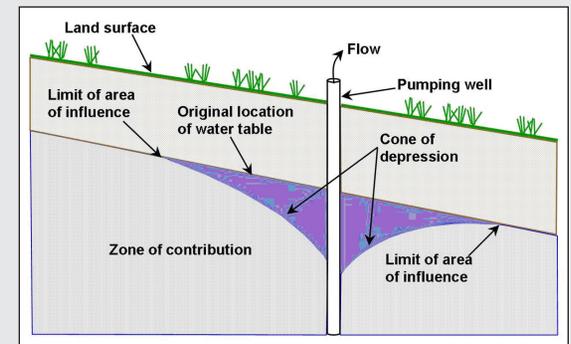


CHAPTER 7: POTABLE WATER SUPPLY STANDARDS



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Commentary

Illustration 7-a. Potable Water



It is important that every home be assured a safe, potable water supply.

Recommended Standards

7.0 INTRODUCTION

Potable water in Pennsylvania is provided by a range of sources: private well, privately owned and operated community systems, municipalities and municipal authorities, and public utilities.

Each type of water system is subject to different regulations and regulatory agency oversight. For example, public water systems operated either by a municipality serving solely within its corporate limits or by a municipal authority are regulated by PA DEP under state-enacted regulatory programs and delegated federal regulatory programs. By contrast, a public utility is authorized and regulated by the Pennsylvania Public Utility Commission and also is subject to the system construction and operation regulations of the PA DEP. Additionally, water systems located within the Delaware River Basin and the Susquehanna River Basin are subject to regulatory oversight by the Delaware River Basin Commission and Susquehanna River Basin Commissions, respectively. Because of these systems, the regulatory agencies, and the applicable regulations for these systems frequently use the same terms to mean different things, it is important to check the source of your regulations before proceeding with a water system design.

Municipal authorities are subject to the Pennsylvania Municipal Authorities Act found in Title 53 of the Pennsylvania Consolidated Statutes. The Pennsylvania Public Commission's regulates public utilities under Title 66 of the Pennsylvania Consolidated Statutes and regulations found in Title 52 of the Pennsylvania Code. PA DEP regulation of public water supplies falls under chapter 109 of the Pennsylvania Code.

Pennsylvania does not have any state level regulations controlling the construction or use of individual private water wells that pump less than an average daily flow of 10,000 gallons per day over a 30-day period (although some county health departments have well permit requirements). Individual well owners are responsible for the health of their own water. Preventing contamination of water supplies is much easier and cheaper than dealing with a water quality problem after the fact. Poor water quality is often a direct result of an improperly constructed well. Therefore, it is very important to follow sanitary well construction guidelines even though there are currently no state regulatory requirements for private wells.

For the purpose of managing our groundwater supplies, the legislature enacted the Water Planning Act (Act 220) in December 2002. Act 220 requires the PA DEP to update the State Water Plan and determine how much water we have, how much we use, and how much will be available in the future. The Act requires any commercial, industrial, agricultural, or individual activity that withdraws or uses 10,000 or more gallons of water per day, averaged over any 30-day period, to register and periodically report their water use to DEP. Those

Recommended Standards

activities that use less than 10,000 gallons per day may choose to register voluntarily.

Chapter 7 focuses primarily on standards for private wells because, for the most part, this is the only system over which the municipality can exercise direct regulatory control. Terms used in this chapter are defined in Appendix 7.A.

7.1 GENERAL

- a. Each dwelling unit and each commercial or industrial building in all subdivisions and land developments hereafter granted approval shall have an adequate supply of potable water for domestic use.
- b. All water supply facilities, whether public or private, located in any designated floodplain district shall be floodproofed up to the regulatory flood elevation.
- c. Abandoned well(s) on a property shall be sealed properly before development to prevent contamination of the aquifer.
- d. Requirements of an applicable River Basin Commission shall be abided.

Commentary

The vocabulary and definitions used throughout this chapter are from chapter 109 and correspond to the design criteria documents from the PA DEP.

The owner of a property can be held liable for contamination that an old, abandoned well causes or spreads. Therefore, it is important that an abandoned well is sealed before construction activity begins on the site. Refer to Reference 2 for information about well abandonment procedures.

In some areas a River Basin Commission may have local requirements. Check with the local authority for additional guidance in water use planning.

- Delaware River Basin Commission (DRBC): <http://www.state.nj.us/drbc/>
- Susquehanna River Basin Commission (SRBC): <http://www.srbc.net/>
- Ohio River Basin Commission: (859) 257-5141
- Interstate Commission on the Potomac River Basin (ICPRB): (301) 984-1908.
- Great Lakes Commission: www.glc.org or www.greatlakes.net

Commentary

A public water system (PWS) is defined as a system that provides water to the public for human consumption, and that serves at least 15 service connections or at least 25 people daily for at least 60 days per year (Ref. 4). A public water system includes collection, treatment, storage and distribution facilities under the control of the operator of the system and used in connection with the system. The term also includes collection or pretreatment storage facilities not under control of the operator that are used in connection with the system. Public water system permit requirements can be found in Subchapter E of Chapter 109 of the Pennsylvania Code. Illustration 7-b shows the relationship of water systems.

Public water supplies are categorized as either community or noncommunity water systems.

A community water system (CWS) is defined as a public water system that serves at least 15 service connections that are used by year-round residents or regularly serves at least 25 year-round residents.

A noncommunity water system is categorized as either a transient or nontransient water system. A nontransient noncommunity water system is defined as a noncommunity water system that serves at least 25 of the same people for at least 6 months of the year. If the noncommunity water system is not a nontransient system, it is considered to be a transient system.

