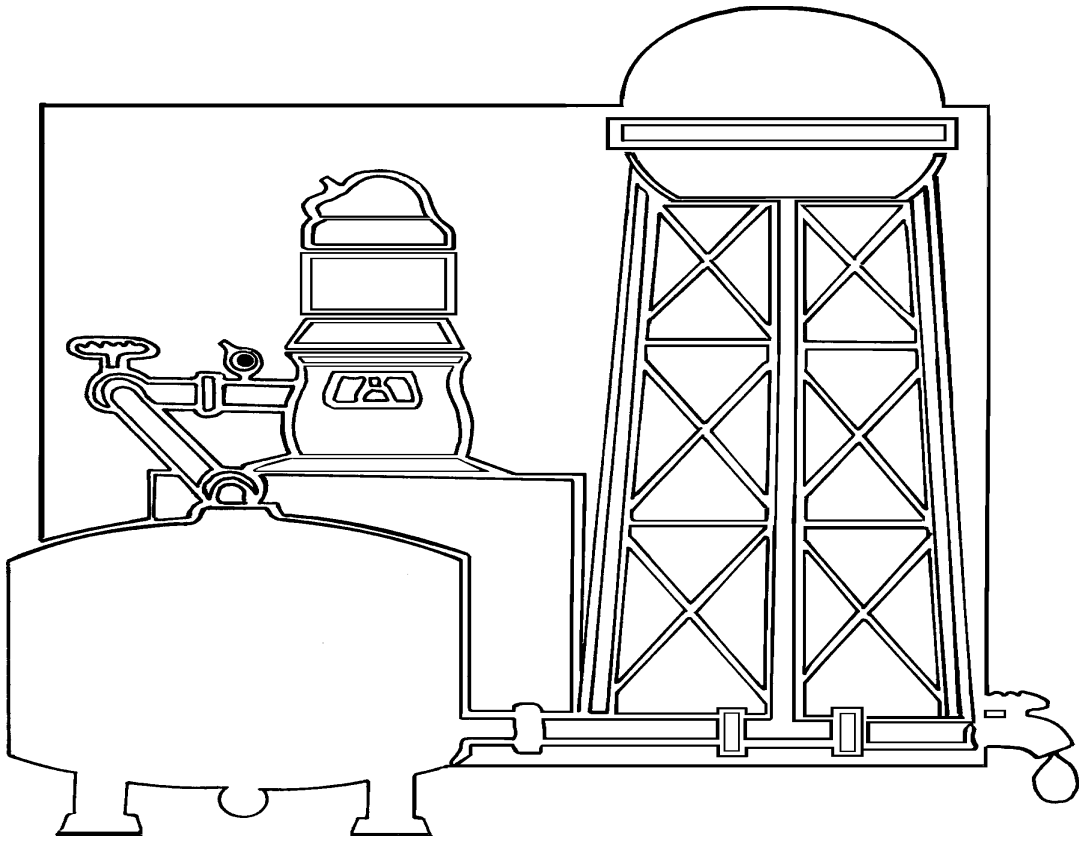
RECOMMENDED MINIMUM DESIGN CRITERIA
FOR
MISSISSIPPI PUBLIC WATER SYSTEMS



Mississippi State Department of Health
Division of Water Supply

August 2001

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Introduction

This document is a compilation of the minimum and recommended design criteria for public water systems in Mississippi. The purpose of these written standards is to serve as a guide to public water system officials, consulting engineers, Certified Waterworks Operators, and Division of Water Supply staff in designing new public water systems and in making modifications to existing public water systems.

It is recognized that every situation has not been addressed and that there may be situations where certain of these criteria do not apply. These instances will be handled on a case by case basis. The limitations of these design criteria are not meant to limit the scope of engineering design. Conversely, the development of new methods and innovative engineering design is encouraged. However, any new developments must be demonstrated to be satisfactory before approval can be given. These cases will be considered on an individual basis.

The 1997 Mississippi Legislature passed legislation revising the Mississippi Safe Drinking Water Act. This new law went into effect on July 1, 1997. One of the key provisions of this new law is a requirement that the engineering plans and specifications for extensions or modifications to public water systems must be approved by the Mississippi State Department of Health prior to beginning construction. The purpose of this new requirement is to protect the public health of all Mississippians by ensuring that all extensions or modifications to public water systems are designed and constructed in accordance with this agency's minimum design criteria. Violations of this law are subject to administrative penalties not to exceed $25,000 per day of violation. Additional information concerning our policy regarding when MSDH approval is required can be found on page 1 of this manual.

Questions or comments concerning this document or recommendations for improvement should be provided to the following address:

Director
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Phone - (601)576-7518.
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Definitions

1. MSDH/DWS - Mississippi State Department of Health, Division of Water Supply

2. MSDH - Mississippi State Department of Health

3. Division of Water Supply - a division of the Office of Environmental Health, Mississippi State Department of Health

4. Public Water Supply or System - as defined in the Mississippi Regulations Governing Public Water Systems, promulgated under the Mississippi Safe Drinking Water Act

5. Shall or must - these are used to denote a mandatory requirement

7. Should - this is used to denote a recommended or desirable condition in most cases

8. AWWA - American Water Works Association

9. U.S. EPA - United States Environmental Protection Agency

10. ASME - American Society of Mechanical Engineers

11. OSHA - Occupational Safety and Health Administration, U.S. Department of Labor

12. NSF - National Sanitation Foundation

13. ASTM - American Society for Testing and Materials

14. gpm - gallons per minute

15. ID - inside diameter

16. OD - outside diameter

17. psi - pounds per square inch

18. Consecutive Supplies - any public water system that receives water from another public water system for distribution

19. SSPC - Steel Structures Painting Council

20. USDA - United States Department of Agriculture

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References

1. American Water Works Association Standards

2. "Community Public Water Systems Design Criteria", Division of Management, Tennessee Department of Health and Environment

3. Ground Water and Wells, Johnson Division, UOP, Inc., 1975

4. Handbook of PVC Pipe Design and Construction, Uni-Bell Plastic Pipe Association, 1979

5. "Recommended Standards for Water Works", Great Lakes - Upper Mississippi River Board of State Public Health & Environmental Managers, 1992

6. "Regulations Governing Public Water Supplies", Alabama Department of Environmental Management

7. "Regulations Governing Public Water Systems", Mississippi State Board of Health, 1997

8. "Rules Governing Public Water Supplies", Section 0600 through 2500 of the North Carolina Administrative Code, Title 10, Department of Human Resources, Chapter 10, Health Services: Environmental Health, Subchapter 10D, Water Supplies

9. "State of Illinois Rules and Regulations", Title 35: Environmental Protection, Subtitle F: Public Water Supplies, Chapter II: Environmental Protection Agency, Parts 651-654, Technical Policy Statement

10. "State of the Art of Small Water Treatment Systems", U.S. Environmental Protection Agency, Office of Water Supply, Washington, D.C. 20460, August, 1977

11. Unpublished data, Division of Water Supply, Mississippi State Department of Health

12. "Waterworks Operator Manual", Division of Water Supply, Mississippi State Department of Health

13. "Small Water Systems Serving the Public", Conference of State Sanitary Engineers, U.S. Environmental Protection Agency, July 1978

14. Secondary Maximum Contaminant Levels, Environmental Agency, Water Programs, Federal Register 42, Number 42, March 31, 1977, 17144-17146.

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Part I
Submission of Engineering Documents to MSDH

A. PRECONSTRUCTION REQUIREMENTS

1. Siting of Facilities (Preliminary)

Prior to the design or expansion of the source and treatment facilities of a public water system, the facility site plan should be submitted to the Division of Water Supply. Particular attention should be given to the location and protection from contamination of proposed new sources of water.

2. Plans and specifications approval

a. Prior to advertising for bids, or prior to beginning construction where bids are not received on a new public water system, or for extensions or modifications to an existing public water system, complete plans and specifications shall be approved in writing by the Division of Water Supply. The following general policy should be used to determine if MSDH/DWS approval is required for water supply extensions or modifications:

MSDH approval is required for:

- Water main extensions along public roads and any main extensions designed to serve more than one connection.
- Water treatment modifications that will change the chemical or biological quality of the drinking water provided to the customers.

If there are questions whether a water supply project must be approved,

prior to employing a consulting engineer, system officials should submit a written description of the proposed project to this agency for review. Division staff engineers will review the proposed project and determine if MSDH approval is required. If MSDH approval is required, a consulting engineer must then be employed to develop engineering plans and specifications that must be submitted to the agency for review and approval prior to beginning construction.

b. Plans and specifications must be prepared, sealed and signed by a professional engineer licensed to practice in Mississippi in accordance with the requirements of the Mississippi State Board of Registration for Professional Engineers and Land Surveyors.

c. Incomplete and/or illegible documents will delay the review and approval process.

d. Separately bound specifications shall be submitted for public water systems. Standard specifications for projects may be approved and kept on file.

e. If requested, the MSDH/DWS will maintain, on file, a public water system's MSDH approved standard set of specifications for public water systems. The public water system's consulting engineer may then reference these "on file" approved specifications when submitting engineering projects for review and approval.

f. Plans and specifications submitted for review must be in accordance with

Appendix C, "Information Needed for Division of Water Supply Review and Approval of Engineering Plans and Specifications for Mississippi Public Water Supplies".

B. POST CONSTRUCTION REQUIREMENTS

A letter of certification shall be submitted from the consulting engineer to the Division of Water Supply stating that the project was constructed in substantial compliance with the approved plans and specifications. Records of satisfactory microbiological results from an approved laboratory must be included with the certification. One set of as-built plans should be included if significant changes were made in the construction of the project. The Division of Water Supply, Mississippi State Department of Health must be notified of the final inspection in sufficient time to insure that a Division representative can be present.

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Part II

WATER USAGE REQUIREMENTS

A. The anticipated usage for a proposed system should be based on actual data from similar systems, taking into account agricultural and industrial usage, lot size, degree of urbanization, water loss and other factors influencing water usage.

B. The water system should be designed to supply all existing homes and lots in the certificated area, whether or not they have requested service. A reasonable growth factor should be included.

C. In the absence of actual data, water systems should be designed to supply the demands in Table 1.

D. Fire flows should be based upon the requirements of the lending agency or other appropriate authority, such as the Mississippi State Rating Bureau.

Table 1
Water Demands

Type of User	Average Usage - gallons per day per connection	Peak Usage - gallons per day per connection	Peak Demand* gallons per minute per connection
Rural Homes	200	400	1
Urban Homes	400	600	1
Subdivisions	400	600	1
Rural Apartments and Trailers	133	267	2/3
Urban Apartments and Trailers	267	400	2/3
Recreational Vehicles	100	200	1/2
Unmetered	150% of rural or urban usage, whichever applies		
Chickens		0.1 per chicken	
Cattle or hogs		15 per head	Depends on waste system
Schools	15-20 per student	30- 40 per student	

*For less than 100 connections or units, the design peak demand is given by the demand curve in Appendix E, "Minimum Flow Requirements for Small Water Systems Without Fire Protection". For apartments and trailers, the design peak demand is 2/3 of the demand curve. For recreational vehicles, the peak demand is 50% of the demand curve. For unmetered connections, the design peak demand is 150% of the demand curve. For non-community water supplies refer to Appendix E.

Example Demand Calculation:

A school with 900 students - unmetered
Peak Demand (gpd)/400 gpcd = connections
Peak Demand = 40 gpd x 900 students = 36,000 gallons
36,000/400 = 90 connections
Since system is unmetered multiply connections by a factor of 1.5
so 90 x 1.5 = 135 connections
Therefore this school would be equivalent to a water system with 135 connections

Part III
WELLS

A. WELL DRILLER REQUIREMENTS

All wells for public water supplies shall be constructed by a water well contractor licensed by the Mississippi Department of Environmental Quality.

B. WELL PERMITS

All wells shall be permitted as required by the Department of Environmental Quality.

C. LOCATION

Well sites shall be approved by the Division of Water Supply/Mississippi State Department of Health. The following criteria shall be considered in determining an acceptable well site:

1. Susceptibility of flooding - the top of the well casing shall be at least 1 foot above the 100 year flood or the highest year flood, whichever is higher
2. Distance from existing wells (depends on characteristics of the formation)
3. Accessibility
4. Sources of pollution - Minimum distance of 100 feet
5. Potential for development of the surrounding area
6. Proximity of roads, railroads, power lines, underground pipelines, cathodic protection systems and other possible causes of damage
7. Degree of natural protection from surface water
8. The ability to obtain water that is free of sand and which meets the current U.S.

EPA primary and secondary drinking water standards.

D. TEST HOLES

Test holes are drilled primarily to locate the depth of the aquifers, determine their relative thickness and to take samples of the aquifers penetrated. All test holes which will be used subsequently as test wells should be a minimum of 8 inches in diameter. Upon completion of a successful test hole, the following information should be made available to all interested parties.

1. Sand samples of the aquifer taken at 10 foot intervals and for any change in formation.
2. Drillers log of the test hole.
3. Gamma ray log of the test hole.
4. Electric log.
5. Sieve analysis of the sand samples for each 10 foot interval of each aquifer penetrated.

A legible copy of each of the items listed above should be forwarded to the Division of Water Supply for the official record.

E. TEST WELLS

1. A water sample for chemical analysis should be obtained from each potential aquifer to be considered.
2. Test Well Design.
   a. Upper casing should have a minimum inside diameter of 6 inches to allow

for pump clearance.

b. Screens should be of wire wrap design with a minimum outside diameter of 4 inches and a minimum length of 20 feet. Slot size should retain from 45% to 60% of the aquifer material.

c. Non-lead packers should be installed above and below the aquifer to limit the influence of other aquifers pierced by the test hole.

d. The test well should be properly developed and water samples should be free of drilling mud and sand. **NOTE:** Only non-organic drilling mud should be utilized in the construction of water wells.

e. The well should be pumped at a minimum rate of 75 gpm or 20% of the final design capacity.

f. Drawdown measurements shall be made at regular intervals during the first 1500 minutes of pumping and afterward until the static water level in the well has recovered.

3. Physical and chemical analyses shall be made of the samples taken after the pumping test and analyzed by a Mississippi State Department of Health approved laboratory to determine the water's suitability for public water supply use. A legible copy of these analyses should be forwarded to the Division of Water Supply for the official record.

F. OBSERVATION WELLS

1. Observation wells for permanent use shall be properly protected from sources of contaminants in the same manner as permanent wells for a public water supply.
2. The casing should extend at least 1 foot above the expected 100 year flood and be provided with an overlapping, lockable cover with a lock.

G. ABANDONED HOLES, TEST WELLS AND WELLS

1. All abandoned wells, test wells, temporary observation wells and holes to or through any aquifer shall be filled with cement grout introduced at the bottom and pumped to the ground surface in one continuous operation.
2. A registered Professional Engineer may be employed to design an alternate abandonment technique. Any alternate technique must be approved by the Division of Water Supply prior to its application. Written certification of completion from the engineer in charge of the abandonment procedure is required.

H. DESIGN OF WELLS SHOULD MEET THE REQUIREMENTS OF THE LATEST REVISION OF AWWA A100.

1. Capacity

A well or well field shall be designed to operate to prevent excessive depletion of the aquifer and to provide standby capacity.

2. Well Casings

a. Well casings shall be installed to prevent the vertical migration or entrance of adjacent ground or surface water. They should be so constructed and

installed to prevent corrosion by aggressive water. They should be sufficiently sized and installed to allow installation, maintenance, or measurements of the pump, water levels, lap pipe and screen. Table 2 indicates recommended casing sizes for various yields, taking into account pump efficiency, head losses and adequate clearance for proper installation of 1760 rpm vertical turbine pumps. In some cases, the casing may need to be larger than indicated by the table to allow for pump settings in the lap pipe. The use of submersible pumps requires additional clearance to prevent excessive head losses in the annulus between the motor and the casing.

Table 2

Recommended Well Casing and Screen Diameters

Proposed well yield, gpm	Nominal size of pump bowls, inches	Optimum size of well casing, inches	Maximum screen size for gravel packed wells
50 - 150	6	10 ID	6
100 - 700	8	12 ID	8
250 - 1500	10	14 OD	10
700 - 2400	12	16 OD	12
900 - 3000	14	20 OD	16
3000 - 4500	16	24 OD	20

b. An annular space on the outside of the casing of at least 2-1/2 inches shall be sealed with cement grout for the full length of the casing. The well casing shall be cemented in place by the Halliburton or other satisfactory method. The Halliburton method requires forcing cement grout in the annular space between the casing and the drill hole from the bottom of the well to the top, thus assuring exclusion of all the water above the water-bearing stratum from which the supply is taken. The grout should be neat cement weighing at least 14 lbs/gal (13 lbs/gal is acceptable if grout contains 8 % bentonite gel).

c. The top of the well shall be sealed to prevent the entrance of contaminants. Properly protected vacuum relief openings should be provided except in the cases where prevented by artesian head.

d. The casing should be provided with an access pipe which is at least 2 inches in diameter to allow for water level measurements. If this is also used as the casing vent, it must be screened and elbowed.

e. The same size casing shall extend from above the top of the foundation to the top of the water bearing stratum.

f. Steel casings shall meet the requirements of the latest revision of the applicable AWWA standard.

g. PVC casings may be allowed provided the justification for their use outweighs the risk of failure. PVC casings shall be designed to withstand

the stresses of installation but shall be limited to the following depths:

SDR*	Depth, FT
26	125
21	250
17	500

* Check manufacturers nominal internal diameters

h. The interior of a mild steel outer casing, the interior/exterior of the lap pipe, pump column and tail pipe in wells with corrosive water should be protected with an EPA or NSF approved coating to prevent corrosion or constructed of corrosion resistant material such as stainless steel. Special attention should be given to sealing the column pipe, coupling, threads and joints.

i. A tight joint is required between well casing and pump head.

The pump head shall be connected to the outside casing by a water-tight threaded connection or by the outside casing being carried to a point not less than one inch above the pump head foundation. Before setting the pump head casing, the contractor shall provide a vacuum seal between the foundation and pump head casing where a partial vacuum will be created. Where submersible pumps are used, a satisfactory water-tight mechanical seal shall be provided.

j. The pump head shall be mounted on a chamfered concrete foundation not

smaller than 24 inches square at the top, extending not less than 18 inches into the solid ground and not less than 18 inches above the finished grade or the 100 year flood elevation.

3. Well Screens

Screens should be designed and installed in such a way as to maximize well efficiency, consistent with constraints of aquifer retention. Refer to Table 2.

a. Screen slot sizes should be designed based on the gradation of the adjacent gravel pack or aquifer material, as determined by sieve analysis.

b. Total open area of the screen should be such that the maximum entrance velocity is limited to 0.1 feet per second.

c. The screen shall be constructed of type 304 stainless steel, be rod-based and wire wrapped. Other materials when adequately justified will be considered on a case by case basis. Shutter screens are not acceptable.

d. The gradation of the gravel pack material should be based on the gradation of the adjacent aquifer material, as determined by sieve analysis. The thickness of the annular gravel envelope should be between 3 inches and 8 inches to allow complete development of the well.

e. The bottom of the screen should be fitted with a backwash valve if needed to permit washing of the screen and to prevent inflow of sand.

4. Lap pipe

The lap pipe should extend into the casing a distance sufficient to assure concentric

alignment of the screen and casing. This must be at least 60 feet for straight wall wells. For gravel packed wells, the lap pipe must be 60 feet or at least as long as the screen for alignment and for storage of additional gravel pack. The space between the lap pipe and the casing should be filled with specially graded gravel according to sieve analysis to prevent sand pumpage. Any deviation from these minimum lap pipe lengths must be approved by this agency prior to construction and will be considered strictly on a case-by-case basis.

5. Pumping equipment

a. The pumping equipment should be designed to deliver the required flow and pressure at the maximum efficiency available.

b. Appurtenances on wells shall include:

i. 3/4 inch sampling faucet installed between the pump discharge flange and chlorination - if it is installed upstream of the check valve, it should be a non-hose bib design and should not be installed on the blind flange of the discharge tee.

ii. Provision for adequate shaft lubrication:

I. Water lubrication - line shaft vertical turbine pumps should be of the water lubricated type, if practical, to prevent problems resulting from the introduction of oil into the system.

a. The pre-lubricating water should be from an

approved source of water, preferably the well itself. If a foot valve is used to hold the pump column full of water, a simple bypass around the check valve is sufficient.

b. The pre-lubricating water should not be allowed to run continuously into the well. A normally open solenoid valve should be used so that an electrical failure will not prevent the flow of lubricating water.

II. If oil lubricated, a non-petroleum based product meeting USDA H1 standards should be used.

iii. Test tee.

iv. Check and gate valve.

v. Freeze protection where needed.

vi. A master meter shall be provided for all public water supply wells. It shall be installed downstream of the check valve according to the manufacturers recommendations and be properly sized to accurately determine well capacity and amount of water pumped.

vii. Lightning and phase failure protection for all three-phase equipment

viii. Anti-reverse ratchet to prevent backspin or a time delay.

ix. An air release valve prior to the check valve.

x. A screened and elbowed (double ell) casing vent. (For flowing

wells a check valve should be installed on the vent.)

xi. Single piece non-plastic air line gauge for water level measurements

xii. Casing access pipe of at least 2 inches in diameter for water level measurements.

c. The use of a submersible pump with a foot valve eliminates the need for item ii.

d. Corrosion resistant materials should be used for the pumping equipment if the corrosiveness of the water is expected to significantly reduce the life of mild steel components.

I. WELL CONSTRUCTION

1. An electrical resistivity and spontaneous potential log should be completed on each drilled hole and be evaluated in relation to other data prior to installation of the casing.

2. The well should be developed to its maximum practical efficiency and be free of visible sand and drilling mud. Turbidity due to the drilling process and/or construction of the well should not exceed 5 NTUs.

3. A pumping test of sufficient duration should be completed with the temporary pumping equipment on the final well to determine anticipated capacity and drawdown.

4. The permanent pump bowls should be set to maintain a 30 foot minimum submergence after pumping for 24 hours at open discharge.

5. After drawdown has stabilized on the well, the permanent pump should have step tests performed to determine capacity. The steps should be in increments no greater than 10 psi and should be from open discharge to shut-off head. Drawdown shall be measured after stabilization for each increment of pressure.

6. Well efficiency - should be minimum of 70% for wells utilizing at least 60% of formation.

7. Water samples should be collected and submitted to the Mississippi State Department of Health or a state approved laboratory for chemical analysis.

J. DISINFECTION

1. All water used in the drilling and construction process shall be obtained from sources of proven satisfactory quality and shall meet the primary standards of the Safe Drinking Water Act Regulations.

2. Gravel to be placed in a well should be disinfected with a solution of at least 50 mg/l free chlorine. A residual of no less than 5 parts per million of chlorine shall be maintained in any water used for development.

3. Upon completion of the well, the well and adjacent aquifer shall be disinfected as necessary using a solution of 50 mg/l free chlorine applied for 24 hours. After disinfection, the well shall be pumped until two consecutive chlorine-free samples are collected from the well which show no coliform bacteria and no confluent growth. The samples shall be collected, submitted and analyzed according to the Mississippi State Department of Health requirements. The second sample shall be

collected following at least two hours of continuous pumping after the first sample. A disinfectant must not be applied between samples.

The person collecting the official microbiological sample(s) must be a representative of the Mississippi State Department of Health, the Licensed Professional Engineer for the project, or the Certified Waterworks Operator for the public water supply.

4. If water from a private well is used, microbiological samples shall be examined prior to use. Routine samples from public supplies may be used as a basis for determining if a supply is satisfactory.

5. The disinfection procedure should meet the current AWWA standard (C654). A solution strength of 50 mg/l free chlorine applied for 24 hours is recommended.

6. When a well has been repaired, such as lowering or replacing the pump, the well should be disinfected. At least two (2) microbiological water samples, taken 2 hours apart with the well pumping continuously, must be obtained prior to placing the well back in service. No coliform bacteria should be present in these samples. If coliform is present, the well should be re-disinfected and re-sampled.

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Part IV
WATER TREATMENT

Treatment facilities shall be provided for all public water to the extent necessary to insure compliance with the Primary Drinking Water Standards established by the U.S. EPA. Treatment facilities should also be provided to the extent necessary to insure compliance with the Secondary Drinking Water Standards and to remove any other harmful or objectionable constituents or qualities. Refer to Appendix A and Appendix B.

A. DISINFECTION

Automatic chlorination equipment is required on all new public water supplies. Chlorination is required on all previously unchlorinated public water supplies at such time that improvements or extensions are made. Chlorination shall be required on those systems that have been unable to meet the microbiological standards of the Safe Drinking Water Act. Disinfectants other than chlorine may be approved on a case by case basis.

1. Gaseous chlorinators shall be of the type with the regulator mounted directly on the chlorine cylinder, which will eliminate any pressure tubing.
2. Chlorination equipment shall have the capacity to feed approximately a 4 mg/l dosage of chlorine and provide a free chlorine residual after the initial chlorine demand has been satisfied.
3. Chlorine cylinders and chlorine pressure tubing should be isolated from electrical equipment, motors, pumps and other materials and chemicals subject to corrosion or oxidation.

4. Walk-in chlorinator and chlorine rooms shall have positive ventilation of at least one fresh air change per minute. Ventilation at the floor level should be provided for chlorinator and chlorine storage rooms.

5. Walk-in chlorine storage and chlorinator rooms shall not have locking restrictions when opening from the inside. The doors should swing open to the outside.

6. 100 and 150 lb. chlorine cylinders must be secured in an upright position.

7. Installation and controls for the chlorinator should be as indicated in Appendix H memo.

B. FLUORIDATION

1. Fluoridation facilities shall be capable of maintaining a uniform fluoride concentration in the water between 0.8 mg/l and 1.2 mg/l.

2. To facilitate precise control, fluoridation equipment shall not have excessive capacity over that required to maintain 4 mg/l fluoride in the treated water.

3. Automatic controls shall be provided which prevent excessive feed rates. The fluoridation unit shall be wired so that it can run only when the well or service pump runs. **Manual fluoridation controls are not acceptable**.

4. The fluoridation systems shall be designed to prevent back-siphonage or uncontrolled flow of fluoride into the water supply.

C. CORROSION CONTROL AND STABILIZATION

1. Corrosion control plants should be capable of adjusting the pH to the $CaCO_3$ stability point.
2. Sampling faucets prior to chemical addition must be provided on the degasifiers (aerators).
3. Aerators should reduce the CO_2 content of the water to 10 mg/l or less.
4. The maximum loading rate should be 10 gallons per minute per square foot for natural draft aerators and 20 gallons per minute per square foot for induced draft and force draft aerators.
5. All aerators without subsequent filtration shall be screened with corrosion resistant material and properly protected from insects and other contaminants.
6. All natural draft aerators should have an alternate chlorine application point prior to the aerator distribution tray to allow periodic treatment with chlorine to control algae growth.
7. Corrosion control plants should have a minimum detention time of 30 minutes to allow for an adequate chlorine contact time and for dissolution of chemicals.
8. Re-carbonation basins should have a minimum detention time of 20 minutes.
9. Phosphates may be used for corrosion control on a case by case basis.

D. CLARIFICATION

This is a combination of the processes of mixing, coagulation, flocculation and sedimentation to remove unwanted solids and to reduce the filter loading. These processes may be carried out in

a single unit, the upflow clarifier. Tube settlers may be used to enhance sedimentation efficiency. The treatment scheme should be based on the chemistry of the water and the degree of treatment required, with the aid of jar tests, bench tests and pilot plants. The following criteria should be used as guidelines:

1. Rapid mix

a. Detention time: 10-60 seconds

b. Minimum velocity gradient: 300 ft./sec./ft.

Note: For surface water using metal coagulants, uniform mixing for less than 10 seconds is recommended.

2. Flocculation

a. The basin should be designed to prevent short circuiting and destruction of floc.

b. Detention time: 30-45 minutes

c. Peripheral paddle speed: 0.5 - 3.0 ft./sec.

d. Flocculation and sedimentation basins should be as close together as possible. The velocity of flocculated water through pipes or conduits should be between 0.5 and 1.5 ft./sec.

3. Sedimentation

a. Conventional

i. Detention time: As determined by bench and pilot plant testing

ii. Velocity: 0.5 - 1.0 ft./min.

iii. Maximum overflow rate: 0.25 - 0.38 gpm/ft.^{2}

iv. Outlet weir loading: 8 - 15 gpm/ft. The higher rates are for heavier floc such as that obtained from lime-soda softening.

Note For Surface Water:

* Length to width ratio should be 4 to 1 minimum.

* Length to depth ratio should be 15 to 1 minimum.

Detention Time should range from 1.5 to 4 hours.

b. Tube settlers - Tube settlers may offer advantages over conventional sedimentation in many cases. Proposals for tube settlers should be supported by adequate data from pilot plant or full scale demonstrations.

c. Sludge handling and disposal - Adequate provisions should be made for automatic removal and approved disposal of water treatment plant sludge. Alternative methods of water treatment and chemical use should be considered as a means of reducing sludge handling and disposal problems.

4. Upflow Clarifiers

These are acceptable for clarification or softening where water characteristics and flow rates are uniform.

a. Upflow rate - The maximum upflow rates used vary from 0.75 gpm/ft.^{2} to 1.25 gpm/ft.^{2}. The lower rates are for iron removal and surface water and the higher rates are for heavier floc such as for softening.

b. Maximum weir loading.

i. Clarification: 10 gpm/ft.

ii. Softening: 20 gpm/ft.

E. FILTRATION

Filter units may be either gravity filters or pressure filters, depending on the degree of pre-treatment required. Pressure filters are normally used to remove small amounts of iron and manganese, where clarification is not economical or practical. Gravity filtration shall be used on all surface water sources. Filtration shall be required on all new spring or surface water supplies.

1. A bypass should be constructed on all single unit filters to allow for maintenance. Multiple units with no bypasses shall be used for surface water treatment.
2. Where potassium permanganate is used prior to filtration, the chlorine application point should be as far as possible upstream of the permanganate application point.
3. The influent water should be baffled to prevent upset of the media.
4. The filter tank should be of sufficient height to allow the necessary media expansion required for adequate backwashing without loss of media.
5. Air wash facilities should be provided where manganese zeolite filter media is used.
6. Surface wash facilities should be used on gravity filters treating surface water.
7. A sufficient quantity of water should be provided for a minimum backwash time of 20 minutes while still maintaining adequate flow to the system.
8. A means of measuring loss of head through the filter should be provided on each filter unit.
9. Filter to waste piping must be provided, along with provisions for automatically maintaining normal flow while filtering to waste.

10. A positive means of automatically controlling the backwash flow rate should be provided. A means of easy observation of the backwash water should be provided.
11. A means of sampling the influent and effluent of each filter unit shall be provided.
12. A means of monitoring filter effluent must be provided for each cell.
13. An automatic air release valve and a man hole which is at least 18 inches in the smallest dimension should be provided on pressure filters.
14. The filter media size, filter rate, backwash rate and media depth should be within the guidelines in Table 3. The higher filtration rates pertain to multimedia filters or anthracite filters with low solids loading. Dual media filters with 12 - 18 inches of anthracite are recommended.
15. In placing media in multimedia filters, each successive type of media shall be backwashed at least twice and skimmed to remove fine particles prior to placement of the next type of media.
16. The underdrains shall provide uniform backwash distribution over the entire area of the filter. They may be of the header and lateral type with graded gravel or they may be the false bottom type, with properly designed strainers in relation to the support and filter media proposed.
17. Settling ponds should be considered for backwash water and other waste discharges in order to meet Mississippi Department of Environmental Quality requirements.
18. Provisions should be made for recycling backwash water.

Table 3
Filter Design Criteria

Parameter		Media	
	Sand	**Anthracite**	**Mn Greensand**
effective size, mm.	0.45 - 0.55	0.7 - 1.2	-----
maximum uniformity coefficient	1.5	1.5	-----
filter rate, gpm/ft.^{2}	2 - 4	2 - 4	2 - 4
backwash rate, gpm/ft.^{2}	15 - 18	10 - 12	8 - 10
media depth, ft. * (excluding gravel)	2-3	2	1.5

* for single media filters

F. WATER WITH LOW IRON AND MANGANESE CONCENTRATIONS

Water with low iron and manganese concentrations (0.3 - 1.5 mg/l Fe, 0.05 - .30 mg/l Mn) may not require clarification prior to filtration. A detention time of 30 minutes should be provided to allow for complete oxidation, unless potassium permanganate is used as an oxidant.

G. CHEMICALS

1. Chemical containers should be labeled to provide the following information:
   a. Chemical name, purity and concentration
   b. Name and address of supplier

c. Expiration date where applicable

2. Chemicals should meet the latest revision of the applicable AWWA standards and have NSF approval for use in potable water.

3. Chemical additions to the water shall be compatible under recommended dosages and should not impair the efficiency of disinfection.

H. DISINFECTION OF TREATMENT FACILITIES

The disinfection procedure should meet the current AWWA standard (C653). A solution strength of 50 mg/l free chlorine applied for 24 hours is recommended. The discharge of highly chlorinated water will require a permit from the Department of Environmental Quality/Office of Pollution Control. At least one clear microbiological water sample shall be collected by a representative of the Mississippi State Department of Health, the Licensed Professional Engineer in charge of the project, or the Certified Operator for the public water supply. Samples with "No Coliform Present" shall constitute acceptable sample(s) when analyzed by the Mississippi State Department of Health or a laboratory certified by the State.

I. OTHER

1. Process diagrams may be required for certain complex treatment processes.

2. All plant piping should be color coded in accordance with recommendations published in "Recommended Standards for Water Works", 1992 issue.

3. All controls for sources, water levels, etc. should be accessible from the treatment plant.

4. An alternate power source should be considered in case of power loss.

5. Any discharges from water treatment facilities will be regulated by the Mississippi Department of Environmental Quality/Office of Pollution Control.

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Part V
WATER DISTRIBUTION

A. DISTRIBUTION SYSTEM DESIGN

1. Pressures

The distribution system should be so designed as to maintain a minimum dynamic pressure of 20 psi and a maximum static pressure of 80 psi. Higher pressures may be considered on a case by case basis provided individual pressure reducers are used on the services.

2. Pipe sizes

All water mains should be designed based on hydraulic analysis using an appropriate friction coefficient.

a. The maximum Hazen-Williams C value to be used is 120.

b. The minimum main size shall be 4 inches regardless of the results of the hydraulic analysis. Smaller lines may be considered on a case by case basis.

c. The minimum main size supplying fire hydrants with pumper connections should be as determined by hydraulic analysis using fire flows, but not less than 6 inches. Flushing (2-way) hydrants may be installed on 4 inch lines if the hydraulic analysis demonstrates satisfactory pressure under fire flow conditions.

d. The maximum velocity in all source, treatment and distribution system piping should be limited to 5 feet per second to minimize friction loss.

3. Materials

All materials not specifically referenced in these guidelines shall be non-toxic and approved for use in potable water systems by AWWA, U.S. EPA, Underwriters Laboratory, National Sanitation Foundation or other appropriate organization.

a. Cast iron, ductile iron and steel pipes and fittings shall comply with the latest applicable standards issued by the American Water Works Association.

b. PVC pipe shall bear the National Sanitation Foundation seal for potable water and meet the requirements of ASTM D 1784 for Class 12454 A or 12454 B compounds. The pipe shall meet the latest revision of the applicable AWWA or Commercial Standards. To provide a safety factor for the surges in PVC pipe using Commercial Standards the maximum pressure should be limited to one-half of the manufacturers pressure rating of the pipe.

c. For static pressures up to 80 psi, 160 psi pipe (SDR 26) may be used. For static pressures greater than 80 psi, 200 psi pipe (SDR 21) should be used.

d. Asbestos cement pipe will not be approved by this office. Existing asbestos cement pipe should be replaced as soon as possible.

4. Consecutive Public Water Systems

Water supplies which meter water through a master meter should use a compound meter unless flows are continually maintained at a rate which will register

accurately on the meter.

B. INSTALLATION

1. Pipe laying

Pipe installation should comply with generally accepted standards of good workmanship, including applicable AWWA and industry standards, along with, but not limited to the following:

a. A continuous uniform bedding should be provided, free of stones and debris within 6 inches of the pipe in the bedding and cover material.

b. There should be a minimum of 30 inches of cover.

c. While under construction, unattended exposed pipelines must have the ends capped. All materials to be used in construction shall be stored above the ground in a manner that will minimize the possibility of contamination.

d. Adequate separation from other utilities for maintenance and/or repair should be provided.

e. Detectable marking tape should be installed on all new pvc water mains to aid in the location of these lines in the future. It is recommended that the tape be blue in color.

2. Separation of water and sewer mains

a. Water mains shall be located on opposite sides of the street from sewers where possible.

b. Adequate separation of water and sewer lines shall be based on the

following factors:

i. Materials and type of joints for water and sewer pipe.

ii. Soil conditions.

iii. Natural drainage and subsurface flow.

iv. Any other local condition affecting the construction, maintenance or future integrity of the installation.

c. Water mains located near sewer lines.

i. Water mains shall be laid at least 10 feet horizontally **and** 18 inches vertically from any sanitary sewer or manhole. The bottom of the water line should be at least 18 inches from the top of the sewer line. (Water lines should always be constructed above sewer lines. Under extraordinary circumstances, the Division of Water Supply may approve the construction of a sewer line above a water line provided the design engineer meets special construction requirements as determined by the Division.

ii. Where local conditions prevent adequate horizontal and vertical separation, the Division of Water Supply may allow the water line to be laid closer to the sewer line if supported by adequate data from the design engineer. Each situation will be reviewed on a case by case basis. A detailed drawing shall be included in the plans for the water line construction submitted to the Division of Water

Supply for review and approval. **All three of the following conditions must be met:**

I. If the 10 foot horizontal separation between water and sewer lines cannot be maintained then the water line should be ductile iron with water line joints located at the maximum distance possible from sewer line joints. PVC pipe may be used if it is protected by a steel casing. Also the water and sewer lines must be in separate trenches with adequate space for maintenance. In some cases, special sewer line construction procedures may be required.

II. Where the 10 foot horizontal **and** 18 inch vertical separation cannot be maintained, condition I. must be met **and** the sewer line shall be constructed according to water main standards.

III. Where water lines cross over sewer lines, the pipe segments should be centered to provide maximum spacing of joints of both water and sewer lines. A vertical separation of at least 18 inches should be maintained (water over sewer).

d. Water lines and sewer lines should be shown on the same layout sheet whether sewer lines are existing or proposed.

e. Potable water lines shall be clearly and permanently identified

where pressure sewer systems exist or where sewers are constructed of water pipe.

3. Surface water, ditch and roadway crossings

a. Water lines crossing ditches and/or streams where less than 30 inches of cover is maintained should be ductile iron pipe or protected by a steel casing. Adequate support and anchorage should be provided on both sides of the ditch.

b. Exposed stream crossings should be above the 100 year flood.

c. PVC pipe crossing roadways should be protected by a steel casing. This office recommends ASTM A252 or ASTM A139 Grade B or better. Pipe should be 35,000 psi ultimate strength.

d. Recommended casing size should be two diameter sizes larger than the pipe to allow for future expansion.

4. All water users should be individually metered.

5. A sufficient number of valves should be provided for line maintenance, repairs and isolation of fire hydrants.

6. Flushing hydrants should be installed on all dead end lines, low areas and in other places that might require flushing. They should be installed in areas where 2.5 ft/sec. velocity can be obtained for adequate flushing.

7. Pressure and leakage tests should be completed and conform to the current AWWA Standard C600, Section 4.

8. Disinfection

a. After completion of the construction and pressure testing of water distribution lines, they shall be flushed and disinfected using at least a 50 mg/l free chlorine solution for 24 hours or as described in the latest revision of AWWA C651. Large volume disposal of this water may require a permit from the Department of Environmental Quality/Office of Pollution Control.

b. After completion of the construction and disinfection of water distribution lines, the contractor shall arrange for at least one microbiological water sample to be collected by a representative of the Mississippi State Department of Health, the Licensed Professional Engineer in charge of the project, or the Certified Operator for the system from every dead-end line and every major looped line. Water being collected for testing shall not have a chlorine residual higher than is normally maintained in other parts of the distribution system. No chlorine shall be present which is a result of line disinfection. A sample showing "No Coliform Present" shall constitute a satisfactory sample when analyzed by the Mississippi State Department of Health environmental laboratory or a laboratory certified by the State.

9. Cross Connections - There shall be no physical connection between a potable water

system and a non-potable system whereby non-potable water or other liquid contaminants may be caused to enter.

a. An appropriate backflow prevention device shall be installed on each service connection where an existing or potential health hazard exists or where a hazardous hydraulic condition may be allowed to exist.

   i. Backflow prevention assemblies shall be installed in a location that provides adequate access for testing and repair of the assembly.

   ii. Reduced pressure principle backflow prevention assemblies and double check valve assemblies shall not be located in a pit below ground level.

b. Prior to service being connected to a public water system, all wells or water sources owned or used previously by the potential customer shall be physically disconnected from the plumbing to be supplied by the public water system.

c. Interconnections between approved water supplies to be used in emergencies may be allowed provided no hazardous or potentially hazardous hydraulic conditions would be created by the use of the interconnection.

   i. A flow of 50% of the peak design flow may be used to

assess the hydraulic conditions with the emergency connection in use.

ii. Division of Water Supply approval of the interconnection shall be obtained prior to installation.

iii. Two closed gate valves should be used to physically separate the two systems. A riser with a small, protected outlet should be installed to signify operation of the emergency connection or failure of one of the valves. A meter should be installed so records of water usage during an emergency may be determined.

iv. A formal resolution of the governing bodies of each of the water supplies shall be adopted prior to construction of the interconnection. This resolution shall clearly define the terms and conditions governing this interconnection of two public water systems.

10. Booster Stations

a. Booster stations should have the storage (collector) capacity, or inflow under peak hydraulic conditions to provide a peak flow for at least 200 minutes in rural areas.

b. A collector tank should be sized for equalizing storage, with a minimum detention time of 30 minutes based on the difference of

influent and effluent for chemical contact.

c. A provision for a bypass around the booster station should be installed to allow for bypassing the booster station with temporary facilities as needed for maintenance.

d. Chlorination facilities may be required to maintain adequate chlorine residuals beyond the booster station.

e. Hydraulics indicating peak flows and fill conditions should be included.

11. In-Line Booster Pumps

The use of in-line booster pumps to boost pressure and/or flow within a distribution system is generally not recommended. In-line booster pumps will not be approved by the MSDH/DWS except in cases where it can be shown that the benefit gained will justify the inherent risk associated with pumps used in this manner. Therefore, approval of in line pumps will be issued on a case-by-case basis dependent upon system hydraulics, fire flow tests, lines sizes, proximity to elevated storage, etc. In all instances where an in-line pump is proposed, adequate documentation must be submitted to the MSDH by a professional engineer licensed to practice in the state of Mississippi for review and approval prior to installation. In addition, the engineer must certify, in writing, that, in his professional opinion, the installation of the in-line booster pump will not result in a threat to public

health due to low water pressure. In all cases, a low pressure cut off switch will be required to shut the pump off in the event that the pressure on the inlet side of the pump drops to a predetermined value (The minimum setting for cut off switches shall be 20 psi).

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Part VI
WATER STORAGE

A. GENERAL

1. Construction Standards

All welded steel tanks should conform to the current "AWWA Standard for Welded Steel Tanks for Water Storage". All pressure tanks should conform to current AWWA standards and to the ASME Code for Unfired Pressure Vessels.

2. Overflows and drains

Overflows and drains shall not be directly connected to sewers or storm drains.

3. Drainage of surfaces

Surfaces of tanks, including hatch covers, should be sloped to drain.

4. Other tank materials

Tanks of materials other than welded steel will be considered on a case by case basis.

5. Coating

a. Paints, primers and sealers used on the interior of water tanks shall be NSF approved for contact with potable water.

b. Coal tar, wax, or bitumastic shall not be used in interior coatings for water tanks. Lead paint shall not be used on the interior or exterior of water tanks.

c. The Division strongly recommends that all painting projects be under the supervision of a licensed professional engineer.

6. Refurbishing/Removal of Coatings

a. Surface preparation - Refer to SSPC requirements. The interior should follow SSPC 10 and the exterior should follow SSPC 6.

b. Coating

I. Interior - for interior coatings in contact with potable water we recommend a catalyzed epoxy system

II. Exterior - for exterior coating we recommend a polyurethane system

c. Lead abatement - Refer to SSPC guidelines.

7. Disinfection and Sampling

Prior to being placed into service after construction or maintenance, tanks and related piping shall be disinfected and sampled.

a. Prior to disinfection, all foreign material should be flushed from the tank.

b. The disinfection procedure should meet the current applicable AWWA standard (C652), or use water with 50 mg/l of free available chlorine for a contact time of 24 hours. Disposal of highly chlorinated water may require a permit from the DEQ/Office of Pollution Control.

c. Water samples for microbiological analysis must be collected by a representative of the Mississippi State Department of Health, the Licensed

Professional Engineer for the project, or the Certified Operator for the public water system. Water being collected for testing should not have a chlorine residual higher than normally maintained in the water system. No chlorine should be present as a result of disinfection.

d. A sample showing "No Coliform Present" shall constitute a satisfactory sample. The sample shall be analyzed by the Mississippi State Department Health environmental laboratory or other State certified laboratory.

B. HYDROPNEUMATIC TANKS

1. Sizing

Pressure tanks should be sized in gallons at a minimum of 40 times the pump capacity in gallons per minute to provide a reasonable cycle and detention time.

2. Allowable pressures

Maximum control pressure range: 20 psi

Design pressure: 100 psi (minimum)

3. Tanks should be built to ASME code requirements.

4. Controls

Air volume and pump controls should maintain the water level between 1/3 and ½ diameter measured from the bottom of the tank. Controls should be designed to minimize release of air through the air release valve and maximize pump run time. A combination of pressure and electrode controls is recommended.

5. Piping

When the inlet and outlet are at the same end of the tank, the inlet should extend into the tank a minimum of 1/2 of its length to prevent short-circuiting.

6. Accessories

a. A sight glass should be provided to allow a visual indication of the water level. Valves should be provided to allow drainage of the sight glass.

b. A pressure relief valve shall be provided, set to discharge if the pressure in the tank exceeds normal working pressure. The pressure relief valve should meet ASME Code requirements.

c. A valved bypass line shall be provided so that the tank may be isolated for maintenance.

d. A drain with a resilient seat valve and a horizontal discharge should be provided on the bottom of the tank, sized to allow draining of the tank in a reasonable time.

e. Access to the tank should be provided in the bottom 1/3 diameter of the tank so that the gasket will remain submerged, sized at least 18 inches in the smallest dimension.

f. A weather proof pressure gauge should be mounted above the maximum water level, with an isolation valve.

g. Valved connections for air volume and pressure controls should be provided.

h. An air compressor should be provided to replenish the air being absorbed.

C. ELEVATED TANKS, STANDPIPES AND GROUND RESERVOIRS

1. Sizing

a. Elevated storage capacity should be at least 50% of the daily demand. This allows up to two connections per source gpm provided the well operating time is 12 hours or less on peak demand days. Storage less than this requires additional source capacity to provide a peak flow of 1 gpm per connection for an equivalent number of minutes. **NOTE**: The Department of Health strongly encourages all public water systems to plan for elevated storage equivalent to one day's normal usage (gallons).

b. Standpipes and reservoirs may be used as elevated storage where elevations allow. The volume of a standpipe above the level required to maintain at least 20 psi dynamic pressure at all connections, as demonstrated by a hydraulic analysis, may be considered elevated storage.

c. Ground level tanks used as pump reservoirs should be sized to provide routine storage plus reserve emergency storage.

d. Absent of hydraulic calculations indicating otherwise, the top 25 feet of a standpipe shall be considered elevated storage.

2. Accessories

a. A water level gauge should be provided to allow a visual indication of the water level in the tank.

b. A screened vent as large as the inlet/outlet pipe shall be provided in accordance with current AWWA standards, to protect the tank from the entrance of insects, birds and other contaminants. The overflow pipe should not be considered a tank vent.

c. An overflow shall be provided in accordance with current AWWA standards.

d. A drain shall be provided, sized to allow draining of the tank in a reasonable period of time.

e. A provision should be made for isolating the tank for inspection and maintenance while maintaining water service.

f. Support columns should have drain plugs.

g. Ladders should be equipped with OSHA approved safety devices.

h. Access into the tank shall be provided according to current AWWA standards. The opening should have a curb at least 4 inches high and the cover should have a downward overlap of at least 2 inches.

i. A 3/4 inch sample faucet shall be provided on the tank riser near its bottom.

j. A manhole should be provided to allow for entrance into the riser. It should be at least 24 inches in diameter.

3. Pre-owned tanks

a. Prior to coating:

i. Any pit greater than 1/8" should be welded.

ii. Any pit less than 1/8" can be repaired using a NSF approved filler.

b. Extra care should be given to grind all welds. (Existing welds included).

c. The Department strongly recommends that all previously owned elevated tanks be inspected by qualified professionals prior to dismantling.

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Part VII
HYDRAULICS

Computerized hydraulic calculations should be provided for all project submittals to the MSDH involving the construction of subdivisions or significant water distribution system extensions. In addition, hydraulic calculations may be necessary for submittals on projects such as elevated tanks and wells where the influence of these system components must be ascertained.

Listed below are the minimum requirements that are needed for the submittal of hydraulic information to the MSDH/DWS:

1. Map of the Proposed System

i. Provide a Node Map that is clearly and accurately displayed.

ii. The Node Map should include the node numbers and elevations, pipe numbers, the number of customers between each node and the location of each source, tank, booster station and pressure reducing valve. The pressure settings and flows should be indicated for each pressure reducing valve.

2. Selection of Fixed Gradient

i. In selecting the flow gradient of elevated tanks, the Mean Sea Level (MSL) of the overflow should be used.

ii. In selecting the flow gradient of hydropneumatic tanks, use the middle range of the tank's operating pressure.

iii. In selecting the flow gradient of wells, use the MSL of the overflow of the tank that the well pumps to.

3. Use the MSDH/DWS "Demand Curve" on all lines where the flow is less than 100 gpm.

4. “Fill" hydraulics will be required to ascertain if wells have the capability of filling elevated tanks, standpipes, booster stations and collector tanks.

5. Use demand factors as specified in Table 1, "Water Demands", in determining the correct demand for unmetered systems, apartments, trailers and recreational vehicles.

Appendix A
MISSISSIPPI STATE BOARD OF HEALTH
ENVIRONMENTAL REGULATIONS

Division 300 - Public Water Supply
Part 301
Public Water Systems
Mississippi Primary Drinking Water Regulation

SECTION A. GENERAL PROVISIONS

301.1 **Legal Authority.** This regulation has been promulgated under the authority of and pursuant to the Mississippi Safe Drinking Water Act of 1997 (Section 41-26-1 through Section 41-26-101, Mississippi Code of 1972, Annotated).

301.2 **Definitions**.

(a) **Department** shall mean the Mississippi State Department of Health.

(b) **Director** shall mean the Executive Officer of the Mississippi State Department of Health or his authorized agent.

(c) **Municipality** shall mean a city, town, village, or other public body created by state law, or an Indian tribal organization authorized by law.

(d) **Federal Agency** shall mean any department, agency, or instrumentality of the United States.

(e) **Administrator** shall mean the Administrator of the U.S. Environmental Protection Agency or his authorized representative.

(f) **Federal act** shall mean the Safe Drinking Water Act of 1974, cited as Public Law 93-523, or any subsequent revisions thereto.

(g) **Regulations** shall mean primary drinking water regulations promulgated by the administrator pursuant to the federal act.

(h) **Backflow** shall mean the reversal of normal flow direction where water flows from the intended point of delivery towards the public water supply.

(i) **Cross Connection** shall mean any direct interconnection between a public water system and a non-public water system or other source which may result in the contamination of the drinking water provided by the public water system. This definition includes any arrangement of piping where a potable water line is connected to non potable water; it may be a pipe-to-pipe connection where potable and non potable water lines are directly connected, or a pipe-to-water connection where the potable water outlet is submerged in non potable water. If the potable and non-potable source are separated by gate valves, check valves or devices other than the appropriate backflow preventer as outlined by this regulation, a cross connection exists. By-pass arrangements, jumper connections, swivel or change over assemblies, or other temporary or permanent assemblies through which, or because of which, backflow may occur are considered to be cross connections.

(j) **Public water system** means a system for the provision to the public of water for human consumption through pipes or, after August 5, 1998, other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. Such term includes: Any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system; and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Such term does not include any "special irrigation district." Service connection, as used in the definition of public water system, does not include a connection to a system that delivers water by a constructed conveyance other than a pipe if:

(1) The water is used exclusively for purposes other than residential uses (consisting of drinking, bathing, cooking, or other similar uses);

(2) The Director or Administrator determines that alternative water to achieve the equivalent level of public health protection provided by the applicable national primary drinking water regulation is provided for residential or similar uses for drinking and cooking; or

(3) The Director or Administrator determines that the water provided for residential or similar uses for drinking, cooking, and bathing is centrally treated or treated at the point of entry by the provider, a pass-through entity, or the user to achieve the equivalent level of protection provided by the applicable national primary drinking water regulation.

Special irrigation district means an irrigation district in existence prior to May 18, 1994 that provides primarily agricultural service through a piped water system with only incidental residential or similar use where the system or the residential or similar users of the system comply with the exclusion provisions in section 1401(4)(B)(i)(II) or (III) of the Federal Safe Drinking Water Act.

(k) The definitions as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.2 are hereby adopted.

301.3 **Coverage.** This regulation shall apply to each public water system in the State,

except that it shall not apply to a public water system:

(a) Which consists only of distribution and storage facilities which does not have any collection and treatment facilities; and

(b) Which obtains all of its water from, but is not owned or operated by, a public water system to which such regulation applies; and

(c) Which does not sell water to any person; and

(d) Which is not a carrier which conveys passengers in interstate or intrastate commerce.

301.4 **Variances and Exemptions**. Variances and exemptions may be issued by the Director in accordance with Sections 1415 and 1416 of the federal act. Treatment utilizing best available technology, as stipulated in Title 40 Code of Federal Regulations Part 142 Subparts F and G may be required in order to grant variances and exemptions under this regulation. Variances and exemptions shall not be issued if not allowed by the National Primary Drinking Water Regulations.

301.5 **Preconstruction and Treatment Requirements**.

