MINIMUM DESIGN CRITERIA
FOR
MISSISSIPPI PUBLIC WATER SYSTEMS

Mississippi State Department of Health
Bureau of Public Water Supply

August 2019 – Final Draft
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Introduction

This document is a compilation of the minimum 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 Bureau of Public 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 aspects 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
Bureau of Public Water Supply
P. O. Box 1700
Jackson, MS 39215
Phone - (601) 576-7518
FAX - (601) 576-7822
Part I - Engineering Document Submission

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 Bureau of Public 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 beginning construction 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 Bureau of Public Water Supply. It is strongly encouraged that approval be obtained prior to advertising due to the possibility that the proposed design might be required to make additional modifications in order to secure approval by MSDH. The following general policy should be used to determine if MSDH 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.
- Water line replacement projects, except size for size replacements. Size for size water line replacement projects are considered "maintenance projects" and do not require formal approval.

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. Water Supply 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. **At least one physical full set of** 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. **Additionally, an electronic version of the submitted plans and specification must be submitted via CD or other means of electronic document storage.**

c. The required Engineering Documents Transmittal Form must be signed by the submitting water system's Responsible Official or a letter from the water system stating they are aware of and agree to serve the proposed project.

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

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

f. If requested, the MSDH 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 approved specifications when submitting engineering projects for review and approval.

g. Plans and specifications submitted for review must be in accordance with Appendix CB, "Information Needed for Bureau of Public Water Supply Review and Approval of Engineering Plans and Specifications for Mississippi Public Water Supplies".

3. Hydraulic Calculations for projects

a. Depending on the project, the submission of hydraulic calculations may be required by the Bureau during plans and specifications review. Submittals where hydraulic calculations are particularly required include:

i. Elevated storage tanks where source and/or treatment facilities are not located on the same site. This is needed to prove that the tanks can fill in off peak times.

ii. Subdivisions or developments in remote locations without a nearby source or storage facilities.
iii. Fill hydraulics for booster station collector tanks

b. If submitted hydraulic calculations indicate that the proposed development and or subdivision will have effect to areas of the distribution causing negative pressures, the submitted project may not be approved.

B. Post Construction Requirements

When final approval is required, a letter of certification shall be submitted from the consulting engineer to the Bureau of Public 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 Bureau of Public Water Supply, Mississippi State Department of Health must be notified of the final inspection in sufficient time to insure that a MSDH representative can be present. It strongly recommended that final approval be obtained by the consultant at project conclusion. This is especially necessary if project was constructed under the direction of an engineer not retained by the supplying water system.

C. Electronic Submissions

Electronic submissions are required to be submitted may be accepted either on CD or USB drive in addition to the submitted one full size copy Arch D, Landscape (36.00 x 24.00 inches) for regional engineer review. Half scale (12.00 x 18.00 inches) plans may be permitted provided sufficient detail is given for the ease of engineering review. The following guidelines are provided to aid in submissions. Electronic submission is an alternative to standard method for form a plan review submission. Details for this process are as outlined in Appendix CB, "Information Needed for Bureau of Public Water Supply Review and Approval of Engineering Plans and Specifications for Mississippi Public Water Supplies". As of October 2016, current federal submission requirements and limitations by the Department prevent electronic submission by email.

1. Plans

Plans submitted in electronic form should meet the following requirements:

a. File Format: Portable Document Format (PDF)
b. Paper Size: Arch D, Landscape (36.00 x 24.00 inches). This is a PDF attribute.

c. Vector graphics are preferred because they minimize file size and are infinitely scalable.

d. For non-vector (raster, bitmap) graphics, resolution should be 200 pixels per inch (ppi).

e. Drawings should be scaled correctly with respect to the paper size.

f. Plans in PDF form should include the signed stamp of the Professional Engineer in charge of the project.

2. Correspondence submitted in electronic form should meet the following requirements:

   a. File Format: Portable Document Format (PDF)

   b. Paper Size: US Letter, Portrait (8.50 x 11.00 inches). This is a PDF attribute.

   c. Text is preferred because it minimizes file size.

   d. For non-text documents (such as scans), resolution should be 300 pixels per inch (ppi).

   e. Changes to plans in response to Bureau comments may require re-submittal of plans via CD or USB Drive.
Part III - Wells

K. Security

All permanent wells shall have a security fence around the perimeter. This fence should be at least 6 feet tall with barbed wire around the top.
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D. Corrosion Control and Stabilization

The primary premise behind the need for corrosion control is to minimize the possibility of the leaching of lead (Pb) and copper (Cu) into drinking water. While compliance with the Lead and Copper Rule (LCR) is a metric for determine corrosion control treatment’s effectiveness, it will not be the sole metric for the determination as to whether treatment provides adequate corrosion control and stabilization. In addition to compliance with the LCR, PWS treatment systems, both existing and any proposed improvements, will be required to maintain adequate pH, alkalinity, and hardness levels to provide proper corrosion control. If a PWS will be or is utilizing phosphate addition for corrosion control, it will be monitored by the system as appropriate to its classification. Besides possible LCR exceedances, lack of proper corrosion control treatment can lead to increased operating expenses associated with the distribution system including flow rate reduction, potential premature replacement of water mains, and other customer plumbing issues as well as a loss of public health protection that customers expect. Systems both newly constructed or existing must have the appropriate corrosion control treatment in place based on a standard corrosivity determination methods. This is regardless of whether or not the system is currently exceeding the action levels set forth in the Lead and Copper Rule (LCR) based on sampling. If an existing water source(s) is determined to be providing corrosive water without proper treatment, then treatment will be required for that source serving the public water system. For new construction, if the source is anticipated to be corrosive in nature, then appropriate provisions for treatment must be considered as a part of the design.

