MUNICIPAL WATER SUPPLIES

INTRODUCTION

In cities and towns, a central source can provide water for domestic, commercial and industrial purposes more economically than can individual sources for each consumer. In rural or isolated areas, however, individual (private) sources are the only ones economically possible.

A municipal waterworks is a public utility, usually operated as a governmental department, developed to procure raw water in adequate quantity, treat it to obtain the desired purity, and distribute the treated water in suitable volume and pressure to users. In some communities the municipal waterworks is owned and operated by private interests.

When addressing the question of the adequacy of municipal water supplies for the firefighting needs of a facility, there are two possible problems. The first, and most common, is that the municipal system might not be able to deliver water at a sufficient flow rate or pressure to the facility to satisfy the design requirements of the installed fire protections systems. This potential is addressed by performing flow tests as described in PRC.14.1.2.1.

The second danger is that the municipal system might not be able to supply the facility's firefighting water needs for a sufficient duration. Due to the size of most municipal systems, this danger is relatively uncommon but, where it exists, it is also much harder to detect.

POSITION

When a public waterworks connection is utilized as a fire protection water supply for a proposed plant or existing plant, determine the water volume and pressure available at the plant site by measuring the water discharged from public hydrants. See PRC.14.1.2.1.

If the municipal water supply is suspected of having inadequate duration or if otherwise deemed necessary, survey the municipal water supply system to determine its adequacy for firefighting purposes. Collect the following information and keep it on file:

- Minimum raw water capacity, i.e., delivery rate of wells and minimum supply in reservoirs;
- Capacity of raw water pumps, i.e., deep well pumps, river pumping stations;
- Capacity of treatment plant, i.e., maximum rate at which water can be safely treated;
- Minimum treated water storage capacity;
- Capacity of distribution system pumps;
- Capacity of standpipes and tanks;
- Locations (including elevations) of all of the above;

- Maximum daily rate of consumption;
- Average daily rate of consumption;
- Existence, location, and arrangement of different pressure zones;
- Susceptibility of the piping system to failure from broken mains and freezing;
- Age, size, and condition of piping;
- Valve exercising policy;
- Susceptibility of the facility to failure from floods, power interruption and fires;
- Emergency response policy toward breaks and other problems;
- Municipality's evaluation of the needs and condition of their system;
- Short and long term plans for the system;
- Record of droughts.

Examination of the above features suggests that there should be more problems in smaller communities than in large ones, but even big cities are not totally immune. Typically the age of a municipality is more critical than size. As systems are expanded to service new areas and new industries, the older parts of a system may be overtaxed.

Obtain the water supply information from the local office of the waterworks (or equivalent private company). Even when previous information is still on file, check the information with waterworks officials to make sure it is up to date and that proposed changes are included.

If changes or revisions of the existing waterworks or water demands are proposed, obtain sufficient information to permit an accurate analysis of the effect of the changes.

Plot the location of the plant site with respect to the waterworks distribution system. Show the location on a map or sketch of the system. Emphasize gridding and valving. Note any left-handed valves. If no suitable plans of the waterworks are available, sketch the important features on a small-scale street map, which usually can be obtained from the town or city engineer, planning commission or zoning commission. Include the distance to and change in elevation from the plant site of the hydrants used in the test.

Due to the wide range of possible results, perform tests of direct-indirect pumping type waterworks when the municipal pumps are running and again when they are shut off.

Record the status of the distribution system at the time of test, such as which pumps are running and the status of suction supplies. Send copies of results of newly conducted tests to the manager of the municipal water department.

DISCUSSION

Normal runoff of raw water from a large area or watershed is stored in an impounding reservoir, usually created by damming a natural stream. Other raw water sources may include lakes or deep well pumps. The reservoir is often at a considerably higher elevation than the community served. The water flows from the reservoir through canals, tunnels, conduits or pipes to a treatment or filtration plant. Here, suspended matter is removed in settling basins or by passing the water through filters. Chemicals may be used to facilitate these processes. Other chemicals, such as chlorine, may be added to counteract harmful bacteria. Water suitable for human consumption is known as potable water.

Gravity Systems

In a gravity fed system, water from the treatment plant flows by gravity through the distribution system, the network of pipes and valves in the community itself.

If the capacity of the treatment plant is less than the peak rate of consumption, a "clear water storage reservoir" tank on a tower or elevated location, or series of such, is provided to hold a reserve supply of treated water to be drawn upon during peak periods.

Seismic concerns however, limit the size of tanks on towers.

Pumping Systems

Pumping systems are used where the primary supply of water is drawn from wells or from rivers or lakes at nearly the same or lower elevation than the community, as is usually the case in relatively flat country. One set of pumps delivers the water to the treatment plant and another set pumps from the clear water reservoir to the distribution system.

Direct pumping systems are those in which the water is pumped directly from the clear water reservoir into the distribution system with no elevated storage. In such a system, the pumping rates may be arranged to vary with the demand.

Direct-indirect or "dual flow" systems are those in which the clear water is pumped directly into the distribution system at a nearly uniform rate. When the demand is less than the rate at which the water is being pumped, the excess goes to elevated reservoirs or tanks. When the demand is greater than the pumping rate, the water in the elevated storage flows back into the system. Such tanks or reservoirs are said to "ride" or "float" on the system.

An altitude valve is often used where the overflow elevation of an elevated storage tank is less than the equivalent head rating of the pumps. The altitude valve is open whenever the elevated storage is less than full. The altitude valve closes when the pumps are running and the elevated storage is full. It is placed in the system to prevent overflowing the elevated storage tank.

Indirect systems are those where all water is pumped into elevated storage reservoirs or tanks from which it flows by gravity into the distribution system. These systems are used infrequently.

No two waterworks are alike; each is designed to fit the particular city or town involved. A complete investigation of a public water supply should include not only a hydrant flow test in the vicinity of the plant site, but also a study of the entire waterworks to make sure that it is capable of providing the amount of water needed at an adequate pressure for the duration of the fire. It is important that adequate amounts of water be available during periods of maximum consumption, droughts, conflagrations, future increased consumption, or during impairments caused by broken mains and loss of pumping facilities.

For additional information, see AWWA M31.