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

MATERIALS PROCEDURE

PROCEDURE FOR EVALUATING INDEPENDENT ASSURANCE SAMPLES WITH ACCEPTANCE SAMPLES

1.0   PURPOSE

To provide a procedure for the immediate evaluation of Independent Assurance (IA) Samples with Acceptance Samples.

2.0   SCOPE

This procedure is intended to apply to the following:

2.1   Aggregate gradations

2.2   Hot Mix Asphalt

2.2.1   Gradation

2.2.2   Asphalt content

2.3   Portland Cement Concrete

2.3.1   Air content

2.3.2   Consistency (slump)

3.0   DEFINITIONS

3.1   Acceptance Samples and Tests - All of the samples and tests performed by State personnel or a State representative used for determining the quality and acceptability of the materials and workmanship which have been or are being incorporated in the project.

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3.2   Independent Assurance Samples and Tests (IA)- Independent samples or other procedures performed by State personnel who do not normally have direct responsibility for process control or acceptance sampling and testing. They are used for the purpose of making independent checks on the reliability of the results obtained in acceptance sampling and testing and not for determining the quality and acceptability of the materials and workmanship directly.

4.0   PROCEDURE (Sampling and Testing)

4.1   This procedure provides a method to compare IA sample results with acceptance sample results for similarity on a one-on-one basis. The IA sample may represent a split of the acceptance sample or one that is taken in close proximity to the acceptance sample in time and space. One of the two cases cited must be represented for this procedure to be applicable.

4.2   Sampling for one-on-one comparison should be accomplished with both the IA and the acceptance sampler present. Coordination of this activity must be accomplished between Materials Control, Soils and Testing Division and District Materials. The frequency established for acceptance samples is equal to approximately 10% of the obligatory frequency for testing given in the Contractor's approved Quality Control Plan. Likewise, the frequency of IA sampling under this procedure will be approximately 10% of the prescribed District acceptance sampling frequency, but do not necessarily on a project-by-project basis. In this case "prescribed" refers to the number of the acceptance samples scheduled in accordance with the acceptance criteria and would not necessarily include any additional acceptance samples that may be scheduled by the District (for whatever reason) in excess of their approximate 10%.

4.3   Identifying criteria, other than the normal, such as time of sampling, split or adjacent samples, etc. must accompany the records of each sample for proper comparison.

4.4   In all cases, the IA sample and the acceptance sample will be taken and tested in the standard manner.

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If splitting is involved, this may be accomplished at the sampling site or other appropriate facility, such as the District laboratory.

4.5   All acceptance samples that have been tested for sieve analysis under this procedure will be retained by the District Materials until such time that the comparison has been made and any dissimilarities resolved.

4.6   All acceptance samples taken for asphalt content under this procedure will have the untested portion of the extraction sample retained (where applicable) by the District Materials Division until such time that the comparison has been made and any dissimilarities resolved.

4.7   After completion of the testing of the acceptance sample (when tested in the District Materials Laboratory), a copy of the test results with identifying criteria will be forwarded to Materials Control, Soils and Testing Division. Immediately after receipt of the acceptance sample test results, they will be compared to the companion IA sample test results for similarity in the manner described in Section 5.0.

4.8   After completion of the testing of the IA and acceptance sample (when tested at the project site, e.g. air and/or slump), the IA sampler will record all acceptance and IA sample test data and results on Form 53 (attached). If the IA sample is found to be similar to the acceptance sample (as determined on the form), the completed form will be included with the IA sampler's normal documentation to the Materials Control, Soil and Testing Division. If, however, the IA sample is found to be dissimilar, the IA sampler will take action in accordance with Section 4.8.1. (Note - A calculated dissimilarity does not mean a material failure, only that a close examination of procedures and/or equipment may be in order.)

4.8.1   When the calculations performed on Form 53 show a dissimilarity, the IA sampler will take steps to try to isolate why the dissimilarities may have occurred, and in this way attempting to resolve the dissimilarity while still at the project site. These steps may be - but not limited to - the following:

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1) Note any differences in equipment used between the IA and acceptance sampler.

2) Review procedures used.

3) If necessary, take a check-comparison sample from the same batch or from the next batch. This includes <u>both</u> an additional IA and acceptance sample.

4) Note any information that may add clarity to the dissimilarity.

4.8.2   All information gained from the review will be included on Form 53 prior to submittal to Materials Control, Soils and Testing Division. If the IA sampler could find no reason for the dissimilarity, and a check sample was taken that proved similar, the dissimilarity will be considered to be resolved and having occurred because of some random local material or testing abnormality not originally detected.

