Materials Procedures Committee Regular Meeting

Meeting Time/Date: November 20th, 10:00 AM

Meeting Location: MCS&T (Library) - 190 Dry Branch Drive, Charleston, WV 25306

Charleston WV, 25301

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\2024\2024 11 20 MP Meeting

Files Available on Webpage:

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

Materials Procedures – Approved at Last Meeting

1. QC MPs – QC MPs, Removes Industry testers list from QC
2. 106.10.51 – WVDOH Buy America Waiver Guidelines
3. 601.03.50 – Guide for Quality Control and Acceptance Requirements for Portland Cement Concrete
4. 604.02.40 – Inspection and Acceptance Procedures for Precast Concrete Products

Materials Procedures - Old Business

Number	Champion	Title	Description
1* - 700.00.53	Brayack	Procedure for the Independent Assurance Program	Major Re-Write based on FHWA guidance
2& -106.10.50	Brayack	WVDOH Buy America Acceptance Guidelines	Removes waiver for Manufactured Materials in anticipation of FHWA Update.
3* - 106.10.51	Brayack	WVDOH Buy America Waiver Guidelines	Splitting out from 106.10.50 due to length and complexity. Outlines waiver process for Buy America Materials. Pending incorporation of updates from FHWA
4* - 603.10.40	Thaxton	Inspection and Acceptance Procedures for Prestressed Concrete Bridge Members	Add E-Ticketing
5* - 720.10.01	Allison	Guide for Using a High-Speed Inertial Profiler to Measure the Longitudinal Profile of Pavement	Minor Updates/Reconfirmation
6* - 700.04.22	Allison	Method for Approving Devices Used for Testing Density and/or Moisture Content of In-Place Material	Process for creating approved list for Density/Moisture Devices

7* - 700.00.54	Brayack	Procedure for Evaluating Quality Control Sample Test Results with Verification Sample Test Results	Modernization/Update of MP.
8* - 106.03.51	Harper	Policy for Materials Certification Reciprocity	Adds PCC technician reciprocity.

Materials Procedures – Editorial Edits

1* - 212.01.21	N/A	Test Method for Unconfined Compressive Strength of Rock Core Specimens	Reconfirmation with minor or no edits
2* - 212.02.20	N/A	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	Reconfirmation with minor or no edits
3* - 401.07.21	N/A	Sampling Compacted Asphaltic Mixtures from The Roadway	Reconfirmation with minor or no edits

Materials Procedures - New Business with Significant or Process Updates

1& - 109.00.21	Brayack	Basis For Charges for Non-Submittal of Sampling & Testing Documentation By The Established Deadline	References new document – MP 109.00.22 listed next.
2& - 109.00.22	Brayack	Procedure for the Submission and Documentation of Quality Control Test Results	Defines the submission of QC samples by the contractor.
3& - 604.02.40	Gillispie	Inspection and Acceptance Procedures for Precast Concrete Products	Revised the cylinder fabrication frequency for dry cast concrete in Section 4.3.2
4& - 712.21.26	Ross/Brayack	Procedure For Determining the Random Location of Compaction Tests	Previously approved MP with minor updates.
5& - 106.00.03	Brayack	Guidelines For Establishing and Maintaining Approved Product Lists of Materials, Systems and Sources	Removal of NTPEP reference.

Note 1: * Denotes this MP is up for Vote

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

Comments

Comments due November 19th, 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 2-weeks before the next meeting: December 4th

Meeting Time/Date: 10:00 AM, December 18, 2024

Meeting Location: MCS&T (Library)

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 2024:

December 18

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

MATERIALS PROCEDURE

PROCEDURE FOR THE INDEPENDENT ASSURANCE PROGRAM

1. PURPOSE

1.1 To provide a procedure for the WVDOH to meet~~ing~~ FHWA's requirements for the Independent Assurance (IA) program.

2. SCOPE

2.1 This procedure applies to the following IA Materials:

2.1.1 Portland Cement Concrete (PCC)

2.1.2 Asphalt

2.1.3 Aggregate

2.1.4 Compacted Soil, Aggregate and Asphalt Materials

2.1.4.1 The WVDOH is in the process of evaluating the method to incorporate this testing into the IA program.

3. REFERENCED DOCUMENTS

3.1 Office of Pavement Technology Publication No. FHWA-HIF-12-001[1], October 2011. Included as Attachment 2.

3.2 23 CFR - PART 637—CONSTRUCTION INSPECTION AND APPROVAL[2]

3.3 MP 106.03.50 - General Information Guide for Technician and Inspector Certification Program (TICP)

3.4 AASHTO R44-07.

4. DEFINITIONS

4.1 QA – Quality Acceptance– The ~~d~~Division sample used for the acceptance of material on a project.

4.2 IA Sampler: The employee at MCS&T Division who oversees the IA program. This person may perform 1:X testing when the population (X) is not large enough to compare samples statistically. The IA Sampler may, at the discretion of the Director of MCS&T, delegate this task to a qualified Division employee.

4.3 Evaluation Period: The calendar year in which the IA program is evaluated. This begins on January 1st and ends on December 31st of the same year.

[1] https://www.fhwa.dot.gov/pavement/materials/hif12001.pdf
[2] https://www.ecfr.gov/current/title-23/chapter-I/subchapter-G/part-637

4.4 IA Material: Each unique material that is evaluated by the IA program. These materials are listed in Section 2.1 of this document.

4.44.5 IA Test: A test that is performed by a QA Tester which is evaluated either directly or indirectly by the IA sampler to demonstrate both the QA Tester and their QA Testing Equipment's proficiency.

4.54.6 QA Testerechnician: Each individual who performs an IA Test on for QA, an IA Material for QA, during the Evaluation Period. Each unique instance of these must be evaluated based on the frequency noted in Section 5.

4.64.7 QA Testing Equipment: Each primary piece of equipment used to perform an IA Test on an IA Material for QA, during the Evaluation Period. This equipment is noted in the respective sections of this document. Each unique instance of these must be evaluated based on the frequency noted in Section 5.

4.8 AASHTO: The American Association of State Highway and Transportation Officials, a nonprofit organization that sets technical standards for highway systems and acts as a liaison between state and federal transportation departments.

4.9 AASHTO re:source[3]: A technical servicess program that provides audits and accreditation to material testing laboratories. This program distributes proficiency samples nationally provides resources for construction materials testing laboratoriesand evaluates the results. The WVDOH uses the evaluations from this program for both asphalt and aggregate IA Tests.

4.74.10 Proficiency Sample: A single (homogeneous) sample that is distributed by an agency or designated agent to be tested at multiple laboratories. The distributing agency will provide a "score", which statistically compares results amongst the laboratories.

4.84.11 Satisfactory Evaluation: If the results of a test fall within the guidelines established in Section 12–13 of this document, the test will be considered satisfactory.

4.94.12 Non-Satisfactory Evaluation: If the results of a test do not fall within the guidelines established in Section 13 of this document, the test will be considered non-satisfactory.

4.104.13 Corrective Action Report (CAR): An action report identifying the probable source of a Non-Satisfactory Evaluation. This report identifies the non-conformance, explains issues which lead to this non-conformance, and explains corrective actions to address this non-conformance.

5. SYSTEM APPROACH FOR IA SAMPLING AND TESTING

5.1 The WVDOH IA program shall operate under the system approach as described in Office of Pavement Technology Publication No. FHWA-HIF-12-001 and AASHTO R44-07.

5.2 Each QA tTest eEquipment and each QA Testertechnician shall be evaluated for each Evaluation Period. Redundant testing shall be avoided unless a failure or faulty testing is reported during the testing.

[3] https://aashtoresource.org/

Commented [MM1]: Do we need to define an IA Test and tie it in with Proficiency Sample (Section 4.7)? We mention IA Test in several sections.

Commented [DB2]: Done, thanks.

Commented [MM3]: We should define IA material, even if it's just referencing Section 2, or noting those are IA materials. We say QA Material in Section 5.3.1.

Commented [DB4]: I've updated 5.3.1 to reference IA material which is defined in 4.4. I did add the reference to the materials in 4.4.

Commented [MM5]: We should define IA material, even if it's just referencing Section 2, or noting those are IA materials. We say QA Material in Section 5.3.1.

Commented [DB6]: I've updated 5.3.1 to reference IA material which is defined in 4.4. I did add the reference to the materials in 4.4.

Commented [MM7]: Isn't this equipment also required to be used to test the IA Samples? Shouldn't we include that language in this definition also?

Commented [DB8]: Added. Thanks.

Commented [MM9]: Should we note that AASHTO re:source distributes Proficiency Samples that we use?

Commented [DB10]: Yes, done.

Commented [MM11]: annually?

Commented [DB12]: Yes, we use "evaluation period".

5.2.1 If a QA Tester is testing and the equipment fails, they shall complete the test on another piece of equipment. If this occurs, it shall be noted in a corrective action report.

5.3 The goal of the IA program is to meet a 90% evaluation threshold for each QA Testertechnician and QA tTest eEquipment. Each of these entities is considered separate and independent of each other.

5.3.1 QA Testerstechnicians shall be evaluated for each unique QA IA mMaterial they test during the evaluation period. If a person tests multiple QA IA mMaterials during the evaluation period, they will be required to be evaluated for each material independently.

5.3.2 The evaluation procedure for tests is described in Section 12 13 of this document.

5.4 If the 90% evaluation threshold is not met, a corrective action summary shall be included in the IA report.

6. POPULATION OF QUALITY ACCPTANCE TESTERS AND EQUIPMENT

6.1 Once per year, before any work is performed by District QA TTestersechnicians, a signed letter stating the names of each of their quality assuranceQA tTesters shall be submitted by the District Construction Engineer to the Director of MCS&T Division. In lieu of this letter, Districts may utilize an MCS&T provided online form.

6.2 If, during the calendar year, additional QA tTesters are added to the District's roster, the District Construction Engineer shall submit an amended list to the Director of MCS&T Division. This shall be done before any quality assurance work is performed by the testertechnician.

6.3 In the event where a project incorporates non-DOH QA acceptance tTesters and/or QA Testing Labs, the District Construction Engineer shall submit to the Director of MCS&T a signed letter stating the names of each of the QAquality assurance tTesters. As part of their duties, this person must participate in the IA program for each evaluation period.

7. PORTLAND CEMENT CONCRETE (PCC)

7.1 Each QA Testertechnician who tests PCC during the evaluation period shall perform an IA Test corresponding to the test they performed during that evaluation period.

7.2 The minimum required IA Sample test frequency goal for each QA Tester and QA Test Equipment is as follows:

PCC IA Samples Frequency	
Air – AASHTO T 152	1/Year
Compressive Strength Testing - AASHTO T 22	1 Set/Year
Slump – AASHTO T119	1/Year

7.3 For PCC, the Division will host at least one in-house proficiency sample style test of plastic concrete. This event shall be a group event where plastic concrete is

Commented [MM13]: Should we include language to define what "threshold" means, and say that this threshold means 90% satisfactory results?

Commented [DB14]: No, our goal is only to evaluate 90 percent of them. We don't have a threshold for satisfactory. We say that we need to evaluate 90 percent. We also says, if they are unsatisfactory, we perform a Car.

Commented [DB15]: Mike, in the case where we use QC for acceptance, we currently aren't capturing them for an IA sample. This is a programmatic change that we need to look at addressing. I honestly don't have any good ideas at this point. We have a lot of other issues to address first.

Commented [MM16]: Just to confirm, is this just breaking the cylinders? Is it correct that we don't need to watch them making cylinders?

Commented [DB17]: Yes, we do not watch them make the cylinders. Confirmed by Hao that he is OK with this.

provided, and each QA Testertechnician is present. The QA Testertechnician will test the material using the equipment they typically use to test concrete.

7.4 Plastic Concrete Testing:

7.4.1 For plastic concrete testing, each QA Testertechnician, their testing equipment, as well as their results shall be recorded.

7.4.2 During thisthe event described in Section 7.3, the IA sSampler as well as representatives from MCS&T Division will observe the QA Testerstechnicians to ensure proper testing procedures are followed.

7.4.3 If a QA Testertechnician is observed deviating significantly from testing procedures, the IA sSampler or an MCS&T Divisiontheir representative may note that test as a Non-Satisfactory Evaluationfail the technician, regardless of the QA Tester'stechnician's results. In this case, the test shall be considered Non-Satisfactorya failure, and require a CAR will be required. Also, their QA Tester's results shall be discarded from the population of results.

7.5 Cylinder Testing:

7.5.1 At thisthe event described in Section 7.3, a standard set of 4"x8" cylinders shall be created for each of the QA Testerstechnician who performs the AASHTO T22 test atin each District. If present, tThis set of cylinders shall be fabricated by a testertechnician from that District, if one is present. If a District has more than 1 QA Testertechnician or more than 1 set of testing equipment, additional sets of cylinders shall be fabricated for each instance.

7.5.17.5.2 In the instance of a non-DOH testing laboratory, a certified individual from the lab's primary District shall fabricate the cylinders as they would for their own District testing laboratory.

7.5.27.5.3 If a QA Tester for a particular District does not attend, a set of cylinders shall be fabricated for that DistiretDistrict by either the IA Sampler or another District.them. This set of cylinders will be tested by that District but will only be considered a "back-up" case if thethat District cannot attend another session.

7.5.37.5.4 The fabricator and testing equipment shall be noted for cylinder testing.

7.5.47.5.5 Upon testing of the cylinders, the Ttester, testing equipment and results shall be documented and sent to the IA sSampler.

7.6 For PCC the IAQA tTesting eEquipment is as follows:

1. Compressive Strength Testing Machine
2. Type B Pressure Meter
3. Slump Cone

Commented [MM18]: Who shall fabricate these cylinders for QA Testers at a non-DOH Lab?

Commented [DB19]: Added. A person from their District. If they have two Districts, one of the Districts can make them.

Commented [MM20]: Fabricated by who?

Commented [DB21]: Updated.

Commented [MM22]: Are we going to watch the QA Tester test these cylinders with their compression machine, similar to the reasoning in Section 7.4.3?

Commented [DB23]: No. We don't watch any of the laboratory tests. If we have a failing break, we could consider this as part of the CAR.

8. ASPHALT IGNITION OVEN – BURN OFF

8.1 Each QA Testertechnician who tests for Asphalt Content during the evaluation period shall perform a yearly burn off IA Test.

8.1.1 Since most Districts operate multiple ignitionburn-off ovens, MCS&T Division shall obtain and distribute a split sample for each of the District's ignitionburn-off

ovens. The QA Testertechnician, the QA tTesting eEquipment as well as the results shall be documented and sent to the IA Sampler.

8.1 The minimum required IA Sample test frequency goal for each QA Tester and QA Test Equipment is as follows:

Asphalt IA Samples	
Asphalt Content by Ignition - AASHTO T308	1/year

9. SUPERPAVE ASPHALT CONCRETE

9.1 Each QA Testertechnician who tests SuperPave Asphalt Concrete during the evaluation period shall perform an IA Test corresponding to theeach test they performed during that evaluation period.

9.19.2 The minimum required IA Sample test frequency goal for each QA Tester and QA Test Equipment is as follows:

SuperPave IA Samples	
Air Voids - AASHTO T 269	1/year
Asphalt Content by Ignition - AASHTO T308	1/year*
Bulk Specific Gravity, Vacuum - AASHTO T331	1/year
Bulk Specific Gravity, SSD - AASHTO T166	1/year
Maximum Specific Gravity - AASHTO T209	1/year
Percent Passing the #200 Sieve - AASHTO T30	1/year

*NOTE. This burn off evaluation is in addition to that described in Section 8.

9.29.3 Each QA Testertechnician shall participate in the AASHTO re:source proficiency program for SuperPave Asphalt Material. This shall apply to all of the above listed tests listed in Section 9.2.

9.39.4 If a District has multiple QA Testersemployees and/orare QA tTesting eEquipment, thatey District shall request additional IA sSamples to ensure that all QA Testerstesting technicians and QA Testing eEquipment are evaluated.

9.49.5 For SuperPave Asphalt Concrete the QAIA tTesting eEquipment is as follows:

1. Gyratory Compactor
2. Core Lok - Asphalt Density Measurement System
3. IgnitionBurn-Off Oven

10. MARSHALL ASPHALT CONCRETE

10.1 Each QA Testertechnician who tests Marshall Asphalt Concrete during the evaluation period shall perform an IA tTest corresponding to eachthe test they performed during that evaluation period.

10.2 The minimum required IA Sample test frequency goal for each QA Tester and QA Test Equipment is as follows:

Marshall IA Samples

Commented [MM24]: We never defined IA Testing Equipment. Isn't it the same as the QA Testing Equipment? Doesn't it have to be used to test the IA Samples? If so, let's stick with QA Testing Equipment to be consistent and eliminate confusion

Commented [DB25]: Updated, thanks

Commented [DB26]: Burn-Off is the same for both SuperPave and Marshall, so we're only listing it in this section.

Commented [CH(27]: Since WVDOH is using AASHTO Resources, do you want to break this section by the AASHTO sample set and identified the tests applicable to Marshall and Superpave?

Asphalt Mixture Ignition Oven (HMI) Samples
T30 D5444 Mechanical Analysis of Extracted Aggregate
T308 D6307 Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method

Asphalt Mixture Marshall Design (MAR) Samples
T166 D2726 Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens
T209 D2041 Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt (HMA)
T245 D6926 Preparation of Bituminous Specimens Using Marshall Apparatus
T245 D6927 Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus
T269 D3203 Percent Air Voids in Compacted Dense and Open Asphalt Mixtures
T331 D6752 Bulk Specific Gravity (Gmb) and Density of Compacted Hot Mix Asphalt (HMA) Using Automatic Vacuum Sealing Method

Asphalt Mixture Gyratory (HMG) Samples
T100 ---- Specific Gravity of Soils (mineral filler)
T166 D2726 Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens
T209 D2041 Theoretical Maximum Specific Gravity of and Density of Hot Mix Asphalt (HMA)
T312 D6925 Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
T331 D6752 Bulk Specific Gravity and Density of Compacted Hot Mix Asphalt (HMA) Using Automatic Vacuum Sealing Method

Commented [DB28]: Fow now, keeping these organized like this, but splitting out burn-off

Bulk Specific Gravity, SSD - AASHTO T166	1/year
Marshall Stability/Flow - AASHTO T245	1/year
Maximum Specific Gravity - AASHTO T209	1/year

10.3 Each QA tTester shall participate in the AASHTO re:source proficiency program for SuperPave Asphalt Material. This shall apply to all the ~~above-mentioned~~ tests listed in the Table in Section 10.2.

10.4 If a District has multiple QA Testers~~employees~~ and/or~~are~~ QA tTesting eEquipment, that~~ey~~ District shall request additional IA sSamples to ensure that all QA Testers~~testing technicians~~ and QA Testing eEquipment are evaluated.

10.5 For Marshall Asphalt Concrete the ~~IA~~QA tTesting eEquipment is as follows:

1. Marshall Hammer
2. Marshall Stabilometer.

11. AGGREGATE GRADATION

11.1 Each QA Tester~~technician~~ who tests Aggregate during the evaluation period shall perform an IA tTest corresponding to the test they performed during that evaluation period.

11.2 The minimum required IA Sample test frequency for each QA Tester and each piece of QA Testing Equipment is as follows:

Aggregate Gradation Samples	
AASHTO T27 and T11	1/year

AASHTO re:source

11.3 Each District QA Tester shall participate in the AASHTO re:source proficiency program for Aggregate.

11.4 If there are more QA Testers in a District than distributed samples, the District shall request additional AASHTO re:source aggregate samples.

MCS&T Distributed Samples:

11.5 Because the Districts have multiple shakers, in addition to the AASHTO re:source samples, MCS&T shall distribute a homogeneously split sample to each testing lab for each set of QA testing equipment. Any QA Tester in the District may test these samples.

~~11.1~~11.5.1 MCS&T shall also distribute a sample of this material to Non-DOH laboratories for each QA Tester and QA testing equipment.

11.5.2 ~~The yearly material~~The specific class and type of material shall be selected by the IA sSampler. The material shall consist of AASHTO specified gradation.

~~11.2 The minimum required IA Sample test frequency goal for each QA tTester and each piece of QA tTesting eEquipment is as follows:~~

~~Aggregate Gradation Samples~~

Commented [DB29]: Mike, based on your comments, I did a significant re-structuring of this section.

Each DOH technician will test one of the re:source samples (4 yearly)

We will distribute an additional sample to make sure we get all the shakers.

For Non-DOH - we will also distribut samples to cover all Testers and Equipment.

Commented [MM30]: What yearly material? Is this the material for the yearly IA Test?

Commented [DB31]: Updated. For example, Class 1 crushed, #57 gravel, etc.

~~AASHTO T27 and T11~~	~~1/year~~

~~11.3~~11.6 All specified sieves will be evaluated for the material passing. For the AASHTO re:source proficiency sample, all scored sieves will be evaluated.

~~11.4 Each QA tTechnician shall participate in the AASHTO re:source proficiency program for Aggregate Material. This shall apply to all the above listed tests listed in Section 11.2.~~

~~11.5 If a District has multiple QA Testersemployees are and/or QAtTesting eEquipment, that Districtey shall request additional IA sSamples to ensure that all QA Testerstesting technicians and QA Testing eEquipment are evaluated.~~

~~11.6 Since most Districts operate multiple aggregate shakers, MCS&T Division shall obtain and distribute a split sample for each of the District's gradation machines that were used during the evaluation period. The QA Testertechnician, the QA tTesting eEquipment as well as the results shall be documented and sent to the IA Sampler.~~

11.7 For Aggregate Gradations the ~~IA~~QA tTesting eEquipment is as follows:

1. Aggregate Shaker

12. COMPACTION

12.1 The WVDOH is currently evaluating the process of adding Asphalt and/or Aggregate/Soil Compaction to the IA program. The goal is to add this to the program for the 2025 evaluation period.

13. EVALUATION PROCEDURE

13.1 IA Samples will be evaluated statistically when the population of results is 5 or greater. If the IA sSample is not provided by AASHTO re:source in the form of a Proficiency Sample, ~~they~~ it will be evaluated by the WVDOH IA sSampler. The calculation method used by ASHTO re:source shall be followed. The calculation method is shown in Attachment 3.

13.2 If the samples are provided by AASHTO re:source a rating of 3, 4, 5, as assigned by the testing agency, shall be considered satisfactory.

13.3 In the event where the population is less than 5, samples will be evaluated by averaging the tests results and using the respective AASHTO Precision and Bias Table as the acceptable range of values between the IA sSampler and the QA tTestering technician(s). In this event, the evaluation method ~~for this case~~ will be specifically described in that year's IA report.

13.3.1 For example, if the average is 5.0 and the table provides a precision and biased of 1.2, the test values must fall between 3.8 and 6.2 to be considered satisfactory.

13.4 If the results of an evaluation are satisfactory, the evaluation will be considered successful. A successful evaluation will verify both the QA Testere~~chnician~~ and the ~~IA~~QA Ttesting eEquipment used during the IA~~material~~ ~~t~~Test.

Commented [MM32]: Do they request additional AASHTO re:source proficiency samples?

Commented [MM33]: Need to define "split sample"

Commented [MM34]: Should this be "aggregate shaker"?

