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

MATERIALS PROCEDURE

AGGREGATE SAMPLING PROCEDURES

1.0 PURPOSE

1.1 To provide a uniform procedure for obtaining aggregate samples.

2.0 SCOPE

2.1 This procedure shall apply to the following:

(a) Process Control sampling by the Contractor.

(b) Acceptance Sampling by the Division.

(c) Independent Assurance Sampling by the Division.

(d) Record Sampling by the Division.

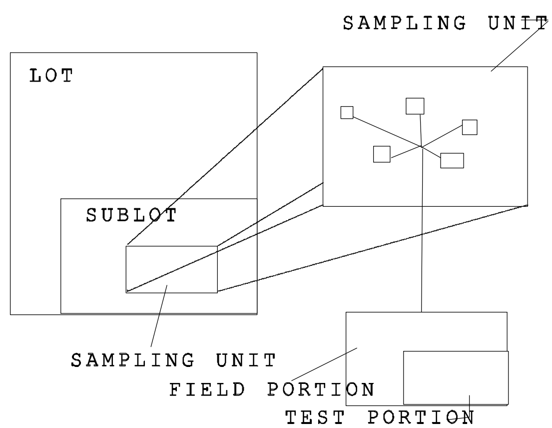
3.0 GENERAL

3.1 Taking a good sample is just as important as conducting a good test. The sampler must use every precaution to obtain samples that will show the true nature and condition of the material they represent.

3.2 Most aggregates are mixtures of various particle sizes, which tend to separate, or segregate, during transporting or stockpiling. For this reason aggregate samples should be obtained at the last practical point before the material is incorporated into the finished product or before compaction.

3.3 Frequency of sampling will be in accordance with the applicable directives for the type sample being procured.

4.0 DEFINITION OF TERMS



4.1 LOT: The quantity of material represented by an average test value. not to exceed five individual test values, calculated in accordance with MP 300.00.51.

4.2 Sublot: The quantity of material represented by a single test value. In the case where only one sample is needed for the total plan quantity, the sublot may be considered the LOT.

4.3 Sampling Unit: The quantity of material within the sublot from which increments are obtained to be combined into a field sample.

4.4 Increment: The portion of material removed from the sampling unit to be combined into a field sample.

4.5 Field Sample: A composite of increments.

4.6 Test Portion: The material split from the field sample to be used in performing a specific test.

4.7 Random Location: A location whose position depends entirely on chance. In other words, one location has as good a chance being selected as any other.

5.0 CONTRACTOR RESPONSIBILITY

5.1 The Contractor shall provide suitable equipment needed for proper inspection and sampling, including required access and any special equipment necessary to comply with the appropriate sampling techniques outlined herein. (See Section 105.5 (5th Paragraph) and Section 105.11 (lst Paragraph) of the 1986 Standard Specifications for Roads and Bridges.)

6.0 SAMPLING PROCEDURES

6.1 There are four general areas from which aggregate samples are usually obtained. These include (1) Sampling from the roadway after the aggregate has been placed, but prior to compaction, (2) Sampling from a conveyor belt, (3) Sampling from a flowing stream of aggregate, and (4) Sampling from stockpiles.

6.1.1.1 Sampling from the roadway (e.g., bases and subbases). The first step in obtaining a roadway sample is to locate the sublot. This is usually the quantity of material that will be represented by the one sample and is defined as a section of roadway of given width and length. The next step is to randomly locate a sampling unit within the sublot. A sampling unit is defined as an area having dimensions of approximately 3.6 m by 3.6 m, or an area of approximately 13.6 m^2 in locations having any dimension less than 3.6 m. Locating the sampling unit is accomplished by use of random numbers contained in Attachment I. Any pair of numbers (decimals) may be used to locate a sampling unit within the sublot. To locate the sampling unit in a sublot defined by area, the length of the area, in meters, is multiplied by one decimal of the pair, and width is multiplied by the other decimal. The resulting distances are to be measured from one end and one side of the area. For example, a sublot of material consists of base course aggregate 7.9 m wide from Station 956+00 to 965+00. The total length in meters is thus 96500 minus 95600, or 274.32 m. A pencil tossed on Attachment I points to the pair of decimals 0.115 and 0.447. To locate the sampling unit, the first decimal is multiplied by the length of the sublot, and the companion decimal is multiplied by the width.

