The Texas Commission on Environmental Quality (TCEQ, agency, or commission) adopts amendments to §§290.38, 290.39, 290.41 - 290.47, 290.110, 290.111 and 290.116.

Sections 290.38, 290.41, 290.45, 290.47, 290.111, and 290.116 are adopted *without changes* to the proposed text as published in the February 6, 2015, issue of the *Texas Register* (40 TexReg 518) and, therefore, will not be republished. Sections 290.39, 290.42 - 290.44, 290.46, and 290.110 are adopted *with changes* to the proposed text.

Background and Summary of the Factual Basis for the Adopted Rules

This rulemaking amends Chapter 290 for consistency with Texas Water Code (TWC), §12.013 and Chapter 13; for consistency with existing federal regulations and guidance; and, to provide clarification on existing state rules. The adopted rulemaking addresses: federal changes to the lead and *Escherichia Coli* (*E. coli*) thresholds; desalination; chloramination; plan review submittal process; enforceability of exceptions; and other drinking water matters.

State Statutes

The amendment to Chapter 290 is necessary to reflect changes to TWC, §12.013 and Chapter 13, made during the 83rd Texas Legislature, 2013, in §2.96 of House Bill (HB) 1600 and §§1, 4, 95, and 96 of Senate Bill (SB) 567, transferring the utilities and rates program to the Public Utility Commission of Texas (PUC), effective September 1, 2014. The majority of the rule changes required to implement HB 1600 and SB 567 will occur under Rule Project Number 2013-057-291-OW. This rulemaking, Rule Project Number 2013-046-290-OW, removes a requirement for the submission of Certificate of Public Convenience and Necessity (CCN) information in existing §290.39(j)(3) as the TCEQ no longer has jurisdiction over CCNs.

Federal Regulations

Reduction of Lead in Drinking Water Act -- The federal Reduction of Lead in Drinking Water Act reduced the allowed lead content of pipes, pipe fittings, and plumbing fittings and fixtures from 8.0% to 0.25%, effective January 4, 2014. The adopted amendments within Chapter 290 address this federal revision.

E. coli Threshold -- The United States Environmental Protection Agency's (EPA's) Long Term 2 Enhanced Surface Water Treatment (LT2) rule required public water systems (PWSs) with surface water or groundwater under the direct influence of surface water sources to monitor for *Cryptosporidium*. The EPA gave primacy states the discretion to allow small PWSs, those with a population less than 10,000, to monitor for *E. coli* instead. Subsequent federal guidance established an *E. coli* trigger level of 100 *E. coli*/100 milliliters, no matter the source of water. The adopted amendments within Chapter 290 are consistent with this federal guidance.

Additional Staff Recommendations -- Staff-initiated rule changes adopted within Chapter 290 address: the process for TCEQ's approval of desalination technology; chloramine disinfection criteria; modification of the plan review submittal process; enforceability of exceptions; clarification for well construction review process; alternative appurtenances for overflow devices; water storage; water distribution crossings; the removal of three Appendices in existing §290.47; and, the related establishment of three agency forms.

Process for Approving Desalination Technology -- The adopted rule allows the use of desalination technologies for chemical removal without submitting an exception request, which is required when proposing the use of any technology that does not have design, operation, maintenance, monitoring, and reporting standards within Chapter 290. These technologies, which are not mentioned in the rules, are considered innovative/alternate treatment technologies and require site-specific review and approval as an exception to the rule.

The use of reverse osmosis membranes and other desalination technologies for water treatment has been in use for decades. Over 15,000 desalination plants were in use worldwide in 2002. Given this length of time in production and the widespread use of desalination, the commission adopts amendments with design, operation, maintenance, monitoring, and reporting standards for desalination based upon recommendations from the executive director's staff and input from the regulated community. Historically, desalination has been approved on a case-by-case basis through the executive director's exception process under existing §290.39(l) and §290.42(g). Desalination has become a common technology used by PWSs; therefore, the TCEQ's practices for approving these technologies have become well developed. By placing the specific requirements for desalination through reverse osmosis and nanofiltration within Chapter 290, a PWS can implement the technology without the added time of requesting and receiving an exception before submitting the plans and specifications for staffs' review if the treatment is not for pathogen control or desalination of seawater.

PWSs can use desalination to remove salts from water that is high in total dissolved solids, making the water more palatable, or to comply with the maximum contaminant level (MCL) for a regulated inorganic chemical like arsenic or fluoride. Under the on-going drought conditions, there has been increased interest in using desalination because of the degradation of potential source water quality. Desalination can be accomplished through reverse osmosis or nanofiltration technology.

On May 9, 2014, and June 3, 2014, the executive director's staff met with a group of interested stakeholders including representatives of PWSs, government agencies, design engineers, membrane vendors, and other interested participants. The purpose of the stakeholder process was to solicit feedback for proposed rules that would allow the approval of desalination technology for chemical removal through reverse osmosis and nanofiltration without obtaining an exception. With the exclusion of treatment for pathogen control and the treatment of seawater (both of which have unique challenges), the stakeholder process worked to develop a path for PWSs and their design engineers to use rule-based criteria to demonstrate that the desalination process would be effective, reliable and safe. With that goal, the executive director's staff presented a discussion outline that included plant design, engineering report, capacity requirements, operator licensing, operating records and reports, and instrument calibration. Among the stakeholders, there was a consensus that the modeling tools of the membrane vendor were sufficiently developed to allow these models as a basis for configuring a reverse osmosis or nanofiltration system. The TCEQ has an existing process for allowing these modeling tools for the design of brackish groundwater treatment systems, but not for the treatment of any primary contaminants. In an effort to allow the most flexibility to the design engineer, many of the stakeholders were resistant to design rules that prescribed defined trigger limits for maintenance/cleaning activities and for when (and how frequently) performance monitoring data was collected (such as conductivity). The preferred process was to allow the design engineer to present the engineering arguments that would support these decisions in an engineering report and then to validate some (or most) of these decisions in a second report after the plant is placed in service. Once a general agreement for the engineering submittal process was completed, the stakeholder discussion continued to address general criteria for plant operations, operator licensing, and capacity. The completed stakeholder process provided the executive director's staff with sufficient feedback to develop proposed rules for desalination through reverse osmosis or nanofiltration that meet the concerns of the regulated community while being protective of public health.

The design requirements adopted in this rulemaking related to desalination through reverse osmosis or nanofiltration include allowable pretreatment, post-treatment for removal of dissolved gases and re-mineralization, pipes and pipe galleries, conductivity or total dissolved solids monitoring, chemical containment, flow metering for dose calculation, sample taps for monitoring and dosing correctly, and technology-specific flux determination monitoring facilities. The adopted operational requirements relate to desalination through reverse osmosis or nanofiltration include: operator licensing; periodic maintenance cleaning; set points for when maintenance is required; and monitoring, reporting, and recordkeeping.

Chloramine Disinfection Criteria -- The adopted rule allows the use of chloramines in most cases without applying for and being granted an exception. PWSs use chloramines as a compliance option for MCLs for trihalomethanes and haloacetic acids and to ensure a long-lasting disinfectant residual. Design, operation, maintenance, and recordkeeping requirements have been added to the rule to no longer require that a PWS obtain an exception for any unit process. The design requirements related to chloramination include pump and tank sizing, chemical containment, flow metering for dose calculation, sample taps for monitoring and dosing correctly, and the ability to drain the tanks as needed. The operational requirements for chloramination include notification, monitoring, recordkeeping, maintenance, and the ability to respond to nitrification, which can occur when nitrifying bacteria uses free ammonia as a food source, causing the loss of residual disinfectant and the potential formation of undesirable nitrite and nitrate.

Modification of the Plan Review Submittal Process -- The amended rule provides a more efficient submittal process and clarifies what constitutes a "significant change." Under the federal Safe Drinking Water Act's special primacy requirements (40 Code of Federal Regulations Chapter 142), the TCEQ is required to review all plans for PWSs, but the EPA grants primacy agencies flexibility regarding the design and operation requirements as long as those requirements are protective of public health. Existing §290.39 instructs PWSs to first notify the TCEQ of significant changes and then submit plans and specifications upon the TCEQ's request. The commission amends §290.39 by requiring PWSs to submit plans and specifications for significant changes to reduce confusion in the regulated community and to reduce staffs' processing time currently spent issuing requests for the submission of plans and specifications. The commission further amends §290.39 by simplifying the criteria for a change to be considered as "significant" under the rule.

Enforceability of Exceptions -- Under existing §290.39(l)(2), if a PWS does not meet the requirements of a granted exception, the exception can be revoked through a time-consuming and cumbersome process, in which a TCEQ field investigator who finds a PWS violating the exception's conditions must contact the agency's Central Office to request revocation of the exception, then wait for its revocation before issuing a violation. To streamline this process and ensure that PWSs follow the conditions established in the granted exception, the amended rule clarifies that failing to follow the conditions of a granted exception is a violation and allows the TCEQ's field investigators to directly issue violations for failure to follow an exception's conditions.

Clarification for Well Construction Review Process -- The amended rule clarifies PWS well construction conditions by including the requirements from the American Water Works Association (AWWA) standards into the rule so that PWSs will have to consult only one source for requirements on well design; specifically, cementing requirements and annular space requirements for PWS wells. The existing rule refers to AWWA standards but does not include them.

Alternative Appurtenances for Overflow Devices -- The amended rule allows the use of alternative appurtenances, which enables PWSs to use these designs without requesting an exception from the TCEQ, saving time for the PWS and TCEQ's staff.

Water Storage -- The amended rule allows PWSs more flexibility when designing water storage tanks because it clarifies that tanks of other materials approved by the AWWA are allowed.

Water Distribution Crossings -- The amended rule aligns the TCEQ's water and wastewater rules for water distribution pipe crossings and helps PWSs protect public health by ensuring pipe integrity when wastewater lines and water lines are near each other.

Appendices -- The amended rule removes three figures, or appendices, in existing §290.47. Based upon the revision of federal law regarding the lead content in pipes, fittings, and fixtures, the commission amends Figure: 30 TAC §290.47(b). During its amendment of Figure: 30 TAC §290.47(b), the commission revisited the other figures in existing §290.47 and adopts the removal of Figures: 30 TAC §290.47(c), (d), and (f).

Section by Section Discussion

The commission adopts administrative changes throughout the adopted rules to correct typographical and syntax errors; maintain alphanumeric order; update citations, cross-references, and terminology; and, conform with *Texas Register* requirements.

State Statutes -- The commission amends §290.39(j)(3) by removing the requirement to submit a CCN to the commission with changes or additions to a PWS since the commission no longer has jurisdiction over CCNs.

Federal Regulations

Reduction of Lead in Drinking Water Act -- The federal requirement for the lead content of pipes, pipe fittings, and plumbing fittings and fixtures was reduced from 8.0% to 0.25%, effective January 4, 2014, therefore the commission amends §§290.41(c)(3)(B), 290.44(b)(1), 290.46(i), and Figure: 30 TAC §290.47(b) by reducing the allowable lead content from 8.0% to 0.25% to be in compliance with the Reduction of Lead in Drinking Water Act. The commission also adopts §290.44(b)(3) and (3)(A) and (B) to incorporate the federal exemptions to be consistent with the federal Reduction of Lead in Drinking Water Act.

E. coli Threshold -- The commission amends §290.111(b)(3)(B)(i) to change the average acceptable *E. coli* level at a surface water plant located on a river from 50 to 100 *E. coli*/100 milliliters and also amends §290.111(b)(3)(B)(ii) to change the average acceptable *E. coli* level at a surface water plant located on a lake from 10 to 100 *E. coli*/100 milliliters. The EPA's LT2 rule required PWSs with surface water or groundwater under the direct influence of surface water sources to monitor for

Cryptosporidium. The EPA gave states the discretion to allow small PWSs, those with a population less than 10,000, to monitor for *E. coli* instead. Subsequent federal guidance established that the appropriate *E. coli* trigger level is 100 *E. coli*/100 milliliters, no matter the source of water. The adopted changes to §290.111(b)(3)(B)(i) and (ii) align the TCEQ rule with EPA's guidance. The commission amends §290.111(b)(6) to identify which entity approves or accredits a laboratory for consistency with the existing Chapter 290 requirements and to reduce confusion in the regulated community. The commission also amends §290.111(b)(6)(B) to remove an outdated reference as the TCEQ no longer certifies laboratories.

