

COMPOSITE GRADING

(An Arizona Method)

Scope

1. This is a method of combining two or more samples of different gradations to produce a final product of a composited gradation.

Procedure

2. (a) For each sample; multiply the percent retained on each sieve by the "Decimal % of Composite" for the sample and record the results to the nearest 0.1%, except that the amount passing the No. 200 sieve shall be to the nearest 0.01%. Adjust the fractions of material for each aggregate sample as necessary to correspond to the total percent of composite for that sample, except that the percent passing the No. 200 sieve shall not be adjusted.

(b) Add the resultant percentages retained on each sieve for all samples and record as the composite % retained. Round the % retained for each sieve to the nearest 1%, except the amount passing the No. 200 sieve shall be rounded and recorded to the nearest 0.1%.

NOTE: Adjustments to the % retained and the % retained rounded may be necessary so that the total equals 100%, except that the % passing the No. 200 sieve shall not be adjusted.

(c) To obtain the composite percent passing each sieve, start with the Pass No. 200 fraction (rounded to the nearest whole percent), in the example 3%; and add the percent retained on the No. 200 sieve (3%), and record the sum as the % passing the No. 100 sieve (6%). Add the % retained on the No. 100 to this total and record as the % passing the No. 50 sieve (6 + 8 = 14). Repeat this procedure for all sieves, the final value should be 100%.

(d) If it is preferred, the % passing each sieve may be determined by beginning with the largest sieve which has material retained, in the example 13% was retained on the 1/2" sieve; subtract the % retained from 100 and record as % passing (100 - 13 = 87); subtract the % retained on the next smaller sieve and record as % passing (87 - 11 retained on the 3/8" = 76); continue this procedure for all sieves, the final value should be the percent passing the No. 200 sieve, rounded to the whole percent.

NOTE: Figure 1 shows an example of a sieve analysis as reported from ARIZ 201, for four individual samples. Figure 2 shows an example of the calculations described in paragraphs (a), (b), (c), and (d), and a completed composite grading of the four individual samples.

(e) If a calculated composite is desired using the percent passing each sieve, it may be obtained by multiplying the % pass each sieve by the "decimal % of composite" for each sample, and accumulate for the resultant composite percent pass each sieve in similar manner as in the method described above for composite % retained. After the composite % passing each sieve is calculated the composite % retained is determined by the following:

$$\left[\begin{array}{c} \% \text{ Retained on} \\ \text{Individual} \\ \text{Sieve} \end{array} \right] = \left[\begin{array}{c} \% \text{ Passing} \\ \text{next larger} \\ \text{sieve size} \end{array} \right] - \left[\begin{array}{c} \% \text{ Passing} \\ \text{desired} \\ \text{sieve size} \end{array} \right]$$

NOTE: Figure 3 shows an example of the calculations described in paragraph (e), and a completed composite grading of the four individual samples.

SIEVE SIZE	SAMPLE #1 % OF COMPOSITE = 23			SAMPLE #2 % OF COMPOSITE = 20			SAMPLE #3 % OF COMPOSITE = 27			SAMPLE #4 % OF COMPOSITE = 30			COMPOSITE		
	% Ret.	% Comp.	% Ret.	% Ret.	% Comp.	% Ret.	% Ret.	% Comp.	% Ret.	% Ret.	% Comp.	% Ret.	% Ret.	Rounded	% Pass
3/4	0	x.23													100
1/2	55	x.23	12.6	0									12.6	13	87
3/8	40	x.23	9.2	10	x.20	2.0	0						11.2	11	76
1/4	5	x.23	1.2	48	x.20	9.6	1	x.27	0.3				11.1	11	65
#4	0	x.23		27	x.20	5.4	9	x.27	2.4	0			7.8	8	57
#8	0	x.23		12	x.20	2.4	29	x.27	7.9 7.8	4	x.30	1.2	11.5	11	46
#10	0	x.23		1	x.20	0.2	10	x.27	2.7	2	x.30	0.6	3.5	4	42
#16	0	x.23		1	x.20	0.2	19	x.27	5.1	6	x.30	1.8	7.1	7	35
#30	0	x.23		0	x.20		12	x.27	3.2	17	x.30	5.1	8.3	8	27
#40	0	x.23		0	x.20		3	x.27	0.8	18	x.30	5.4	6.2	6	21
#50	0	x.23		0	x.20		3	x.27	0.8	21	x.30	6.3	7.1	7	14
#100	0	x.23		0	x.20		4	x.27	1.1	23	x.30	6.8 6.8	7.9	8	6
#200	0	x.23		0	x.20		3	x.27	0.8	6	x.30	1.8	2.6	3	3.0
Pass #200	0	x.23		0.8	x.20	0.16	6.9	x.27	1.86	3.3	x.30	0.99	3.01	3.0	
TOTAL	100		23.0	99.8		19.96	99.9		26.96	100.3		29.99	99.91		

FIGURE 2

SIEVE SIZE	SAMPLE #1			SAMPLE #2			SAMPLE #4			SAMPLE #4			COMPOSITE		
	% OF COMPOSITE = 23			% OF COMPOSITE = 20			% OF COMPOSITE = 27			% OF COMPOSITE = 30			% Pass	% Ret.	% Pass
	% Pass	% Comp.	% Pass	% Pass	% Comp.	% Pass	% Pass	% Comp.	% Pass	% Pass	% Comp.	% Pass	% Pass	% Ret.	Rounded
3/4	100	x.23	23.0	100	x.20	20.0	100	x.27	27.0	100	x.30	30.0	100.0	100	100
1/2	45	x.23	10.4	100	x.20	20.0	100	x.27	27.0	100	x.30	30.0	87.4	13	87
3/8	5	x.23	1.2	90	x.20	18.0	100	x.27	27.0	100	x.30	30.0	76.2	11	76
1/4	0	x.23	0	42	x.20	8.4	99	x.27	26.7	100	x.30	30.0	65.1	11	65
#4				15	x.20	3.0	90	x.27	24.3	100	x.30	30.0	57.3	8	57
#8				3	x.20	0.6	61	x.27	16.5	96	x.30	28.8	45.9	11	46
#10				2	x.20	0.4	51	x.27	13.8	94	x.30	28.2	42.4	4	42
#16				1	x.20	0.2	32	x.27	8.6	88	x.30	26.4	35.2	7	35
#30				1	x.20	0.2	20	x.27	5.4	71	x.30	21.3	26.9	8	27
#40				1	x.20	0.2	17	x.27	4.6	53	x.30	15.9	20.7	6	21
#50				1	x.20	0.2	14	x.27	3.8	32	x.30	9.6	13.6	7	14
#100				1	x.20	0.2	10	x.27	2.7	9	x.30	2.7	5.6	8	6
#200				0.8	x.20	0.16	6.9	x.27	1.86	3.3	x.30	0.99	3.01	3	3.0

FIGURE 3