CONCRETE AGGREGATES*

T HIS committee, working in close co-operation with Committee C-9 on Concrete and Concrete Aggregates of the American Society for Testing Materials, has had the progress of its work seriously interfered with by the active participation of many of its members in government work, and more recently by urgently pressing business demands and lack of assistants in laboratories. The committee has, through its sub-committees, continued some of its investigations along lines previously laid out and has considered a large mass of data, made available by various investigators in the field covered by this committee. Some of this data relates to the concrete and mortar making qualities of aggregates, both fine and coarse, as indicated by their "Fineness Modulus" proposed by Prof. Abrams, their "Surface Area" proposed by Mr. Edwards, and their "Surface

TABLE	1-AVERAGE	WEIGHTS	OBTAINED	BY ALL	OPERATORS
	WITH				

	WITH ALL DIZES OF MEASURES	
	Sand	Rod Method
		Lbs.
1.	Coarse dry	. 107.5
2.	Coarse wet	. 93.4
3.	Difference	. 14.1
4.	Fine dry	. 99.5
5.	Fine wet	. 82.9
6.	Difference	. 16.6
7.	Dry	. 103.5
8.	Wet	. 88.7
9.	Difference	. 15.3
10.	Average of all	. 95.8

Modulus" proposed by Prof. Talbot, and also to the effect on the strength of concrete or mortar of the "Water-Cement Ratio" proposed by Prof. Abrams.

To get a better idea of the relative value and importance of these functions, a special sub-committee is now engaged in the conduct of a series of tests, which it is hoped will be carried out by a considerable number of co-operating laboratories, designed to duplicate some of the work already done by one or two laboratories in their own investigations, and so to furnish a basis for some general comparisons of the functions mentioned in the last paragraph above. This sub-committee met in Chicago on November 17 and 18 last, and spent the two days considering data placed before it and at the end of the session drew up an outline of a series

TABLE 2—AVERAGE OF DIFFERENCE BETWEEN HIGHEST AND LOWEST WEIGHTS OBTAINED BY ALL OPERATORS WITH ALL SIZES OF MEASURES

	CARLES AND AND AND AND
Sand	Rod Method
	Lbs.
Coarse dry	3.8
Coarse wet	7.5
Fine dry	4.4
Fine wet	6.1
Dry (coarse and fine)	4.1
Wet (coarse and fine)	6.8
Difference	2.7
1 - 11 - 11	
Average of all	5.4

of tests designed to touch the high spots of the work previously done at enough points to indicate the relative value of the functions under investigation. These tests are now progressing.

Cloyd M. Chapman, chairman, made an extended report in 1917 of the work done and results obtained in investigating some eight methods of determining the unit weight of sand. At that time it was suggested that another method

*Report of Committee on Concrete Aggregates, American Concrete Institute. which had been in use at Lewis Institute might prove of value, and consequently the committee undertook an additional series of tests to compare this newly proposed method with those previously investigated.

Fill the measure one-third full of the aggregate, then, with a pointed iron rod of a prescribed size, jab or puddle the aggregate twenty-five times, distributing the strokes over the surface of the aggregate and avoiding penetrating through the layer of aggregate so as to hit the bottom of the measure. Then add another one-third to the contents of the measure and again jab with the iron rod twenty-five times, penetrating only the last layer of aggregate placed in the measure. Next, fill the measure to overflowing and repeat the jabbing, then strike off the surplus sand with the iron rod and weigh.

This method appears equally applicable to fine or coarse aggregate, or mixtures thereof, and its simplicity and convenience recommend it to consideration, since the results obtained are of a degree of concordance equal to that obtained with the best of the other methods considered in the 1917 report.

To investigate this method, it was desirable that the same aggregates be used that were used in the previous tests, so that results would be directly comparable without repetition of the earlier tests. Inquiry, however, developed the fact that only two of the laboratories co-operating in the 1917 series had retained their samples, so it was decided to have the new method investigated in only one laboratory, using the same old samples, but having five different operators make five tests each with the same measures used in the previous tests, with the two grades of fine aggregate,

TABLE 3—AVERAGE FOR ALL OPERATORS FOR ALL SIZES OF MEASURES, OF THE VARIATION FROM THE MEAN WEIGHT OF ALL OPERATORS

Sand		1. The	Rod Method Lbs.
Coarse dry			8
Coarse wet			1.6
Fine dry			
Fine wet			9
Dry (coarse and fine)	Kuine.		8
Wet (coarse and fine)			1.3
Difference			
Average of all			1.0

each of them used in a dry and in a damp condition. These tests were, therefore, conducted in the laboratory of Westinghouse, Church, Kerr & Co., under the direction of the chairman of the sub-committee.

The six measures, described and illustrated in the 1917 Proceedings, were used. They were a 100 cc. cylindrical measure, a 1,000 cc. cylindrical, a $\frac{1}{4}$ cu. ft. cylindrical, a $\frac{1}{4}$ cu. ft. cubical, a 1 cu. ft. cylindrical, and a 1 cu. ft. cubical measure. The rods used were $\frac{1}{4}$ in. diameter by 18 ins. long for the 100 cc. and 1,000 cc. measure, $\frac{1}{2}$ in. by 18 ins. (long for the quarter) for cubic foot measures, and $\frac{3}{4}$ in. by 18 ins. for the cubic measures. The aggregates were a coarse siliceous Long Island sand and a fine siliceous New Jersey sand. These aggregates were used "room dry" and moistened to the extent of $\frac{3}{6}$ for the coarse sand and $\frac{5}{6}$ for the fine sand.

In order to make a comparison between the results obtained by this rod method and those reported on in 1917, a set of tables similar to those previously published are given herewith for the rod method.

By comparing this table with Table 1 on page 319 of the 1917 Proceedings, it will be noted that the rod method gives average weights about equal to those given by Methods B and E, or about midway between the light weights given by Methods A, F, and G, and the heavy weights given by Methods D and the cone method.