

The specification includes, of course, all the usual clauses regarding tests, workmen's rights, progress certificates, inspectors' powers, etc., but the following points covered by the specification may be interesting to engineers and contractors interested in water supply problems:—

It is the intention to utilize the present clear water reservoir, which has an area of 2.2 acres with a depth of 12 ft., but it is probable that some bidders may require a clear water basin. If so, cost of same must be included in tender. The work also includes:—

The necessary number of mechanical filter units of four million Imperial gallons each, or approved equivalent. These units to be complete with all appurtenances. Filters will be grouped on both sides of the piping gallery, which will be utilized as an operating platform. Filter tanks to be of steel or reinforced concrete. Filters to discharge into clear water reservoir at Elevation 45, Toronto datum.

The low lift pumping machinery shall comprise three centrifugal pumping units, each of not less than 36,000,000 Imperial gallons capacity per 24 hours. Units to be capable of pumping from an elevation of 30 (Toronto datum) to whatever height is necessary for delivering the water to the filters.

The necessary wash water pumps connected to the tank. Each pump shall be of ample capacity to supply all the wash water required for the entire plant.

The necessary air-blowers, each of which shall be of ample capacity to supply all the air required at the desired pressure for washing.

#### Interesting Specification Details.

All piping and connections from shore end of existing intakes to pumps, including hydraulically operated valves, together with well and surge overflow, all furnished and erected in place.

The amount specified by tenderer for coal storage shall provide for a building capable of storing not less than 1,500 tons of coal, and shall include coal-handling apparatus from scow to storage building, and from thence to boiler-room.

The low lift pumping station shall be of ample size and proper construction to accommodate all the apparatus requisite for pumping the water, together with the wash water pumps, air-blowers, travelling crane and other machinery, and also to accommodate certain enumerated machinery that will be moved from the old to the new pumping station, as the old station is crowded.

The window frames and sash of all buildings shall be of approved pressed steel, fitted with first quality wired glass.

All plans and specifications submitted by the tenderers shall become the property of the city, and must be specially prepared for this work, and be in sufficient detail so that the quantities of the work and materials can be computed with accuracy.

The contractor shall furnish and install all the necessary filter equipment, including strainer system, filter piping, the necessary hydraulically operated valves, all the operating tables, loss of head gauges, air and wash-water gauges, recording gauges for wash-water tank, measuring apparatus for automatically recording the amount of wash water used, filter sand, filter gravel, rate controllers, wash-water pump and gutters, air-blower with requisite motive power, sampling devices, water meters.

Tenderers may also tender on a combined air and water wash, consisting in the application of both compressed air and filtered water through the strainer system.

Tenderers may bid on a separate air and water wash, comprising the application of compressed air through a separate air-distributing system of perforated brass tubes and of the filtered water through the strainer system.

The general design of the strainer system shall be such, that in combination with other parts of the filters and filter piping a uniform distribution of wash water and of air, if used, shall be ensured over the entire bottom of the filters; it shall be designed so as to completely drain the bottom of the filters; the system shall be substantial, and provision made that the parts may be readily renewed. Further, the individual openings in the system shall be large enough so as not to be easily clogged, and yet small enough and so formed as to secure uniform distribution of the wash water.

#### Operating Equipment Complete.

The contractor shall furnish and install on each operating table a loss-of-head gauge of approved type, complete with all the necessary floats, float tube, counterweight, wire, pulleys and other appurtenances. The gauge shall be arranged to accurately record the loss of head through the corresponding filter by means of an approved pen upon a chart mounted on a disk or drum revolving once in twenty-four hours, graduated in an approved manner, so as to report distinctly losses ranging from zero to the maximum, while the travel of the pen is about 6 inches. The float tubes shall be 8-inch galvanized wrought iron pipe of ample length, capped at the lower end, and securely fastened in a truly vertical position. Floats shall be seamless and spherical, about 6-inch diameter, and made of copper. The connections from the filters and effluent pipe shall be of not less than  $\frac{3}{4}$ -inch brass pipe, with brass nipple, through the wall of the filter.

Provision must be made to prevent the entrance of wash water or sand into the float tubes. The mechanism of the gauge shall be of brass enclosed in a strong, neatly finished, heavily nickel-plated brass case, same to be accessible for adjustment and repair. Connection shall be made to the tubes to permit of adjustment and drainage, and valves shall be placed on the connections between the tubes and the filter wall or effluent line respectively.

Special care shall be taken in transporting and placing filter sand to prevent contamination of any sort, and sand which may have become dirty, either before or after placing in the filters, shall be washed or removed or replaced by clean sand in a satisfactory manner. All contaminated sand shall be rejected. After sand is in place in the filters it shall be washed at least ten times with the washing devices connected with the filter, and the fine sand appearing at the surface shall be removed by scraping or otherwise. Sufficient sand shall be placed in each filter bed to secure a layer of the proper depth required for giving the most efficient results after the sand has been washed and scraped. The contractor must state the depth of filtering medium in inches required in the filters, and he must also state the effective filtering surface, and the rate of filtration in Imperial gallons per sq. ft. per hour.

The contractor shall furnish and erect in suitable location, approved by the Commissioner, one chimney not less than 120 feet in height above the grate bar level, with an inside diameter not less than 84 in. This chimney may be built of buff brick or other approved material, and provided with stranded copper lighting conductor, with all necessary ground and other connections, and of design approved by the Works Commissioner.