Recommended Standards

7.2 PUBLIC WATER SUPPLY

- a. If a public water system is proposed for a new development, the developer must first obtain a construction permit from the PA DEP as required by Pennsylvania Code, chapter 109. Specific Permit requirements are found in subchapter E.
- b. A public water system may not be designed or constructed in a manner that creates a cross-connection.
- c. Whenever an existing or approved water system is accessible to a proposed project, a distribution system shall be provided to furnish an adequate supply of water to each unit.
- d. When documentation is received, applicants shall submit to the Municipality documentation in the form of a copy of Certificate of Public Convenience from the Pennsylvania Public Utility Commission that the project is located in an area served by a public utility and a statement that the utility has the capacity to serve the project at the time of application; or a cooperative agreement or an agreement to serve the project from a bonafide cooperative association of lot owners or from a municipal corporation, authority, or utility.
- e. Where a regional system is not accessible, particularly where on-site wastewater treatment systems are to be used, a community water supply may be required. If such a system is provided, it shall be approved by the PA DEP, and appropriate measures shall be provided to ensure adequate maintenance.
- f. Water supply facilities should be designed on the following basis (Ref. 3.):

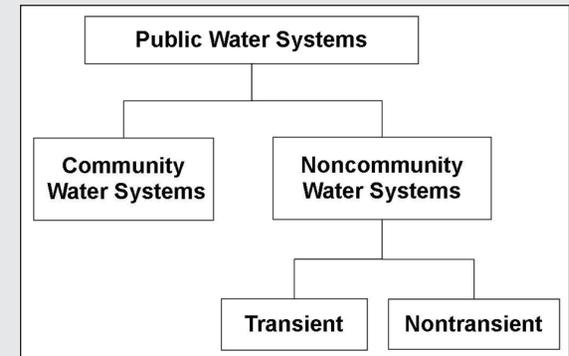
System Component	Minimum Capacity
Raw water pumping & transmission facilities	Maximum daily demand with consideration to finished water storage and fire flow demands
Treatment facilities system	Shall exceed the maximum daily demand of the system
Finished water storage	To meet peak hourly demands with consideration to fire flow demands. One day's storage is the recommended minimum
Distribution system piping, pump stations and appurtenances	Provisions for maximum daily and peak hourly demand at a minimum pressure as specified in section 7.4

Recommended Standards

- g. A new community water system shall be designed to provide an adequate supply of finished water during periods of peak demand. To assure continued service in the event of source contamination or outage, the design shall provide a minimum of one (1) day of reserve capacity based on average daily demand or usage. Reserve capacity may be provided through finished water storage. In addition, reserve capacity may be provided through sources and interconnections not likely to be subject to the same contamination event. Sources and interconnections used for reserve capacity shall be permitted according to PA Code, chapter 109.
- h. Finished water storage facilities shall be completely enclosed to prevent contamination of the finished water supply.

Commentary

Illustration 7-b. Categories of Public Water Systems



Source: PA DEP Public Water Supply Manual, Ref. 4

Community Water Supply systems shall be designed and permitted in accordance to the PA DEP Public Water Supply Manual, Part II: Community Design Standards (Ref 3).

Noncommunity Water Systems shall be designed according to PA DEP Public Water Supply Manual Part IV: Noncommunity System Design Standards (Ref. 4).

Any PWS that is not a Community Water System is considered to be a noncommunity water system. Noncommunity water systems are categorized as either transient or nontransient. These systems may be supplied by a single water well but they are considered Public Water Supply systems because the public is served by it.

A nontransient noncommunity water system is defined as a noncommunity water system that serves at least 25 of the same people for at least 6 months of the year. Examples of nontransient noncommunity water systems are schools, hospitals, commercial establishments and industrial parks. These

Commentary

examples are non-transient because it is assumed that there would be least 25 of the same employees or students being served by the system, making them nontransient users.

If the noncommunity water system is not a non-transient system, it is considered to be a transient system. Examples of transient noncommunity systems are restaurants, churches and campgrounds. These examples are transient because it is assumed that the users will vary so that fewer than 25 people will consistently be served. A larger restaurant with more than 25 employees would be a nontransient noncommunity system.

The standard noted in 7.2.i for the maximum distance to connect a subdivision to a water distribution system is based on the Lancaster County Subdivision and Land Development Ordinance. A review of ordinances from across the state showed a great deal of variety in the way this issue is treated. Distances ranged from 200 to 2,000 feet. Others didn't have specific distance requirements but used vague language such as "when deemed possible" that would allow for inconsistent application. The standard used in this document was selected for its ability to be applied consistently and fairly based on the size of the development.

Recommended Standards

- i. If a water system is available within the following distances and has adequate supply, then all lots within the subdivision and/or land development shall be allowed to connect to the existing water distribution system:

Maximum distance from nearest lot line to water distribution system requiring connection to said water system:

One (1) unit	two hundred (200) feet
Two (2) units	four hundred (400) feet
Three (3) to five (5) units	five hundred (500) feet
Ten (10) or more units	one thousand (1,000) feet

Recommended Standards

j. Point-of-Entry (POE) Devices

If a Point of Entry (POE) device is to be used as part of a water treatment system, the public water supplier shall be responsible for control of the POE devices installed under a permit according to PA Code Title 25 § 109.503(a)(2) (relating to public water system construction permits). This includes the installation, operation and routine maintenance of each device.

A public water supplier that installs a POE device shall obtain and maintain a right-of-access to the house, building or other facility where the POE device is installed in the form of a covenant running with the land.

