

# **CHAPTER 5**

## **MODIFIED ACCEPTANCE PROGRAM**

### **MODIFIED ACCEPTANCE PRODUCTION CONTROL PLAN**

#### **Open Graded Coarse and Fine Aggregates**

The purpose of this document is to establish gradation control guidelines for a modified acceptance program in the production of aggregates specified in Sections 202-206, 207 Types II and III, and 209 of the Road and Bridge Specifications. Approval of the producers modified acceptance program shall in no way relieve the producer or contractor of their responsibility for complying with all the requirements of the contract or specifications. It is not intended to change the present procedures but merely shift responsibility for acceptance testing from the Department to the Producer.

#### **Test and Equipment**

Test procedures shall be conducted in accordance with the referenced standards as noted in the current specification. Testing for gradation and Atterberg Limits will be conducted on the monitor samples. Only gradation is necessary on acceptance samples, unless a known problem exists. To accommodate the testing requirements, a field or plant laboratory shall be furnished. The laboratory shall contain the same equipment as stated in Chapter 3.

#### **Sampling Rate**

The guide sampling rate shall be one sample per 1000 tons of material produced. It is recognized that due to production schedules, past performance and perhaps several other factors this rate may be changed, either up or down, for a particular operation. Therefore the actual rate for a specific location will be at the discretion of the District Materials Engineer.

#### **Sampling Method**

Samples shall be obtained from each size material produced. These samples shall be selected from barges, conveyor belts, stockpiles, or as approved by the Engineer. Sampling and testing shall be performed by qualified personnel. Qualified does not imply that they be certified under any formal program.

#### **Acceptance of Materials**

Material which fails to meet the specification requirements, shall not be shipped to state projects under any circumstance.

All materials meeting the applicable specification requirements may be shipped as accepted based on the producer's certification. This certification, stamped or printed on the delivery ticket should follow the wording as outlined in Section 200.04 of the Road and Bridge Specification. The producer will furnish to the Department a copy of the test results for each size material produced on signed company letterhead. No particular format will be required. A worksheet or summary sheet will be sufficient.

The producer will keep all records pertinent to the production for a period of one year and they shall be available for review by the Engineer.

### **Monitor System**

The Department will conduct a monitor testing program. The purpose of the monitor testing is to verify the adequacy and accuracy of the producer's quality control program. One sample per week regardless of the size material being produced or generally one sample per month for each size produced will be obtained from the production plant. This sample shall be taken by the producer in the presence of the Department's monitor and then either quartered or introduced through a sample splitter with each party conducting the test on their half. Monitor tests will be conducted in the Department's laboratory by Department personnel. The producer's half of the monitor sample may serve as his production sample for that day. If the comparisons indicate monitor test results are not in relatively close agreement with the contractor's results, an investigation will be made to determine the reason for the difference. In the event it is determined that the contractor's test results are not representative of the product, the Department will take such action as it deems appropriate to protect the interest of the Commonwealth.

### **General**

The producer's quality control program shall include a system by which the Department will be advised as to the amount and size of material shipped to each project or order. If the producer's quality control program is found to be unsatisfactory, the Department may withdraw approval of the program.

### **Aggregate Gradation**

As previously stated in Chapter 3 the grading of an aggregate is determined by a sieve analysis in which the particles are divided into various sizes by sieves. The sieves for grading course aggregate are:

#### **Course Aggregate Sieves**

150 mm (6 in.)  
75 mm (3 in.)  
37.5 mm (1 1/2 in.)  
19.0 mm (3/4 in.)  
9.5 mm (3/8 in.)  
4.75 mm (No. 4)

#### **Fine Aggregate Sieves**

4.75 mm (No. 4)  
2.36 mm (No. 8)  
1.18 mm (No. 16)  
600 μm (No. 30),  
300 μm (No. 50),  
150 μm (No. 100)  
75 μm (No. 200)

For any test to be valid, it should be run on a sample that is representative of the total material to be used or, as it is in concrete, the total stockpile. The method of obtaining a representative sample for aggregate gradations has been previously explained in Chapter 3.

The representative sample must now be reduced to the proper size for testing by either the quartering method, or by use of a sample splitter. Both methods reduce the sample to approximately half the size each time it is used. The sample size is determined by the size of the aggregate as shown on page 3-3.

<b>Nominal Maximum Size Aggregate</b>	<b>Minimum Test Sample Size (grams)</b>
No. 8 (2.36 mm)	300
No. 4 (4.75 mm)	300
No. 3/8 (9.5 mm)	1,000
½ in. (12.5 mm)	2,000
¾ in. (19.0 mm)	5,000
1 in. (25.0 mm)	10,000
1 ½ in. (37.5 mm)	15,000
2 in. (50.0 mm)	20,000

In a sieve analysis, a nest of sieves is placed in a mechanical vibrator with the smallest openings on the bottom and largest on top. A dry representative sample of aggregate is weighed and placed in the top sieve and the nest of sieves are vibrated until all particles are separated.