The length value will be measured from Station 965+00 and the width value from the left-hand edge of the base. Thus, 900 times 0.115 equals 104, and 26 times 0.447 equals 12, so the sampling unit would be located at Station 956+00 plus 1+04, or 957+04 at 3.6 m from the left edge. This point could define the center or any corner of the sampling unit. If we use the center, a 3.6 m by 3.6 m sampling unit would fall between Stations 956+98 and 957+l0 with longitudinal boundaries 1.82 m and 5.49 m from the left edge of the base. Five approximately equal increments are then located within the sampling unit. This is also best accomplished by means of the random numbers in Attachment 1. Procedures to follow are essentially the same as those set forth for locating the sample unit. The five increments are taken from the sampling unit and combined to form a field sample whose weight equals or exceeds the minimum recommended in Table 1. All increments shall be taken from the roadway for the full depth of the material being sampled, care being taken to exclude any foreign material which may have been incorporated during the normal construction process. The specific areas from which each increment is to be removed shall be clearly marked; a metal template placed over the area is a definite aid in securing approximately equal increment weights.

6.1.2 Sampling from a Conveyor Belt. The first step in obtaining a sample from the conveyor belt is to define the sublot. This is generally defined as a unit of time, i.e., a half-day or a day's production. The next step is to randomly locate a sampling unit within the sublot. A sampling unit in this case is generally considered to be the material contained within the length of the conveyor. Locating the sampling unit is accomplished by use of the random numbers contained in Attachment I. Any number may be used to locate a sampling unit within the sublot. To locate the sampling unit in a sublot defined by time, the length of time, usually in minutes, is multiplied by the random decimal obtained from Attachment I. For example, a sublot of material consists of concrete aggregate used in a half-day's production estimated to be between 8:00 a.m. and 12:00 noon. A pencil tossed on Attachment I points to decimal 0.279. Thus, the sampling unit would be located somewhere within the four hour period (8:00 a.m.

to 12:00 noon). Four (hours) times 60 (minutes per hour) times 0.279 equals 67 minutes. The sampling unit would be located 67 minutes after the 8:00 a.m. startup; or at 9:07 a.m. (or as soon thereafter as practical). Five randomly located, approximately equal increments are obtained from the sampling unit and combined to form a field sample whose weight equals or exceeds the minimum recommended in Table 1. The location of the five increments is determined by multiplying the length of the belt by five random numbers. The conveyor belt is stopped while the increments are being obtained. Two templates, conforming to the shape of the belt and spaced such that the material contained between them will yield an increment of the required size, are inserted into the aggregate stream on the belt. All material between the templates is carefully scooped into a suitable container, including all fines on the belt collected with a brush and dustpan.

6.1.3 Sampling from a Flowing Aggregate Stream (bin or belt discharge). Definition of the sublot and location of the sampling unit is generally identical with sampling from a conveyor belt, with the exception that the sampling unit in this case is defined as that material which will flow during a five minute period. Once the sampling unit is located, five approximately equal increments, randomly spaced, are obtained and combined to form a field sample whose weight equals or exceeds the minimum recommended in Table 1. Each increment is taken from the entire cross-section of the material as it is being discharged. It is usually necessary to have a special device constructed for use at each particular plant. This device will consist of a pan of sufficient size to intercept the entire cross-section of the discharge stream and hold the required quantity of material. A set of rails may be necessary to support the pan as it is passed under the discharge stream. If the sampling pan overflows, it should be struck level so that only material that is within the pan is retained.