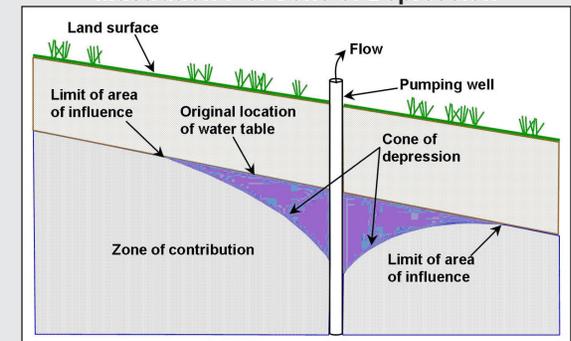
7.3 PRIVATE WATER WELLS

- Where no public water is accessible, and a private centralized water supply and distribution system is not required, water shall be furnished by the owner on an individual lot basis. If wells are installed on each lot, the well shall be of the drilled type, cased and grout sealed in the bedrock.
- Water wells shall be isolated from wastewater treatment absorption fields and shall be protected from surface water run-off.
- Disinfection of a home groundwater source should be performed after completing construction of a new well or spring supply (Ref. 6).
- All on-site wells shall be shown on all plans.
- Areas where the groundwater comes within ten (10) feet of the soil surface should be avoided (Ref. 13).
- If wells are installed on each lot and the lot also contains its own wastewater treatment system, the well shall be of the drilled type, cased and grout-sealed into the bedrock. The well will be required to have a production of not less than six gallons per minute as established by bailer tests and certified by the well driller. Before being placed in consumer use, it shall be disinfected by the use of sodium hyperchlorite or other acceptable solutions and a sample bacteriological examination performed by a licensed water analyst.

Commentary

A Point-of-Entry device is a treatment device used as an alternative to central treatment that is installed on a public water line or service connection to a house, building or other facility for the purpose of reducing contaminants in the water distributed throughout the house, building or facility.

Illustration 7-c. Cone of Depression



Pumping creates a cone of depression or an area of drawdown where the water table surface is lower around the well.

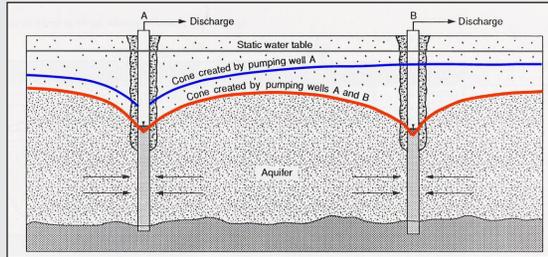
Well owners have a right to reasonable use of the groundwater beneath their land; however, as neighborhoods and communities expand, private water wells may compete for the available groundwater (Ref 15).

As water is pumped from a well, the groundwater table is depressed. When many homes in a subdivision are all using individual wells, the cones of depressions may overlap, causing even further depression of the water table (Illustration 7-d). This

Commentary

can require the drilling of deeper wells.

Illustration 7-d. Overlapping Cones of Depression Causing a Competition for Groundwater.



Source: Corbitt

Private water supplies are currently unregulated in Pennsylvania. Therefore, homeowners who have their own private water supplies are not protected by any regulations or standards (Ref. 6).

There are no state requirements for well construction materials, yield or quality. State law does require drillers to have a valid rig permit and a Water Well Drillers License. They must also give the state and homeowner a copy of the Water Well Completion report. This report describes where, when and how the well was constructed (Ref. 6).

Open rock wells in fractured rock aquifers are the most common type of private water well in Pennsylvania. The typical well has steel casing set in bedrock with a borehole that taps groundwater in the fractures of the rock (see illustration 7-d).

Recommended Standards

7.3.1 PA DEP Recommended Guidelines for Installing a Private Sanitary Water Well in Bedrock

- a. Wells should be sited at least one-hundred (100) feet away from sources of contamination such as septic system leach fields, roads, fuel tank and barnyards. Ideally, the well should be located uphill from these pollution sources.
- b. Casing. The casing should be new and ASTM standards. Casing should be at least twenty (20) feet in length and extend at least five (5) feet into sound bedrock. The casing should extend at least twelve (12) inches above the land surface -- more if the area is subject to water accumulations that might enter the well.

The driller should ensure that the casing seals off shallow water.

- c. Drive Shoe. In most cases a drive shoe should be used to protect the casing from cracking and splitting during installation into bedrock.
- d. Pitless Adapter. The pitless adapter should be manufactured by a reputable company and installed so that it is watertight.
- e. Casing Grout. The annual space created between the wall of the boring and the well casing should be filled with a watertight sealant, such as a cement-based grout, or a grout and clay mixture. To ensure a watertight seal, the annular space should be filled from bottom to top by placing a pipe in the annular space and pumping the sealant as the pipe is withdrawn. The annular space should be grouted from the casing bottom to at least the base of the pitless adapter. For long casing lengths, the driller should grout at

Recommended Standards

least thirty (30) feet of casing to the pitless adapter.

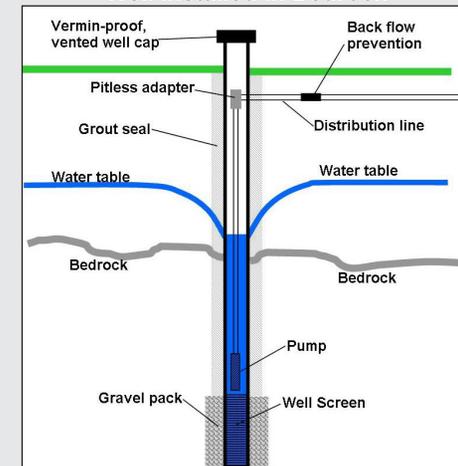
The driller should ensure that grout is not placed into the open rock portion of the well.

f. Well Construction Steps for Driller

- i. Drill the well hole into firm bedrock, install and grout the casing.
 - ii. Allow the grout to cure.
 - iii. Drill the hole to the desired depth.
 - iv. Develop the well by cleaning out the fine material.
 - v. Estimate the well yield.
 - vi. Disinfect the well to kill any organisms that were introduced during the construction.
- g. The owner must be provided a copy of the well construction record that includes information on the well depth, water level, well yield and the depth of the pump.
- h. Well cap. The well should be topped with a vermin-proof, vented cap that can be locked.

Commentary

Illustration 7-e. Schematic of a Private Water Well Installed in Bedrock



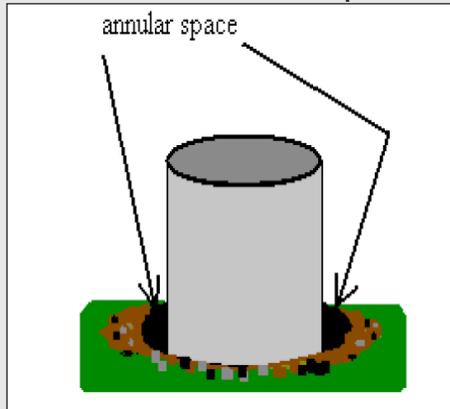
Source:

Below the casing, the lower portion of the borehole is the intake through which water enters the well. The intake may be an open hole in bedrock or it may be screened and gravel-packed, depending upon the geologic conditions (Illustration 7-e).

A Pitless Adapter diverts water laterally below the frost line from the well to a storage tank. It allows the well casing to extend above the ground surface. It provides a watertight subsurface connection for buried pipe installation below the frost line, thereby eliminating the need for a pit. Where a submersible pump is installed in the well, the use of a pitless adapter allows the pump to be installed or removed without disturbing the underground discharge pipe (see Illustration 7-e).

Commentary

Illustration 7-f. Annual Space



Source: Ref. 6

Annual space is created between the wall of the boring and the casing. If not properly sealed, the annular space becomes an avenue for pollution to move into the water supply. Sealing this space with grout prevents surface water from seeping down along the casing directly into the groundwater.

Well caps required an air vent to equalize the air pressure between the inside of the casing and the atmosphere. It is also essential that the cap be vermin-proof to reduce the risk on contamination from insects and small rodents (Illustration 7-g).

Illustration 7-g. Vermin-proof Well Cap.



Source: WI DNR

Recommended Standards

Recommended Standards

Commentary

Wells that provide 10 to 20 gallons per minute typically meet all the requirements for a household. Lower-yielding wells can be usually made adequate for most domestic purpose by drilling deeper. A deeper borehole acts a storage tank (Ref. 15). Also, a water storage tank can be placed in the basement to compensate for a low-yielding well.

As of this writing, normal operating pressures specified in Chapter 109 of the Pennsylvania Code are as follows:

- For Average Daily flows/demand -- Not less than twenty-five (25) pounds per square inch gauge (PSIG), nor greater than one-hundred twenty-five (125) pounds per square inch gage (PSIG).
- For Peak Hourly flows/demand -- Not less than twenty-five (20) pounds per square inch gage (PSIG) nor greater than one-hundred fifty (150) pounds per square inch gage (PSIG)
- Hourly Minimum flows/demand -- Not more than one-hundred fifty (150) pounds per square inch gage (PSIG). This generally occurs with zero (0) flow in the system (static pressure only).

Average Daily Demand is the average amount of water used each day during a one-year period for the entire system.

Maximum Daily Demand is the average rate of consumption on the maximum day. The maximum day is the 24-hour period during which the highest consumption total is recorded in the latest three-year period (Ref. 7).

7.4 DISTRIBUTION SYSTEM

For community systems that do not fall under the jurisdiction of a public, or other authority, the following standards for water distribution system capacity, layout, and materials shall apply.

7.4.1 Capacity

- a. The water supply system shall be adequate to handle the necessary flow, based on complete development of the tract.
- b. When plans for future development necessitate oversizing of the water supply system, the municipality or utility authority may enter into an agreement with the developer to address the fair share of costs allocable to each party.
- c. Distribution systems and distribution system modifications shall be designed and constructed to maintain normal operating pressures as specified in chapter 109 of the Pennsylvania Code.
- d. The demand rate for all uses shall be considered in computing the total system demand.
- e. Design flow rates for water distribution systems shall be based on the peak hourly demand. Where fire protection is provided through the potable drinking water system, the system shall be capable of providing the greater of the following flows at the pressures identified in :
 - The required fire demand (see section 7.6) plus the maximum daily demand, or
 - The maximum hourly demand.

Commentary

Maximum Hourly Demand is the maximum amount of water used in a single hour, in any day, in a three-year period expressed in gallons per minute.

The variability in peaking factor is primarily a function of the number of dwelling units being constructed. Table 7.a provides an example tabulation of peak hourly flow rates as a function of the total number of houses served. Table 7.a can be used as a guide to assist in determining appropriate peaking factors.

Common design practice is to use a peaking factor for the Maximum Daily Flow (PF1) of 1.5 and a peaking factor for the Maximum Hourly Flow (PF2) of 3.0.