4.8.3   If the sampler could find no reason for the dissimilarity, and a check sample was taken that also proved to be dissimilar and the IA sampler has confirmed the acceptance testing procedures, then further action is necessary in accordance with Section 6.2. (Note - It is not the intent of the IA sampling program to impede the progress of the Contractor; however, any unresolved dissimilarity will be reported to the Project Engineer.)

5.0   PROCEDURE (Comparison)

5.1   Aggregate Gradation - Split or Adjacent

1) Determine the average percent passing for each specified sieve size of the IA and Acceptance Sample test values (see sample computation sheet).

2) Individually, locate each average value to the appropriate interval column in Table 1 - depending upon whether the average represents a split of adjacent sample.

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3) From the appropriate interval column, read the corresponding value in the maximum difference (md) column. These values represent the maximum difference allowed between the average value and either of the two results that make-up the average.

4) Calculate the actual difference (ad) between each average and either of the two values that make-up the average. (It makes no difference which value is chosen, since both are equal distance from their average - in either case the absolute vale (no sign) is calculated).

5) If the actual difference (ad) is less than the maximum difference (md), the results on that particular sieve size will be considered similar.

6) If the actual difference (ad) is greater than the maximum difference (md), the results on that particular sieve size will be considered dissimilar.

7) If all the represented sieve size results are considered similar, then the sample evaluation is considered similar.

8) If one or more of the represented sieve size results is considered dissimilar, then the final sample evaluation is considered dissimilar.

5.2   Hot Mix Asphalt: Gradation - Adjacent or Split Sample

1) Calculate and evaluate gradation similarity in the manner described in Subsection 5.1.

5.3   Hot Mix Asphalt; Asphalt Content - Adjacent or Split Sample

1) Determine the difference of asphalt content between the two test values.

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2) If the value determined in Subsection 5.3(1) is less than or equal to 0.8, then the two samples will be considered similar. If the value determined is greater than 0.8, the two samples will be considered dissimilar.

5.4   Portland Cement Concrete; Air Content (Field Test - No distinction between split or adjacent samples in this procedure)

1) Determine the difference in air content between the two values.

2) If the value determined in Subsection 5.4(1) is less than or equal to 1.5, the two sample air contents will be considered similar. If the value is greater than 1.5, the two sample air contents will be considered dissimilar.

5.5   Portland Cement Concrete; Consistency (Field Test - no distinction between split or adjacent samples in this procedure). Not applicable to special high slump mixes.
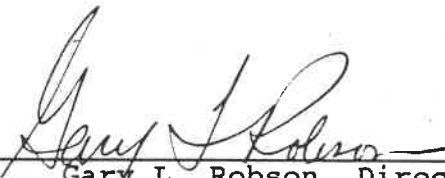
1) Determine the difference in consistency (slump) between the two test values.

2) If the value determined in Subsection 5.5(1) is less than or equal to 36, the two measurements will be considered similar. If the value is greater than 36, the measurements will be considered dissimilar.

6.0   REPORTING

6.1   If the comparison of any of the above is similar, then proof of this similarity will be shown on the reverse side (or attachment) of a copy of the IA sample test document. All applicable calculations specified in Section 5.0 using a format similar to that illustrated on the sample computation sheet will be included. A copy of this information will be forwarded to the applicable District Materials Section.

6.2   If the comparison of any of the above is dissimilar, the following action will be taken:

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6.2.1   Materials Control, Soils and Testing Division will immediately notify the applicable ·District of the dissimilarity, and submit a copy of the IA sample test document with proof of dissimilarity to the District. In the case where a dissimilarity has occurred as noted in 4.8.3, and not resolved, a copy of the IA sampler's completed Form 53 will also be submitted to the District.

6.2.2   Materials Control, Soils and Testing Division will immediately begin an investigation in an attempt to determine the cause of the dissimilarity. The findings of this investigation will subsequently be documented in a Materials Inspection Report (MIR).

6.2.3   Results of the investigation as documented in an MIR will be submitted to the applicable District. One copy shall be maintained in the Materials Control, Soils and Testing Division file.

Gary L. Robson, Director
Materials Control, Soils
and Testing Division

GLR:d

Attachments

COMPUTATION SHEET
(SAMPLE)

A	B	C	D	E	F	G	H
Sieve Size	IA SAMPLE GRAD.	ACCEPT. SAMPLE GRAD.	$\bar{X}$ $\dfrac{B-C}{2}$	"md" MAX. DIFF.	"ad" ACTUAL [D-C]	Similar ad < md	Dis-similar ad > md
37.5 mm	100	100	100	2.0	0	YES	
19.0 mm	86	73	79.5	5.0	6.5		YES
9.5 mm	26	25	25.5	4.5	0.5	YES	
4.75 mm	4	1	2.5	2.0	1.5	YES	
2.36 mm	1	1	1.0	2.0	0	YES	
75 μm	0.1	0.1	0.1	2.0	0	YES	

Samples represent a split ___x___ adjacent _____.

