PSI	FT/LBS	PSI	FT/LBS	PSI	FT/LBS	PSI	FT/LBS
100	2	2100	692	4100	1307	6100	1940	8100	2573
200	52	2200	721	4200	1337	6200	1971	8200	2605
300	93	2300	752	4300	1368	6300	2003	8300	2637
400	125	2400	776	4400	1401	6400	2035	8400	2669
500	163	2500	797	4500	1434	6500	2067	8500	2702
600	195	2600	836	4600	1465	6600	2098	8600	2732
700	228	2700	880	4700	1496	6700	2131	8700	2764
800	259	2800	903	4800	1527	6800	2163	8800	2797
900	287	2900	924	4900	1560	6900	2194	8900	2828
1000	306	3000	956	5000	1591	7000	2225	9000	2860
1100	351	3100	987	5100	1622	7100	2257	9100	2891
1200	397	3200	1017	5200	1654	7200	2289	9200	2923
1300	426	3300	1048	5300	1685	7300	2321	9300	2954
1400	458	3400	1081	5400	1717	7400	2353	9400	2986
1500	491	3500	1113	5500	1749	7500	2384	9500	3018
1600	524	3600	1145	5600	1780	7600	2416	9600	3049
1700	556	3700	1177	5700	1812	7700	2447	9700	3081
1800	589	3800	1222	5800	1844	7800	2479	9800	3112
1900	623	3900	1267	5900	1876	7900	2511	9900	3143
2000	659	4000	1288	6000	1908	8000	2542	10000	3177

Tv = 900 ft-lbs = 2,797 psi*

1.10Tv = 990 ft-lbs = 3,110 psi*

[redacted] certifies that the above instrument has been calibrated in accordance with [redacted] calibration procedures under the conditions noted above using laboratory standards which are traceable to SI units. The uncertainty represents an expanded uncertainty at approximately the 95% confidence level using a coverage factor of k=2.

*DETERMINED USING LINEAR INTERPOLATION BETWEEN ADJACENT DATA POINTS

Expanded Uncertainty

Range	k = 2	Units
0-20,000	78.52	FT/LBS

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

MATERIALS PROCEDURE

RAPID DETERMINATION OF THE POLISH SUSCEPTIBLE CARBONATE PARTICLE CONTENT IN AGGREGATES

1. PURPOSE

1.1 To establish a rapid testing procedure for determining the approximate percentage, by weight, of polish susceptible carbonate particles in aggregate.

2. SCOPE

2.1 This procedure is designed to be used in conjunction with the testing of heterogeneous aggregate such as river gravel.

3. APPLICABLE DOCUMENTS ASTM E-11

3.1 ASTM C702 or AASHTO T248

3.2 MP 700.00.06

4. APPARATUS

4.1 A 4.75 mm (No. 4) U. S. Standard 203 mm diameter sieve, conforming to ASTM E-11 Specifications.

4.2 Balance or scale, having a capacity of at least 300 grams and a sensitivity of at least 0.1 grams.

4.3 Oven capable of being maintained at 110 ± 5ºC (230 ± 9ºF).

4.4 Containers: an acid resistant 225 × 175 × 51 mm Pyrex dish.

4.5 Receiving beaker: 400 or 600 ml Pyrex beaker.

4.6 Tongs: Acid resistant

4.7 Hydrochloric Acid: 6N solution

4.8 Safety Apparatus (rubber gloves, apron, respirator, ventilation hood, eye protection.)

4.9 A source of magnification, preferably a microscope of sufficient power, to discern grain sizes as small as 2 mm.

5. SAMPLE PREPARATION

5.1 Samples shall be representative of the sources from which they are obtained and shall be reduced to an appropriate size by use of a sample splitter or by quartering in accordance with ASTM C-702 or AASHTO T-248.

5.2 Samples shall be sieved and thoroughly washed over a 4.75 mm (No. 4) sieve and dried in an oven to constant weight at 110± 5°C (230 ± 9ºF).

5.3 An oven dry sample, weighing a minimum of 350 grams, shall be used for the test and shall be weighed to the nearest 0.1 gram.

5.3.1 The selection of samples of an exact predetermined weight shall not be attempted.

6. PROCEDURE

6.1 Under a ventilation hood, pour a quantity of 6N hydrochloric acid into the Pyrex dish to cover the largest piece of aggregate in the sample.

6.2 Place a small number of aggregate particles from the sample into the acid and observe signs of effervescence.

6.3 Immediately remove all pieces of aggregate exhibiting strong signs of effervescence and place in the receiving beaker containing water to stop the acid-carbonate reaction.

6.4 Repeat this process until all particles exhibiting effervescence have been removed from the sample.

6.5 Thoroughly wash and oven dry all pieces which exhibited effervescence and discard the remainder of the sample.

6.6 Each individual piece of aggregate should be carefully examined under a microscope by a person qualified by education and experience to employ petrographic techniques for the recognition of characteristic properties of rocks and minerals.

6.6.1 It is the intent of this test to determine those carbonate particles which would be considered to be polish susceptible and detract from the overall anti-skid properties of the aggregate. Those carbonate particles which exhibit frictional properties by virtue of a coarse grained texture (> 2 mm) should not be counted as polish susceptible. Calcareous sandstone, for example. would not be considered as a carbonate particle because only the matrix would be made up of carbonate material.

6.7 After this final separation has been made, weigh the carbonate particles to the nearest 0.1 gram.

7. CALCULATIONS

7.1 Calculate the percentage of carbonate particles as follows:

$$C = \frac{W_1}{W_2} \times 100$$

Where:
C = Percentage of carbonate particles
W_1 = Total weight of carbonate particles
W_2 = Total weight of test sample coarser than 4.75mm

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

MP 402.02.20 Steward – Aggregate & Soils Section
RLS:M

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

MATERIALS PROCEDURE

PROCEDURE FOR DETERMINING THE TORQUE ON TAMPER RESISTANT HARDWARE

1. PURPOSE

1.1 To set forth a procedure for determining the torque on tamper resistant hardware.

2. SCOPE

2.1 The procedure is applicable for tamper resistant hardware furnished under Section 661.2.2 of the West Virginia Division of Highways Standard Specifications for Roads and Bridges.

Commented [BDA1]: GH to review section of Spec Book based on SB's comment (refer to 661.2)

3. EQUIPMENT

3.1 Calibrated torque wrench which will read in inch-pounds or foot pounds.

3.2 12-inch section of 1 lb./ft u-channel post.

3.3 6 inch x 9 inch plate manufactured of 0.080 inch aluminum meeting the requirements of ASTM B-209, alloy 5052-H38. The plate shall contain two 3/8 inch holes drilled 1.5 inch from either end and be centered from both ends.

3.4 4 inch x 4 inch shim manufactured of 0.080 inch aluminum meeting the requirements of ASTM B-209, alloy 5052-H38. The shim shall contain one 3/8 inch hole drilled offset 1.5 inch on the center of the shim.

3.5 Screwdriver

4. SAMPLE REQUIREMENTS

4.1 Samples are to be selected in accordance with Section 4.6 of MP 661.02.40.

5. PROCEDURE

5.1 Place the shim on the flange side of the u-channel post.

5.2 Place the plate on top of the shim and line up the holes.

5.3 Place the steel washer, then the nylon on the bolt and push through the plate, shim and back of the u-channel.

5.4 Hand tighten the nut on to the bolt until it touches the back of the u-channel.

5.5 Set the reading on the torque wrench to zero.

5.6 Using the torque wrench, slowly turn the nut until the hex shaped drive head separates from it. Hold the bolt head with the screwdriver to prevent any movement during the torquing operation.

5.7 Read the torque wrench to determine the breaking point. Results are to be reported in foot-pounds.

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

MP 661.20.00 Steward – Metals Section
RLS:H

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

MATERIALS PROCEDURE

SAMPLING AND TESTING OF MATERIALS AT THE SOURCE (COVERAGE)

1. PURPOSE

1.1 To provide definitions and general guidelines of source sampling and testing to minimize non specification material arriving at the project site.

2. SCOPE

2.1 This procedure applies to materials sampled at the source (or some intermediate storage area) on a lot-by-lot basis.

3. DEFINITIONS

3.1 Pre-~~sampling~~ sampling - The sampling operation that is completed while the material is at the source, or other intermediate storage area, prior to shipment to the project site. ~~Pre~~ Pre-sampled material cannot be used until authorization of approval is received from Materials Control, Soil and Testing Division.

3.2 Pretesting - The testing of ~~pre~~ pre-sampled material. A pretested material is that which has been sampled, tested, and evaluated prior to shipment to the project site. Such material may be used upon arrival at the project site.

~~3.2~~3.3 Directive: Applicable Materials Procedures and/or Specifications.

4. PROCEDURE

4.1 Sampling Frequency

4.1.1 Frequency of sampling shall be in accordance with applicable directives for specific items.

4.2 Sampling

4.2.1 All material will be sampled by an authorized representative of the Division. Sampling will be conducted in accordance with the applicable directives.

4.3 Identifying Pre-~~sampled~~ sampled Material

4.3.1 When a specific quantity (lot) of material has been sampled, the material shall be set aside (isolated) and marked, sealed, tagged, or otherwise identified during storage as being ~~pre~~ pre-sampled. The material shall be stored with reasonable

assurance that it will not be contaminated, included, or mixed with other materials that have not been represented in the sampling plan.

4.3.2 Identifying records shall include the following ~~(where applicable)~~, and must accompany the sample to the laboratory:

a) Name of ~~Manufacturer~~Producer/Supplier
b) Date of ~~Manufactur~~Fabrication~~er~~
c) Batch or Lot Identification (Coverage Number)
d) Quantity of Material Represented by Inspection
e) Date Sampled
f) Test(s) Required
g) Sampler/Inspector
h) Project Number (If known at the time of testing)
i) Any other information necessary to identify the material.

4.4 Identifying Pre-tested Material

4.4.1 Packaged Material - When tests indicate packaged material has met the specification requirements they may be tagged, sealed, stamped, or otherwise identified by the state representative as having been pretested and approved.

4.4.2 Bulk or Miscellaneous Materials - When tests indicate bulk or miscellaneous materials have met specification requirements they may be stored in suitable enclosures until shipped. These enclosures may be tagged, sealed, stamped, or otherwise identified by the state's representative as having been pretested and approved. If appropriate, miscellaneous materials may be individually identified by tag, seal, or stamp as being pretested and approved. When closed conveyances are used to ship pretested materials, these conveyances may be tagged, sealed, stamped, or similarly treated to identify the contents as being pretested and approved for shipment to the project site.

5. DOCUMENTATION

5.1 Documentation of Samples - Samples must be documented setting forth all information necessary for proper identification of the materials in accordance with section 4.3.2.

5.2 Sample Document Distribution - Original documentation shall be transmitted with the sample to the testing laboratory. The sampler will retain a copy of this documentation.

5.3 Documentation of Test Results - The testing laboratory will perform all required tests and document the results on the appropriate form. A concluding statement on the form shall indicate that the material does or does not meet the requirements of the controlling specifications. This form shall also contain all applicable identifying information described in Section 4.3.2.

5.4 Testing Document Distribution

5.4.1 When testing is done by a Division approved laboratory, a copy of the test report will be furnished to Materials Control, Soil and Testing Division.

5.4.2 Test reports will be reviewed, assigned a laboratory number, and distributed by Materials Control, Soil and Testing Division as required.

5.5 Shipping Documentation - When test results indicate the material has met the specification requirements, authorization is given for shipment to the project site. The supplier shall prepare a shipping document and shall include as a minimum the following:

1. All information applicable in Section 4.3.2
   a) Information applicable for the shipment of aggregate, asphalt, and concrete include all items except c, e, f, and g of the above referenced section.
   b) Information applicable to shipment of paint include all items except e, g, and h of the above referenced section.
2. Date of shipment
3. The laboratory number assigned to the approval document.

When the material is from stock identified by a ~~Master Laboratory~~Coverage Number, a copy of the shipping document will be transmitted to the ~~Finalization~~ Materials Control Section of ~~the Division~~MCS&T. A copy of the shipping document will always accompany the shipment and be included in the project file.

5.6 Final Acceptance of Pre-tested Material - Tests completed on materials at the source may be used by the Division for acceptance. However, the Division reserves the right to inspect, resample and/or retest the materials at the source or after the materials have arrived at the project.

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

MP 700.00.01 Steward – Materials Control Section
RLS:B

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

MATERIALS PROCEDURE

PROCEDURE FOR EVALUATING QUALITY CONTROL SAMPLE TEST RESULTS WITH VERIFICATION SAMPLE TEST RESULTS

Commented [BDA1]: Review uses of "Similarity", "Verification", "Assurance."

1. PURPOSE

1.1 To provide a procedure for the comparison of quality control sample test results with verification sample test results (similarity).

2. SCOPE

2.1 This procedure is ~~primarily applicable to the contractor's test results when used in the acceptance process~~used to review and evaluate contract quality control samples.~~. Other tests, not necessarily applicable to the acceptance process but used for control of materials, may also apply.~~

2.2 Materials and Tests

2.2.1 Aggregate Gradations

2.2.2 ~~Hot Mix~~ Asphalt (Marshall)

1. Asphalt Content
2. Air Voids
3. Stability
4. Flow
5. Gradation

2.2.3 Asphalt (SuperPave)

1. Asphalt Content
2. Air Voids
3. Gradation

~~2.2.3~~2.2.4 Portland Cement Concrete

1. Air Content
2. Consistency

3. PROCEDURE

3.1 The following procedure will be implemented by the District Materials ~~Engineer/~~Supervisor.

3.2 ~~Immediately after~~After completion of the ~~verification~~ similarity sample test, the data will be entered into the Division approved materials tracking program. ~~it~~ This data will be compared by the software to the applicable quality control sample test results for the same item. Note that all samples being compared must be taken from the same sampling location, e.g., stockpile, roadway, etc., and sampled and tested in the same manner. ~~The comparison will be made in the following manner (also see example sample computation sheets in the attachments).~~

3.2.1 If there are more than ten quality control samples ~~available~~, a verification sample shall be done for first ten samples. Additional similarity samples shall be done at the frequency of one in ten. For example, if 16 QC samples are taken, there shall be a similarity for samples 1-10 and then another for 11-16.

~~3.2.1~~3.2.1.1 If~~determine the average of the ten consecutive quality control samples $\bar{X}_{10}$ whose midpoint is nearest chronologically to the verification sample. Should there only be~~ there are only five to ~~ten~~ nine quality control samples available, determine the average of all the available consecutive quality control test results. When comparing the grading characteristics of an aggregate, the average ($\bar{X}$) for each sieve will be determined.

3.2.2 In the event there are less than five quality control samples available when the ~~verification~~ similarity sample is complete, the District Materials ~~Engineer/~~Supervisor will make an informal review of ~~-~~ the data. If the data is such that a dissimilarity appears obvious (even without a formal comparison) then Section 4.1 of this procedure would apply. If, however, the verification sample results appear to be similar to the quality control sample results then the verification sample would be judged at this point by the District Materials ~~Engineer/~~Supervisor to be similar, and the applicable portions of Section 5.1 of this procedure would apply with the following statement: "This verification sample (verification sample number recorded here) has been judged to be similar in accordance with Section 3.2.2 of MP 700.00.54." This statement shall be on the sample record for the similarity.

3.2.3 Determine the range (R) of the quality control samples used in Section 3.2.1 by subtracting the smallest test value from the largest test value. When comparing the grading characteristics of aggregate, the range (R) for each sieve will be determined.

3.2.4 Compute the interval (I) by substituting the values calculated in Sections 3.2.1 and Section 3.2.3 into the proper equation below. When comparing the grading characteristics of aggregate, the interval(I) for each sieve will be determined.

No. of Samples Used in Calculating the Average in Section 3.2.1	Equation for Computing the Interval (I)
10	$I = \bar{X}_{10} \pm 0.91 \times R$
9	$I = \bar{X}_{9} \pm 0.97 \times R$
8	$I = \bar{X}_{8} \pm 1.05 \times R$
7	$I = \bar{X}_{7} \pm 1.17 \times R$

6	$I = \bar{X}_6 \pm 1.33 \times R$
5	$I = \bar{X}_5 \pm 1.61 \times R$

3.2.5 The interval (I) is determined by first adding the average ($\bar{X}_n$) to the product of the range (R) times the given constant. This determines the upper limit of the interval. Note that for gradings, if the result obtained is greater than 100, it will be recorded as 100. And second, subtract the product of the range (R) times the given constant from the average ($\bar{X}_n$). This determines the lower limit of the interval. Note here that if the result is less than zero, it will be recorded as zero.

3.2.6 Compare the verification sample test result with the calculated interval. When comparing the grading characteristics of aggregates, a comparison for each sieve will be determined.

3.3 If the verification sample is an aggregate and all sieve results coincide with or lie between the upper and lower limits of the interval, the quality control sample test results will be considered similar to the ~~verification~~ verification sample test results.

3.4 If the ~~verification~~ similarity sample is an aggregate and any one of the compared values (on any sieve) does not coincide with or lie between the upper and lower limits of the interval, the quality control samples test results will be considered dissimilar to the verification sample.

3.5 If the ~~verification~~ similarity sample is an asphalt mix, and the asphalt content and air voids coincide with or lie between the upper and lower limits of their interval, the quality control samples will be considered to be similar to the verification sample.

3.6 If the ~~verification~~ similarity sample is an asphalt mix, and any one of the compared values is not similar to the quality control data, the quality control samples will be considered to be dissimilar ~~to the verification sample~~.

3.7 If the ~~verification~~ similarity sample ~~(test)~~ is Portland Cement concrete, and both the air content and consistency coincide with or lie between the upper and lower limits of their interval, the quality control samples (tests) will be considered to be similar ~~to the verification sample~~.

4. EVALUATION

4.1 If the quality control sample data is dissimilar to the verification sample the following action will be taken where appropriate.

4.1.1 Review the quality control sampling procedure.

4.1.2 Review the quality control testing procedures.

4.1.3 Check testing equipment

4.1.4 Review computations.

4.1.5 Review documentation.

4.1.6 Perform any additional investigations that may clarify the dissimilarity.

5. REPORTING AND SAMPLE SUBMISSION

5.1 If the quality control samples are found to be similar to the verification sample, ~~proof of the similarity will be shown on the back of, or attached to, the original verification sample test report. The proof will include all of the calculations specified in Section 3.2.1 through 3.2.6 using the format similar to that shown on the appropriate sample computation sheet (attached). The report should be signed by the District Materials Engineer/Supervisor and distributed as specified in Sections 5.5 and 5.6~~the sample shall be marked as "Similar Passed" and submitted to the respective Materials Regional Coordinator for final evaluation using the currently materials tracking software.

5.2 If the quality control samples are dissimilar to the verification sample,~~ the sample~~ shall be marked as "Non-Similar or Similar Passed" and submitted to the respective Materials Regional Coordinator for final evaluation using the currently materials tracking software ~~the investigation described in Section 4.0 will be documented on the reverse side, or attached to, the original verification sample test report as described below, omitting the words in parenthesis which do not apply. A copy of all calculations specified in Section 3.2.1 to using the format similar to that shown on the appropriate sample computation sheet will also accompany the test report~~.

~~1. Quality control sampling procedures (are, are not) in accordance with applicable directives.~~

~~2. Quality control testing procedures (are, are not) in accordance with applicable directives.~~

~~3. Testing equipment (is, is not) in proper working order.~~

~~4. Computations (are, are not) correctly performed.~~

~~5. Documentation (is, is not) properly performed.~~

~~6. Report any other information that may have been determined in accordance with Section 4.1.6.~~

5.3 ~~All negative replies noted above will be explained.~~ If the Sample is not similar, a note will be made on the sample record including ~~This will include~~ a brief statement of the action taken to correct the deficiency. In the event other documentation is needed, such as a District Materials Inspection Report, to explain and/or support the final resolution of the dissimilarity, the dissimilar verification sample number should be referenced therein.

5.4 Results of the investigation as reported will ~~be signed~~noted by the District Materials ~~Engineer/Supervisor~~in their email submission.

5.5 ~~On the~~ The test ~~report~~ agency view ~~at the bottom will be typed the followings~~hall contain the information: "Issued by District (Number) per MP 700.00.54, (Date)."

5.6 ~~The signed, issued report should be prepared in duplicate and distributed as follows~~When the sample is completed, it shall be authorized by the respective Materials Regional Coordinator.~~:~~

~~5.6~~5.7 The testing technician shall be listed on each verification sample.