Table 7.a. Design Standards for Peak Hourly Flow

Total Houses Served	Peak Hourly Flows (gallons / minute / house)
5	8.0
10	5.0
50	3.0
100	2.0
250	1.3
500	0.8
750	0.7
1,000 or more	0.6

Source: New Jersey Code, Title 5, Chapter 21 as amended through July 2002, Ref. 9

Illustration 7-h shows the layout of a looped system to allow for continued water supply to as many consumers as possible in the event of a shutdown.

Recommended Standards

The maximum daily demand and the maximum hourly demand shall be determined from local water use data. If local water use data are unavailable, design water demand for residential uses shall be computed as follows:

$$\text{Maximum Daily Demand} = \text{PF1} \times \text{Average Daily Demand}$$

$$\text{Maximum Hourly Demand} = \text{PF2} \times \text{Average Daily Demand}$$

Appropriate engineering judgment shall be applied in the selection of an appropriate peaking factor.

Table 7.2. Typical Peaking Factor Ranges

Typical System Peak Flow Characteristics as Ratios of Average Daily Flows	
Average Daily Flow	1.0
Maximum Daily Flow (PF1)	1.3 – 1.8
Peak Hourly Flow (PF2)	2.5 – 6.0

Modified from Source: Sweitzer and Flentje, Basic Waterworks Management, Ref. 8

7.4.2 System Design and Placement

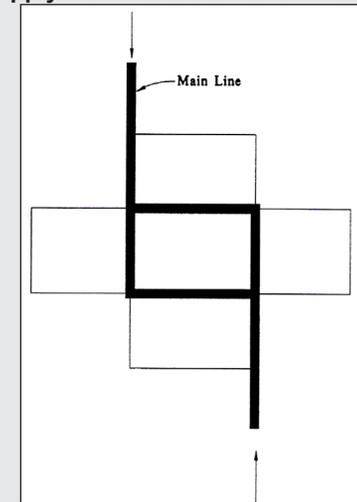
- a. Distribution mains of the overall system shall be connected into loops so that the supply may be brought to the consumer from more than one direction.
- b. In balancing loops in the design, the Hardy-Cross, or an equivalent, method shall be used.

Recommended Standards

- c. Dead-end lines shall be permitted within the design of a looped system provided that there is a maximum of twenty (20) dwelling units (or 50 dwelling units temporarily) on a dead-end line. When dead-end lines are used, they shall be provided with a hydrant or blow off at the terminus as a means of flushing.
- d. Generally, water mains shall be configured to form a loop system to enhance the continual supply of fresh water. When dead ends occur on new mains, they shall all be closed with cast iron plugs and caps, with a blowoff valve, with a concrete anchor, or fire hydrant. Concrete anchors (thrust blocks) shall be provided at all vertical and horizontal bends.
- e. There shall be no physical connection between a public or private potable water supply system and a sewer which will permit the passage of any sewage or polluted water into the potable water supply.
- f. Blowoffs shall not be connected to any sanitary sewer or be submerged in any manner that will permit back siphonage in the distribution system.
- g. Valves, except on a permitted dead-end, shall be located on distribution mains so that no more than one hydrant would be out of service as a result of a single water main

Commentary

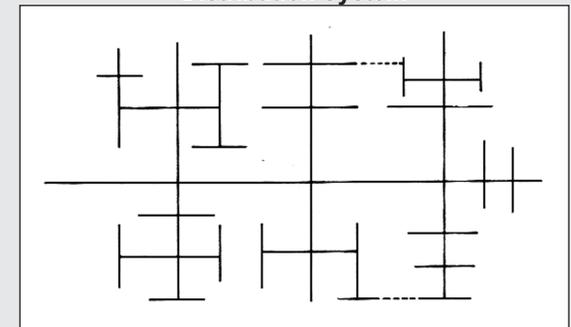
Illustration 7-h. A Looped System to Bring Supply from More than One Direction



Source: Ref. 10

The restriction on dead-end lines is intended to maintain water quality by eliminating stagnant zones within the distribution system, and provide more consistent water pressure (characteristic of looped systems). See Illustration 7-l.

Illustration 7-i. Potential Dead-ends can be Connected to Eliminate Stagnant Zones with the Distribution System



Source: Ref. 11

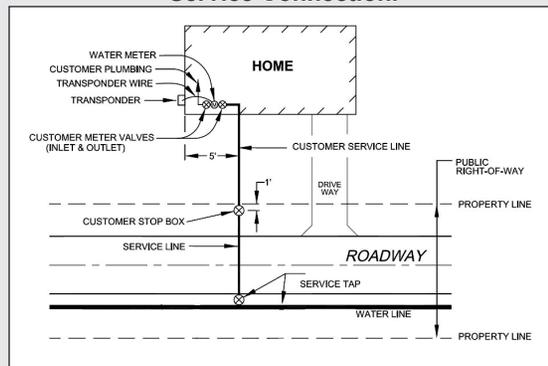
Commentary

Recommended Standards

break. They shall be located in all small branches off larger mains and, where eight (8)-inch or larger main lines intersect, a valve shall be located in each branch. At street intersections, valves shall be located near pipe intersections for ease in finding in the event of a water-main break.

- h. In addition to the above requirements, water mains shall be valved so that not more than one-fifth (1/5) of a mile will be affected by a single water main break. Geared valves on sixteen (16)-inch mains or larger shall be furnished when required by the Municipality or water authority.
- i. Gate valves shall be cast-iron body with double-disc gates, bronze mounted conforming to AWWA C500 or resilient-seated wedge, non-rising stem mechanical joint conforming to AWWA C509.
- j. Butterfly valves shall conform to AWWA C504. The type of valve to be used shall be specified by the municipality or water authority.
- k. Valve interior openings shall be full size, and valves on sixteen (16)-inch mains or larger shall be geared and have suitable bypasses.
- l. Valve boxes shall be of the adjustable type with the cover marked (WATER) and the direction of the valve operation indicated.
- m. No pipe shall be placed on private property unless the owner of the land is to own or operate the pipe, or an easement deeded to the municipality or water authority is obtained.
- n. All easements shall be a minimum of ten (10) feet wide unless depth of pipe, soil conditions, or additional utilities require wider. Where the easement is located adjacent to a right-of-way, the municipality or authority may approve a narrower easement.
- o. A building service connection shall consist of a corporation stop at the main, a curb stop, and a water meter.