The fraction of material retained on each sieve is weighed cumulatively, and the cumulative percent retained and percent passed each screen is calculated. The results are compared with the gradation range of the specification to determine if the aggregate meets gradation requirements.

(Note: In a fine aggregate sieve analysis, the test sample is washed over the No. 200 (75 µm) sieve and the portion retained on the No. 200 (75 µm) is dried and the loss recorded.)

## GRADING A SAND

### Sieve Analysis Example

The following sieve analysis is for a sample of natural sand not subject to abrasion and meets Virginia Department of Transportation requirements for Grading “A” Sand.

In this example, the cumulative weight retained on each sieve was determined in the sieve analysis. The first step is to calculate the cumulative percent retained on each sieve. Divide the cumulative weight retained by the total weight of the sample, and multiply the answer by 100 (converts decimal to percent).

Sieve Size	Cumulative Grams Retained	Cumulative % Retained	% Passing	VDOT Specs. (% Passing)
9.5 mm (3/8 in.)	0.0	0.0	100	100
4.75 mm (No. 4)	6.2	1.0	99	95-100
2.36 mm (No. 8)	108.5	18.1	82	80-100
1.18 mm (No. 16)	228.7	38.2	62	50-85
600 $\mu$ m (No. 30)	355.5	59.4	41	25-60
300 $\mu$ m (No. 50)	476.3	79.6	20	5-30
150 $\mu$ m (No. 100)	551.9	92.2	8	0-10
75 $\mu$ m (No. 200)	583.6	97.5	2.5	0-5
Total Wt.	598.7	100.0		

For Example:

4.75 mm (No. 4) sieve cumulative % retained =

Cumulative weight retained:  $\frac{6.2 \text{ grams}}{598.7 \text{ grams}} = 0.0103 \times 100 = 1.0\%$

Total weight of sample: 598.7 grams

After finding the cumulative percent retained on each sieve, we subtract the cumulative percentage retained on each standard sieve from 100 to obtain the percent passing, as illustrated below:

9.5 mm (No. 3/8 in.) sieve:  $100.0 - 0.0 = 100\%$

4.75 mm (No. 4) sieve:  $100.0 - 1.0 = 99\%$

The percent passing is compared to the VDOT specification range to determine if the sample passes.

**Section 202.02**

**TABLE II-1  
Fine Aggregate**

Grading	Amounts Finer Than Each Laboratory Sieve (Square Openings) ( % by Mass)							
	3/8 in. 9.5 mm	No. 4 4.75 mm	No. 8 2.36 mm	No. 16 1.18 mm	No. 30 600 μm	No. 50 300 μm	No. 100 150 μm	No. 200 75 μm
A	Min. 100	95-100	80-100	50-85	25-60	5-30	Max. 10	
B	Min. 100	94-100					Max. 10	
C	Min. 100	94-100				Max. 25		

(e) **Deleterious Material:** The amount of deleterious material in sands shall be not more than the following:

Material	% by Weight	Test Method
Clay lumps	0.25	T112
Shale, mica, coated grains, soft or flaky particles	1.0	T113
Organic material	0	T21
Total material passing No. 200 sieve by washing <sup>1</sup>		T11 and T27
For use in concrete subject to abrasion	3	
For other concrete	5	

<sup>1</sup>In the case of stone sand, if the material passing the No. 200 sieve is dust of fracture essentially free from clay or shale, the the percentages shown for use in concrete subject to abrasion and in other concrete may be increased to 5.0% and 7.0%, respectively.

Sieve Size	Grams Retained	% Retained	% Passing	VDOT Specs. (% Passing)
37.5 mm (1 1/2 in.)	0.0	0.0	100	100
25.0 mm (1 in.)	97.7	1.0	99	95 - 100
19.0 mm (3/4 in.)	1087.8	10.8	88	
12.5 mm (1/2 in.)	4269.8	42.5	46	25 - 60
9.5 mm (3/8 in.)	2286.3	22.8	23	
4.75 mm (No. 4)	1805.2	18.0	5	0 - 10
2.36 mm (No. 8)	210.7	2.1	3	0 - 5
<b>Total Wt.</b>	<b>10037.5</b>			

**57 Sieve Analysis Example**

25.0 mm (1 in.) sieve % retained =

Weight retained: 97.7 grams =  $0.0097 \times 100 = 1.0\%$   
 Total weight of sample: 10037.5 grams

After finding the percent retained on each sieve, we subtract the percentage retained on each standard sieve from 100 to obtain the percent passing, as illustrated below:

37.5 mm (1 1/2 in.) sieve  $100.0 - 0.0 = 100\%$   
 25.0 mm (1 in.) sieve  $100.0 - 1.0 = 99\%$

The percent passing is compared to the VDOT specification range to determine if the sample passes.