Additional Staff Recommendations

Process for Approving Desalination Technology -- The adopted rule allows the use of desalination technologies without an exception request, which is required when approving the use of any technology that does not have design, maintenance, monitoring, and reporting standards within Chapter 290. Technologies that are not mentioned in the rule are considered as innovative/alternate treatment technologies and require specific review and approval as an exception to the rule. Desalination can be accomplished through reverse osmosis or nanofiltration technology. The commission amends §290.38 to allow the use of reverse osmosis and nanofiltration technologies for chemical removal without an exception, but to still require an exception for pathogen treatment. An exception which includes a pilot study, or data from an alternative site, is required by existing §290.42(g) for PWSs proposing the use of innovative/alternate treatment. Since January 2012, PWSs have been allowed to submit computer models instead of a pilot study or alternative site information for reverse osmosis or nanofiltration membrane systems. Also, the exception and plan review processes have been performed concurrently when plans and computer models have been submitted. The commission formalizes this process by removing reverse osmosis and nanofiltration membrane systems from the technologies that are considered innovative/alternate treatment (when proposed for treatment other than pathogens); thus, an exception is no longer required if the reverse osmosis or nanofiltration treatment is used for any treatment other than pathogen removal. To facilitate these changes, the adopted rule introduces new terminology in the rule language or, in some cases, changes the meaning of existing definitions in the rule. To assure that the terminology referenced in the rule change (for PWSs using reverse osmosis or nanofiltration) is clearly understood by all users of the rule, new definitions are added and several existing definitions are amended in §290.38. The commission adopts §290.38(10), (30), (57), (79), and (82), defining "Baseline performance," "Flux," "Pass," "Stage," and "Vessel," respectively. For the definition of "Flux" in adopted §290.38(30), the language is taken from the EPA's *Membrane Filtration Guidance Manual*. For the definition of "Stage" in §290.38(79), the adopted language is from the AWWA's *Manual of Water Supply Practices M46*. The other definitions adopted by the commission in §290.38(10), (57), and (82) are consistent with the intent of the adopted rule and based on standard operation of these technologies. The commission amends existing §290.38(34), which defines "Innovative/alternate treatment," by deleting the examples of treatment types that were considered innovative/alternate treatment prior to this rulemaking. In addition, the adopted change in the definition of "Innovative/alternate treatment" will help prevent the misinterpretation of treatment types that would be innovative/alternate treatment in some circumstances.

The commission adopts §290.39(e)(6) and (7) as part of a staff-initiated change to allow use of reverse osmosis and nanofiltration technologies for desalination without the need for a granted exception. Specifically, these adopted changes require planning materials in an engineering report and an addendum to be submitted to and approved by the executive director prior to the construction and use of a reverse osmosis or nanofiltration membrane system. The desalination technology's engineering report requirements are specified in adopted §290.39(e)(6) and its subdivisions. The engineering report must provide a clear source description, reverse osmosis or nanofiltration modeling analysis (or one of the accepted alternatives), proof of conformance with appropriate NSF International (NSF) standards, blending calculations, analysis of disinfection byproduct potential, and process control details. When the desalination facility is placed into service, the design engineer must prepare an addendum to the engineering report to document the system's performance. The addendum's requirements are specified in adopted §290.39(e)(7) and its subdivisions.

The addendum shall include initial baseline performance (for net driving pressure, normalized permeate flow, and salt rejection), set points for membrane cleaning or replacement, verification of the design model's accuracy, verification of plant capacity, and a complete physical and chemical analysis of the raw and treated water. Some of these additional engineering report requirements provide engineering criteria and performance validation data that were previously required by the pilot study requirements in existing §290.42(g) for innovative/alternate treatment. The adopted rule in §290.39(e)(6) formalizes the option to use industry-accepted manufacturer's modeling tools (and submit the modeling results in the engineering report) and then requires validation data for the full-scale treatment process after the start-up of the facility (and requires the PWS to report that data as an addendum to the previously submitted engineering report required by adopted §290.39(e)(7)). This adopted rule allows the design engineer to use pilot testing in cases where the pilot process would be beneficial. In response to comment, the commission revised §290.39(j)(1) by moving proposed §290.39(j)(1)(E) and revising it as adopted §290.39(j)(4)(A) - (E), and relettering proposed §290.39(j)(1)(F) as adopted §290.39(j)(1)(E). Adopted §290.39(j)(4)(A) - (E) requires written notification of membrane replacement or change of membrane modules instead of requiring plan submittal in all cases as proposed. Under the adopted rule, a new plan submittal and baseline performance data will most likely need to be provided any time the manufacture or model is changed, but may not be required in all circumstances. Because there may be some situations where a new plan submittal and/or baseline data may not be necessary, the adopted rule requires notification and the PWS will be notified if a new plan submittal and/or baseline performance data is required.

The commission adopts §290.42(b)(2)(D) and (9) and its subdivisions to allow the use of reverse osmosis and nanofiltration technologies for treatment by providing acceptable design standards. Adopted §290.42(b)(2)(D) and (9) and its subdivisions allow a PWS to implement the technology without having to request and receive an exception before submitting the plans and specifications for the executive director's review. Because adopted §290.42(b)(2)(D) defines specific design parameters for the approval of groundwater systems using reverse osmosis or nanofiltration, the use of these technologies will no longer be considered innovative/alternate treatment. To complement the addition of reverse osmosis and nanofiltration design requirements in §290.42(b)(9) and its subdivisions, the commission adopts §290.42(b)(9)(C)(i) to allow a design process based on the industry-accepted modeling tools of the membrane's manufacturer to demonstrate the efficacy of the reverse osmosis or nanofiltration membrane for groundwater treatment. Existing §290.42(b)(2) states that groundwater treatment facilities shall be provided in conformance with established and proven methods. To expand the list of established and proven options, the commission adopts §290.42(b)(2)(D), which directs PWSs proposing to use reverse osmosis or nanofiltration for groundwater treatment to the adopted design requirements in

§290.42(b)(9) and its subdivisions. Adopted §290.42(b)(9) and its subdivisions replace the design information that was previously submitted to the TCEQ under the exception requirements in existing §290.42(g). Specifically, adopted §290.42(b)(9) and its subdivisions includes a rule for a design based on an approved method of production validation (modeling, pilot, alternate site, or allowable manufacturer parameters), acceptable methods of pretreatment, post-treatment for corrosion control and re-mineralization, pipes and pipe galleries, chemical storage, cross connection protection, and process monitoring equipment. In response to comment, the commission revised §290.42(b)(9)(G) to specify feed and permeate conductivity monitoring on each individual membrane unit at a nanofiltration or reverse osmosis plant because the executive director's staff inadvertently used an undefined term of "facility" instead of the defined term of "membrane unit." In response to comment, the commission adopts §290.42(c)(8) to address an inadvertent oversight, thus including the ability for a PWS treating groundwater under the direct influence of surface water to use reverse osmosis or nanofiltration design requirements in the same circumstances as surface water systems. The commission adopts §290.42(d)(17) to allow PWSs treating surface water or groundwater under the direct influence of surface water to use the reverse osmosis and nanofiltration design requirements as outlined in adopted §290.42(b)(9) and its subdivisions for groundwater systems, which would be applicable only when this technology is proposed for chemical removal treatment, not pathogen treatment. This adopted change will extend the benefits of the rule for the use of reverse osmosis and nanofiltration technologies to PWSs treating surface water or groundwater under the direct influence of surface water as long as the required microbiological control is achieved through other approved treatments and technologies. The commission amends §290.42(j) to correct the references to American National Standards Institute (ANSI) NSF Standards 60 and 61 as the terms "direct additives" and "indirect additives" are no longer used in the ANSI/NSF Standards 60 and 61 descriptions. For ANSI/NSF Standard 60, "direct additives" has changed to "Drinking Water Treatment Chemicals." For ANSI/NSF Standard 61, "indirect additives" has changed to "Drinking Water System Components." The commission amends §290.42(l) to ensure that the plant operations manual includes additional information when reverse osmosis or nanofiltration technologies are used. The additional information in the plant operations manual must include the system's configuration, baseline performance data, and any set point for membrane cleaning or replacement. The additional information is required so that operators can know: 1) when the membrane systems should be cleaned; and 2) what the baseline performance of the membrane was when new. By comparing present day performance with baseline performance, the operators can see if: the cleaning is working; the membranes are still performing adequately; or, whether it is time for the membrane's replacement. Failing membranes should be replaced because they will not provide the quantity or quality of the water expected by the PWS's customers.

The commission amends §290.45(a)(6) and its subdivisions to ensure that the production capacity of PWSs using reverse osmosis or nanofiltration membrane systems is calculated properly. The calculated capacity must consider any water losses associated with the membrane processes, such as concentrate and permeate used for cleaning, when calculating the capacity of the treatment units.

The commission adopts §290.46(e)(2)(D) to require operators who operate a reverse osmosis or nanofiltration membrane system to obtain reverse osmosis or nanofiltration membrane specific training by successfully completing at least one executive director-approved course or one executive director-approved training event. The existing operator licensing rules do not provide course work to address the unique operating processes at a membrane treatment plant. In response to comment, the commission amends §290.46(e)(2)(D) to allow operators to complete the training by August 31, 2016. This will allow adequate time for operators to take a training class if they have not previously taken one. Additionally, the commission will consider courses an operator has previously taken which meet the executive director's criteria for approval. The TCEQ's criteria for approving training courses or events will be developed through a stakeholder process. The commission amends §290.46(e)(5)(C) and (D), and (6)(A) and (B) to update the course titles to be consistent with existing 30 TAC §30.390(f). The commission amends §290.46(f)(3)(A)(vi) to ensure that PWSs are maintaining records of each reverse osmosis or nanofiltration membrane cleaning event for at least two years. These records are necessary as evidence to demonstrate that the membrane facility is operated in accordance with the conditions of approval. Typically, any conditions of approval for the use of reverse osmosis or nanofiltration desalination technologies will require a treatment facility to clean or replace membranes based on a specified limit for salt passage, pressure differential, or another similar parameter to prevent irreparable damage to the membrane equipment. The commission adopts §290.46(f)(3)(B)(x) to ensure that PWSs using reverse osmosis or nanofiltration membranes maintain records of treatment effectiveness monitoring for at least three years. These records are necessary as evidence to demonstrate that the membrane facility is operated in accordance with the conditions of approval. The conditions of approval, based on the commission's review of the engineering report and supplemental addendums, will require any membrane treatment facility to make operational adjustments based on any critical change in performance in the membrane equipment. The adopted requirement in §290.46(f)(3)(B)(x) to keep these records for at least three years should help existing and new personnel at the PWSs better understand the required frequency of and benefits to these operational adjustments. In response to comment, the commission revised §290.46(f)(3)(B)(x) to specify feed and permeate conductivity monitoring on each individual membrane unit at a reverse osmosis or nanofiltration plant because the proposed rule did not specify the location for the conductivity results that are to be maintained for three years. Also in response to comment, the commission revised §290.46(f)(3)(B)(x) to change the phrase "transmembrane pressure differential" to "pressure differential across a membrane vessel" as the term "transmembrane pressure" is generally not associated with reverse osmosis and nanofiltration membranes. The commission adopts §290.46(m)(7) to ensure that PWSs using reverse osmosis or nanofiltration membranes maintain the good working condition of the system's facilities and equipment. This adopted rule limits reverse osmosis or nanofiltration plant operations to the allowable operating conditions of the membrane manufacturer and requires membrane cleaning or replacement based on predetermined set points for changes in salt passage, pressure differential, and/or normalized permeate flow to prevent irreparable damage to the membrane equipment. The commission amends §290.46(s)(1) to ensure that flow-measuring devices and rate-of-flow controllers, as required by §290.42(b)(9)(J) for reverse osmosis or nanofiltration membrane systems, are properly calibrated at least once every 12 months for PWSs using reverse osmosis or nanofiltration. This adopted rule helps a PWS to know that the instruments used for flow measurement are accurate. The commission adopts §290.46(s)(2)(G) to ensure that conductivity (or total dissolved solids) monitors and pressure instruments are properly calibrated for PWSs using reverse osmosis or nanofiltration. This adopted rule helps a PWS and the TCEQ to know that the instruments used to determine when maintenance or corrective measures are required are accurate. The commission adopts §290.46(s)(2)(H) to ensure that temperature-measuring devices are properly calibrated for PWSs using reverse osmosis or nanofiltration and also to correct a typographical error. This adopted rule helps a PWS know that the instruments used to determine when maintenance or corrective measures are required are accurate. By placing the requirements for desalination through reverse osmosis and nanofiltration within Chapter 290, a PWS - including those impacted by on-going drought conditions - can implement this technology without undergoing the added time and expense associated with requesting and receiving an exception before submitting the plans and specifications, including the required engineering report, for review by the executive director's staff.

