

from the bins. Its uniformity was such that a careful grading seemed unnecessary.

*Water.*—All water used in the tests was taken from the city water mains, the source of supply being Lake Ontario. The chemical analysis is as follows:—

Parts per million.

Total solids .....	120.0
Alkalinity (lacmoid) bicarbonates 103; carbonates 2 .....	105.0
Permanent hardness .....	32.5
Total hardness .....	137.5
Silicious matter .....	3.84
Iron oxide, alumina and phosphates .....	0.17
Lime (CaO) .....	43.4
Magnesia (MgO) .....	12.2
Sulphates (SO <sub>4</sub> ) .....	18.5
Chlorides .....	9.0

All steel reinforcement was rolled material. Its surface condition was excellent, showing little evidence of either mill scale or incipient rust.

#### Composition and Preparation of Test Sands

Within a radius of, say, 25 miles from Toronto good limestone sands having a large variety of gradings may be secured with little difficulty. The actual grading of a considerable number of these sands provided a range of grading within which, for practical reasons, it seemed advisable to limit the predetermined gradings of all test sands. Fig. 1 shows graphically the gradings of several natural sands; also, the gradings of the three original sands secured for the tests.

The practical range of sand gradings as above described having been fixed, the compositions for 12 different sands were predetermined as shown in Table I.

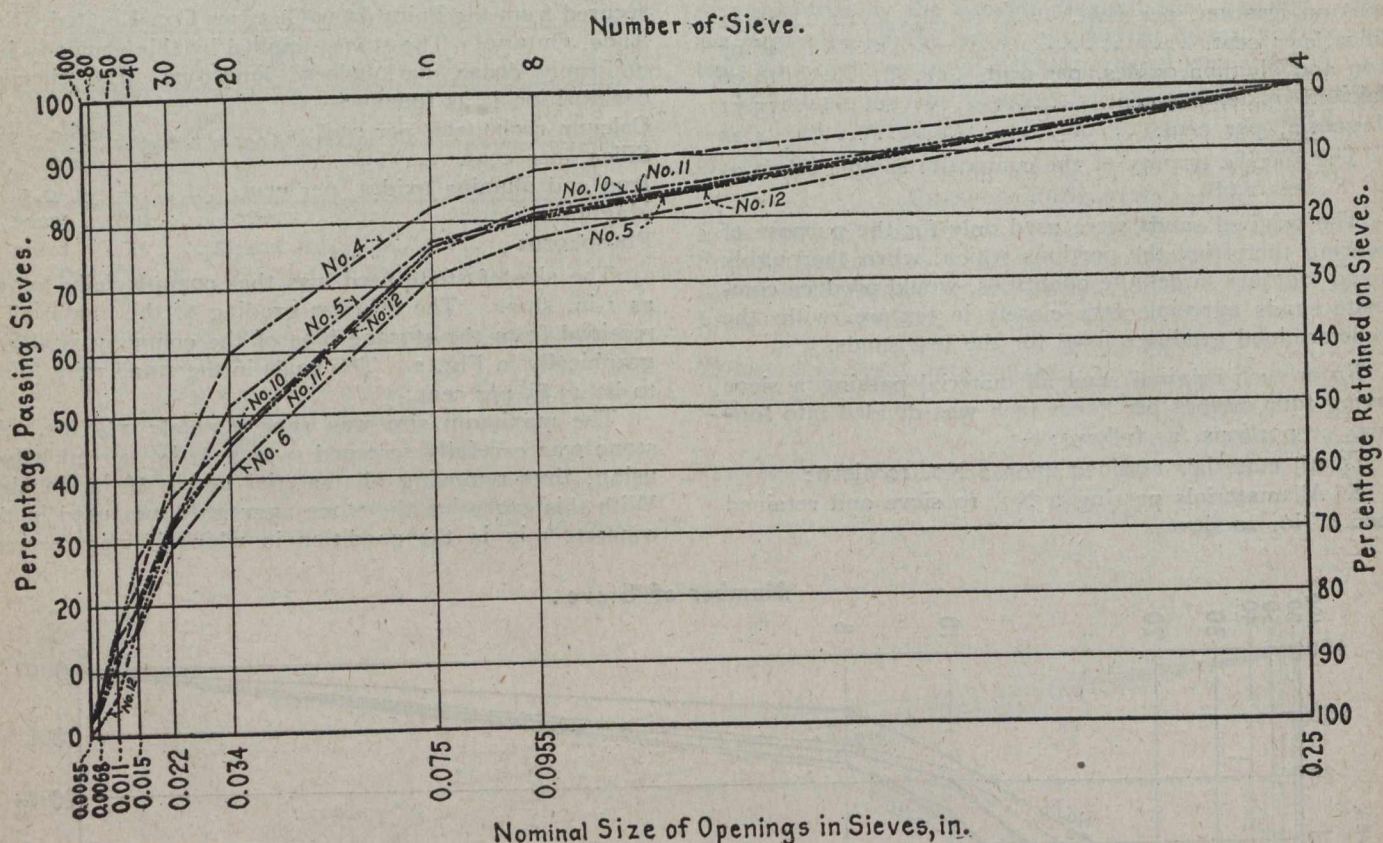


Fig. No. 5.—Gradings of Test Sands Nos. 4, 5, 6, 10, 11 and 12, as Determined from Mixer-Produced Samples

*Steel Reinforcement.*—The reinforcing steel was used only in the consistency tests upon reinforced-concrete beams.

Following are the physical and chemical properties determined in accordance with the specifications of the American Society for Testing Materials:—

#### PHYSICAL PROPERTIES

Tensile strength, lbs. per sq. in. ....	72,860
Elastic limit, lbs. per sq. in. ....	41,090
Elongation in 2 ins., per cent. ....	19.5
Character of fracture .....	½ cup, silky
Cold bend test .....	O.K.

#### CHEMICAL PROPERTIES

Carbon, per cent. ....	0.26
Manganese, per cent. ....	0.38
Phosphorus, per cent. ....	0.027
Sulphur, per cent. ....	0.033

These gradings are also shown graphically in Fig. 3.

TABLE I.—PREDETERMINED GRADINGS FOR SANDS

Series No.	Sand No.	Percentages Retained on Sieves.			
		No. 10.	No. 20.	No. 50.	No. 100.
1 .....	1	15	35	80	97
	2	20	50	85	97
	3	25	60	95	97
2 .....	4	15	40	85	97
	5	20	45	85	97
	6	30	60	85	97
3 .....	7	20	40	85	97
	8	25	45	90	97
	9	30	50	95	97
4 .....	10	25	55	80	97
	11	25	55	85	97
	12	25	55	95	97

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