**Table II-3**

**Sizes of Open Graded Course Aggregates**

**Amounts Finer Than Each Laboratory Sieve (Square Openings) (% by Weight)**

VA Size No.	4 in. mm	3 1/2 in. mm	3 in. mm	2 1/2 in. mm	2 in. mm	1 1/2 in. mm	1 in. mm	3/4 in. mm	1/2 in. mm	3/8 in. mm	No. 4 mm	No. 8 mm	No. 16 mm	No. 50 μm	No. 100 μm
1	Min. 100	90-100		25-60		Max. 15		Max. 5							
2			Min. 100	90-100	35-70	Max. 15		Max. 5							
3				Min. 100	90-100	35-70	0-15		Max. 5						
357				Min. 100	95-100		35-70		10-30		Max. 5				
5						Min. 100	90-100	20-55	Max. 10	Max. 5					
56						Min. 100	90-100	40-85	10-40	Max. 15	Max. 5				
57						Min. 100	95-100		25-60		Max. 10	Max. 5			
67							Min. 100	90-100		20-55	Max. 10	Max. 5			
68							Min. 100	90-100		30-65	5-25	Max. 10	Max. 5		
7								Min. 100	90-100	40-70	Max. 15	Max. 5			
78								Min. 100	90-100	40-75	5-25	Max. 10	Max. 5		
8									Min. 100	85-100	10-30	Max. 10	Max. 5		
8P									Min. 100	75-100	5-30	Max. 5			
9										Min. 100	85-100	10-40	Max. 10	Max. 5	
10										Min. 100	85-100				10-30

## **Crusher Run**

- (a) Grading - Grading shall conform to the following when tested in accordance with the requirements of AASHTO T27:

<b>% by Mass of Materials Passing Sieve</b>						
<b>Size No.</b>	<b>63 mm 2 ½ in.</b>	<b>50 mm 2 in.</b>	<b>37.5 mm 1 ½ in.</b>	<b>25.0 mm 1 in.</b>	<b>19.0 mm ¾ in.</b>	<b>4.75 mm No. 4</b>
24	Min. 100	95±5				32±18
25			Min. 100	95±5		32±18
26				Min. 100	95±5	38±22

- (b) Atterberg Limits - The liquid limit shall be not more than 25. The plasticity index shall be not more than 3. Tests will be performed in accordance with the requirements of VTM-7.
- (c) Soundness Loss - Soundness loss shall conform to the requirements of Table II-4 for aggregate bases. Tests will be performed in accordance with the requirements of AASHTO T103 or T104.
- (d) Abrasion Loss - Abrasion Loss shall be not more than 45 percent. Tests will be performed in accordance with the requirements of AASHTO T96.

**Chapter 5**  
**Modified Acceptance**  
**Questions**

1. What is the rate of sampling under the Modified Acceptance Plan for Open Graded Aggregates?
  - A. one per 500 tons
  - B. one per 1000 tons
  - C. one per 1500 tons
  - D. one per 2000 tons
  
2. The sample taken for open graded aggregates accepted under the Modified Acceptance Plan is taken from:
  - A. Conveyor Belt
  - B. Stockpile
  - C. Barge
  - D. All of the above
  
3. Does the Quality Control Technician have to be certified?
  - A. Yes
  - B. No
  
4. All Open-Graded Aggregates must have a job mix submitted before production can start.
  - A. True
  - B. False

**Chapter 5**  
**Modified Acceptance**  
**Problem No. 1 Sieve Analysis**  
**Open Graded Aggregates**

Check the following sieve analysis of a sample of natural sand for use in concrete not subject to abrasion and determine if it meets Virginia Department of Transportation requirements for Grading “A” Sand. Circle the sieve(s) not passing, if any.

Sieve Size	Cumulative Grams Retained	Cumulative % Retained	% Passing	VDOT Specs. (% Passing)
9.5 mm (3/8 in.)	0.0			
4.75 mm (No. 4)	16.6			
2.36 mm (No. 8)	64.5			
1.18 mm (No. 16)	214.1			
600 $\mu$ m (No. 30)	389.2			
300 $\mu$ m (No. 50)	483.0			
150 $\mu$ m (No. 100)	543.4			
75 $\mu$ m (No. 200)	565.0			
<b>Total Wt.</b>	<b>573.0</b>			

Does this sample pass?      Yes \_\_\_\_\_ No \_\_\_\_\_

**Chapter 5**  
**Modified Acceptance**  
**Problem No. 2 Sieve Analysis**  
**Open Graded Aggregates**

Check the following sieve analysis of a sample of 57s and determine if it meets Virginia Department of Transportation requirements. Circle the sieve(s) not passing, if any.

Sieve Size	Grams Retained	% Retained	% Passing	VDOT Specs. (% Passing)
37.5 mm (1 1/2 in.)	0.0			
25.0 mm (1 in.)	0.0			
19.0 mm (3/4 in.)	703.2			
12.5 mm (1/2 in.)	4544.7			
9.5 mm (3/8 in.)	2247.8			
4.75 mm (No. 4)	2250.6			
2.36 mm (No. 8)	116.1			
<b>Total Wt.</b>	<b>10120.7</b>			

Does this sample pass?      Yes \_\_\_\_\_ No \_\_\_\_\_