Chloramine Disinfection Criteria -- The use of chloramines has become a common practice at PWSs. The TCEQ's existing exception process prescribes the required public notice, sampling frequency, equipment requirements, nitrification action plans, records retention, chemical injection locations, chemical feed and storage requirements for chloraminating PWSs. The commission amends Chapter 290 to allow the use of chloramines without requiring a site-specific exception review to reduce the time involved for both the regulated community and TCEQ staff by moving the design, operation, maintenance, monitoring, and documentation criteria currently in the exception approval letters to the rules to simplify the process for the TCEQ and PWSs. The commission adopts §290.39(e)(8) to require the submission of calculations for sizing feed pumps and chemical storage tanks along with the submission of engineering plans to support the approval of chloramination without an exception request. Under existing rules, the chloramine chemical pump and tank sizing are reviewed by the executive director's staff using the site-specific exception process to assure the chemical facilities can deliver and store the amount of chloramine chemical needed for effective dosing. By placing this requirement in the rule, this adopted change will allow staff to review this information during the review of the submitted plans and specifications and will also reduce confusion in the regulated community regarding when to submit the chemical pump and tank sizing information. Having this information readily available will also speed up TCEQ's review and prevent delays encountered while awaiting the submission of this required information under existing rules.

The commission amends §290.42(e)(3)(B) to allow for manual control instead of automatic proportioning of disinfectant dosage at all treatment plants if the flow varies less than 50% above or below the average flow. The existing rule only allows manual controls at PWS using surface water or groundwater under the direct influence of surface water. The change is to ensure that disinfectant chemicals are dosed properly at all plants with automatically variable water flow rates or with highly variable flow rates, regardless of water source. The commission amends §290.42(e)(3)(D) to simplify the language by replacing the phrase "as well as" with the word "and" to make the rule easier to understand. The commission amends §290.42(e)(3)(G) to remove the requirement that all PWSs with chloramine residual in their drinking water must have a granted exception. By adding design and other requirements for chloramination to the adopted rule, an exception will no longer be needed for most situations, thus saving the regulated community and TCEQ staff time. However, under amended §290.42(e)(3)(G), if chloraminated and chlorinated water will be blended, an exception request will be required to be submitted and a case-by-case review will be performed by the executive director's staff as chloramination is only successful when the ratio of chlorine and ammonia is carefully controlled. Improper mixing can cause a low disinfectant residual as well as unpleasant tasting and smelling water. An exception is needed when water containing chloramines will be blended with water containing free chlorine so that the executive director can review the specific design components and determine site-specific conditions based upon staffs' review. The commission adopts §290.42(e)(7) and its subdivisions to add the minimum chloramine design requirements to Chapter 290, thus making a chloramine exception unnecessary. Design requirements regarding the order of chemical addition, mixing of chloramination chemicals, feed and storage of chemicals, laboratory equipment, and sampling taps are adopted in this rulemaking to incorporate the standard policies and procedures that have been required on a case-by-case basis for past exception reviews.

In its rulemaking proposal, the TCEQ requested public comment on the way PWSs should inject the chloramine chemicals. The proposed rule had the following requirements: inject the first chemical, mix, and then inject the second chemical and mix. The best practice for controlling the chlorine-to-ammonia ratio was stated as measuring the first chemical residual before adding the second chemical, because the second chemical dose can be based on the actual concentration of the first chemical, including loss due to demand, instead of dosing based on the calculated dose. In keeping with best practices, the commission proposed in §290.42(e)(7)(C) to require a sample tap before and after each chemical injection point. By monitoring upstream of any injection, between the first and second chemical injections, and also downstream of the second chemical injection, operators will be able to know how much of the first chemical is needed based on the first sampling point, how much of the second chemical is needed based on the residual found in the water of the first chemical, and finally, after the last point, the disinfecting species - monochloramine - can be monitored to assure that the ratio and amount of chemicals added are appropriate. The TCEQ proposed these sampling taps because improper chloramine dosing can cause taste and odor issues, low disinfectant residual, and potentially nitrification. Furthermore, because low disinfectant and nitrification can lead to acute health risks, the TCEQ proposed design requirements in §290.42(e)(7)(B) and (C) to allow the most accurate dosing of chemicals. In its proposal, the commission sought public comment on the effect this proposed design criteria would have on PWSs that are currently adding chloramines. In response to TCEQ's call for comment, written comments were received and have been addressed in the Response to Comments section of this rulemaking. In response to comment, the commission revised §290.42(e)(7)(C) and its subdivisions to apply the need for sample taps between chloramine injection points to installations submitted for plan approval starting January 1, 2016. The TCEQ recognizes that after January 1, 2016, some installations may need to locate chlorine injection points closer to the subsequent ammonia injection point to control disinfection byproduct formation, leaving no room for the tap between the two injectors; however, a tap must be provided before any chemical injection and after the second chemical is injected.

The commission amends §290.42(f) by removing the word "surface" to clarify that the chemical feed and storage facility rule applies to all PWSs. When initially adopted, only surface water systems required complex chemical feed and storage facilities; however, these design standards have been applied on a case-by-case basis through the TCEQ's exception process for innovative/alternate treatment involving chemical addition regardless of the water source, including chloramination and reverse osmosis. Because the adopted rulemaking incorporates requirements for chloramination and reverse osmosis by rule, it is necessary to add the requirements of §290.42(f) to the rule so that groundwater and purchased water systems will also be designed to handle, store, and feed chemicals properly. Stakeholders also supported this adopted change. One impact of the addition of chemical storage and feed requirements relates to the use of day tanks. The commission amends §290.42(f)(1)(B) to specify that the day tanks in the adopted rule are only required for bulk storage tanks. A day tank holds the volume of chemical used in one typical day and the installation of a day tank can prevent the possibility of severely overfeeding the chemical from bulk storage. Small chemical storage tanks, such as a 55-gallon drum, would require a very small day tank if the rule were applied to all chemical storage. A very small day tank is impractical. The adopted rule avoids confusion and the unnecessary installment of day tanks. The commission amends §290.42(f)(1)(E)(ii)(V) to exempt 55-gallon hypochlorite solution containers from spill containment. The existing rule allows 35-gallon hypochlorite solution containers to be installed without spill containment. The existing rule was intended to allow the exemption to non-permanent containers that are replaced instead of refilled, unlike permanent chemical storage facilities. Currently, 55-gallon non-permanent containers are commonly used, thus the adopted rule expands the volume allowed to the size of a commonly used, non-permanent chemical storage container.

Nitrification is a biological process that can occur in distribution pipes and storage tanks, causing a loss of residual and regrowth of bacteria. Nitrification of the PWS's distribution system is also a concern as it can raise nitrite and nitrate to levels that have been shown to potentially harm infants. In the past, some PWSs have had nitrifying organisms colonize a storage tank and have needed to drain the tank to fight nitrification. When a nitrification event occurs, PWSs should be able to quickly drain water storage tanks with high levels of nitrifying organisms, nitrite, or nitrate levels; however, some storage tanks were not designed for efficient draining, sometimes taking several days to drain, even with the use of pumps and other equipment. Therefore, the commission proposed amending §290.43(c)(7) by adding a requirement that storage tanks containing chloraminated water shall be designed to drain "efficiently" as a means to control nitrification. In response to comment, the commission revised §290.43(c)(7) to read "[*e*]*ach clearwell or potable water storage tank must be designed to drain the tank*." The rule requires a tank to have a drain, but will not contain a potentially vague term about how the tank must be drained.

The commission amends §290.46(d)(2)(B) to reword the type of distribution system and finished water storage tank that are required to have a chloramine residual. The existing rule states that only PWSs that feed ammonia may have a chloramine residual (measured as total chlorine). Chemically, chloramines are formed when free chlorine reacts with ammonia creating chlorinated compounds. When a PWS has chloramines in the water, no matter how the chemicals are added to create them, the disinfectant will be expressed as "total chlorine" when measured. "Free chlorine" is not present in correctly chloraminated water because the chlorine has reacted with ammonia to form a family of chlorinated nitrogen compounds that are measured as "total chlorine." Of the approximately 7,000 PWSs in Texas, approximately 800 have a chloramine residual in their PWS without adding ammonia. If the PWS purchases and redistributes water which already has a chloramine residual, or if the source of the water has naturally occurring ammonia, then only chlorine may be added. Since the monitoring equipment measures total chlorine in a chloraminated PWS (no matter what chemicals are added or occur naturally), the water from a PWS that purchases and redistributes chloraminated water, adds chlorine to water with naturally occurring ammonia, or adds ammonia to chlorinated water must still measure total chlorine to have meaningful results. The adopted rule applies the total chlorine residual requirement in §290.46(d)(2)(B) for PWSs that distribute chloraminated water, regardless of which chemicals are added by the system. The adopted rule allows the TCEQ to approve the use of chloramines without a site-specific exception review. Recordkeeping is one of the conditions applied with a granted exception. Existing §290.46(f)(3)(A)(ii) requires all water systems to keep the records of the volume of water treated for two years. There is some confusion regarding whether a purchased water system "treats" water and whether records of the volume should be kept. To reduce confusion while still requiring the same amount of recordkeeping, the commission amends §290.46(f)(3)(A)(ii) and its subdivisions to require all PWSs to keep records of the volume of water distributed. In support of the adopted rule change to approve chloramines based on design requirements instead of an exception, the commission also changes in §290.46(f)(3)(A)(ii) the use of the word "treated" to "distributed" and to require groundwater and purchased water systems to keep records of the volume of water treated. In the adopted rule the word "treated" means that PWSs that add chemicals or provide pathogen or chemical removal "treat" the water. For some systems, the treated water and distributed water may be the same volume and may be monitored by the same flow meter. For example, a groundwater system that adds only chlorine will most likely have the same volume of distributed and treated water. Knowing the volume of water is essential to the operators of PWSs when dosing any chemicals and determining the system's water loss. The commission adopts §290.46(f)(3)(B)(ix) to require records on chloramination be kept for at least three years, which will give the PWSs sufficient information to identify seasonal trends in chloramination. The commission adopts §290.46(s)(2)(D), which adds a requirement for the calibration of the chloramine analyzers every 90 days. Calibration is necessary to assure that the analyzers used to monitor the effectiveness of the chloramination process and to check for potential nitrification chemicals provide accurate results. The commission reletters existing §290.46(s)(2)(D) and (E) with the addition of adopted §290.46(s)(2)(D). The commission amends §290.46(y) and (y)(1) to comply with *Texas Register* requirements and also correct a typographical error. The commission adopts §290.46(z) and its subdivisions, adding requirements for a PWS that uses chloraminated water to create a nitrification action plan. The nitrification action plan is a site-specific plan describing the levels of total chlorine, monochloramine, ammonia, nitrite, and nitrate that are acceptable and what levels should initiate actions such as additional sampling to determine the cause of the imbalance, which is usually a low disinfectant residual. Nitrification in the PWS's distribution system is a concern as it can cause a loss of residual that allows bacterial regrowth and raise nitrite and nitrate to levels that have been shown to potentially harm infants. Each PWS using chloramines must have a nitrification action plan to show what trends in the monitoring data suggest incipient nitrification, what steps to take to prevent nitrification, and actions to take if nitrification is found. The nitrification action plan is only required under existing rules when a chloramination exception is granted. In response to comment, the phrase used to describe the nitrification action plan, "to prevent nitrification," was removed from §290.46(z) to eliminate confusion; additionally, the phrase "distributing chloraminated water" was added to §290.46(z) to maintain consistency with Chapter 290.

The commission adopts Figure: 30 TAC §290.47(h), Sample Language for Notification Upon Changing from Free Chlorine to Chloramines, to contain the required customer notification language of a pending change in the PWS's disinfectant from chlorine to chloramines. Due to the nature of chloramines, some health care facilities and persons with pet fish might need to change their equipment to accommodate the chloramines instead of chlorine. By notifying the customers, they can make any necessary changes before they begin receiving the chloraminated water. The adopted notification language will assure a correct and consistent message is relayed to affected PWS customers. Exception approval letters for chloramines under existing rules include this notification requirement and language; therefore, the chloramine requirement in the adopted rule contains consistent language for customer notification.

The commission amends §290.110(b)(2), (4), and (5) to clarify the type of chloramine measurement that is used when determining whether a PWS meets the required minimum or maximum chloramine level. These requirements are required under existing rules through site-specific exceptions. This rulemaking adopts minimum chloramine design requirements in Chapter 290, making a chloramine exception unnecessary. Because the species of chloramines that provides disinfection is monochloramine, the adopted rule refers to monochloramine. By introducing monochloramine into the adopted rule, it becomes unclear which measurement the PWSs should use to determine compliance when the word "chloramine" is used. The commission adds the clarification that the chloramine level in this condition shall be "measured as total chlorine." The commission amends §290.110(c)(1) - (4) by adding catchlines to differentiate the sampling location and purpose - whether for compliance or to manage treatment processes for effective chloramination. Catchlines are added so that the regulated community can more easily identify the sampling requirements at each point in the PWS. The commission amends §290.110(c)(1)(A) and (B) by replacing the phrase "entering the distribution system" with the phrase "at each entry point" which is defined in existing §290.103(13). The commission also adopts §290.110(c)(1)(C) to specify the frequency at which the disinfectant residual must be recorded. Adopted §290.110(c)(1)(C) is contrasted with existing rule, §290.110(c)(1)(A) and (B), which states that the residual at the entry point must be recorded continuously. Since "continuous" is not defined, and as a true continuous recording is not possible, the commission requires a 30-minute recording interval, which is consistent with existing guidance in Regulatory Guidance-211, *Monthly Testing and Reporting at Surface Water Treatment Plants*. The commission adopts §290.110(c)(2)(A) and (B) to add specificity by restating the requirements for entry point disinfection instead of cross-referencing to §290.110(b)(2). The commission further amends §290.110(c) to include the monitoring requirements included when a chloramine exception is granted. These adopted chloramine effectiveness monitoring requirements can be summarized in the following table. The commission requires that a water system with a chloramine residual must, at a minimum, measure and record the following:

Figure 1: 30 TAC Chapter 290 -- Preamble

	At or After the **Entry Point(s)**	In the **Distribution System**	Downstream of Any Chlorine or Ammonia **Injection Points**
Free Ammonia	Weekly.	At least weekly.[a]	Weekly and before and after adjusting the chlorine or ammonia feed rate.
Mono-chloramine	Weekly.	At least weekly.[a]	Weekly and before and after adjusting the chlorine or ammonia feed rate.
Total Chlorine	Weekly.	Daily/weekly.[b]	Weekly and before and after adjusting the chlorine or ammonia feed rate.
Nitrite and Nitrate	As needed to set baseline, then quarterly.	At least quarterly, and in response to action level triggers.	Routine sampling not required.

[a.] *When collecting a routine sample such as a bacteriological or disinfectant residual sample, the free ammonia and monochloramine should be measured at the same time.*
[b.] *Total chlorine must be collected weekly or daily, based on the system size, at locations representing the entire distribution system in accordance with §290.110.*

The commission adopts §290.110(c)(5) to include the chloramine effectiveness monitoring and to also demonstrate when the sample results will be used to determine compliance with the MCLs, maximum residual disinfectant levels (MRDLs), action levels, or treatment techniques. To clearly differentiate between results used for compliance and those not used for the MRDLs, action levels, or treatment technique compliance; total chlorine monitoring is included in §290.110(c)(4). Total chlorine monitoring is not included with the chloramine effectiveness monitoring because all total chlorine monitoring in the distribution system is used for MRDL compliance, thus it cannot be included with the adopted chloramine effectiveness monitoring. The commission adopts §290.110(c)(4)(E) to require that PWSs distributing chloraminated water test for chloramines (measured as total chlorine) at any distribution system site that adds chemicals to boost the chloramine residual. The testing is completed weekly or whenever the chemical dosage is changed at the disinfection booster station. The monitoring is in conjunction with chloramine effectiveness sampling described in adopted §290.110(c)(5)(C). The commission adopts §290.110(c)(5) with a non-substantive change to the catchline. To correct a typographical error, the commission removed the hyphen from between the words "chloramine" and "effectiveness." The commission adopts §290.110(c)(5) describing the sampling that must occur to assure that chloramines are being formed properly and that nitrification is controlled in the PWS to establish the chloramine requirements in rule instead of requiring an exception request. Sampling as adopted in §290.110(c)(5) has been previously required as a condition to a granted exception. Poor chloramine addition can result in taste and odor issues, low disinfectant residual, and nitrification. Low disinfectant residual levels and nitrification can both cause acute health effects. Sampling lets the PWS know what levels of chemicals exist throughout the PWS's distribution system. The sampling results inform the PWS if nitrification or poor chloramination is occurring. Adopted §290.110(c)(5)(A) requires monitoring of ammonia, nitrite, and nitrate at the water coming into the PWS at least once to determine if the source water has ammonia, nitrite, or nitrate. If the ammonia levels are higher than 0.5 milligram per liter free ammonia (as nitrogen), additional samples are required to determine if the ammonia level is consistent or variable. Free ammonia is used in the creation of chloramines so knowing the source water's concentration is necessary for downstream dosing and evaluating trends in the distribution system. Nitrite and nitrate monitoring is needed to allow a PWS's operator to know whether these chemicals are from the source or from nitrification. Knowing what the nitrite and nitrate levels are in the PWS's source water helps to determine if the nitrite or nitrate levels are rising. The PWS can take action when the levels first begin rising, not when they are near the level that can cause acute health effects to infants or complete loss of disinfectant residual. Adopted §290.110(c)(5)(B) and (B)(i) require sampling the chloraminated water that just entered the distribution system for total chlorine, ammonia and monochloramine. This sampling point is located after the chloramine chemical addition and can show if the chemical addition successfully made monochloramine. Nitrite and nitrate are required to be monitored in §290.110(c)(5)(B)(ii) for at least six months to find a baseline for the PWS and to develop the nitrification action plan. Nitrite and nitrate are monitored in §290.110(c)(5)(B)(iii) to determine if any of the levels in the nitrification action plan have been exceeded. Knowing the entry point nitrite and nitrate levels in the water after treatment, but before distribution, will allow the PWS to determine if the nitrite or nitrate levels are rising, thus the PWS can take action when the levels first begin rising, not when they are near the level that can cause acute health effects. Adopted §290.110(c)(5)(B)(ii) explicitly disallows the use of the results of the nitrite and nitrate samples collected to determine the effectiveness of chloramination dosing from also being used for compliance with §290.106 because PWSs are directed to take them at the first customer, which is not a federal compliance site, and because they are taken with a field instrument, which is accurate but which does not use an EPA-approved method. In §290.110(c)(5)(B)(iii), the adopted rule explicitly allows the use of samples collected for compliance with §290.106 to also be used for chloramine treatment effectiveness sampling. Currently, those compliance samples are collected by a TCEQ contractor, while process effectiveness samples are collected and potentially analyzed by the PWS. These "self-collected" samples are not to be used for compliance because they would not use an EPA-approved method, and would not be collected at the federal compliance location, but TCEQ contractor collected samples can be used for treatment effectiveness. Adopted §290.110(c)(5)(C) and its subdivisions describe the sampling that must be performed immediately upstream and downstream of the chloramine chemical injection points. These treatment samples are taken to be able to dose chloramines based on actual residual, not on a calculated dose. The process described in the adopted rule provides a more accurate chloramine dosing strategy and limits the potential health effects caused by low residual or nitrification. In response to comment,

§290.110(c)(5)(C)(iii) was revised to reference that the sampling must occur between the injection of the two chemicals only if a sample tap is required or present. Though sampling between the injection points of the two chloramine chemicals is best practice, the responses that TCEQ received in response to its call for comment upon this issue was that not all PWSs have taps or can have taps between the injection of the chemicals already. To allow for flexibility, the commission is only requiring sample taps on new construction. Because the taps may not be available at all PWSs, the sampling is only required where taps are installed or required. Adopted §290.110(c)(5)(C)(iv) and (v) describe which chemicals must be monitored if the treatment occurs before the entry point or if the treatment occurs in the distribution system. Adopted §290.110(c)(5)(D) and its subdivisions describe the sampling that must be performed in the PWS's distribution system. Monochloramine and free ammonia must be monitored once per week in conjunction with the disinfectant residual samples in the distribution system described in existing §290.110(c)(4). Nitrite and nitrate must be monitored quarterly. Monochloramine, free ammonia, nitrite and nitrate are sampled in the distribution system to determine if nitrification is occurring. Changes in these levels can indicate nitrification. The PWS can then take the steps outlined in the PWS's nitrification action plan to control or prevent the nitrification. The commission amends §290.110(d) and its subdivisions to provide the analytical sensitivity required for the analysis methods for chloramine chemicals. Adopted §290.110(d) and (d)(3) - (6) support the chloramination requirements by providing analytical methods for the tests that need to be performed to monitor chloramination. In response to comment, §290.110(d)(5) and (6) was revised to change the accuracy requirement from 0.5 milligrams per liter as nitrogen (mg/L as N) to 0.1 mg/L as N for nitrate and from 0.05 mg/L as N to 0.05 mg/L as N for nitrite. The adopted accuracy levels will allow PWSs to better detect changes in the distribution system that may indicate nitrification. Existing §290.110(d) includes a reference for nitrite and nitrate sampling in existing §290.119, which references EPA approved methods; however ammonia and monochloramine do not have EPA approved drinking water methods and the field methods commonly used to determine nitrite and nitrate are not EPA approved. The sensitivity for each test is described in adopted §290.110(d)(3) - (6), and will allow PWSs greater flexibility when choosing a test method. Adopted §290.110(d) and its subdivisions also assures the test methods are sensitive enough to detect changes in water quality that could indicate nitrification, which could potentially cause acute health effects in infants. The commission amends §290.110(d)(1) to specify which chloramine test may be used to determine the chloramine residual. Because the species of chloramines that provides disinfection is monochloramine, the adopted rule refers to monochloramine. By introducing the term "monochloramine" into the rule, it becomes unclear which measurement the PWSs should use to determine compliance when the word "chloramine" is used. Therefore, the commission adds that the chloramine is "measured as total chlorine" to avoid confusion. Also, §290.110(d)(1) is amended to no longer require written permission of the executive director to use a color comparator, commonly referred to as a "color wheel." The adopted rulemaking supports the chloramination use requirements by removing another requirement for written permission. The adoption will shorten the activities required and time spent by a PWS when electing to use chloramines. Adopted §290.110(d)(1) establishes requirements on the appearance of the color comparator, the age of the comparator, the age of the reagents, proper storage of the comparator, and the range of the comparator. If the comparator or sample cells are old, discolored, or in a different range than the water, the test will provide inaccurate results, potentially providing inaccurate chloramine dosing or monitoring. The commission amends §290.110(e)(2) to incorporate forms needed to report disinfectant levels at the entry point and in the distribution system for PWSs using surface water or groundwater under the direct influence of surface water. There are currently three forms for PWSs that treat surface water and groundwater under the direct influence of surface water but only two are listed in the existing rule. This adopted rule supports the chloramination use requirements for Chapter 290 by adopting all three forms for use when reporting disinfection information. The commission amends §290.110(e)(5) and renumbers existing §290.110(e)(5) and (6) as a result of the adopted addition. The adopted addition sets the report requirements for a nitrification action plan, which is kept at the PWS unless the plan is required to be seen by the executive director. The recordkeeping requirement in adopted §290.110(e)(5) is a condition on current letters granting chloramine exceptions as required by the existing rules. Keeping the nitrification action plan for three years will allow the regulated community to compare past nitrification action plans to see how water quality has changed over time, as well as highlight any trends and seasonal fluctuations. The commission amends §290.110(f)(6) - (9) to specify which chloramine test may be used to determine the chloramine residual. Because the species of chloramines that provides disinfection is monochloramine, the adopted rule refers to monochloramine. By introducing monochloramine into the rules, it becomes unclear which measurement the PWSs should use to determine compliance when the word "chloramine" is used. Therefore, the commission adds that the chloramine is "measured as total chlorine" to avoid confusion. The commission amends §290.110(g)(5) to clarify that the monitoring for chloramines will not fall under the requirements for public notices required on federally mandated compliance monitoring and reporting violations. The chloramination monitoring is to ensure proper disinfection and avoid nitrification, and is not for federal compliance purposes. Nitrite and nitrate have MCLs, but they are measured at the entry point, not in the PWSs distribution system. The adopted rule change in §290.110(g)(5) is to avoid confusion and clearly state that public notice would be needed if a PWS fails to perform federally mandated compliance monitoring; however, a public notice is not required if the PWS fails to perform the chloramination effectiveness monitoring. The commission also adopts §290.110(g)(6) and its subdivisions to require PWSs notify their retail and wholesale customers when the PWS first provides chloraminated water and also when new customers begin receiving the chloraminated water. Adopted §290.110(g)(6) and its subdivisions describe when the notification must be sent, how it must be sent, and who must be notified. Adopted §290.110(g)(6)(D) and (E) also clarify when new customers must be notified and state that the notice must be provided in multiple languages, if appropriate. This notification is a condition of a granted exception as required by existing rules. Due to the nature of chloramines, some health-care facilities and persons with pet fish might need to change their equipment to accommodate the switch to chloramines. By amending the notice requirements, customers of affected PWSs can make any changes needed before they begin receiving the chloraminated water.