~~5.6.1 The original copy will be submitted to the Division.~~

~~5.6.2 One copy should be maintained in the District Materials file.~~

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

MP 700.00.54 Steward – Materials Control Section
RLS:Bf

COMPUTATION SAMPLE SHEET ASPHALT

Quality Control Lab Number	Date	Asphalt Content (%)	Air Voids (%)	Stability (Newton)	Flow (0.25 mm)
C7-68439	9-15-98	3.8	2.5	9586	11.3
C7-68676	9-16-98	4.3	3.2	9512	9.8
C7-68922	9-16-98	3.5	4.1	9688	10.6
C7-69314	9-17-98	4.0	4.4	9450	11.5
C7-69658	9-17-98	4.2	3.8	9498	10.2
C7-69770	9-18-98	4.0	5.0	9725	9.1
C7-69879	9-22-98	4.0	4.6	9531	10.3
C7-69891	9-22-98	4.0	3.7	9706	11.1
C7-70126	9-23-98	4.5	3.0	9825	11.6
C7-70245	9-24-98	4.3	4.6	9412	10.8
$\bar{X}$		4.06	4.01	9593.3	10.63

Property	Average $\bar{X}_{10}$	Constant (C)	Range (R)	Interval (I)	V.S.[1] Result	Similar Yes/No
Asphalt Content	4.06	0.91	1.0	5.0/3.2[2]	4.5	Yes
Air Voids	4.01	0.91	3.0	6.7/1.3[2]	3.9	Yes
Flow	10.63	0.91	2.5	12.9/8.4[2]	10.3	Yes
Stability	9593	0.91	413	9969/9217[3]	9650	Yes

Note: All four of these tests may not apply to any one sample. For those tests that do apply and all replies in the "Similar column are Yes", take action specified in Section 5.1. If one or more of the applicable test replies in the "Similar column are No", take action specified in Section 5.2.

1 - Verification Sample.

2 - $I=\bar{X}_n \pm C \times R$, round calculated intervals to nearest 0.1 percent.

3 - Round calculated interval to nearest whole Newton.

COMPUTATION SAMPLE SHEET PORTLAND CEMENT CONCRETE

Quality Control ID or Lab Number	Date	Air Content(%)	Consistency Slump (inch)
01	9-15-98	6.2	2.50
02	9-16-98	7.0	2.75
03	9-16-98	5.2	2.50
04	9-17-98	6.4	3.00
05	9-17-98	5.0	2.75
06	9-18-98	5.8	2.25
07	9-22-98	5.4	2.50
08	9-22-98	5.0	2.75
09	9-23-98	6.0	3.00
10	9-24-98	6.0	2.50
$\bar{X}$		5.8	2.65

Property	Average $\bar{X}_{10}$	Constant (C)	Range (R)	Interval (I)	V.S.[1] Result	Similar Yes/No
Air Content	5.8	0.91	2.0	7.6/4.0[2]	7.6	Yes
Consistency	2.65	0.91	0.75	3.25/2.00[3]	3.00	Yes

Note: All four of these tests may not apply to any one sample. For those tests that do apply and all replies in the "Similar column are Yes", take action specified in Section 5.1. If one or more of the applicable test replies in the "Similar column are No", take action specified in Section 5.2.

1 - Verification Sample.

2 - $I=\bar{X}_n \pm C \times R$, round calculated intervals to nearest 0.1 percent.

3 - Round calculated interval to nearest 0.25 inches.

COMPUTATION SAMPLE SHEET AGGREGATE GRADATION

Quality Contr Lab Number	Date	1½″	1″	½″	#4	#8	#200
C7-68439	9-15-98	100	100	25	4	2	0.6
C7-68676	9-16-98	100	100	30	2	2	0.6
C7-68922	9-16-98	100	99	28	2	1	0.4
C7-69314	9-17-98	100	99	49	8	2	1.0
C7-69658	9-17-98	100	100	32	2	1	0.5
C7-69770	9-18-98	100	100	36	1	1	0.6
C7-69879	9-22-98	100	100	42	2	2	0.7
C7-69891	9-22-98	100	100	19	1	1	0.5
C7-70126	9-23-98	100	100	36	2	2	0.3
C7-70245	9-24-98	100	100	43	1	1	0.3
$\bar{X}$		100	99.8	34	2.5	1.5	0.57

Sieve Size	Average $\bar{X}_{10}$	Constant (C)	Range (R)	Interval (I)	V.S.[1] Result	Similar Yes/No
1	100	0.91	0	100/100[2]	100[2]	Yes
1½	99.8	0.91	1	100/99	100[2]	Yes
½	34.0	0.91	30	61/7	24[2]	Yes
#4	2.5	0.91	7	9/0	2[2]	Yes
#8	1.5	0.91	1	2/0	1[2]	Yes
#200	0.57	0.91	0.7	1.2/0	0.4[3]	Yes

Note: All four of these tests may not apply to any one sample. For those tests that do apply and all replies in the "Similar column are "Yes", take action specified in Section 5.1. If one or more of the applicable test replies in the "Similar column are No", take action specified in Section 5.2.

1 - Verification Sample.

2 - $I=\bar{X}_n \pm C \times R$, round calculated intervals to nearest whole number.

3 - Round calculated interval to nearest tenth.

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

QUALITY ASSURANCE TESTING OF COATING PRODUCTS LISTED ON WVDOH APPROVED PRODUCT LISTS (APLs)

1. PURPOSE

1.1 To establish a procedure to perform quality assurance (QA) testing on coating products listed on MCS&T's approved product lists (APLs).

1.1.1 To perform QA testing in the MCS&T Division Paint Laboratory on all coating products listed on WVDOH APLs.

1.2 To establish a procedure for maintaining a record of such information.

2. REFERENCED DOCUMENTS

a. *WVDOH Specifications for Roads and Bridges, Section 711 Protective Coatings, Stains, and Traffic Paints.*

b. *WVDOH Specifications for Roads and Bridges, Section 601.13.3 Concrete Protective Coating.*

c. *WVDOH Specifications for Roads and Bridges, Section 707.16 Concrete Protective Coating Materials.*

d. *MP 711.00.20 Paint Testing Methods, most recent edition.*

e. *MCS&T Division Approved Product Lists (APLs) for coating products.*

f. *National Transportation Product Evaluation Program (NTPEP).*

g. *North East Protective Coating Committee (NEPCOAT).*

3. QUALITY ASSURANCE TESTING PROCEDURE

3.1 The quality assurance (QA) testing shall be performed on each approved coating listed on any of MCS&T's APLs.

Commented [1]: The purpose of this MP is to test, once a year, all the coating products and coating related products that are listed on our APLs in our paint lab at MCS&T. Our test data will be used to reassure the products listed on the APLs are still meeting our established criteria. This will also include testing any products that were placed on an APL using NTPEP or NEPCOAT test data.

Commented [2]: Comment made by Mance: Please format this wording so that it reads as section in this MP and add it as Section 1.1.1.

Commented [3]: I have worded the Title in as section 1.1.1

Commented [4]: This section is so we can do QA testing on all the coating products currently listed on our APLs each year and the coatings group at MCS&T does the testing in their paint lab.

3.2 The QA testing shall be performed in MCS&T's Paint Laboratory and by MCS&T personnel.

3.3 The QA testing shall be performed every calendar year.

3.4 MCS&T shall obtain a sample of each approved product from the coating manufacturer.

3.5 The coating manufacturer shall supply a sufficient quantity of the product to perform all the required testing.

3.6 Each coating product shall be tested in accordance with the appropriate WVDOH Specification.

3.7 Each product shall be tested based on the testing requirements in the WVDOH Specifications.

3.8 The coating manufacturers will submit Safety Data Sheets (SDS) and Product Data Sheets (PDS) directly to MCS&T.

3.9 The coating manufacturers shall submit clearly marked samples, as well as, all required documentation for mixing and application directly to MCS&T.

3.9.1 MCS&T shall split the samples provided by the coating manufacturers. One ~~3.9~~ portion of the split sample shall be used for the QA testing and the remaining portion shall be retained for any necessary investigations as described in Section 7.

4. QUALITY ASSURANCE HISTORICAL DATA

4.1 MCS&T shall maintain a spreadsheet for the purpose of collecting historical data for each coating product tested.

4.2 The historical data for each coating product will be analyzed yearly to determine if each product continues to meet the specification requirements necessary to remain on our APLs.

4.3 MCS&T will store the spreadsheet in a ProjectWise folder located under the Environmental & Coatings Group's folder.

5. NTPEP TEST DATA

5.1 MCS&T shall obtain NTPEP's test data for each product by using the DataMine function located on the NTPEP website. www.data.ntpep.org.

Commented [5]: Comment by Mance: Please add a Section 3.9.1 which outlines that we will split each sample and retain a portion for use in any investigation as described in Section 7.

Commented [6]: I have added 3.9.1 to have a split sample for investigation purposes.

Commented [7]: This section is to setup our spreadsheet that we will use to keep historical test data on each product. The data will be analyzed each year and kept in our groups PW folders.

Commented [8]: The purpose of this section is to show where we obtained NTPEP's test data and to mention we will also be using NTPEP test data to compare to our test data.

We will also be testing products that were added to an APL based on NTPEPs test data.

NEPCOAT uses test data from NTPEP to make their QPLs.

5.2 NEPCOAT uses test data from NTPEP to generate their Qualified Product List. The NEPCOAT Website

5.3 Any product that uses NTPEP's test data to obtain APL approval shall be compared to MCS&T's test data each year.

6. MCS&T'S QUALITY ASSURANCE TESTING

6.1 MCS&T will use the spreadsheet data, as described in Section 4, to perform QA testing analysis.

6.2 The purpose of the QA testing is to determine if each of the coating products listed on our APLs are still satisfying our specification requirements.

6.3 Products that meet the specification requirements, based on MCS&T's test data, will remain on the APL.

6.4 Products that do not meet the specification requirements, based on MCS&T's test data, shall go through an internal investigation.

7. MCS&T INTERNAL INVESTIGATION

7.1 MCS&T shall perform an internal investigation on any coating product that does not meet the specification requirements necessary to remain listed on our APLs.

7.2 MCS&T shall run a second test on any sample that fails. If MCS&T's test data from the second test passes, then the product will remain listed on our APLs.

~~7.3~~ ~~However, i~~If MCS&T's test data from the second test does not pass, then ~~NTPEP shall run a second test on the sample. If NTPEP's test data from the second test passes, then the product will remain on our APLs.~~

~~7.4~~7.3 ~~If the second test data from both MCS&T and NTPEP fails, then~~ the product will be removed from our APLs.

~~7.5~~7.4 The findings from the internal investigation shall be kept with the historical data spreadsheet, described in Section 4.

~~7.6~~7.5 MCS&T shall notify the company about the removal of their product from our APLs. The company must wait one-year from the date of the removal before they will be allowed to resubmit their product to MCS&T.

~~7.7~~7.6 The company must resubmit their product through MP 106.00.02 *Procedure for Evaluating Products for use in Highway Construction*. MP 106.00.02 requires HL-468 Form to be submitted to MCS&T. MP-100s (wv.gov).

Commented [9]: This section is our internal investigation for what we will do if a product fails. The product will be retested a second time by MCS&T and if it passes then ok. If fails, then ask NTPEP to do a second test.

Products can be removed from our APL for failing test data.

Commented [10]: Not sure if we can require NTPEP to do a second test for us or do we have to pay them to do a second test.

Commented [11]: Comment by Mance: Please check with them and let me know what you find out.

Commented [12]: I have checked on NTPEP website and the cost for running samples is substantial. So, I have changed the language to not include NTPEP and only MCS&T does a second sample. The only other option is to have the coating manufacturer to pay for the rerun but with some of the cost I am not sure they would be willing to do that for all these products.

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

RLS:Mp

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

MATERIALS PROCEDURE

PROCEDURE FOR DETERMINING A REDUCED UNIT PRICE TO BE PAID FOR SELECT MATERIAL FOR BACKFILLING WHICH DOES NOT CONFORM TO GRADING REQUIREMENTS OF GOVERNING SPECIFICATIONS

1. PURPOSE

1.1 To define a range of nonconformance in the grading of aggregates used for Select Material for backfilling which would ~~necessitate~~require a special investigation of the aggregate ~~its removal from the project,~~ and provide a procedure for reducing the price to be paid for said aggregate. When more than one sample is taken in succession, this procedure is applicable to MP 300.00.51: "Procedural Guidelines for Maintaining Control Charts". In some cases, however, because of the nature of the item, only one sample is taken. In this regard a control chart may not be ~~necessary~~necessary, and conformance will be based on the results of the single sample.

2. SCOPE

2.1 This procedure shall apply only to those aggregates specified for use as Select Material for Backfilling.

3. DEFINITION OF TERMS

3.1 Sublot - The quantity of material represented by a single test value.

3.2 LOT - The quantity of material represented by an average test value.

3.3 In those cases where only one sample is taken to represent the total quantity the sublot and LOT will be considered the same.

4. DESIGNATION OF QUANTITIES FOR EQUITABLE PRICE ADJUSTMENT

4.1 When an average gradation test value, or three individual test values, fall outside the limits of the Specifications, the LOT of material represented thereby is considered to be nonconforming to the extent that the last of its sublots is nonconforming. When a lot of material is nonconforming, then the last sublot contained therein shall have its price adjusted in accordance with Table 1. In no event, however, shall a sublot of material have its price adjusted more than once, and the first adjustment which is determined shall apply.

4.2 When only one sample is taken to represent the total quantity of material used, and any sieve value falls outside the limits of the specification, the material represented thereby is considered to be nonconforming. This material shall have its price adjusted in accordance with Table 1.

5. DEGREE OF NONCONFORMANCE

5.1 When a sublot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve determined to be nonconforming (nonconforming as described in 4.1 above), and this value shall be compared to Table 1. The total measure of the degree of nonconformance is, therefore, the sum of nonconformance on the two sieve sizes of the sublot.

Table 1

Degree of Nonconformance	Percent of Contract Price to be Reduced
1.0 to 3.0	2
3.1 to 5.0	4
5.1 to 8.0	7
8.1 to 12.0	11
Greater than 12.0	*

~~Table 1~~

~~Degree of Nonconformance~~	~~Designated Action~~
~~1.0 to 3.0~~	~~Reduced Price 2%~~
~~3.1 to 5.0~~	~~" " 4%~~
~~5.1 to 8.0~~	~~" " 7%~~
~~8.1 to 12.0~~	~~" " 11%~~

6. DETERMINATION OF EQUITABLE ADJUSTMENT

6.1 When the total degree of nonconformance has been established and it is 12.0 or less, the designated action shall be initiated from Table 1. When the degree of nonconformance for a sublot is greater than 12.0, ~~said sublot will not be incorporated into the project, and in fact, removed from the project as soon as possible.~~ the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed.

7. METHOD OF ACCOUNTING AND CHANGE ORDER PREPARATION

7.1 Equitable reductions for nonconformance will be determined, for each lot or sublot. These adjustments may be processed with a single change order when the item is complete by tabulating the data for all nonconforming sublots, and preparing the change order for the total dollar adjustment shown on the tabulation. A copy of the tabulation should accompany and be made a part of the change order.

7.2 Dollar reduction shall be calculated by (A) quantity ×~~x~~ (B) % reduction from Table 1 ×~~x~~ (C) unit contract price. (A sample tabulation sheet is attached).

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

MP 212.02.20 Steward – Aggregate & Soils Section
RLS:M
ATTACHMENT

Equitable Reduction Procedure

TABULATION OF EQUITABLE REDUCTIONS (partial)

Sublot Identity (Note 1)	Quantity	Degree of Nonconformance	Price Reduction	Unit Contract Price	Dollar Reduction From Contract (A)×~~x~~(B)×~~x~~(C)
	800 FT^3	7.5	7%	3.50	196.00
	200 FT^3	2.6	2%	3.50	14.00
	500 FT^3	5.0	4%	3.50	70.00

Subtotal (1) (Note 2) $280.00

	1000 FT^3	1.2	2%	3.50	70.00
	1000 FT^3	11.7	11%	3.50	385.00

Subtotal (2) (Note 2) $455.00

Total Reduction (Note 3) $735.00

Note 1: Station numbers may also be used to identify sublots.

Note 2: These subtotals should be made at the end of contract pay periods, and the subtotal amounts deducted from contract payments on a current basis.

Note 3: This total reduction should be processed in one change order when the construction of the item is complete.

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

MATERIALS PROCEDURE

DETERMINATION CRITERIA FOR MONITORING GROUND VIBRATIONS IN RESIDENTIAL AREAS

1. PURPOSE

1.1 To establish a procedure for event inspection, recording, and determination of possible damaging vibrations in structures caused by highway traffic.

1.2 This procedure shall apply to property or areas that have been requested to be instrumented to assist in the determination of possible vibration damage. The Division may elect to use other control procedures if special conditions dictate.

2. REFERENCED DOCUMENTS

2.1 Other Standards:

a. Bureau of Mines Report of Investigations #8507 Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting by D.E. Siskind, M.S. Stagg, J.W. Kopp, and C.H. Dowding.

b. Federal Highway Administration Report, Vibrations Induced by Construction Traffic, a historic case study by Henwood and Khamis Y. Haramy.

c. 1996 Report on Estimated Airblast and Blast-Related Vibration at the Lincoln Project, Placer County, California. Green Valley, Arizona by W. L. Bender.

3. APPARATUS AND EQUIPMENT

3.1 One electronic recording seismograph capable of operation for at least three days of continuous monitoring. This device may be all self-contained or have separate transducer sensors.

3.2 A power source such as a battery, or AC power outlet suitable to operate seismograph for approximately one week of continuous monitoring, if required.

3.3 A water resistant, vented protective covering to prevent moisture build-up if seismograph is used in an outside environment.

3.4 Two small sandbags weighing approximately 15 lbs each, to maintain stability in mounting seismographs when monitoring inside a structure.

3.5 A power transfer cable capable of transferring power from auxiliary battery to seismograph device.

3.6 A leveling plate to attach to the seismograph when used indoors to provide better coupling and leveling to structure.

3.7 If recording seismographs are used outside for monitoring, ground spikes may be used as per manufactures recommendations.

4. MONITORING PROCEDURES

4.1 Adjust seismograph to manufacturer's recommendations for monitoring ground vibrations, with emphasis on setting Geo trigger minimum level at 0.5 inches per second, and Geo trigger maximum range at 10.00 inches per second. Additionally, when monitoring device is active it must be placed as level as possible.

4.2 When locating seismographic device inside or outside a structure, the most preferable method for measuring vibration is to direct couple the geophone transducer device to a structure. This may not be possible due to physical or property owner considerations.

4.3 For monitoring inside a structure or residence, place seismograph recording sensors in a non-obtrusive location away from pets or other possible interference. Place preferably on a hard surface such as a hardwood floor, using small sandbags to stabilize the device if a direct coupling with structure is not possible.

4.4 If device is used for outside monitoring, use ground spikes attached to geophone sensors and firmly place in level soil, making a tight firm fit between the sensor and ground then place a 30lb sand bag on sensor to secure it, or bury geophone sensor completely, taking notice to place seismograph in area not to be disturbed by interference such as lawn mowing or children's play areas. Additionally, locate in a manner not to attract attention and to discourage theft.

4.5 Once a location has been chosen to place geophone transducer sensors, make sure the sensor transducer is oriented as per manufacturer's specifications to possible source of vibrations.

4.6 Once geophone transducers are properly seated and power supply is sufficient, activate recording device as per manufactures specifications and begin recording data for a minimum of 24 hours, unless otherwise directed.

5. REPORT

5.1 Vibration strength determination shall be defined by the maximum rate of velocity of particle movement, and referred to as Peak Particle Velocity (PPV) measured in inches per second (in/sec).

5.2 After all data is collected and evaluated, determination of the severity of vibration will be documented as listed in the table below:

Response	**Ground Vibration, PPV (in/sec)**
Barely to distinctly perceptible	0.02 - 0.10
Distinctly perceptible to strongly perceptible	0.10 - 0.50
Strongly perceptible to mildly unpleasant	0.50 - 1.00
Mildly unpleasant to distinctly unpleasant	1.00 - 2.00
Distinctly unpleasant to intolerable	2.00 - 10.00

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

MATERIALS PROCEDURE

DETERMINATION OF CHEMICAL CONSTITUENTS IN HYDRAULIC CEMENTS

1. PURPOSE

1.1 To set forth procedures for determining the chemical constituents of hydraulic cement by wet chemical and instrumental methods.

1.2 To establish a procedure for maintaining a record of such information.

2. REFERENCED DOCUMENTS

2.1 a. ASTM C114 - Standards Test Methods for Chemical Analysis of Hydraulic Cement (more to title?)

b. ASTM C150 - Standard Specification for Portland Cement

3. PROCEDURE FOR CONSTITUENTS

3.1 Procedure set forth for the following constituents:

1. Silicon Dioxide (SiO_2)
2. Ammonium Hydroxide Group ($A1_2O_3$, Fe_2O_3, TiO_2, and P_2O_3)
3. Ferric Oxide (Fe_2O_3)
4. Calcium Oxide (CaO)
5. Magnesium Oxide (MgO)
6. Insoluble Residue (IR)
7. Sulfur Trioxide (SO_3)
8. Loss on Ignition
9. Alkali Oxides
10. Sodium Oxide (Na_2O)
11. Potassium Oxide (K_2O)

Commented [BDA1]: ASTM C595 - Reference

Table 1 - TriCal Aluminate, Note C (old ref, note E instead)

Commented [BDA2R2]: (From Clay McCabe)

Commented [BDA3R2]: Can possibly remove this MP, redundant? CP to review.

4. TEST PROCEDURES

4.1 The test procedures to be used are given in Table 1

TABLE 1

TEST	TEST PROCEDURES
Silicon Dioxide	ASTM C114 Reference Method/XRF
Ammonium Hydroxide Group	ASTM C114 Reference Method/XRF
Calcium Oxide	ASTM C114 Reference Method/XRF
Insoluble Residue	ASTM C114 Reference Method
Sulfur Trioxide	ASTM C114 Reference Method/XRF
Loss on Ignition	ASTM C114 Reference Method/TGA (Note 1)
Magnesium Oxide	Atomic Absorption/ICAP/XRF
Ferric Oxide	Atomic Absorption/ICAP/XRF
Sodium Oxide	Atomic Absorption/ICAP/XRF
Potassium Oxide	Atomic Absorption/ICAP/XRF
Aluminum Oxide	Atomic Absorption/ICAP/XRF
Tricalcium Aluminate	Calculated as per Note C of ASTM C150, Table 1

Commented [BDA4]: Not typically tested, do we need to keep this?