Samples similar ___x___ Dissimilar _____.

ASPHALT CONTENT

IA Result	Acceptance Result	Difference
6.3%	6.5%	0.2%

Samples represent a split ___x___ adjacent _____.

Samples similar ___x___ Dissimilar _____.

PCC AIR CONTENT

IA Result	Acceptance Result	Difference
4.2%	5.0%	0.8%

Samples similar ___x___ Dissimilar _____.

PCC CONSITENCY (SLUMP)

IA Result	Acceptance Result	Difference
4.2%	5.0%	0.8%

Samples similar ___x___ Dissimilar _____.

Independent Assurance Sample
Maximum Difference Values
Gradation Analysis Comparison Per Sieve

Table 1

Split Samples		Adjacent Samples	
Average % Passing Column 1	(md) Max. Diff. From Average Column 2	Average % Passing Column 3	(md) Max. Diff. From Average Column 4
0 ----> 7.0	2.0	0 ----> 4.5	2.5
7.5 ----> 11.5	2.5	5.0 ----> 7.5	3.0
12.0 ----> 16.0	3.0	8.0 ----> 10.5	3.5
16.5 ----> 19.5	3.5	11.0 ----> 13.5	4.0
20.0 ----> 23.5	4.0	14.0 ----> 16.0	4.5
24.0 ----> 27.0	4.5	16.5 ----> 18.5	5.0
27.5 ----> 31.5	5.0	19.0 ----> 21.0	5.5
32.0 ----> 36.0	5.5	21.5 ----> 23.5	6.0
36.5 ----> 42.5	6.0	24.0 ----> 26.0	6.5
43.0 ----> 65.0	6.5	26.5 ----> 28.5	7.0
65.5 ----> 71.5	6.0	29.0 ----> 31.0	7.5
72.0 ----> 76.0	5.5	31.5 ----> 34.0	8.0
76.5 ----> 80.0	5.0	34.5 ----> 37.0	8.5
80.5 ----> 83.5	4.5	37.5 ----> 40.5	9.0
84.0 ----> 87.0	4.0	41.0 ----> 44.5	9.5
87.5 ----> 90.0	3.5	45.0 ----> 50.0	10.0
90.5 ----> 93.5	3.0	50.5 ----> 66.5	10.5
94.0 ----> 97.0	2.5	67.0 ----> 71.5	10.0
97.5 ---->	2.0	72.0 ----> 79.5	9.5
		80.0 ----> 81.5	8.0
		82.0 ----> 83.5	7.5
		84.0 ----> 85.5	7.0
		86.0 ----> 87.0	6.5
		87.5 ----> 88.5	6.0
		89.0 ----> 90.0	5.5
		90.5 ----> 91.5	5.0
		92.0 ----> 93.0	4.5
		93.5 ----> 94.0	4.0
		94.5 ----> 95.5	3.5
		96.0 ----> 96.5	3.0
		97.0 ----> 97.5	2.5
		98.0 ----> 99.0	2.0
		99.5 ---->	1.5

TO USE TABLE

1) Calculate the average percent passing for each sieve size for the IA and Acceptance Sample.

2) Individually locate each average to the appropriate interval in the Table in Column 1 or 3 depending on Sample selection (split or adjacent)

3) For the maximum difference (md) between the sample result(s) and the average, read the value listed in Column 2 or 4 depending upon the sample selection.

4) If the difference between the result(s) and the average is equal to or less than the listed value, the individual sieve size will be considered similar. If the difference is greater than the listed value, the individual sieve size will be considered dissimilar.

FORM 53

IA FIELD TEST DOCUMENTATION
FOR AIR AND SLUMP COMPARISONS

IA Sampler: _____

Project: _____

Date of Test: _____   Check spaces - use
                                                only if check
Type of Test _____   comparison made

Batch ID: _____   [Check _____]

IA Sample ID: _____   [Check _____]

Acceptance Sample ID: _____   [Check _____]

Test Result 1) IA: _____   [Check _____]

Test Result 2) Acceptance: _____   [Check _____]

Calculations:

       Largest: _____ - Smallest _____ = _____ Difference

(Check)   Largest: _____ - Smallest _____ = _____ Difference

Similar?   FOR SLUMP THE DIFFERENCE MUST BE 37.5 mm OR LESS

       Yes _____ No _____   [Check: Yes _____   No _____]

       FOR AIR CONTENT THE DIFFERENCE MUST BE 1.5% OR LESS

       Yes _____ No _____   [Check: Yes _____   No _____]

If Dissimilar, use this space for IA Sampler's review and comments: