CHAPTER 31

MINIMUM STANDARDS FOR SMALL SYSTEM GROUNDWATER WELLS

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Signed:
Donna M. Waters, County Clerk

CHAPTER 31
MINIMUM STANDARDS FOR SMALL SYSTEM GROUNDWATER WELLS

ARTICLE I: APPROVAL REQUIREMENTS FOR SMALL WATER SUPPLY SYSTEM

31-101

a. No person shall erect, construct, or operate a public water system, nor undertake substantial enlargements, extensions, additions, modifications, renovations or repairs to any public water system, including storage, distribution, purification, or treatment components, without having first secured the County approval.

b. Before a person may initiate construction of a new water system or increase the capacity of an existing water system, the person shall notify the County and obtain the County's approval for development of the project within its jurisdiction, prior to the submittal of the plans and specifications to the County for approval. To the extent practicable, the person should avoid locating part or all of the new or expanded facility at a site which:

   1. is subject to a significant risk from earthquakes, floods, fires or other disasters which could cause a breakdown of the public water system or a portion thereof; or

   2. except for intake structures, is within the floodplain of a 100-year flood or is lower than any recorded high tide where appropriate records exist; or

   3. is on or in close proximity to an abandoned landfill or any other site used for waste disposal.

c. To assure the continuity of operation and maintenance, the supplier of the water system shall submit a copy of a trust indenture or other legal agreement approved by the County. The Trustee should preferably be the County (if agreed) or be a property owners association organized to guarantee the operation and maintenance of the water system. The association must be made up of members who are owners of properties served by the water system. For acting as the Trustee of the water system, the County may at its discretion require the owner to provide a trust fund, performance bond, or irrevocable letter of credit. The Trustee under the

conditions of the trust indenture may use funds from the trust fund, performance bond or irrevocable letter of credit to obtain compliance with the said regulations and/or correct said deficiencies. In addition, if the water system owner fails after a reasonable period of time to correct all said violations and deficiencies, under the conditions of the trust indenture the Trustee may assume ownership of the water system in order to assure that the water system is properly maintained and operated for the benefit of the system's customers.

ARTICLE II: GROUND WATER

31-201 GROUND WATER: A ground water source includes all water obtained from drilled wells or springs.

31-202 GENERAL

a. The person constructing the well must be a licensed water well contractor in the State of Georgia in accordance with the provisions of the Water Well Standards Act of 1985 (O.C.G.A. 12-5-120, et. seq.). The contractor must maintain accurate driller logs, including material setting and grouting data, complete the results of the pump test, including water level measurements, and must furnish a signed copy of the results to the owner and to the County.

b. Ground water sources (wells and springs) shall be evaluated for direct influence of surface water, when required by the County.

c. Two important concerns in the design of water wells must be adequately addressed:

1. The provision for the proper depth to which the well casing shall be installed as a watertight conduit, and

2. The provision for positive sealing of the annular space between the outside of the well casing and the well hole to prevent movement of water vertically along the outside of the well casing pipe. The well must be protected from contamination by surface waters and other sources of contamination.

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31-203 WELLS SHALL BE LOCATED

a. generally at the highest point, and as far removed, and in a direction opposite to the ground water flow from any known or probable source of contamination;

b. not less than fifty (50) feet from a septic tank;

c. not less than one hundred (100) feet away from a septic tank absorption field;

d. not less than ten (10) feet away from a sewer;

e. not less than one thousand (1,000) feet away from a solid waste disposal site and not in a direction where ground water flow from the site may be intercepted by the well;

f. as far removed as possible from all open abandoned wells;

g. not is areas of sink holes;

h. not in the flood plain areas, unless adequate protection is provided to prevent submergence of the well casing, pumps and appurtenances;

i. not less than one hundred (100) feet from surface water;

j. not less than one hundred (100) feet from buildings, mobile homes, permanent structures, animal houses or lots, or cultivated areas to which chemicals are applied;

k. not less than one hundred (100) feet from a chemical or petroleum fuel underground storage tank with secondary containment;

l. the County may require greater separation distances or impose other protective measures when necessary to protect the well from any potential source of pollution, based upon: the hazard or health risk associated with the source of pollution; the proximity of the potential source to the well; the type of material, facility or circumstance that poses the source or potential source of pollution; hydrogeological features of the site which

could effect which well operation might have on the movement of contamination; and, the feasibility of providing additional separation distances or protective measures;

m. the well and the associated pumping and water treatment equipment shall be protected from unauthorized entry and use by an enclosed shelter or enclosed by a fence. The water treatment equipment shall be enclosed in a weatherproof shelter.

31-204 WELL ABANDONMENT

a. Wells not used as sources of water supply shall be filled, plugged and sealed to protect against contamination of the ground water.

b. Wells to be abandoned shall be sealed to prevent undesirable exchange of water from one aquifer to another.

c. Preferably the well hole should be filled with neat cement grout.

d. Have fill materials other than cement grout or concrete, disinfected and free of foreign materials.

e. When filled with cement grout or concrete, these materials shall be applied to the well hole through a pipe, tremie, or bailer.

31-205 GENERAL WELL CONSTRUCTION

a. All public water supply wells must be constructed in accordance with the requirements of the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, by a water well contractor licensed in the State of Georgia.

b. Pitless adapter wells shall not be constructed for public water supply systems.

c. Wells shall be tested for plumbness and alignment in accordance with the latest edition of AWWA A100 Standard.

d. Drilling fluids must be from an uncontaminated source or must be disinfected.

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e. All permanent casing, liners, screens and other manufactured material used in the well installation must be new. Material used shall preferably be wrought iron or steel.

f. All casing and liner pipe joints shall be water tight the entire length in drilled wells. They shall have full circumferential welds or threaded coupling joints.

g. The well casing shall neither terminate below ground nor in a pit.

h. Packers shall be of a material that will not impart taste, odor, toxic substances or bacterial contamination to the water in the well.

i. During the periods of stoppage of the well construction and when the site is unattended, the drilling contractor must have the well opening securely covered to prevent tampering and possible contamination. A welded metal plate is preferred for capping a well.

j. During the well construction, the premises, construction material, tools and equipment must be maintained in a sanitary manner to prevent contamination of the well by the person excavating the well.

k. The pump house floor shall be at least one foot above the original ground surface and not less than two feet above the highest known flood elevation.

31-206 STEEL CASING

a. Steel pipe well casing shall conform to American Society for Testing and Materials (ASTM) Specification A 120 or A 53 or American Petroleum Institute (API) Specification 5L or 5LS or equal standard and meet the following minimum wall thickness unless otherwise approved by the Division:

Nominal Casing Diameter (in inches)	**Minimum Wall Thickness (in inches)**
4	0.188
5	0.188

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31-207 PLASTIC PIPE CASING

a. The use of plastic well casing and screens must be approved by the Division prior to well installation.

b. The plastic well casing and couplings shall meet the requirements of the ASTM Standard F 480 or equal standard and the National Sanitation Foundation standard for use with potable water.

c. Any approved plastic well casing shall conform to the following minimum wall thickness:

Nominal Casing Diameter (in inches)	Minimum Wall Thickness (in inches)
4	0.265
4.5	0.291
7	0.390

d. The plastic well casing and screen shall not extend to a depth of greater than three hundred (300) feet below the ground surface.

31-208 CASING DEPTH AND GROUTING

a. The outer, permanent, protective casing shall extend at least five (5) feet into the first solid, unweathered or impervious subsurface rock strata encountered, and shall have a minimum length of twenty-five (25) feet from the ground surface into a well excavated into water-bearing formations in crystalline rocks and fifty (50) feet in a well excavated into sedimentary water-bearing formations.

b. The outer, permanent, protective casing shall be cement grouted its entire length with a cement slurry consisting of not more than six (6) gallons of water to one cubic foot of cement, plus standard additives, when necessary, to facilitate placing or setting. The neat cement shall conform to ASTM Standard C150.

c. The outer protective casing shall be provided with sufficient guides or centralizers attached or welded to the casing to permit unobstructed flow and uniform thickness of grout.

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d. The guides or centralizers shall be attached to the bottom of the casing and at intervals not greater than twenty-five (25) feet.

e. The grout shall be placed under pressure by a positive displacement method, such as pumping, from the bottom of the annular space upward until the grout is extruded at the earth's surface in one continuous operation.

f. The wall thickness of the cement grout surrounding the outer, permanent, protective casing shall be not less than one and one-half (1 ½) inches at any point.

g. Subsurface well construction shall cease for at least twenty-four (24) hours after grouting.