Commented [CH(35)]: What about utilizing one of the two procedures for comparing the means; the difference two-sigma (d2s) limits and the paired t-test in the AASHTO R44?

Commented [DB36]: We like the re:source rating and consider it ideal. We can consider this in the 1 to x<5 scenario. I think the precision and biased is a good method though.

Commented [CH(37)]: Can you elaborate on the AASHTO Resource rating, or provide the rubric as an atatchement

Commented [DB38]: This is now attached

Commented [CH(39)]: Can you add this as an attachment?

Commented [DB40]: Done

13.5 If the results of an evaluation are deemed non-satisfactory, the IA ~~material t~~Test will be reviewed by the ~~respective~~ by the IA Sampler and/or the respective District Materials Supervisor. Within 30 days of notification of the non-satisfactory evaluation, the District Construction Engineer shall submit a ~~c~~Corrective ~~a~~Action ~~r~~Report to the Director of Materials Control Soils and Testing Division. This Corrective Action Report will be included in the yearly IA ~~r~~Report. A sample of this Corrective Action Report is provided in Attachment 1. The live version of the file is in the WVDOH MCS&T Toolbox[4].

13.5.1 If possible, an additional IA ~~s~~Sample will be tested~~run~~ by the QA Tester~~technician~~ in that calendar year, using the same QA Testing ~~e~~Equipment. This IA ~~t~~Test will be closely observed by the IA ~~s~~Sampler or their designee to help establish the root cause.

13.5.2 If this cannot be accomplished during the calendar year, the process will be followed for the subsequent calendar year's IA ~~s~~Sample.

13.6 The evaluation criteria ~~acceptance criteria~~ in this section s~~s~~hall be evaluated every three years. The most recent evaluation of this criterion was on :

_____ by _____ (Director of MCS&T)**.

** Note: This document shall be effective as per the signature date at the end of this document. However, the live version of this document will be updated as indicated above. This review date will not affect the signature nor effective date of the procedure, but rather provide documentation of WVDOH's compliance with Federal guidelines.

14. RECIPROCITY OF IA TESTING AND TECHNICIAN CERTIFICATION.

14.1 If ~~Given that~~ the practical exam portion of the technician certification program (as described in MP 106.03.50) is equivalent to that of an IA ~~s~~Sample, reciprocity between these tests can be applied in agreed upon by both the Technician Certification Coordinator and the IA Sampler. ~~by the respective program administrator~~.

14.2 At the discretion of the Technician Certification and Training Coordinator, a successful IA sample may be considered the "Practical" portion of a technician's recertification for the respective material.

14.3 At the discretion of the IA sampler, the practical portion of either a certification or recertification may be considered a successful IA sample.

15. REPORTING

15.1 The evaluation period shall be the calendar year, starting with January 1st and ending December 31st.

15.2 The annual I~~.~~A~~.~~ report shall be submitted to FHWA. The due date for the report is April 1st of the year following~~proceeding~~ the evaluation year~~period~~. The annual report shall~~ould~~ include the following information: the number of certified technicians, the number of active technicians, the number of technicians covered

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

Commented [MM41]: What about non-DOH QA Testers? There may be some who attend the first 2025 session who are not yet working in any District.

Commented [DB42]: I added the IA sampler in here.

Commented [CH(43]: How will the Corrective Actions be followed? Next IA report?

Commented [DB44]: Added 13.5.1 and 13.5.2

Commented [MM45]: Does this mean the IA Sampler would go to the District or non-DOH Lab to witness this test?

Commented [DB46]: Yes, or remotely.

Commented [MM47]: What acceptance criteria?

Commented [DB48]: The code says we need to evaluate our acceptance criteria every 3 years. This gives us a way to evaluate it without running the MP through committee.

Commented [DB49]: Mike, Hao had a comment about this, we resolved it.

Commented [MM50]: Who is this? Is it the Technician Certification and Training Coordinator or the IA Sampler?

Commented [DB51]: They should both agree on this. Thanks.

Commented [DB52]: I discussed this with Hao. This may be more trouble than its worth, but I think its worth it for Concrete.

by the IA program, the number of IA Samples~~reports~~ that were Non-Satisfactory~~had deviations~~, and a summary of the Corrective Action Reports~~how the deviations were addressed~~ along with the potential systematic solutions to reoccurring deficiencies (FHWA-HIF-12-001).

_____
Michael A Mance, PE
Director
Materials Control, Soils & Testing Division

MP 700.00.53 Steward – Materials Control Section
MAM:B
ATTACHMENTS

Attachment 1: Sample Corrective Action Report

WVDOH Independent Assurance Corrective Action Report		
	Form 2024-IA-CAR	
Date of Occurrence:		
Date Submitted:		
Name of Tester:		
Testing Equipment:		
Material Tested:		
Describe the issue reported:		
What was the root cause of the issue?		
What actions have been done to correct this issue?		
Signature of QA Tester		
Signature of District Materials Supervisor		
Signature of District Construction Engineer	Review: MCST	

Attachment 2: Office of Pavement Technology Publication No. FHWA-HIF-12-001[5], October 2011.

[5] https://www.fhwa.dot.gov/pavement/materials/hif12001.pdf

TechBrief

The Construction and Materials Quality Assurance Program is an integrated, national effort to improve the effectiveness of the State acceptance of materials both in the inspection, sampling and testing. The program is designed to provide tools and guidance in implementing Quality Assurance programs. The program is designed to provide tools and guidance in implementing Quality Assurance programs.

U.S. Department of Transportation
Federal Highway Administration

Office of Pavement Technology

Publication No.
FHWA-HIF-12-001

October 2011

INDEPENDENT ASSURANCE PROGRAMS

This Technical Brief provides information regarding independent assurance as it relates to activities for the evaluation of the sampling and testing procedures used in a materials and quality acceptance program.

Introduction

23 CFR 637 defines an Independent Assurance Program as: Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program.

An Independent Assurance Program ensures the sampling and testing is performed correctly and the testing equipment used in the program is operating correctly and remains calibrated. It involves a separate and distinct schedule of sampling, testing and observation.

Qualified sampling and testing personnel, other than those performing the verification and quality control (QC) sampling and testing, should perform the Independent Assurance (IA) tests. Likewise, equipment other than that used for verification and QC should be used for IA sampling and testing. By regulation IA sampling and testing is conducted by agency personnel or an accredited laboratory designated by the agency.

The regulation requires IA specifically be designed to include testing performed on project produced materials. Since the testing of project produced materials are tested in multiple locations and by multiple personnel it is necessary to have some assurance the testing is being performed accurately. Manufactured products are typically tested in the State's central laboratory or by a designated consultant laboratory. Testing in the central laboratory is considered to be covered by the laboratories accreditation and participation in proficiency testing.

Background

In the early sixties Congressional investigation uncovered improper testing and fraud in some of the federally funded highway projects. To address the issue of improper testing a separate sampling and testing program was developed. The program was operated by personnel different than project personnel on different equipment. The samples were split with project personnel and the test results were compared. In addition, testing procedures were also observed. This was done to ensure sampling procedures were performed correctly and equipment stayed in calibration. In later rewrites of the regulation this program became the Independent Assurance program.

Scope

The regulation, 23 CFR 637, only covers projects that are on the National Highway System (NHS). The regulation requires testing personnel that perform any verification testing or QC testing used in the acceptance decision be covered by an IA program regardless of the agency, including a local agency or a toll authority administering a project.

Some States have IA testing personnel perform other duties such as: (1) instructing other testers, (2) obtaining samples for the verification of manufactured products,(3) obtaining samples of aggregate, cement, binder samples at production facilities for purposes other than IA, (4) inspecting precast or other facilities. Even though these functions are a necessary part of an overall Quality Assurance (QA) program they will not be discussed in this Tech Brief since the purpose of this Tech Brief is to discuss the IA functions as defined in the regulation.

Regulation 23 CFR 637

The text of the entire regulation can be found at this website:
http://www.access.gpo.gov/nara/cfr/waisidx_03/23cfr637_03.html

The following is a summary of the elements of the IA program:

1. Establish IA sampling and testing frequencies;
2. Evaluate testing equipment by using one or more of the following: calibration checks, split samples, or proficiency samples.
3. Evaluate testing personnel by observations and results from testing split samples or proficiency samples.
4. Prompt comparison and documentation of test results obtained by the tester being evaluated and the IA tester.
5. Develop guidelines including tolerance limits for the comparison of test results.

6. Provide an annual report to the FHWA when the system approach is used.

The rest of the Tech Brief will discuss best practices for each of the above requirements.

System versus Project Approach

The Independent Assurance Program can be set up on a project basis, which is the traditional approach, or on a system basis. The difference in the two approaches is the basis of the frequency of testing (cover all projects versus cover all personnel).

Some States have moved away from having testing personnel on all projects and are moving toward centralizing testing away from the project level. As this occurs testers may perform testing on several projects and it becomes more efficient to have a frequency based on the testers instead of projects quantities. In addition, the project approach does not always include all the testing personnel.

As States have moved toward the system approach they have also incorporated the IA program results as part of the technician qualification program.

Frequency of Independent Assurance Testing

Project Approach - The State establishes the frequency for the IA testing based on the testing frequency performed on the project or on a time frequency on a project. Typically, the States use a frequency of 10 percent of the verification/acceptance testing. For example if the verification testing is performed at the rate of 1 per 500 tons the IA frequency would be 1 per 5000 tons.

System Approach - An alternative method to basing frequency on project testing frequencies is to base the IA frequency on a time basis for all testers and equipment. In this case, the personnel and equipment would be verified on a "system" basis. The purpose is to cover all the testers and equipment over a period of a year. While States strive to reach all testers, it is not always possible. States typically set a goal of reaching 90% of the active testers. Active testers are defined as those testers that are performing testing in a given year, in most States this is a subset that is smaller than all “qualified” testers since some qualified personnel may have retired, move to other jobs or resigned. The system approach can be a more effective means of performing IA since it ensures that most testers are reviewed and that the same testers are not continually reviewed.

One challenge is to determine the active testers. For States that have an electronic materials management system it is very easy to determine the active testers since these systems indicate who is performing a given test. The IA testers will run reports periodically (monthly) to

determine the testers that need to be reviewed. For those States that do not have an electronic materials management system it becomes more challenging to determine the active testers. A good practice under these circumstances is to require the project personnel to identify the personnel that are going to perform testing, state, consultant, and contractor, at the beginning of the project along with any changes to the IA personnel. The IA testers will then know the active testers along with the testers that they have already been reviewed and will thus know the testers that need to be reviewed in the future.

Mixed Approach - It is permissible to separate the verification of equipment and personnel, i.e., one method to check equipment is to require a calibration and inspection frequency. Personnel can be checked by sending out proficiency samples. It is permissible to use a mixed approach, i.e. where some test procedures and or some testers are covered by a project approach where the remaining procedures are covered by a system approach.

Equipment and Personnel

Testing equipment may be evaluated by using one or more of the following: calibration checks, split samples, or proficiency samples.

Testing personnel may be evaluated by observations and split samples or proficiency samples.

The typical approach for performing IA is to check equipment and personnel at the same time. This is performed by IA personnel visiting a job site to observe the sampling and testing on site and to also test a split of the sample on site with equipment the IA personnel brought or to take the split to another laboratory for testing. When the test results are compared it checks both the equipment and tester. If a set of samples do not compare further analysis is required to determine if the source of the error is in procedure or equipment.

Some States send out proficiency samples to district, other subsidiary laboratories as well as consultants and contractors. Some of these States develop their own samples, while others require the laboratories to subscribe to the AASHTO Materials Reference proficiency samples. Proficiency samples are a way to address equipment and test procedures. Some States are preparing enough proficiency samples for all the active testers. In cases where all the testers are covered by the proficiency samples additional IA work would only need to review those that did not compare. If the proficiency program did not cover all the testers additional IA work would also be required.

Another method that covers just the equipment is performed by frequent standardization and or calibration. The frequency for standardization and/or calibration differs by equipment due to the unique nature of each testing device. AASHTO R-18 and some of the test procedures contain a frequency for standardization/calibration of the testing equipment. However, if standardization/calibration is the only check on the equipment (no split samples or proficiency samples) the standardization/calibration should probably be run frequently.

As some States move toward the system approach the States are checking testers in a central location. This allows the IA inspectors to cover numerous testers at one time. This has worked especially effectively in States where the projects and or laboratories are spread across a large geographic area. The States that use this approach are also including this data for requalification of testing personnel. When this approach is used the equipment needs to also be covered by standardization/calibration, split sample or proficiency sample testing.

Some States will suspend and/or revoke a technician's qualification/certification for repeated poor performance on IA evaluations. These are in addition to suspensions and/or revocation due to fraudulent activities. Some States will also perform testing on 3 way split-samples. In this approach one split is tested by project personnel, one split is tested by the contractor personnel and the third split is tested by the IA personnel. This is typically performed at the beginning of production to ensure that all testing personnel and equipment are performing correctly.

Prompt Comparison and Documentation

It is essential the IA Program compare results and detect deficiencies in State or contractor testing procedures in a timely manner. This improves the reliability of sampling and testing. The timely comparison of data may be restricted by the resources of an agency including personnel, facilities, and geographical constraints. These resource needs must be considered in an agency program.

Deviations from the established tolerances will require an engineering audit of the respective sampling and testing procedures, and the equipment used. When comparison of QC and verification data reveals significant differences in test values, the variables involved should be evaluated by the IA personnel to determine whether further testing and investigation is needed to establish the source of the discrepancy.

Corrective actions should be incorporated as appropriate under the direction of IA personnel.

Tolerances for Comparison of Test Results

A common place to start in establishing comparison tolerances are the D2S limits in the published test procedures. However, as States reduce the options in published test procedures and as testers become more proficient, the tolerances should be reduced. When split samples are used, the materials and sampling variability are eliminated from the analysis and only the variability due to the testing procedures and the equipment are included.

The comparison of split sample test results should be based on established deviation values or tolerances that are representative of the testing procedures and materials used. AASHTO and ASTM have published precision statements for some test methods. However, many of these procedures have multiple methods and or options inside the procedure. In order to reduce

testing variability most States have specified the particular options within the test procedures. Therefore the agency should develop Independent Assurance tolerances based on their specific options that the State is requiring. Care must be taken when historical data are used in establishing theses limits to ascertain that the data are not biased; i.e., they were obtained in a random manner and that all test results have been reported. Otherwise, the variability may be underestimated and the limits too restrictive.

Many States distribute proficiency samples to their district laboratories. This data can be analyzed to determine IA tolerances. The formula for D2S is $D2S = 2\sqrt{2}(1S)$ where

$1S = the\ standard\ deviation\ of\ the\ results$.

Established tolerances should be periodically evaluated and modified to ensure that the goals of IA are being met; that is, it assures the reliability of contractor and agency test results. Some States are evaluating their tolerance every year. As a minimum the tolerances should be evaluated every 5 years.

In situations where multiple split tests are performed on a project a paired t-test can also be used to analyze data.

Annual Reports

The regulation requires those States that use a system approach to prepare and submit an annual report to the FHWA Division Office.

The annual report should include the following information: the number of certified technicians, the number of active technicians, the number of technicians covered by the IA program, the number of IA reports that had deviations, and a summary of how the deviations were addressed along with the potential systematic solutions to reoccurring deficiencies.

Alternate Approach

One State is statistically analyzing State and Contractor data in an innovative manner to accomplish both verification and IA.

An example of this approach is shown in Figure 1. In this approach the contractor performs sampling and testing at the rate of 4 samples per lot. The State takes verification samples, at the beginning of production; a minimum of 4 samples are taken the first week of production and at least 1 per lot. The State's verification samples are taken at the plant by contractor personnel under the direction of the State personnel. The verification samples are split and one split is given to the contractor. Analysis is performed in two ways. First, for IA, the split results are compared using IA comparison tolerances. In the figure below; IA1 is compared to the contractor split of that sample, sample 4 of lot 1. For validation, the State verification

samples are made independent by removing the corresponding contractor splits. In the figure below samples 1, 2, 3 from lot 1; samples 1, 2, 4 from lot 2; samples 1, 2, 3 from lot 3; and samples 1, 3, 4 from lot 4 are compared to the State's IA1, IA2, IA3, and IA4 with the F& t tests.

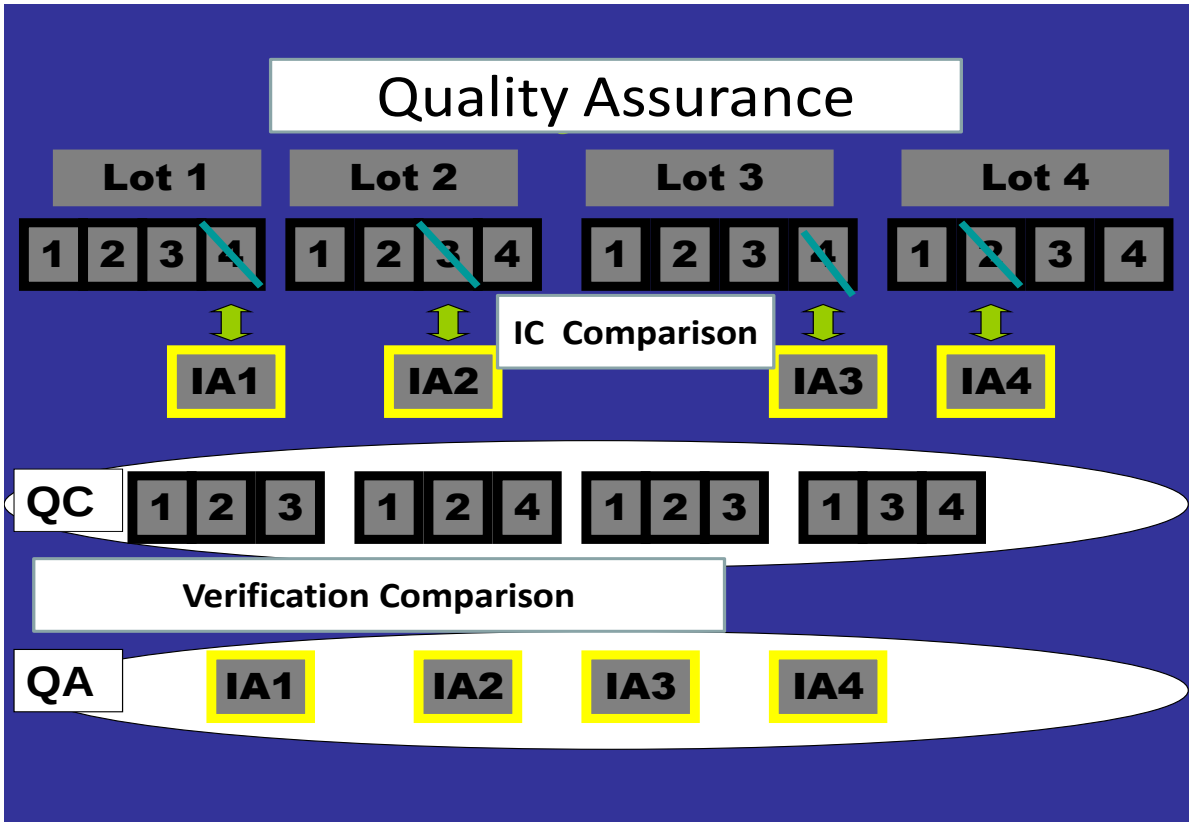

Figure 1. Example of Alternate Approach.

Conclusion - Commonly Noted Areas of Concern

- Test results from the IA program should only be compared to split test results or results from others testing the same set of proficiency samples.
- IA results are not to be used in the acceptance decision.
- IA should be based on split samples or proficiency samples not independent samples so that data can be compared without material variability.
- All tests that are performed in the field to determine the final acceptability of the materials should be covered by the IA program.

- All technicians that are performing testing that is used in the acceptance decision need to be covered by the IA program.
- Observation of sampling and testing procedures should be included as part of an IA system to evaluate sampling and testing personnel and ensure that testing and sampling procedures are performed correctly.

Further Information:

- "23 CFR Part 637," Subpart B - Quality Assurance Procedures for Construction, Federal Highway Administration, *Federal Register*, Washington, DC published on June 29, 1995, and amended on December 10, 2002, and September 24, 2007, http://www.access.gpo.gov/nara/cfr/waisidx_03/23cfr637_03.html
- Non-regulatory supplement for 23 CFR Part 637, Subpart B - Quality Assurance Procedures for Construction, Federal Highway Administration. The non-regulatory supplement was updated on July 19, 2006. http://www.fhwa.dot.gov/legsregs/directives/fapg/0637bsup.htm
- Frequently asked questions (FAQ) on the Quality Assurance Regulation. The FAQs were updated on November 26, 2006. http://www.fhwa.dot.gov/pavement/materials/matnote11.cfm - qaa
- AASHTO Standard Practice R 44, “Independent Assurance Programs” has been published in the 2007 AASHTO Standards. This guide will assist the States in developing Independent Assurance Programs
- NHI Course 134042, “Materials Control and Acceptance –Quality Assurance.” The course is four days long and covers the basic essentials of QA. A two-day version of the course is also available. http://www.nhi.fhwa.dot.gov/training/brows_catalog.aspx
- NHI Course 134064 – “Transportation Construction Quality Assurance”

For information related to the Materials Quality Assurance Program, please contact the following:

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Dennis Dvorak - dennis.dvorak@dot.gov (Pavement & Materials Technical Service Team)

This **TechBrief** was developed as part of the Federal Highway Administration's (FHWA's) Materials Quality Assurance Program.

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AASHTO re:source (formerly AMRL) In Focus

Proficiency Sample Ratings: Being Average Has Never Been So Good

By Brian Johnson, AASHTO Accreditation Program Manager
Posted: October 2010

So you opened up your email notification to see that the latest AASHTO re:source proficiency sample ratings were just posted, you log into the website to view your ratings (Figure 1), and you see ratings of **, -5, -3, 5,4. You think to yourself, "I know that 4 and 5 are good, but what about the negative numbers? Those are below 3, so they must be bad... and what are the stars for? I doubt they're like the stars that my elementary school teacher used to give me... and what is this repeatability rating?"

Sieve Analysis
Total Material Passing the 2.36-mm (No. 8) Sieve (percent) - T27/C136
View Youden Diagram | View Performance Chart

	Sample 167						Sample 168					Repeatability (within-lab)		
	Total Labs	Lab Data	Avg	1S	Z-Score	Lab Rating	Lab Data	Avg	1S	Z-Score	Lab Rating	1S	Z-Score	Lab Rating
4	1448	**86.0**	85.40	0.38	**1.56**	**3**	**84.1**	83.58	0.39	**1.34**	**4**	0.24	**-0.22**	**-5**

= the line of data on the report
= the total labs that submitted data just for that line of data
= the results of sample 167 showing the lab's data, the average of all labs' data, 1 standard deviation, the z-score, and the rating
= the results of sample 168 showing the same information as shown for sample 167
= the repeatability, which shows you how close your z-scores were to each other

Figure 1: A Typical Line of Proficiency Sample Data (Color-Coded)

Calculating Averages and Standard Deviations
The first thing that you should understand is that laboratory ratings are based on the average of the results, although the reported averages are determined only after removing invalid and outlier results. It is important to eliminate them from the rating determination equations so that the ratings are not affected based on what some might consider to be "bad data." We determine a standard deviation for each data set (displayed as "1S" in Figure 1 above) and then begin the process of calculating ratings.