The commission amends §290.111(d)(4)(C) to specify which chloramine test - total chlorine - may be used to determine the chloramine residual. Because the species of chloramines that provides disinfection is monochloramine, the adopted rule refers to monochloramine. By introducing monochloramine into the rule, it becomes unclear which measurement the PWSs should use to determine compliance when the word "chloramine" is used. Therefore, the commission adds that the chloramine is "measured as total chlorine" to avoid confusion. Also, §290.111(d)(4)(C) is amended to no longer require written permission of the executive director to use a color comparator. This adopted change in §290.111(d)(4)(C) supports the adopted chloramination use requirements by removing another requirement for written permission. The adoption will shorten the activities required and time spent by a PWS when electing to use chloramines. As adopted, §290.111(d)(4)(C) would establish requirements on the appearance of the color comparator, the age of the comparator and the reagents, proper storage of the comparator, and the range of the comparator. If the comparator or sample cells are old, discolored, or in a different range than the water, the test will provide inaccurate results, thus potentially providing inaccurate chloramine dosing and monitoring information. The commission amends §290.111(h)(2) and its subdivisions to incorporate forms needed to report disinfectant levels at the entry point and in the PWS's distribution system. There are currently three forms for PWSs that treat surface water and groundwater under the direct influence of surface water, but only two are listed in the existing rule. The adopted rule specifies which form is appropriate for use by the PWSs in §290.111(h)(2)(A) - (C). The commission removes §290.111(h)(3) because the requirement in this section was moved to adopted §290.111(h)(2)(C). The commission also deletes §290.111(h)(7) and (8) as these have been incorporated into the forms required by §290.111(h)(2). The commission also renumbers the paragraphs as a result of the adopted changes.

The commission amends §290.116(a)(1) and (d)(2) by adding the word "must" to address a syntax error. The commission amends §290.116(c)(3)(C) to specify which chloramine test - total chlorine - may be used to determine chloramine residual. Because the species of chloramines that provides disinfection is monochloramine, the adopted rule refers to monochloramine. By introducing monochloramine into the rule, it becomes unclear which measurement the PWSs should use to determine compliance when the word "chloramine" is used. Therefore, the commission adds that the chloramine is "measured as total chlorine" to avoid confusion. Also, §290.116(c)(3)(C) is amended to no longer require written permission of the executive director to use a color comparator. Adopted §290.116(c)(3)(C) supports the chloramination use requirements by removing the requirement for written permission. The adoption will shorten the activities required and time spent by a PWS when electing to use chloramines. Adopted §290.116(c)(3)(C) establishes requirements for the appearance of the color comparator, the age of the comparator, the age of the reagents, proper storage of the comparator, and the range of the comparator. If the comparator or sample cells are old, discolored or in a different range than the water, the test will provide inaccurate results, thus potentially providing inaccurate chloramine dosing and monitoring information.

Modification of the Plan Review Submittal Process -- The commission amends §290.39(i) by adding the words "previously approved" to describe the submittal of information on changes to plans that have already been approved by TCEQ, whereas other sections require plan submittal for new projects that have not been approved by TCEQ. The commission amends §290.39(j) and its subdivisions to provide a more efficient submittal process and clarify the definition of a "significant change" in §290.39(j)(1)(A) - (F). Existing §290.39(j) instructs PWSs to first notify the TCEQ of significant changes and then submit plans and specifications upon TCEQ's request. The commission amends §290.39(j)(1) by requiring PWSs to submit plans and specifications for significant changes to reduce confusion in the regulated community and reduce staffs' processing time currently spent issuing requests for plans and specification submission. The commission further amends §290.39(j)(1)(D) by simplifying the criteria for a change to be considered as "significant" under the rule. As amended, §290.39(j)(1)(D) will be simplified to consider any changes greater than 10% of the number of connections, any change that results in the system's inability to comply with any of the applicable capacity requirements of §290.45 and any change that involves an interconnection with another PWS. The adopted distribution system criteria is 10% of connections, instead of, 10% of the existing distribution capacity or 250 connections, whichever is smaller. The two criteria for a significant change in distribution caused much confusion for the regulated community. The commission also amends §290.39(j)(2) and its subdivisions to move the requirement for approval of long term-treatment changes that will impact the corrosivity of the water and that need written approval from the executive director from existing §290.39(j)(1)(G) to adopted §290.39(j)(2) because the long-term treatment changes, though considered significant changes and must have approval, may not require the submittal of plans and specifications. Adopted §290.39(j)(2)(A) is a portion of existing §290.39(j)(1)(G) that provides examples of long-term treatment changes, while adopted §290.39(j)(2)(B) allows the executive director to determine the need for plan and specification submittal. Lastly, the commission adopts §290.39(j)(3) and its subdivisions to include the requirements for another entity to review plans and specification in lieu of the TCEQ's review, as taken from existing §290.39(j)(2)(B)(i) - (iii) and (C). The adopted amendments to existing §290.39(j)(1) and (2) providing for a more efficient submittal process and clarifying the definition of a "significant change" required a reorganization of this section, including the adopted movement of rule language from existing §290.39(j)(2)(B)(i) - (iii) and (C) to adopted §290.39(j)(3) and its subdivisions. As previously discussed in the *Process for Approving Desalination Technology* portion of the Section by Section Discussion, in response to comment, the commission revised §290.39(j)(1) by moving proposed §290.39(j)(1)(E) and revising it as adopted §290.39(j)(4)(A) - (E), and relettering proposed §290.39(j)(1)(F) as adopted §290.39(j)(1)(E). Adopted §290.39(j)(4)(A) - (E) requires written notification of membrane replacement or change of membrane modules instead of requiring plan submittal in all cases as proposed. Under the adopted rule, a new plan submittal and baseline performance data will most likely need to be provided any time the manufacture or model is changed, but may not be required in all circumstances. Because there may be some situations where a new plan submittal and/or baseline data may not be necessary, the adopted rule requires notification and the PWS will be sent a letter if a new plan submittal and/or baseline performance data is required. The explanation of revisions made in response to comment has been repeated in this portion of the Section by Section Discussion to give a full picture of the changes to the rule.

Enforceability of Exceptions -- The commission adopts §290.39(l)(4) and (5) to streamline the process when a PWS does not follow the conditions of a granted exception. Under existing §290.39(l)(2), if a PWS does not meet the requirements of a granted exception, the exception can only be revoked and a violation issued through a time-consuming and cumbersome process, in which a TCEQ field investigator who finds a PWS violating the exception's conditions must contact the agency's Central Office to request revocation of the exception, then wait for its revocation before issuing a violation. To streamline this process while also ensuring a PWS follows the conditions established in the granted exception, the adopted rule clarifies that failing to follow the conditions of a granted exception is a violation and allows the TCEQ's field investigators to directly issue violations for failure to follow an exception's conditions.

Clarification for Well Construction Review Process -- The commission amends §290.41(c)(3)(C) to clarify and specify well construction for a PWS. The commission amends §290.41(c)(3)(C) to specify the grouting mixture for pressure cementing as neat cement as specified in the most current AWWA Standard for Water Wells and to which a maximum of 6%, by dry weight, bentonite and 2%, by dry weight, calcium chloride may be added. The commission further amends §290.41(c)(3)(C) to specifically define well annular space for a PWS well as the minimum annular space between the outside diameter of the casing pipe and the borehole shall be no less than 1 1/2 inches in radial thickness or three inches in net diametrical difference and to clearly explain that well annular space pressure grouting shall be from the bottom upward utilizing one of the methods listed in §290.41(c)(3)(C) for all PWS groundwater well construction. Existing

§290.41(c)(3)(C) refers to the current AWWA standard for determining pressure cementing method. Amended §290.41(c)(3)(C) will reduce confusion in the regulated community, reduce staffs' processing time currently spent issuing continuing requests for documentation regarding proper construction, and reduce approval time for the regulated community. The rule adoption serves also to consolidate the requirements for wells into one location, making them more accessible to the PWSs by not requiring separate access to the AWWA standards.

Alternative Appurtenances for Overflow Devices -- The commission amends §290.43(c)(3) to allow other acceptable options for a tank overflow cover. The existing rule requires a "gravity-hinged and weighted cover" at the end of the overflow pipe on water storage tanks; however, other designs have also proven to be effective at preventing backflow and the entrance of contaminants. The adopted rule allows a duckbill or any other overflow cover that closes automatically to less than 1/16 inch gap. The adopted rule allows any design that meets this specific criterion. The commission adopts a gap criteria of 1/16 inch because that is the size of a midge fly and the cover is used to prevent wildlife and insects from being able to enter the water storage tank. The midge fly, in particular, is a small insect that can enter the tank, lay eggs, and then distribute its hatched, red colored worms to the distribution system. Establishing the gap tolerance at 1/16 inch will prevent incursions from this insect. The existing rule requires PWSs to receive a case-by-case exception to use these other devices. The commission amends §290.43 to establish a standard to streamline the process for PWSs using other pipe cover designs and to reduce staffs' time currently spent reviewing these exception requests.

Water Storage -- The commission amends §290.43(c) to remove the reference to AWWA D103 and address the perception that other types of bolted tanks are not allowed. The existing rule states "all facilities for potable water storage shall be covered and designed, fabricated, erected, tested, and disinfected in strict accordance with current AWWA standards." Thus, the existing rule already allows the use of any tank with an AWWA standard, and the reference to D103 is redundant and has caused misunderstanding of the rule. The removal of the sentence referencing D103 from §290.43(c) allows PWSs more flexibility when designing water storage tanks by allowing tanks of other materials approved by the AWWA. The commission amends §290.43(c)(9) by replacing the word "Commission" with the phrase "executive director" to correct a typographical error.

Water Distribution Crossings -- During a rule change in 1995, language applicable to waterlines crossing under wastewater lines was added to §290.44 which created conflict with the requirements for wastewater lines in 30 TAC §217.53. The commission amends §290.44(e)(4)(B) and its subdivisions to: adjust the water and wastewater line crossing requirements for protection of public health; reduce confusion within the regulated community and its consultants; and remove the conflict with the requirements for wastewater lines in existing §217.53. The commission has an on-going rulemaking for wastewater, Rule Project Number 2012-040-217-OW, *Amendments to Chapter 217: Design Criteria*. The TCEQ's Office of Water's wastewater and drinking water programs have been working together to maintain consistency across programs. The commission amends a cross-reference in §290.44(e)(4)(B)(iii) to maintain consistency with Rule Project Number 2012-040-217-OW. In this rulemaking, Rule Project Number 2013-046-290-OW, the commission also amends §290.44(e)(5) by inserting the word "manhole" between the words "main or" in the first two sentences of that paragraph to address a point of confusion in the regulated community. With the addition of the word "manhole" in this paragraph, the commission clarifies that a potable waterline is to be separated from a wastewater main manhole or lateral manhole or cleanout, instead of requiring separation from a wastewater main, lateral manhole, or cleanout as interpreted by some readers of this rule.