Note 1 Porcelain crucibles may be used in place of platinum crucibles.

Note 2 Qualification data for atomic absorption methods available Cement and Concrete Reference Laboratory round-robin testing program historical data.

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

MATERIALS PROCEDURE

PAINT TESTING METHODS

Commented [BDA1]: CP to remove metric

1. PURPOSE

1.1 To set forth the standard test methods to be used in analyzing paint.

2. REFERENCED DOCUMENTS

a. American Society for Testing and Materials (ASMTM) Section 6, Paints, Related Coatings, and Aromatics.

b. Federal Test Methods Standard Number 141D, Paint, Varnish, Lacquer and Related Materials: Methods of Inspection, Sampling and Testing.

3. TESTING METHODS

3.1 Table I contains the following information:

3.1.1 Test, Reference and Test Method Number

4. GENERAL INFORMATION

4.1 Adhesion
(Film thickness greater than 5 mils (125 µm)) Section 3.1 D3359 (METHOD A)

Adhesion
(Film thickness 5 mils (125 µm) or less) Section 3.2 D3359 (METHOD B)

4.2 Test Panel Preparation

4.2.1 Panels for testing shall meet the requirements of Federal Test Method 2011.

4.2.2 Panels that receive hot-dip galvanizing should be blast clean to near white finish (SSPC-SP10) and galvanized in accordance with the AASHTO M 111. Average galvanized coating thickness should be 1.8 Mils.

4.2.3 Coating applied over galvanizing will be done in accordance with the manufacturer's product data sheets. If the data sheet does not show how to apply the coating over galvanizing, then the manufacturer shall furnish this information in writing. Failure to provide this information could result in incorrect preparation of the galvanized surface, thus resulting in failure of the paint system.

4.2.4 All coatings shall be applied at the normal field application thickness. Primers will be applied over panels that have been cleaned to a near white (SSPC-SP10) condition. All coatings, which are part of a coating system, shall be applied over the previous coating in the system.

4.3 Curing Conditions

4.3.1 All coatings except zinc primers shall be cured seven days prior to testing. The curing will be done in the laboratory under normal laboratory conditions of temperature and humidity.

4.3.2 Zinc primers shall be cured, as in 4.3.1, except the cure period will be 10 days.

4.3.3 All coatings which require chemical resistance ~~testings~~testing, will be cured an extra 24 hours at 221°F - 230°F (105°C - 110°C).

4.4 Chemical analyses of pigments shall be conducted by ASTM test methods. In cases where no ASTM test method is available, Federal test methods or a mutually agreed procedure shall be used.

4.5 Any test method not included in Table I shall be conducted according to ASTM, Federal ~~Testor~~Test or mutually agreed to procedures.

4.6 Initial approval of a paint requires that all specified tests be conducted. Subsequent batches, at the Division's option, may have randomly selected tests conducted.

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Attachment

TABLE I

	Test	Reference	Test Methods
1.	Density (Weight/Gallon)	Section 3.1	D1475
2.	Consistency (Viscosity)	3.1	D562
3.	Drying Time	3.1	D1640
4.	Drying (Traffic Paint - No ~~Pick Up~~Pickup)	3.1	D711
5.	Pigment - Vehicle	3.2	4021
6.	Total Solids	3.1	D2369
7.	Nonvolatile Vehicle	3.2	4051
8.	Coarse Particles	3.1	D185
9.	Fineness of Grind	3.1	D1210
10.	Flexibility	3.2	6221
11.	Condition of Container	3.2	3011
12.	Water	3.2	4081
13.	Color	3.1	D2244
14.	Working Properties	3.2	4541, 4321, 4331
15.	Compatibility	3.2	4203
16.	Storage Stability	3.1	D1849
17.	Specular Gloss (60°)	3.1	D523
18.	Skinning	3.2	3021
19.	Chemical Resistant (Spot Test)	3.1	D1308
20.	Infrared Scan	3.1	D2621
21.	Salt Spray	3.1	B117
22.	Accelerated Weathering	3.1	G53
23.	Leafing	3.1	D480
24.	Adhesion Section	5.1	MP 711.00.20
25.	Chemical Analysis of Pigments	3.1	MP 711.00.20
26.	Sampling	3.1	D3925

Commented [BDA2]: Populate this throughout

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

METHOD OF EVALUATING OF NON-STANDARD OR NON-CONFORMING MATERIALS IN CONSTRUCTION VIA ST-1

1. PURPOSE

1.1 To provide guidelines of sampling, testing, and resolution of all materials that may be addressed in the plans but are not otherwise addressed by the current edition of the Standard Specifications and Supplementals (Standard Specifications) and/or Materials Control, Soils and Testing Division (MCS&T) Materials Procedures.

2. DEFINITIONS

2.1 ST-1: Special Testing Form 1- The ST-1 is a historic WVDOH document which has been used to provide an acceptance method for a material that does not have a prescribed acceptance method or is otherwise outside the scope of the normal acceptance procedure. This form has evolved over the years, but it is still used for the original purpose. An ST-1 is to be done before the material is placed.

2.2 DMIR: District Materials Inspection Report – A DMIR is an investigation typically into a material failure or any other situation where there is no prescribed method for the resolution of a material on a project. A DMIR can have several outcomes including, but not limited to: Remove and replace, a price reduction, or accept in place etc.

2.3 AWP: AASHTOWare Project Management Software – This is the generic term for the suite of software used by the WVDOH to manage and process projects. This system manages contracts, samples, tests and other aspects of projects.

2.4 Authorize a Sample – This is a technical AWP term in which the user closes or locks the sample. Authoring a sample indicates that the sample has been resolved in the system and the system will allow the project to proceed through certification. This does not have any indication of whether the sample has passed or failed.

2.5 Concur/Non-Concur of Sample – This is a technical AWP term in which the reviewer indicates their acceptance of a sample. A “Non-Concur” typically requires additional action to accept the material in the system.

2.6 Sample ID – This is a technical AWP term which refers to the “key” field for a record in the AWP database.

3. SCOPE

3.1 This procedure applies to all materials that do not have an acceptance, or non-conformance resolution already established in the Standard Specifications, or any other WVDOH documents.

3.2 This procedure applies to situations where additional documentation for evaluation is required by the Standard Specifications or other WVDOH documents.

4. PROCEDURE

4.1 The ST-1 form shall be submitted to MCS&T with documentation and/or data sheets pertaining to the proposed material. Pre-sampled material cannot be used until authorization is received from MCS&T.

4.1.1 Payment for this material shall be withheld upon MCS&T's non-concurrence with the ST-1, pending a DMIR.

4.1.2 Unless otherwise directed from MCS&T, in the instance where the Specifications refer to multiple component materials in a system and each of these component materials have specific material requirements, each of these component items shall be submitted on a separate ST-1.

5. ST-1 DOCUMENTATION AND SUBMISSION TO MCS&T

5.1 The live ST-1 Form is available as a fillable pdf file on the Division Webpage[1]. A sample of this form is attached. This form shall be filled out with all the listed information pertaining to the material that the contractor proposes to use or has used. All required fields must be completed before submitting the ST-1 to MCS&T.

5.1.1 The District must electronically send the fillable PDF form. This cannot be hand-written and scanned (Fields must be able to be selected for Copy and Paste). The entire submission shall be 1 file, with a total file size must be less than 25mB. Only one DMIR may be submitted per email.

~~5.1.1 The District must electronically send the fillable PDF form. This cannot be hand-written and scanned (the Sample ID must be available to be selected for Copy and Paste).~~

~~5.2~~ The ST-1 shall be submitted by District Construction to the District Materials Supervisor. ~~The District shall then generate the sample in AWP and associate all line items before submitting the ST-1 sample to MCS&T for review and concurrence/non-concurrence. A workflow guideline for this is available in the MCS&T ProjectWise folder (location provided by request.) This file is also located on the Division Webpage.~~

~~5.3~~5.2 The ST-1 shall be sent to the ST-1/DMIR mailbox (St1dmir@wv.gov).

Commented [BDA1]: Identical to the update in 100.00.03

Commented [BDA2]: MCST starts the sample in AWP.

[1] https://transportation.wv.gov/highways/mcst/Pages/tbox.aspx

~~5.3.1~~5.2.1 ST-1 Request Email files shall be submitted in the following format for both the subject of the email and the file name for the submission: ST-1-District Lab Number-CID Contract ID. An example follows,

~~5.3.2~~5.2.2 ST-1-MXZXXXX-CID 2019001346

~~5.4~~5.3 Upon receipt of the ST-1, MCST will notify the submitter that the submission has been received. The sample shall be logged and sent to the applicable MCS&T section to review. If the subject material(s) meets the project requirements, MCS&T will concur with the sample and the reviewer will then authorize the sample in AWP.

~~5.4.1~~5.3.1 An email will be generated by the District Material Supervisor to the District Materials Supervisor notifying them that the ST-1 has been concurred and authorized. The District will place the ST-1 and MCS&T email into ProjectWise under the Contract ID and associated line item number.

~~5.5~~5.4 If the material fails to meet the minimum requirements, the reviewer will mark the sample as non-concur, then authorize the ST-1 sample in AWP. MCS&T will send the ST-1 to the District Materials Supervisor stating why the ST-1 was not concurred. The District will place the ST-1 and MCS&T email into ProjectWise under the Contract ID and associated line item number.

~~5.6~~5.5 In the situation where an ST-1 is non-concurred by MCST, the material shall be evaluated using a DMIR.

_____
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RLS:B

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

METHOD OF EVALUATION OF NON-STANDARD OR NON-CONFORMING MATERIALS IN CONSTRUCTION VIA DMIR

1. PURPOSE

1.1 Provide a method for evaluating material that does not meet the requirements of the Contract Documents.

1.1.1 To evaluate a material when a failure is not otherwise addressed in the Contract Documents.

1.2 Provide guidelines and/or a course of action when a material test has not been performed or has been performed incorrectly.

2. DEFINITIONS

2.1 ST-1: Special Testing Form 1- The ST-1 is a historic WVDOH document which has been used to provide an acceptance method for a material that does not have a prescribed acceptance method or is otherwise outside the scope of the normal acceptance procedure. An ST-1 is to be done before the material is placed.

2.2 DMIR: District Materials Inspection Report – A DMIR is a materials investigation, into a situation where the material does not meet the requirements of the Contract Documents.

2.3 AWP: (AASHTOWare Project Management Software) – This is the generic term for the suite of software used by the WVDOH to manage and process projects. This system manages contracts, samples, tests and other aspects of projects.

2.4 Concur/Non-Concur of Sample – This is a technical AWP term in which the reviewer indicates their acceptance of a sample. A “Non-Concur” typically requires additional action to accept the material in the AWP system.

2.5 District Lab Number – This is the tracking number and database field for the WVDOH materials management system.

3. SCOPE

3.1 This procedure applies to situations where the resolution of a non-conformance is not clearly defined or described by Contract Documents.

3.1.1 The DMIR shall be submitted to MCS&T for consideration and either concurrence/non-concurrence for the following situations:

3.1.1.1 The Material did not meet the Standard Specifications or other Division Testing Requirements.

3.1.1.2 The Material is not addressed in the Standard Specifications or other Division Documents and has been placed before testing (ST-1 or evaluation methods were not utilized).

3.1.1.3 Sampling and/or testing was not done correctly, samples or documentation was lost, or testing otherwise cannot be used to represent or accept the material.

3.1.1.4 The resolution of the material has not been addressed in a change order or other contractual document.

3.2 As per Section 105.3 of the Standard Specifications, the Engineer may accept materials that do not conform to Contract Documents. In this instance, material acceptance shall be processed via DMIR.

3.2.1 In any event of a DMIR, a change order shall be processed, even if the final evaluation/penalty of the DMIR is $0.00.

3.2.2 A note of each DMIR, regardless of evaluation amount shall be in the final material certifications letter (MC-8).

4. DMIR DOCUMENTATION AND SUBMISSION TO MCS&T

4.1 The DMIR form is available on the WVDOH MCS&T Webpage[1]. All required fields must be completed before submitting the DMIR to MCS&T.

4.1.1 The preparer of the DMIR, typically the Materials Supervisor or their designee, shall clearly state all details that initiated the DMIR and shall include the following categories of information:

1. General/Project Information
2. Date or Dates of Incident
3. Date of Report
4. Materials Information
5. Type of Deviation
6. Situation
7. Review
8. Conclusion
9. Review and Signatures from Construction Engineer and Materials Supervisor
10. Supporting Documentation

4.1.2 A description of the material, known quantities, technical issues, or any requirement from the applicable Specifications, Contract Proposal, Project Plans, Material Procedures (MPs), Standard Details, Special Provisions, AASHTO, ASTM, or any Non-Specification issues shall be provided.

[1] https://transportation.wv.gov/highways/mcst/Pages/tbox.aspx

4.1.3 A justification and any supporting and/or relevant detail shall be provided.

4.1.4 The conclusion shall clearly state and justify the final price assessment resolution (which may be $0.00), including all applicable fees and penalties.

4.1.5 The assessment fees should be listed individually and with a final total price assessment. Justification of the price assessment shall be provided.

4.1.6 The supporting documentation shall provide the necessary information and evidence for the materials inspection.

4.2 The DMIR shall be sent to the ST-1/DMIR mailbox (St1dmir@wv.gov).

4.2.1 DMIR Request Email files shall be submitted in the following format for both the subject of the email and the file name for the submission: DMIR-District Lab Number-CID Contract ID. An example follows:

4.2.1.1 DMIR-MXZXXXX-CID 20XX00XXXX

4.3 The sample shall be logged in the current materials tracking system and sent to the applicable MCS&T Section to review. If the subject material(s) and the resolution meets the project requirements, MCS&T will concur; otherwise, MCS&T will non-concur.

4.3.1 The District must electronically send the fillable PDF form. This cannot be hand-written and scanned (~~the Sample ID~~Fields must be able to be selected for Copy and Paste). The entire submission shall be 1 file, with a total file size must be less than 25mB. Only one DMIR may be submitted per email.

4.4 After MCS&T has reviewed the DMIR (whether be concur or non-concur), the DMIR will be sent to Regional Construction Engineer at the Contract Administration Division. If the DMIR is an AWP Project, MCS&T will bcc the "Assistant Director - Logistics & Technology."

4.4.1 If the project is being tracked in AWP, Contract Administration will process the sample by creating a DWR record, as well as a change order, otherwise, the sample record in Site Manager shall be processed by the project.

4.5 After completing the DMIR, the Regional Construction Engineer will send the DMIR back to MCST with their final decision as well as the District.

_____

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

MP 100.00.03 Steward – Materials Control Section
RLS:B

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

MATERIALS PROCEDURE

PROCEDURE FOR EVALUATING PRODUCTS FOR USE IN HIGHWAY CONSTRUCTION

1. SCOPE

1.1 New products are frequently presented to the Division by various manufacturers, suppliers and/or producers (MS&Ps) with a request that they be considered for use in our highway program. To facilitate handling of such requests in a uniform and expeditious manner, this Materials Procedure outlines the steps necessary for such product submittal and evaluation. This Procedure covers the addition of approved submitted products to the Division's Approved Product List (APL).

2. REFERENCE DOCUMENTS

2.1 MP 106.00.03: Guidelines for Establishing and Maintaining Approved Product Lists of Materials, Systems and Sources.

2.2 MP 106.10.50: WVDOH Buy America Acceptance Guidelines.

3. PROCEDURE

3.1 Consideration for new product evaluation shall be requested through completion by the MS&Ps of West Virginia Division of Highways (DOH) Form HL-468, "*Preliminary Information for New Product Evaluation*". Once completed, DOH Form HL-468 shall be submitted to the Materials Control, Soils and Testing Division (MCS&T) via email to the New Products Evaluation email address: DOHNewProducts@wv.gov .

3.1.1 The HL-468 Form can be found on the MCS&T Division's Materials Procedures Webpage[1]. A sample of this form is shown in Attachment 1. An online form may also be used to meet this requirement.

3.2 Upon receipt of the completed Form HL-468, the Materials Control, Soils and Testing Division shall distribute to applicable MCS&T parties for preliminary evaluation. Within 30 calendar days of receipt, the parties shall review the submittal in accordance with the applicable material requirements and decide if the product is acceptable. If more time is required to sample and/or test the material, the reviewing parties shall notify MCS&T who will intern, notify the submitting entity. ~~. This preliminary evaluation shall determine the need/usefulness of the product/process for various DOH applications.~~

[1] https://transportation.wv.gov/highways/mcst/Pages/MP-100s.aspx

~~3.1.2~~3.2.1 If the reviewing entity is outside MCS&T, MCS&T shall give that entity 7 calendar days to review the submission before making a final decision. If the entity does not respond within that time, their affirmative for the approval will be assumed.

~~3.1.3~~3.2.2 If the preliminary review indicates that the product may be accepted without further evaluation, the Product shall be considered accepted and added to the APL.

~~3.1.4~~3.2.3 If the preliminary review indicates that ~~further research or evaluation~~additional information is needed ~~is warranted~~, the MS&P shall be notified by MCS&T to submit additional types of information. This may include but not be limited to: samples, product specifications, certified test data, or product demonstrations. Product testing shall be coordinated by the MCS&T Division with the results of any further testing/evaluation being submitted to all appropriate evaluating parties. In the case where additional information has been requested, the 30-day timeframe shall be reset to the date when the additional information is provided.

~~3.2~~3.3 If the evaluation indicates that the product is not acceptable, the Manufacturer/Supplier shall be notified by MCS&T. The MS&P shall not submit the same product for evaluation during the same calendar year.

~~3.3~~3.4 In the instance where a product has significant approved usage, the Director (or their Designee) of MCS&T may add a product to either a new or existing APL as per MP 106.00.03. If a product is a candidate for being added to the APL in this manner, the Lab Coordinator shall contact the MS&P prior to the addition of the product to the APL to request completion of the required HL-468.

4. DOCUMENTATION

4.1 The MCS&T Division shall maintain a New Product Evaluation listing with the status of all requests from the time of receipt. This listing shall include the product evaluation report number, which will provide information such ~~as;~~as the product name, the Manufacturer/Supplier, date of initial request, and the final action recommended. This listing will be maintained on the Division's website. Where applicable, product evaluation data will also be submitted for inclusion in the AASHTO Product Evaluation List (APEL).

4.1.1 Additionally, MCS&T may evaluate the product/process after one year to determine if the performance or functionality of the product/process meets the desired results, goals or intentions of the DOH. Please note that any such evaluation may result in the product being removed from the New Product Evaluation Listing. This report will be in the form of a Materials Inspection Report (MIR) and this report will remain as part of the new products evaluation listing.

5. BUY AMERICA

5.1 Each HL-468 submission must include whether the product meets the Federal and State Buy America requirements of Section 106.1 of the Specifications. If the MS&P indicates that their product meets Buy America requirements, the company shall produce a notarized Certificate of Compliance (CoC) signed by a company

official with knowledge and authority to certify the product is compliant with applicable Buy America requirements.

5.1.1 In the event where the source of materials is changed and is no longer Buy America compliant, the MS&P must notify MCS&T in writing.

5.1.2 Under no circumstance shall the CoC described above be used for Buy America compliance on a project. Each project much submit a CoC as described in MP 106.10.50 "WVDOH Buy America Acceptance Guidelines"

5.2 A notarized CoC shall contain the following information:

5.2.1 Title: Certification of Buy America compliance for Source Approval.

5.2.2 The Name, Address and Contact Information for the Company.

5.2.3 The date of the application

5.2.4 A company statement that demonstrates compliance with Buy America.

5.2.5 The name of the material and/or material code reference in the CoC. This material name shall be a clear, common name of the material that is comparable to the AWP Material Name. Part Numbers etc. may also be on the document if the company wishes.

5.2.6 Signature of the Company Official and date.

5.3 The document must be notarized.

5.4 A sample of this CoC document is provided in Attachment 2.

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

MP 106.00.02 Steward – Lab Support Section
RLS:Bps
ATTACHMENTS

ATTACHMENT 1 - SAMPLE HL-468 FORM

ATTACHMENT 2: SAMPLE COMPLIANCE FORM

Certification of Buy America, Build America Compliance For Source Approval

Acme Manufacturing Company
123 Main Street
Charleston, WV
25302

HL 468 Submission Date: 10/31/2022

The below listed materials and products meets all the requirements of all Federal and State Laws for Buy America, including but not limited to: Chapter 5, Article 19 and Chapter 5A, Article 3 Section 56 of the West Virginia Code; 23 U.S.C. 313 Buy America, 23 CFR 635.410 Buy America Requirements, and Build America, Buy America Act, Section 70914.