Illustration 7-j. A Typical Layout of a Building Service Connection.



Recommended Standards

- p. When the meter is located outside a building, an additional shut-off valve shall be installed on the discharge side of the meter. When the meter is located inside a building, a valving shall be in accordance with the Plumbing Subcode of the PA Uniform Construction Code.
- q. Curb stops and water meters shall be located as specified by the public or private water supplier.
- r. Common water service connections shall be permitted where allowed by the Plumbing Subcode of the Uniform Construction Code.
- s. Where water system extensions are constructed by a developer and meter fees are not paid by the developer, the water meter(s) shall be furnished by the developer and shall be of a manufacture and type approved by the municipality or water authority. The meter(s) shall read in volume units as determined by the municipality or water authority. Where meter fees are paid by the developer, the meter(s) shall be furnished by the municipality or water authority.

7.4.3 Pipe Sizes and Materials

- a. Pipe size shall comply with the following requirements:
 - i. Water mains shall be a minimum diameter of eight (8) inches except at the end of a permanent cul-de-sac, unless another size is required for fire flow or other criteria. A six (6)-inch main may be used when it serves not more than twenty (20) dwelling units and only one (1) fire hydrant.
 - ii. Building service connection pipe shall have a minimum diameter of three-quarters (3/4) of an inch.
 - iii. The design capacity of water mains shall be such as to maintain a minimum pressure of 20 pounds per square inch (psi) at street level under all flow conditions.
- b. Pipe material used in the construction of water mains shall be cement-lined ductile iron pipe, prestressed concrete cylinder pipe, reinforced concrete pressure pipe, or PVC pipe. All pipe and appurtenances shall comply with the applicable AWWA standards in effect at the time of application.
 - i. Ductile iron pipe, appurtenances, and fittings shall comply with the following standards:

Commentary

Water supply pipe should not be oversized. Oversized pipes that supply more water than is used allows water to lay in the pipes and increases the chance for bacteria growth. Standard engineering practice and good judgment should be used in the sizing of water pipes to ensure that the demand is met without leaving water stagnant in the distribution system.

Commentary

Recommended Standards

ANSI/AWWA C110/A21.10 (fittings)
 C111/A21.11 (gasket joints)
 C115/A21.15 (flanged joints)
 C151/A21.51 (pipe)

- Thickness shall be designed in accordance with ANSI/AWWA C1150/A21.50.
 - Ductile iron pipe shall be cement mortar-lined in accordance with ANSI/AWWA C104/A21.4.
 - Joints shall be gasketed, push-on joints or mechanical iron pipe shall be covered with an asphaltic, epoxy-type coating. In aggressive soils, ductile iron pipe wrapped in polyethylene in accordance with ANSI/AWWA C105/A21.5 shall be used.
- ii. Prestressed concrete cylinder pipe with rubber and steel joints shall conform to ANSI/AWWA C301.
- Reinforced concrete pressure pipe (steel cylinder) type shall meet ANSI/AWWA C300.
 - Concrete pressure pipe (bar-wrapped steel cylinder type) shall meet ANSI/AWWA C303.
- iii. PVC pipe, appurtenances, and fittings shall conform to ANSI/AWWA C900 or AWWA C909 for pipe sizes four (4) inches to twelve (12) inches and shall conform to AWWA C905 for sizes fourteen (14) inches through thirty-six (36) inches.
- Joints shall be elastomeric-gasket couplings of a corresponding size. Laboratory performance requirements, as specified in ASTM D3139, shall be met. Solvent-cement coupling shall not be permitted.
 - PVC pipe installations shall be provided with a metallic locator tape.
- iv. Where transitions to flanged fittings are made, adapters approved by the municipality or water utility authority shall be used.
- v. Building service connection pipe shall be type K copper or polyethylene (PE) pressure pipe that complies with ANSI/AWWA C901.

Recommended Standards

- c. Ductile iron pipe shall be used at all locations where water lines cross sewer lines and are separated by less than twelve (12) inches vertically. At these locations a twenty (20)-foot section of ductile iron pipe shall be installed centered on the sanitary sewer line.
- d. Ductile iron pipe shall also be used any time a water line crosses a stream or active drainage-way. The ductile iron pipe should extend for a distance of twenty (20) feet on either side of the stream bank.
- e. Pipe bedding and backfill shall be installed in accordance with the pipe manufacturer's recommendations.
- f. To avoid settlement under paved roadways, PennDOT 2A stone should be used to backfill waterline trenches when they pass under paved roadways.

7.5 FIRE PROTECTION

- a. All fire protection facilities shall be designed in accordance with the most recent edition of International Fire Code (Ref. 12).

7.5.1 Fire-Flow Requirements

- a. Fire Flow is the flow rate of a water supply, measured at twenty (20) pounds per square inch (psi) residual pressure within the distribution system that is available for fire fighting.
- b. The fire chief, or other municipal authority, is authorized to reduce the fire-flow requirements for isolated building or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.
- c. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.
- d. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142 or the International Urban Wildland Interface Code.