Appendices -- With the adopted amendment to Figure: 30 TAC §290.47(b), the commission revisited the other figures in existing §290.47 and adopts the removal of existing Figures: 30 TAC §290.47(c), (d), and (f) and reletters existing Figures: 30 TAC §290.47(e), (g), (h), (i), and (j) as Figures: 30 TAC §290.47(c), (d), (e), (f), and (g), respectively. Additionally, the commission adopts updated cross-references to the relettered Appendices in §§290.39(c)(4)(A) and (o)(1); 290.44(h)(1)(A) and (4); and, 290.46(j)(2), (p)(2), and (q)(1) and (2). The commission adopts the removal of existing Figure: 30 TAC §290.47(c), *Sample Sanitary Control Easement Document for a Public Water Well*; existing Figure: 30 TAC §290.47(d), *Customer Service Inspection Certificate*, and existing Figure: 30 TAC §290.47(f), *Sample Backflow Prevention Assembly Test and Maintenance Report* to allow the executive director's staff to make revisions to these forms outside of a formal rulemaking. Existing Figure: 30 TAC §290.47(c), *Sample Sanitary Control Easement Document for a Public Water Well*, is an example only and is not required to be used by the regulated community. An agency form that can be amended outside of a rulemaking process allows the form to be revised as improvements are suggested after consideration by the regulated community through the TCEQ's Drinking Water Advisory Work Group and its subcommittees instead of amending the form during a formal rulemaking. This also allows the document to be provided in a format that can be modified as needed by a PWS to incorporate the PWS's specific information. Adopting existing Figure: 30 TAC §290.47(d), *Customer Service Inspection Certificate*, and existing Figure: 30 TAC §290.47(f), *Sample Backflow Prevention Assembly Test and Maintenance Report*, as agency forms will allow the regulated community to use the forms in a recordable, electronic format. The existing Figures are available only as portable document formats, PDFs, and require the regulated community to retype the certificate or report to keep an electronic record or fill in the portions of the certificate or report that are applicable to each PWS. Providing these two Figures as forms facilitates the end user's ability to comply with applicable records retention requirements by being able to retain the forms electronically. Once this rulemaking is effective, the commission's forms will be available as: No. 20698, *Sanitary Control Easement*; No. 20699, *Customer Service Inspection Certificate*; and No. 20700, *Backflow Prevention Assembly Test and Maintenance Report*. Additionally, references to the existing Figures that are adopted as agency forms once this rulemaking is effective are also updated in §§290.39(e)(4), 290.44(h)(4)(C), and 290.46(j). Further, the commission amends existing §290.38(70) and §290.44(h)(4)(B) to refer to agency forms and further clarify their usage.

Final Regulatory Impact Analysis Determination

The commission reviewed the adopted rulemaking in light of the regulatory analysis requirements of Texas Government Code, §2001.0225 and determined that the rulemaking is not subject to Texas Government Code, §2001.0225. A "major environmental rule" means a rule with a specific intent to protect the environment or reduce risks to human health from environmental exposure, and that may adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state.

First, the adopted rulemaking does not meet the statutory definition of a "major environmental rule" because its specific intent is not to protect the environment or reduce risks to human health from environmental exposure. The specific intent of the adopted rulemaking is fourfold.

The first intent of the adopted rulemaking is to comply with requirements and standards established by the EPA pursuant to its federal requirements related to Texas' primary enforcement responsibility with regard to drinking water. Specifically, the federal drinking water standards changed regarding two contaminants. First, the lead content allowed in pipes, pipe fittings, and plumbing fittings and fixtures was reduced through federal legislation. Second, the EPA provided states the discretion to allow small PWSs using surface water or groundwater under the influence of surface water to monitor for *E. coli* rather than *Cryptosporidium*. Texas adopted this alternate monitoring, with a trigger level of 10 or 50 *E. coli*/100 milliliters, depending on the water source. Federal guidance subsequently established the *E. coli* trigger level of 100 *E. coli*/100 milliliters, no matter the water source. As a primacy state, Texas has the obligation of complying with EPA drinking water standards. The federal requirements that would be implemented through the adopted rulemaking are designed to reduce risks to human health from environmental exposure by limiting exposure to lead and microbial pathogens, but the changes in the adopted rules are intended to maintain compliance and consistency with EPA requirements and standards.

The second intent of the adopted rulemaking is to implement state legislation enacted during the 2013 legislative session. This legislation related to the transfer of the commission's utilities and rates program to the PUC. Specifically, the adopted rulemaking removes a requirement related to a CCN with notification of changes or additions to a PWS. CCNs are part of the utilities and rates program transferred effective September 1, 2014, and the agency no longer has jurisdiction over CCNs as they relate to Chapter 291. The adopted rulemaking implements HB 1600, §2.96 and SB §§1, 4, 95 and 96, both enacted by the 83rd Texas Legislature, though the majority of the rule changes necessary to implement this legislation will occur in a different rulemaking, specifically Rule Project Number 2013-057-291-OW.

The third intent of the adopted rulemaking is to clarify existing rules and make them more efficient by amending language, correcting cross-references, and eliminating potential ambiguities. The adopted rulemaking provides a more efficient plan submittal process; clarifies that an exception once granted must be complied with; clarifies the well construction review process; provides alternative appurtenances to use for overflow devices; provides more flexibility for PWSs in selecting water storage tanks; and aligns the commission's water and wastewater rules related to pipes and water distribution. Part of this intent involves correction of typographical and syntax errors, updating of citations, cross-references, and terminology.

The fourth intent of the adopted rulemaking is to make the rules more cost-effective and efficient for the regulated community and for the agency by eliminating the requirement to process desalination treatment requests and requests for use of chloramines as a primary disinfectant through the exceptions process under existing rules. The exceptions process can be burdensome and time-consuming. Desalination has become of increasing interest in the regulated community because of the on-going drought and the degradation of potential source water quality. The use of desalination technologies has become common for PWSs and the adopted rulemaking contains adequate safeguards to ensure that safe drinking water is provided to the public, while streamlining approval for the use of such technologies. Chloramines have been used as a secondary disinfectant for several years; its use as a primary disinfectant under the current rules requires approval through the exceptions process. The adopted rulemaking streamlines the use of chloramines as a primary disinfectant while ensuring adequate safeguards to ensure the provision of safe drinking water to the public.

Second, the adopted rulemaking does not meet the statutory definition of a "Major environmental rule" because the adopted rules would not adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state. It is not anticipated that the cost of complying with the adopted rules will be significant with respect to the economy as a whole or with respect to a sector of the economy; therefore, the adopted amendments will not adversely affect in a material way the economy, a sector of the economy, competition, or jobs.

Finally, the adopted rulemaking does not meet any of the four applicability requirements for a "Major environmental rule" listed in Texas Government Code, §2001.0225(a). Texas Government Code, §2001.0225 only applies to a major environmental rule, the result of which is to: 1) exceed a standard set by federal law, unless the rule is specifically required by state law; 2) exceed an express requirement of state law, unless the rule is specifically required by federal law; 3) exceed a requirement of a delegation agreement or contract between the state and an agency or representative of the federal government to implement a state and federal program; or 4) adopt a rule solely under the general powers of the agency instead of under a specific state law. The adopted rulemaking does not meet any of the preceding four applicability requirements because this rulemaking does not exceed any standard set by federal law for PWSs and is adopted to comply with standards set by the EPA; does not exceed any express requirement of state law under Texas Health and Safety Code (THSC), Chapter 341, Subchapter C; does not exceed a requirement of a delegation agreement or contract between the state and an agency or representative of the federal government but rather is adopted to comply with applicable federal standards related to the federal Safe Drinking Water Act; and is not adopted solely under the general powers of the agency, but specifically under THSC, §341.031, which gives the commission authority to establish standards ensuring the supply of safe drinking water, as well as the other general powers of the commission.

The commission invited public comment regarding this draft regulatory impact analysis determination during the public comment period. No comments were received on the draft regulatory impact analysis determination.

Takings Impact Assessment

The commission evaluated this adopted rulemaking and performed analysis of whether these adopted rules constitute a taking under Texas Government Code, Chapter 2007. The specific purpose of the adopted rules is to amend Chapter 290 for consistency with TWC, §12.013, and Chapter 13, and with existing federal legislation and guidance; and provide clarification on and increased efficiency under existing state rules. The adopted rules would substantially advance the stated purpose by amending the rules to reflect the reduced lead content allowed under federal legislation in pipes, pipe fittings, and plumbing fittings and fixtures; by changing the appropriate *E. coli* trigger level for small PWSs; by creating a process for approving desalination technology; by establishing chloramine disinfection criteria; by modifying the plan review submittal process; by clarifying the enforceability of exceptions; by clarifying the well construction review process; by providing alternative appurtenances for overflow devices; by clarifying water storage requirements; by clarifying the rules regulating water distribution crossings; by correcting typographical and syntax errors; and by updating citations, cross-references, and terminology.

The commission's analysis indicates that Texas Government Code, Chapter 2007, does not apply to these adopted rules based upon exceptions to applicability in Texas Government Code, §2007.003(b). First, the adopted rulemaking is an action that is reasonably taken to fulfill an obligation mandated by federal law, exempt under Texas Government Code, §2007.003(b)(4). In order to maintain primacy over public drinking water, the state must enact rules no less stringent than the federal requirements. Second, the adopted rulemaking includes a modification of an existing regulation that provides a unilateral expectation that does not rise to the level of a recognized interest in private real property, exempt under Texas Government Code, §2007.003(b)(5). Chapter 290 is a set of existing rules that regulate public drinking water. The unilateral expectation on the part of the agency is that the regulated community will comply with the amended rules in Chapter 290; the unilateral expectation on the part of the regulated community is that the agency will enforce the amended rules in Chapter 290. Neither unilateral expectation rises to the level of a recognized interest in private real property because Chapter 290 regulates public drinking water.

Further, the commission has determined that promulgation and enforcement of these adopted rules would be neither a statutory nor a constitutional taking of private real property. Specifically, there are no burdens imposed on private real property under the rules because the adopted rules neither relate to, nor have any impact on, the use or enjoyment of private real property, and there would be no reduction in property value as a result of these rules. The rules require PWSs to comply with drinking water standards protective of human health and the environment, and the rules bring those standards into concurrence with the corresponding federal requirements. The rules also clarify and make existing rules more efficient, thereby streamlining regulation rather than making it burdensome. Therefore, the adopted rules would not constitute a taking under Texas Government Code, Chapter 2007.

Consistency with the Coastal Management Program

The commission reviewed the adopted rules and found that they are neither identified in Coastal Coordination Act Implementation Rules, 31 TAC §505.11(b)(2) or (4), nor will they affect any action/authorization identified in Coastal Coordination Act Implementation Rules, 31 TAC §505.11(a)(6). Therefore, the adopted rules are not subject to the Texas Coastal Management Program (CMP).

The commission invited public comment regarding the consistency with the CMP during the public comment period. No comments were received regarding the consistency of this rulemaking with the CMP.

Public Comment

The commission held a public hearing on this proposal in Austin on February 26, 2015, and no oral testimony occurred. The comment period closed on March 10, 2015. The commission received timely written comments from the South Central Membrane Association with the support of the American Membrane Technology Association (SCMA/AMTA) and two individuals.

The comments focused on the reverse osmosis and nanofiltration requirements and the chloramination requirements. The comments on reverse osmosis and nanofiltration included questions on: a reverse osmosis and nanofiltration definition; the water sources that may be treated by reverse osmosis and nanofiltration; when a plan review and a baseline study is required; the location of conductivity samples; the use of historical classes for training requirements; the maintenance of records; when a module must be replaced; and, the calibration interval for instruments. The comments on chloramination included questions on: when a nitrification action plan is required; where the nitrification action plan samples can be taken; disinfection sample collection; mixing requirements; drain requirements; sample accuracy limits; and, color comparators. The comments have been summarized in the Response to Comments section of the preamble.

Response to Comments

An individual commented on the preamble's fiscal note stating that the "*Costs to State and Local Government, Additional Staff Recommendations, Chloramine Disinfection Criteria*" did not include the cost of creating a nitrification action plan.