This Certification of Compliance is for the material listed below:

526.003.004 - Widget, Part Qi
596.003.004 - Widget, Part Hr

Jonathan Doe, Quality Assurance Manager

WVDOH Use Only

Reviewed by: Reviewed Date: Status:

HL-468-22

WEST VIRGINIA DIVISION OF HIGHWAYS
PRELIMINARY INFORMATION FOR TECHNOLOGY/PRODUCT EVALUATION

1 TRADE NAME _____

MANUFACTURER _____

ADDRESS _____ APPLIED FOR? _____
City State Zip

2 REPRESENTATIVE _____

ADDRESS _____ PHONE _____
City State Zip

3 PRODUCT CATEGORY _____

4 EXISTING MATERIAL CODE: _____

5 BUY AMERICA BUILD AMERICA COMPLIANT? _____ NO _____ YES

5A IF 5 IS YES, SIGNED AND NOTARIZED CERTIFICATE OF COMPLIANCE PROVIDED IN ACCORDANCE WITH MP 106.00.02 _____ YES

6 RECOMMENDED USE - PRIMARY

7 RECOMMENDED USE - ALTERNATE

8 ANY KNOWN OR PROBABLE ADVERSE AFFECT ON PRESENTLY USED OR INSTALLED MATERIALS, STRUCTURES OR EQUIPMENT

9 PLAN DRAWING, PICTURE, OR SKETCH FURNISHED BY MANUFACTURER?

_____ YES _____ NO

10 MEETS REQUIREMENTS OF FOLLOWING SPECIFICATIONS

<-AASHTO <-ASTM <-FHWA <-OTHER

11 APPROVED FOR PROPOSED USE BY HIGHWAY AUTHORITIES OR OTHER AGENCIES IN THE FOLLOWING STATES

12 ARE INSTRUCTIONS OR DIRECTIONS FOR INSTALLATION, APPLICATION OR USE AVAILABLE?

YES NO

COPY ATTACHED: YES NO

13 WILL DEMONSTRATION BE PROVIDED?

14 ARE EDUCATIONAL COURSES OR VIDEOS AVAILABLE? YES NO

15 AVAILABILITY SEASONAL NON-SEASONAL

DELIVERY AT SITE

AFTER RECEIPT OF ORDER.
ARE QUANTITIES LIMITED? YES NO

16 WILL FREE SAMPLE BE FURNISHED? YES NO

17 NEW MARKET? YES NO

ALTERNATE FOR WHICH EXISTING PRODUCT?

18 IS PRODUCT GUARANTEED? YES NO

CONDITIONS?

19 BACKGROUND DESCRIPTION OF COMPANY AND ITS PRODUCT

20 ADDITIONAL IMFORMATION

21 THE FOREGOING INFORMATION IS FURNISHED BY

NAME/TITLE: _____

EMAIL ADDRESS: _____

COMPLETED FORMS SHOULD EMAILED TO:
DOHNewProducts@wv.gov

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

MATERIALS PROCEDURES

QUALITY ASSURANCE PROCEDURES FOR PORTLAND CEMENT CONCRETE

Commented [BDA1]: Need reference to flow chart

1. PLANT AND EQUIPMENT INSPECTION STICKERS

1.1 Physical plants and equipment, which prepare materials for, or deliver materials to, State projects shall be regularly inspected and approved by an authorized representative of the Division. The process for this inspection is shown in the Plant Inspection Flow Chart in Attachment 1.

1.2 The inspections and approval shall be documented on the MC-4 Form (sample show in Attachment 2 and live form available on the MCS&T webpage) and confirmed by an inspection sticker supplied by the Materials Control, Soils & Testing Division (MCS&T). The inspection sticker will indicate the following:

1. Name of inspector
2. Plant or portion thereof, or singular piece of equipment inspected.
3. Date of inspection
4. Date of expiration of approval
5. Lab Number

1.3 Inspections may be made at any time at the option of the Division, and the status of the inspected facility shall be determined by the latest inspection. The date of expiration of approval, as noted on latest inspection sticker, shall be the last day on which the facility is considered to be approved by Division, and such facility must have an approved status at time of preparing materials for or delivering materials to State projects.

1.4 The sole purpose of the inspection sticker is to inform all concerned that a plant, or portion thereof, or a singular piece of equipment has been inspected and found to meet, substantially, all requirements of the specifications and is, therefore, approved to supply materials to State projects. Said inspection sticker shall therefore be affixed to the equipment or displayed in other manners so that the purpose as above stated will be fulfilled.

1.5 The stickers shall be applied, insofar as practicable, and each District shall maintain records of these inspections in ProjectWise. The records shall include all the items listed in 1.2.

1.6 A plant or portion thereof, or a singular piece of equipment, shall be approved for a period not to exceed six (6) months. The period of approval shall be determined, in general, by the age, physical condition, or durability of the plant or equipment, and the

inspection interval shall be such that the Division will have reasonable assurance that the plant or equipment is maintained in an acceptable manner.

1.6.1 During the plant inspection, the plant must demonstrate their capability to produce an E-Ticket as defined in Section 109.20.1 of the Specifications. A sample ticket shall be provided to the inspector, and compliance with this requirement shall be documented on the MC-4 form.

~~1.6.1~~1.6.2 After each time a plant has been inspected, the District shall notify the Director of MCS&T, or their designee. MCS&T will generate a list of approved plants and post these on the Division Webpage[1].

1.7 Additional information regarding inspections and a sample of an inspection sticker is contained in Attachment ~~1~~3.

2. QUALITY ASSURANCE IN PORTLAND CEMENT CONCRETE

2.1 PURPOSE

The purpose of this procedure is to establish guidelines which will aid Division personnel in implementing in a prescribed and uniform manner the Division's Quality Assurance Program for portland cement concrete, said program being directed primarily to maintaining a predetermined and acceptable level of assurance that portland cement concretes do conform to their governing specification.

2.2 DEFINITION OF TERMS

2.2.1 QUALITY ASSURANCE

Quality Assurance is an expression of confidence which the Division has in its program of acceptance testing and inspection which determines conformance of materials and construction to governing specification. A Quality Assurance Program is a planned program of acceptance testing and inspection which is conducted by the Division for the express purpose of maintaining a predetermined and acceptable level of assurance that construction materials do conform to governing specifications. Part of any Quality Assurance Program, is an awareness and knowledge of the Producer's Quality Control Program and the level of Quality Control maintained by that Producer.

2.2.2 QUALITY CONTROL

Quality Control is a planned program of testing, inspection and related activities conducted by a concrete Producer for the purpose of measuring the various properties of concrete and its component materials which are governed by the specification and

[1] https://transportation.wv.gov/highways/mcst/pages/default.aspx

controlling these properties within the limits of the specification.

2.3 GENERAL DISCUSSION

The Division and the Contractor-Supplier industry have jointly participated in a program whose primary objective is to improve the quality of concrete in highway construction. One of the outcomes of this program is that the Division will run a smaller risk of having non-conforming materials incorporated into the work, and the Contractor-Supplier industry will run a smaller risk of having suitable materials rejected.

The following major developments are outgrowths of the program just mentioned:

2.3.1 Portland cement concrete technicians certification is available in the Contractor-Supplier industry to implement a program of Quality Control.

2.3.2 The requirement for a Contractor (or his authorized representative, a subcontractor or a commercial supplier) to do Quality Control of portland cement concrete and to have in his service a Certified Portland Cement Concrete Technician is specified in Sub-articles 501.4.2 and 601.4.2 of the Standard Specifications.

2.3.3 The requirement for a Contractor (or his authorized representative, a subcontractor or a commercial supplier) to have a field laboratory which is equipped and maintained in specified manner so as to aid in the conduct of a Quality Control Program is specified in Sub-articles 501.5.1 and 601.5.1 of the Standard Specifications.

2.3.4 Concrete batch plants and hauling equipment are regularly inspected by the Division, and their approval as conforming to requirements of governing specification is attested to by an inspection sticker (See Section 1 of this MP for details).

2.3.5 The requirement to do concrete design, using the particular sources of materials that are to be used in the work, is specified in articles 501.3 and 601.3.1 of the Standard Specifications. This requirement allows commercial concrete suppliers to have laboratory design work done for the various classes of concrete to be supplied, and it guards against the possibility of source materials changing appreciably and affecting the quality of subsequent concrete work.

Although all producers should maintain an acceptable level of Quality Control, it is reasonable to assume that a number of producers will maintain a level of Quality Control well above the minimum accepted level.

It is generally agreed that an acceptable level of Quality Assurance may be maintained with less acceptance testing and inspection when the level of Quality Control is increased.

The capability to perform a positive and sustained level of Quality Control in practically all producer plants today is now well established. Also, the Division has the means for measuring the level of Quality Control maintained by each producing plant. Accordingly, it would be desirable to pursue a Quality Assurance Program which takes into account the level of Quality Control in a Producer's plant so that an acceptable level

of Quality Assurance could be maintained with a minimum cost (man-hours and dollars) to the Department. As previously stated the purpose of this procedure is to establish guidelines which will aid Department personnel in implementing, in a prescribed and uniform manner, such a Quality Assurance Program.

2.4 DIRECTIVE

Concrete plants will be inspected in accordance with Section 1 of this MP and the condition of conformance will be determined. Those plants which are found to conform to the specifications will be identified as Class A plants, and those which do not conform will be identified as Class B plants. The level of Quality Control at each concrete plant will also be evaluated.

Those plants which have a high level of Quality Control will be considered to have a Level 1 Quality Control, and those plants which have a lower level of Quality Control will be considered to have a Level 2. All concrete plants will then be rated with one of the following classification numbers Al, A2 or B.

2.4.1 LEVEL 1 QUALITY CONTROL

All plants producing concrete which reasonably conforms to the specification requirements, and which satisfies the following additional requirements, will be considered to have LEVEL 1 Quality Control:

2.4.1.1 The compressive strength of the concrete produced by the plant shall have a coefficient of variation of 0.15 or less and the average compressive strength shall be equal to or greater than the specified requirement plus 2 1/2 standard deviations.

2.4.1.2 The air content of the concrete produced by the plant shall have a coefficient of variation of 0.18 or less, and the average air content shall not differ from the specified optimum value by more than one standard deviation.

2.4.1.3 The consistency of the concrete produced by the plant shall have a coefficient of variation of 0.20 or less, and the average consistency shall not differ from the specified optimum value by more than two standard deviations.

2.4.1.4 The plant shall maintain an adequate Quality Control Program for aggregate gradation.

2.4.2 LEVEL 2 QUALITY CONTROL

All plants which fail to meet one or more of the requirements specified in 2.4.1 will be considered to have LEVEL 2 Quality Control.

2.4.3 PHYSICAL PLANT-EVALUATION

District personnel will inspect and evaluate concrete plants in conformance with Section

1 of this MP. A copy of the inspection data, which is specified in Subsection 1.5, will be transmitted to the Materials Division immediately after the inspection is completed.

2.4.4 LEVEL OF QUALITY CONTROL - EVALUATION

The evaluation of the level of Quality Control maintained by concrete plants will be performed and maintained current by the Materials Division. The initial evaluation of the level of Quality Control will be based on an analysis of historical data. There after, tests for strength, entrained air, and consistency will be made by certified personnel on random samples taken from plant production. This test data will be used by the Materials Division to update the statistical parameters and maintain a current and valid evaluation of each plant's Quality Control level. The Materials Division will publish a list of concrete plants with their rating numbers, said publication to be updated monthly.

2.4.5 CLASS Al PLANTS - TEST AND INSPECTION REQUIREMENTS

Concrete from Class Al concrete plant shall be sampled and tested by certified personnel on a project-by-project basis, at random, with the frequency specified in Table 1 of MP 601.03.50.

Plant inspection and monitoring of batching operations at Class Al concrete plants shall be performed by District personnel on a random basis during production for Division Projects.

A concrete batch ticket, as defined in Section 4.2.9 of MP 601.03.50, shall be initiated and signed at the plant and accompany each delivery to the project.

2.4.6 CLASS A2 PLANTS - TEST AND INSPECTION REQUIREMENTS

Concrete from Class A2 concrete plants shall be sampled and tested by certified personnel on a project- by-project basis, at random, with the frequency specified in Table 1 of MP 601.03.50.

Plant inspection and monitoring of batching operations at Class A2 concrete plants shall be performed by District personnel on a continual basis during the time that concrete for items other than miscellaneous concrete are being produced for Division projects.

2.4.7 CLASS B PLANTS

Concrete purchased by a Contractor for use on Division projects shall be supplied from Class Al or A2 plants. Concrete purchased through competitive bidding with Purchase order contracts shall be supplied from Class Al or A2 plants. Class B plants are not considered to be eligible to compete with Class A plants in the furnishing of concrete to State projects.

In the event it is not practical to obtain small quantities of concrete for miscellaneous items (See 2.4.8) from a Class Al or A2 plant and a survey reveals that a Class B plant is conveniently situated with respect to the construction site, then a direct purchase of concrete by the Division from the Class B plant may be accomplished in conformance with the applicable Division procedures. The direct purchase of concrete from Class B plants shall also be made to conform to the requirements set out in Subsection 2.5 entitled QUALITY ASSURANCE OF DIRECT PURCHASE CONCRETES FROM CLASS B PLANTS. Plant inspection at Class B plants and the sampling, testing and documentation of concrete from Class B plants shall also conform to the requirements set out in Subsection 2.5.

2.4.8 SMALL QUANTITIES FOR MISCELLANEOUS ITEMS

Miscellaneous concrete shall be defined as relatively small quantities incorporated into items that will not adversely affect the traffic carrying capacity of a completed facility. Such items would not include any concrete intended for major structures permanent mainline or ramp pavements, or other structurally critical items.

The following items are suggested as a guideline in establishing miscellaneous concrete:

1. Sidewalks
2. Curb and gutter
3. Slope walls for under drain outlet pipes
4. Temporary pavements and pipe crossings
5. Building floors
6. Slope paving and headers
7. Paved ditch or gutter
8. Small (less than 36” diameter) culvert headwalls
9. Catch basins, manhole bases, inlets, and junction boxes (and adjustments of such items) not located in the roadway
10. Foundations for breakaway supports
11. Utility trench fills
12. Cast-in-place survey markers

2.5 QUALITY ASSURANCE OF DIRECT PURCHASE CONCRETE FROM CLASS B PLANTS

2.5.1 PURPOSE

The purpose of this instruction is to provide guidance in specifying direct purchase of concrete and for inspection and testing of direct purchase concrete from Class B plants, so that a predetermined and acceptable level of Quality Assurance may be maintained by Division personnel. This instruction is set apart from the main directive in Subsection 2.4 because it is the intent to have concrete from Class B plants used in highway work only when it is not practical or economical to obtain concretes from Class A1 or A2 plants.

2.5.2 DEFINITION OF TERMS

2.5.2.1 Direct Purchase - Direct purchase is a formal procedure used to purchase materials for government agencies, including the Division of Highways) when it is not practical or economical to use the procedure of competitive bidding. Direct purchase requisitions will always specify the name of the proposed supplier as well as product name, quantity, specifications, etc.

2.5.3 GENERAL DISCUSSION

When highway work requiring portland cement concrete is being done by Division forces, and it is found to be impractical or uneconomical to obtain concrete from a Class Al or A2 plant but that it would be practical to obtain it from a Class B plant, then the purchase of concrete from a Class B plant shall be made to conform to the requirements of article 2.5.4.

2.5.4 INSTRUCTION

The purchase of portland cement concrete from a Class B plant will be permitted only after a field condition survey has been conducted and properly documented which indicates that it would be impractical and uneconomical to obtain concrete from a Class Al or A2 plant, and that a Class B plant does exist from which a direct purchase of concrete could practically and economically be made.

Procedures for making direct purchases of concrete shall be as prescribed by the appropriate State Agency. The method of specifying direct purchase concrete shall be as follows:

1. Specify the class of concrete.
2. Specify that the concrete mix design will be approved by the Division.
3. Specify that a Division inspector will be at the plant during the full time that concrete is being batched to direct the batching operation, and that batching shall not commence until the inspector is present.

In addition to the Quality Assurance activity performed at the plant, the Division will sample and test as deemed necessary all direct purchase order LOTS of concrete used in highway maintenance work.

3. PLANT APPROVAL STATUS

3.1 PLANT CERTIFICATION

3.1.1 When District Personnel determine that a Concrete Plant, which is not already listed as a Class A1, A2, or B plant on the Division's Approved Source Page, has met the requirements of this Materials Procedure, the Specifications, and all other applicable Materials Procedures, they shall notify MCS&T Division and provide all applicable documentation and information to MCS&T Division.

3.1.2 MCS&T Division shall then notify the subject Concrete Plant that they are approved to begin production for WVDOH projects. MCS&T Division shall also add that

Concrete Plant to the Division's Approved Source Page and begin monthly evaluations of that Concrete Plant as outlined in this MP and MP 711.03.26.

3.2 PLANT DE-CERTIFICATION

3.2.1 When District Personnel determine that a Concrete Plant, which is listed as a Class A1, A2, or B plant on the Division's Approved Source Page, is not complying with the requirements of this MP, the Specifications, or any other applicable Materials Procedure, they shall immediately notify MCS&T Division and provide all applicable documentation and information to MCS&T Division. This information shall include a summary of the reason(s) for the de-certification of the subject Concrete Plant.

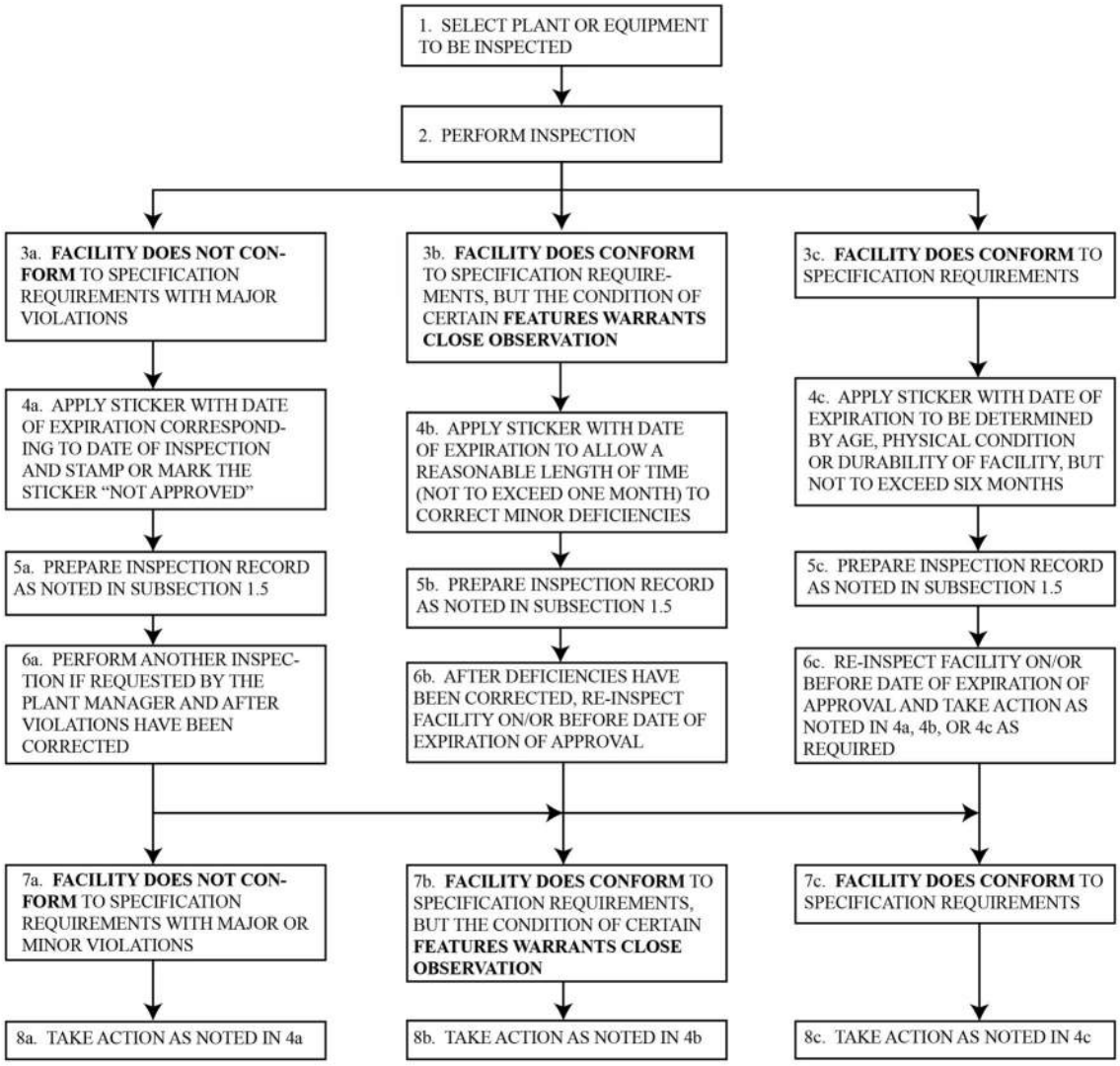
3.2.2 MCS&T Division shall then immediately notify the subject Concrete Plant and all applicable WVDOH District and Divisions that the subject Concrete Plant is no longer approved to supply concrete for WVDOH projects.

3.2.3 If the subject Concrete Plant, which has been de-certified and removed from approved status, desires re-approval, they shall initiate the re-approval process by submitting a plan of corrective action, which addresses all of the reasons for which that Plant was de-certified. This plan of corrective action shall be submitted to the District in which the Concrete Plant is located and to MCS&T Division.