(a) **Siting Requirements.** Before a person may initiate construction of a new community or non-transient non-community public water system or increase the capacity of an existing community or non-transient non-community public water system, he shall submit sufficient information to the director for evaluation of the proposed site, to determine whether the site and design of the proposed construction or modification will enable the system to comply with this regulation.

(b) **Plans and Specifications Approval.** Prior to advertising for bids and/or initiating construction of a new community or non-transient non-community public water system or making significant extensions or alterations to an existing community or non-transient non-community public water system which may effect the operation of that system, plans and specifications for the proposed construction shall be approved by the director. Plans and specifications submitted to the director for approval shall be prepared by a professional engineer licensed to practice in the State of Mississippi.

(c) **Operation and Maintenance Plans**. Each applicant for a new community or non-transient non-community public water system shall submit an operation and maintenance plan for review and approval by the director. The plan must be approved by the director prior to beginning construction.

(d) **Financial and Managerial Viability.** Each applicant for a new community or non-transient non-community public water system shall submit financial and managerial information as required by the Public Utilities Staff. Plans and specifications shall not be approved by the director until written certification of the financial and managerial viability of the new water system is received from the Executive Director of the Public Utilities Staff.

(e) **Changes to Existing Public Water Systems.** Plans and specification for changes to an existing community or non-transient non-community public water systems shall not be approved if the director determines the changes would threaten the viability of the water system or if the changes may overload the operational capabilities of the water system.

(f) **Non-Centralized Treatment Devices**. Public water systems may utilize point-of-entry devices to comply with maximum contaminant levels as stipulated in the National Primary Drinking Water regulations as published at Title 40 Code of Federal Regulations Sections 141.100 and 141.101.

(g) **Ban of Use of Lead Products**. Any pipe, solder, or flux used in the installation of any public water system, or any plumbing in a residential or nonresidential facility providing water for human consumption which is connected to a public water system shall be lead free. Solders and flux are defined as "lead free" when they contain not more than 0.2 percent lead, and pipes and pipe fittings are defined as "lead free" when they contain not more than 8.0 percent lead.

(h) **Lead Service Line Replacement**. It shall be the responsibility of each supplier of water to comply with the lead service line replacement requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.84.

(i) **Overloaded Public Water Systems**. Public water systems that are serving customers in excess of the design capacity as determined by the Director shall be identified as overloaded and shall immediately, upon written notification by the Director, cease adding new customers. Public water systems identified as overloaded shall not add new customers until notified in writing by the Director that the system's design capacity has been increased and that the water system can resume adding new customers.

SECTION B. MAXIMUM CONTAMINANT LEVELS

301.6 **Microbiological**. All microbiological maximum contaminant levels shall apply to public water systems as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.63.

301.7 **Inorganic Chemicals**. All inorganic chemical maximum contaminant levels

and action levels shall apply to public water systems as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.11, 141.23(d & e), 141.51, 141.60, 141.62(b & c), and 141.80.

301.8 **Organic Chemicals**. All organic chemical maximum contaminant levels shall apply to public water systems as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.12, 141.50, 141.60, and 141.61.

301.9 **Turbidity.** The maximum contaminant levels for turbidity shall apply to public water systems as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.13.

301.10 **Radionuclides.** All radionuclide maximum contaminant levels shall apply to public water systems as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Sections 141.15 and 141.16.

301.11 **Miscellaneous Contaminants**. All maximum contaminant levels not previously referenced in this regulation shall apply to public water systems as stipulated in the latest revision of the National Primary Drinking Water Regulations.

SECTION C. MONITORING, ANALYTICAL, AND TREATMENT TECHNIQUE REQUIREMENTS

301.12 **Coliform Sampling and Analyses**. It shall be the responsibility of each supplier of water to comply with the Coliform Monitoring and Analytical Requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.21 or any subsequent revisions thereto except that the following optional provisions of Title 40 Code of Federal Regulations Section 141.21 are not adopted:

(a) The provision of Title 40 Code of Federal Regulations Section 141.21 (a)(2) concerning the reduction of the monitoring frequency for community water systems serving 1,000 or fewer persons;

(b) The provision of Title 40 Code of Federal Regulations Section 141.21 (a)(5) concerning waiver of the time limit for sampling after a turbidity sampling result exceeds 1 NTU;

(c) The provision of Title 40 Code of Federal Regulations Section 141.21 (b)(1) concerning waiver of the time limit for repeat samples;

(d) The provision of Title 40 Code of Federal Regulations Section 141.21 (b)(3)

concerning collection of large volume repeat samples in containers of any size;

(e) The provision of Title 40 Code of Federal Regulations Section 141.21 (b) (5) concerning waiver of the requirement to take five routine samples the month after a public water system has a total coliform positive sample;

(f) The provision of Title 40 Code of Federal Regulations Section 141.21 (c) (1) (ii) and Section 141.21 (c) (1) (iii) with respect to invalidation of total coliform-positive samples;

(g) The provision of Title 40 Code of Federal Regulations Section 141.21 (d) concerning agents other than State personnel conducting sanitary surveys;

(h) The provisions of Title 40 Code of Federal Regulations Section 141.21 (e)(2) with respect to waiver of fecal coliform or E. Coli testing on a total coliform-positive sample;

301.13 **Inorganic Chemical Sampling and Analyses**. It shall be the responsibility of each supplier of water to comply with the inorganic chemical sampling/analysis requirements, analytical techniques, and water quality parameters as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Sections 141.23, 141.86, 141.87, 141.88, and 141.89 except that the optional provision of Title 40 Code of Federal Regulations Section 141.23 (a)(4) which allows compositing of samples is not adopted.

301.14 **Organic Chemical Sampling and Analyses**. It shall be the responsibility of each supplier of water to comply with the organic chemical sampling and analysis requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.24, 141.30 and 141.40 except that the following optional provisions of Title 40 Code of Federal Regulations are not adopted: Sections 141.24 (f)(14) and (h)(10) and Section 141.40 (n)(9) which allow compositing of samples.

301.15 **Radionuclides**. It shall be the responsibility of each supplier of water to comply with the radionuclide sampling and analysis requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Sections 141.25 and 141.26.

301.16 **Turbidity Sampling and Analyses**. It shall be the responsibility of each supplier of water to comply with the turbidity sampling and analysis requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.22.

301.17 **Filtration and Disinfection**. It shall be the responsibility of each supplier of water to comply with the filtration and disinfection analytical and monitoring

requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.74.

301.18 **Miscellaneous Contaminants**. It shall be the responsibility of the supplier of water to comply with the special monitoring requirements of the National Primary Drinking Water Regulation Title 40 Code of Federal Regulations Section 141.41 (special monitoring for sodium) and Section 141.42 (special monitoring for corrosivity characteristics). It shall also be the responsibility of the supplier of water to comply with all other monitoring and analysis requirements not previously addressed in this regulation as stipulated in the National Primary Drinking Water Regulations.

301.19 **Sanitary Surveys**. The Mississippi State Department of Health will make periodic on-site surveys of each public water system for the purpose of determining the adequacy of the water source, facilities, equipment, and operation and maintenance procedures. These surveys include the right to inspect all records, take water quality samples, or verify procedures, to determine compliance with the regulation.

301.20 **Treatment Techniques.** It shall be the responsibility of each supplier of water to comply with the treatment techniques as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Sections 141.81, 141.82, 141.83, 141.110 and 141.111.

SECTION D. REPORTING, RECORDS, AND PUBLIC NOTIFICATION.

301.21 **Reporting Requirements**.

(a) The supplier of water shall provide the results of all water quality analyses to be utilized for compliance with this regulation to the director as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.31, 141.35, 141.75, and 141.90.

(b) The supplier of water shall report to the director the failure to comply with these regulations, including failure to comply with monitoring and analytical requirements, and failure to meet maximum contaminant levels as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.31 and 141.35.

(c) The supplier of water shall provide proof of public notification to the director as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Sections 141.31(d) and 141.32.

(d) The supplier of water shall maintain records and submit to the

director copies of all required records as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.31 (e) and 141.91.

301.22 **Public Notification and Education**. Each supplier of water shall provide public notification or education due to non-compliance as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.32, 141.35, and 141.85. Public notification of fluoride content is required of all public water suppliers as stipulated in Title 40 Code of Federal Regulations Section 143.5.

Each supplier of water shall give public notification concerning the potential health effects and recommended protective actions regarding the possible occurrence of lead in drinking water as stipulated in Title 40 Code of Federal Regulations Section 141.34.

301.23 **Record Maintenance**. Each supplier of water shall retain records and make such records available to the director as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Sections 141.33, 141.35, 141.75, 142.14, 142.15, and 142.62.

301.24 **Laboratory Certification**.

(a) The director may prescribe minimum requirements for a laboratory to be certified by the Mississippi State Department of Health to perform water quality analyses required under this regulation.

(b) Each supplier of water must utilize the services of certified laboratory to complete all water quality analyses required by this regulation.

301.25 **Filtration and Disinfection - Surface Water Treatment Rule**.

(a) **General Requirements**: Each public water system that uses a surface water source or a ground water source under the direct influence of surface water must comply with the treatment technique requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.70.

(b) **Criteria for Avoiding Filtration**: In order to avoid filtration, a public water system that uses a surface water source or a ground water source under the direct influence of surface water must comply with the criteria for avoiding filtration as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.71.

(c) **Disinfection**: A public water system that uses a surface water source

or a ground water source under the direct influence of surface water must comply with the disinfection requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.72.

(d) **Filtration**: A public water system that uses a surface water source or a ground water source under the direct influence of surface water and does not meet all of the criteria in Title 40 Code of Federal Regulations Section 141.71 for avoiding filtration must comply with the treatment requirements as stipulated in the National Primary Drinking Water Regulations as published under Title 40 Code of Federal Regulations Section 141.73.

NOTE: SECTIONS E thru J (Cross Connections) are currently under revision due to changes in state law and are not included in this version of the Minimum Design Criteria.

SECTION K. EMERGENCY CONDITIONS AND ENFORCEMENT

301.42 **Emergency Conditions**. The director is authorized to develop and implement a plan for the provision of safe drinking water in emergency circumstances for any public water system.

301.43 **Enforcement**. Violations of any requirement of this regulation shall be subject to the enforcement provisions of the Mississippi Safe Drinking Water Act of 1997 as found at Sections 41-26-1 through 41-26-101, Mississippi Code of 1972, Annotated.

CERTIFICATION OF REGULATION

This is to certify that the above PRIMARY DRINKING WATER REGULATION was adopted by the Mississippi State Board of Health on 11 April 2001 to become effective 11 May 2001.

Original Signed by

F. E. Thompson, Jr., M.D., M.P.H.
Secretary and Executive Officer

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Appendix B

MISSISSIPPI STATE BOARD OF HEALTH
ENVIRONMENTAL STANDARDS

Public Water System
Secondary Drinking Water Standards

Secondary standards are set for, and the Secondary Maximum Contaminant Level (SMCL) is applied to, those contaminants that affect the aesthetic quality (such as taste, odor, or color) of the water. Water that exceeds the SMCL for these contaminants may not be pleasant to drink, but will cause no health problems.

