

The turbine shafts will be of open hearth forged steel, with the following physical characteristics:—

Ultimate tensile strength not less than 75,000 lbs. per square inch; elastic limit, 37,500 lbs. per square inch; elongation under 2 inches, at least 25 per cent.; reduction of area, at least 40 per cent.

The governors will be of the water pressure type and will be supplied with distant speed controllers, hand controls, gate limiting devices, over speed shut down devices, manual speed adjustments, gate opening indicators and tachometers.

The governors will be adjusted to normal time of 3 seconds for closing the gates of the turbines.

Devices will be provided which will close the gates automatically if a governor belt breaks or other similar accident occurs. The governors must readjust the gates whenever the speed varies more than one-half of 1 per cent. from normal. The specifications state that they must not race or hunt, but must come to rest quickly when not again disturbed by changes of load or head.

Tenderers are asked to specify the data on which they can deliver the turbines and governors, and tenders are being asked in the following six ways:—

(1)—Lump sum tender, erected complete; (2)—lump sum tender, f.o.b., works; (3)—cost plus ..... per cent., giving estimated cost complete; (4)—cost plus ..... per cent., giving estimated cost f.o.b., works; (5)—cost plus fixed sum of \$....., giving estimated cost complete; (6)—cost plus fixed sum of \$....., giving estimated cost f.o.b. works. Tenderers are allowed to quote on one, two or three units, or on all four units. Quotation is also asked on spare runners.

## COMBINED OR SEPARATE SEWER SYSTEMS

**I**N an effort to lay down somewhat definite principles for guidance in determining whether the combined or separate sewage system should be adopted, the Engineering Department of the Bureau of Industrial Housing and Transportation of the U.S. Department of Labor has issued the following tentative instructions:—

### Conditions Favoring Separate System

The separate system of sewers is indicated as most desirable when the following conditions obtain:—

Where storm water does not require extensive underground removal or where it can be concentrated in a few shallow underground channels.

Where drainage areas are short and steep, facilitating rapid flow of the water over street surfaces to the natural water courses.

Where the sanitary sewage must be pumped and additional cost of pumping even of a small amount of storm water is great.

Where the sanitary sewage must be purified and storm water is a combined system either purified or by-passed—either scheme requiring large purification plant capacity or creating nuisance due to the overflow of objectionable refuse.

Where the sewers are being built in advance of a city's development to encourage growth, the separate system often provides a maximum number of miles of sewer for a minimum of expenditure.

The storm sewers, if ever required, may be gradually introduced later and rarely need to cover over about one-half the area covered by a sanitary system. This consideration, however, is not always applicable to the

present intensive and complete housing development schemes.

A combined system of sewers must usually be relatively of larger capacity than a separate storm drain for the same area, because the storm drain may be overloaded at long intervals with slight inconvenience, whereas in a combined sewer any overflow is accompanied by a great nuisance and complaint owing to basement connections and consequent liability of flooding.

In general, rather rough topography with marked natural drainage and open spaced residential settlement not likely in the future to become dense, together with the desirability of sewage treatment indicates the separate system as the method most desirable.

### Conditions Favoring Combined System

The conditions that indicate that the combined system is the one most desirable are as follows:—

Where it is evident that both storm water drains and sanitary sewers must be fully and completely installed throughout the entire length of the street in the district, it is obvious that the total cost will be far greater for the separate than for the combined system.

Where no pumping or purification is required at present or is anticipated in the future.

In general, flat topography without natural drainage and with dense settlement, or future liability to dense settlement, together with the lack of necessity of sewage treatment indicates the combined system as the method which is desirable.

### Combination of Two Systems

The selection of system to be adopted should not follow hard and fast rules. Often in the same development it may be desirable to provide in one part the separate system, in another part the combined system, and still in another part a combination of the two methods. Occasionally a combined sewer may be introduced in a separate system to advantage with interception of its natural flow at some point before the outlet is reached. The economical and efficient method is only arrived at by outline design and cost comparisons of different projects.

### Combined Systems and Treatment Plants

It does not always follow that where sewage treatment is involved the selection of the separate system is imperative. It is usually desirable but cases may arise where the combined system should be adopted although sewage treatment in some form is necessary. This latter condition will be the same ordinarily where—

- (1) All streets must have storm water removal.
- (2) Where very complete treatment is not necessary.
- (3) Where high-grade effluent from the treatment plants is not warranted.
- (4) Where storm flows can be safely and properly by-passed into flooded streams.
- (5) And in general where cost of treatment works (considering operation as well) for a somewhat large normal flow are obviously less than the cost of duplicate sewers in full throughout the district drained.

Green, Dods and Co., Royal Bank Building, Toronto, have been appointed Canadian agents for Anderson and Co., 165 Broadway, New York, who are the American representatives of the French Mercantile Marine, and have recently placed in Canada contracts for wooden ships aggregating over \$7,000,000.