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

RLS:M
Attachment

Attachment 1: Plant Inspection Flow Chart



Attachment 2: MC-4 Plant Inspection Form

Form MC-4
Rev 4/24/23

Page 1

West Virginia Division of Highways
Materials Control, Soils and Testing Division
Checklist For Inspection of Transit Mix & Central Mix Concrete Plants

Plant Inspected:	Date:	Date Sticker Expires:
Location:	Facility Code:	Sticker No. Assigned:
Plant Officials:		
E-Ticketing Requirements Met: Yes: ☐ No: ☐		

I. Plant Type:	Transit Mix: ☐	Central Mix: ☐	Combination: ☐

II. Aggregates:

Are the Stockpiles Segregated:	Yes ☐	No ☐	Any Foreign Matter in the Stockpiles:	Yes ☐	No ☐
Stockpiles Properly Separated:	Yes ☐	No ☐	Type of Base:		
Method of Handling Aggregates:					
Does Concrete Plant Stockpile Non-specification Materials:				Yes ☐	No ☐
If Yes, Are These Materials Properly Segregated From Specification Materials:				Yes ☐	No ☐
Source of Supply of Fine Aggregate:					
Source of Supply of Coarse Aggregate:					
Are all materials ordered to comply with West Virginia Division of Highways Specifications:				Yes ☐	No ☐

III. Scales:

Cement:				
Dial ☐	Capacity:	Increments:		
Load Cell ☐	Capacity:	Increments:		
Do Scales Comply With Specifications:			Yes ☐	No ☐
Aggregates:				
Dial ☐	Capacity:	Increments:		
Load Cell ☐	Capacity:	Increments:		
Do Scales Comply With Specifications:			Yes ☐	No ☐
Separate Scales for Cement and Aggregates:			Yes ☐	No ☐
Overall Condition of Scales:				
Date Sealed By Dept. of Weights & Measures:	Cement:	Aggregate:		

IV. Bins and Hoppers:

Number of Bin Compartments for Fine Aggregate:		Number of Bin Compartments for Coarse Aggregate:		
Maximum Size Batch:	Is the Cement Hopper Equipped with a Vibrator:		Yes ☐	No ☐
Is the Aggregate Hopper Equipped with a Vibrator:			Yes ☐	No ☐
Operation of the Hoppers Satisfactory: Yes ☐	No ☐	If "No", Why?		
Type of Cement Bin:	Number of Bins:	Capacity of Each Bin:		

V. Water:

Type of Water Measuring Device:	Scales ☐	Meter ☐	Truck Mixer Tanks ☐	
Automatic ☐	Manual ☐	Does Device Meet Specifications:	Yes ☐	No ☐
Date Sealed by Dept. of Weights & Measures:	Scales:	Meter:		

VI. Admixtures:

Brands Used:			
Air Entrainment:	Automatic Dispenser:	Yes ☐	No ☐
Retarder:	Automatic Dispenser:	Yes ☐	No ☐
Other Admixtures (Name & Type):	Automatic Dispenser:	Yes ☐	No ☐

VII. Central Mixer:

Condition of Drum:	Condition of Blades:	
Does Automatic Timing Device Meets Specifications:	Yes ☐	No ☐
Remarks:		

VIII. Truck Mixers:

Trucks Equipped with Electronic Counters:	Yes ☐	No ☐	Number of Trucks Added to Fleet Since Last Inspection:
Number of Trucks Deleted From Fleet Since Last Inspection:			
Truck Mixers Now Failing to Meet Specifications:			

TRUCK NUMBER	REASON FOR FAILURE

IX. Testing of Materials:

Tests of Aggregates Performed at Plant by:		Qualified:	Yes ☐	No ☐
Does Testing Equipment Comply with Specifications:			Yes ☐	No ☐
If "No", What Equipment Fails:				
Approved Test Weights Available in the Plant:	Yes ☐	No ☐	Date Last Checked:	

X. General Condition of Plant:

XI. Any Further Remarks:

XII. Rating Assigned:	A ☐	B ☐	Plant Inspected By:

Attachment 3: Sample Plant Inspection Sticker

West Virginia Division of Highways
CHECKED & ACCEPTED
INSPECTOR: _____ **DATE:** _____ **LAB NUMBER:** _____ **DISTRICT:** _____
DATE OF EXPIRATION **MONTH/DAY/YEAR** _____/_____/_____
PLANT / TRUCK

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

COMMERCIAL AND POTENTIAL SKID RESISTANT AGGREGATE SOURCE APPROVAL PROCEDURES

1. PURPOSE

1.1 To provide a uniform procedure for the following:

1.1.1 Approval of producers/suppliers of aggregates for the West Virginia's Department of Transportation's Division of Highways (WVDOH) Approved Material Source/Product List.

1.1.2 Monitoring of producers/supplier's ongoing compliance with the governing specifications for use of their products in WVDOH projects.

2. SCOPE

2.1 This procedure shall apply to any aggregate producers/suppliers intending on ~~supplying~~supplying aggregates to any WVDOH projects ~~conducted by the WVDOH~~.

3. APPLICABLE DOCUMENTS

3.1 West Virginia Division of Highways ~~Standard~~ Specifications, Roads and Bridges~~, both Current Edition & Supplementary~~.

3.2 West Virginia Division of Highways Construction Manual~~, Current Edition~~.

3.3 West Virginia Division of Highways Materials Procedures.

4. CONSIDERATION FOR THE LIST OF COMMERCIAL AGGREGATE SOURCES

4.1 If an entity wants to be placed on the commercial source list and has had no previous dealings with WVDOH, they shall submit a ~~Letter of Intent (LOI)~~HL-468 New Products Evaluation form to Materials Control, Soils and Testing Division (MCS&T) describing what they intend on selling, what production process is used, what type of projects they intend on supplying, and when they intend on starting production. The ~~LOI~~submission, upon review by MCS&T, will be forwarded to the nearest adjacent WVDOH District Materials Supervisor for notification purposes.

4.2 Test d~~D~~ata from a minimum~~total~~ of 20 samples shall be evaluated~~considered~~ for addition of the new Producer/Supplier to the WVDOH List of Approved Aggregate Sources. Historic data concerning aggregate quality test results signifying compliance

Commented [MMA1]: See comment below

Commented [BDA2]: DB, MM, where is the quarterly sampling requirement?

Commented [MMA3]: Is this just for the Commercial Source APL? Aren't A-1 Sources (Maintenance Contracts) covered by MP 700.00.52? We should clarify this.

Commented [MMA4]: Should this be the District Materials Supervisor in the District in which the source is located?

Commented [MMA5]: Commercial and Potential Skid Resistant ?

with WVDOH specifications shall be available for review. Any data accepted by MCS&T concerning the quality of the material shall be obtained from an AASHTO re:source accredited laboratory.

4.2.1 At their discretion, MCS&T may sample stockpiles currently in production for quality testing. If the material sampled meets the quality specifications, the stockpile can be approved for use in WVDOH projects. This data will be included with the required 20 sets of data for source approval in the future, if necessary. Any material submitted for use in WVDOH projects shall meet the criteria described in Sections 702, 703 and 704 of the WVDOH specifications for that ~~particular~~ material.

4.2.2 Independent quality testing data shall be evaluated~~verified~~ by MCS&T to ensure compliance with the ~~governing s~~Specifications. All data submitted will be reviewed in the verification process and may be included in the quality testing data compiled by MCS&T.

4.2.3 Records of both the geologic features of the source and historical quality testing data of the products compiled by the producer/supplier, if available, may be submitted to MCS&T for review.

4.2.4 Manufacturing and quality control processes and pertinent historical data shall be made available for review by MCS&T, if requested.

~~4.2.4~~4.2.5 The new Producer/Supplier shall demonstrate that they are capable of producing an E-Ticket as defined in Section 109.20.1 of the Specifications. A sample ticket shall be provided to MCS&T and shall be included on the HL-468 New Products Evaluation form at the time of initial submittal.

4.3 ~~Subsequent to~~After the review of historical and geologic data concerning the material in question, a sampling regimen shall be implemented to continually evaluate the quality of the material over the course of production.

4.4 Acceptance of any material submitted for approval from any potential producer/supplier is left to the discretion of MCS&T.

5. MAINTENANCE OF THE LIST OF COMMERCIAL AGGREGATE SOURCES

5.1 To remain on the WVDOH List of Commercial Aggregate Sources, the following criteria shall apply:

5.1.1 The Pproducer/Ssupplier shall maintain a consistent and satisfactory ~~compliance of the~~ quality of the aggregates according to Sections 702, 703, and 704 of the WVDOH Specifications ~~of Roads and Bridges, Sections 702, 703 and 704 by~~ and shall permit~~ting~~ random, intermittent quality sampling of the aggregate source by MCS&T. This testing will determine~~s~~ if the approved products continually exhibit the same characteristics and quality as the originally approved material~~.~~ (see MP 700.00.55; Guidelines For

Commented [MMA6]: Possibly re-word as: "may be used in this evaluation if it is available"

Commented [MMA7]: Do we need to define "quality testing"? (i.e. Soundness, LA Abrasion, Deleterious, etc.)

Commented [MMA8]: I think that we should discuss this. Is "all" data included or just data from an AASHTO re:source accredited lab?
Also, is this an "evaluation" process or an "approval" process?

Commented [BDA9]: DB, MM, where is the quarterly sampling requirement? How many samples tested per year to remain on the list?

Commented [BDA10]: Add e-ticketing here.

Commented [MMA11]: Is this where we want to specify a frequency (i.e. quarterly, annually, etc.)?

Commented [MMA12]: Should this be MP 106.00.03 instead?

Establishing And Maintaining Approved Lists Of Materials And Sources, ~~section~~ Section 6)

5.2 If the Pproducer/Ssupplier has not provided any material~~products~~ to any WVDOH projects over a period of 5 consecutive years from the same source, that source will be removed from the WVDOH List of Commercial and Potential Skid Resistant Aggregate Sources. ~~In the event of~~ If an inactive Producer/Supplier~~source~~ re-establishes~~ing~~ production and desires ~~the producer/supplier wishes to~~ regain Division approval~~acceptance~~, ~~they shall refer to~~ sSection 4 of this MP shall apply~~for reconsideration~~.

6. REMOVAL FROM LIST OF COMMERCIAL AGGREGATE SOURCES

6.1 In the event the Pproducer/Ssupplier does not provide materials in compliance with the ~~governing~~ sSpecifications, the following actions shall be taken by the Pproducer/Ssupplier~~,~~ and ~~subsequently by~~ MCS&T, up to and including removal from the List of Commercial and Potential Skid Resistant Aggregate Sources:

6.1.1 Upon testing~~sampling~~ of an aggregate sample ~~source~~ by MCS&T, if the quality test results from that sample do not meet the minimum specifications requirements, then a second test portion shall be split from the original~~same~~ field sample, and it shall be ~~re~~tested. The test results and methods of testing shall then be reviewed for accuracy and precision.

Commented [MMA13]: Need to define "quality" tests. See Section 4.2.2.

6.1.2 ~~When~~ If the "split" sample in Section 6.1.1~~a material, upon reexamination,~~ fails to meet WVDOH Specifications, MCS&T shall notify the Pproducer/Ssupplier ~~shall be notified~~ of the failing results and a second field sample shall be obtained by MCS&T and tested for quality. The results from this sample will determine if further action is needed.

6.1.3 ~~For the second Field sample, f~~Follow the same procedure~~tocol~~ in~~for~~ Section 6.1.1 for the second samples obtained in Section 6.1.2. If the second sample does not meet quality requirements~~specifications~~, at the discretion of MCS&T personnel, a third sample may be obtained from the Pproducer/Ssupplier by MSC&T and tested for quality.

6.1.4 ~~For the third Field sample, f~~Follow the same protocol in~~for~~ Section 6.1.1 for the third sample obtained in Section 6.1.3. If the third sample does not meet quality requirements, ~~specifications~~ the following course of action shall be taken:

6.2 Communication of sample information shall be implemented as follows:

6.2.1 The Pproducer/Ssupplier shall be notified of what aspect(s) of the samples did not meet Specification requirements~~the deficiency~~, either in writing or via electronic communication (i.e. email).

6.2.2 The 10 District Material Supervisors, the Regional Construction Engineers, the Director of Contract Administration, and the Director of MCS&T shall be notified of what aspect(s) of the samples did not meet Specification requirements ~~the deficiency~~ via electronic communication (~~i.e.~~i.e., email).

6.3 The Pproducer/Ssupplier of the material in question~~substandard product~~ is then responsible for mitigating the deficiency~~inquency~~ and improving the production quality to comply with the ~~corresponding governing s~~Specifications. Mitigation of substandard materials is not the responsibility of MCS&T; only the verification of the quality of material provided by the Pproducer/Ssupplier shall be the responsibility of MCS&T.

6.4 A supplemental sampling program shall be implemented to confirm the mitigation of the deficiency and shall be coordinated as follows:

~~a)~~ 6.4.1 If the Pproducer/Ssupplier was previously included on the List of Commercial and Potential Skid Resistant Aggregate Sources, a series of three (3) ~~consecutive~~ samples shall be obtained, either by a WVDOH District technician or if necessary, by a representative of MCS&T. Each of these~~new~~ samples shall be obtained every six (6) days of production to test the quality of the new material. If there is no constant flow of production, then the samples shall be obtained from each stockpile produced (minimum stockpile size of approximately 2000 tons).

a)

b) 6.4.2 After three samples have been tested for full quality, and if they are found to comply with the ~~governing s~~Specifications, random, intermittent sampling of the material shall be performed by the adjacent District and sent to MCS&T for verification of quality. The frequency of the intermittent sampling of the material shall be determined by ~~up to the discretion of~~ MCS&T.

c)

~~c)~~d) 6.4.3 If the ~~most recent~~ samples in Section 6.4.1 and 6.4.2 all meet the Specification requirements ~~comply with the corresponding specifications concerning the material~~, the Pproducer/Ssupplier shall be notified of compliance, ~~conformance~~ and they shall be included on the List of Commercial and Potential Skid Resistant Aggregate Sources for the next fiscal quarter.

e)

~~d)~~f) 6.4.4 If the material ~~continues to~~ fails to meet the ~~corresponding s~~Specifications requirements, further action shall be taken, up to and including removal of the Pproducer/Ssupplier from the List of Commercial and Potential Skid Resistant Aggregate Sources.

6.5 If any of the aforementioned quality samples fail quality testing and a new field sample cannot be obtained due to the source not being accessible (due to seasonal closure, lack of material for sampling, etc.), then the Pproducer/Ssupplier will~~th~~ be removed from

Commented [MMA14]: District in which the Producer/Supplier is located?

Commented [MMA15]: At what point did we remove them from the list? Did we want to remove them in Section 6.2 or 6.3 until they have shown us that they have mitigated the problem, or do we want to say "shall remain on the …"?

the List of Commercial and Potential Skid Resistant Aggregate Sources until the resampling can be completed.

6.6 Acceptance protocol detailed in ~~s~~Section 4 of this MP shall be re-implemented once the deficiency has been mitigated to WVDOH specification minimums and the new materials will be considered for testing.

Commented [MMA16]: Does this only apply when a Producer/Supplier is removed (Sections 6.4.4 and 6.5) or any time that mitigation is required (Section 6.3)?

7. DOCUMENTATION

7.1 All samples obtained by MCS&T shall be assigned a corresponding laboratory reference number for record keeping, ensuring proper access by MCS&T personnel to pertinent information regarding the materials provided by the ~~p~~Producers/~~s~~Suppliers.

7.2 In the event of recurring failure to meet ~~repeat non-conformance of~~ WVDOH ~~s~~Specifications, the following procedure shall be implemented:

7.2.1 A record of communication between the Division and the P~~p~~roducer/S~~s~~upplier's contact shall be retained for future reference.

~~a)~~
~~b)~~a) 7.2.2 The sample (or samples) failing to meet ~~quality s~~Specification~~s~~ requirements shall be packaged and stored for later access by MCS&T personnel for future reference. The sample containers shall display the lab reference number, the date on which the tests were conducted, the type of material tested, and data revealing what ~~s~~Specification~~s~~ requirements were not met~~out of compliance~~.

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

MP 700.00.56 Steward – Aggregate Section
RLS:R

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

MATERIALS PROCEDURE

METHOD OF TEST FOR DETERMINING MORTAR STRENGTH

1. PURPOSE

1.1 To provide a method of testing to determine the effects of organic impurities in fine aggregate on mortar strength.

2. SCOPE

2.1 This procedure is applicable to fine aggregate to be used in concrete that has been tested and deemed darker than the standard in accordance ~~to~~ with the guidelines established in AASHTO T21 and Section 702.1.4 of the West Virginia ~~Standard~~ Specifications.

3. APPLICABLE PROCEDURES

3.1 AASHTO T21

3.2 AASHTO T84

3.3 ASTM C109

3.4 ASTM C230

3.5 ASTM C305

3.6 ASTM C511

3.7 ASTM C778

~~3.7~~3.8 ASTM C1437

4. APPARATUS

4.1 Nonabsorbent pan of sufficient size to hold and manipulate the sample.

4.2 Drying device with variable temperature control capable of producing a flowing stream of warm air.

4.3 ~~Cone~~ Mold and ~~tamping rod~~ tamper conforming to the requirements of Section 6.2.1 of AASHTO T84.

4.4 Balance having a capacity 5000 grams and sensitive to the nearest 0.1 gram.

4.5 A variable speed planetary and revolving motion mixer with paddle blades conforming to the requirements of ASTM C305.

4.6 Flow ~~T~~table, conical mold, and calipers conforming to the requirements of ASTM C230.

4.7 Specimen molds and tamper conforming to requirements ASTM C109.

4.8 Moisture cabinet conforming to the requirements of C511.

4.9 Compression apparatus capable of at least a 20,000-pound load.

4.10 Nonabsorbent containers for holding excess fine aggregate and cement.

4.11 Distilled water.

5. PROCEDURE

5.1 Approximately 5000 grams is obtained from field sample.

5.2 Dry field sample to SSD condition as described in Section 7 of AASHTO T 84, remove and weigh out a portion to be used in the test. This is an estimate of the amount needed to bring the mix to the right consistency. Weigh out additional ~~sand~~fine aggregate to be added if needed. Place each in an airtight container. Cover remaining sample with a damp cloth.

5.3 Pre-measure ~~360~~ 180 ml of distilled water into a total drain (TD) beaker. Add the ~~360~~ 180 ml of distilled water into the mixing bowl and let beaker drain for 30 seconds.

5.4 Add ~~600~~ 300 grams of Type ~~III~~ IL cement to water in the mixing bowl. Start the mixer and mix at slow speed (140 +/- ~~10~~5 r/min) for 30 seconds.

5.5 Slowly add ~~the~~ a measured quantity of fine aggregate over the next 30 seconds while continuing mixing at slow speed to provide proper consistency.

5.6 Switch the mixer to medium speed (285 +/- 10 r/min) and mix for 30 seconds.

5.7 Stop the mixer and let it stand for 90 seconds. During the first 15 seconds quickly scrape the material collected to the side of the bowl into the batch. Cover the bowl.

5.8 Remove the cover and mix for 60 seconds at medium speed. If the mix appears too wet, ~~add~~ additional fine aggregate may be added ~~during~~ after the first 30 seconds of this mixing period. To do so, stop the mixer briefly, add the fine aggregate, and then complete the additional 30 seconds of mixing. At the end of 60 seconds stop the mixer and remove bowl.

5.9 Perform the flow test on the mixture in accordance with ASTM C~~109~~1437 with the exception that the table will be dropped ~~10~~ 25 times to achieve desired flow of ~~100~~ 110 +/- 5 ~~mm~~ percent.

5.10 If the flow is less than the target tolerance, the sample will be discarded and the test started over.

5.11 If the flow is greater than the desired target, place the sample back into the bowl and place the bowl in the mixer, add additional ~~sand~~ fine aggregate as needed, then remix for 30 seconds.

5.12 Check flow as described in Section 5.9. If the flow is within the target tolerance a set of compressive strength cubes will be made in accordance with ASTM C109. If more than two trials must be made to obtain a flow of 110 ± 5 percent, consider the mortar as a trial mortar, and prepare test specimens from a new batch The cubes will be tested for compressive strength at ~~three~~ seven days.

5.13 A control sample will be prepared of Ottawa sand that meets ASTM C778. Compressive strength cubes will be made in accordance with ASTM C109 with the exception that the sand will not be taken to SSD condition. The preparation of the control sample will follow the procedures as outlined in Sections 5.3 through 5.12. A ~~N~~new control sample shall be ~~performed~~ prepared for test sample with each shipment of cement.

6. CALCULATION

6.1 The average of the compressive strength breaks of the control samples will be divided into the average of the breaks of the fine aggregate being tested.

$(\bar{X}_t / \bar{X}_c) =$ relative compressive strength of test sample.

where: $\bar{X}_c =$ average test results of control sample.

$\bar{X}_t =$ average test results of test sample.

7. REPORTING

7.1 The results will be reported out to the nearest 0.1 percent.

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

MP 702.01.25 Steward – Cement and Concrete Section
RLS:T

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

MATERIALS PROCEDURE

QUALITY ASSURANCE OF REINFORCED CONCRETE CULVERT, STORM DRAIN, AND SEWER PIPE

1. PURPOSE

1.1 To set forth the procedures which govern the Quality Assurance of Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

1.2 To set forth manufacturers Quality Control requirements.

1.3 To set forth acceptance inspection procedures.

1.4 To set forth documentation and shipping procedures.

2. SCOPE

2.1 This procedure will apply to all manufacturers of Reinforced Concrete Culvert, storm pipe, and sewer pipe for use in West Virginia projects.

