PROTECTION AND DEVELOPMENT OF KENTUCKY WATER SUPPLIES

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Communities throughout Kentucky have come to the full realization that an abundant supply of pure clean water is of the utmost importance to their growth and development as well as to their health and welfare. The future of any community, to a great extent, is dependent upon a water system that will adequately meet its domestic and industrial needs. Through the combined efforts of federal and state programs and agencies, communities in Kentucky are making headway and are succeeding as never before in getting new water supply systems. Most of us are aware of our state's rich water resources, but few of us realize that in order to attract new industries and provide for the growth of our community that the existence of natural water sources is not enough. Public water plants must be designed and operated by qualified persons. Routine inspections of these water supplies must be made by the state engineers to assure good service. It is the responsibility of the Sanitary Engineering Program of the Division of Environmental Health in the State Department of Health to protect and improve the health of the public by upholding and enforcing the regulations affecting the health and safety of public water supplies.

As I have mentioned previously, a community must be able to provide an adequate supply of good water in order to attract industries and encourage the general economic and social development. The one single and almost insurmountable obstacle appears to be that of financing. However, since the passage of the Accelerated Public Works Act in 1962, sixty-six Kentucky communities have received grants for the construction of new water treatment plants or for the improvement of existing systems. Over ten million dollars have been provided under APW and seven and one-half million dollars by local sources, bringing the total construction cost made possible under the Federal Public Works Act to seventeen and one-half million dollars. Funds for the APW program have now been exhausted. However, we hope appropriations will be made in the future for additional grants.

When a community proposes to build or improve a water plant, the engineers of the Kentucky State Department of Health review for approval the plans and specifications before construction begins. Sanitary features of design are carefully evaluated. Inspections are conducted regularly upon completion of the plant to assure proper maintenance and operation of these water plants. At the present time there are 335 Kentucky communities that have public water supply systems. A total of one and one-half million people or 50% of the population of the state are being served by public water supplies. The other one and one-half million residents of Kentucky receive their water from private systems consisting of wells, cisterns and springs, or from surface sources such as ponds. These rural water supply systems are often subject to surface and subsurface contamination. Much has been done to provide water for rural areas through water districts. In Kentucky today, there are sixty-three operating water districts. Some of these districts have their own water treatment facilities and some are merely extensions to existing municipal supplies. Although over 700 water districts have been formed in Kentucky throughout the years, a relatively small number, as I have indicated, are actually functioning. This is due to several factors but primarily to lack of adequate support and in some cases it has been discovered that the cost is considerably out of proportion to the overall benefits to be expected. By far, many have found that financing is the biggest problem. However, in most cases, well informed leadership has overcome these obstacles. Since the creation of water districts in Kentucky has proved to be one of the most popular and suitable means of obtaining water for rural areas, I would like to dwell a little on their creation.

The formation of water districts is covered in the Kentucky Revised Statutes, Chapters 74 and 106. As most of you probably know, a water district is created by an order of the County Court upon petition of seventy-five property owners within the proposed district. The court makes the order designating the district by name. The County Judge appoints the Board of Commissioners who supervise the operation of the district. When organized, the district has authority to issue bonds, the retirement of which is derived from revenues of the district.

It is possible for municipalities to acquire water districts and water districts to acquire city water systems by mutual consent. As a matter of fact, sewerage systems may be acquired by water districts...
by virtue of a 1962 amendment to the Water District Law.

Financing for water districts is commonly obtained by assistance from the federal government in grants and/or loans, or public sale of bonds. The federal agency usually involved is the Farmers Home Administration with offices in Lexington, Kentucky. In addition, loans are available from Community Facilities of the Housing and Home Finance Agency, Atlanta, Georgia. Until December 31, 1964 loans were also available under the Area Redevelopment Administration of the Depressed Area Act. However, at the present time, the most popular means of financing water districts is the Farmers Home Administration. This agency is specifically authorized to finance water districts for farmers and rural residents. This includes towns of under 2500 population. In Kentucky the financing of water districts has been with revenue bonds sold on the open market but insured by the federal government. Interest rates to the districts have been under 4%. At the present time, thirteen water districts have been completed or under construction which have received assistance from the FHA. Five other districts have received tentative approval and seventeen applications have been received for future water districts. The remaining fifty water districts in the state have received financial aid from other agencies besides FHA.

I would like to briefly mention the role of the Public Service Commission in the regulation of water districts. Prior to 1964, a water district was not considered a utility. The 1964 General Assembly enacted House Bill 493, thereby placing the water districts under the jurisdiction of the Public Service Commission, which includes the setting of rates and charges of utilities. In effect, a water district is now a utility in the meaning of that term as it relates to the P. S. C. A Certificate of Convenience and Necessity is required to be issued by the Commission prior to commencement of construction.

The role of the consulting engineer in the construction of a water district starts after the water district has been legally established with boundaries and the number of customers that it will serve. The consulting engineer determines the best available source of water and the feasibility of developing the project. The source may be wells, lakes or springs. Connection to an existing water system may be recommended as the most feasible arrangement in some cases.

Since we of the Kentucky State Department of Health have been repeatedly requested to outline our requirements in the development of water districts, I would like to review step by step what information should be provided. Under the Kentucky Public Water Supply Regulations KRS 211, plans and specifications for all public water supply systems must first receive approval from the Kentucky State Department of Health before construction begins. This provision is covered under item 2, page of the regulations as follows:

“No municipality, county, public institution, firm, corporation, officer or employee thereof, or other person shall install or start construction of any public water supply facilities, or make any material change in any such existing facilities or works, until plans and specifications, together with an engineering report supporting in detail the design set forth in such plans, have been submitted to the State Department of Health and approved in writing. Plans, specifications, reports and other information shall be submitted of such form and contents as may from time to time be specified by the Department.”