31-209 GRAVEL PACK WELLS

a. The gravel for gravel-packed wells must be washed, free of organic matter, and composed of well rounded particles which are 95% siliceous material.

b. Gravel shall be properly sized and disinfected immediately prior to or during placement.

c. Gravel pack shall be placed in one uniform continuous operation.

d. Gravel refill pipes, when used, shall be Schedule 40 steel pipe incorporated within the pump foundation and terminated with screwed or welded caps at least 12 inches above the pump house floor or concrete apron.

e. Gravel refill pipes located in the grouted annular opening shall be surrounded by a minimum 1 ½ inches of grout.

f. Protection from leakage of grout into the gravel pack or screen shall be provided.

31-210 WELL SCREENS

a. Shall be constructed of material which will not be damaged by the chemical action of ground water or future cleaning operations;

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b. Have the size of openings based on sieve analysis of the formation and/or based on the size of gravel if any artificial gravel pack is installed;

c. Have sufficient length and diameter to provide adequate specific capacity and low aperture entrance velocity. Usually the entrance velocity should not exceed 0.1 feet per second;

d. Be installed so that the pumping water level remains above the screen under all operating conditions;

e. Be designed and installed to permit removal or replacement without adversely affecting the water-tight construction of the well;

f. Be provided with a bottom plate or washdown bottom fitting of the same material as the screen.

31-211 WELL DEVELOPMENT

a. The well shall be properly developed, disinfected, and pump tested by the drilling contractor.

b. Development of the well shall accomplish removal of native silts and clays, drilling mud or finer fraction of the gravel pack, and shall continue until the maximum specific capacity is obtained from the completed well.

c. Every well shall be tested for yield and drawdown. The static water level, drawdown and pumping water level must be measured.

d. The well shall be test pumped at not less than the desired yield for a period of at least twenty-four (24) hours and shall continue for at least four (4) hours after the pumping level has stabilized.

e. The methods of testing shall include but are not limited to the following:

1. Constant Discharge Method - This type of test is preferred for wells completed in unconsolidated aquifers. It is made by maintaining a constant rate of discharge equal to or greater than the desired yield of the well throughout the entire period of pumping. Measurements of pumping rate and water level shall be made every minute for the first 10 minutes of the test, every 2 minutes for the next 10 minutes, every 5 minutes for the next 40 minutes, every 15

minutes for the next hour, every 30 minutes for the next 3 hours, hourly for the remainder of the pumping period. Recovery water-level measurements shall be made with the same frequency beginning with the cessation of pumping and continuing until complete recovery has occurred or until sufficient data have been collected to extrapolate full recovery.

2. Step Drawdown Method - This method is preferred for wells completed in consolidated rock formations. It involves the well being "step" tested at rates approximately ½, 1, and 1 ½ times the design capacity of the well. Each step should consist of equal periods of pumping except the final step may be continued for a longer period of time if desired by the owner. The pump is operated continuously for the entire period of the test. The discharge must be controlled with a gate valve, if electric driven, or a gate valve and throttle if engine driven. The discharge is controlled and maintained at approximately the desired discharge for each step with an accuracy of + 5 percent. Pump discharge is measured with a meter such as a circular orifice meter that will permit instantaneous determination of the discharge rate. A half-inch I.D. or larger pipe is installed from a point about 2 feet above the pump intake to the well head. The top of the pipe is readily accessible to insert remove and read the depth to water using either a steel tape or 2-wire electric sonde. Measurements of pumping rate and water level are made for each step of the test according to the schedule given in the constant discharge method. Recovery water-level measurements are made with the same frequency until the well has fully recovered or until sufficient date have been recovered to extrapolate full recovery. The test pump shall be capable of pumping 150 percent of the desired yield of the well.

f. The pumping equipment shall be capable of operating continuously without interruption for the maximum period contemplated for the test.

g. Data shall be provided to the County Health Department.

31-212 <u>WELL DISINFECTION</u>

a. The well must be disinfected prior to the pumping test by the introduction of a chlorine solution into the well under sufficient pressure to overcome the natural flow pressures of all developed water-bearing zones, and in

sufficient quantity to produce a minimum chlorine residual of fifty (50) parts per million (mg/L) in six (6) hours after such application.

b. Table to determine chlorine compound necessary to dose 100 feet of water-filled well at 50 mg/L:

Well-Hole or Well-Casing Diameter (in inches)	Volume Per 100 ft. of Water Depth (in gallons)	Amount of Chemical Compound		
		Calcium Hypochlorite (65% avail. $C1^2$)	Sodium Hypochlorite (12 trade %)	Liquid Chlorine (100% avail. $C1^2$) (in pounds)
4	65.28	0.7 oz.	3.5 fl. oz.	0.03
6	146.9	1.5 oz.	7.8 fl. oz.	0.06

a. After disinfection, the well must be pumped until no trace of chlorine remains in the water, nor in the water samples taken for microbiological analysis. If the water samples submitted are found to be unsatisfactory, the disinfection procedure must be repeated.

b. The permanent pump and pumping equipment shall be disinfected with a chlorine solution prior to being placed into service.