6.1.4 Sampling from a Stockpile. If possible, stockpile sampling should be avoided when sampling to determine the gradation of an aggregate. However, circumstances sometimes make it necessary, and when this occurs a sampling plan and the number of samples to be taken must be considered for each Specific case. Stockpiled aggregates tend to segregate with the coarser particles rolling to the outside base of the pile, which makes gradation representation difficult. Because of this, every effort should be made to enlist the services of power equipment (such as a front-end loader) to develop a separate small sampling pile composed of material taken from various levels and depths in the main pile. Increments from this pile may be combined, thoroughly mixed, and reduced by quartering and/or sample splitter to obtain the field sample. Methods for quartering and splitting samples are given in AASHTO T-248. If power equipment is not available, hand sampling may be employed to obtain at least three increments per sample: One increment taken from the top one third of the pile, one from the middle and one from the bottom third. When hand sampling, the outer layer of the pile should be removed (scraped away with the shovel) at the point prior to sampling.

7.0 WEIGHTS REQUIRED

7.1 Field Sample Weights

Field sample weights as listed in Table I are minimum values. Actual weights required must be predicated on the type and number of tests to which the material is to be subjected. Generally speaking, the amounts specified in Table I will provide adequate material for routine gradation and quality analysis.

7.2 Test Portion Weight

The weight of the test portion to be obtained from the field sample for a particular test will be defined in the Standard Procedures of the test involved. Reduction of the field sample into test portions is done with a sample splitter. The weight of test portion recommended for gradation testing is given in Table II.

8.0 TRANSPORTING SAMPLES

8.1 Testing at Site of Sampling

Samples taken for testing In the field may be placed in any suitable clean container of appropriate size which is secure enough to prevent loss of material when transporting the sample to the testing location.

8.2 Samples to be Shipped from Site of Sampling

Samples to be shipped should be placed in standard sampling sacks. If the sample contains an appreciable quantity of fine material, a plastic liner should be put in the sack to prevent loss of the fines. Each sack must be securely tied to prevent loss of material in transit. It is also essential that sample identification be maintained from the field to the testing site. Each sack must have appropriate indelible identification attached and enclosed so that field reporting, laboratory logging, and test reporting may be facilitated.

Gary L. Robson, Director
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GLR:w

Attachments

TABLE I

WEIGHT OF SAMPLES

NOMINAL MAXIMUM SIZE OF PARTICLES*	MINIMUM WEIGHT OF FIELD SAMPLES
Sieve Size	Kilograms
2.36 mm	10
4.75 mm	10
9.5 mm	10
12.5 mm	15
19.0 mm	25
25.4 mm	50
37.5 mm	75
50 mm	100
63 mm	125
75 mm	150
90 mm	175

*The nominal maximum size of particles is defined as the largest sieve size listed in the applicable specifications upon which any material is permitted to be retained. Exception: If the specification tolerances are such that no sieve listed has a range of X-100 percent passing, then the next smallest standard sieve, as listed in Table I, and below that sieve which 100 percent must past will be considered the nominal maximum size.

TABLE II

TEST PORTION FOR GRADATION

NOMINAL MAXIMUM SIZE OF PARTICLES	MINIMUM WEIGHT OF TEST PORTION
Sieve Size	Kilograms
2.36 mm	0.1
4.75 mm	0.5
9.5 mm	1.0
12.5 mm	2.0
19 mm	5.0
25 mm	10.0
37.5 mm	15.0
50 mm	20.0
63 mm	35.0
75 mm	60.0
90 mm	100.0

ATTACHMENT I

RANDOM NUMBERS

.858	.082	.886	.125	.263	.176	.551	.711	.355	.698
.576	.417	.242	.316	.960	.879	.444	.323	.331	.179
.587	.288	.835	.636	.596	.174	.866	.685	.066	.170
.068	.391	.139	.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	.589	.751	.308	.025	.836	.200	.055	.510	.656
.608	.910	.944	.281	.539	.371	.217	.882	.324	.284
.215	.355	.645	.450	.719	.057	.287	.146	.135	.903
.761	.883	.711	.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
.269	.707	.372	.486	.340	.680	.928	.397	.337	.564
.338	.917	.942	.985	.838	.805	.278	.898	.906	.939
.130	.575	.195	.887	.142	.488	.316	.935	.403	.629
.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