Calculating Z-Scores and Ratings
Each laboratory is rated with two values: a z-score and a lab rating. In statistics, the z-score, also known as the standard score, indicates how many standard deviations a result is from the average. The z-score is determined by the following calculation:

$$\text{Z-Score} = \frac{\text{(Laboratory Test Result - Average Value)}}{\text{(Standard Deviation)}}$$

The laboratory rating calculation is based on the absolute value of the z-score:

If Z-Score <= 1 Then Rating = 5

If Z-Score > 1 And <= 1.5 Then Rating = 4

If Z-Score > 1.5 And <= 2 Then Rating = 3

If Z-Score > 2 And <= 2.5 Then Rating = 2

If Z-Score > 2.5 And <= 3 Then Rating = 1

If Z-Score > 3 Then Rating = 0

Which Way Is Up?
If you're confused by all of this, check out Figure 2 below for a graphical representation of z-scores and ratings. Here are a few quick points to remember:

- Low z-scores are good.
- High ratings are good.
- A negative sign on a z-score or laboratory rating merely indicates that the laboratory's result was below the average, while a positive z-score or rating indicates that the laboratory's result was above the average.

Simply put, the closer your result is to the average, the better your rating. In the competitive world we live in, being average conjures up words like commonplace, mediocre, or ordinary; but in the world of proficiency testing, being average is the definition of excellence!

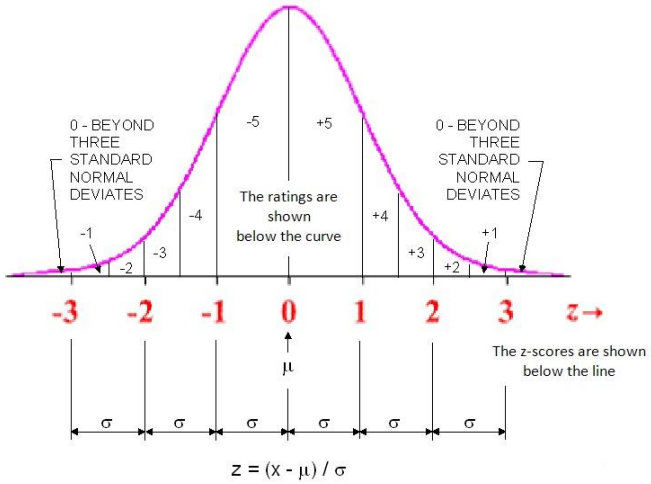


Figure 2: The Normal Distribution of AASHTO re:source Proficiency Sample Data

Low Ratings
Any rating less than a 3(z-score > 2) is considered a low rating according to the AASHTO Accreditation Program, but don't let that bother you unless you consistently receive low ratings. (See Figure 3 and the section below on Performance Charts.) Yes, low ratings are worth investigating, and you might even uncover an equipment problem or procedural mistake. Sometimes, however, your investigation of low ratings will lead you nowhere, and that's okay. The laws of statistics govern that some laboratories have to get low ratings - every lab will be on the low side of the ratings every once in a while. When an AASHTO-accredited laboratory receives low ratings for a given test, they are required to perform a root cause analysis and implement corrective action. If the laboratory receives low ratings again for that test, it might be a sign that either the corrective action was not effective or that the laboratory did not actually apply any corrective action. Now that you understand the concept of ratings, let's discuss a couple of other items that cause confusion.

The ** Rating
The ** rating indicates that the test results have been suppressed. Ratings may be suppressed for several reasons, but usually this is an indication of one of three things: 1) The data collected was for informational purposes only and is not a measure of the laboratory's competency, 2) data received is unusual and does not fit a normal distribution, or 3) there were not enough data points to provide an accurate analysis.

Repeatability (Within-Lab)
Ratings Repeatability is an estimate of the variation in results that you might expect if you repeated the same test over and over in your laboratory. The within-lab rating is based on the difference between the two individual lab results, but also any actual differences between the two sample materials.

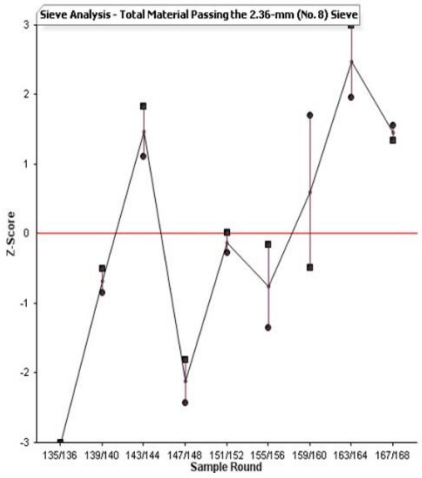


Figure 3: A Sample Performance Chart

Performance Charts
Performance charts provide an easy way to gauge your laboratory's proficiency testing performance over time (see Figure 3). As stated above, too much emphasis should not be placed on an occasional low rating. However, patterns in performance charts should be analyzed carefully, as they are usually good indicators of testing problems. The ideal scenario is to have all points over the center line - results right on the average time after time. Generally speaking, however, points scattered within the bands of +2 and -2 are indicative of good testing performance. Points drifting away from the centerline and points consistently on one side of the centerline are indicative of performance problems.

Now What?
I'm glad you asked. You've just learned all that you need to know about the proficiency sample program and how the results are reported. Now you have to take that knowledge and use it to get the most out of the program. You'll be reviewing your results, repeatability ratings, performance charts, and taking meaningful corrective actions so that you can score 5's and -5's - and you'll be more excited than ever to be average!

Corrective Action Report

WVDOH Independent Assurance Corrective Action Report		
Form 2024-IA-CAR		
Date of Occurrence:		
Date Submitted:		
Name of Tester:		
Testing Equipment:		
Material Tested:		
Describe the issue reported:		
What was the root cause of the issue?		
What actions have been done to correct this issue?		
Signature of Testing Technician		
Signature of District Materials Supervisor		
Signature of District Construction Engineer	Review: MCST	

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

MATERIALS PROCEDURE

WVDOH BUY AMERICA ACCEPTANCE GUIDELINES

1. PURPOSE

1.1 To set forth instructions for compliance with both State and Federal Buy America Requirements (henceforth referred to as "Buy America Requirements"), as listed in this document.

2. REFERENCED DOCUMENTS

2.1 PUBLIC LAW 117–58—NOV. 15, 2021, Infrastructure Investment and Jobs Act.

2.2 Build America, Buy America Act (BABA).

2.3 23 U.S.C. 313 and 23 CFR 635.410 "Buy America Requirements".

2.4 2 CFR part 184 Buy America Preferences for Infrastructure Projects.

2.5 M-22-11 Initial Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure.

2.6 M-24-02 Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure.

2.7 Chapter 5, Article 19 and Chapter 5A, Article 3, Section 56 of the West Virginia Code, entitled "West Virginia American Steel Act of 2001."

2.8 West Virginia Notary Handbook, Current Edition.

2.9 MP 106.10.51 – WVDOH Buy America Waiver Guidelines.

3. ACCEPTANCE OF MATERIALS

3.1 This procedure applies to the following:

1. Steel and Iron
2. Manufactured Products
3. Construction Materials
4. Section 70917(c) Materials

3.2 An article, material, or supply shall only be classified into a single category listed in Section 3.1. In some cases, an article, material, or supply may not fall under any of these categories. Classification of the category must be made based on the status of article, materials, or supply at the time it is brought to the work site for incorporation into the project. The work site is generally the location of the project at which the materials will be incorporated. An article, material, or supply permanently incorporated into a project must meet the Buy America Preference for only the single category in which it is classified.

3.3 A Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to a project. As such, it does not apply to

tools, equipment, and supplies, such as temporary scaffolding brought to the construction site and removed at or before the completion of the project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished project but are not an integral part of the structure or permanently affixed to the project.[1]

3.3.1 Buy America preference does not apply to materials such as temporary paint or temporary traffic control devices.

4. STEEL AND IRON

4.1 Pursuant to Buy America Requirements, all manufacturing processes for steel and iron materials must take place in the United States.

4.2 Definition

4.2.1 "Iron or steel products" means articles, materials, or supplies that consist wholly or predominantly of iron or steel or a combination of both.

4.2.1.1 "Predominantly of iron or steel or a combination of both" means that the cost of the iron and steel content exceeds 50 percent of the total cost of all its components. The cost of iron and steel is the cost of the iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product and a good faith estimate of the cost of iron or steel components.

4.3 Standard

4.3.1 This includes all processes from the initial melting stage through application of coatings occurs in the United States.

5. MANUFACTURED PRODUCTS

5.1 Pursuant to Buy America Requirements, all Manufactured Materials are required to be produced in the United States. All manufacturing processes shall occur in the United States.

~~5.1 The Federal Highway Administration (FHWA) has a longstanding waiver in effect exempting Manufactured Products from Buy America Requirements.~~

5.2 Definition

5.2.1 Manufactured products means:

1. Articles, materials, or supplies that have been:
   A. Processed into a specific form and shape;
   B. or Combined with other articles, materials,
   C. or supplies to create a product with different properties than the individual articles, materials, or supplies.

2. If an item is classified as an iron or steel product, or a construction material, then it is not a manufactured product. However, an article, material, or supply classified as a manufactured product under 2 CFR 184.4(e) and paragraph (1) of

[1] M-24-02: Memorandum for the Heads of Executive Departments and Agencies, Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure, Page 4

this definition may include components that are construction materials, iron or steel products, or Section 70917(c) materials.

5.3 Standard

5.3.1 Pursuant to Buy America Requirements, all manufactured products used in the project are produced in the United States; this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard that meets or exceeds this standard has been established under applicable law or regulation for determining the minimum amount of domestic content of the manufactured product.[2]

5.3.1.1 In determining whether the cost of components for manufactured products is greater than 55 percent of the total cost of all components, use the following instructions:

1. For components purchased by the manufacturer, the acquisition cost, including transportation costs to the place of incorporation into the manufactured product (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued).
2. For components manufactured by the manufacturer, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1), plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the manufactured product.

6. CONSTRUCTION MATERIALS.

6.1 Pursuant to Buy America Requirements, all Construction Materials are required to be produced in the United States. All manufacturing processes for the Construction Materials shall occur in the United States.

6.2 Definition

6.2.1 Construction materials means articles, materials, or supplies that consist of only one of the items listed in Section 6.2.1.1, except as provided in Section 6.2.1.2. To the extent one of the items listed in Section 6.2.1.1 contains as inputs other items listed in this section, it is nonetheless a construction material.

6.2.1.1 The listed items are:

1. Non-ferrous metals;
2. Plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
3. Glass (including optic glass);
4. Fiber optic cable (including drop cable);
5. Optical fiber;
6. Lumber;
7. Engineered wood; and

[2] M-24-02: Memorandum for the Heads of Executive Departments and Agencies, Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure, Page 15-16.

8. Drywall.

6.2.1.2 Minor additions of articles, materials, supplies, or binding agents to a construction material do not change the categorization of the construction material.

6.3 Standard

6.3.1 The Buy America Preference applies to the following construction materials incorporated into projects. Each construction material is followed by a standard for the material to be considered "produced in the United States."

1. Non-ferrous metals. All manufacturing processes, from initial smelting or melting through final shaping, coating, and assembly, occurred in the United States.
2. Plastic and polymer-based products. All manufacturing processes, from initial combination of constituent plastic or polymer-based inputs, or, where applicable, constituent composite materials, until the item is in its final form, occurred in the United States.
3. Glass. All manufacturing processes, from initial batching and melting of raw materials through annealing, cooling, and cutting, occurred in the United States.
4. Fiber optic cable (including drop cable). All manufacturing processes, from the initial ribboning (if applicable), through buffering, fiber stranding and jacketing, occurred in the United States. All manufacturing processes also include the standards for glass and optical fiber, but not for non-ferrous metals, plastic and polymer-based products, or any others.
5. Optical fiber. All manufacturing processes, from the initial preform fabrication stage through the completion of the draw, occurred in the United States.
6. Lumber. All manufacturing processes, from initial debarking through treatment and planing, occurred in the United States.
7. Drywall. All manufacturing processes, from initial blending of mined or synthetic gypsum plaster and additives through cutting and drying of sandwiched panels, occurred in the United States.
8. Engineered wood. All manufacturing processes from the initial combination of constituent materials until the wood product is in its final form, occurred in the United States.

6.3.2 Except as specifically provided, only a single standard under this section should be applied to a single construction material.

7. SECTION 70917(C) MATERIALS

7.1 The standards developed under BABA 70915(b) (1) shall not include cement and cementitious materials, aggregates such as stone, sand, or gravel, or aggregate binding agents or additives as inputs of the construction material. These are referred to as 70917(C) materials.

7.2 Definition

7.2.1 Section 70917(c) materials means cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives. See section 70917(c) of the Build America, Buy America Act.

7.3 These materials are exempt from Buy American Requirements.

8. BUY AMERICA COMPLIANCE.

8.1 On a given project, the Division shall not accept, approve, authorize, or make any payments to any Contractor not fully compliant with Buy America.

8.1.1 When Buy America Requirements apply, the Contractor shall furnish a notarized Certificate of Compliance signed by their official with knowledge and authority to certify that all applicable materials and products to be incorporated into the project, including those of any subcontractors and suppliers, are compliant with Buy America Requirements. This shall be done prior to the permanent incorporation of the materials into the project.

8.1.2 The notarized Certificate of Compliance shall contain the following information:

8.1.2.1 Title: Buy America Certification of Compliance.

8.1.2.2 The Name, Address and Contact Information for the Contractor.

8.1.2.3 A contractor statement that demonstrates compliance with Buy America Requirements.

8.1.2.4 The Contract ID for the Material (if applicable).

8.1.2.5 Both the Federal and State Project Number for the Material (if applicable).

8.1.2.6 The name of the material referenced in the Certificate of Compliance. This material name shall be a clear, common name for the material as stated in the proposal. Part Numbers, etc., may also be on the document if the contractor wishes.

8.1.2.7 The Line Item for the Material (if applicable).

8.1.2.8 The Bid and/or Placed Quantity of the Material.

8.1.2.9 Signature of the Contractor and date.

8.1.2.10 A list of materials on the project that “Buy America” applies but are not Buy America compliant.

8.1.2.11 The document must be notarized as per the “West Virginia Notary Handbook.”

8.2 Attachment 1 shows a sample Certificate of Compliance.

8.2.1 Multiple items may be listed on the Certificate of Compliance, though all the information for each line must be on the document.

8.2.2 A list of these materials may be referenced on an attached page as long as that page is also signed and notarized.

9. BUY AMERICA WAIVERS

9.1 Buy America Waivers are outlined in MP 106.10.51 as per "§ 184.7 Federal awarding agency's issuance of a Buy America Preference waiver" and "23 CFR 635.410(c)".

10. BUY AMERICA MATERIALS

10.1 Attachment 2 includes a list of materials and products used in WVDOH construction projects and the applicability of Buy America Requirements. This attachment also shows each category of each based on Section 3.1 of this document. Finally, if the material is not applicable to Buy America Requirements, justification is given. Example exemptions are as follows:

1. Historic Waiver: Manufactured Product is waived by FHWA as per Section 5 of this Document.
2. Temporary Material: Material is not permanently incorporated into the project.

10.1.1 This materials and products list may be updated by the Director of MCS&T as needed to ensure compliance with Buy America Requirements. Any update to this form will be in accordance with guidance from and through an affirmation process with FHWA.

10.1.2 Glass added to a permanent paint product requires a Certificate of Compliance.

10.1.3 Attachment 3 includes OMB Memorandum M-24-02[3], dated October 25, 2023, for additional guidance and as the source material for WVDOH's compliance.

[3] https://www.whitehouse.gov/wp-content/uploads/2023/10/M-24-02-Buy-America-Implementation-Guidance-Update.pdf

11. DOCUMENTATION OF BUY AMERICA CERTIFICATION OF COMPLIANCE

11.1 The Certificate of Compliance shall be placed in the QC Plan Folder in ProjectWise (or the current WVDOH approved document retention software) under the contract.

Michael Mance, P.E.
Director
Materials Control, Soils and Testing Division

MP 106.10.50 Steward – Materials Control Section
ATTACHMENTS

Buy America Certification of Compliance

Acme Construction Company
123 Main Street
Charleston, WV 25302

Ship Date: 10/31/2023

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 and project listed below:

CID: 22000005R1
Federal Number: B-0010(000)X
State Number: U002-00-1.00

Line: 0020	Widget, Part Q^{i}	500 Cubits
Line: 0025	Widget, Part H^{r}	300 Cubits

Non-Compliant Buy America Materials

Line: 0055	Widget, Part I^{z}	300 Cubits

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA

Charleston, WV 25304
My Commission Expires October 16, 2027

Janie Doe, Contractor President

Attachment 2: Full document is available at the WVDOH MCST Toolbox[4].

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

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

MATERIALS PROCEDURE

WVDOH BUY AMERICA WAIVER AND EXCEPTION GUIDELINES

1. PURPOSE

1.1. To set forth instructions for Waivers and Exceptions for Buy America Materials.

~~1.1.~~1.2. If material does not meet the requirements for an exception as specified in Section 3, under certain circumstances a waiver may be granted. These waivers are specified in Sections 4-8.

2. REFERENCED DOCUMENTS

2.1. MP 106.10.50 – WVDOH Buy America Acceptance Guidelines.

2.2. West Virginia Code | §5A-3-56[1]

2.3. West Virginia Code | §5-19[2]

3. OVERVIEW OF BUY AMERICA EXCEPTIONS (MOVED FROM END OF DOCUMENT)

3.1. Federal Minimal Use Exception

3.1.1. As provided for in 23 CFR 635.410(b)(4), an exception from Federal Buy America requirements exists for the minimal use of steel and iron materials "if the cost of such materials used does not exceed one-tenth of one percent (0.1 percent) of the total contract cost or $2,500, whichever is greater. For the purposes of this paragraph, the cost is that shown to be the value of the steel and iron products as they are delivered to the project".

[1] http://www.legis.state.wv.us/Bill_Status/bills_text.cfm?billdoc=hb2207%20intr.htm&yr=2001&sesstype=RS&i=2207
[2] https://code.wvlegislature.gov/5-19/

3.2. State Minimal Use Exception

3.2.1. As provided for in Chapter 5A, Article 3 Section 56 of the West Virginia Code, an exception from West Virginia domestic steel preference requirements exists for the minimal use of foreign steel products, when authorized in writing by the director of Purchasing Division, if "The cost for each contract item used does not exceed one tenth of one percent of the total contract cost or $2,500, whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project."

3.3. There are no Buy America exceptions for Manufactured Products or Construction Materials.

3.4. If these conditions are not met, foreign material ~~may~~ shall not be used on a project unless a waiver is granted. The conditions for these waivers are described in the following sections.

Commented [CH(1]: Shall

Commented [DB2]: done

4. OVERVIEW OF BUY AMERICA WAIVERS

4.1. In certain circumstances, waivers may be applied to materials exempting them from both Federal and State Buy America requirements.

4.2. For each Buy America required ~~type of~~ material as described in MP 106.10.50, a separate process is described.

These Buy America required materials are as follows:

1. Steel and Iron
2. Manufactured Products
3. Construction Materials

4.3. If the contractor chooses to use foreign material for steel and iron, aluminum and glass and no exemption applies, both Federal and State laws require Buy America waivers. These waivers are independent of each other. Compliance and acceptance of one waiver does not in any way shape or form demonstrate compliance with the other waiver.

4.4. If the contractor chooses to use foreign material for construction materials and no exemption applies, Federal law requires Buy America waivers.

4.5. There are two different types of waivers

4.5.1. The general applicability waivers are waivers that applies generally across multiple projects. A general applicability waiver can be "product-specific" (e.g., applies only to a product or category of products) or "non-product specific" (e.g., applies to all "manufactured products").

4.5.2. The Project-Specific -Waivers are waivers on a project-by-project basis and they are not transferable. Therefore, a waiver that is approved for one particular project cannot be used on another project. WVDOH may request a project--specific waiver based on non-aAvailability or ~~and~~ inconsistent with the Public Interest

5. FEDERAL BUY AMERICA WAIVERS FOR STEEL AND IRON

5.1. Project-Specific Waiver WVDOH may request a waiver from Federal Buy America requirements for steel and iron materials based on:

(1)Public Interest: the application of Buy America requirements would be inconsistent with the public interest; or

(2) Non-Availability: steel and iron materials/products are not produced in the United States in sufficient and reasonably available quantities which are of a satisfactory quality.

5.2. If a contractor wishes to apply for a Project-Specific Waiver, they will contact the Division with justification and Relevant supporting information. This will be reviewed by the WVDOH and will be sent to FHWA for approval.

6. STATE BUY AMERICA WAIVERS FOR STEEL AND IRON

6.1. As provided for in H. B. 2207, West Virginia Code | §5A-3-56, the Director of the West Virginia State Purchasing Division may authorize in writing the use of a minimal amount of foreign steel products if either of the following is true:

6.2. The director of the purchasing division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

7. FEDERAL BUY AMERICA WAIVERS FOR MANUFACTURED PRODUCTS

7.1. There is a federal general applicability waiver -for Manufactured Products. Due to the Manufactured Products General Waiver, manufactured products permanently incorporated into FHWA-funded projects do not need to be produced domestically, apart from predominantly iron or steel manufactured products and predominantly iron or steel components of manufactured products.

7.2. There are currently no additional ~~exceptions~~ waivers for Federal Buy America Requirements for ~~Construction Materials or~~ Manufactured Products.

Commented [DB3]: Hao, is this true?

Commented [CH(4]: Here is a limited wavier on EV chargers, do you want to mention it?

https://www.fhwa.dot.gov/construction/contracts/buyam_qaev/

Commented [DB5]: Lets hold off on EV-Chargers - if we're going to start implementing them, we'll do a separate MP

8. FEDERAL BUY AMERICA WAIVERS FOR CONSTRUCTION MATERIALS

8.1. Project-Specific Waiver

8.1.1. WVDOH may request a waiver from Federal Buy America requirements for construction materials based on:

(1) Public Interest: the application of Buy America requirements would be inconsistent with the public interest; or

(2) Non-Availability: construction materials/products are not produced in the United States in sufficient and reasonably available quantities which are of a satisfactory quality.

8.1.2. If a contractor wishes to apply for a Project-Specific Waiver, they will contact the Division with justification and ~~Relevant~~ relevant supporting information. This will be reviewed by the WVDOH and will be sent to FHWA for approval.

Michael A. Mance, P.E.
Director
Materials Control, Soils & Testing Division

MP 106.10.51 Steward – Materials Control Section
MM:B

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

MATERIALS PROCEDURE

INSPECTION AND ACCEPTANCE PROCEDURES FOR PRESTRESSED CONCRETE BRIDGE MEMBERS

1. PURPOSE

1.1 To set forth procedures for the inspection and acceptance of prestressed concrete bridge members, including beams, pier caps, deck panels, and any other prestressed members, and the approval of the plants at which they are fabricated.

2. SCOPE

2.1 This procedure will apply to all prestressed concrete bridge members supplied for use on West Virginia Division of Highways projects and to all prestressed concrete bridge member fabricators that supply material for use on West Virginia Division of Highways projects.