31-213 WELL APPURTENANCES

a. A concrete slab with a minimum thickness of six (6) inches shall be constructed around the well casing and shall extend at least two (2) feet in all directions, sloping away from the casing.

b. The well casing shall extend at least twelve (12) inches above the concrete slab of the floor.

c. When a submersible pump is used, the top of the casing shall be effectively sealed against the entrance of water under all conditions of vibration or movement of conductors or cables.

d. For submersible pump installations, the well casing shall be provided with a sealed cover plate and, vented by a screened riser pipe so that the

screened opening terminates downward at least twelve (12) inches above the top of the casing or ground level.

e. For turbine pump installations, a concrete block to support the pump motor shall be constructed around the outer well casing, shall extend at least twelve (12) inches above the concrete slab, and:

1. the outer casing shall extend at least one (1) inch above the pump motor block;

2. the well head and pump base shall be sealed to prevent seepage and the casing shall be vented by a screened riser pipe so that the screen opening terminates downward and above any point of back flow of contaminants into the well; and,

3. oil lubricated vertical turbine pumps shall be lubricated with an acceptable turbine oil as prescribed by the pump manufacturer.

31-214 DISCHARGE PIPING SHALL

a. be designed to keep friction losses at minimum;

b. be equipped with a check valve, a shutoff valve, a pressure gauge and a means of measuring flow (water meter);

c. be provided with a raw water sampling tap prior to the well discharge pipe check valve;

d. where applicable, be equipped with an air release-vacuum relief valve located upstream from the check valve, with exhaust/relief piping terminating in a down turned position at least 18 inches above the floor and covered with a 24 mesh corrosion resistant screen;

e. have an access port of not less than five-eighths (5/8) inch in diameter, with screen cap, for water level measurements; a deep well air line and gage may also be used in conjunction with the access port;

f. where pneumatic water level measuring equipment is used, it shall be manufactured using corrosion resistant materials attached firmly to the drop pipe or pump column and in such a manner as to prevent the entrance of foreign materials;

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g. have all chemical injection ports located down stream from the well discharge pipe check valve;

h. have control valves and appurtenances located above the pumphouse floor;

i. have all exposed piping, valves and appurtenances protected against physical damage or freezing;

j. be properly anchored to prevent movement;

k. be protected against surge or water hammer;

l. be valved or have means of pumping to waste (a blow-off), but shall not be directly connected to a sewer.

ARTICLE III: SPRINGS

31-301

a. Springs must be protected by an enclosed structure. The walls of the structure must extend down to bedrock, or into the soil sufficiently to provide for a proper foundation to prevent surface water infiltration.

b. All surface water run-off must be diverted from the spring.

c. The spring must be protected from any entry of surface water.

d. The overflow from the spring's enclosed structure must be designed to prevent entrance of contaminants or animals.

e. A chlorine contact time of a least 30 minutes shall be provided.

f. Continuous turbidity monitoring shall be provided with an automatic cutoff at 1.0 NTU.

g. The pumping and water treatment facilities must be enclosed in shelters that are of weather and vandal-proof construction.

h. The spring area must be secured to prevent unauthorized entry.

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ARTICLE IV: DESIGN CAPACITIES AND WATER DEMANDS

31-401 GENERAL - An important factor in the planning and design of a water system is an accurate estimate of the quantities of water which must be supplied to meet water needs. These estimates are pivotal to the entire design including the production of water, pumping, treatment, storage, and the distribution system. Each water system component is designed to meet certain flow requirements and to insure that water will be available at the various water use points throughout the system in adequate quantities to meet demands.

31-402 ESTIMATING BASIC WATER DEMANDS

a. The various components of a water system are designed to meet specific water flow criteria which are dependent upon the type of water system and the objectives of the system.

b. Average Daily Demand expresses the quantity of water used in a system in an average day. It is based upon experience from water meter readings in similar water systems over an extended period of time and reflects the normal seasonal and daily variations. For design purposes, it is usually determined by estimating the population or units of housing or other units and multiplying by an average per person or per unit water consumption derived from past experience. The average daily demand will be exceeded on many days (during peak demands), so it is not appropriate to design merely for the average. The greatest amount of water usage in one day or other period of time must be considered.