The Secondary Maximum Contaminant Levels for public water systems are as follows:

Contaminant	Level
Chloride	250 mg/l
Color	15 Color Units
Corrosivity	Non-corrosive
Iron	0.3 mg/l
Manganese	0.05 mg/l
Odor	3 Threshold Odor Number (TON)
pH	6.5 - 8.5
Sulfate	250 mg/l
TDS	500 mg/l
Zinc	5 mg/l

Reference:

Secondary Maximum Contaminant Levels, Environmental Protection Agency, Water Programs, Federal Register 42, Number 42, March 31, 1977, 17144-17146.

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Appendix C
Information Needed For Division of Water Supply

Review And Approval Of Engineering Plans and Specifications for Mississippi Public Water Supplies

A. Plans (standard size sheets - 24 x 36 inches, preferably folded)

1. Title sheet indicating the name of the project.
2. Location and a vicinity map showing certificated area to be reviewed in relation to existing certificated areas. (Mississippi County)
3. Major water lines from the water source (well or storage tank) need to be shown (with sizes and lengths) to the areas to be served.
4. Layout sheet to show location, length and size of water lines, location of sewer lines, lot numbers, location and type of existing potential users.
5. Layout sheet to show design points, contour lines, and/or pertinent elevations, water courses, and other pertinent features.
6. Layout sheet to show locations of valves, fire hydrants, flushing hydrants and service connections.
7. Water detail sheet showing thrust blocking, hydrants, valves, service line connections, etc.
8. If included in the project, the well, storage tank, chlorination and other treatment equipment details need to be shown, including all piping and valving arrangements.
9. Prior to approval of any new extensions or major construction, installation of a master meter on wells or treatment plants will be required if one does not already exist.

B. Specifications

1. General

a. Statement on disinfection procedures for wells, storage tanks and distribution lines as applicable.

b. Statement on separation of water and sewer lines.

c. Statement on cover depth.

d. Statement on pressure testing of piping.

e. Statement on microbiological testing and acceptance of system.

f. Complete specifications on pipes, valves, hydrants, etc.

g. Construction methods, including protection of distribution lines from gross contamination during construction.

h. Contract proposal.

i. A transmittal sheet will be required. For subdivisions and apartment complexes, the number of lots or units should be specified.

2. Well

a. Capacity and head.

b. Anticipated depth and water quality.

c. Casing materials, sizes and lengths.

d. Screen size and lengths.

e. Coating.

f. Pump head foundation size and design.

g. Cementing of casing.

h. Lap pipe and/or seal.

i. Back pressure valve.

j. Venting of casing.

k. Pump information - setting, speed, head, etc.

l. Piping arrangements such as sizes, valves, sampling bib, etc.

m. Provision of a master meter.

n. Controls and operations.

3. Chlorinator and Other Treatment Facilities

a. Type and meter size.

b. Booster pump information such as head, capacity, etc.

c. Piping and valving arrangements.

d. Housing information such as insulation, ventilation, etc.

e. Provision of test kits.

4. Hydropneumatic Tank

a. Size, pressure rating and standards.

b. Coating inside and out.

c. Sight gauge, manhole and drain.

d. Air volume controls and pressure relief valves.

e. Sizes and arrangement of piping and valves.

f. Bypass piping arrangements.

5. Elevated and Ground Storage Tanks

a. Size, type, material and height.

b. Standards to be met, coating inside and out.

c. Height of high and low levels.

d. Overflow arrangement and heights.

e. Drain size and arrangement.

f. Piping and valve size and arrangement of each.

g. Manhole, venting and screening.

h. Controls.

6. Booster Stations

a. Service pump information such as head and capacity.

b. Collector tank size, coating, etc.

c. Pressure tank information (as given above).

d. Information on orifice to fill collector tank.

e. Insulation of pipes.

f. Controls for service pump.

C. Hydraulic Computations - Needed from source to system and throughout the system if it is deemed critical.

D. Administrative Needs

1. Plans and specifications must be prepared by a professional engineer licensed to

practice in Mississippi and submitted with the engineer's seal affixed. A minimum of two complete sets of plans and specifications should be submitted for administrative purposes, plus the number the engineer requires for his purposes.

2. If obtaining water from a municipality, rural water association or other MSDH approved public water system, a copy of the agreement from the supplier indicating their willingness to serve this area must be submitted.

3. Separate specifications should be bound, sealed and the name of the project shown. If reference is made to standard specifications, a current copy must be on file with the Division of Water Supply.

4. If one or more additions or parts are to be added to a project at a later date, an overall layout sheet must be submitted. The original design should be compatible with the proposed addition without excessive duplication of lines or interruption of service. For distribution extensions, an overall layout map should be submitted.

5. Where sewage or sewage treatment facilities are involved, the Mississippi Department of Environmental Quality, Office of Pollution Control must approve these facilities before the water system can be formally approved. A copy of the Office of Pollution Control's approval must be submitted.

6. Subdivisions where individual onsite sewage treatment and disposal systems are proposed shall meet the requirements of the "Regulation Governing Individual

Onsite Wastewater Disposal Systems" and the Mississippi State Department of

Health policies and procedures related to this regulation.

7. The Mississippi Public Service Commission should be contacted for approval of certificated areas.

8. For new public water systems, the Public Utilities Staff must evaluate the financial and managerially capabilities of the proposed water system and the Department of Health must receive written certification from the Executive Director of the Public Utilities Staff that the proposed new public water system is financially and managerially viable. The Department of Health is prohibited by law from approving new public water systems until this certification from the Executive Director of the Public Utilities Staff is received.

Appendix D

Mississippi State Department of Health
Division of Water Supply
Procedure for Approval of Water Supply Sources for Bottled Water Facilities

Preliminary Engineering Report

A. A preliminary engineering report prepared by a registered engineer licensed to practice in Mississippi should be submitted to the Division of Water Supply in order to facilitate the approval of the proposed water source for the bottled water facility. This report should include:

1. Proposed site location
2. Information regarding the vulnerability of the water source to contamination
3. Summary and evaluation of results of water quality analyses
4. Recommendations concerning need for water treatment and protection of the water source

Additional information may be required depending upon the specific water source for which approval is requested.

Site Inspection

B. The preliminary engineering report should include the results of a site inspection of the geographical area within the proximity (at least 2 mile radius) of the proposed water supply source. The purpose of this site inspection is to locate any landfills, garbage dumps, industrial sites, oil exploration sites and any other potential contaminant sources that may affect the water source. The proposed location of the water source should be carefully reviewed to determine if it is susceptible to contamination by surface runoff.

Preliminary Water Quality Analyses

C. The preliminary engineering report should include the results of water quality samples collected from the potential water source. These water analyses should include all Safe Drinking Water Act required analyses and a general chemical and physical analysis to determine if treatment of the source will be required prior to actual bottling. These analyses should be completed by an environmental laboratory certified to complete Safe Drinking Water Act analyses for public water supplies. If requested, the Mississippi State Department of Health environmental laboratory will complete the full battery of required water quality analyses for a fee.

D. The preliminary engineering report should be submitted to the Mississippi State Department of Health, Division of Water Supply for review and comment. After completion of the review and resolution of any noted problems the Division will issue a letter of concurrence with the report.

Completion of Final Plans and Specifications

E. Final plans and specifications of construction for the water source should then be provided to the Division of Water Supply for review and comment.

F. After any noted problems with the submitted plans and specifications have been resolved, the Division will issue a letter of approval for construction.

Construction of Water Source

G. Construction of the water source may then be initiated. After construction is completed,

the consulting engineer shall certify to the Division that the project has been constructed according to the approved plans and specifications.

Final Water Quality Analyses

H. A final complete set of required water quality analyses should be completed on the water source. After review of these water quality analyses and based upon the consulting engineer's certification that the project was constructed according to approved plans and specifications, the Division will issue a letter of final approval of the water source.

Issuance of Operating Permit

I. The owner of the proposed bottled water facility can then move forward, working with the Mississippi State Department of Health, Division of Sanitation to meet all additional requirements for the issuance of a permit to operate a bottled water facility in the State of Mississippi.

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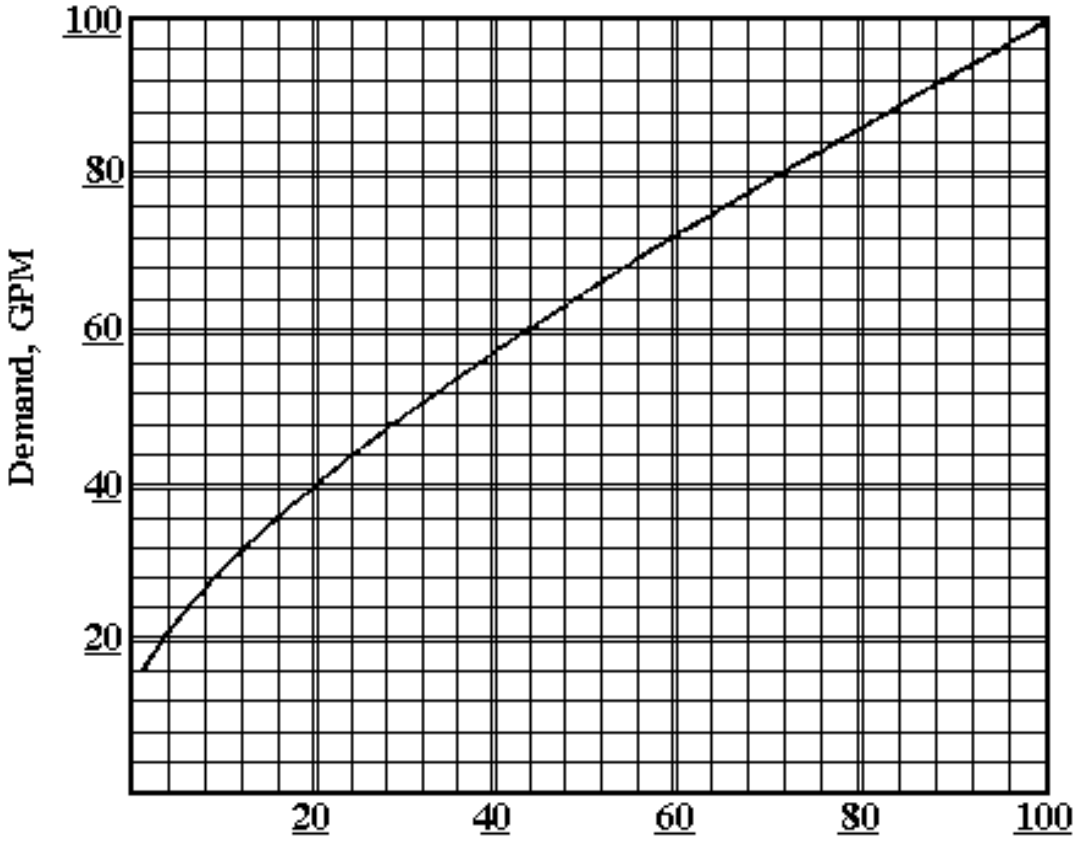
Appendix E
Minimum Flow Requirements