Commentary

Refer to Chapter 8 of this ordinance for standards for fire protection facilities that do not utilize the potable water distribution system.

Recommended Standards of section 7.5.1 apply only to public water distribution systems.

Commentary**Recommended Standards**

- e. Fire-flows are based on building density, construction techniques, and total floor area. The total floor area included in the fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building.
- f. The minimum fire-flow requirements for one- and two-family dwellings having a fire-flow calculation area that does not exceed three-thousand six hundred (3,600) square feet shall be one-thousand (1,000) gallons per minute with a duration of two hours.
- g. Fire-flow and flow duration for dwellings having a fire-flow calculation area in excess of three-thousand six hundred (3,600) square feet shall not be less than that specified in Appendix B of the International Fire Code (Ref. 12).
- h. The minimum fire flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in Appendix B of the International Fire Code (Ref. 12).

7.5.2 Fire Hydrants

- a. The minimum number and spacing of fire hydrants shall be as specified in Appendix C of the most current edition of the International Fire Code. For one- and two-family dwellings the hydrants shall have a spacing not exceeding five-hundred (500) feet. In addition, the maximum distance from any point along the road frontage at the right-of-way line to a hydrant shall be two-hundred-fifty (250) feet.
- b. Size, type and installation of hydrants shall conform to the following specifications:
 - Size, type, and installation of hydrants shall conform to the AWWA Standard for Dry-Barrel Fire Hydrants, ANSI/AWWA C502.
 - Hydrants shall have at least three (3) outlets: one (1) outlet shall be a pumper outlet; the other outlets shall be at least two and one-half (2-1/2)-inch nominal size.
 - The pumper outlet shall face the street. All outlets and nozzles shall be at least twelve (12) inches above the adjoining grade.
 - When a concrete slab is provided around the hydrant riser, the flange at which the hydrant connects to the riser shall be at least two inches above the adjacent grade.

Recommended Standards

- Street main connections for fire hydrants shall not be less than six (6) inches in diameter.
 - Hose threads on outlets shall be compatible with existing municipal equipment and shall either conform to NFPA 1963, or shall match existing municipal requirements.
 - A valve shall be provided on connections between hydrants and street mains.
 - All pipes, fittings, and appurtenances supplying fire hydrants shall be AWWA or ASTM approved.
 - All fire hydrants shall conform to NFPA Standard 291.
- c. Whenever the water supply system contains sufficient capability or is planned to have such capability within two (2) years from the date of the Final Plan approval, fire hydrants shall be provided.
- d. A hydrant may be used in place of blow-offs at all low points and at high points within the distribution system to serve as a system blow-off.

Commentary

References

References

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2. PA DEP. DEP Groundwater Monitoring Guidance Manual Chapter 7: Well Abandonment Procedures. Document No. 383-3000-001. 12/1/01.
3. PA DEP. Public Water Supply Manual, Part II: Community Design Standards. Document No. 383-2125-108. 5/6/06.
4. PA DEP Public Water Supply Manual. Part IV: Noncommunity System Design Standards. Document No 383-2128-108. 5/21/01.
5. PA DEP. Summary of Key Requirements for the Phase II and Phase V/Wellhead Protection Rules. Document No 383-0810-105. 3/13/02.
6. A DEP. Guidelines for Installing Private Water Wells in Bedrock. Document No. 3800-FS-DEP2450.
7. Insurance Services Office (ISO). Fire suppression Rating Schedule, New York: ISO, 1998.
8. Sweitzer, R.J., M.E. Flentje, & F.B. Smith. Basic water works manual. American Concrete Pressure Pipe Association, Chicago, 1958.
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10. Dion, T.R. Land Development for Civil Engineers, 2nd Edition, John Wiley & Sons, Inc., New York, 2002.
11. Hammer, Mark J. Water and Waste-Water Technology, John Wiley & Sons, Inc., New York, 1975.
12. International Fire Code. International Code Council, Inc., Country Club Hills, Illinois, 2003.
13. Master Well Owner Network. Private Water System Management. Penn State. College of Agricultural Sciences. Available online at: <http://mwon.cas.psu.edu/>.
14. Cote, Arthur. Operation of Fire Protection Systems: A Special Edition of the Fire Protection Handbook. National Fire Protection Association, Inc., Massachusetts, 2003.
15. PA DEP. Understanding Your Drinking Water Well. Document No. 3800-FS-DEP2780. 7/05.

Appendix 7.A Definitions

Appendix 7.A Definitions

Annular Space -- The space between two (2) cylindrical objects, one of which surrounds the other, such as the space between a drill hole and a casing pipe and a liner pipe.

Aquifer -- A geological formation that contains and transmits water.

Average Daily Demand -- The average amount of water used each day during a one-year period for the entire system.

Back Siphonage -- The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel or other sources into a potable water supply pipe due to negative pressure in such pipe.

Backflow -- The flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any source or sources other than its intended source.

Casing -- An impervious durable pipe placed in a well to prevent the walls from caving in and to seal off surface drainage or undesirable water, gas or other fluids and prevent them from entering the well.

Community Water System -- A public water system that serves at least fifteen (15) service connections used by year-round residents or regularly serves at least twenty-five (25) year-round residents.

Cross-connection -- An arrangement allowing either a direct or indirect connection through which backflow, including backsiphonage, can occur between the drinking water in a public water system and a system containing a source or potential source of contamination, or allowing treated water to be removed from any public water system, used for any purpose or routed through any device or pipes outside the public water system, and returned to the public water system. The term does not include connections to devices totally within the control of one or more public water systems and connections between water mains.