3. REFERENCED DOCUMENTS

3.1 MP 603.02.10 - Guide for Approval of Component Materials at Precast and Prestressed Concrete Plants

3.2 MP 700.00.30 - Certification of Batch Scales and Calibration of Standard 50 Pound Test Weights

4. INSPECTION

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

4.1.1 The process for approving a Fabricator shall include, but not be limited to, an on-site visit to the fabrication plant by a WVDOH representative from MCS&T Division. During this visit, the WVDOH Quality Assurance (QA) personnel shall inspect the fabrication facility and Quality Control (QC) lab, meet with QC and other key personnel

from the Fabricator, and sample component materials which will be used in fabrication of precast items. In addition, all fabricators must set up their invoicing as an E-Ticket that meets the requirements of Section 109.20.1 of the Specification prior to approval.

4.1.1.1 Sampling and testing of component materials shall be done in accordance with MP 603.02.10. All component materials shall be approved prior to the start of fabrication. Batch scales shall be calibrated in accordance with MP 700.00.30 at a minimum once per year.

4.1.1.2 Shipping invoices shall document the assigned Laboratory Reference Number, type of material, number of pieces, size, and cast dates. ~~All Division invoicing must be submitted as an E-Ticket to the project that meets the requirements of Section 109.20.1 of the Specifications.~~

4.1.1.3 Any fabricator which does not produce for the WVDOH for a period of 2 years shall be removed from the approved fabricator list and the fabricator will need to be approved again before they can do work. Sampling of component materials will not continue when the plant is removed from the approved fabricator list.

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

4.1.1.5 Prior to beginning fabrication of any prestressed concrete bridge members, the Fabricator shall provide written notification to MCS&T Division at least one calendar week in advance of the date on which fabrication is to begin. After fabrication has begun, the Fabricator shall keep MCS&T Division and the Inspector (whether a WVDOH employee or a contract employee representing the WVDOH) informed in advance of the days on which fabrication will take place.

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

4.1.3 The Inspector, as a minimum, shall be registered with the Precast/Prestressed Concrete Institute (PCI) as a Level II Quality Control Technician.

4.2 The Inspector shall be present at any or all times during fabrication including casting bed layout, steel placement, stressing operations, concrete testing, placing, and

finishing, detensioning operations, camber measurements, testing hardened concrete cylinders, post-pour inspections, and repairs.

4.2.1 Fabricators must provide adequate lighting to illuminate the casting bed to allow for visual inspection of the entire rebar assembly and setup. Fabricators must make forms safely accessible for visual inspection of the setup down in the form for the entire length of the bed.

4.3 After fabrication is completed and prior to shipment, the Fabricator shall provide MCS&T Division with a written request for Final Inspection a minimum of one calendar week prior to the desired date of inspection. This written request may be in the form of an e-mail. Upon receipt of the written request for Final Inspection from the Fabricator, MCS&T Division will notify the Fabricator of the earliest possible date of this inspection. Effective communication from the Fabricator to MCS&T Division and Consultant Inspection Agency is key to avoiding any scheduling conflicts regarding Final Inspection.

4.4 At Final Inspection, the Inspector shall witness any compressive strength tests which may be required, inspect repairs as needed, and conduct a thorough visual examination of each member. After the Final Inspection is completed, the Inspector shall provide the Fabricator with a copy of the inspection report. This report shall include the findings of the Final Inspection and any other observations or notes taken by the Inspector during fabrication, including a completed copy of the Inspector's checklist. A copy of the Inspector's daily reports, a copy of the final inspection report, and all other pertinent information provided to the Inspector by the Fabricator shall be kept on file by MCS&T Division.

4.5 The Inspector shall use the checklist and inspection forms which are included as Attachments to this MP. The Fabricator shall also document all required information on the applicable Attachments.

5. ACCEPTANCE

5.1 Upon completion of the inspection of a member, the subject member shall be classified in one of two ways. The first way is that the member does not contain any defects. The second way is that the member contains some type of defect.

5.1.1 If a member meets all specification requirements and does not contain any defects, the Inspector will stamp the subject member as accepted by MCS&T Division.

5.2 If a member contains some type of defect, it will be classified into one of the following three categories. These categories are Category I (Cosmetic Defects), Category II (Dimensional Tolerances), and Category III (Structural Defects).

5.2.1 Category I defects include cosmetic defects such as minor spalls with no exposed reinforcing steel or prestressing strand, bug holes, and minor surface irregularities, etc. Category I defects also include cracks up to and including 16 mils in width for which repair procedures are addressed by the standard specifications. Prior to the start of fabrication, the Fabricator shall submit to MCS&T Division, for approval, the proposed repair procedures for Category I defects which may be encountered.

5.2.1.1 Any Category I defect(s) will first be noted by the Inspector and may be subsequently repaired by the Fabricator as per the Fabricator's pre-approved repair procedure. The Inspector shall inspect the repair(s), and if the repair(s) is satisfactory, and if all other aspects of the member meet specifications, the Inspector will stamp the subject member as accepted by MCS&T Division.

5.2.2 Category II addresses any aspect of a member which exceeds the dimensional tolerances set forth in the Specifications. The Inspector will document the variance(s) and notify the Fabricator. At this point, the Fabricator may seek acceptance of the subject member by sending a written notification to the Contractor including a copy of the Inspector's report and any other pertinent data.

If the Contractor agrees to accept the subject member with the defect at the original contract price, then the Contractor shall provide a written statement to District Construction personnel and MCS&T Division stating such.

5.2.2.1 The Contractor, or his designated representative (i.e. the Fabricator), shall then contact MCS&T Division and provide them with a report containing all relevant information and a detailed summary of the dimensional variation(s) in the subject member for which the Fabricator is seeking acceptance. MCS&T Division shall then contact the Designer (either Engineering Division, or the appropriate District, or Engineer of Record) and District Construction personnel and forward this information to them. If the member was designed by a Consultant, Engineering Division may forward the information to the appropriate Consultant. The Designer will then analyze the dimensional variation(s) and provide a written statement to the Contractor, the Fabricator, MCS&T Division, and District Construction personnel as to whether it will affect the structural performance of the subject member. After receipt of that statement from the Designer, District Construction personnel shall then provide a written statement to the Contractor, the Fabricator, and MCS&T Division as to whether the dimensional variation will create construction difficulties.

5.2.2.2 If the Designer states that this dimensional variation(s) will adversely affect the structural performance of the member, or if District Construction states that it will create construction difficulties, or if the Contractor does not agree to accept the subject member with the defect at the original contract price, MCS&T Division will not accept the subject member. MCS&T Division will assign a laboratory number to this subject member~~,~~ which notes that the member does not meet specifications, and will include a thorough explanation as to why the member does not meet specification requirements. If rejected by MCS&T, the subject member may be accepted by the District by means of a District Materials Inspection Report (DMIR).

5.2.2.3 If the Designer does not feel qualified to perform the analysis outlined in Section 4.2.2 and make the decision as to whether the dimensional variation will affect the structural performance of the subject member, the Designer shall inform MCS&T Division of this fact, and MCS&T Division will relay this to the Fabricator. The Fabricator may then elect to have the defect(s) evaluated by a Division approved, qualified, independent Engineer in the same manner that the Designer would analyze the defect(s). The Division would then review and take into consideration this Engineer's analysis as part of the acceptance decision.

5.2.3 Category III defects include structural defects (spalls that expose prestressing strand or reinforcing steel, honeycombed areas, etc.) and cracks for which the specifications require evaluation by the Designer. If a member contains any structural defect(s), the defect(s) will be noted in the Inspector's report. The Fabricator shall then provide the Contractor with detailed information regarding the type, size, and location of the defect(s). It is then the Contractor's, or his designated representative's, responsibility to contact MCS&T Division and provide them with a report containing all relevant information and a detailed summary of the structural defect(s) in the subject member for which the Fabricator is seeking acceptance. MCS&T Division shall then contact the Designer (either Engineering Division, or the appropriate District) and forward this information to them. MCS&T Division shall also contact District Construction to inform them of the situation. In situations when the member(s) was designed by a Consultant, Engineering Division may forward the information to the appropriate Consultant. The Designer will then analyze the subject defect(s) and provide a written statement to the Contractor, the Fabricator, District Construction, and to MCS&T Division as to the effect of the defect(s), if the member will be structurally adequate, if a repair may be made, and if, in the Designers opinion, the service life of the member will be reduced because of the defect. It shall also be documented in the Inspector's report whether, in the opinion of the Inspector, the service life of the member will be reduced because of the defect.

5.2.3.1 If the Designer does not feel qualified to make the decision concerning the effect of the defect(s), they shall inform MCS&T Division of this fact, and MCS&T Division will relay this to the Fabricator. The Fabricator may then elect to have the defect(s) evaluated

by a Division approved, qualified, independent Engineer in the same manner that the Designer would analyze the defect(s). The Division would then review and take into consideration this Engineer's analysis as part of the acceptance decision.

5.2.3.2 Category III defect Scenario 1 – Category III defect which will adversely affect the structural performance of the member:

If the Designer states that the defect(s) will adversely affect the structural performance of the subject member, the Division will not accept the subject member.

5.2.3.3 Category III defect Scenario 2 – Category III defect which will not adversely affect the structural performance of the member and will not reduce the service life of the member:

If the Designer states that the defect(s) will not adversely affect the structural performance of the subject member, and that a repair should be made, and if MCS&T Division and the Designer agree that the service life of the member will not be reduced, the Fabricator shall submit a repair procedure to MCS&T Division for approval. If the repair procedure is approved, the Fabricator may proceed with the approved repairs in the presence of the Inspector. If the repair(s) is satisfactory, the Inspector will stamp the subject member as accepted by MCS&T Division.

5.2.3.4 Category III defect Scenario 3 – Category III defect which will not adversely affect the structural performance of the member, but which will reduce the service life of the member:

If the Designer states that the defect(s) will not adversely affect the structural performance of the subject member, and that a repair should be made, but if either MCS&T Division or the Designer feels that the service life of the member will be reduced, the Fabricator may submit a repair procedure to MCS&T Division for approval. If the repair procedure is approved, the Fabricator may proceed with the approved repairs in the presence of the Inspector. After the inspection of the repair(s), the Inspector will document whether the repair(s) is satisfactory. Since the service life of the member will be reduced, MCS&T Division will not accept the subject member. MCS&T Division will assign a laboratory number to this member, which notes that the member does not meet specifications, and will include a thorough explanation as to why the member does not meet specification requirements. MCS&T Division will then contact District Construction, forward all information relevant to the subject member to the District, and based on the quality of the repairs and the degree to which the service life of the member will be reduced, it is the District's option whether or not to accept the subject member. If the District decides to accept the member it will be paid for at a reduced price based on 40% of the Contract Unit Bid Price. . This cost does not include the cost of items such as bearing pads, guardrail items, delivery charges, etc., which are incidental to the cost of the member. If the District accepts

the subject member with this type of defect and reduced service life, it shall be accepted by means of a DMIR.

Michael A. Mance, P.E.
Interim Director
Materials Control, Soils and Testing Division

MM:AT
MP 603.10.40 Steward – Cement and Concrete Section
ATTACHEMENT

ATTACHMENT: PRESTRESSED CONCRETE BRIDGE BEAMS
WVDOT DIVISION OF HIGHWAYS MCS&T DIVISION
INSPECTION CHECKLIST

PROJECT NAME: _____ **AUTHORIZATION:** _____

PROJECT NUMBER: (State) _____ **(Fed.)**_____

BRIDGE NUMBER: _____ **COUNTY:** _____ **DISTRICT:** _____

MANUFACTURER: _____ **JOB NUMBER:** _____

PROPOSED PRODUCTION DATE(S): _____
INSPECTION AGENCY: _____ **INSPECTOR(S):** _____

Preliminary Verifications

SHOP DRAWING REVIEW

Approval Date: _____ **Approved By:** _____

Concrete Strength Requirements: _____ **at release** _____ **at 28 days**

Beam Type: _____ Total Number of Beams: _____

Finish Requirements: Top: _____ **Bottom/Sides:** _____ **Ends:** _____

Notes: _____

_____

_____

CONCRETE COMPONENTS

Cement Source: _____ **Mix Design Lab Number:** _____

Cement Type: _____ **Lab Number:** _____

Coarse Aggregate: _____ **Lab Number:** _____

Fine Aggregate: _____ **Lab Number:** _____

Batch Water Source: _____ **Lab Number (if applicable):** _____

Admixtures: _____

STEEL COMPONENTS

Bearing Plate: **Fabricator:** _____

Mill Certs: _____ **Galvanize Cert.:** _____ **Lab Number:** _____

Reinforcement: Supplier(s): _____

Description: _____ **Lab Number:** _____

_____

_____

Prestressing Strand: Manufacturer: _____ **Description:** _____

Coil Numbers: _____

Lab Numbers: _____

Inserts: **Supplier(s):** _____

Description: _____ **Lab Number:** _____

_____

_____

SHIPLOOSE MATERIAL

Sole Plate: **Fabricator:** _____

Mill Certs.: _____ **Galvanize Cert.:**_____ **Lab Number:** _____

Bearing Pad: **Fabricator:** _____

Inspected at: _____ **Lab Number:** _____

Diaphragm: **Fabricator:** _____

Inspected at: _____ **Lab Number:** _____

Angles: Mill Certs.: _____ **Galvanize Cert.:** _____**Lab Number:** _____

Anchor Rod: **Supplier:** _____ **Description:** _____

Mill Certs.: ____**Galvanize Cert.:** ____ **Lab Number:** _____

Repairs: **Approved Repair Procedure:** _____

Approved by: _____ **Approval Date:** _____

Repair Witnessed: _____

Repair Satisfactory? _____

Comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

Form Inspection *(Pre-Placement)*

BEAM NUMBER					
Formwork constructed of metal w/ concrete foundation					
Form clean & free of debris					
Form dimensionally correct					
Length (bulkhead to bulkhead)					
Depth of form					
Width at top flange					
Width at bottom flange					
Width of web					
End square					
Skew dimensions					
Location of inserts, sleeves, blockouts, etc.					
Reinforcing steel (condition)					
Size and grade					
Location & lapping lengths					
Spacing & Clearances					
Chairs, spacers properly used					
Hold Down locations (draped strand)					
Form properly sealed at joints & edges					
Release agent applied					
Strand Placement					
Number of strand					
Strand location (vertical & horizontal)					
Strand free of damage or contaminants					
Strand Tensioning					
Jack & gauge calibration					
Initial load					
Final Load					
Elongation					
Theoretical vs. Actual (within 5%)					
Strand symmetrically loaded					
Check for strand slippage					
Bearing plate location					

Concrete Placement

Ambient temperature, weather conditions					
Concrete Temperature					
Concrete quality (appearance)					
Placement (start/completion times)					
1st Lift					
2nd Lift					
3rd Lift					
QC Tests performed per specification					
Slump					
Air content					
Compressive strength cylinders					
Concrete placed within specified time restrictions					
Concrete properly vibrated					
External vibration applied					
Internal vibration per specification					
Top surface per specification					
Lifting loops per specification					
Curing per specification					
Heat sensors properly installed					
Beams adequately covered					
Compressive strength cylinders stored with beams					
Stress Transfer					
Cylinders loaded to failure per specification					
Release strength met – record average of 2 tests (psi)					
Strands properly cut					
Strands detensioned in specified sequence					

Product Inspection *(Post-Placement)*

Visual inspection for damage					
Note size & location of cracks, spalls, honeycomb, etc.					
Discuss damaged areas with QC Manager					
Beams in need of repair					
Repair method approved?					
Dimensional Tolerances met?					
Length					
Width(s)					
Depth					
Inserts, sleeves, etc.					
Stirrups (horizontal. & vertical within tolerance)					
Finish per specification					
Top scored per specification					
Fascia finish as specified					
Camber					
Lifting loops OK					
Beams properly transported					
Beams stored on proper dunnage at bearing points					
Sweep					
Design shipping strength (28 day) met? (avg of 2 tests)					
Repairs satisfactory					
Beam stamped for shipment					
Concrete Sealer (Silane) applied as specified					
Interior Sides blast cleaned (within 5 days of shipment)					

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

MATERIALS PROCEDURE

GUIDE FOR USING A HIGH-SPEED INERTIAL PROFILER TO MEASURE THE LONGITUDINAL PROFILE OF PAVEMENT

1. SCOPE

1.1. This procedure establishes a process for collecting longitudinal profiles of roadways using a High-Speed Inertial Profiler (HSIP) equipped with laser height sensors. The HSIP shall be capable of collecting data at speeds between 15 mph and 65 mph. The collected data is analyzed to determine rate of smoothness or Ride Quality.

1.2. The rate of smoothness of the pavement is measured using the International Roughness Index (IRI) with units of inches per mile (in/mi).

2. PURPOSE

2.1. To establish a procedure for safe operation of a HSIP and the collection of quality pavement longitudinal profile data.

3. REFERENCED DOCUMENTS

3.1. AASHTO R -56: Certification of Inertial Profiler System

3.2. AASHTO R -57: Operating Inertial Profiler System

3.3. AASHTO M -328: Standard Specification for Inertial Profiling

3.4. ASTM E-950: Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with ~~a~~an Accelerometer-Established Inertial Profiling Reference

4. EQUIPMENT REQUIREMENTS

4.1. The High-Speed Inertial Profiler (HSIP) must conform to AASHTO M -328 and have a minimum of two laser sensors and two accelerometers mounted in tandem with each wheel path laser. The lasers shall be mounted between 30 and 36 inches to the left and right of the center of the host vehicle. Other equipment can be added including, but not limited to, a third laser mounted on the center line of the host vehicle for rut evaluation. The HSIP shall be equipped with a data acquisition system that collects and stores elevation profile data and a Distance Measuring Instrument (DMI) for measuring traveled distance. The HSIP may also incorporate a Global Positioning System (GPS) unit. The host vehicle shall not exceed the axle loads specified by the vehicle manufacturer.

4.2. The HSIP shall be equipped with an automated triggering system capable of detecting a reference mark to start, stop, and event mark the data collection process.

4.3. All measuring requirements shall comply with AASHTO R 56. The resolution of the vertical measurement shall be a minimum of 0.001 inches. The accelerometer range shall be large enough to accommodate the levels expected from the bounce motions of the measuring vehicle. The DMI shall produce a sufficient series of pulses, the intervals which represent a distance along the traveled surface that would result in a resolution of less than or equal to 1.0 inch. The data acquisition system shall also operate at a sufficient speed and capacity in order to display the sensors' outputs in real time.

4.4. All electronic and mechanical components of the profiling system shall be adequately designed and built to meet or exceed the requirements set forth in AASHTO M 328.

5. SAFETY~~SAFTEY~~ PRECAUTIONS~~PERCAUTIONS~~

5.1. The HSIP, all attachments, and host vehicle shall comply with all applicable State and Federal Laws. Additional precautions shall be taken beyond those imposed by law to ensure the safety of all personnel and the general public. At minimum the following conditions must be followed when testing with a HSIP:

1. All test lanes must be free of any debris and obstructions.
2. Heavy acceleration and deceleration should be avoided while testing.
3. All lanes must remain open to traffic unless deemed unsafe.
4. Testing should not be done during peak~~during done peak~~ traffic hours.
5. Testing should only be conducted at speeds recommended by the manufacturer~~manufacture~~.

6. CALIBRATION~~CALBRATION~~ AND VERIFICATION~~VERIFCATION~~

6.1. Calibration Locations

6.1.1. Distance Calibration Test Location – The test section(s) used to calibrate the distance measuring instrument (DMI) shall be tangent and require a minimum length of 528 feet with minimal grade. The test section should have little to no traffic with areas for the HSIP to turn around on either end. The test section shall include a minimum of 528 feet lead in and lead out sections as well as at least 528 feet for the calibration testing and verification. The pavement shall be free of standing water and debris during testing and calibration. The length of the test section shall be measured using a measuring wheel capable of measuring distances to the nearest 1.0 inch accuracy. The triggering mechanism (i.e. reflective tape) shall be placed at the beginning and end of the test section to signal the location of section limits.

6.1.2. Pr~~e~~e~~r~~ Operation Calibration and Verification – Pre-operation calibration and verification should be done on a flat and smooth surface while there is little wind. Pre-operation calibrations and verification includes:

1. Tire Pressure Check (Section 6.2.1)
2. Block Test (Section 6.2.3)
3. Accelerometer Calibration (Section 6.2.4)
4. Bounce Test (Section 6.2.5)

6.2. Calibration and Verification Procedures

6.2.1. Tire Pressure Check – The cold tire pressure shall be checked and maintained as set by the inertial profiler Manufacture. The check shall be performed before warm-up and according to Table 6.3.

6.2.2. Distance Check and Calibration – After checking the cold tire pressure and before calibrating the DMI, the tires and electronic equipment shall have enough time to warm-up as specified by the manufacturer~~manufacture~~. The operator shall measure the longitudinal distance traveled using the DMI on the HSIP on a test section measuring at least 528 feet with an accuracy of ±0.15 percent. If the measured distance is out of tolerance, (for a 528 feet test section the acceptable limits are ± .792 feet) the DMI must be recalibrated. The calibration passes shall be done at a constant speed above 15 mph by traveling the test section in three repeat passes or as recommended by the manufacturer~~manufacture~~. All passes should be done in the same direction as the section was measured. The passes must be auto triggered at the beginning and end of the test section. If the operator deems any pass questionable, such pass shall be discarded and the distance measurement repeated until sufficient number of runs with consistent accuracy is achieved. This calibration data and distance calibration factor shall be saved and used for distance data collection.

6.2.3. Block Test – ~~–~~Before completing the block test the accelerometer calibration shall be done while no one is inside the HSIP. The block test shall be performed according to manufacturer's procedures while meeting or exceeding the requirements outlined~~outline~~ in AASHTO R 57. Using a minimum of three-gauge blocks that measure at three different heights. The thickness of each gauge block shall be measured at three different positions on each side of the block with a device capable of measuring to the nearest 0.001 inch. For each block, nominal thickness shall be determined as an average of the measurements made and recorded. The average distance between nominal thickness of the block and measured values for each block shall not exceed 0.01 inch. The equipment shall have the capability to display and report the error for the operator's acceptance. In the absence of manufacturer's~~manufacture's~~ procedures, the block check shall be performed as specified in AASHTO R 57.

6.2.4. Accelerometer Calibration – ~~–~~Prior to the accelerometer calibration, the HSIP shall be warmed-up as specified by the manufacturer~~manufacture~~ Must be done according to manufacturer's procedures with operator and other personnel present for daily data collection seated in the HSIP.