2.2 This procedure will establish the basis for acceptance of reinforced concrete pipe.

3. APPLICABLE SPECIFICATIONS

3.1 All standard types of reinforced concrete pipe are to be manufactured and tested in accordance with Section 714.2 of the WVDOH Specifications for Roads and Bridges.

3.2 Each LOT of reinforced concrete pipe having a wall thickness of 4.5 inches or less, which is manufactured in accordance with the applicable specifications is treated in the following manner to determine acceptability.

3.2.1 The three-edge bearing test (AASHTO T 280) shall be used to determine the force required to produce the 0.01-inch crack and the minimum specified ultimate load.

3.2.1.1 50% of the LOTs of Class III and Class IV concrete pipe 24 inches in diameter and less, and conforming to WVDOT Specifications, will be accepted based on the Fabricator's certification, provided they are QCast Certified by the American Concrete Pipe Association (ACPA). Testing of Class III and Class IV concrete pipe greater than 24 inches in diameter shall be witnessed by the Division.

3.2.1.2 50% of the LOTs of Class V Concrete Pipe with a diameter less than 24 inches, and conforming to WVDOT Specifications, will be accepted based on the Fabricator's certification, provided they are QCast Certified by the ACPA. Testing of Class V Concrete Pipe, with a diameter greater than or equal to 24 inches, shall be witnessed by the Division.

3.2.2 The absorption test (AASHTO T 280) shall be conducted on samples selected from the wall of the pipe.

3.2.3 A plant inspection of the finished product is conducted to determine dimensional conformance and freedom from defects.

3.2.3.1 For LOTs of concrete pipe accepted on the Fabricator's certification, the inspection, including the three-edge-bearing test, will be performed and recorded by the Fabricator's Quality Control person. These LOTs shall be as defined in Table 1, but the sizes shall be based on the criteria in the QCast Certification program.

3.3 Each LOT of reinforced concrete pipe fabricated with dry cast concrete having a wall thickness greater than 4.5 inches, which is manufactured in accordance with the applicable specifications, is treated in the following manner to determine acceptability.

3.3.1 The compressive strength of the concrete will be determined by testing cores taken from the wall of the pipe. The manufacturer may choose to test this pipe as specified in Section 3.2.1, in which event the requirements for the 0.01-inch crack and the minimum specified ultimate load shall be met. This choice shall not be applied to a LOT (refer to Table 1) of pipe, which has been previously cored and found unacceptable.

3.3.2 The absorption test (AASHTO T 280) shall be conducted on samples selected from the wall of the pipe.

3.3.3 A plant inspection of the finished product will be conducted by the Division to determine dimensional conformance, and freedom from defects.

3.4 Each LOT of reinforced concrete pipe fabricated with wet cast concrete can be accepted on the basis of compressive strength from cylinder breaks (cylinders made per AASHTO R 100 and tested per AASHTO T 22) reaching the required 28-day compressive strength or by the three-edge bearing test (AASHTO T 280) as detailed in Section 3.2.1.

3.4.1 The absorption test (AASHTO T 280) for wet cast pipe shall be conducted on samples cored from the wall of the pipe or by making cylinders (4-inch x 8-inch minimum in accordance with AASHTO R 100).

3.5 Flared end sections will be accepted by either the inspection method or Fabricator certification method, with the same size criteria as outlined in Section 3.2.

3.5.1 Acceptance by the inspection method of precast concrete flared end sections is to be based on verification of compressive strength of concrete as determined from cylinders or cores. Flared end sections must also meet the dimensional requirements listed on the standard detail and on appearance. The testing frequency for compressive strength cores and steel verification coring is 1 out of every 40 pieces, but cylinders shall be fabricated and tested for each piece, if cylinders are used for strength acceptance instead of cores.

3.5.2 In order to accept flared end sections by the Fabricator certification method, the Fabricator must be QCast Certified by the ACPA. The fabricator will take photos/videos showing correct steel placement and cover for one piece in each LOT. All flared end sections must be fabricated within the dimensions listed on the standard detail and have an acceptable finish free of bug holes, spalls, cracks and other surface defects.

TABLE 1

SAMPLING AND TESTING FREQUENCY FOR REINFORCED CONCRETE PIPE

A production "LOT" is defined as follows:

It is a pipe of the same size and class that is manufactured using the same process and similar materials during ~~continuous~~ consecutive days of production, excluding weekends and holidays. ~~–~~The production LOT shall not exceed the specified value of 1% of the LOT and the minimum number tested per LOT is as follows:

Number of Pipe Sections in the LOT	Number of Pipe Sections to be Tested
0 to 300	1
301 to 800	2
801 to 1500	3
over 1500	3 plus 1 section per each 600 pieces or fraction thereof over 1500 pc.

When the tests indicate that a production LOT is acceptable for WVDOH use, the LOT should be inspected by the Division's representative.

4. QUALITY CONTROL REQUIREMENTS

4.1 Quality Control is the responsibility of the manufacturer and shall include the following:

4.1.1 Ensure all component materials used in the fabrication of the pipe have been sampled, tested, and approved (MP 603.02.10).

4.1.2 Ensure quality workmanship as well as a quality product throughout the production.

4.1.3 To scribe into each piece of pipe the following:

(a) Cast Date
(b) Class and Wall Type
(c) Manufacturer's Trademark

4.1.4 Notify the Division's representative upon the completion of casting of a LOT (Refer to Table 1) of pipe so the Division may select a representative sample and witness the testing.

4.1.5 To conduct the three-edge bearing test or to secure cores to ensure strength requirements are met (Section 3.2 and 3.3).

4.1.6 To conduct the absorption test (AASHTO T 280) on samples selected from the wall of the pipe.

4.1.7 Any LOT of pipe or portion of a LOT of pipe failing to meet the specification requirements will be stored separately from acceptable pipe.

4.1.8 Accurate inventory records containing the information required in Section 6.1.2 will be kept and maintained by the manufacturer.

5. ACCEPTANCE CRITERIA

The Division will:

5.1 Sample and test the component materials to be used in the manufacturer of the reinforced concrete pipe in accordance with MP 603.02.10.

5.2 Select representative samples of the LOT to be tested and:

(a) Witness the three-edge bearing test and/or the coring procedure
(b) Verify dimensional conformance
(c) Verify actual steel placement
(d) Determine the steel area

5.3 Ensure each piece comprising the LOT is scribed as stated in 4.1.3.

5.4 Make a visual inspection of the LOT and designate unacceptable units to be removed or set apart from the approved pipe in the LOT.

6. SHIPPING REQUIREMENTS

6.1 The approved LOT of pipe or portion of the LOT can be shipped by the manufacturer providing the following provisions have been met:

6.1.1 The manufacturer will notify the Division's representative prior to each shipment so that the Division may maintain a current inventory with the manufacturing plant.

6.1.2 The manufacturer will supply one copy of the shipping invoice to Materials Control, Soils and Testing Division and one copy to the Division's representative at the project site. The invoice shall contain the following information.

(a) Cast date of the approved LOT
(b) Master laboratory reference number
(c) Size, class, and wall type
(d) Project number
(e) Number of pieces

7. ACCEPTANCE PRACTICE

7.1 Ensure the information on the shipping invoice, as required in Section 6.1.2, agrees with the shipment it accompanies. (Number of pieces, class, size, and type, etc.).

7.2 Check each piece of pipe for the proper identification markings (Section 5.3) and make a visual inspection of each piece to ensure there is no evidence of damage during shipment.

8. COVERAGE REQUEST FROM PROJECT SITE

8.1 Request for coverage shall include the information as referenced on the shipping invoice, Section 6.1.2

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

MP 714.03.30 Steward – Cement and Concrete Section
RLS:Mg

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

MATERIALS PROCEDURE

METHOD FOR ACCEPTANCE OF COMPACTION TESTING

1. PURPOSE

1.1 To provide a procedure for the acceptance of compaction testing.

2. SCOPE

2.1 This procedure is applicable to all materials that require evaluation of compaction tests.

3. TESTING

3.1 The minimum frequency for acceptance testing shall be 10% of the contractor's individual tests. Five tests shall be performed in a lot for acceptance testing.

3.2 Acceptance testing shall be distributed throughout the placement of material.

3.3 The material should be categorized according to the base, subgrade, pipe backfill, embankment, etc.

4. EVALUATION

4.1 Calculations shall be rounded to the following significant digits according to ~~AASHTO Method R-11.~~ASTM Method E29.

Average (X)	0.1%
Standard Deviation	0.01
Range	1%

4.2 Determine the number of lots tested by the contractor for a particular material since the last monitoring including the lot just tested. Record the percent relative densities on the attached form.

4.3 Calculate the standard deviation (S) for the percent relative densities.

4.4 Calculate the range (R) for plus and minus 1.65 standard deviations (S) from the average (X) for the contractor's tests ($R = X \pm 1.65\ S$).

4.5 Compare the acceptance tests to the calculated range.

4.5.1 If all the acceptance tests are within the range, the testing is similar. When the testing is similar, the degree of compaction for the lots of material represented by the acceptance evaluation may~~ean~~ be accepted.

4.5.2 If any of the 5 acceptance tests are outside the range, calculate 3 standard deviations for the contractor's tests ($R = X \pm 3S$).

4.5.3 If all acceptance tests are within the range, the testing is considered similar, however, the quality control practices by the contractor should be reviewed for possible problems.

4.5.4 Any test outside the standard 3 deviation range indicates that there may be ~~are probably~~ problems with the quality control system and no additional material shall~~should~~ be placed until the problem is resolved. The investigation would include checking such areas as equipment, test procedures, location of tests, variability of materials, compaction techniques, etc. The results of the investigation shall be documented in the project files.

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

MP 700.00.50 Steward – Asphalt Section
RLS:J
ATTACHMENT

PROJECT NUMBER: _____

ITEM NUMBER (S): _____

TYPE OF MATERIAL: _____ DATE: _____

QUALITY CONTROL
TESTS

LOT NUMBER				
	1 2 3 4 5			
	AVERAGE (X)		STANDARD DEVIATION	
ACCEPTANCE TESTS				
TEST NUMBER	1 2 3 4 5	X + 1.65 (S) = X - 1.65 (S)= WITHIN LIMITS	YES NO	= UPPER LIMIT = LOWER LIMIT (SIMILAR) (DISSIMILAR)
		X +- ±3-(S) = X - –3-(S) = WITHIN LIMITS	YES NO	= UPPER LIMIT = LOWER LIMIT (SIMILAR) (DISSIMILAR)

EVALUATED BY: _____ CHECKED BY: _____

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

MATERIALS PROCEDURE

STANDARD METHOD OF MICROSCOPIC DETERMINATION OF AIR-VOID CONTENT

1. PURPOSE

1.1 To obtain quantitative information concerning air voids, matrix, fine aggregate, and coarse aggregate in hardened concrete.

2. SCOPE

2.1 By using the linear traverse method of point counts, ~~we can determine~~ the relative composition of hardened concrete cylinders or cores on a percentage basis can be determined.~~.~~

3. EQUIPMENT

3.1 A large stone saw.

3.2 A lapidary grinding apparatus.

3.3 A linear traveler apparatus.

3.4 A reflecting illumination system.

3.5 A binocular microscope with a cross hair type reticle. (Magnification preferably in the 10x, 30x, and 60x range).

3.6 Miscellaneous: Silicon carbide grinding material, grit numbers 120, 240, 400 and 600, a set of 4 mechanical specimen counters, or a wet polishing device with similar grit values ranging from 120 to 600, a 305 mm ruler, and a ~~magic~~ permanent marker.

4. PROCEDURE FOR PREPARATION OF CONCRETE SPECIMENS

4.1 The concrete specimens sh~~ould~~all be cut on the large stone saw so as to bisect the cylinder along its longitudinal dimension. Care sh~~ould~~all be taken in avoiding, if ~~possible~~possible, the steel reinforcing bars encountered in bridge deck cores.

4.2 Select the better half of the specimen and make a cut perpendicular to its long axis, 102 mm below the top surface of bridge deck core specimens. If the specimen is a concrete cylinder a 102 mm section from the middle of the cylinder is cut and used for point counting. These operations are done so that the linear traveler specimen holder can accommodate the specimen.

4.3 All portions of the specimen are retained for possible later inspection.

4.4 That portion of the specimen prepared in Section 4.2 is now polished, first using silicon carbide grit number 120, in order to obtain a uniform surface, and subsequent polishing by silicon carbide grit numbers 240, 400 and 600 to obtain a smooth, highly polished surface.

5. OPERATIONAL PROCEDURES USING THE LINEAR TRAVELER

5.1 The polished specimen is placed on the specimen holder of the linear traveler.

5.2 After the specimen is centered on the specimen holder, the specimen shall~~should~~ be leveled, so as to minimize refocusing.

5.3 A right vertical margin and a left vertical margin shall~~should~~ be drawn on the polished surface of the specimen. The placement of each margin is dependent upon the horizontal limits of the linear traveler and the irregularity of the boundaries of the specimen. If an irregularity exists, the corresponding margin is placed along the inner edge of the irregularity.

5.4 A light source shall~~should~~ be directed onto the specimen surface for illumination of the visual field.

5.5 The ~~biocular~~binocular microscope assembly ~~should~~ shall be positioned so that the technician can observe the entire distance between margins as the linear traveler moves horizontally.

5.6 Horizontal movement of the linear traveler is accomplished by pushing the horizontal motion control switch on a manual linear traveler. The direction of horizontal motion is controlled by the directional selector lever located to the left of the specimen holder and in front of the motor housing. Automated travelers will transition after the previous point is recorded.

5.7 Vertical movement of a manual ~~the~~ linear traveler is accomplished by manually cranking the lower ~~left hand~~left-hand wheel located directly beneath the specimen holder. For automated travelers, the vertical movement will be executed once the horizontal traveler is returned to the home position.

5.8 By using the controls of the linear traveler, position the specimen while viewing through the microscope at 10x, 30x or 60x magnification, so that the vertical cross hair is in~~on~~ line with one of the vertical margins and the horizontal cross hair is approximately 3.2 mm below the specimen, or 3.2 mm below the deepest penetration of an irregular edge.

5.9 Readjust the light source so as to obtain an adequate field illumination.

5.10 Adjust the directional selector lever so that the technician views that portion of the specimen between the margins as the linear traveler moves horizontally.

5.11 Focus the microscope on the specimen surface (periodic refocusing may be necessary).

5.12 Push the horizontal motion control switch so that the linear traveler moves one unit and stops.

5.13 At the intersection of the cross hairs, decide whether the material is an air void, matrix, fine aggregate (-4.75 mm) or coarse aggregate (+4.75 mm) and record the decision on a mechanical specimen counter properly designated.

5.14 Repeat procedures set forth in Sections 5.12 and 5.13 for the entire width of the specimen between the margins.

5.15 When the vertical cross hair reaches a margin after traversing the specimen, reverse the horizontal direction on a manual traveler using the directional selector lever and crank the vertical control wheel two complete revolutions clockwise. For an automatic traveler, follow the manufacturer prompts to return the horizontal traveler to the beginning of the traverse, and follow the manufacturer prompt to allow the vertical traveler to transition to the next row for testing.

5.16 Repeat procedures set forth in Sections 5.14 and 5.15 until the total number of point counts indicated on the mechanical specimen counter equals 600.

6. COMPOSITION PERCENTAGES

6.1 Each category such as air void content, matrix, fine aggregate (-4.75 mm), and coarse aggregate (+4.75 mm), is expressed as a percentage of total number of point counts.

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MP 700.03.50 Steward – Cement and Concrete Section

RLS:T

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS DIVISION

MATERIALS PROCEDURE

PROCEDURE FOR DETERMINING THE RANDOM LOCATION OF COMPACTION TESTS

1. PURPOSE

1.1 This procedure provides methods for determining the random locations for compaction tests.

2. SCOPE

2.1 This procedure is applicable for locating all compaction tests.

3. EQUIPMENT

3.1 Measuring tape, approximately 50 feet.

4. PROCEDURE

4.1 Compaction test site locations are to be randomly located along the roadway centerline (length) and offset (width) randomly from this reference line. Some test site locations, such as pipe backfill, require random selection of lifts for the tests and a random determination of the side of the pipe backfill to test.

4.2 Selection of random numbers

4.2.1 Determine the number of test sites which will be required for the lot or test section.

4.2.2 The table of random numbers (Table I attached) or a calculator, which will generate random numbers, can be used.

4.2.3 The table of random numbers contains 5 sections with 2 columns of numbers in each section.

4.2.3.1 The first column of numbers in each section is for determining the test site along the centerline. The second column of numbers is for determining the distance from the centerline (offset). Either column of numbers can be used for selecting lifts to be tested.

4.2.3.2 To use the table, select a random point on the table by tossing a pencil upon the page or blindly pointing out a location with the finger. The selection of random numbers will consist of a pair of random numbers. Once the point is located, select the number in the first column for the length and the corresponding number in the right column for the width. When more than one pair of random numbers is needed, continue selecting the pairs of numbers down the page. If the bottom of the page is reached, go to the top of the next section to the right or to the top of the first section on the left side of the page if the bottom of the right most

section of the page is reached. When selecting lifts to be tested, only single random numbers are needed and can be obtained from any of the columns of numbers.

4.2.3.3 To use a calculator, which will generate random numbers, select all numbers needed for a test site before selecting numbers for additional test sites.

4.3 Location of test sites

4.3.1 There are many variations in the required number of tests and the physical dimensions of the area to be tested.

4.3.2 Random location of tests on a single lift that rectangular in shape (Example 1 of Attachment).

4.3.2.1 Generally, the Materials Procedure used for testing a material and/or Specifications requires a lot, portion of a lot, or a test section to determine the maximum density of a material to be divided into equal sublots or subsections when more than one test is required.

4.3.2.2 Divide the length of the area along the centerline by the number of tests to determine the length of each sublot or subsection.

4.3.2.3 From the beginning station number, add the length of the subsection or sublot to the station number to determine the station number for the beginning of the next sublot or subsection. Next add the length of the subsection or sublot to this station number to determine the station number at the beginning of the next subsection or sublot. Continue this procedure until the beginning station numbers for all subsections or sublots have been calculated.

4.3.2.4 Select the random numbers according to 4.2 through 4.2.3.3.

4.3.2.5 Multiply the length of the subsections or sublots by the random numbers selected for the length.

4.3.2.6 Add the values to the corresponding station numbers for the beginning of each subsection or sublot. The station numbers locate the test sites along centerline.

4.3.2.7 Next multiply the width of the test section or lot by the random numbers selected for the offset.

4.3.2.8 Determine the offset distance of the lot or test section from the centerline when the centerline is not within the area to be tested. This will usually be a constant value. Always calculate the offset by working from the side nearest the centerline. Add each of the values calculated in 4.4.2.7 to the constant value. The values establish the offset distance of each test site from the centerline. Designate rather the offset is left or right of centerline.

4.3.2.9 When the centerline is contained within the area to be tested, the offset can be calculated from the left or right side of the test area and test location designated in relation to centerline.

4.3.3 Random location of test sites on a single lift that is irregular in shape (Example 2 –attached).

4.3.3.1 Determine the dimensions of the area to be tested.

4.3.3.2 Determine the minimum dimensions of a rectangle that will contain the area to be tested and has two sides parallel to centerline.

4.3.3.3 Divide the rectangle into the desired number of subsections or sublots and randomly locate the test sites locations as in sections 4.3.2 - 4.3.2.8 above. If a test site location falls outside the area to be tested, obtain a new set of random numbers for the test site and recalculate the test site location. Continue this procedure until the test site falls within the area to be tested.

4.3.4 Random selection of lifts to be tested (Example 3 attached).

4.3.4.1 When testing certain materials, especially backfill material, where an area to be backfilled will constitute a lot of material to be tested, a random selection of lifts to be tested is required.

4.3.4.2 Determine the projected number of lifts to be contained in the lot. Divide the number of lifts by the number of tests in the lot. If the value is not an even number, assign an additional lift to the first sublot and continue to assign a lift to each consecutive sublot until all remaining lifts have been assigned to a sublot.

4.3.4.3 By starting with the bottom lift, number the lifts in the lot, select a single random number for each test site.

4.3.4.4 Multiply each random number by the number of lifts in each sublot and round the values to whole numbers. Each value designates which lift in each sublot that will be tested.

4.3.4.5 Once the lifts to be tested have been selected, the random location of the test site on the lift can be determined.

4.3.5 Random selection of the side of backfill for pipe culverts.

4.3.5.1 When a lot of pipe backfill is being tested, tests should be performed on both sides of the pipe. The side to be tested can be randomly selected by using the random numbers selected for the location of the tests along the pipe. If the random number is less than 0.500, the test is on the left side and greater than 0.500 on the right side of the pipe.

