## CHEMICAL PROPERTIES

Loss on ignition, per cent	2.68
Insoluble residue, per cent	0.81
Sulphuric anhydride, per cent	2.17
Magnesia, per cent	2.78

Sand.—All sand used in the tests was of limestone origin, secured from a chosen section of the pits of the Maple Sand and Gravel Co., Maple, Ontario. In its original state the sand existed in three clearly defined strata, which to all appearances, varied only in the degree of fineness of the sand grains. The terms "medium fine," "medium" and "coarse" have been applied to the original sands as indicating, in a general way, their character of grading. The actual gradings as determined by tests are shown graphically in Fig. 1.

The following is the chemical composition of a composite sample of the three original sands :--

Loss on ignition, per cent.	16.32
Silica. per cent.	46.97
Iron and alumina oxides, per cent	13.06
Calcium oxide, per cent	15.71
Magnesia, per cent	4.22

The specific gravity of the composite sample taken at  $70^{\circ}$  F. was 2.684.

The original sands were used only for the purpose of securing therefrom the portions which, when thoroughly mixed together in definite quantities, would produce com<sub>T</sub> posite sands agreeing very closely in texture, with the predetermined gradings fixed for the test sands.

From each original sand all material passing a sieve having four meshes per linear inch was divided into four Parts or portions, as follows:—

I. All materials retained upon a No. 10 sieve;

2. All materials passing a No. 10 sieve and retained upon a No. 20 sieve;

3. All material passing a No. 20 sieve and retained upon a No. 50 sieve; and

4. All materials passing a No. 50 sieve.

The parts so secured were placed in bags and carefully labeled for identification.

Prior to making the division above described the original sands were thoroughly dried upon a metal heater, since the sands as received from the pit were damp. With the object of determining the shrinkage in volume and weight due to drying, 4 cu. ft. of medium sand were measured and weighed, dried, and again weighed and measured. Following are the results of the test:—

Average weight of sand, lb. per cu. ft. $\left\{ \right.$	dry 85.25
Loss in weight (7.30 lb.)	. 7.9 per cent.
Loss in volume (324 cu. in.)	. 18.7 per cent.

Stone.—All crushed stone used in the tests was secured from the Point Anne Quarries Co., Limited, Point Anne, Ontario. The stone supplied by this company is a uniformly dense, dark-colored limestone. Its chemical composition is as follows:—

Calcium carbonate, per cent	96.0 - 98.0
Silica, per cent	2.0 - 2.5
Iron and alumina oxides, per cent	0.5
Magnesia	trace
Phosphorus	trace

The size of stone used was that commercially known as 1-in. stone. The average grading of this material as received from the storage bins of the company is shown graphically in Fig. 2. The voids in the stone were found to be 43.85 per cent.

The maximum size was approximately 1<sup>1</sup>/<sub>4</sub> ins. All stone was carefully screened over a <sup>1</sup>/<sub>4</sub>-in. screen before using, thus removing all material under <sup>1</sup>/<sub>4</sub> in. in size. With this exception the stone aggregate was used in the concrete mix in the condition in which it was received



Fig. No. 4.-Gradings of Test Sands Nos. 1, 2, 3, 7, 8 and 9, as Determined from Mixer-Produced Samples