provide that the concrete shall be mixed in the proportions of 1 volume of cement to 4½ volumes of sand and broken stone or gravel, and the proportions of fine and coarse aggregate are varied slightly as a result of field void tests so that the greatest density is obtained. Should the size or character of the materials change there would be a corresponding change in the proportioning of the mixture.

The coarse aggregate should consist of a well-mixed product of clean No. 1, No. 2 and No. 3 stone or gravel.

No. 1 size is that retained on ⅜-in. circular and passing a ⅝-in. circular screen.

No. 2 size is that retained on ⅝-in. circular and passing a 1½-in. circular screen.

No. 3 size is that retained on 1½-in. circular and passing a 2¾-in. circular screen.

It is provided, however, that not more than 25% of the total shall be No. 1 size, the proportions being so graded as to give a minimum of voids.

Aggregates should never be used unless they comply with the tests prescribed.

You may note that we allow, as our maximum size, stone that will pass a 2¾-in. ring, whereas most specifications permit only 1½-in. stone as a maximum. This may seem radical, but our reason for the increase in size is that we get equally as good if not better results from the larger stone, and at a cost decidedly lessened by our using more nearly the product of the crusher. Especially is the price to be considered on contracts where the local supply is crushed on the ground, as is the case in most of our work. If you desire economy, this change is worthy of your consideration. We save 15% in crushing costs by this use of stone larger than the previously accepted standards.

From a practical standpoint a pile of stone graded from ¾ to 2¾ ins. has more stability when properly mixed than stone graded from ¾ to 1½ ins. In our 1916 work we used stone up to 2¾ ins. in size; as an indication of the compressive strength per square inch of field cubes tested at an age of 26 days we have a grand average of 3,370 pounds per square inch for 504 cubes of stone and gravel, of which only 13¼% were under 3,000 pounds. Greater density can be obtained by using stone up to 2¾ ins. in size and with the larger size stone there is less probability of spalling at joints and along edges.

Sand.—Concrete pavement sand should be such that 100% should pass the ¼-in. screen; not more than 20% should pass a No. 50 sieve and not more than 6% should pass a No. 100 sieve. However, where more than 20% of the sand passes a No. 50 sieve, where it is well graded to give a low percentage of voids, and where it conforms to all other requisites, special permission for its use may be given by the chief engineer. Sand may be rejected if it contains more than 5% of loam or silt. All sand to be acceptable should have a compressive strength equal to Ottawa sand when tested in a proportion of one part cement to three parts sand at the same age, same consistency and using the same blend of cement as for Ottawa sand in the same proportions. It must be free from organic matter and any coating of grains.

Method of Mixing.—The concrete should be mixed in approved mechanical batch mixers. Mixing should be continued at a speed of not less than ten revolutions nor more than sixteen revolutions per minute, for at least one minute after all materials are in the drum and before any discharge is made.

If at any time during the progress of the work the temperature is so low that in the opinion of the engineer in charge of the work it will within 24 hours drop to 35° F. the water and aggregates should be heated and precautions taken to protect the work from freezing for at least ten days. Should these temperature conditions persist for two consecutive days, permission should be obtained from the chief engineer before proceeding. He will lay down such requirements of procedure as may be permitted; such procedure should be only for emergency work. In no case should concrete be deposited on frozen subgrade.

CANADIAN NORTHERN RAILWAY-HYDRO CONTROVERSY AT HAMILTON.

In connection with the controversy between the Ontario Hydro-Electric Commission and the Canadian Northern Railway regarding an entrance into the city of Hamilton, Ont., a committee of five representative citizens there has recommended that a broad and impartial investigation into the matter be carried on by a board of independent engineers. Until this report is submitted there is little likelihood of any definite action being taken by the city.

The engineers who compose this board are Col. R. W. Leonard, St. Catharines, Ont., formerly chairman National Transcontinental Railway Commission; Sir John Kennedy, Montreal Harbor Commissioner, ex-chief engineer, Great West Railway of Canada; Wm. F. Tye, consulting engineer, Montreal; Dr. Louis Herdt, electrical engineer, Montreal; W. J. Francis, consulting engineer, Montreal.

These gentlemen are all members of the Canadian Society of Civil Engineers. The local committee is urging delay until the board of engineers as above constituted has completed its investigation.

CANADA'S PRODUCTION OF MINERALS.

The tremendous expansion in Canada's production of minerals, particularly copper, iron, nickel, zinc and other ores needed in the manufacture of munitions, was interestingly dealt with by John McLeish, chief statistician of the Department of Mines at Ottawa, in an address to the members of the Royal Canadian Institute, Toronto, on the evening of January 27th. During 1916 the mineral output of the Dominion rose to 175,000,000 tons of ore, as compared with 135,000,000 in 1915, and the increase in production and in the market value of the minerals meant an extra $33,000,000 of money.

The pressing demand for certain metals had resulted in the development of ore bodies that had never been exploited before, owing to the cost of mining. An instance was the mining of molybdenum in Quebec, which last year produced ore worth $300,000. Chromite was another ore now being supplied from Quebec. Before the war the United States secured nearly its whole supply from New Caledonia.

Mr. McLeish stated that the lack of refineries in Ontario was unfortunate, but that they were now being built in a number of places in Canada. The refining of Canadian minerals at home would go on after the war was over.

There seems every prospect of rational coal mining being possible in Iceland, and preparatory work is being pushed ahead with considerable energy. For this purpose a Danish-Icelandish Coal Mining Company has been formed, with a capital of 350,000 kr., privately subscribed, which will be greatly increased when deemed necessary. A Swedish expert has examined and reported upon the Icelandish coal deposits; he estimates them to contain some 180,000,000 tons. The quality is said to be considerably better than hitherto supposed. The coal is reported to be fully equal to Scotch coal, and even if, on account of its large percentage of ash, it is unsuited for steamship boilers, a good market for it will be found for use for domestic purposes and power stations.