DEMAND CURVE

Based on Formula: $GPM = (10)^{.1325\log(conns) + .037}$

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Appendix F

Customer Capacity based
upon Elevated Storage

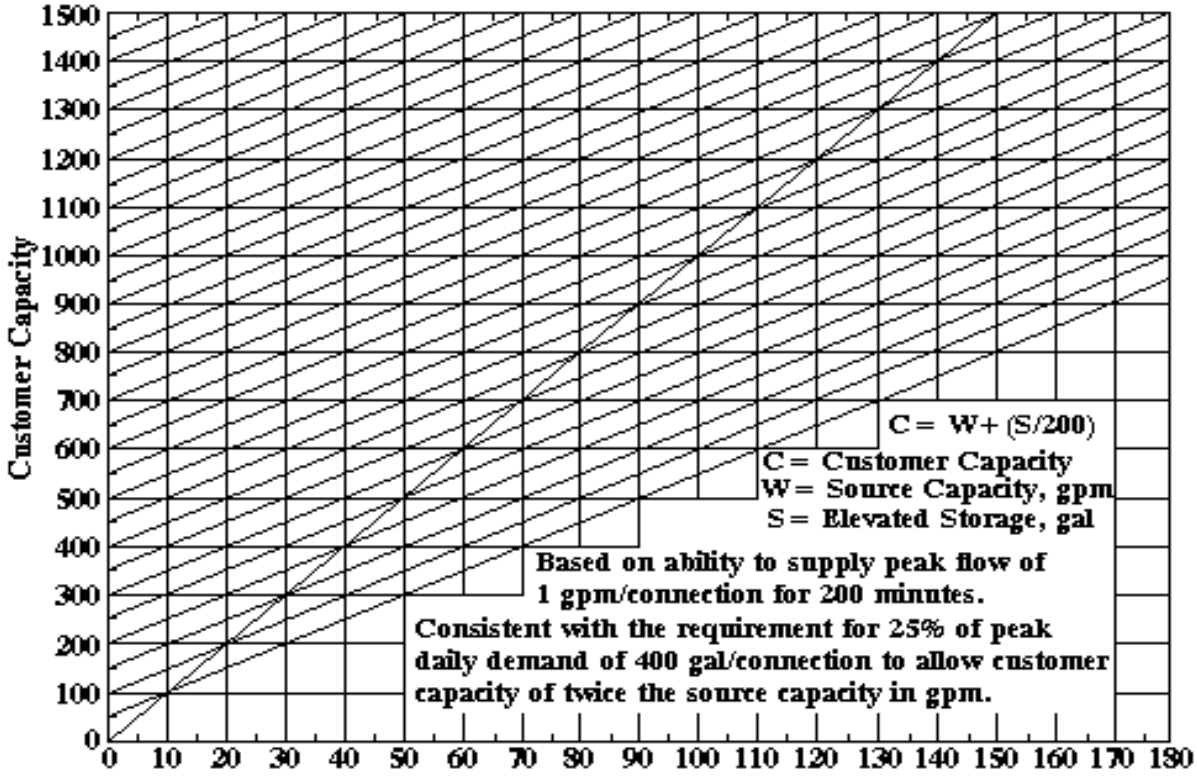

Figure 4. Customer Capacity Based Upon Elevated Storage.

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Appendix G

Guide for Estimating Average Daily Water Requirements

Type of Establishment (The unit is per person unless otherwise stated)	**Average Daily Use (gpd)**
Airport (per passenger)	3 - 5
Assembly Halls (per seat)	2
Camps - Children, overnight, central facilities - Construction - Migrant Labor - Day type, no meals served	40 - 50 50 35 - 50 15
Churches (per member)	1
Cottages, season occupancy	50
Clubs - Residential - Non residential	100 25
Factories (sanitary uses, per shift)	15 - 35
Food Service - Restaurants - With bars - Fast food	7 - 10 9 - 12 2
Highway Rest Areas	5
Hotels (2 persons per room)	60
Institutions - Hospitals (per bed) - Nursing Homes (per bed) - Others	250 - 400 150 - 200 75 - 125
Office Buildings	15 - 30
Laundries, self service (per customer)	50
Motels (per bed)	60
Type of Establishment (The unit is per person unless otherwise stated)	**Average Daily Use (gpd)**

Parks - Day use (with flush toilets) - Mobile homes (per unit) - Travel trailers (per unit)	5 200 90 - 100
Picnic Areas (with flush toilets)	5 - 10
Residential Communities - Multi family (per bedroom) - Rooming house and tourist homes type (per bedroom) - Single family type (per house)	120 120 400
Resort Motels and Hotels	75 - 100
Retail Stores (per toilet room)	400
Schools - Day (no showers or cafeteria) - Day (with cafeteria) - Day (with showers and cafeteria) - Residential types	15 20 25 75 - 100
Shopping Centers (per sq. ft. sales area)	0.16
Swimming Pools and Beaches	10
Theaters - Drive in (per car) - Others (per seat)	3 - 5 3

NOTE: The values listed in the table are for normal water requirements and do not include special needs or unusual conditions. Additional allowance should be made for frequent lawn watering, swimming pool maintenance, industrial or commercial process water, cooling water, fire fighting and other special uses.

The maximum daily demand is 1.5 to 2 times the average daily demand.

Appendix H
Special Requirements for Chlorinator Installations

In certain situations, it is necessary to install gaseous chlorinators that are controlled by solenoid valves rather than booster pumps. Whenever it is necessary to use solenoid valves to control the gaseous chlorinator, the following procedures **Must** be followed:

1. Place a wye strainer in the piping upstream of the solenoid valve to ensure that no trash can clog the valve. If a plastic wye strainer is used, it **Must** be schedule 80.

2. The solenoid valve should always be the "fail closed" type of valve so that, if power is lost, the valve would be normally in the closed position.

3. Directly wire the solenoid **(i.e. no plug-in connections)** so that no power is on the valve when the well is not pumping water. This requires a direct connection to the starter at the well.

4. If a bypass is provided around the solenoid valve, the bypass **Must** remain closed at all times unless the system is being tested or repaired. The bypass should **Never** be left open and unattended.

5. If the outlet water level is below the solenoid valve, a corrosion resistant vacuum breaker must be placed after the injector at a level higher than the solenoid valve.

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Appendix I
DETERMINATION OF CUSTOMER DESIGN CAPACITY FOR PUBLIC WATER SYSTEMS IN MISSISSIPPI

The maximum number of customers that a water system is designed to serve is known as the Customer Design Capacity for that system. The Customer Design Capacity is a calculated value based upon several factors. These factors include, but are not limited to, the following: Well capacity(gallons per minute), service pump capacity (gallons per minute), storage capacity (gallons), distribution system capacity and water treatment capacity (gallons per minute). If a system has exceeded the calculated Customer Design Capacity, it is declared by the MSDH/DWS to be "overloaded".

It is important that officials of public water systems know the Customer Design Capacity of the systems they manage. This information is critical in planning for future water system improvements. By comparing the current customer load to the calculated value of Customer Design Capacity, water system officials and their consulting engineers can make intelligent decisions regarding the timing of needed improvements. Clearly, the Customer Design Capacity calculation is a tool which should be utilized by system officials and their consulting engineers to help identify critical needs before the system becomes "overloaded" and customers are adversely affected.

It is a violation of the Mississippi Safe Drinking Water Act and the regulations of the Mississippi State Board of Health for a public water system to serve customers in excess of its design capacity. A public water system that is serving customers in excess of its design capacity is classified as overloaded by the Mississippi State Department of Health. Public water systems, after officially being notified by the MSDH that they are overloaded, are prohibited from adding any additional customers until the overloaded condition is corrected by the construction of appropriate improvements. Public water systems, after receiving notification from the MSDH that they are overloaded, are required to immediately begin planning to make the necessary improvements to eliminate the overloaded condition.

The procedure which is outlined on the following page has been developed to provide officials of public water systems and their consulting engineers a systematic method of determining the Customer Design Capacity. Please remember that this procedure is based primarily on the adequacy of the water source in determining if the public water system is "overloaded." Other factors such as very small water distribution mains or inadequate water storage will also cause a public water system to be overloaded.

If there are questions regarding the use of this standardized procedure to determine Customer Design Capacity or if there are questions concerning other factors that may cause a public water system to be "overloaded," please contact the Mississippi State Department of Health/Division of Water Supply at 601/576-7518.

MISSISSIPPI STATE DEPARTMENT OF HEALTH
DIVISION OF WATER SUPPLY
STANDARD PROCEDURE FOR DETERMINING CUSTOMER DESIGN CAPACITY OF A PUBLIC WATER SYSTEM

TYPE # 1) Water Systems with wells only Pumping Directly into the Distribution System

Design capacity (# connections) = well capacity (gpm) _____ + $\frac{\text{elevated storage (gallons)}}{200}$

NOTE: Design capacity is limited to twice(2X) well capacity(gpm) unless excess elevated storage is useable(See Note 5 below). Water systems with wells pumping into pressure tanks will have a design capacity equal to the total well capacity (gpm).

TYPE # 2) Water Systems with Clear Wells

Step # 1 - Determine the limiting factor(lessor of): well capacity (gpm) ____, treatment capacity (gpm)_____, service pump capacity (gpm) _____

Limiting factor= _____ **NOTE**: If service pump capacity is limiting factor, skip to step # 3. [In this situation, useable service pump capacity = service pump capacity]

Step # 2 - Determine usable service pump capacity (gpm)

usable service pump capacity (gpm) = limiting factor _____ + $\frac{\text{clearwell volume (gallons)}}{200}$

useable service pump capacity = _____ gpm

Step # 3 - Determine Customer Design Capacity (CDC)

CDC = useable service pump capacity (gpm) _____ + $\frac{\text{elevated storage (gallons)(see Note \# 5 below)}}{200}$

Customer Design Capacity (maximum # connections)=_____

TYPE # 3 - Water Systems where the MSDH does not have Water Well Capacity (gpm) Information

Well Casing Size	Design Capacity (meters)	Design Capacity (no meters)
2 inch	1 connection	1 connection
4 inch	29 connections	13 connections

NOTE: Above design capacity (# connections) is based on a normal capacity of 50 gpm for 4 inch casing and 15 gpm for 2 inch casing wells (MSDH residential water demand curve is used). If well capacity is documented, this value should be used in conjunction with MSDH residential water demand curve.

DESIGN NOTES:

Note 1: Water systems with standpipes can use top 25 feet as elevated storage

Note 2: Customers served by booster station(s) are not included in the total customers served by the water system unless any water system well(s) must pump more than 12 hours per day.

Note 3: Run time for public water system wells is limited to 12 hours per day.

Note 4: Clear Wells and booster stations must be refilled in 6 hours or less.

Note 5: For excess elevated storage to count as useable, the water system must be capable of refilling elevated tank in 6 (six) hours (based on MSDH approved hydraulic calculations).

Name of Public Water System: _____ **PWS ID #**: _____

Capacity Determined by: _____ **Date**: ___/___/___
Name (Please Print or Type)

If there are questions regarding this procedure, please contact the Division of Water Supply at 601/576-7518.