The following provides a guide for estimating the average daily demand for various types of establishments, in gallons per day per unit. The unit is persons per day unless otherwise indicated. The values are for normal water requirements and do not include special needs or unusual conditions. Additional allowances should be made for fire fighting, lawn watering, swimming pool, industrial or commercial process water and other special uses.

Type of Establishment (The unit is per person unless otherwise stated)		Average Daily Use (gallons per day)
Camps	-Children, overnight, central facilities	40-50
	-Construction	50
	-Migrant Labor	35-50
	-Day type, no meals served	15
Churches (per member)		1
Cottages, season occupancy		50
Clubs	-Residential	100
	-Non residential	25
Factories, sanitary uses, per shift		15-35
Food Service	-Restaurants	7-10
	-With bars	9-12
	-Fast Food	2
Highway Rest Areas		5
Hotels (2 persons per room)		60
Institutions	-Hospitals (per bed)	250-400
	-Nursing Homes (per bed)	150-200
	-Others	75-125
Office Buildings		15-30
Laundries, self service (per customer)		50
Motels (per bed)		60
Parks	-Day use (with flush toilets)	5
	-Mobile Homes (per unit)	200
	-Travel trailers (per unit)	90-100
Picnic Areas (with flush toilets)		5-10
Residential Communities		
Single Family Dwelling (per person)		100
	-Single Family Dwelling (per house maximum)	400
	-Multi-family (per bedroom)	120
	-Rooming house/tourist home (per bedroom)	120
Resort Motels and Hotels		75-100
Retail Stores (per toilet room)		400
Schools	-Day, no showers or cafeteria	15
	-Day, with cafeteria	20
	-Day, with showers and cafeteria	25
	-Residential types	75-100
Shopping centers, per sq. ft. sales area		0.16

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Type of Establishment (The unit is per person unless otherwise stated)		Average Daily Use (gallons per day)
Swimming Pools and Beaches		10
Theaters	-Drive-in (per car)	3-5
	-Others (per seat)	3

c. Maximum Daily Demand expresses the greatest amount of water a system will use in one day. Small residential water systems may experience that their maximum day is 1.5 to 2 times the average day. However, this ratio may not apply to other types of water systems. In general, the smaller the water system, the greater the variation between the average and the maximum day.

d. Maximum Hourly Demand expresses the greatest amount of water which will be used in any hour during the day. This is sometimes referred to as the peak hour demand, although these will be short term peak demand rates lasting for several minutes which will exceed the maximum hourly demand rate. Each type of system exhibits its own maximum hourly and short term peak demands and the hours of peak occurrence will vary. For example, shopping centers usually experience hourly peaks in the early afternoon while residential communities may experience two peak hours, about 8:00 a.m. and 6:00 p.m. The maximum hourly demand is often expressed as a ratio of the average daily demand, in gallons per minute. Generally speaking, the smaller the water system, the greater the maximum hour rate in respect to the average daily rate. The peak hourly demand at small residential communities may range about 6 to over 10 times the average daily demand.

e. Peak Demand (instantaneous demand) is the maximum amount of water necessary to meet the peak short term demand rate which may occur several times during a day, usually occurring during the peak hour period. The instantaneous peak may last for several minutes. The rate is particularly important in considering the sizing of the storage tank in a hydro pneumatic system. The effective storage capacity is usually designed to meet these short term peaks. The minimum effective storage volume of pressure tanks, in gallons, shall equal the peak demand, in gallons per minute (gpm), minus the pumping capacity (gpm), multiplied by 20. In the absence of sufficient effective storage to meet extended peak demands, the wells and pumps must be capable of meeting the peak

demands. The smaller the water system, the greater the ratio of the peak demand to the average demand.

INSTANTANEOUS (PEAK) DEMAND FOR RESIDENTIAL COMMUNITIES

Number of Connections	Gallons Per Minute
9	37.5
8	35.5
7	32
6	30
5	26.5
4	22
3	18

Note: It should be noted that fire flow is not included in the definition of average daily and maximum daily demands and should be added if fire protection is desired. Fire flows are usually expressed as gallons per minute to fight a fire of a certain duration, and could be designed into a water system for fire fighting purposes.

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