The commission respectfully disagrees that the cost of creating a nitrification action plan should have been addressed in the fiscal note. The nitrification action plan is a site-specific plan describing the levels of total chlorine, monochloramine, ammonia, nitrite, and nitrate that are acceptable and what levels should initiate actions such as additional sampling to determine the cause of the imbalance. Nitrification in the PWS's distribution system is a concern as it can cause a loss of residual that allows bacterial regrowth and raise nitrite and nitrate to levels that have been shown to potentially harm infants. The commission responds that the TCEQ has directed significant resources toward ensuring PWSs have the most recent exception language which includes a requirement for a nitrification action plan and plain-language instructions on how to create the nitrification action plan, which is available as *Enclosure 2: Monitoring Plan Alert and Action Levels* at http://www.tceq.texas.gov/assets/public/permitting/watersupply/pdw/Use_of_Chloramines.pdf. Additionally, the cost associated with creation of a nitrification action plan is minimal. The commission provides free, on-site

assistance for creation of a nitrification action plan through the Water Supply Division's financial, managerial and technical (FMT) assistance program, which can further lessen the cost for a PWS to develop a nitrification action plan. Information regarding the TCEQ's FMT program is available at *http://www.tceq.texas.gov/drinkingwater/fmt*. Interested PWSs can contact the FMT Program Coordinator by calling (512) 239-4691, by email at *pdws@tceq.texas.gov*, or by submitting the TCEQ's *Financial, Managerial & Technical Assistance Referral Form* (commission Form 20167). No change has been made in response to this comment.

Process for Approving Desalination Technology

An individual commented on §290.38(79), stating that "*while this definition of stage is certainly correct, it is not completely clear as to its intent*" and further commented "[*a*] *single stage would be a set of pressure vessels installed in parallel. Any vessels connected in series to those parallel vessels would then be considered an additional stage*." The individual requested TCEQ clarify this definition as it pertains to multiple stages.

The commission responds that this definition was taken directly from the AWWA's manual of *Water Supply Practices, M46, Reverse Osmosis and Nanofiltration*. The commission acknowledges that PWSs may be

constructed with multiple stages and passes, and in different configurations. The definition of "stage" is not intended to cover all scenarios. The commission's intent in incorporating this definition in the adopted rule is to assist readers of the rule with a basic understanding of the commission's regulatory requirements. No change has been made in response to this comment.

SCMA/AMTA commented on §290.39(e)(7), asking if there is a minimum time period expected for collecting the baseline performance data reported in the engineering report's addendum.

The commission responds that a minimum time to collect baseline performance data has not been specified in the rule. However, the rule does specify that the addendum must be submitted to the executive director and approved prior to using the reverse osmosis or nanofiltration system to produce drinking water. Each source water is different and the time necessary to collect the baseline data should be determined by the PWS and its professional engineer. Please contact the Water Supply Division's Plan and Technical Review Team at (512) 239-4691 if individual guidance is needed. No change has been made in response to this comment.

SCMA/AMTA commented on §290.39(e)(7), asking if "*the submitted addendum* [i]s *subject to review and approval by the TCEQ before the production of drinking water or is the addendum for record purposes*."

The commission responds that the addendum must be submitted to the executive director and approved prior to using the reverse osmosis or nanofiltration system to produce drinking water. The commission has mimicked the existing process for its approval of wells in its desalination technology rules. The well approval process allows the design engineer to present the engineering plans and specifications for approval first then, after construction, to validate the water quality produced by the well. No change has been made in response to this comment.

SCMA/AMTA commented on §290.39(e)(7)(A), questioning if the PWS is responsible for providing TCEQ with a new baseline upon membrane replacement at some time in the future. SCMA/AMTA also commented on §290.39(e)(6), questioning "*what documentation would TCEQ require if a water utility changes membranes from one manufacturer to another*," identifying two potential scenarios: 1) changing to recognized equivalent (both brackish reverse osmosis membranes), and 2) changing the type of membrane (from brackish reverse osmosis to low energy reverse osmosis, or vice versa).

The commission responds that a new plan submittal and baseline performance data will most likely need to be provided any time the manufacture or model has been changed, but these items may not be required in all circumstances. The TCEQ acknowledges that there may be some situations where a new plan submittal and/or baseline data may not be necessary. In response to this comment, the commission has revised §290.39(j)(1)(D) - (F) and has added §290.39(j)(4)(A) - (E) to require written notification of membrane replacement or change of membrane modules instead of requiring plan submittal in all cases. The PWS will be sent a letter if a new plan submittal and/or baseline performance data is required.

SCMA/AMTA commented on §290.39(e)(7)(A) - (E), asking "[*i*]*s the membrane cleaning frequency, as required in Section 7(B), the design cleaning frequency or the verified frequency determined after sufficient operating time? Depending on the interpretation of Section 7, there may be a scenario where a PWS would be required to delay drinking water production until items (A) - (E) are established for inclusion in the addendum.*"

The commission responds that the items specified in the addendum must be

reviewed and approved prior to drinking water production. However, the intent of the addendum is for the PWS and their engineer to compile data to determine baseline performance during start up in a relatively short timeframe (for example, a few days and not the standard 90 day pilot study), with the exception of the PWS's receipt of laboratory results. Regarding §290.39(e)(7)(B), the design engineer should select a set-point (based on the loss of performance from baseline) that would be a trigger for the PWS to clean the membranes. Alternatively, the rule allows for the engineer to set a time interval for cleaning. In §290.39(e)(7)(A) - (E), the commission mimicked the existing process for its approval of wells. The well approval process allows the design engineer to present the engineering plans and specifications for approval first then, after construction, to validate the water quality produced by the well. No change has been made in response to this comment.

SCMA/AMTA commented on §290.42(b)(9)(G), questioning "[*i*]*s TCEQ looking at total feed and permeate conductivity reading at each unit?*" SCMA/AMTA further commented on §290.46(f)(3)(B)(x), asking "[*i*]*s the requirement for monitoring the conductivity with respect to total or individual units?*"

The commission agrees that clarification of the proposed rules is necessary.

In response to this comment, the commission has revised §290.42(b)(9)(G) to specify feed and permeate conductivity monitoring on each individual membrane unit at a nanofiltration or reverse osmosis plant because the executive director's staff inadvertently used an undefined term of "facility" in the proposed rule instead of the defined term of "membrane unit." The commission also revised §290.46(f)(3)(B)(x) to specify feed and permeate conductivity monitoring on each individual membrane unit at a nanofiltration or reverse osmosis plant because the location for the conductivity results that are to be maintained for three years was not specified in the proposed rule.

SCMA/AMTA commented on §290.42(b)(9)(K), stating they "*liked the requirement for having instrumentation between stages, such as pressure indicators, which make it easier to troubleshoot systems*."

The commission acknowledges the support expressed by the commenter. No change has been made in response to this comment.

An individual commented on §290.42(d)(17), noting that it will greatly reduce the burden for surface water systems which would also wish to include reverse osmosis nanofiltration and commending its inclusion. The individual also requested that TCEQ consider the inclusion of identical language in proposed §290.42(d)(17) in a new paragraph under §290.42(c).

The commission acknowledges the support expressed by the commenter and agrees that the language in proposed §290.42(d)(17) should be included in §290.42(c). PWSs using groundwater under the direct influence of surface water sources should be able to utilize reverse osmosis and nanofiltration as contemplated by the proposed rules. In response to this comment, the commission added §290.42(c)(8) to address this inadvertent oversight in the proposed rule.

SCMA/AMTA commented on §290.42(l), asking if the baseline performance data (that is required to be maintained in the Plant Operations Manual) will need to be changed after cleaning when the membrane performance is not restored to the original baseline performance.

The commission responds that regardless of the changes in performance after membrane cleaning, the original baseline performance data is the only baseline data to be kept in the Plant Operations Manual. The intent of the requirement to maintain the original baseline data is for the plant operations staff to be aware of changes in plant performance since start up

so they can evaluate the effectiveness of cleaning regimes, and prepare for when membrane replacement or other service is required. No change has been made in response to this comment.

SCMA/AMTA questioned whether the TCEQ will require a minimum license level for operation of membrane facilities in §290.46(e)(2)(D).

The adopted rule does not change the minimum operator level required for either a groundwater or surface water treatment facility. The rule change only addresses the requirement for an approved training that addresses concerns unique to reverse osmosis and nanofiltration processes. No change has been made in response to this comment.

SCMA/AMTA questioned whether the TCEQ will recognize/grandfather training taken by an operator prior to the rule's effective date.

The commission responds that it will consider courses taken in the past. The criteria for course acceptance is being developed through a stakeholder process. In response to comment, the commission amended §290.46(e)(2)(D) to allow operators to complete the training by August 31, 2016. This will allow adequate time for operators to take a training class if

they have not previously taken one. Additionally, the commission will consider courses an operator has previously taken which meet the executive director's criteria for approval. The TCEQ's criteria for approving training courses or events will be developed through a stakeholder process.

SCMA/AMTA asked whether operators will be required to have a minimum experience of operating a membrane plant in addition to certification in §290.46(e)(2)(D).

At this time, there are no minimum experience requirements for operators at a membrane plant. No change has been made in response to this comment.

SCMA/AMTA commented on §290.46(f)(3)(A)(vi), requesting that the TCEQ consider adding the chemicals used and the reason that triggered the cleaning (e.g., an increase of pressure to 10 pounds per square inch) to the list for maintained records of the clean-in-place procedure.

The commission respectfully disagrees that the requested rule additions are necessary. The commission responds that, under existing §290.46(f)(3)(A)(i), the list of chemicals used must be maintained in the PWS's records; therefore, no change has been made in response to this

comment. The commission concurs that the PWS best practices should include documenting the reason for the clean-in-place, even if the clean-in-place was simply conducted at a scheduled interval. Knowing the reason for the cleaning is important to extend the lifecycle of the membrane and also when troubleshooting problems. Knowing the reason for the cleaning is not necessary to support TCEQ's health-based requirements; therefore, no change has been made in response to this comment.

SCMA/AMTA commented on §290.46(f)(3)(B)(x), requesting that TCEQ consider changing the phrase "transmembrane pressure differential" to "pressure differential across a membrane vessel" as the term "transmembrane pressure" is generally associated with low pressure membranes.

The commission concurs and, in response, has revised §290.46(f)(3)(B)(x).

SCMA/AMTA commented on §290.46(m)(7), suggesting that the cleaning and replacement of membrane elements be left to the discretion of the PWS instead of the proposed requirement that reverse osmosis or nanofiltration systems be cleaned or replaced in accordance with the allowable operating conditions of the manufacturer.

The commission respectfully disagrees that the rule infringes on the

discretion of a PWS to make operating decisions. The commission responds that the adopted rule is not intended to require the PWS to replace the membranes based solely upon the manufacturer's terms. The rule requires the cleaning and replacement of membranes to be based upon local membrane performance. The commission cautions that unintended damage may occur if membranes are exposed to chemicals, pressures, temperatures, or operating procedures that have been identified as unacceptable by the manufacturer. No change has been made in response to this comment.

SCMA/AMTA commented on §290.46(s)(2)(G), proposing the replacement of the requirement for calibration of conductivity monitoring devices from once a year to "*in accordance with the manufacturer's specifications.*" SCMA/AMTA asks if once a year is sufficient for calibrating a conductivity meter.

The commission respectfully disagrees that calibration for conductivity monitoring devices should be based on the manufacturer's specifications because the proposed rule is clear, yet offers flexibility. The adopted rule states that conductivity (or total dissolved solids) meters must be calibrated at least once a year and does not preclude the PWS from conducting more frequent calibrations based upon the manufacture's recommendations or

local decisions. No change has been made in response to this comment.

Chloramine Disinfection Criteria

An individual requests clarification on mixing that is required to disperse chemicals in §290.42(e)(7)(B). The individual questioned "*what defines mixing*" and further commented "[*f*]*or example, is an injector designed to inject chemical at the center of a pipe sufficient?*" SCMA/AMTA commented that the commission should grandfather those plants that are not designed or constructed with mixing equipment (e.g., in-line mixers) in order to allow them to meet the requirements of §290.42(e)(7)(B).

The commission respectfully disagrees that revision of the proposed rule is necessary and responds that the intent of the requirement was to assure efficient chemical dispersion. Mixing chlorine and ammonia correctly assures adequate disinfection and saves a PWS money by ensuring that chemicals are not overdosed. There are numerous ways to assure adequate mixing, including those referenced in the comments. The proposed rule language allowed flexibility for PWSs to implement appropriate technology as necessary. Therefore, there is no need to grandfather those plants because flexibility has already been provided in §290.42(e)(7)(B) and many of the methods already installed work adequately. No change has been made in response to these comments.

