

CRD-C 50-69

METHOD OF TEST FOR EFFECT OF GRINDING DURING CONCRETE MIXING ON THE GRADING OF AGGREGATES

Scope

1. This method outlines procedures for determining the effect of grinding during concrete mixing on the grading of aggregates. Two procedures are described:

(a) Laboratory Method.- The laboratory method is intended for use principally in connection with investigations of potential aggregate sources and will yield results that will permit an evaluation to be made of the relative anticipated degree to which materials from such sources may be expected to undergo a change in grading due to grinding during concrete mixing.

(b) Field Method.- The field method is intended for use principally in connection with the development of information on the actual grading of aggregates in job-mixed concrete as discharged from the mixer.

Laboratory Method

Preparation of Materials

2. (a) Materials will be prepared in sufficient quantity for the tests described below and to make two batches of simulated concrete of the batch size indicated, depending on the grading range of the coarse aggregate:

Size Range of Coarse Aggregate	Batch Size, cu ft
No. 4 to 3/4 in.	0.5
No. 4 to 1-1/2 in.	0.5
No. 4 to 3 in.	1.0
No. 4 to 6 in.	2.0

(b) Pozzolan from a single source meeting the requirements of CRD-C 262 will be used as the entire cementitious material in the simulated concrete. All of the pozzolan to be used will be processed to remove all particles coarser than the No. 200 sieve (Note).

Note.- Pozzolan may conveniently be processed to remove particles coarser than the No. 200 sieve by laboratory air classifiers such as a Raymond laboratory air classifier as referred to in WES TR 6-583 (1961). If suitable facilities for so processing the pozzolan are unavailable, it may be processed to remove particles coarser than the No. 100 sieve.

(c) All of the fine and coarse aggregate to be used will be sieved to determine the grading of each size range.

Making of Concrete

3. (a) Mixture proportions shall be selected in accordance with the applicable proportions of CRD-C 3.

(b) Two batches of concrete will be made in accordance with the applicable provisions of CRD-C 10 except that there will be no "butter" batch. The normal capacity of the concrete mixer used should not exceed three times the size of the batch to be mixed.

Tests

4. The entire batch shall be discharged and the mixer shall be washed clean. The batch including all washings used in cleaning the mixer shall be washed over all sieves used to determine grading of the aggregates.

Calculation

5. The grading of the aggregates before mixing shall be calculated from the sieve analyses made on the materials used in the batches. The grading of the aggregates after mixing shall be calculated from the sieve analyses of the batches mixed, reducing the proportion of material finer than the No. 200 sieve by the amount of pozzolan included in the batch.

Repeatability

6. The change in grading of the aggregates due to grinding during concrete mixing as indicated by the results of the tests of two batches, expressed as change in fineness modulus

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of the total aggregate or as change in fineness modulus of each aggregate size range included, shall agree within 0.02.

Evaluation

7. An aggregate tested as described above will be regarded as likely to require precautions to compensate for grinding during mixing, if used in construction, when the grading of the total aggregate or any size range thereof after mixing, expressed as fineness modulus, is more than 0.04 lower than before mixing or when the amount of material finer than the No. 200 sieve¹ expressed as a percentage by weight of the amount of material finer than the No. 4 sieve, after mixing, is greater than the amount before mixing by more than 5.0.

Field Method

Sampling

8. (a) Aggregate.- Samples of fine aggregate and of each size range of coarse aggregate shall be taken to be as representative as possible of the aggregates used in the concrete batch to be sampled; and shall be tested for sieve analysis in accordance with CRD-C 103, including the use of the No. 200 sieve.

(b) Concrete.- Samples of mixed concrete shall be taken in accordance with the applicable provisions of CRD-C 55.

Testing

9. (a) If the samples taken as prescribed above are to be used for test according to CRD-C 55 as well as for test according to this method, they should be kept separate and treated as prescribed therein as well as being additionally tested to obtain the information described below. If tests are desired only according to this method, the three samples shall be combined and treated as follows.

(b) The individual or combined samples shall be sieved over all sieves coarser than the 1-1/2-in. sieve that were used in obtaining the sieve analysis of the aggregates. The material retained on each sieve shall be washed, dried, and weighed.

(c) A weighed sample of approximately 25-lb weight of the material finer than the 1-1/2-in. sieve shall be sieved over all sieves coarser than No. 4. The material retained on each sieve shall be washed, dried, and weighed.

(d) A weighed sample of approximately 2-lb weight of the material finer than the No. 4 sieve shall be sieved over all sieves finer than No. 4 used in determining fine aggregate grading. The material retained on each sieve shall be washed, dried, and weighed.

Calculations

10. The sieve analysis of the aggregates after mixing shall be calculated. The sieve analysis of the size fractions of coarse aggregate and that portion of the fine aggregate coarser than the No. 200 sieve shall be calculated directly. The total weight of solid material finer than the No. 200 sieve shall be calculated from determinations of water content of mortar made as prescribed in CRD-C 55. The calculation of the portions of the solid material finer than the No. 200 sieve that is cementitious material and aggregate, respectively, will be based on either the known amounts included in the batch or on determinations of cement content according to CRD-C 55 as may be appropriate.

Precautions

11. It will be noted that the laboratory method described in Par. 2 through 7 contemplates tests on two batches and prescribes that *all* aggregates used in making each batch be tested for sieve analysis before use and that all aggregates in both batches be tested for sieve analysis after mixing. It is not regarded as feasible to employ this procedure in the field. Hence the field method as

¹See note to Par. 2(b).

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outlined in Par. 8 through 11 provides for testing samples of the aggregates before and after mixing. The precision and accuracy of the field method will therefore be lower than that of the laboratory method at least by the effects of the sampling errors introduced both before and after mixing.

It is therefore recommended that as many tests as possible be made according to this method before drawing final conclusions regarding the effect of grinding during concrete mixing on the grading of aggregates in job-mixed concrete. A minimum of six tests is recommended.