6.2.5. Bounce Test – ~~–~~Prior to the Bounce test, the HSIP shall be warmed-up as specified by the manufacturer~~manufacture~~. In addition, the accelerometer calibration shall be completed while no-one is inside the HSIP and the vehicle's motor is turned off. The bounce test shall be performed by positioning the HSIP on a level and flat surface with no wind present. The HSIP's engine must be turned off with the emergency brake applied and with the transmission in park. In some cases, it may also be necessary to place tire chalks on either side of the front tires and a thin non-glossy surface, such as a sheet of paper placed under both wheel path lasers. The data shall be collected by simulating the DMI at the manufacturer's~~manufactures~~ recommended speed. At

minimum, data collection shall be performed with a 0.1 mile of lead-in, a 0.1 mile static portion of the test, a 0.5 mile bounce portion, followed by another 0.1 of static collection. During the bounce portion, the laser sensors shall be vertically displaced in a smooth motion for a total displacement between 1 and 2 inches. The bounce test shall be analyzed using the IRI interval report with a segment length of 528 feet. The static portion of the test shall be less than 3 inches/mile and the bounce portion IRI results shall be less than 8 inches/mile. If the system fails to meet these requirements repeat this procedure three additional times. If thresholds cannot be achieved in all three interactions, contact the manufacturer~~manufacture~~ for troubleshooting before additional testing is performed. The bounce test shall be done according to the schedule outlined in Table 6.3 After the bounce test is successfully completed and recorded, accelerometer calibrations shall be redone with operator and other personnel present for daily data collection seated inside the HSIP and done according to Section 6.2.4.

6.3. Frequency of Calibration and Test Procedures – ~~.~~The frequency of calibration procedures described in Section 6.2 shall be performed in accordance with Table 6.3 at minimum.

Table 6.3- Frequency of Calibration Procedures

Calibration Procedure	**Frequency**		
	Before Every Project	Daily	Weekly
Tire Pressure and Safety Lights (Section 6.2.1.2)		x	
Distance Calibration/Check (Section 6.2.1)			x
Accelerometer Calibration (Section 6.2.2)	x		
Block Test (Section 6.2.3)			x

7. OPERATOR AND EQUIPMENT CERTIFICATION~~CERTFICATION~~

7.1. All HSIP operators must be certified by the West Virginia Division of Highways. To obtain certification or recertification, contact the WVDOH Quality Assurance Training Program Administrator at qaschoolscoordinator@wv.gov. Proof of certification must be available upon request.

7.2. The equipment must be certified at a facility approved by the Materials Control, Soils and Testing Division. Proof of certification must be available upon request. For more information contact the Pavement Analysis and Evaluation Section at DOHMCSnTRoadway@wv.gov~~WVDOH State Pavement Engineer~~.

8. DATA COLLECTION

8.1. Bring the HSIP to the desired speed and alignment prior to the section being tested. Speed should be maintained as constant as possible throughout the test.

8.2. Turn the Distance Measurement Instrument (DMI) on approximately 500 feet before the start of the test section.

8.3. At the beginning milepost of the project, reset the DMI and begin data collection.

8.4. After marking the end of the project, continue~~project continue~~ driving the lane that is being tested for a minimum of an additional 200 feet after the ending milepost and then turn the DMI off.

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

8.6. Perform testing per manufacturer's operating procedures.

8.7. It is recommended that areas that will be removed from analysis (bridges, intersections, etc.) be flagged and noted.

8.8. Areas where the HSIP is operated below the manufacturer's recommended operating speed shall be flagged and noted.

8.9. Raw data, equipment maintenance, and calibrations records shall be maintained in a log book located within the host vehicle or on the data collection system and made available upon request.

8.10. The data shall be collected and exported with the 250-mm filter turned off.

9. ANALYSIS

9.1. All analysis shall be completed using the most recent version of ProVAL.

9.2. All applicable runs for the project shall be imported to one ProVAL file and renamed to reflect lane and direction (i.e: EB Traffic Lane)

9.2.1. The name of the project must be the Contract ID for the project followed by "RQ Analysis".

9.3. Unless otherwise noted, analysis should be done using Ride Quality analysis in a fixed interval length of 0.1 miles. Analysis shall be done for both the right and left wheel-paths as well as the average IRI of both wheel paths or Mean Roughness Index (MRI).

9.3.1. The 250mm filter shall be checked when running analysis.

9.4. The lead in/out sections, areas where the HSIP is operated below the manufacturer's suggested speed, as well the areas that are not part of the project shall be removed from analysis. The data shall be analyzed in accordance with WVDOH Specification 720.4 unless otherwise noted.

10. REPORTING AND SUBMITTING

10.1. All Ride Quality data for a particular project shall be submitted to the project engineer with the following information:

1. One ProVAL project with all data analyzed
2. Excel and .pdf Reports created from ProVAL
3. The WVDOH Road Profile Log Sheet completed for each project. Please see the WVDOH MCS&T Webpage Toolbox for the most current version of the fillable form for the WVDOH Road Profile Log Sheet (non-fillable sample form is attached.)

Commented [DB1]: Add link to webpage in document

10.2. All raw data does not need to be submitted, however shall be available upon request.

_____
Michael A. Mance, P.E.
Director
Materials Control, Soils and Testing Division

ATTACHMENT

MM:Awf

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

METHOD FOR APPROVING DEVICES USED FOR ACCEPTANCE TESTING DENSITY AND/OR MOISTURE CONTENT OF IN-PLACE MATERIAL

Commented [1]: JC - Asphalt - PWL - Contractor can do anything they want. Contractors use it for non-nuclear for check. Will this approve list roll that out?

1. PURPOSE

1.1. THE WVDOH HAS A LONG HISTORY OF USING NUCLEAR MOISTURE/DENSITY GAUGES AND IS FAMILIAR WITH THE TEST PROCEDURES, RELIABILITY, MAINTENANCE, AND CALIBRATION PROCEDURES OF SUCH DEVICES. IN RECENT YEARS, MORE DEVICES HAVE COME TO MARKET THAT ARE LOW OR NON-NUCLEAR. THIS MP IS IN PLACE ~~T~~to establish procedures used to approve the use of any testing devices for Density and/or Moisture of in-place material on WVDOH projects.

2. SCOPE

2.1. THIS MP APPLIES TO MOISTURE AND DENSITY TESTING DEVICES USED FOR ACCEPTANCE TESTING, AS WELL AS ANY TIME SUCH DEVICES MIGHT BE USED WHEN QUALITY CONTROL TESTING RESULTS ARE USED FOR ACCEPTANCE.~~To establish procedures used to approve the use of testing devices for Density and/or Moisture of in-place material on WVDOH projects.~~

3. REFERENCED DOCUMENTS

3.1. ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

3.2. ASTM D4959 – Standard Test Method for Determination of Water Content of Soil by Direct Heating

3.3. ASTM D8167/D8167M – Standard Test Method for Density of Asphalt Mixtures in Place by Nuclear Methods~~Add Name~~

3.4. MP 207.07.20 – Nuclear Field Density – Moisture Test for Random Material Having less than 40% of +3/4 Inch Material

3.5. MP 700.00.24 – Nuclear Density Test by Roller Pass Methods

~~1.1~~3.6. MP 717.04.21 – Guide for Quality Control of Compaction ~~Add MPs from BW email~~

4. approval of DEVICES FOR TESTING OF DENSITY AND/OR MOISTURE OF IN-PLACE MATERIAL~~TESTING PROCEDURE~~

4.1. The testing device must meet WV DOH Standard Specification ~~717~~716.3.2, as well as conform to the needs of the above referenced MPs and ASTM procedures.

4.2. The testing device must provide accurate and precise results that are repeatable and comparable to other typical testing procedures.

4.3. The testing device must be reasonably suitable for each application.

4.4. The testing device must be capable of providing wet density, dry density, and moisture.

4.5. The testing device must be capable of providing results in one single test, without the need for other devices.

4.6. The testing device must deliver reasonably rapid results, suitable for the application. Maximum of one minute per test.

4.7. The testing device must not allow the introduction of bias into test results, i.e., the device must test once and provide a reliable result, rather than test multiple times to find the best result.

4.8. The testing device must not interfere with, nor be susceptible to interference from, any other typical device that is expected to be on a project.

~~4.1.~~4.9. The WVDOH will evaluate each brand/model of moisture/density testing device as needed according to the above listed requirements and reserves the right to reject or remove any brand or model without further explanation. Upon satisfactory evaluation and demonstrated field performance, the brand and model of the device will be listed in section 5 below.

5. CURRENT **APPROVED LIST OF DEVICES FOR TESTING OF DENSITY AND/OR MOISTURE OF IN-PLACE MATERIAL**

5.1. Humbolt HS-5001 series

5.2. Troxler 3430/3440 series

5.3. Instrotek 3500 series

5.4. Instrotek Xplorer 2

5.5. Instrotek/CPN MC-1

~~5.1.~~5.6. Instrotek/CPN MC-3~~Process TBD~~

6. ~~**APPROVAL OF DEVICES FOR TESTING OF DENSITY AND/OR MOISTURE OF IN-PLACE MATERIAL**~~

6.1. ~~Process TBD~~

Commented [2]: Doesn't exist, needs to be updated/deleted, BW to take a look at this

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

1. PURPOSE

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

Commented [DB1]: All instances of "similarity" replaced with Verification

2. DEFINITIONS

2.1. Quality Assurance: Samples performed by the Division to accept material on the Project.

2.2. Quality Control: Samples performed by the Contractor on the Project to demonstrate material compliance.

2.3. Verification Sample: A quality assurance sample performed by the District and Statistically compared to a series of Quality Control Samples.

3. SCOPE

3.1. This procedure is used to review and evaluate contract quality control samples.

3.2. Materials and Tests

3.2.1. Aggregate Gradations

3.2.2. Asphalt (Marshall)

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

3.2.3. Asphalt (SuperPave)

1. Asphalt Content
2. Air Voids
3. Gradation

3.2.4. Portland Cement Concrete

1. Air Content
2. Consistency

4. PROCEDURE

4.1. The following procedure will be ~~implemented~~ performed by the District Materials Supervisor.

4.2. After completion of the verification sample test, the data will be entered into the Division approved materials tracking program. 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.

4.2.1. If there are more than ten quality control samples, a verification sample shall be done for the first ten samples. Additional verification samples shall be done at the frequency of one in ten.

4.2.1.1. For example, if 16 QC samples are taken, there shall be a verification for samples 1-10 and then another for 11-16.

Commented [DB2]: Moved to its own section

4.2.1.2. If there are only five to 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.

4.2.2. In the event there are less than five quality control samples available when the verification sample is complete, the District Materials 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~~5.1 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 Supervisor to be similar, and the applicable portions of Section ~~5~~6.1 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~~4.2.2 of MP 700.00.54." This statement shall be on the sample record.

4.2.3. Determine the range (R) of the quality control samples used in Section ~~3~~4.2.1 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.

4.2.4. Compute the interval (I) by substituting the values calculated in Sections ~~3~~4.2.1 and Section ~~3~~4.2.3 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~~4.2.1	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	$I = \bar{X}_{5} \pm 1.61 \times R$

4.2.5. 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, i~~If the result obtained is greater than 100, it will be recorded as 100. ~~And s~~Next~~econd~~, 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 i~~If the result is less than zero, it will be recorded as zero.

4.2.6. 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.

Aggregate Verification Samples.

4.3. The verification sample will be considered similar if ~~If the verification sample is an aggregate and~~ all sieve results ~~coincide with or~~ fall within the~~lie between the~~ upper (U^l) and lower limits (L^l) of the interval~~, the quality control sample test results will be considered similar to the verification sample test results.~~ ($U^l <= Result <= L^l$). Otherwise, the sample will be considered dissimilar.

Asphalt Verification Samples.

4.4. The verification sample will be considered similar if the asphalt content and air voids fall within the upper (U^l) and lower limits (L^l) of the interval ($U^l <= Result <= L^l$). Otherwise, the sample will be considered dissimilar.

Portland Cement Concrete Verification Samples

~~If the verification 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.~~

~~If the verification 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.~~

~~If the verification 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.~~

4.5. The verification sample will be considered similar if the air content and consistency fall within the upper (U^l) and lower limits (L^l) of the interval ($U^l <= Result <= L^l$). Otherwise, the sample will be considered dissimilar.

~~4.3. If the verification sample 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 similar.~~

5. EVALUATION

5.1. If the quality control sample data is dissimilar to the verification sample ~~the following~~the District Materials Supervisor ~~action~~ will ~~be~~ take~~n~~ the following actions where appropriate:~~.~~

~~5.1.1.~~1. Review the quality control sampling procedure.

~~5.1.2.~~2. Review the quality control testing procedures.
~~5.1.3.~~3. Check testing equipment.
~~5.1.4.~~4. Review computations.
~~5.1.5.~~5. Review documentation.
~~5.1.6.~~6. Perform any additional investigations that may clarify the dissimilarity.

6. REPORTING AND SAMPLE SUBMISSION

6.1. If the quality control samples are found to be similar to the verification sample, the sample shall be ~~marked~~ labeled ~~as~~ "Similar~~-~~ Passed" and submitted to the respective Materials Regional Coordinator for final evaluation using the currently materials tracking software.

6.2. If the quality control samples are dissimilar ~~to the verification sample~~, the sample shall be ~~marked as~~labeled "Non-Similar" and submitted to the respective Materials Regional Coordinator for final evaluation using the currently materials tracking software.

6.2.1. If the Sample is not non-similar, a note ~~will~~ shall be made on the sample record including a brief statement of the action taken to correct the deficiency.

~~6.2.1.~~6.2.2. In the event that other documentation is needed to resolve the material, ~~, 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~~that information shall also be provided ~~therein~~.

6.3. The results of the investigation as reported will be noted by District Materials in their email submission.

6.4. The test agency view shall contain the information: "Issued by District (Number) per MP 700.00.54, (Date)."

6.5. When the sample is completed, it shall be authorized by the respective Materials Regional Coordinator.

6.6. The testing technician shall be listed on each sample.

Michael Mance, PE
Interim Director
Materials Control, Soils & Testing Division

MP 700.00.54 Steward – Materials Control Section
MM:B

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

MATERIALS PROCEDURE

POLICY FOR MATERIALS CERTIFICATION RECIPROCITY

Commented [DB1]: List what the equivalent certification is. Its in 106.03.50. If we do not decide to combine these.

1. PURPOSE

1.1 This Materials Procedure is for certifying applicants who do not hold current materials certifications from West Virginia. Details for the Technician program can be found in MP 106.03.50 on the Materials Division Website[1].

1.2 This Materials Procedure establishes a path for those applicants who wish to become certified PCC Inspectors, PCC Technicians, and/or Aggregate Technicians in the state of West Virginia. For those who currently hold certifications in surrounding states or recognized industrial certifications the Provisional Path is available. This path is available only if the West Virginia Division of Highways deems the certification(s) transferable into the West Virginia certification program.

2. REFERENCED DOCUMENTS

2.1 MP 106.03.50

~~2.~~3. PROVISIONAL PATH

~~2.1~~3.1 This certification path is for applicants who hold a current, applicable certification from another state, or recognized industrial certification and wish to become a certified West Virginia Inspector/Technician. To become certified through this path, the applicant must take the West Virginia provisional certification exam. The applicant will be given only one (1) attempt to test-out and receive a passing score. The applicant may only test-out for disciplines that the West Virginia Division of Highways deems as a comparable certification.

~~2.2~~3.2 If a passing score is not obtained on the test-out, the Provisional Certification will not be provided, and applicant will be required to take the respective class and pass the certification exams to be certified in West Virginia. If a passing score is obtained the applicant will become a West Virginia certified inspector and be bound by the rules of the West Virginia Certification Program.

~~2.3~~3.3 To request a Provisional Certification, the following steps are required:

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

~~2.3.1~~3.3.1 The applicant must provide copies of all current, applicable certification cards / certificates.

~~2.3.2~~3.3.2 Email these attachment(s) to qaschoolscoordinator@wv.gov

~~2.3.3~~3.3.3 The West Virginia Division of Highways will review the application and will notify the applicant within 30 days by email if the application has been approved or rejected. The applicant shall then be required to create an online learning account. (See Section 3.)

~~3.~~4. CREATING AN ACCOUNT AND SCHEDULING THE EXAM

~~3.1~~4.1 To create an online learning account, visit the How to create an online learning account[2] webpage at the Materials Control, Soils and Testing Division website and follow the instructions. The applicant shall notify qaschoolscoordinator@wv.gov by email that the account has been established.

~~3.2~~4.2 After passing the exam, the Provisional Applicant may go to The technician certification search portal[3] at the Materials Control, Soils and Testing Division website and print out the Provisional Certification Card. The card may also be saved as a screenshot on a smart phone, which may be used in-lieu of a printed card.

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

MP 106.03.51 Steward – Personnel, Payroll Section
RLS:Eb

[2] https://transportation.wv.gov/highways/mcst/Documents/Technician School Documents/Coursemill new account instructions.pdf
[3] https://transportation.wv.gov/highways/mcst/Pages/Technician-Directory-Portal.aspx

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

MATERIALS PROCEDURE

TEST METHOD FOR UNCONFINED COMPRESSIVE STRENGTH OF ROCK CORE SPECIMENS

1. PURPOSE

1.1 To establish a procedure for testing the unconfined compressive strength of rock core specimens.

2. SCOPE

2.1 This procedure shall apply to nominal 2-inch diameter rock core specimens obtained for the purpose of determining the uniaxial compressive strength of rock.

2.2 This procedure will specify the requirements for the apparatus to be used in the test procedure, specimen preparation, and the actual test procedure.

3. APPARATUS

3.1 Diamond Saw – A manual or automatic rock saw equipped with a circular diamond saw blade, and appropriate cooling and cutting agents.

3.2 Feeler Gage – The feeler gage 3 inch “leaves” must include sizes beginning at 0.0015 inches.

3.3 Testing Machine – The testing machine shall meet the requirements for the testing machine specified in ASTM C 109.

4. SPECIMENS

4.1 Test specimens shall be nominal 2-inch diameter rock cores with a length–to-diameter ratio (L/D) of 2.0 to 2.5 and a diameter of not less than 1.88-inches.

4.1.1 The field moisture condition of the test specimen shall be preserved until the time of the test unless otherwise specified.

4.2 The sides of the specimen shall be generally smooth and free of abrupt irregularities that, as determined by the technician performing the test, would adversely affect the compressive strength result.

4.3 Cut the ends of the specimens parallel to each other and at right angles to the longitudinal axis using a diamond saw.

4.4 Determine the diameter of the test specimen to the nearest 0.01 inches by averaging two diameters measured at right angles to each other at about mid-height of the specimen. Determine the length of the test specimen to the nearest 0.01 inches at the centers of the end faces.

4.5 When the Modified Rock Hardness and Unconfined Compressive Strength (HCSI) of the specimen is 3 or less (average rock – corresponding to an estimated compressive strength of ≤8,000 psi), the ends of the specimens shall be capped with high-strength gypsum cement paste in accordance with ASTM C 617.

4.6 When the Modified Rock Hardness and Unconfined Compressive Strength (HCSI) of the specimen is 4 or greater (hard rock – corresponding to an estimated compressive strength of >8,000 psi), the ends of the specimens shall be sawed or ground flat to a tolerance not to exceed 0.002 inches.

5. PROCEDURE

5.1 Ensure that the spherically seated block of the testing machine rotates freely in its socket before each test. Wipe clean the bearing faces of the upper and lower bearing blocks and place the test specimen in the testing machine on the lower bearing block below the center of the upper bearing block. Bring the spherically seated block into uniform contact with the surface of the specimen.

5.2 Apply the load at a relative rate of movement between the upper and lower platens corresponding to a loading on the specimen within the range of 35 ± 7 psi/s. Obtain this designated rate of movement of the platen during the first half of the anticipated maximum load and make no adjustment in the rate of movement of the platen in the latter half of the loading.

5.3 Record the maximum load carried by the specimen. Load readings in pounds (kilonewtons) shall be recorded to the nearest 10 lbs.

6. CALCULATION

6.1 Calculate the compressive strength of the specimen as described in section 6.2 and express the result to the nearest 10 psi.

6.2 Calculate the compressive strength of the specimen as follows:

$$CS = \frac{ML}{0.25 \cdot \pi \cdot D^2}$$

Where:
CS = Compressive strength of the specimen
ML = Maximum load carried by the specimen during the test
π = Mathematical constant PI
D = Average diameter of the specimen (as determined in section 4.4)

7. REPORT

7.1 The report shall include the following:

7.1.1 Laboratory number;

7.1.2 Project name, project number, and authorization number;

7.1.3 Date of test;

7.1.4 Core boring number and depth of specimen from the top of the hole;

7.1.5 Station and offset of the core boring;

7.1.6 Specimen diameter and length as determined in section 4.4;

7.1.7 Specimen end preparation method (capping, sawing, or grinding);

7.1.8 Maximum load as determined in section 5.3;

7.1.9 Compressive strength as determined in section 6.2;

7.1.10 Physical description of the rock specimen (type, color, and grain size).

7.2 Use Attachment 1 as the format for the report.

MP 212.01.21 Steward – Cement and Concrete Section
MM:T
ATTACHMENT

ATTACHMENT 1

WEST VIRGINIA DIVISION OF HIGHWAYS MATERIALS CONTROL, SOILS AND TESTING DIVISION UNCONFINED COMPRESSIVE STRENGTH OF ROCK CORES			
Laboratory Number:			
Project Name:			
Project Number:		Authorization Number:	
Date of Test:		Core Boring Number:	
Station:		Offset:	

Depth From Top of Hole (ft)	
Diameter (in.)	
Average Diameter (in.)	
Length (in. / mm)	
End Preparation Method	
Maximum Load (lb.)	
Compressive Strength (psi)	

Physical Description of Rock:
Type:
Color:
Grain Size:

Remarks:

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 require a special investigation of the aggregate 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, 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	*

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, 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 × (B) % reduction from Table 1 × (C) unit contract price. (A sample tabulation sheet is attached).

MP 212.02.20 Steward – Aggregate & Soils Section
MM:R
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)×(B)×(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

SAMPLING COMPACTED ASPHALTIC MIXTURES FROM THE ROADWAY

1. PURPOSE

1.1 This procedure has been written to provide a means for sampling compacted roadway asphalt mixtures.

2. SCOPE

2.1 This method covers the procedure for sampling of asphaltic paving mixtures taken from the finished pavement for determination of the characteristics of the compacted mixture.

2.2 Samples obtained using this method will be collected for several reasons including but not limited to the following:

2.2.1 Visual examination.

2.2.2 Measurement for layer thickness.

2.2.3 Determination of bulk specific gravity, air voids, and other volumetric properties.

2.2.4 Determination of bond strength between constructed layers.

3. REFERENCED DOCUMENTS

3.1 WVDOH Standard Specifications – Current Edition

a) Section 410: Asphalt and Wearing Courses, Percent Within Limits (PWL)

3.2 Materials Procedures

a) MP 401.02.31, Quality Control and Acceptance of Asphalt Mixtures
b) MP 401.07.20, Sampling Loose Asphaltic Mixtures
c) MP 401.07.22, Measurement for Thickness of Asphalt Pavement Using Drilled Cores
d) MP 401.07.23, Interface Bond Shear Strength of Multi-layered Asphalt Pavement Specimens
e) MP 401.13.50, Determination of Percent Within Limits

3.3 AASHTO Procedures

a) AASHTO T331, Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method

4. EQUIPMENT AND TOOLS

4.1 Powered core drill, water cooled, equipped to core cylindrical samples.

4.2 Diamond drill bit of six (6) inch inside diameter size. 150 mm

4.3 Incidental materials and equipment.

4.4 Hand-held core sample extraction tool capable of grasping and removing a drilled cylindrical pavement core sample from the pavement without damage to the core sample.

Note: Worn drill bits of the same size as those used for coring have been successfully used by cutting slots vertically along the side of the casing to allow for expansion.