1. Methods of corrosion determination of source water:
   a. Baylis Curve: Using raw water quality parameters, the curve will indicate whether source water is prone to scaling or corrosion of plumbing and distribution. If parameters of the source water on curve reflect no scaling or corrosion, treatment may not be required. If parameters of the source indicate that scaling or corrosion will be problem, then the appropriated level of treatment will be required for the system to stabilize or provide corrosion control.
   b. Langelier Saturation Index (LSI): Using raw water quality parameters, LSI calculation determines the tendency of water to scale or corrode plumbing and distribution piping. If the calculated index of the water is between 0 and +2.0 then the water be determined to be stable and treatment may not be necessary. If the calculated index deviates from the aforementioned range, corrosion control or stabilization treatment will be required for the public water supply.
b-c. **Coupon Study:** a corrosion control coupon study could be performed to provide a quantitative estimate of the corrosion rates that currently are taking place or will take place. The coupon will also be a visual representation of the corrosion type that may be occurring within the distribution system.

2. Treatment Parameters

   a. Corrosion control plants should be capable of adjusting the pH to the CaCO3 stability point or to the appropriate pH required for a film forming additive such as phosphate.

   b. Sampling faucets prior to chemical addition must be provided on the degasifiers (aerators).

   c. Aerators should reduce the CO2 content of the water to 10 mg/l or less. Less efficient aerators may be required for situations where buildup is likely and will be approved on a case by case basis.

   d. 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.

   e. All aerators without subsequent filtration shall be screened with corrosion resistant material and properly protected from insects and other contaminants.

   f. 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.

   g. 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.

   h. Re-carbonation basins should have a minimum detention time of 20 minutes.

   i. Phosphates may be used for corrosion control on a case by case basis provided that source water characteristics meet their minimum standards for use. If source water characteristics are lacking, then some primary corrosion control treatment may be necessary for the addition of phosphate chemicals to work properly.
j. If existing required corrosion control treatment for a PWS is found to inoperable or to have fallen into disrepair, the Bureau through various enforcement mechanisms will require appropriate repair and/or replacement.
Part V – Water Distribution

A. Distribution System Design

1. Pressures

The distribution system shall be so designed as to maintain a minimum dynamic pressure of 20 psi and a maximum static pressure of 80 psi. In certain situations, significant elevation differences may dictate that higher pressures beyond 80 psi within the service area may be necessary. When evident, higher pressures may be considered on a case by case basis provided individual pressure reducers are used on the services.
Part VIII – Safety and Security

All water system facilities shall be designed to include measures to provide protection against vandalism, sabotage, terrorist acts, or access by unauthorized personnel.

A. Protection of Water System Facilities

All finished wells, treatment facilities, pumping structures, and water storage tanks shall be protected from trespassing, unauthorized access and vandalism. Protection measures may include, but are not limited to:

1. Lockable doors and access ways;
2. Secured outdoor electrical and control systems;
3. Windows designed to deter human entrance;
4. Exterior lighting sufficient to provide safe access and deter vandalism and sabotage;
5. Fencing with locked gates. All permanent water system facilities shall have a security fence around the perimeter. New fence installation must be at least 6 feet tall with barbed wire around the top. Existing fencing at facilities may be at least 5 feet tall with barbed wire around the top.
6. Physical barriers to entrance of ladders
7. Provision for ensuring security of the facilities at all times. Incorporation of appropriate intrusion alarms should be provided which can effectively communicate to the operator in charge or system representatives.

B. Project Site Safety

The proximity of residences, industries and other establishments shall be identified and their effect on the safety, security, operation and maintenance of facilities.

1. Projects located in areas that are subject to a significant risk from earthquakes, floods, fires, pollution or other disasters which could cause a breakdown of the public water system shall be designed to protect the facilities to the extent practical.
2. Systems shall not be located on sites with any potential sources of pollution or other factors that may influence the quality of the supply or interfere with effective operation of the water works system, such as sewage absorption systems, septic tanks, privies, cesspools, sinkholes, sanitary landfills, refuse and garbage dumps.
Appendix B - Information For Review/Approval of Engineering Plans & Specifications

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.
10. Alternatively, Additionally, the consultant shall send the plans electronically in pdf form via CD or USB drive in addition to the one 24 x 36 inch set used by the regional engineers in their review. One 12 x 18 inch set (half scale) of plans may be submitted instead of a full scale set provided necessary details are given in the submission. The electronic version should be stamped and signed within the pdf document.

B. Specifications

1. General
   a. Appropriate information regarding the proper disinfection of new facilities post construction including necessary sampling requirements
   b. Distribution projects shall include the followings:
i. Information regarding the proper separation of water and sewer lines.
ii. Information on the proper depth of bury of water lines based on location.
iii. Information on the proper method of pressure testing of piping post construction to leakage is in accordance with AWWA Standards.
iv. Information for proper microbiological testing and acceptance of system to ensure that the newly constructed distribution meets minimal sanitary requirement for potable water.
v. Complete specifications on pipes, valves, hydrants, etc.
vi. Construction methods, including protection of distribution lines from gross contamination during construction.

c. Contract proposal.
d. A transmittal sheet will be required and should be signed by the Responsible Official.
   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 along with the electronic version via CD or other electronic storage method should be submitted for administrative purposes, plus the number the engineer requires for his/her 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 Bureau of Public 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. 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.

8. A transmittal sheet will be required and should be signed by the Responsible Official.