Groundwater -- Water within the earth below the water table within the zone of saturation. Groundwater includes both water under water table conditions and confined with deep aquifers.

Grout -- A permanent water tight joint or connection made by filling with concrete or other approved impervious material between the casing and the undisturbed formation surrounding the well or between two (2) strings of casing.

GUDI -- Groundwater under the direct influence of surface water.

- a. Any water beneath the surface of the ground with the presence of insects or other macroorganisms, algae, organic debris or large diameter pathogens such as *Giardia lamblia* and *Cryptosporidium*, or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity or pH which closely correlate to climatological or surface water conditions
- b. The term does not include finished water.

Appendix 7.A Definitions (cont.)

Maximum Daily Demand -- The average rate of consumption on the maximum day. The maximum day is the 24-hour period during which the highest consumption total is recorded in the latest three-year period (Reference A).

Maximum Hourly Demand -- The maximum amount of water used in a single hour, or any day, in a three-year period expressed in gallons per minute.

Noncommunity Water System -- A public water system that is not a community water system.

Nontransient Noncommunity Water System -- A noncommunity water system that regularly serves at least twenty-five (25) of the same persons over six (6) months per year.

Pitless Adapter -- A device or assembly of parts that will permit water to pass through the wall of the well casing or extension thereof, and that provides access to the well and to the parts of the water system within the well in a manner to prevent entrance of pollution into the well and the water produced.

Point-of-entry (POE) Device -- A treatment device used as an alternative to central treatment that is installed on a public water line or service connection to a house, building or other facility for the purpose of reducing contaminants in the water distributed throughout the house, building, or facility.

Public Water System -- A system which provides water to the public for human consumption that has at least fifteen (15) connections or regularly serves an average of at least twenty-five (25) individual daily at least sixty (60) days out of the year. The term includes collection, treatment, storage and distribution facilities under control of the operator of the system and used in connection with the system. The term includes collection or pretreatment storage facilities not under control of the operator that used in connection with the system. The term also includes a system that provides water for bottling or bulk hauling for human consumption. Water for human consumption includes water that is used for drinking, bathing and showering, cooking, dishwashing or maintaining oral hygiene.

Source -- The place from which water for a public water system originates or is derived, including, but not limited to, a well, stream, reservoir, pond, lake or interconnection.

Surface Water -- Water open to the atmosphere or subject to surface runoff. The term does not include finished water.

System --

- a. A group of facilities used to provide water for human consumption including facilities used for collection, treatment, storage and distribution. The facilities shall constitute a system if they are adjacent or geographically proximate to each other and meet at least one of the following criteria:
 - i. The facilities provide water to the same establishment that is a business or commercial enterprise or an arrangement of residential or nonresidential structures having a common purpose and includes mobile home parks, multi-unit housing complexes, phased subdivisions, campgrounds, and motels.
 - ii. The facilities are owned, managed, or operated by the same person.

Appendix 7.A Definitions (cont.)

- iii. The facilities have been regulated as a single public water system under the Federal Safe Drinking Water Act (42 U.S.C.A. §§ 300f-300j-10) or the Pennsylvania Sate Drinking Water Act (35 P.S. § 721.1-721.17).
- b. This definition may not be interpreted to require two or more currently regulated public water systems to become one system.

Transient Noncommunity Water System -- A public water system that is not a community, nontransient noncommunity, bottled or vended water system, nor a retail water facility or a bulk water hauling system.

Wellhead Protection Area -- The surface and subsurface area surrounding a water well, well field, spring or infiltration gallery supplying a public water system, through which contaminants are reasonably likely to move toward and reach the water source. A well head protection area shall consist of the following zones:

- a. Zone I. The protective zone immediately surrounding a well, spring or infiltration gallery which shall be a one-hundred (100) to four-hundred (400)-foot radius depending on site-specific source and aquifer characteristics.
- b. Zone II. The zone encompassing the portion of the aquifer through which water is diverted to a well or flows to a spring or infiltration gallery. Zone II shall be one-half (1/2) mile radius around the source unless a more detailed delineation is approved.
- c. Zone III. The zone beyond Zone II that contributes surface water and groundwater to Zones I and II.

Wellhead Protection Program -- A comprehensive program designed to protect a well, spring or infiltration gallery used by a public water system from contamination.

Appendix 7.B Additional Resources

Appendix 7.B Additional Resources

Wellowner www.wellowner.org

Standard Methods for the Examination of Water and Wastewater, latest edition.

The following sources are available from the PA DEP e-Library <http://164.156.71.80/WXOD.aspx>

PA DEP. Fact Sheet. For Planners, Builders and Developers: Identifying a Community Water System (CWS). Document Number 3800-FS-DEP4072. 6/2/06.

PA DEP. Public Water Supply Manual, Part VII: Cross-Connection Control/Backflow Prevention. Document Number 383-3100-111

PA DEP. Guidance to Public Water Systems. Document Number 383-2100-108. 1/1/05.

PA DEP. Safe Drinking Water Program Compliance Strategy. 383-0810-102. 10/10/97.

PA DEP. PWS Manual Part V: Operations and Maintenance.383-3110-111. 11/1/97.

PA DEP. DEP Approval Guide for Noncommunity Water Systems. 383-2100-208. 8/5/00.

PA DEP. Summary of Key Requirements for Community Water Systems. 383-0810-101. 11/26/01.

PA DEP. Summary of Key Requirements for Nontransient Noncommunity Water Systems. 383-0810-301. 3/13/02.

PA DEP. Summary of Key Requirements for Transient Noncommunity Water Systems. 383-0810-201. 8/1/98.