4.5 An ice cooler large enough to hold the sample without distortion after it is removed from the pavement.

140 Liters

Note: Large ice coolers (approximately 150 quart) have been used successfully to store and transport multiple pavement cores.

4.6 Small plastic bags for core specimens

4.7 Masking tape

4.8 A marking pencil, paint pen, lumber crayon, or other means suitable for labeling cores.

4.9 Markers for labeling the plastic bags.

5. MAT DENSITY, BOND STRENGTH, AND THICKNESS CORE SAMPLES

5.1 Density acceptance of the asphalt mixture from the roadway shall be determined on the basis of test results from core samples for each Lot. One sample shall be taken from each Sublot. Samples are to be selected by means of a random sampling plan.

5.1.1 Random numbers used shall be generated from a calculator, software capable of generating random numbers, or from the Random Number Table attached to this MP. All random numbers shall be recorded and maintained in order to verify the means of sample locations.

5.2 At the Pre-Paving Meeting, WVDOH and Contractor personnel shall confer and agree on the sequence and widths of the paving operation in order for a sampling

plan to be developed by the Division. The plan shall begin at the intended starting point and progress continuously until the end of the paving operation. Lots for mainline travel lanes should not be extended onto outside shoulders. As paving progresses onto the outside shoulders, new lots shall be established along the shoulders. Ramps, turning lanes, and truck lanes are traveled lanes and shall be considered as mainline pavements.

5.3 All lots shall be calculated and laid out based on converting 2500 tons to square yardage using the project plan lift thickness and a project theoretical yield. The theoretical yield shall be based on 94% of the design maximum theoretical density from the approved JMF (Form T400) for asphaltic mixture designs. The lots shall be laid out using the full width of placement for each pull. However, no samples shall be taken from the inside shoulder adjacent to the median (generally four feet in width), or the outside 12 inches (one foot) of the unsupported or supported edge of a paving mat. The remaining dimension of width shall be considered testable and used to determine the random location of each sample. Partial lots shall be laid out and either considered separate lots or combined with the previous lots as per Table 410.7.1 of the WVDOH Standard Specifications.

5.3.1 Sample locations determined using random numbers shall be rounded to the nearest 1ft for both length and offset. If it is determined that the offset is zero or the maximum dimension in the testable width, the samples should be taken within either the first or last one foot respectively of material at each side of the testable width. Additionally, samples determined to fall at the same location as a sample removed from an underlying paving lift should be recalculated using a new random number for either width or length.

NOTE: It is likely that some lots will be laid out in the field beginning with a mat that is a different dimension than that where the lot ends. Such would be the case for a lot that starts within a mat being pulled along the median where the fast lane and inside shoulder are being pulled simultaneously (approximately 16’), but ends along the outside or slow lane (approximately 12’) on the other side of the median. In such a case, it will be necessary to calculate the area on the side of the median where the lot is started, then use the remaining area for the lot to determine the length of the remaining portion of the lot on the other side of the median.

5.4 Refer to the Illustrative Example included in this MP for examples of how to select samples using a random sampling plan for pavement courses. Density acceptance samples and bond strength samples should be cross-referenced to a corresponding mixture acceptance sample as per MP 401.07.20.

5.4.1 For purposes of identification, the sampling ID shall be consistent for projects. Along with the pertinent project identification data (as indicated in Section 410 of the Standard Specifications) that is needed for processing test results, it will be necessary to discern all samples on the project by lot, sublot, and type of sample. For mat density and bond strength samples obtained from the mat, and for joint density samples obtained from the longitudinal joint, they should follow the

convention shown below. Please note that mat density and bond strength samples shall also be measured for thickness.

Layer/Lot Designation	Lot #	Sub Lot #	Type of Sample	Example Sample ID
B – Base I – Intermediate S – Surface/Wearing J – Joint Density Core	2	5	M – Mat B – Bond Core D – Density Core	B2-5M J2-5

5.5 Samples for mat density shall be used to determine the percent compaction of the finished mat by first determining the bulk specific gravity of each specimen as per AASHTO T331, and then by dividing by the corresponding daily theoretical maximum density of the paving mixture.

6. LONGITUDINAL JOINT DENSITY CORE SAMPLES

6.1 Samples shall be taken on the basis of a random sampling plan established for each lot. Lots shall be established as specified in Standard Specifications 410.7 - Acceptance Testing and will consist of 10,000' of constructed longitudinal joint. Each lot will be further divided into sublots consisting of 2,000'. Partial lots shall be addressed as described within Section 410.7 of the Standard Specifications. Lots along constructed joints between travel lanes shall not extend onto the constructed joint adjacent to the outside shoulders. New lots shall begin with the constructed joint adjacent to the outside shoulders.

3 km

600 m

6.2 One sample shall be taken from each sublot. Refer to Figure 3 for an example of how to select samples using a random sampling plan.

6.3 A core sample taken from a longitudinal vertical joint shall be centered on the line where the joint between the two adjacent lifts abut at the surface as illustrated in Figure 1 below. The center of all vertical joint cores shall be within one (1) inch of this joint line.

25 mm

305 mm

6.4 When the two lanes forming the longitudinal joint have daily theoretical maximum specific gravity values differing by more than 0.050, particular attention should be paid to these core locations. Examine each longitudinal joint core sample to ensure that approximately one-half of the longitudinal joint core sample is from each lane. If the materials in the longitudinal joint core are unbalanced, take a replacement sample at a location within twelve (12) inches longitudinally of the original sample location and adjust the location of the core drill relative to the joint line to ensure approximately equal material on each side of the joint will be obtained in the core sample.

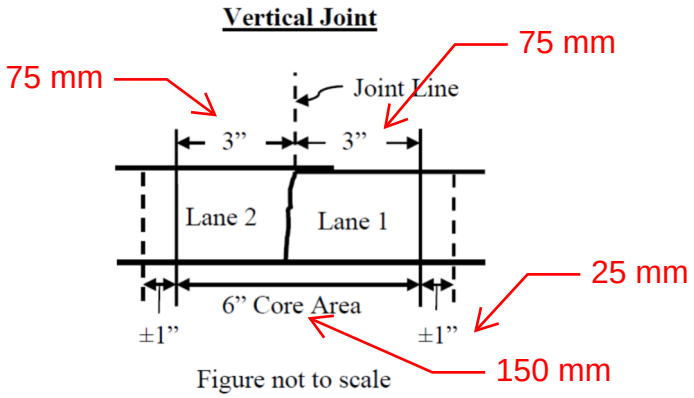


Figure 1 – Cross-sectional View, Position of Core Along Longitudinal Joint

6.5 Samples for joint density shall be used to determine the percent compaction of the finished mat by first determining the bulk specific gravity of each specimen as per AASHTO T331, and then by dividing by the corresponding daily theoretical maximum densities of the paving mixture.

7. GENERAL CORING AND SAMPLING PROCEDURE

7.1 In the presence of the Engineer's representative, the contractor shall core and identify the density acceptance samples as specified in Section 410.7 of the Standard Specifications.

152.4 +/- 0.3 mm

7.2 Efforts should be taken to cool the pavement with ice or other suitable means prior to coring. Using the powered core drill, drill core samples to the specified diameter (6.0 ±0.125 inches) and to a depth sufficiently below the depth of the pavement course to be sampled. Ensure sufficient water is dispersed through the core bit during drilling to keep the drill bit and core sample cool enough in order to allow cutting through the pavement without damaging the sample and the core bit. Carefully and slowly lower the drill bit to the surface of the pavement course at the start of drilling to prevent the drill bit from moving and to obtain a smooth clean initial drill cut at the surface of the core sample. After drilling to a sufficient depth, carefully raise the core drill bit to prevent any damage to the core sample.

7.2.1 Additional care should be taken when laying out and drilling samples for bond strength testing. Prior to drilling the sample, mark the pavement within the area to be cored using a lumber crayon or other suitable means to indicate the direction of traffic. Efforts shall be taken to ensure the core location has cooled sufficiently, and the drill bit is plumb so the sample is not skewed after removal. Skewed samples will likely not be suitable for testing in the shear testing apparatus. Drilling depth shall be such that the core is cut completely through the material immediately underlying the surface lift to prevent the core from pulling apart at the bonded surface during the removal process.

7.3 Carefully dislodge or break the core sample away from the underlying pavement layer. Do not distort, bend, crack, damage or physically change the physical condition of the core sample during this operation.

7.4 Using a hand-held core sample extraction tool, carefully grasp and remove the core sample from the pavement. Do not distort, bend, crack, damage or physically change the physical condition of the core sample during removal from the pavement.

7.5 Immediately after removing the core sample from the pavement, wash off the core sample with water to remove the fine material generated from the drilling operation. Air dry or towel dry the core sample sufficiently to allow identification of the Lot and sublot number on each core sample by using a paint pen, or other suitable means.

7.6 If a core sample includes materials other than the material or pavement course to be tested, clearly show and mark with a paint pen the section(s) of each core sample to be discarded. Core samples suspected of including more than one material and not clearly showing the section to test, and the section(s) to discard, will be considered non-conforming samples and will not be tested until the section to test is identified.

7.7 Once the core sample has been obtained and identified, the Division will take immediate possession of the core sample and store it in a proper environment. Overheating or impact can damage core samples and prevent accurate test results.

7.8 Samples should be placed in separate small plastic bags and stored out of direct sunlight and/or placed in a cooler with enough ice to prevent them from warming up. The sample bags can be marked ahead of time to further help identify individual samples once transported to the lab. Core samples should then be laid in the cooler with the top surface (flat) down on the bottom of the cooler to prevent movement.

7.9 During the same work shift for placement of the sampled asphalt concrete mix, each core hole location shall be backfilled with compacted mixture of the same material being used for paving, or other preapproved method. Efforts shall be taken to clean the hole of loose debris and any standing water shall be removed. If asphalt mixture is used for backfilling, the material shall be placed in lifts, as necessary, and substantial compactive effort shall be applied to each lift using a device comprised of a suitable handle with an attached tamping foot of a size slightly smaller than the core hole. Fuel or solvent based release agents are strictly prohibited during this process. Each core location shall be sealed with an approved crack/joint sealant prior to contract completion.

7.10 After the Lot is completed or has been terminated, or at the end of each day of placement, the Division personnel will transport the core samples from each day of production to the District Materials Laboratory or Materials Control, Soils & Testing Division for additional processing and evaluation.

Example in English Units only

Illustrative Example – Project and Lot Layout

An exactly four-mile-long project is to commence paving within the next couple of weeks along an interstate roadway. The division has contacted the contractor to determine the paving sequence and widths and has confirmed that the approved JMF maximum theoretical density is 2501 kg/m3. For theoretical yield on the project, 94% of 2501 kg/m3 is 2351 kg/m3. Dividing by 1000 and then multiplying by 62.4 PCF, the corresponding density in English units is 146.7 PCF. Using this value, and selecting the proper conversion factor from Table 1 below, the corresponding application rate per square yard at 1.5 inches thick is determined as follows:

Table 1 - Conversion of Design Bulk Density to In-Situ Application Rate

Project Design Thickness (inches)	Conversion for Application Rate (psy)
1.00	0.750
1.25	0.938
1.50	1.125
1.75	1.313
2.00	1.500
2.25	1.688
2.50	1.875
2.75	2.063
3.00	2.250

(Use English units) 146.7 pcf x 1.125 cf/SY = 165 psy (nearest pound)

The corresponding lot area for placement of the material in square yards is then calculated as follows:

(2500 tons x 2000 pounds per ton)/165 psy = 30,303 sy (nearest sy)

Work will begin on the inside fast lane next to the median. The first pull will be 16’ wide. The length of the lot, length per sublot, and total area per sublot is calculated as follows:

30,303 SY x 9 = 272,727 sf

272,727 sf/16 = 17,045’ Total lot length (nearest linear foot)

17,045/5 = 3409’ length per sublot

30,303/5 = 6,061 sy per sublot (nearest sy)

These values will be used to lay out the station for the beginning of each sublot, and to keep track of the breakdown of a sublot that begins on one side of median and then continues on the other side in an opposite direction. The area for each sublot is used when the situation above occurs and there is a change within the sublot to a pull of a different width.

The beginning and ending stations for each lot and sublot shall then be calculated and plotted in continuous fashion. Figure 2 shows a clean project layout using the widths for each pull, beginning and ending stations and how each lot/sublot progress for a complete project. Daily stops can also be approximated and then actual stops shown on a diagram to help keep track of

the entire project. Partial mat and joint lots were addressed along the main travel lanes and new lots were started along the shoulder.

Project Layout By Area - With Estimated Daily Paving Stops

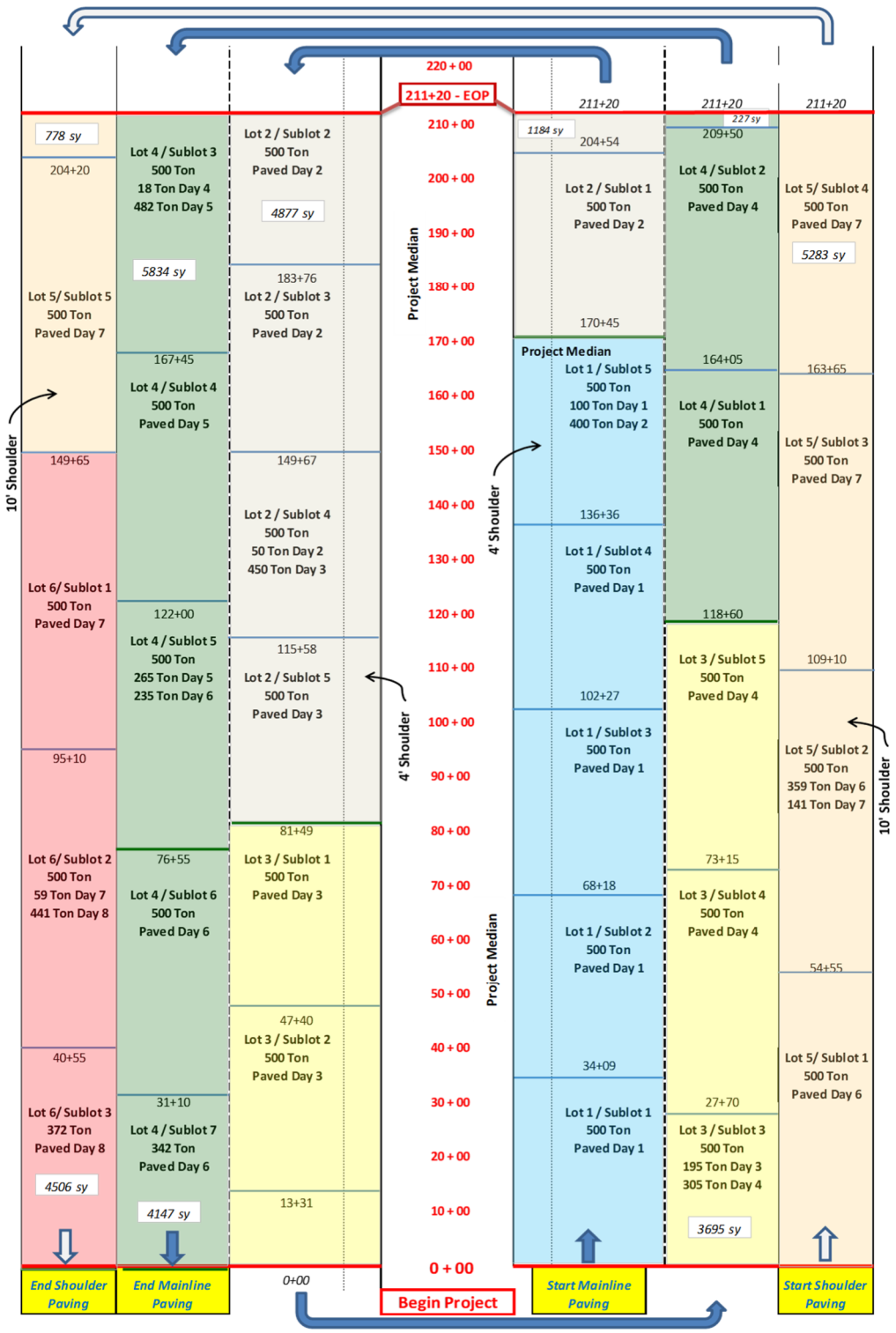


Figure 2

Using Lot 1 from Figure 2, the random sample locations are determined as shown below:

Lot #1-Density Cores

Sublot	Random Numbers		Length	Width
	X (length)	Y (width)		
1	0.632	0.287	0.632 (3409') = 2,155'	0.287 (11') = 3'
2	0.534	0.264	0.534 (3409') = 1,820'	0.264 (11') = 3'
3	0.871	0.159	0.871 (3409') = 2,969'	0.159 (11') = 2'
4	0.753	0.177	0.753 (3409') = 2,567'	0.177 (11') = 2'
5	0.277	0.530	0.277 (3409') = 944'	0.530 (11') = 6'

Lot #1- Bond Strength Cores

Sublot	Random Numbers		Length	Width
	X (length)	Y (width)		
1	0.149	0.155	0.149 (3409') = 508'	0.155 (11') = 2'
2	0.239	0.992	0.239 (3409') = 815'	0.992 (11') = 11'*
3	0.295	0.480	0.295 (3409') = 1,006'	0.480 (11') = 5'
4	0.517	0.473	0.517 (3409') = 1,762'	0.473 (11') = 5'
5	0.805	0.741	0.805 (3409') = 2,744	0.741 (11') = 8'

* Sample should be taken between 10'-11' offset

Using the offsets and lengths within each sublot, the stations and offsets for Mat Density and Bond Strength Core samples are determined as shown below.

Lot #1 - Corresponding Sample Stations for Mat Density –

Sublot	Beginning Station	Length	Sample Station
1	0+00	2,155	21+55, 3' offset
2	34+09	1,820'	52+29', 3 offset
3	68+18	2,969'	97+87, 2' offset
4	102+27	2,567'	127+94, 2' offset
5	136+36	944'	145+80, 6' offset

Lot #1 - Corresponding Sample Stations for Bond Strength

Sublot	Beginning Station	Length	Sample Station
1	0+00	508’	5+08, 2’ offset
2	34+09	815’	42+24, 10’ offset
3	68+18	1,006’	78+24, 5’ offset
4	102+27	1,762’	119+89, 5’ offset
5	136+36	2,744’	163+80, 8’ offset

For purposes of illustration, all locations for loose samples, mat density cores, and bond strength cores are shown in Figure 3 below. Refer to MP 401.07.20 for more information on obtaining loose samples of asphaltic mixture for determination of asphalt content and gradation.

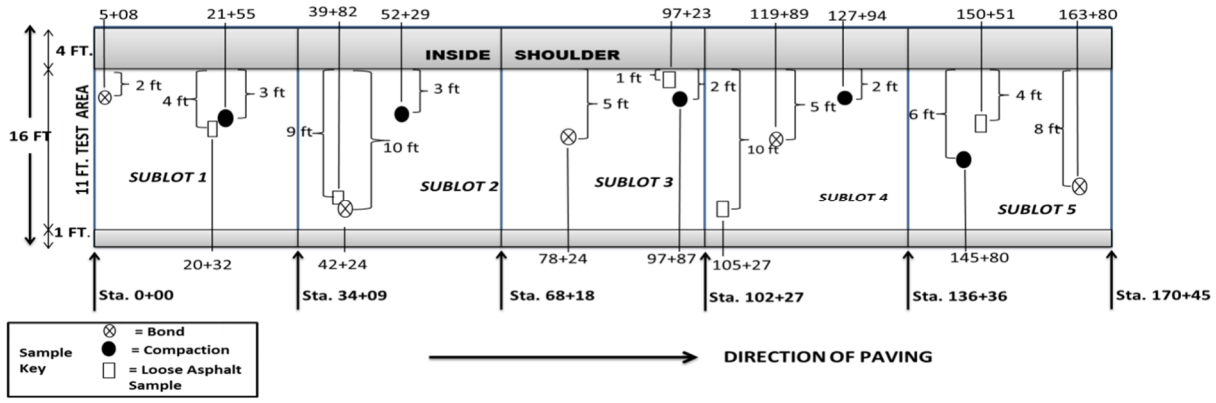


Figure 3

Using the same methodology and following the continuous lots in correspondence to paving sequence, the entire project layout for sampling can be completed as shown in Figure 4. Longitudinal joint lots begin at Station 0+00 between the fast and slow lanes and Joint Lot 1 ends at 10+00. Joint Lot 3 begins at Sta. 20+00 and continues to the other side of the median and extends the amount of the lot remaining.

After Figure 4, a summary is shown to help quantify the daily and total sampling efforts for the project.

