Standard WFLHD Method of Test for
ACCELERATED WEATHERING OF AGGREGATE BY USE OF DIMETHYL SULFOXIDE

1. SCOPE

1.1 This method covers the procedure to be followed in testing aggregates to determine their resistance to disintegration when immersed in a solution of dimethyl sulfoxide (DMSO). It furnishes information helpful in judging the durability of aggregates subject to weathering action, particularly when adequate information is not available from service records of the material exposed to actual weathering conditions. Attention is called to the fact that test results by the use of the two solutions differ considerably and care must be exercised in fixing proper limits in any specification which may include requirements for these tests.

2. APPARATUS

2.1 The apparatus shall consist of the following:

2.1.1 Sieves with square openings of the following sizes conforming to the Standard Specifications for Sieves for Testing Purposes (AASHTO M-92) for sieving the samples in accordance with 4 and 5:

Coarse Series

4.75 mm (No. 4)
8.0 mm (5/16 in.)
9.5 mm (3/8 in.)
12.5 mm (1/2 in.)
16.0 mm (5/8 in.)
19.0 mm (3/4 in.)
25.0 mm (1 in.)
31.5 mm (1-1/4 in.)
37.5 mm (1-1/2 in.)
50 mm (2 in.)
63 mm (2-1/2 in.)
larger sizes by
12.5 mm (1/2 in.)
spread

2.1.2 Containers for immersing the samples of aggregate in the solution, in accordance with the procedure described in this method, shall be prepared of materials not attacked by the solution used. The volume of the solution in which samples are immersed shall be at least five times the volume of the sample immersed at one time.

Note 1.--Baskets of suitable wire mesh or sieves with suitable openings are satisfactory containers for the samples. Pans or other containers without perforations may be used.

2.1.3 Suitable means for regulating the temperature of the samples during immersion in the solution shall be provided.

2.1.4 Balance -- The balance shall conform to AASHTO M 231, Class E.

2.1.5 Drying Oven--The oven shall be capable of being heated continuously at 110 ± 5 C (230 ± 9 F).

2.1.6 Mechanical Sieving Device--The mechanical sieving device shall be capable of providing the motion specified in AASHTO T 27, Sieve Analysis of Fine and Coarse Aggregates.

3. SPECIAL SOLUTION REQUIRED

3.1 Dimethyl Sulfoxide -- Dimethyl sulfoxide shall be an industrial chemical, marketed under the name DMSO. Discolored solution shall be discarded, or filtered before reuse (See Note 2).

Note 2.--To reduce evaporation and prevent contamination, keep the solution covered at all times when access is not needed.

4. SAMPLES

4.1 Coarse Aggregate--Coarse aggregate for the test shall consist of material from which the sizes finer than the 4.75 mm (No. 4) sieve have been removed. The sample, obtained by means of a sample splitter or quartering, shall be of such a size that it will yield not less than the following amounts of the different sizes.

Size (Square-Opening Sieves)		
4.75 to 9.5 mm	300 g	
9.5 to 19.0 mm	1000 g	
Consisting of:		
9.5 mm to 12.5 mm material	33	percent
12.5 mm to 19.0 mm material	67	percent
19.0 mm to 37.5 mm	1500 g	
Consisting of:		
19.0 mm to 25.0 mm material	33	percent
25.0 mm to 37.5 mm material	67	percent
37.5 mm to 63 mm	3000 g	
Consisting of:		
37.5 mm to 50 mm material	50	percent
50 mm to 63 mm material	50	percent
Larger sizes by 25.0 mm spread in sieve size each fraction	3000 g	

4.2 Should the samples contain less than 5 percent of any of the sizes specified in 4.1, that size shall not be tested, but, for the purpose of calculating the test results, it shall be considered to have the same loss as the average of the next smaller and the next larger size, or if one of these sizes is absent, it shall be considered to have the same loss as the next larger or next smaller size, whichever is present. When the 9.5 to 19.0 mm, 19.0 to 37.5 mm, or 37.5 to 63 mm test samples specified in 4.1 cannot be prepared due to absence of one of the two sizes of aggregate shown for each, the size available shall be used to prepare the sample tested.

5. PREPARATION OF TEST SAMPLE

5.1 Coarse Aggregate--The sample of coarse aggregate shall be thoroughly washed and dried to constant mass at 110 ± 5 C (230 ± 9 F) and shall be separated into the different sizes in 4.1 by hand sieving to refusal until none of the particles being sieved are passed in one minute's time (Note 3). The proper mass of sample for each fraction shall be weighed out and placed in separate containers for the test. In the case of fractions coarser than the 19.0 mm sieve, the number of particles shall be counted.

Note 3.--Finger manipulation of the particles may be used to determine refusal.

5.2 Test samples of coarse aggregate shall be weighed to the nearest 1 g.

6. PROCEDURE

6.1 The samples shall be immersed in the solution for not less than 112 hours nor more than 120 hours in such a manner that the solution covers them to a depth of at least 12.7 mm (1/2 in.). The containers shall be covered to reduce evaporation and prevent the accidental addition of extraneous substances. The samples immersed in the solution shall be maintained at a temperature of 21 ± 3 C (70 ± 5 F) for the immersion period.

6.2 After the immersion period, the sample shall be removed from the solution, permitted to drain for about 15 min. and washed with tap water.

7. QUANTITATIVE EXAMINATION

7.1 After the solution has been removed, each fraction of the sample shall be dried to constant mass at 110 ± 5 C (230 ± 9 F), and weighed. Hand sieve the coarse aggregate over the sieve shown below for the appropriate size of particle:

Size of Aggregate	Sieve Used to Determine Loss
63 to 37.5 mm (2-1/2 to 1-1/2 in.)	31.5 mm (1-1/4 in.)
37.5 to 19.0 mm (1-1/2 to 3/4 in.)	16.0 mm (5/8 in.)
19.0 to 9.5 mm (3/4 to 3/8 in.)	8.0 mm (5/16 in.)
9.5 to 4.75 mm (3/8 in. to No. 4)	4.00 mm (No. 5)

8. REPORT

8.1 The report shall include the following data:

8.2 Mass of each fraction of each sample before and after testing.

8.3 The material from each fraction of the sample passing the sieve used to determine the loss expressed as a mass percent of the fraction.

TABLE 1
Suggested Form for Recording Test Data (With Illustrative Test Values)

Sieve Size		Grading of Orig Sample Percent	Mass of Test Fractions Before Test, g.	% Passing Sieve Used to Determine Loss	Weighted Average (Corrected Percentage Loss)
Passing	Retained on				
Test of Coarse Aggregate					
63 mm (2-1/2 in.)	3.75 mm (1-1/2 in.)	20.0	3000b	4.8	1.0
3.75 mm (1-1/2 in.)	19.0 mm (3/4 in.)	45.0	1500b	8.0	3.6
19.0 mm (3/4 in.)	9.5 mm (3/8 in.)	23.0	1000b	9.6	2.2
9.5 mm (3/8 in.)	4.75 mm (No. 4)	12.0	300b	11.2	1.3
TOTALS.....		100.0	5800	....	8.1

[b] Minimum amounts, larger samples may be used.

8.4 Weighted average calculated from the percentage of loss for each fraction, based on the grading of the sample as received for examination or, preferably, on the average grading of the material from that portion of the supply of which the sample is representative.

8.4.1 The weighted average loss shall be computed to the nearest 0.1 percent.

8.5 Character of solution Dimethyl Sulfoxide (DMSO).