A public water supply is any water supply serving the public irrespective of its ownership or operation and made available for drinking and/or domestic use. All public water supply systems therefore, whether they are designed to serve a water district or a city, must conform to the above requirements. The facilities may consist of a complete water treatment plant or merely an extension to an existing water system. Essentially, the following steps must be followed after the water district has been legally formed:

1. A professional consulting engineer or engineering firm, registered in the State of Kentucky, must be employed by the water district to prepare a preliminary engineering report. The consulting engineer must submit a one gallon sample of the water of the proposed raw water source, whether it be a deep well or a surface source, to the State Laboratories at the Kentucky State Department of Health, Frankfort, Ky., for a routine chemical examination. The water sample must be properly tagged as to name of water district; date of collection; point of collection; and name of collector. A report of the laboratory results with interpretation and recommendations for proper treatment or rejection will be made by the office of Sanitary Engineering to the consulting engineer.

2. Following the recommendations of the State Department of Health as to the extent and degree of treatment necessary to produce a safe and potable water, the type of treatment must be incorporated in the final plans by the consulting engineer. Plans and specifications must be submitted in triplicate to the office of Sanitary Engineering of the Ken-
would like to discuss briefly the actual treatment required for ground and surface water supplies.

Surface water supplies derived from lakes and impoundment, rivers and streams must be given complete treatment. This includes quick mix, 40 to 60 minutes coagulation, 4-hours settling, gravity filtration at 2 gal. per sq. ft. per minute (slow sand filtration at 2 gal. per 25 sq. ft. per minute), and chlorination. All deep well supplies must be chlorinated allowing a minimum of 30-minutes contact time. However, additional treatment for well supplies, such as iron and manganese removal, may also be required if the chemical analysis indicates this to be necessary. Low productivity, high chloride and nitrate content will be the basis for rejection of a well supply.

Since a considerable number of the rural water supplies are derived from wells, I would like to confine the last part of my discussion to ground water supplies. A safe well water supply depends on good location and construction. Ground water obtained from properly located and constructed wells is generally free from disease-production bacteria. However, in Kentucky due to the sedimentary rock type formation and relatively thin layers of top soil, it is not always possible to obtain safe water from a well. Therefore, precautions in protecting the well and chlorination of the water becomes necessary. Wells must be constructed in such a way as to exclude surface and ground water above the levels of water producing formations.

Additional security can be obtained by removing known sources of contamination as far possible from the well or constructing a new well a safe distance from such sources. The well site should not be subject to flooding. It should be properly graded and drained to facilitate the rapid removal of surface water. To assure protection against the entrance of surface and subsurface water, the well should be located uphill with the following minimum distances from sources of pollution:

- Pit privies and septic tanks _______ 50 ft.
- Subsurface sewage lateral fields and barnyards ____________ 70 ft.
- Seepage pits _______________ 100 ft.
- Cesspools ______________________ 150 ft.

If it is necessary for sewer or drain lines to pass closer than 50 ft. from a well, the sewer must be constructed of cast iron pipe with leaded joints. Under no condition should any pipe carrying sewage pass within 20 ft. of a well.

Proper construction of a well depends on a number of items, some of which I would like to mention:

1. The suction pipe of a well within 10 ft. below the ground surface should be surrounded by a water
tight casing extending above the ground, platform or floor surface.

2. Every pump platform or pump room floor should be water tight and elevated above the land level.

3. Water tight concrete platforms should be properly reinforced and sloped to drain off surface and waste water from the center of the well casing to the outer edges of the slab.

4. The slab or pump room floor should have a minimum thickness of 4-inches and extend not less than 2 ft. from the well casing in all directions.

5. The pump's base should form a watertight seal with the well covering or casing. In instances where the pump is not installed directly over the well, the well casing should extend at least 6-in. above the pump house floor and a watertight packing should close the space between the casing and section pipe.

6. No well casing, pump, pumping machinery, or exposed suction pipe should be located in any pit or space below ground level or any space above the ground which does not have free drainage by gravity to the ground surface.

A pitless adaptor which provides heavy cast iron housing to well casing below the frost depth may be used as a safe and sanitary seal against surface contamination.

Last, I would like to emphasize the importance of chlorination. Automatic chlorination is mandatory for all public water supplies and is recommended for all private supplies. A new well or one which has recently been repaired or cleaned usually contains contamination which may remain for weeks unless the well is thoroughly disinfected. Disinfection may be accomplished by the use of any one of many chlorine compounds available. Continuous application of chlorine usually ranges from one to several parts per million, depending upon the amount of chlorine absorbed by the material in the water and the chlorine residual necessary to keep the water safe. A 0.2 ppm of chlorine residual in drinking water is required at all times. The chlorine is applied to the water on the well pump discharge side and before the water enters the pressure tank. The pressure tank must be of such a capacity as to provide a minimum of 30-minutes contact time between the water and chlorine.

In closing, let me add that bacteriological testing should be conducted at regular intervals to assure the safety of our drinking water. The State Laboratories offer this service at no cost. Sample containers may be obtained from the county health department or directly from the State Department of Health.