Project Layout with Sampling Plan - Density and Bond Cores, Loose Mix Samples

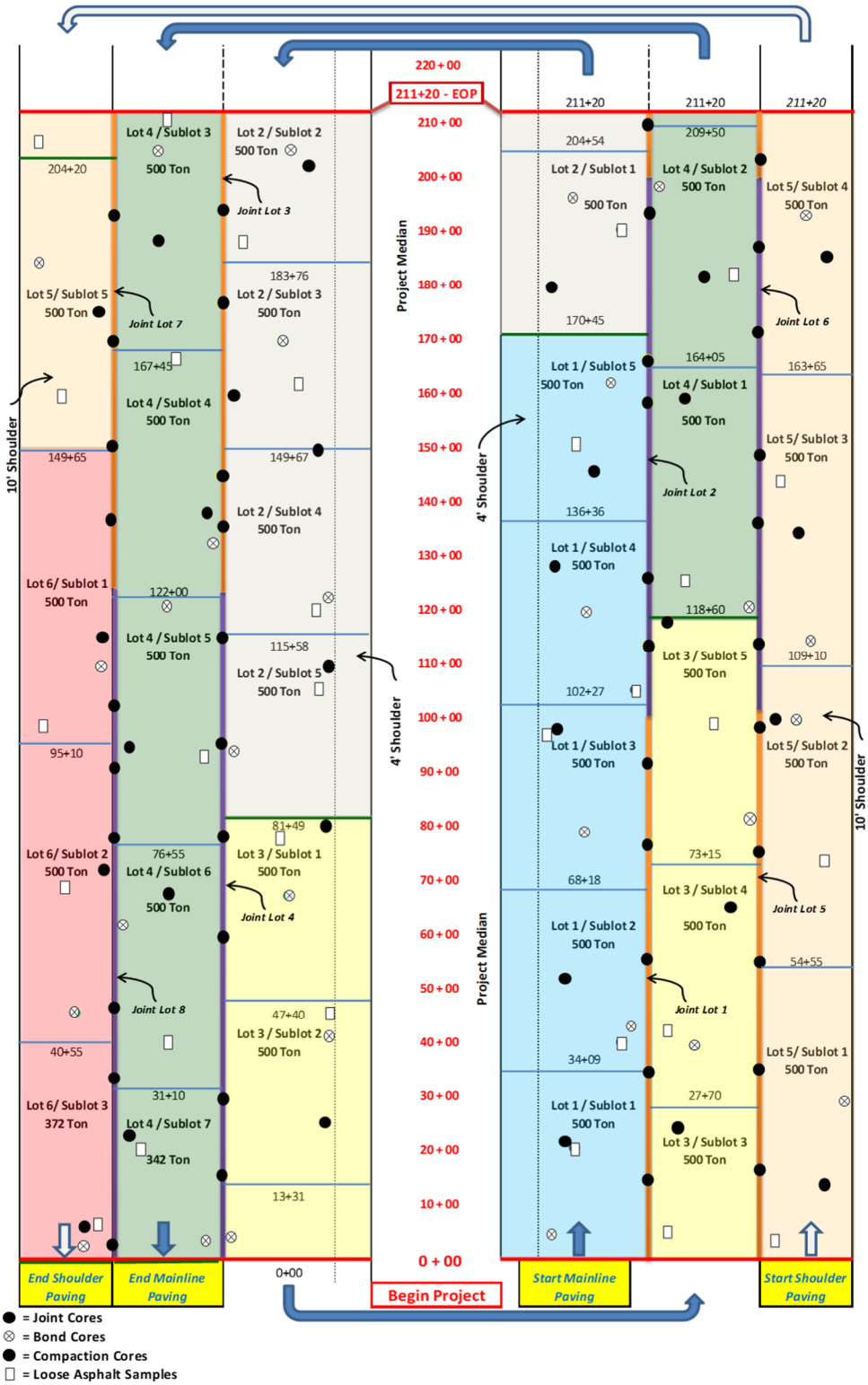


Figure 4

Table 2 – Testing Summaries from Daily and Total Production

	Loose Sample	Density Core *	Bond Core *	Joint Cores
Day 1	4	4	4	0
2100 Ton	4 --> Lot 1	4 --> Lot 1	4 --> Lot 1	
Day 2	4	5	4	0
1950 Ton	1 --> Lot 1	1 --> Lot 1	1 --> Lot 1	
	3 --> Lot 2	4 --> Lot 2	3 --> Lot 2	
Day 3	4	3	5	0
2145 Ton	2 --> Lot 2	1 --> Lot 2	2 --> Lot 2	
	2 --> Lot 3	2 --> Lot 3	3 --> Lot 3	
Day 4	5	5	4	11
2323 Ton	3 --> Lot 3	3 --> Lot 3	2 --> Lot 3	5 --> Lot 1
	2 --> Lot 4	2 --> Lot 4	2 --> Lot 4	5 --> Lot 2
				1 --> Lot 3
Day 5	2	2	3	5
1265 Ton	2 --> Lot 4	2 --> Lot 4	3 --> Lot 4	4 --> Lot 3
				1 --> Lot 4
Day 6	5	4	3	9
1918 Ton	3 --> Lot 4	3 --> Lot 4	2 --> Lot 4	5 --> Lot 4
	2 --> Lot 5	1 --> Lot 5	1 --> Lot 5	4 --> Lot 5
Day 7	3	5	4	13
2200 Ton	1 --> Lot 5	2 --> Lot 5	2 --> Lot 5	1 --> Lot 5
	2 --> Lot 6	3 --> Lot 6	2 --> Lot 6	5 --> Lot 6
				5 --> Lot 7
				2 --> Lot 8
Day 8	3	2	3	4
812 Ton	3 --> Lot 6	2 --> Lot 6	3 --> Lot 6	4 --> Lot 8
		* *Measured for Thickness*		
Totals :	**30**	**30**	**30**	**42**
	6 Lots	**6 Lots**	**6 Lots**	**8 Lots**
	60 Cores Measured for Thickness			

Table 3 - 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

08/23/2023

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

MP 401.07.21 Steward – Asphalt Section
RLS: J

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

MATERIALS CONTROL, SOILS AND TESTING DIVISION
MATERIALS PROCEDURE

BASIS FOR CHARGES FOR NON-SUBMITTAL OF SAMPLING & TESTING DOCUMENTATION BY THE ESTABLISHED DEADLINE

1. PURPOSE

1.1 To provide a unit cost per test to be assessed to the Contractor when testing documentation or samples are not submitted by the Contractor by the established deadline. Periodic updates of this Attachment shall be the responsibility of the Director of Materials Control, Soils and Testing Division or their designee (Director).

2. REFERENCED DOCUMENTS

2.1 MP 109.00.22 – Procedure for the Submission and Documentation of Test Results

3. SCOPE

3.1 This procedure is applicable to circumstances where a construction item's testing documentation or samples are not submitted by the deadline established in this document. In the case of a general item, this timeframe is seven (7) days from the sampling date. The timeframe for special-case items such as gradations and cylinder breaks is noted in Attachment 1.

3.1.1 All of the following requirements shall be met to meet the above-defined timeframe:

3.1.1.1 Documentation submission includes: (A) generating the sample in the Division Approved Sampling and Testing software (SiteManager, AASHTOWare Projects, etc.), (B) entering all data into this system, (C) presenting the data to the District for review and (D) providing all testing documentation. The process for the submittal of test results is documented in MP 109.00.22.

3.2 The penalty for an infraction as described in Section ~~23~~.1 is $700 per test. In the instance where a single test comprises of a prescribed series of sub-tests (typically 5), the cost of each infraction will be the standard rate divided by the total number of required sub-tests. This is only applicable in the certain circumstances as noted in Attachment 1.

3.2.1 This procedure is not limited to tests listed in Attachment 1, but applicable to any material test required by the Standard Specifications and/or Materials Procedures. For this case, the Director will establish the timeframe for the test or may utilize the standard timeframe as described in Section ~~23~~.1. The rate shall follow Section ~~23~~.2.

4. ABSENT TESTING DOCUMENTATION OR FAILURE TO TEST

4.1 In no case shall this Materials Procedure allow for the acceptance of non-tested material. In the case where no testing was performed, or no documentation was submitted for the material, the resolution for the acceptance of the material shall be in accordance with the applicable section(s) of the Standard Specifications and Materials Procedures. Additionally, and regardless of the outcomes of this resolution, a price assessment in accordance with Attachment 1 shall also be assessed.

Michael A. Mance, PE
~~Interim~~ Director
Materials Control, Soils & Testing Division

MP 109.00.21 Steward – Materials Control Section
MM:B
ATTACHMENT

Cost Penalties Per Test

Material Category	Test and Rate	Testing Time Frame (Days)	#Cost/Sub Test	Cost
Soil and Aggregate	In-Place Density (5 tests)	*T	0.2 (*Rate)	*Rate
	Gradation (Each Test)	14		*Rate
	Liquid and Plastic Limits	*T		*Rate
	Crushed Particle Analysis	14		*Rate
Asphalt	Asphalt Mixture Test	*T		*Rate
	In-Field Density Testing	*T	0.2 (*Rate)	*Rate
Chip Seal	Gradation (Each Test)	*T		*Rate
Concrete	Abar	14		*Rate
	Optimized Gradation	14		*Rate
	Cylinder Test	35		*Rate
	Rapid Chloride Permeability	*T		*Rate
	Air and Slump (1 test)	*T		*Rate
Grout	Grout Break Report (Each Test)	*T		*Rate
	Grout Strength Report	*T		*Rate
CLSM	Cylinder Test	35		*Rate
	Flow Test	35		*Rate

*T - Standard timeframe as described in Section 2.1

*Rate - Standard rate as described in Section 2.2

#Cost/Ea - Unless there is rate in this column, each infraction results in the full rate

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

PROCEDURE FOR THE SUBMISSION AND DOCUMENTATION OF QUALITY CONTROL TEST RESULTS

1. PURPOSE

1.1 To provide guidance for the streamline submission of test results documentation from the Contractor to the District.

2. REFERENCED DOCUMENTS

2.1 MP 109.00.21 – Basis for Charges for Non-Submittal of Sampling & Testing Documentation by the Established Deadline

3. DEFINITIONS

3.1 AWP: AASHTOWare Projects – The Division Approved Sampling and Testing Documentation Software.

3.2 Authorize: In AWP, the action in which a sample record is "completed" or "finished", regardless of the final sample status.

4. SCOPE

4.1 As required by MP 109.00.21, contractors must submit their Quality Control test results by the deadline specified in that document.

4.2 The submission of results includes the following steps: (A) generating the sample in the Division Approved Sampling and Testing software (SiteManager, AASHTOWare Projects, etc.), (B) entering all data into this system, (C) presenting the data to the District for review and (D) providing all testing documentation.

4.2.1 This procedure expands on each of these points.

5. GENERATION OF A SAMPLE RECORD IN AASHTOWARE PROJECTS

5.1 Test results shall be documented in AWP (or the current Division Approved Sampling and Testing Documentation Software) using the live version of the training guides available on the WVDOH MCS&T Webpage[1]. A sample of these guides is provided in Attachment 1.

6. ENTERING OF TEST DATA.

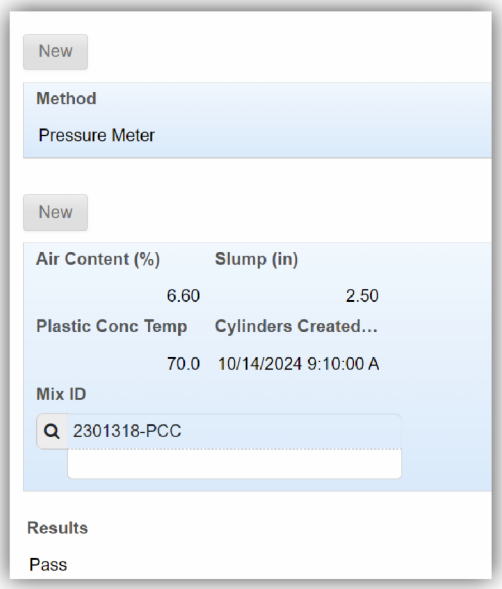
6.1 All applicable data shall be entered into AWP. This shall include all required fields as shown in the live version of the training guides available on the WVDOH MCS&T Webpage. A sample of these guides is provided in Attachment 1.

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

6.1.1 This data includes test results such as compacted density, or percentage of material passing a specific sieve.

6.1.2 Figure 1 shows an example of test data entered into AWP.

Figure 1 – An Example of Test Data Entered into AWP.



7. PRESENTING THE DATA TO THE DISTRICT FOR REVIEW AND SUBMITTING TESTING DOCUMENTATION

7.1 Once the test data has been entered, the data must be submitted to WVDOH.

7.2 An email shall be sent by the Contractor to the District Approved email submission inbox. An example of this email is shown in Attachment 2. A list of these inboxes is available on the WVDOH MCST Toolbox Webpage[2].

7.2.1 The title of the email shall contain the Contract ID and the Name of the Project, as well as "QC Test Results".

7.2.2 The body of the email shall contain, but not be limited to the following information:

1. Contract ID
2. Name of the Project
3. Lab Reference Number
4. Sample ID
5. Material Name
6. Line Number(s)
7. Final Status of the Material (Pass/Fail/Information Only)
8. A direct link to the AWP Sample Record
9. A PDF scan of all test data

7.3 Unless otherwise directed by the District, only one complete test (AWP link) may be entered per email.

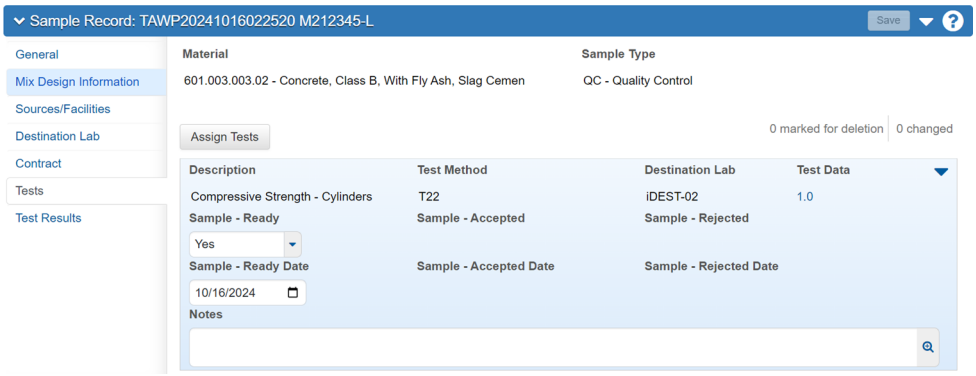
[2] https://transportation.wv.gov/highways/mcst/Pages/tbox.aspx

7.3.1 For example, if you have two sets of cylinder breaks, they must be sent on two separate emails.

7.3.2 If there are multiple tests associated with one sample record (for example slump and air), these can be submitted in one email.

7.4 Once the sample record is ready to be submitted, the user will mark the test complete on the Sample Record. An example of this action is shown in Figure 2.

Figure 2 – An Example of a Submitted Sample Record into AWP.

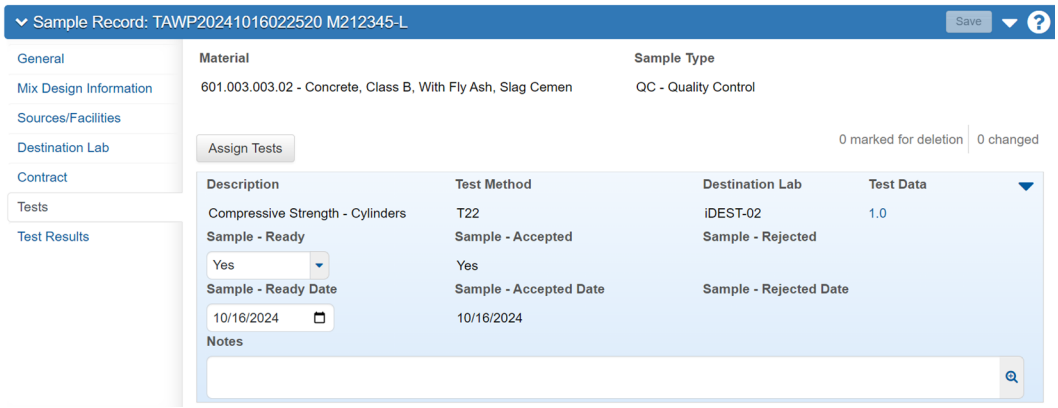


8. RECEIVING OF SAMPLES BY THE WVDOH

8.1 Once the District has received and accepted the sample record, they will "authorize" the sample.

8.2 The District will also mark the sample as "Sample-Accepted" on the sample record tests tab. An example of the completed screen is shown in Figure 3.

Figure 3 – An Example of an Accepted Sample Record into AWP.



8.3 Once accepted, the District shall reply to the submission email stating that the sample record has been accepted.

8.4 If rejected, the District will mark the Sample as "rejected" with the rejection date. The District will then reply to the original email, stating the reasons for the rejection.

MP 109.00.22 Steward – Materials Control Section
MM:B
ATTACHMENT

ATTACHEMNT 1 (from Webpage)

ATTACHMENT 2 – Sample Email Submission

Subject Line: 20240001243 – Contract Name – QC Test Results

Dear Scott,

I am submitting the following Sample Record:

20240001243
WV 19 to Allen's Run
C1N-1234
TAWP20241016022520
Class B Concrete with Fly Ash
LN 0020, LN 0030
Pass

https://wvdot-pr-prod.infotechinc.com/#/SampleRecord/44209/Summary

Attached is the Testing Documentation (PDF)

Very Truly Yours,

Jimmy John, from Tom's Construction.

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

MATERIALS PROCEDURE

INSPECTION AND ACCEPTANCE PROCEDURES FOR PRECAST CONCRETE PRODUCTS

1. PURPOSE

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

2. SCOPE

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

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

3. FABRICATOR APPROVAL

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

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

3.2.1. All fabricators must set up their invoicing as an E-Ticket that meets the requirements of Section 109.20.1 of the Standard Specification prior to approval.

3.3. The process for approving a Fabricator shall include, but not be limited to, an on-site visit to the fabrication plant by a WVDOH representative from MCS&T Division. During this visit, the WVDOH Quality Assurance (QA) personnel shall inspect the fabrication facility, the Quality Control (QC) lab, and meet with QC and other key personnel from the Fabricator. Component materials which will be used in the fabrication of precast items shall be sampled for testing. Batch scales shall be calibrated in accordance with MP 700.00.03 at a minimum once per year.

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

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

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

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

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

3.5. The Fabrication Plant QC Personnel, as a minimum, shall be a certified ACI Grade I Concrete Field Testing Technician and/or a WVDOH PCC Inspector. In addition, if Self-Consolidating Concrete (SCC) is used, Fabrication Plant QC Personnel shall be a certified ACI SCC Testing Technician.

3.6. All Precast Concrete items shall be accepted by Direct or Master Coverage except when a Fabricator is certified as an Approved Source of concrete lagging as defined in Section 7.

4. FABRICATION & INSPECTION OF PRODUCTS FOR DIRECT & MASTER COVERAGE

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

4.1.1. Depending upon the precast items being fabricated, MCS&T Division may choose to monitor fabrication. Fabrication of structurally significant products such as box

culverts and 3-sided bridge units shall be monitored. Other items may be monitored at the discretion of MCS&T.

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

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

4.3. Concrete cylinders shall be made for compressive strength testing with 6-inch by 12-inch or 4-inch by 8-inch molds. The cylinders are to be cured in the same area as the products for which they represent (Field Cured as outlined in AASHTO R100) until tested to create a curing environment similar to the product that they represent. A compressive strength test shall consist of the average result of a set of cylinders, which is at least two cylinders. Form removal for wet cast concrete is not permitted until concrete has reached 50% of the design strength, unless otherwise specified. If forms are stripped from box culverts at 50% of the design strength, another curing method from section 601.12, or ASTM C1577 must be used until 70% of the design strength is obtained. Form removal limitations do not apply to elements fabricated with dry cast concrete. Dry cast concrete is defined as concrete with a slump less than 1-inch.

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

4.3.2. For dry cast mixes, the 28-day strength shall be confirmed by a set of compressive strength cylinders. Compressive strength testing for form removal is not required for dry cast mixes. A minimum of one set of 28-day compressive strength cylinders shall be fabricated from every ~~14~~20 cubic yards of concrete, or fraction thereof, with a minimum of one set per day per mix design. The cylinders are to be fabricated in the molds on the vibration table in accordance with ASTM C497. For dry cast mixes, slump testing is not required, and concrete temperature testing shall be performed on the first batch of concrete each day and every time that cylinders are fabricated.

4.4. For precast manholes fabricated with wet cast and SCC mixes, absorption tests are to be conducted in accordance with ASTM C642. Tests should be conducted on a weekly basis for each mix design used, at a minimum, unless otherwise specified.

4.5. For precast products fabricated with dry cast mixes, absorption tests are to be conducted in accordance with ASTM C642, and tests should be conducted on a weekly basis for each mix design used. The maximum allowable absorption shall be 9%.

4.6. Unless otherwise specified, for conventional wet cast and SCC mixes, plastic concrete shall have an air content measured at 7.0 ± 2.0%. For dry cast concrete, the air content test requirement is waived.

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

Table 4.6.1 - SCC Mix Design Acceptance

Fresh Property	**Mix Design Batch Acceptance Criteria**
Air Content	7.0± 1.5%
Spread (ASTM C1611)	Target ± 1.5 inches 2 seconds $\leq T_{50} \leq$ 7 seconds Visual Stability Index ≤1.0
Passing Ability (ASTM C1621)	J-Ring Value $\leq$ 1 inch
Segregation Resistance (ASTM C1610)	Segregation ≤ 12%
Unit Weight and Yield	±2% of Theoretical

4.6.2. The following table lists the criteria for SCC production.

Table 4.6.2 - SCC Production Acceptance

Fresh Property	**Production Acceptance Criteria**
Air Content	7.0± 2.0%
Spread (ASTM C1611)	Target ± 2 inches 2 seconds $\leq T \leq$ 7 seconds Visual Stability Index ≤1.0
Concrete Temperature	<90°F
Unit Weight and Yield	±2% of Theoretical

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

4.6.4. Precast products fabricated with dry cast concrete shall be limited to a maximum wall thickness of 12 inches when single sided vibration is used and 18 inches when double sided vibration is used.

5. FINAL INSPECTION

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

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

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

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

6. ACCEPTANCE & REJECTION

6.1. Upon completion of final inspection, if a precast product meets all specification requirements and does not contain any defects, the Inspector will stamp the precast product as accepted by MCS&T Division and provide a 7-digit Laboratory Reference Number for shipment.

6.1.1. Shipping invoices shall document the assigned Laboratory Reference Number, type of material, number of pieces, size, and cast dates. All Division invoicing must be submitted as an E-Ticket to the project that meets the requirements of Section 109.20.1 of the Specifications.

6.2. If, however, the precast product does not meet all specification requirements due to damage, defect, or dimensional tolerance, the product must be further evaluated before potential acceptance by the MCS&T Division as described in the following subsections.

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

6.2.1. Minor defects may be repaired in accordance with the pre-approved repair procedures which should be incorporated within the Fabricator QC Plan. Cracks 4 mils or less shall be sealed by silane; and cracks between 4 mils and 16 mils shall be repaired by epoxy injection in accordance with Section 603.10.2. Any crack exceeding 16 mils shall be considered a major defect and the item shall be rejected by MCS&T. If repairs have been approved, and appear satisfactory and all other specifications are met, the Inspector shall stamp the product as approved for shipment and issue a 7-digit Laboratory Reference Number for acceptance.

6.2.2. Major defects shall include dimensions that exceed tolerances, failure to reach required compressive strength, cracks greater than 16 mils, and any defect that could be considered structural. Lagging dimensions shall be within ± ¼'' from the specified dimension, and all other items must meet relevant tolerances in AASHTO and ASTM Standards. Items with major defects shall be rejected by MCS&T Division, and a 7-digit Laboratory Reference Number will be assigned documenting MCS&T Division's rejection. When items are load bearing, they shall be evaluated by the Designer for structural adequacy and then may be accepted by DMIR, pending concurrence by the District, and or the Engineer of Record. If a product is approved for repair, and if repairs appear satisfactory, the Inspector shall proceed with a final shipping inspection of the piece. Any items found to be not acceptable by the Engineer of Record, Designer, or the District/Division; shall be rejected by the Division.

6.2.3. When an item does not achieve the specified 28-day compressive strength prior to shipment, and if it is accepted by a DMIR, the following formula for the price adjustment shall be used in the DMIR, plus any administrative fee.

f'_c – 28 Day Compressive Strength (psi)
$\overline{X}$ – Average 28 – day Compressive Strength (psi)
IC - The invoiced cost of the precast item only.

Formula 1 (Constructed by Contractor)

$$\text{Price Reduction} = \left[\frac{f'_c - \mathbf{X}}{.5\, f'_c}\right] x\ 40\%\ \text{Unit Bid Price}$$

Formula 2 (Constructed by Division)

$$\text{Price Reduction} = \left[\frac{f'_c - \mathrm{X}}{.5\, f'_c}\right] x\ \mathrm{IC}$$

7. PROCEDURE FOR APPROVED SOURCE OF PRECAST CONCRETE LAGGING

7.1. Precast concrete Fabricators may be classified as an Approved Source of precast concrete lagging if they have met the requirements of Section 3 and are producing lagging which is made in accordance with the relevant WVDOH Standard Details.

Once classified as an Approved Source of precast concrete lagging, an Approved Source Lab Number will be assigned to the Fabricator for material tracking.