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Director
Materials Control, Soils and Testing Division

~~4.3.3.4~~

~~4.3.2.1 When testing certain materials, especially backfill material, where an area to be backfilled will constitute a lot of material to be tested, a random selection of lifts to be tested is required.~~

~~4.3.2.2 Determine the projected number of lifts to be contained in the lot. Divide the number of lifts by the number of tests in the lot. If the value is not an even number, assign an additional lift to the first sublot and continue to assign a lift to each consecutive sublot until all remaining lifts have been assigned to a sublot.~~

~~4.3.2.3 By starting with the bottom lift, number the lifts in the lot.~~

~~4.3.2.4 Select a single random number for each test site.~~

~~4.3.2.5 Multiply each random number by the number of lifts in each sublot and round the values to whole numbers. Each value designates which lift in each sublot that will be tested.~~

~~4.3.3.5 Once the lifts to be tested have been selected, the random location of the test site on the lift can be determined.~~

~~4.3.3.6 Random selection of the side of backfill for pipe culverts.~~

~~4.3.3.6.1 When a lot of pipe backfill is being tested, tests should be performed on both sides of the pipe. The side to be tested can be randomly selected by using the random numbers selected for the location of the tests along the pipe. If the random number is less than 0.500, the test is on the left side and greater than 0.500 on the right side of the pipe.~~

~~MP 712.21.26 Steward – Asphalt Section~~
~~RLS:J~~
~~ATTACHMENT~~

TABLE 1 RANDOM NUMBERS

.858	.082	.886	.125	.263	.176	.551	.711	.355	.698
.576	.417	.242	.316	.960	.819	.444	.323	.331	.179
.687	.288	.835	.636	.596	.174	.866	.685	.066	.170
.068	.391	.739	.002	.159	.423	.629	.631	.979	.399
.140	.324	.215	.358	.663	.193	.215	.667	.627	.595
.574	.601	.623	.855	.339	.486	.065	.627	.458	.137
.966	.529	.757	.308	.025	.836	.200	.055	.510	.656
.608	.910	.944	.281	.539	.371	.217	.882	.324	.284
.215	.355	.645	.460	.719	.057	.237	.146	.135	.903
.761	.883	.771	.388	.928	.654	.815	.570	.539	.600
.869	.222	.115	.447	.658	.989	.921	.924	.560	.447
.562	.036	.302	.673	.911	.512	.972	.576	.838	.014
.481	.791	.454	.731	.770	.500	.980	.183	.385	.012
.599	.966	.356	.183	.797	.503	.180	.657	.077	.165
.464	.747	.299	.530	.675	.646	.385	.109	.780	.699
.675	.654	.221	.777	.172	.738	.324	.669	.079	.587
.279	.707	.372	.486	.340	.680	.928	.397	.337	.564
.338	.917	.942	.985	.838	.805	.278	.898	.906	.939
.316	.935	.403	.629	.130	.575	.195	.887	.142	.488
.011	.283	.762	.988	.102	.068	.902	.850	.569	.977
.683	.441	.572	.486	.732	.721	.275	.023	.088	.402
.493	.155	.530	.125	.841	.171	.794	.850	.797	.367
.059	.502	.963	.055	.128	.655	.043	.293	.792	.739
.996	.729	.370	.139	.306	.858	.183	.464	.457	.863
.240	.972	.495	.696	.350	.642	.188	.135	.470	.765

EXAMPLE 1~~I ENGLISH~~

Length of test section = 100 ft Width of section = 10 ft
Number of tests required = 5
4 equal subsections 100/5 = 20 ft
Test section starts at station 5+46

Station number at the beginning of each subsection

1. 5+46
2. 5+46 + 20 = 5+66
3. 5+66 + 20 = 5+86
4. 5+86 + 20 = 6+06
5. 6+06 + 20 = 6 +26

Random Numbers

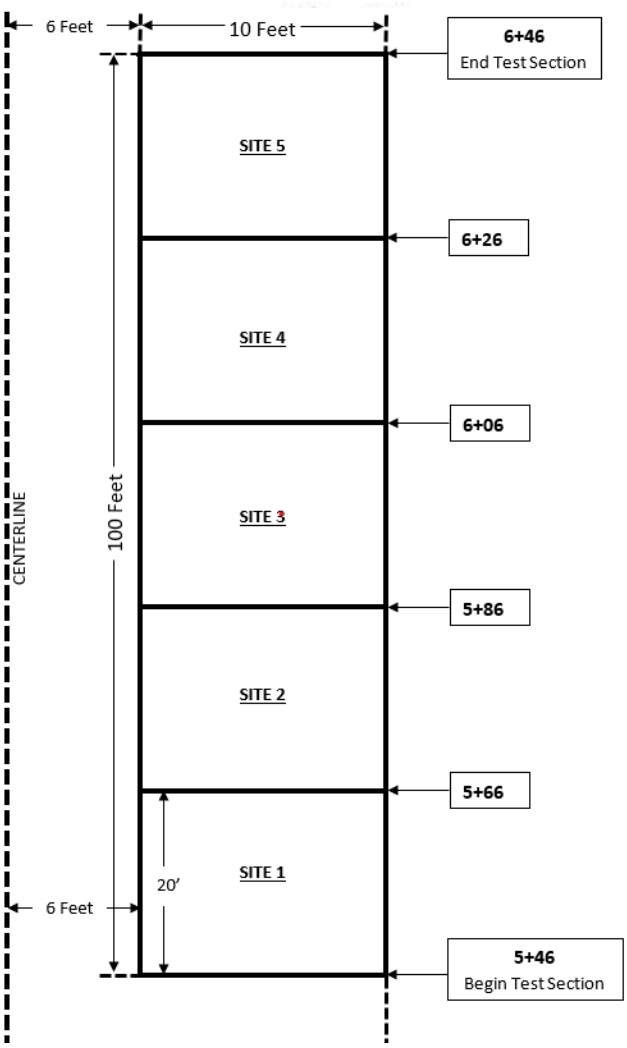
Length	Width
1. .869	.222
2. .562	.036
3. .481	.791
4. .599	.966
5. .464	.747

Multiply the length of each subsection by the random numbers for the length.

1. 20 x .869 = 17
2. 20 x .562 = 11
3. 20 x .481 = 10
4. 20 x .599 = 12
5. 20 x .464 = 9

Add the values to the beginning station numbers of each subsection to determine the station number for each test.

1. 5+46 + 17 = 5+63
2. 5+66 + 11 = 5+77
3. 5+86 + 10 = 5+96
4. 6+06 + 12 = 6+18
5. 6+26 + 9 = 6 +35



Multiply the width of each subsection by the random numbers for the width.

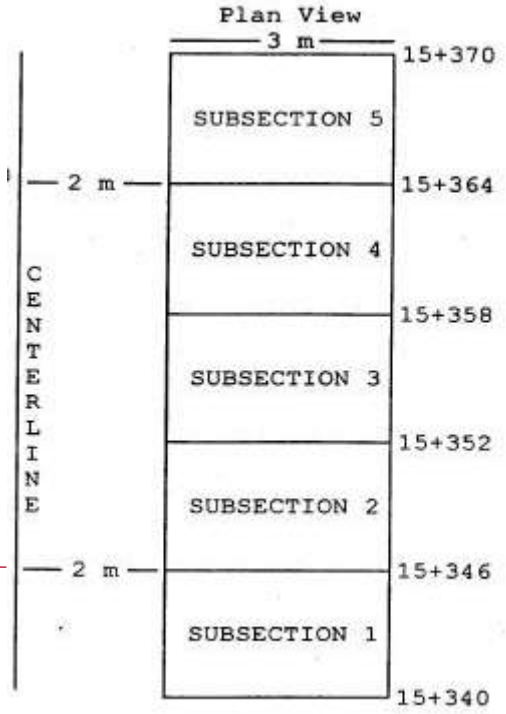
1. 10 x .222 = 2
2. 10 x .036 = 0
3. 10 x .791 = 8
4. 10 x .966 = 10
5. 10 x .747 = 7

Add the values to the constant distance the test section is from the centerline and label the values as right of centerline .

1. 6 + 2 = 8 ft right of centerline
2. 6 + 0 = 0 ft right of centerline
3. 6 + 8 = 14 ft right of centerline
4. 6 + 10= 16 ft right of centerline
5. 6 + 7 = 13 ft right of centerline

~~EXAMPLE I~~
~~METRIC~~

~~Length of test section = 30.00 m~~
~~Width of section = 3.00 m Number of tests required = 5~~
~~5 equal subsections 30/5 = 6 m Test section starts at station 15+340~~



~~Station number at the beginning of each subsection~~

1. ~~15+340~~
2. ~~15+340 + 6 = 15+346~~
3. ~~15+346 + 6 = 15+352~~
4. ~~15+352 + 6 = 15+358~~
5. ~~15+358 + 6 = 15+364~~

~~Random Numbers~~

~~Length~~	~~Width~~
~~1. .869~~	~~.222~~
~~2. .562~~	~~.036~~
~~3. .481~~	~~.791~~
~~4. .599~~	~~.966~~
~~5. .464~~	~~.747~~

~~Multiply the length of each subsection by the random numbers for the length.~~

1. ~~6.00 x .869 = 5.2~~
2. ~~6.00 x .562 = 3.4~~
3. ~~6.00 x .481 = 2.9~~
4. ~~6.00 x .599 = 3.6~~
5. ~~6.00 x .464 = 2.8~~

~~Add the values to the beginning station numbers of each subsection to determine the station number for each test site.~~

1. ~~15+340 + 5.2 = 15+345.2~~
2. ~~15+346 + 3.4 = 15+349.4~~
3. ~~15+352 + 2.9 = 15+354.9~~
4. ~~15+358 + 3.6 = 15+361.6~~
5. ~~15+364 + 2.8 = 15+366.8~~

~~Multiply the width of the test section by the random numbers for the width.~~
~~1. 3.00 x .222 = 0.7~~
~~2. 3.00 x .036 = 0.1~~
~~3. 3.00 x .791 = 2.4~~
~~4. 3.00 x .966 = 2.9~~
~~5. 3.00 x .747 = 2.2~~

~~Add the values to the constant distance the test section is from the centerline — and label the values as right of centerline.~~
~~1. 2.00 + 0.7 = 2.7 m rt of centerline~~
~~2. 2.00 + 0.1 = 2.1 m rt of centerline~~
~~3. 2.00 + 2.4 = 4.4 m rt of centerline~~
~~4. 2.00 + 2.9 + 4.9 m rt of centerline~~
~~5. 2.00 + 2.2 = 4.4 m rt of centerline~~

EXAMPLE 2 ~~METRIC~~

The shaded area designates the lift to be tested. For this example, 2 sublots are required with 1 test in each sublot.

Since the area to be tested is not rectangular in shape, place the smallest rectangle around the area that will include all the shaded area.

Divide the rectangle into 2 equal areas (160 feet long by 90 feet wide).

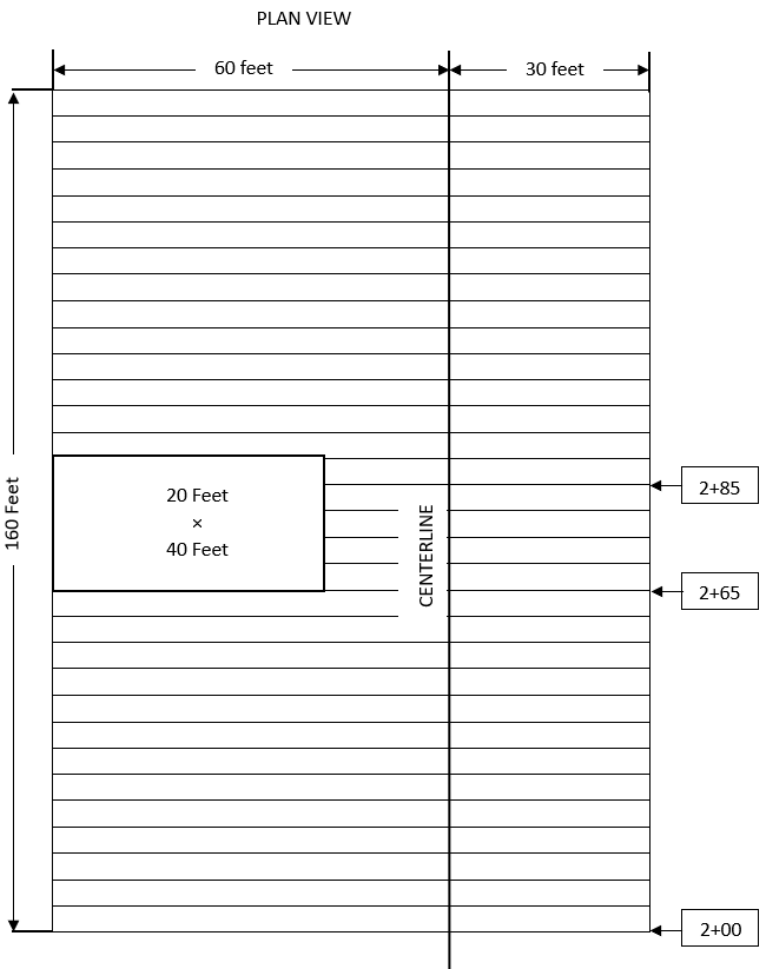
Since the centerline is located within the area to be tested, the offset can be calculated and measured from either side. For this example, work from the right side.

Determine the station number for the beginning of each sublot.

Sublot No. 1	2.+00
Sublot No. 2	2+00 + 80 = 2+80

Random Numbers
Since there is the possibility that the location of a ~~Length Width~~ test site may fall outside the area to be tested, an additional set of random numbers was selected.

Length	Width	
.902	.850	~~additional set of random numbers was selected.~~
.275	.023	
.794	.850	



Multiply the random number by the length of the sublot (80 x .902 = 72 feet). Add the value of the beginning station number (2+00 + 72 = 2+72). Multiply the width of the sublot by the random number (90 x .850 = 76 feet). By working from the right side, it is 30 feet to the centerline, therefore the test site is 76 – 30 = 46 feet to the left of centerline. The test site falls outside the test area.

By using the next set of random numbers, calculate the test site location.

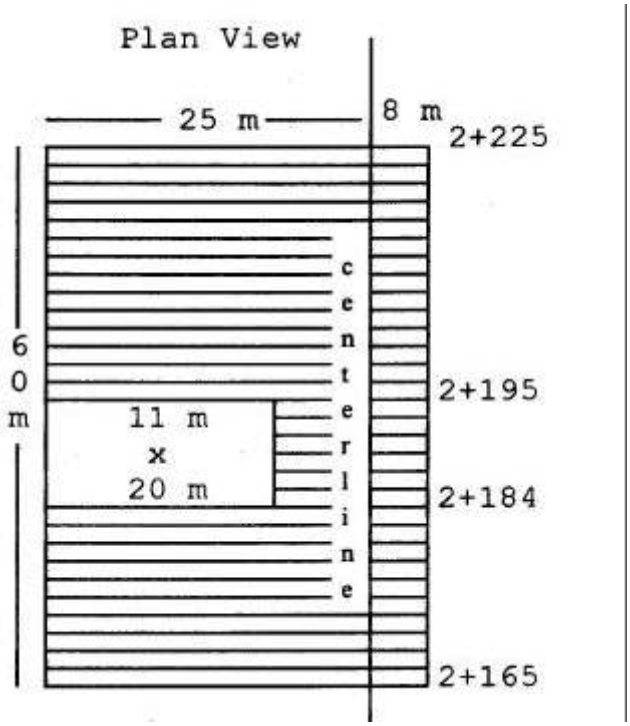
80 x .275 = 22 feet	90 x .023 = 2 feet
2+00 + 22 = 2+22	30 – 2 feet = 28 feet right of centerline

The test site for sublot 1 now falls within the test area.

Calculate the test location for sublot 2.

80 x .794 = 64 feet	90 x .850 = 76 feet
2+80 + 64 = 3+44	76 - 30 = 46 feet left of centerline

EXAMPLE 2
METRIC



The shaded area designates the lift to be tested. For this example, 2 sublots are required with 1 test in each sublot.

Since the area to be tested is not rectangular in shape, place the smallest rectangle around the area that will include all the shaded area.

Divide the rectangle into 2 equal areas (30 m long by 33 m wide).

Since the centerline is located within the area to be tested, the offset can be calculated and measured from either side. For this example, work from the right side.

Determine the station number for the beginning of each sublot.

Sublot No. 1 2.+165
Sublot No. 2 2+165 + 30 = 2+195

Random Numbers Since there is the possibility that the location Length Width of a test site may fall outside the area to be

.902	.850
.275	.023
.794	.850

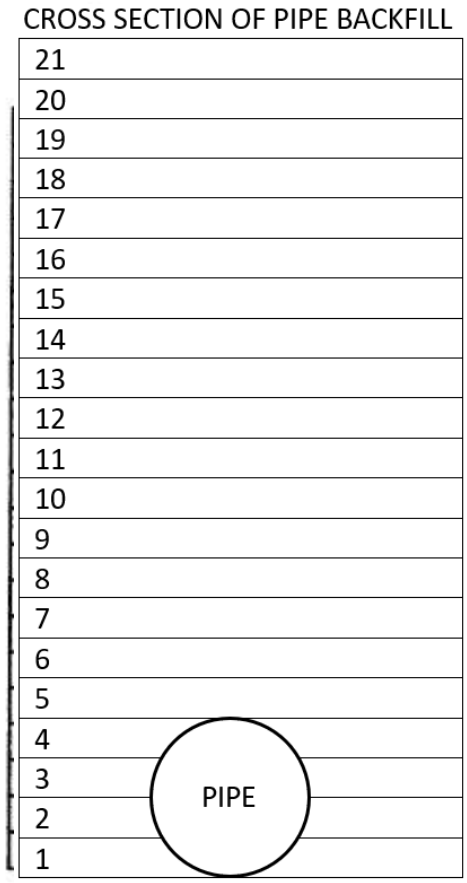
tested, an additional set of random numbers was selected.

Multiply the random number by the length of the sublot (30 x .902 = 27.1 m). Add the value of the beginning station number (2+165 + 27.1 = 2+192.1). Multiply the width of the sublot by the random number (33 x .850 = 28.1 m). By working from the right side, it is 8 m to the centerline, therefore the test site is 28.1 – 8 = 20.1 m to the left of centerline. The test site falls outside the teSt area.

By using the next set of random numbers, calculate the test site location. 30 x .275 = 8.2 m 33 x .323 = 0.8 m
2+165 + 8.2 = 2+173.2 8 – 0.8 m = 7.2 m right of centerline The test site for sublot 1 now falls within the test area.

Calculate the test location for sublot 2
30 x .794 = 23.8 m 33 x .850 = 28.0 m
2+195 + 23.8 = 2+218.8 28 – 8 = 20 m left of centerline

EXAMPLE 3



21 lifts of material are required to backfill the pipe.

All of the backfill material is included in 1 lot. There are 5 tests required with 1 test in each sublot.

Divide the number of lifts by the number of sublots to determine the number of lifts in each sublot (21/5 = lifts with 1 lift left over). This includes the lift in sublot number 1.

Sublot Number 1	Lifts 1 – 5
Sublot Number 2	Lifts 6 - 9
Sublot Number 3	Lifts 10 - 13
Sublot Number 4	Lifts 14 - 17
Sublot Number 5	Lifts 18 – 21

Random numbers
1. .599
2. .464
3. .675
4. .279
5. .338

Multiply the number of lifts in the sublot by the random numbers.

The values determine which lift in each sublot to test.

1.	5 x .599 = 3	Test lift 3 in sublot number 1, Lift number 3
2.	4 x .464 = 2	Test lift 2 in sublot number 2, Lift number 7
3.	4 x .675 = 3	Test lift 3 in sublot number 3, Lift number 12
4.	4 x .279 = 1	Test lift 1 in sublot number 4, Lift number 14
5.	4 x .338 = 1	Test lift 1 in sublot number 5, Lift number 18

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

MATERIALS PROCEDURE

CHEMICAL ANALYSIS FOR pH OF SOIL

1. PURPOSE

1.1 To establish a procedure to perform the chemical analysis of soil.

1.2 To establish a procedure to determine its pH and organic contents.

2. REFERENCED DOCUMENTS

a. *Standard Methods of Chemical Analysis, F.J. Welcher, Editor, Sixth Edition, Pages 2310 - 2337.*

b. *AASHTO T-267-22 Determination of Organic Content in Soils by Loss on Ignition*

c. *Test method 1:1 Soil-Water Ratio in Standard methods of Chemical Analysis, Page 2329.*

3. CHEMICAL ANALYSIS pH TESTING PROCEDURE

3.1 *Required Reagents (Liquid substance for analysis)*: Distilled, freshly boiled water.

3.2 *Apparatus*: One (1) pH meter with electrodes capable of measuring to the nearest 0.1 pH unit. Buffer solutions of pH 4.0, 7.0 and 10.0. Dry and freshly ground soil. A 50ml beaker and stirring utensil. One (1) drying oven capable of measuring 110+/- 5°C (230+/-9°F). One (1) Evaporating dish or oven crucible.

3.3 *Test Method 1:1*: Dry the soil overnight in an evaporating dish or crucible inside the drying oven at 105+/- 4°C.

3.4 Place 20g (grams) of the soil from the evaporating dish or crucible in the 50 milliliter beaker.

3.5 Add 20 ml of distilled water to the soil and stir with the stirring utensil at regular intervals for 1 hour.

3.6 Standardize the pH meter *prior* to measuring the soil.

3.7 Measure the pH of the mixture. (Stir well just before submerging the electrodes into the mixture).

4. CALCULATION

4.1 The pH content shall be expressed as a percentage of the mass of the oven-dried soil and shall be calculated as follows:

Percent pH = (A-B/A-C) x 100

Where:

A = Mass of the 50 ml beaker and oven dried soil (*before* adding distilled water and buffer solution)

B = Mass of the 50 ml beaker and oven dried soil (*after* adding distilled water and buffer solution), and

C = Mass of the 50 ml beaker, to the nearest 0.01g.

