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APPENDIX A  
SIEVE ANALYSIS

Apparatus and Supplies

Special

1. Set of sieves

General

1. Brush ( for cleaning sieves )
2. Beam balance ( 0.1 g. sensitivity )
3. Drying oven
4. Desicator
5. Syringe
6. Large pan
7. Mortar and rubber-tipped pestle

The selection of sieves for a given test depends on the soil to be tested, e.g., the coarser the soil, the larger the top sieve should be. A good spacing of soil diameters on the grain size distribution curve will be obtained if a nest of sieves is used in which each sieve has an opening approximately one-half that of the coarser sieve above it in the nest.

For soil finer than a No. 10 sieve (2mm.), the ASTM requires the following sieves: No. 20, 40, 60, 140, and 200. The AASHTO specifies No. 40, 60, and 200.

Table IV-1 is a partial list of sieve sizes in current use. The Tyler series are specified by "mesh," which is the number of openings per inch of screen. The list of Tyler sieves in Table IV-1 (except for the top two and the 9 and 60 mesh) are selected so that the opening in each sieve is 2 times that of the sieve listed immediately below it. The sieves of the U.S. Bureau of Standard series are numbered; the number are based on the size of opening. Thus a No. 100 sieve has openings which are twice as large as those of a No. 200 sieve. Specifications usually permit variations in average openings ranging from 2% for the coarse sieves to 7% for the fine sieves.

#### Recommended Procedure

1. Weigh to 0.1 g each sieve which is to be used. Make sure each sieve is clean before weighing it.
2. Select with care a test sample which is representative of the soil to be tested ; break the soil into its individual particles with the fingers or a rubber-tibbed pestle.
3. Weigh to 0.1 g. a specimen of approximately 500 g. of oven-dried soil. If the soil to be tested has many particles coarser than the opening in a No.4 sieve, a large weight of soil should be used.



TABLE IV-1  
Sieve Series \*

Mesh	Tyler Standard Opening		Wire Diameter, in.	Number	U.S. Bureau of Standards Opening	
	in.	mm.			in.	mm.
..	3.0000	76.200	0.2070	..	4.0000	101.000
..	2.0000	50.800	0.1920	..	2.0000	50.800
..	1.0500	26.670	0.1480	..	1.0000	25.400
..	0.7420	18.850	0.1350	..	0.7500	19.100
..	0.5250	13.330	0.1050	..	0.5000	12.700
..	0.3710	9.423	0.0920	..	0.3750	9.520
03	0.2630	6.680	0.0700	03	0.2500	6.350
04	0.1850	4.699	0.0650	04	0.1870	4.760
06	0.1310	3.327	0.0360	06	0.1320	3.360
08	0.0930	2.362	0.0320	08	0.0937	2.380
09	0.0780	1.981	0.0330	10	0.0787	2.000
10	0.0650	1.651	0.0350	12	0.0661	1.680
14	0.0460	1.168	0.0250	16	0.0469	1.190
20	0.0328	0.833	0.0172	20	0.0331	0.840
28	0.0232	0.589	0.0125	30	0.0232	0.590
35	0.0164	0.417	0.0122	40	0.0165	0.420
48	0.0116	0.295	0.0092	50	0.0117	0.297
60	0.0097	0.246	0.0070	60	0.0098	0.250
65	0.0082	0.208	0.0072	70	0.0083	0.210

TABLE IV-1 Continue

## Sieve Series \*

Mesh	Tyler Standard Opening		Wire Diameter,	Number	U.S. Bureau of Standards Opening	
	in.	mm.	in.		in.	mm.
100	0.0058	0.147	0.0042	100	0.0059	0.149
150	0.0041	0.104	0.0026	140	0.0041	0.105
200	0.0029	0.074	0.0021	200	0.0029	0.074
270	0.0021	0.053	0.0016	270	0.0021	0.053
400	0.0015	0.038	0.0010	400	0.0015	0.037

4. Sieve the soil through a nest of sieves by hand shaking, using a motion of horizontal rotation or using a mechanical shaker, if available. At least 10 minutes of hand sieving is desirable for soils with small particles.

5. Weigh to 0.1 g. each sieve and the pan with the soil retained on them.

6. Subtract the weights obtained in step 1 from those of step 5 to give the weight of soil retained on each sieve. (The sum of these retained weights should be checked against the original soil weight.)

7. If a sizable portion of soil is retained on the No.200 sieve, it should be washed. This is done by placing



the sieve and retained soil in a pan and pouring clean water on the screen. Use a spoon or glass rod to stir the slurry. Recover the soil which is washed through; dry and weigh it. The weight of soil recovered should be subtracted from the weight retained on the No.200 sieve and added to the weight retained in the pan determined in step 6.

#### Discussion of Procedure

The method of weighing the sieve plus soil rather than attempting to remove the soil from the sieve for soil is often lost during the removing. Even using this suggested procedure, we have to be careful to minimized the loss of soil during the sieving.

Step 4 recommends that the sieving consist of approximately 10 minutes of horizontal shaking. A horizontal motion was suggested instead of a vertical one since it has been found more efficient and since less soil escapes from the nest of sieves during horizontal shaking. The amount of shaking required depends on the shape and number of particles. As an example of the fact that the shaking time required is increase as the number of particles is increased, for crushed quartz it was found (IV-2, that, in a given time, the percentage passing was 25% less for a 250-g. sample than it was for a 25-g. sample. Since a given weight of a fine-grained soil contains more particles than an equal weight of a coarse-

grained one, more shaking time is necessary for the finer-grained soils.

### Calculations

1. Percentage retained on any sieve

$$= \frac{\text{wt. of soil retained}}{\text{total soil wt.}} \times 100 \%$$

In case the lumps were not completely broken down into their individual particles in step 2, allow the slurry to sit until they can be.

2. Cumulative percentage retained on any sieve = sum of percentages retained on all coarser sieves

3. Percentage finer than any sieve size = 100 % cumulative percentage retained.

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## BIOGRAPHY

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