7.2. MCS&T Division may perform regular quality assurance inspections prior to shipment and/or, monitor fabrication of lagging from a Fabricator that is an Approved Source. The Approved Source Lab Number shall be noted on all shipping documents from the fabricator, and material coverage will be requested under the assigned Approved Source Lab Number. All relevant concrete test data, component material information, QC inspection data, and shipping information shall be kept on file at the Fabricator for the last three years of fabrication and shall be available upon request by the Division. Failure to produce requested documentation may result in revocation of the Fabricator's Approved Source certification status.

7.3. Approved Sources will be evaluated by the Division by random audits. Audits will be conducted on the material that is available to the Inspector at the time of the audit. All documentation and records for the pieces must be made available to the Inspector on the day of the audit and must be complete, current, and accurate. Failure to produce records shall be a cause for decertification.

7.3.1. All shipping documentation, concrete test data, and component material certifications shall be made available to the Inspector for review. These documents shall include all documents from material that has been shipped to state projects since the last audit. If data indicates that any material did not conform to this MP, the applicable Specifications, or Standard Detail; and was used in a state project, then the Fabricator will be de-certified as an Approved Source of precast concrete lagging.

7.3.2. In addition to documentation, the audit will consist of fabrication monitoring, test observance, and a visual inspection of material that is stocked for shipping on the day of the audit.

7.3.2.1. Each material test monitored during the audit must be performed in accordance with the applicable Standards, and Specifications. Visual inspection of stocked material will include quality checks of surface finish for cracks, spalls, and other surface blemishes after all repairs have been performed and dimensional checks. The material shall be properly stored to avoid handling damage and be accessible to the Inspector. Audits shall be graded on a point system deducted from 100 and weighted based on the Non-Conformance Points found per Table 7.3. A minimum score of 75 shall be considered passing.

TABLE 7.3

Audit Category	**Non-Conformance Points**
Material Test Data Review	10 (per error)
Component Material Certification Review	10 (per error)
Shipping Documentation	10 (per error)
Stocked Material Visual Inspection	15 (per defect)
Dimension Check	20 (per error)
Test Performance Check	15 (per Test)

7.4. When a Fabricator, which is an Approved Source, fails an audit, the Fabricator must submit a written corrective action plan to bring their QC program back into compliance with this MP and corresponding Specifications during a probationary period of one month during which time the fabricator must prove they have fulfilled the corrective actions they submitted before supplying the material again. If the Fabricator fails to bring their material back into compliance within the probationary period, the Approved Source status will be revoked for a minimum of one year from the date of the end of the probationary period, or until the Fabricator has corrected the nonconformances listed during the failed audit. Two failing audits in a year shall result in revocation of the Fabricator's Approved Source status for one year from the date of the last failed audit. Any evidence of document falsification shall result in immediate loss of Approved Source status, and removal from the Approved List of Concrete Fabricators for a minimum 2 years. Depending on the severity and the legality of the falsified documents the removal may be permanent.

7.5. Non-Conforming material received by WVDOH projects and reported to MCS&T shall result in an immediate failing audit and will require the Fabricator to submit corrective actions. If the Fabricator fails the subsequent audit, it will result in the loss of their Approved Source status.

Michael A. Mance, P.E.
~~Interim~~ Director
Materials Control, Soils and Testing Division

MP 604.02.40 Steward – Cement and Concrete Section
MM:T
ATTACHMENT

PRECAST CONCRETE PRODUCTS
WVDOT DIVISION OF HIGHWAYS MCS&T DIVISION

SAMPLE FABRICATION CHECKLIST

Preliminary Verifications

NPCA (National Precast Concrete Association) Certification _____

CONCRETE COMPONENTS

Mix Design Lab # (if applicable): _____

Cement Source: _____ **Fly Ash Source:** _____

Coarse Aggregate Source 1: _____ **Coarse Aggregate Source 2:** _____

Cement Type: _____ **Approved/Tested:** _____

Fly Ash Type: _____ **Approved/Tested:** _____

Coarse Aggregate 1: _____ **Approved/Tested:** _____

Coarse Aggregate 2: _____ **Approved/Tested:** _____

Fine Aggregate 1: _____ **Approved/Tested:** _____

Fine Aggregate 2: _____ **Approved/Tested:** _____

Batch Water Source: _____ **Approved/Tested:** _____

Admixtures: _____

STEEL COMPONENTS

Reinforcement: Supplier(s): _____

Description: _____ **Lab Number:** _____

Description: _____ **Lab Number:** _____

Description: _____ **Lab Number:** _____

Inserts: Supplier(s): _____

Description: _____ **Lab Number:** _____

_____

_____

SHIPLOOSE MATERIAL

Grates: Fabricator: _____

Mill Certs.: _____ **Galvanize Cert.:** _____ **Lab Number:** _____

Mastic: Fabricator: _____

Inspected at: _____ **Lab Number:** _____

SHOP DRAWING REVIEW

Approval Date: _____ **Approved By:** _____

PRECAST CONCRETE PRODUCTS
WVDOT DIVISION OF HIGHWAYS MCS&T DIVISION
SAMPLE FABRICATION CHECKLIST

Preliminary Verifications

POST POUR WORK

Repairs: **Approved Repair Procedures: ____**

Approved by: _____ **Approval Date: _____**

Repair Witnessed: _____

Comments: _____

Sample Form Inspection (Pre-Placement of Concrete)

Product Type (s)				
Criteria	**Design Dimension**	**Tolerance (±)**	**Actual Measurement**	**Within Tolerance**
Fill in Form Information (if applicable)				
Height of Product (ft-inch)				
Depth of form (ft-inch)				
Inside Width of form (inch)				
Outside Width of form (inch)				
Inside Length of form (inch)				
Outside Length of form (inch)				
Wall Thickness (inch)				
Forms Square and Level (√)				
Skew dimensions [if applicable (ft-inch)]				
Locations of inserts, sleeves, block outs, etc. (√)				

Product Type(s)		**Form Properly sealed at joints & edges (√)**	
Framework Constructed of metal on concrete foundation (√)		**Form Clean & Free of debris (√)**	
Form dimensionally correct (√)		**Release Agent applied (√)**	
Other Information:			

Reinforcing Steel	
Reinforcing Steel (Condition)	
Fill in steel information (if applicable)	
Size & Grade	
Location & Lapping Length (√)	
Spacing and Clearances (√)	
Chairs, Spacers properly used	

Sample Concrete Placement & Curing

Quality Control Concrete Testing			
Concrete Truck Arrival Time		**Concrete Truck Departure Time**	
Concrete Temp		**Ambient Temp, Weather Conditions**	
Slump/Spread (inch)		**Air Content (%)**	
QC Tests performed per Specifications & Passing		**Number & diameter (inch) of Cylinders**	
Comments:			

Placement of Concrete			
Lift	**Start Time**	**Completion Time**	**Vibrated (External/Internal/Both)**
1st			
2nd			
3rd			
4th			
Placement of Concrete Completion Time			
Comments:			

Curing/Finishing of Concrete	
Top Surface Finished Per Specification	
Lifting loops/inserts accessible	
Product Curing Location (Inside/Outside)	
Product Covered & Heat Applied (Time Start & Time Finished)	
Heat Sensors Installed (√)	
Compressive Strength Cylinders Stored with Product under Curing/Normal Environment (√)	
Compressive Strength Test Conducted when curing was discontinued (√)	
Comments:	

Sample Concrete Post Pour Product Inspection

Product	
Visual Inspection for Damage (√)	
Notes (Size & Location of cracks, spalls, honeycomb, etc.)	
Products in Need of Repair (√)	
Repair Method Approved (√)	
Comments:	

Product Type (s)				
Criteria	**Design Dimension**	**Tolerance (±)**	**Actual Measurement**	**Within Tolerance**
Fill in Form Information (if applicable)				
Height of Product (ft-inch)				
Inside Width of product (inch)				
Outside Width of product (inch)				
Inside Length of product (inch)				
Outside Length of product (inch)				
Wall Thickness (inch)				
Product Square and Level (√)				
Skew dimensions [if applicable (ft-inch)]				
Locations of inserts, sleeves, block outs, etc. (√)				

Product	
Dimensional Tolerances Met? (yes or no)	
Heights (yes or no)	
Widths (yes or no)	
Depths (yes or no)	
Wall Thickness(es) (yes or no)	
Inserts, sleeves, lifting points, etc. (yes or no)	
All Concrete Finishes per specification (yes or no)	
Product properly transported (yes or no)	

Product stored on proper dunnage (yes or no)	
Design Shipping Strength met (yes or no)	
Repairs Satisfactory (yes or no)	
Product Stamped for Final Inspection (yes or no)	
Comments:	

Sample Inspection Sheet

Inspection Date_____ QC Personnel_____ QC Signature_____

Fabricator_____ Location_____

Project Name_____ WV State Project #_____ Federal Project #_____

Authorization # _____ Inspection done by_____

Steel Reinforcement

Reinforcement Supplier _____

Description_____ Approved Lab #_____

Description_____ Approved Lab #_____

Description_____ Approved Lab #_____

Product Description	Quantity	Date Cast	Slump/ Spread (inch)	Air Content (%)	Design Strength (psi)	Cylinder Breaks (psi)	Date Of Break	Absorption (%)
Type "D" inlet								
Type "G" inlet								
36-inch Manhole (base, riser, top)								
48-inch Manhole (base, riser, top)								
10'0"x 12'0" Box Culvert								NA
Lagging 8"x24"x54"								NA
Type A Reinforced Panel								NA
6'0" Coping								NA
24-inch Wing wall								

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 soil and aggregate compaction tests on WVDO~~H~~T projects.

2. SCOPE

2.1 This procedure is applicable for locating all compaction tests.

3. EQUIPMENT

3.1 Measuring tape, approximately 50 feet.

4. DEFINITIONS

4.1 Test Section- A test section is an isolated quantity of material used to determine the maximum density and optimum moisture content of the material using the roller pass method.

~~3.1~~4.2 Lot- A lot is an isolated quantity of specified material from a single source or a measured amount of specified construction assumed to be produced by the same process.

~~4.~~5. PROCEDURE

~~4.1~~5.1 Compaction test site locations ~~are to~~ shall 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~~5.2 Selection of random numbers:

~~4.2.1~~5.2.1 Determine the number of test sites which will be required for the lot or test section.

~~4.2.2~~5.2.2 The table of random numbers (Table 1~~I~~ attached) or a calculator, which will generate random numbers, can be used.

~~4.2.3~~5.2.3 The table of random numbers contains 5 sections with 2 columns of numbers in each section.

~~4.2.3.1~~5.2.3.1 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~~5.2.3.2 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.

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

~~4.2.3.3~~5.2.3.4 Round to the nearest whole number when calculating the test site location.

~~4.3~~5.3 Location of test sites:

~~4.3.1~~5.3.1 There are many variations in the required number of tests and the physical dimensions of the area to be tested.

~~4.3.2~~5.3.2 Random location of tests on a single lift that rectangular in shape (see Example 1 of Attachment).

~~4.3.2.1~~5.3.2.1 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 compacted density of a material to be divided into equal sublots or subsections when more than one test is required.

~~4.3.2.2~~5.3.2.2 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~~5.3.2.3 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~~5.3.2.4 Select the random numbers according to ~~4.2 through 4.2.3.3~~sSection 45.2.

~~4.3.2.5~~5.3.2.5 Multiply the length of the subsections or sublots by the random numbers selected for the length. 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.

Commented [DB1]: Check all references

~~4.3.2.6~~5.3.2.6 Next multiply the width of the test section or lot by the random numbers selected for the offset. The offset can be calculated from the left or right side of the test area and test location designated in relation to centerline. If the test site falls on the edge of the lot or sublot, move 2 feet into the lot and perform the test at that location. Alternatively, a new set of random numbers can be used to avoid this occurrence.~~.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..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.~~

~~4.3.2.7~~5.3.2.7 When the centerline is not contained within the area to be tested, the offset distance of the lot or test section from the centerline shall be determined. 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 5.3.2.7 to the constant value. The values establish the offset distance of each test site from the centerline. Designate if the offset is left or right of centerline.~~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~~5.3.3 Random location of test sites on a single lift that is irregular in shape (see Example 2 attached):

~~4.3.3.1~~5.3.3.1 Determine the dimensions of the area to be tested.

~~4.3.3.2~~5.3.3.2 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~~5.3.3.3 Divide the rectangle into the desired number of subsections or sublots and randomly locate the test sites locations as in sections 5~~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.

5.3.4 Random selection of lifts to be tested (see Example 3 attached):

5.3.4.1 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 shall be tested.

5.3.4.2 Determine the projected number of lifts to be contained within 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.

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

5.3.4.4 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.

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

5.3.4.6 The test site location can be found by multiplying the length of the lot by the first column of random numbers in the section. The offset of the test site location can be calculated by multiplying the second column of random numbers in the section by the width of the lot, if applicable.

5.3.5 Random selection of the side of backfill for pipe culverts:~~.~~

5.3.5.1 When a lot of pipe backfill is being tested, tests shall be performed on both sides of the pipe. The side to be tested shall 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 or equal to 0.500 on the right side of the pipe.

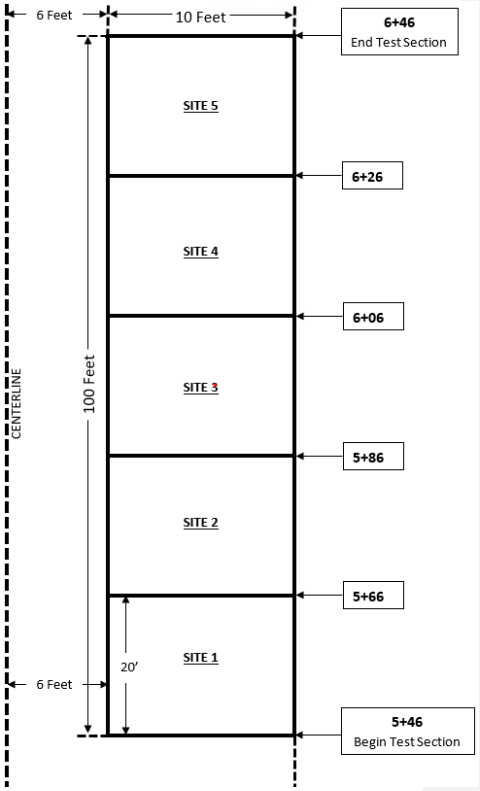
5.3.5.2 The test site location's length is calculated by multiplying the denoted random number by the length of the lot of the pipe backfill.

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
A. 5+46
B. 5+46 + 20 = 5+66
C. 5+66 + 20 = 5+86
D. 5+86 + 20 = 6+06
E. 6+06 + 20 = 6 +26

Random Numbers

	Length	Width
A.	.869	.222
B.	.562	.036
C.	.481	.791
D.	.599	.966
E.	.464	.747

Multiply the length of each subsection by the random numbers for the length.
A. 20 x .869 = 17
B. 20 x .562 = 11
C. 20 x .481 = 10
D. 20 x .599 = 12
E. 20 x .464 = 9

Add the values to the beginning station numbers of each subsection to determine the station number for each test.
A. 5+46 + 17 = 5+63
B. 5+66 + 11 = 5+77
C. 5+86 + 10 = 5+96
D. 6+06 + 12 = 6+18
E. 6+26 + 9 = 6 +35

Multiply the width of each subsection by the random numbers for the width.
A. 10 x .222 = 2
B. 10 x .036 = 0
C. 10 x .791 = 8
D. 10 x .966 = 10
E. 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 .
A. 6 + 2 = 8 ft right of centerline
B. 6 + 0 = 0 ft right of centerline → Test shall be taken 28 ft right of centerline
C. 6 + 8 = 14 ft right of centerline
D. 6 + 10= 16 ft right of centerline
E. 6 + 7 = 13 ft right of centerline

Metric example deleted

Commented [DB2]: Adam O to work on updating this example with compaction coordinator.

EXAMPLE 2

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.

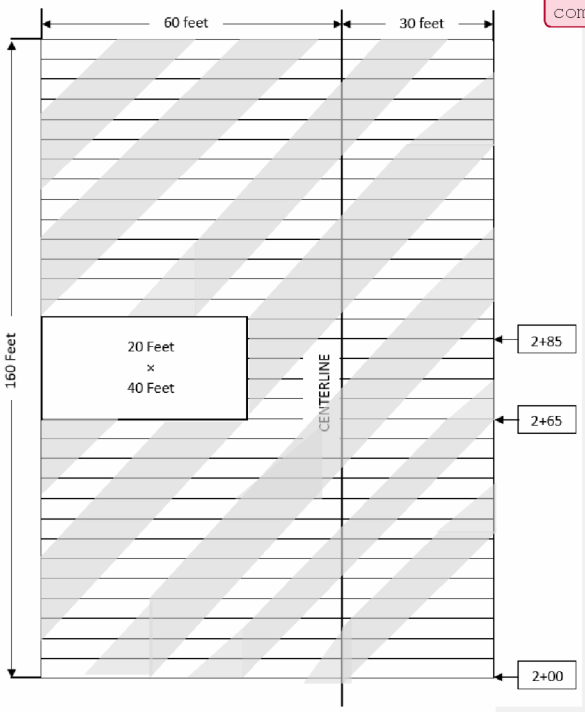
Determine the station number for the beginning of each sublot.

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 test site may fall outside the area to be tested, an additional set of random numbers was selected.

	Length	Width
A.	.902	.850
B.	.275	.023
C.	.794	.850

PLAN VIEW



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.

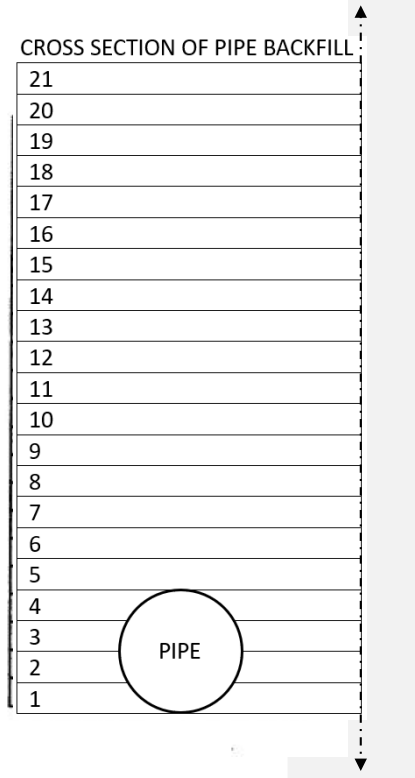
By using the next set of random numbers, calculate the test site location.
80 x .275 = 22 feet
2+00 + 22 = 2+22
90 x .023 = 2 feet
30 – 2 feet = 28 feet right of centerline

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

Calculate the test location for sublot 2.
80 x .794 = 64 feet
2+80 + 64 = 3+44
90 x .850 = 76 feet
76 - 30 = 46 feet left of centerline

Metric Example Removed

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 for lift selection.

A. .599
B. .464
C. .675
D. .279
E. .338

Multiply the number of lifts in the sublot by the random numbers.
The values determine which lift in each sublot to test.

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

Test location	Length	Width
A.	.627	.595
B.	.458	.137
C.	.510	.656
D.	.324	.284
E.	.135	.903

Multiply the first column of numbers by the length of the sublot. Then multiply the second column by the width of the sublot. For this example, the sublot shall be 75 ft long and 10 feet wide, with the centerline being placed on the right side of the trench.

A.	.627 x 75 = 47 ft	.595 x 10 = 6 feet left of centerline
B.	.458 x 75 = 34 ft	.137 x 10 = 1 foot left of centerline
C.	.510 x 75 = 38 ft	.656 x 10 = 7 feet left of centerline
D.	.324 x 75 = 24 ft	.284 x 10 = 3 feet left of centerline
E.	.135 x 75 = 10 ft	.903 x 10 = 9 feet left of centerline

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

MATERIALS PROCEDURE

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

1. PURPOSE

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

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

2. SCOPE

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

3. REFERENCED DOCUMENTS

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

4. DEFINITIONS

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

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

4.3 AASHTO: American Association of State Highway and Transportation Officials

4.4 APEAS: AASHTO Product Evaluation and Audit Solutions, formerly known as NTPEP.

5. REQUISITES FOR THE CREATION OF AN NEW APL

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

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

5.1.2 Approval by a WVDOH Committee, or Applicable Task Force, such as the "Roadway Departure Task Force."

5.1.3 Testing and or approval via information gathered from national testing or auditing agencies.

5.1.4 Historic usage and approval on DOH projects by ST-1s, Special Provisions, etc.

5.1.5 Consistent satisfactory compliance of the product with the Specifications.

6. APPROVAL CRITERIA

6.1 A material may not be added to an approved list if it does not meet the Specifications.

~~6.1~~6.2 Approval shall be granted by the Director, to a material or source ~~providing~~ provided at least one of the following criteria are met:

~~6.1.1~~6.2.1 The manufacturer of the material has developed and operates under a Division approved Quality Control Plan that sufficiently controls the quality of the material to the extent that the possibility of a substandard material being produced and shipped is substantially reduced, if not eliminated.

~~6.1.2~~6.2.2 The record of Specification compliance of the material or source is satisfactory to the Division.

~~6.1.3~~6.2.3 The manufacturer has successfully undergone an evaluation of manufacturing and quality control processes that ~~has~~have led to certification or accreditation by a Division recognized accreditation agency.

~~6.1.4~~6.2.4 Acceptance or approval of a particular material by an AASHTO national and/or regional test program.

~~6.1.4.1~~6.2.4.1 In the instance where a producer/supplier has a product which has a satisfactory audit from ~~AASHTO Product Evaluation and Audit Solutions~~APEAS, has national usage and the test data falls within the applicable specification limits of ASTM or AASHTO, at the discretion of the Director, this product may be added to its respective approved product list.

~~6.1.5~~6.2.5 Acceptable evaluation by field-testing of a material or product design analysis.

~~6.2~~6.3 Unless otherwise directed by the Director, acceptance criteria shall be documented and maintained by the Materials Lab Coordinator. These acceptance criteria shall be available in the MCS&T ProjectWise folder so other employees will be able to consistently review the approval criteria and duplicate the approval process.

7. RETENTION OF APPROVED STATUS

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

7.1.1 This inspection and validation shall be performed at a frequency determined by the respective MCS&T Section Supervisor. Once the process has been completed, each re-approved source shall retain its issued approval/lab number unless the product has changed from its original state enough to warrant a new number (For example, a new, updated version of the product.)

7.1.2 If a product is not validated within the guidelines established above, the product will be removed from the APL and a letter issued to the company.

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

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

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

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

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

7.1.3.5 Continued presence on an accepted national/regional program such as ~~AASHTO Product Evaluation and Audit Solutions~~APEAS.

7.2 In the instance where a company has changed its name, but retains the originally approved product, including the same design, formulation, manufacturing process and quality control processes, the product shall retain the original approval number. The Approved Product List shall be updated to include the new name with the original approval number.

7.2.1 If the product is changed in any physical way (aside from a different name label or stamp), the product shall be treated as a completely new product.

8. DOCUMENTATION AND AVAILABILITY OF APLS

8.1 The new or updated APL shall be submitted to the Director for approval. Once approved, the APL will be uploaded to the MCS&T Webpage[1] and distributed to the District Materials Supervisors and any other interested parties.

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

SIGNATURE BLOCK

MP 106.00.03 Steward – Lab Support Section
MM:B

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