4.2 Calculate the percentage of pH to the nearest 0.1 percent..

5. ORGANIC CONTENT ANALYSIS OF SOIL

5.1 Use apparatus and test method (Ignition Procedure) in AASHTO T-267-22 Determination of Organic Content in Soils by Loss on Ignition.

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

MATERIALS PROCEDURE

CONTRACTOR'S QUALITY CONTROL FOR SURFACE WATER AND SAMPLING PROCEDURES FOR QUALITY DETERMINATION

1. PURPOSE

1.1 The purpose of this procedure is to establish practices for the Contractor's Quality Control System for surface waters. This procedure is intended to be used in designing an adequate Quality Control Plan for the sampling, testing, and evaluation of surface water quality during construction.

1.2 This procedure includes the requirements for methods to be used in collecting samples and conducting testing. Also, procedures are established that outline actions to be taken if the water quality is not maintained.

2. REFERENCED DOCUMENTS

2.1 *Other Standards:*

a. MP 642..40.20

b. West Virginia Administrative Regulations, State Water Resources Board, Chapter 20-5 and 20-5A, Series I

c. Environmental Water: Quality Check

3. REQUIREMENTS AND GUIDELINES

3.1 General Requirements: The Contractor will design a Quality Control Plan to include tests, methods, and frequency of sampling. The plan will be submitted to the Engineer at the Pre-Construction Conference and a plan must be approved by the District Materials Section before construction may begin. The Contractor's Quality Control results of the surface water testing, both field and laboratory, will be documented and copies will be provided to the Engineer throughout the life of the contract.

3.1.1 The Quality Control Plans shall be updated as needed during the life of the contract. The updating will be done by the Contractor as directed by the project Engineer/Supervisor. The updating shall be approved by the District Construction Division.

3.1.2 The Contractor will assign a qualified technician to each project to perform and document the sampling and testing.

3.1.2.1 A qualified technician is defined as a person who is knowledgeable and trained in the sampling and testing of surface waters for those tests as stated in Section 4.3 of this procedure. A resume of the technician's experience in the water quality sampling and testing must accompany the Quality Control Plan. If found inadequate, the technician will be replaced by the Contractor or be given additional training so that sampling and testing is adequately performed.

3.2 Quality Control Plan: The plans will clearly describe the methods by which the Quality Control Program will be conducted. As a minimum, and acceptable plan will include the following:

3.2.1 Name of company official for the specific project who is responsible for the Quality Control and liaison with the Division project personnel. Also the name of the person(s) actually conducting sampling and testing. Sampling and testing will be conducted by a qualified technician and such duties are to be this person's primary assignment.

3.2.2 The tests and type of equipment to be used in sampling and testing will be listed along with accepted methods.

3.2.3 The number and locations of sampling points shall be identified. This may need to be updated frequently during the course of the project.

4. QUALITY CONTROL BY THE CONTRACTOR

4.1 Quality Control testing of the surface waters will be performed by the Contractor. Sampling and testing will be conducted on those surface waters within the Division of Highways project areas and in adjacent surface waters that may be affected by construction on these projects.

4.1.1 The Contractor will ensure that a precipitation gauge is located on the project. A daily record will be kept of precipitation. This record will be submitted to the project with any test results that cover the same time period.

4.2 Points of Sampling

4.2.1 Water quality will be determined on flowing streams and/or other surface waters to be affected by construction.

4.2.1.1 The Contractor will monitor the quality of the water upstream and downstream from the limits of construction.

4.2.1.2 In cases of major highway construction, streams will be sampled above and below structures, such as bridges, large sediment control devices, or a series of smaller devices.

4.2.1.3 Streams outside the construction limits that receive flow from construction affected streams are to be sampled. This sampling will be conducted on the receiving stream above and below the mouth of the stream affected by construction. Sampling on the receiving stream will not have to be conducted when the distance of the affected stream from the construction limits to the receiving stream is greater than one-half mile, unless it is observed that pollution is carried a greater distance to enter the receiving stream.

4.2.2 Samples will be taken approximately 15 m above and 30 m below construction limits, structures, sediment control devices and the confluence of streams.

4.2.2.1 When mixing has not created visible homogeneous conditions within approximately 30 m below a confluence, sampling will be conducted at the nearest point where visible homogeneity exists throughout the cross section. This location is to be recorded. When homogeneity does not exist within approximately 304 m below confluence, a minimum of three samples are to be taken along the cross section at this point. Additional samples may be necessary if determined by the Engineer.

Commented [1]: 30 m?

4.2.3 Samples should not be taken from areas of heavy aeration, agitation, or stagnation, unless for specific circumstances and tests.

4.2.4 Under some conditions, points of sampling may have to be located at a specific spot to determine influx of concentrated substances or isolated sources of pollution.

4.2.5 Grab samples will be appropriate in most cases. Depth of samples will be from just below the surface to 9 m below depending on the depth of the stream.

4.2.5.1 Containers for grab samples may be either soap and water cleaned glass or plastic, fitted with plastic screw caps. Containers will be able to hold at least 500 ml.

4.3 Testing

4.3.1 The following tests will be conducted using MP 642.40.20:
pH
Tubidity

Testing for pH and turbidity will be conducted within thirty (30) minutes after the samples have been collected. The Engineer will be notified immediately after testing when limits have been exceeded.

4.3.1.1 For other tests that may be specified in the contract document, the Contractor will utilize MP 642.40.20.

4.3.2 The Contractor's attention is directed to the "Limits as per W.Va. Administrative Regulations" attachment. Under the turbidity limit it is noted that this control factor may not apply if the sediment control plans are submitted to the appropriate cooperative. This may result in a waiver approval by the cooperative with concurrence of the chief for streams other than trout streams. The cooperative, as mentioned above, is the Soil Conservation District that has control in the area of construction. The chief, as mentioned above, is the head of the Water Resources Division of the Division of Natural Resources.

4.3.2.1 The waiver approval may contain limits for turbidity. If the waiver does not contain limits for turbidity, then the following limits shall apply. Turbidity shall not exceed 20 Nephelometric Turbidity Units (NTU) over background (I) turbidity when the background is 50 NTU or less, or have more than a 20 percent increase in turbidity (plus 20 NTU minimum) when the background turbidity is more than 50 NTU.

4.3.2.2 The continuation of the waiver, for the duration of the project construction period, will be based on the adherence of the Contractor to the control plan submitted.

4.3.2.3 The Engineer shall be monitoring the water quality data to determine compliance with the specifications and sediment control plan to determine if the methods of control need revision, maintenance, or adjustment.

4.4 Frequency and Duration of Sampling

4.4.1 In normal weather conditions, water quality sampling and testing will be conducted daily at each site, when testing indicates that pollution problems exist, sampling and testing will be conducted once per work shift.

(1) Background water quality is the quality of water entering the project area or the quality of the receiving body of water upstream from the discharge point of project affected water.

4.4.2 During periods of no precipitation (greater than once a week), when it is evident by the Contractor's is testing that pollution is not being created beyond standard limits at a site, and with the concurrence of the Engineer, water quality sampling and testing may be limited to a weekly frequency at these sites. Visual observations are to be made daily to determine that conditions have not significantly changed. If a change is noted visually, testing is to be conducted and the frequency revised as needed.

Commented [2]: "Contractor's testing" Remove "is"

4.4.3 During in-stream construction, when visual inspection indicates possible pollution, water quality sampling and testing will be conducted at least once per work shift.

4.4.4 During periods of project shut down, sampling will be conducted at least once per week.

4.5 Documentation of Results

4.5.1 Water quality will be maintained on the Division's form entitled "Environmental Water: Quality Check" or on a Contractor's form containing the same information as the Division's form. The completed forms will be provided to the Project Engineer on a daily basis.

5. ACCEPTANCE PROCEDURE

5.1 Acceptance shall be the responsibility of the Division. Acceptance may be accomplished by testing a sample obtained by and tested by the Contractor, by observation of Contractor's sampling and testing, or sampling and testing independent of the Contractor's

5.1.1 Testing or observation frequency should be equal to approximately 10% of the frequency of the Contractor's sampling and testing listed in the Quality Control Plan. Normally, some sampling and testing shall be independent of the Contractor's testing.

5.1.2 When discrepancies exist between the Contractor's data and the Division's findings, the Division and Contractor shall individually test a sample in an attempt to locate and correct the problem. These samples shall be taken at the same times and location. The investigation of the problem is to be mutually cooperative.

5.2 Water quality which is affected by actions of the Contractor resulting in violations will require actions to be taken. The water quality requirements are contained in the West Virginia Administrative Regulations, State Water Resources Board, Chapter 20-5 and 20-5A, the limits specified by the cooperative or this Material Procedure. Action will be taken by the Contractor to reduce the pollution to acceptable limits (for such limits, see attachment or section (4.3.2.1)). The action may include, but are not necessarily limited to, the following: (1) Work in the area of influence will be reduced or stopped until the cause, such as rain, had abated to a degree that pollution is within acceptable levels and/or (2) appropriate Best Management Practices will be utilized to reduce the pollution to an acceptable level.

5.2.1 If the Contractor does not take action to control the population, the Engineer may stop construction work other than pollution control work, on the project until adequate measures are taken to control the pollution.

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Attachments

Attachment 1

Limits as Per West Virginia Administrative Regulations,
State Water Resource Board, Chapters 20-5 and 20-5A

pH - No Value below 6.0 nor above 9.0

Turbidity - No point or non-point source to West Virginia;s waters shall contribute a net load of suspended matter such that the turbidity exceeds 10 NTU over background turbidity when the background is 50 NTU or less, or have more than 10 percent increase in turbidity (plus 10 NTU minimum) when the background turbidity is more than 50 NTU.

This Limitation shall apply to all earth disturbance activities and shall be determined by measuring stream quality directly above and below the area where drainage from such activity enters the affected stream. Any earth disturbance activity continuously or intermittently carried on the same or associated persons on the same stream or tributary segment shall be allowed a single net loading increase.

This regulation shall not apply to those activities at which Best Management Practices in accordance with the State's adopted 208 Water Quality Management Plan are being utilized on a site specific basis as determined by the appropriate 208 cooperative with concurrence of the chief or an approved Federal or State Surface Mining Permit is in effect. The exemption shall not apply to trout waters.

Attachment 2

ENVIRONMENTAL WATER: QUALITY CHECK

PROJECT_____COUNTY_____DISTRICT_____

LAB. NUMBER _____

DATE SAMPLED/TESTED _____

SAMPLED BY _____

SAMPLING OBSERVED BY DISTRICT: YES NO

RAINFALL (24 HRS.) _____"

	SITE#	SITE#	SITE#	SITE#	SITE#
STATION	_____	_____	_____	_____	_____
OFFSET	_____	_____	_____	_____	_____
TURBIDITY	_____	_____	_____	_____	_____
pH	_____	_____	_____	_____	_____
IRON	_____	_____	_____	_____	_____
WATER TEMP. °C	_____	_____	_____	_____	_____
AIR TEMP. °C	_____	_____	_____	_____	_____

REMARKS:

_____

_____

_____

_____

_____
Technician's Signature

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

MATERIALS PROCEDURE

FIELD SAMPLING AND TESTING OF SURFACE WATER FOR QUALITY DETERMINATION

1. PURPOSE

1.1 This procedure sets forth guidelines for collecting surface water samples within the limits of Division of Highways projects and in adjacent surface waters that may be affected by construction on these projects.

1.2 The procedure establishes general and specific methods to be utilized in determination of sampling points, duration of sampling and how to collect samples. Or also discusses necessary equipment and tests.

2. REFERENCED DOCUMENTS

2.1 Applicable Documents:

a. MP 642.40.20

b. MP 642.03.50

3. EQUIPMENT

3.1 Chemically inert glass and/or plastic bottles (depending on the test to be performed) or 1 liter capacity fitted with screw caps will be used for chemical analyses samples.

3.1.1 All containers will be machine or hand washed with suitable cleaning compound or biodegradable soap. After washing, containers will be well rinsed with clean tap water and finally with distilled water to remove any residue of the cleaning compound or soap.

3.2 Containers used for samples for biological test determination by the Central Laboratory shall be 100 ml plastic bottles with screw caps. The bottles and caps must be able to withstand sterilization procedures.

3.3 Plastic or rubber gloves when sampling in certain contaminated waters (for example, sewage waters).

3.4 Rubber boots if required for sampling in deep water.

3.5 Materials Control, Soils and Testing (MCS&T) Division personnel will need equipment to determine pH, temperature, dissolved oxygen, specific conductivity, total alkalinity, and total acidity. District personnel will need equipment for determination of pH, temperature, and turbidity.

4. SOURCE OF SAMPLES

4.1 Samples may be obtained from streams, springs, drainage from coal mines and other waste, or other sources that may affect water quality.

4.2 Generally, all perennial streams should be sampled. In certain cases, sources that are of an intermittent nature may require sampling when flows are present and if it is likely that the source will have a significant effect on the quality of receiving water and the stream flow.

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4.3 Drainage from coal mines or coal waste piles should be sampled if this drainage is disrupted, channelized by the highway construction, or it is contributing to the flow of water that passes through the project or proposed project, but is not located within the project limits.

4.4 Springs or other special sources should be sampled especially if the supply is for human consumption and/or other public, recreational or natural resources uses in the immediate area.

4.5 When possible, samples to be taken prior to construction or in the design phase of a project should be obtained when flows are considered to be in low or normal conditions, except as noted in Section 4.2.

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5. POINTS OF SAMPLING

5.1 Samples should not be taken from areas of stagnation, heavy aeration, or agitation unless for special circumstances and tests.

5.2 Samples shall not be taken from the confluence of streams. Samples shall be taken a minimum of 15 m above and 30 m below such points. When mixing has not created visible homogeneous conditions within 30 m below a confluence, sampling will be conducted at the nearest spot where visible homogeneity exists.

5.2.1 When conditions are such that homogeneity does not exist within 305 m downstream from confluence, sufficient samples should be obtained to delineate any differences. These points of sampling are to be recorded.

5.3 Under some conditions, to be determined by the sampler, points of sampling may have to be located at a specific spot to determine influx of concentrated substances or isolated sources of pollution.

6. FREQUENCY AND DURATION OF SAMPLING

6.1 Samples Collected by MCS&T Division Personnel: Sampling will be conducted in the design phase of a project. At least three (3) samples should be obtained at different times prior to construction at each of the sources outlined in Section 4.1 if encountered in the project area.

6.2 Samples Collected by District Personnel During Construction: Sampling by District personnel will be conducted as an acceptance procedure when MP 642.03.50 is in effect on a project. See MP 642.03.50 for sampling requirements.

6.2.1 In some cases, MP 462.03.50 may not be in effect on a project. Sampling will be conducted if it is determined that construction activity could result in a disturbance of the water source drainage area. Sampling frequency will be daily.

6.2.1.1 When construction is not active, but conditions are such that erosion and pollution can still occur, sampling will be conducted daily.

6.2.1.2 When construction is not active, but conditions are such that erosion and pollution are not likely to occur, sampling will be conducted weekly.

6.3 Monitoring will be continued throughout the life of the project.

7. VOLUME OF SAMPLES

7.1 Samples collected for testing in the MCS&T Division Central Laboratory will be on the quantities as set forth in MP 642.40.20 for each test required.

7.2 The quantity of water for field testing by MCS&T Division personnel shall be 1 liter.

7.3 The quantity of water for District testing shall be a minimum of 500 ml.

7.4 A minimum sample for biological testing will be 100 ml.

7.5 Appropriate preservation method and quantities for all tests are listed in MP 642.40.20.

8. SAMPLING

8.1 Individual grab samples will be appropriate in most cases.

8.2 Generally, sampling from the steam bank will be acceptable. In certain cases, however, grab or composite samples collected from a boat or structure may be necessary.

8.3 The samples should be taken at least an arm’s length in depth or half the steam depth.

8.3.1 In some sources too shallow for submerging the sample bottle, water will have to be dipped or a hole dug large enough to allow submergence of a sample bottle. When a hole is dug, a minimum of 15 minutes must pass before the sample is taken. However, in some cases where stream flow and volume is low or turbidity is not equalized, a longer waiting period will be necessary,

8.4 The mouth of the sample bottle should be held in such a manner that the flow of water will not pass over the hand before entering the bottle.

8.5 The container used for chemical test samples should be rinsed two or three times with the water to be collected before taking the sample. Rinse water is to be poured out downstream of the site.

8.6 The sample will be capped and sealed as soon as possible after sampling to limit exposure to the atmosphere.

8.7 Containers used for biological test samples will be kept sterile at all times. The bottle will be submerged and the cap taken off underwater when taking the sample. The container will be capped after filling while still underwater.

8.8 Samples shall be handled prior to analysis in a manner that protects the substances to be tested.

9. TESTING

9.1 The following tests will be conducted by MCS&T Division Personnel in the field at the sample site: 1) pH, 2) dissolved oxygen, 3) specific conductivity, 4) total alkalinity, 5) total acidity, and 6) water temperature.

9.2 Tests to be conducted in the field by District personnel will be pH and water temperature.

9.2.1 The turbidity of the samples will be determined in the District laboratory.

10. SHIPPING SAMPLES

10.1 Samples collected for testing by the Central Laboratory will be delivered to the MCS&T Division.

10.1.1 Samples shall be scheduled to arrive within the limits of the holding times as indicated in MP 642.40.20.

11. DOCUMENTATION

11.1 Water quality results for samples taken by MCS&T Division personnel will be maintained on the Division's appropriate forms.

11.2 Water quality results for samples taken by District personnel may be maintained on the Division's form entitled " Environmental Water: Quality Check" (see MP 462.03.50)

Commented [3]: See Attachment

12. ASSISTANCE

12.1 Personnel from the MCS&T Division will provide training for District personnel in all aspects of the work made necessary by this MP.

12.2 Assistance in planning and developing a testing program for a particular project or projects will also be provided by this Division.

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

MATERIALS PROCEDURE

CHEMICAL DETERMINATION OF CEMENT CONTENT IN HARDENED CONCRETE

1.0 PURPOSE

1.1 To set forth a procedure for determining the cement content of hardened concrete by a chemical method.

2.0 APPLICABLE DOCUMENTS

2.1 Highway Research Record, Number 370, 1971.

2.2 American Society for Testing and Materials, C-127.

3.0 PROCEDURE

3.1 Bulk Specific Gravity (ASTM Method C-127 with adaption for concrete saturated surface dried basis).

3.1.1 A sample of the concrete approximately three times the size of the largest aggregate used in the concrete mix is dried to constant weight at 105º C $\pm$ 2º C. After soaking for 24 hours, the sample is surface dried and weighed in air, then weighed in water.

3.2 Free Water Loss

3.2.1 The sample from 3.1.1 is dried in an oven for 24 hours at 105º C $\pm$ 2º C. The sample is cooled in a desiccator and weighed.

3.3 Combined Water Loss

3.3.1 The sample from 3.2.1 is crushed and pulverized to 850 µm. The sample is

split to approximately 100 grams.

3.3.2 Approximately 50 grams of sample are accurately weighed on an analytical balance. The sample is placed into a weighed dish and dried at 600º C ± 10º C for four (4) hours. The sample is then cooled in a desiccator and weighed.

3.4 Extractable Matter

3.4.1 Approximately 10 grams of sample are accurately weighed on an analytical balance. To the sample is added 400 milliliters of 20% maleic acid (dissolved in anhydrous methanol). The sample is stirred for ten (10) minutes. The sample is decanted through a previously weighed set of filter papers in a Buchner funnel, one paper should be fast filtering, the other slow filtering. To the residue in the beaker is added an additional 200 milliliters of the maleic acid solution. The sample is stirred for ten (10) minutes, then washed into the filtering funnel. The funnel is carefully washed with methanol to remove the maleic acid from the paper. The residue is dried for ten (10) minutes at 105º C ± 2º C, cooled in a desiccator, and weighed.

4.0 CALCULATIONS

4.1 Bulk Specific Gravity (ssd)

$$\text{Sp. Gr.} = \frac{A}{A-B}$$

Where A = weight in grams of saturated surface dried sample in air. B = weight in grams of saturated sample in water.

4.2 Free Water Loss (percent)

$$Lf = \frac{A-C}{A} \times 100$$

Where C = weight in grams of sample after 24 hours at 105ºC (ssd).

MP 601.03.20
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__ 4.3 Combined Water Loss (percent)

$$Lc = \frac{D-E}{D} \times 100$$

Where D = Weight in grams of sample
E = Weight in grams after heating at 600ºC.

4.4 Extractable Matter (percent)

$$M_E = \frac{F-G}{F} \times 100$$

Where: F = Sample weight in grams
G = Weight of residue in grams

4.5 Residue

$$R = 100 - M_E$$

4.6 Cement Percentage

$$Cp = (100-R-L_C)\left(1-\frac{Lf}{100}\right)$$

4.7 Cement Content in bags/m^3

$$cc = \frac{(Cp)\,(1)\,(Sp.\ Gr.)\,(K)}{(100)\,(42.64)}$$

Where K = 997.05

GLR:w