An individual stated that a sample tap is required before and after each chemical injection point in §290.42(e)(7)(C) and that chlorine must be monitored before ammonia is added in §290.110(c)(5)(C). The individual commented that these plants feed chlorine and ammonia close together to limit disinfection byproduct formation, thus making sampling before and after each injection point impractical. The individual recommended putting this practice of measuring free chlorine prior to the addition of ammonia in a guidance document instead of in the commission's rules. SCMA/AMTA also commented that the commission should grandfather those plants not built to accommodate the proposed sample points in §290.42(e)(7)(C).

The commission specifically requested comments regarding this requirement because the commission recognized that the industry could have difficulty making changes to accomplish the proposed requirement. This requirement was proposed because dosing chloramines correctly in surface water treatment plants is important to ensure the assumed viral log removal in the EPA's Surface Water Treatment Rules and correct dosing at any location is required to ensure that monochloramine is formed and that chemicals are not over or underfed. However, some source waters are more challenging to treat because even short periods (seconds) of free chlorine contact before ammonia addition can allow formation of regulated

disinfection byproducts. In response to these comments, the commission has revised §290.42(e)(7)(C) and its subdivisions to apply to installations submitted for plan approval starting January 1, 2016, and to include the recognition that some installations after that time may have the need to locate chlorine injection points closer to the subsequent ammonia injection point to control disinfection byproduct formation so that there is no room for the tap between the two injectors. However, a tap must be provided before any chemical injection and after the second chemical is injected. The January 1, 2016, date was chosen to give the professional engineers time to add the additional taps to projects. Also, the date was chosen to not impose the condition on projects that had already been submitted to the commission for approval. Additionally, in response to these comments, the commission has revised §290.110(c)(5)(C)(iii) to reference that the sampling must occur between the injection of the two chemicals only if a sample tap is required or present.

SCMA/AMTA commented on §290.43(c)(7), questioning what the word "efficiently" means, and asked TCEQ to consider grandfathering tanks not designed or constructed with the means to drain efficiently.

The commission acknowledges that the term "efficiently" could be vague,

and in response has revised §290.43(c)(7) to instead state "[*e*]*ach clearwell or potable water storage tank must be designed to drain the tank.*" Regarding the request to grandfather the design of tanks, the commission respectfully disagrees that revision of the proposed rule is necessary because the commission does not approve tanks designed without drains. In the preamble the commission referenced an example where a PWS took several days to drain a tank during a nitrification event, which is a public health risk. The lack of a drain presents an immediate public health risk. The ability to drain a tank to remove water with high levels of nitrate or nitrite is critical. No change has been made in response to this comment.

An individual suggested requiring a nitrification action plan in §290.46(z) only if distribution chlorine residual regulations are not met, or allowing reduced monitoring for systems in compliance with total chlorine residual requirements. Alternatively, SCMA/AMTA referenced §290.110(c)(5), suggesting that a nitrification action plan may only be required if action levels are exceeded.

The commission respectfully disagrees that revision of the proposed rules is necessary and responds that chloramination is a complex process that must be monitored to assure safe drinking water is produced. A PWS with compliant total chlorine residuals can experience nitrification. The intent

of the nitrification action plan is to prevent or control nitrification. If the nitrification action plan is only required after exceedances which may cause unsafe water, it would not fulfill the public health intent of the requirement, because it would not prevent or control nitrification. The commission has required nitrification action plans as a condition of the site-specific exceptions for several years. No change has been made in response to these comments.

SCMA/AMTA recommended amending §290.46(z), replacing the word "prevent" with "control."

The commission concurs with this comment and responds that while prevention is the ultimate goal, nothing in nature can be completely prevented. In response to this comment, the phrase "to prevent nitrification" is removed from §290.46(z) as proposed, rather than replacing the verb with "control" as suggested, to eliminate confusion. Additionally, the phrase "distributing chloraminated water" has been added to adopted §290.46(z) to maintain consistency with Chapter 290.

An individual questioned what will be the specific sampling requirements of the nitrification action plan in §290.46(z).

The commission responds that the minimum nitrification action plan baseline and continuing sampling locations and frequencies has been specified in §290.110(c)(4) and (5) and their subdivisions. No change has been made in response to this comment.

An individual recommends Total Coliform Rule (TCR) sample sites be used for nitrification action plan sampling described in §290.46(z). Similarly, SCMA/AMTA recommends using the TCR sample sites for nitrification action plan sampling, referencing §290.110(c)(4).

The commission respectfully disagrees that revision of the proposed rules is necessary. The commission responds that nitrification action plan distribution system samples for monochloramine and free ammonia are to be taken at the same time and place as the total chlorine residual samples required by §290.110(c)(4). The existing rule allows the flexibility for the disinfectant residual samples to be taken at the TCR sample locations or at the routine disinfectant level monitoring locations. Existing regulations in §290.110 and §290.121 require PWSs to set appropriate sample sites that are representative of the distribution system and to document these locations in their monitoring plan. No change has been made in response to

these comments.

SCMA/AMTA recommends incorporating a one or two year grace period for PWSs to develop a meaningful data set for action levels in §290.46(z)(2) and §290.110(c)(5) because the baseline data collection may take longer than proposed.

The commission respectfully disagrees that revision of the proposed rules is necessary. The commission responds that an initial nitrification action plan may be developed with less than a year of data collection. A nitrification action plan, like any operating instruction document, is a living document that will be revised to accommodate changes over time, including subsequent data collection. Further, the commission notes that the site-specific exceptions have required development of nitrification action plans for several years, so most PWSs have already developed a nitrification action plan. Finally, the TCEQ provides free, on-site assistance for nitrification action plan development through the Water Supply Division's FMT assistance program. Information regarding the TCEQ's FMT program is available at *http://www.tceq.texas.gov/drinkingwater/fmt*. Interested PWSs can contact the FMT Program Coordinator by calling (512) 239-4691, by email at *pdws@tceq.texas.gov*, or by submitting the TCEQ's *Financial, Managerial & Technical Assistance Referral Form* (commission Form

20167). No change has been made in response to this comment.

SCMA/AMTA suggested quarterly or annual sampling for the chloramine effectiveness suite for systems that demonstrate consistently meeting target levels for weekly sampling as required in §290.110(c)(5)(C).

The commission respectfully disagrees that revision of the proposed rules is necessary. The commission responds that distribution systems are a dynamic and changing environment and small changes in the system, not caused by the PWS, can result in large changes in the chloramination chemistry. For example, many PWSs had trouble in 2007 during an extremely wet year which caused nitrification in PWSs that had not had any issues previously. Weekly sampling is required to assure the health and safety of the drinking water. No change has been made in response to this comment.

SCMA/AMTA commented requesting clarification of whether TCR sample sites are intended to be used for the monitoring described under §290.110(c)(5)(C)(v), which relates to monitoring for monochloramine and free ammonia after injection of chloramination chemicals within the distribution system.

The commission responds that the requirements of §290.110(c)(5)(C)(v) regarding the monitoring monochloramine and free ammonia after the addition of chloramination chemicals within the distribution system, commonly known as booster chloramination, is to determine whether the chloramines are being dosed properly. Therefore, the sample locations used for this monitoring should be close enough to the booster location to provide immediate knowledge of the impact of chemical addition on the ratio and concentration of total chlorine, monochloramine, and free ammonia. If a coliform sample site is present in such a location, the rule allows the flexibility to use that sample site. However, the PWS's existing coliform sample sites may be too far away from the booster station to provide meaningful data, so requiring use of a TCR site would not accomplish the intent of the rule. No change has been made in response to this comment.

SCMA/AMTA suggested increased nitrate and nitrite sampling from quarterly to monthly at TCR sites in §290.110(c)(5)(D)(ii).

The commission respectfully disagrees that revision of the proposed rules is necessary and responds that the intent of the chloramine effectiveness suite is to provide the water system with the ability to respond prior to

nitrification events. Monitoring parameters such as monochloramine, free ammonia and total chlorine frequently provides the PWS with meaningful data to be able to respond before nitrification occurs. Nitrification has an acute health impact and can also be difficult to eliminate once it has begun; thus, the TCEQ has focused on providing proactive - not reactive - steps within its rule. The quarterly nitrate and nitrite sampling is intended to be a minimum sampling frequency. The commission concurs that many PWSs may find that additional sampling is necessary as a response to system specific action levels as defined in each PWS's nitrification action plan. Also, a PWS may want to expand the number of sampling points or frequency of the sampling to provide more insight into the condition of the distribution system. The rule's flexibility allows for more frequent than quarterly sampling. No change has been made in response to this comment.

SCMA/AMTA expressed concern on the requirements for the use of color comparators in §290.110(d)(1), specifically asking whether color comparators have been a source of inaccurate compliance data.

The commission responds that color comparators have been a source of inaccurate data in the past. The causes of the inaccuracies, such as a faded color chart, were used to create the criteria for accurate operation of the

color comparator tool that appears in the rule. No change has been made in response to this comment.

SCMA/AMTA questioned if the proposed minimum accuracy level for nitrite and nitrate is adequate for detecting nitrification and recommended amending §290.42(e)(7)(E)(v) to include a detection limit of 0.01 mg/L as N for nitrite.

The commission responds that the specific minimum accuracy levels for the equipment listed in §290.42(e)(7)(E)(v) are contained in §290.110(d)(5) and (6) as 0.5 mg/L as N for nitrate and 0.05 mg/L as N for nitrite, respectively. The commission acknowledges that changes in levels as low as 0.01 mg/L as N for nitrite may be meaningful in detecting nitrification. Upon consideration of the submitted comment and based upon the proven accuracy of commonly available methods, the commission agrees that the minimum accuracy levels of nitrite and nitrate in §290.110(d)(5) and (6) should be revised to 0.1 mg/L as N for nitrate and 0.01 mg/L as N for nitrite, respectively, and, in response, has revised §290.110(d)(5) and (6) accordingly. The commission notes that PWSs can still choose more stringent methods.

SUBCHAPTER D: RULES AND REGULATIONS FOR PUBLIC WATER SYSTEMS

§§290.38, 290.39, 290.41 - 290.47

Statutory Authority

The amendments are adopted under Texas Water Code (TWC), §5.102, which establishes the commission's general authority necessary to carry out its jurisdiction; TWC, §5.103, which establishes the commission's general authority to adopt rules; TWC, §5.105, which establishes the commission's authority to set policy by rule; Texas Health and Safety Code (THSC), §341.031, which allows the commission to adopt rules to comply with standards established by the United States Environmental Protection Agency pursuant to the federal Safe Drinking Water Act, 42 United States Code, §§300f to 300j-6; and, THSC, §341.0315, which requires public water systems to comply with commission rules adopted to ensure the supply of safe drinking water.

The adopted amendments implement TWC, §§5.102, 5.103, and 5.105; THSC, §341.031 and §341.0315; and, House Bill 1600 and Senate Bill 567, both enacted during the 83rd Texas Legislature, 2013.

§290.38. Definitions.

The following words and terms, when used in this chapter shall have the following meanings, unless the context clearly indicates otherwise. If a word or term used in this chapter is not contained in the following list, its definition shall be as shown in 40 Code of Federal Regulations (CFR) §141.2. Other technical terms used shall have the meanings or definitions listed in the latest edition of *The Water Dictionary: A Comprehensive Reference of Water Terminology*, prepared by the American Water Works Association.

(1) Affected utility--A retail public utility (§291.3 of this title (relating to Definitions of Terms)), exempt utility (§291.103(d)(1) of this title (relating to Certificates Not Required)), or provider or conveyor of potable or raw water service that furnishes water service to more than one customer:

(A) in a county with a population of 3.3 million or more; or

(B) in a county with a population of 550,000 or more adjacent to a county with a population of 3.3 million or more.

(2) Air gap--The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet conveying water to a tank, fixture, receptor, sink, or other assembly and the flood level rim of the receptacle.

The vertical, physical separation must be at least twice the diameter of the water supply outlet, but never less than 1.0 inch.

(3) American National Standards Institute (ANSI) standards--The standards of the American National Standards Institute, Inc.

(4) American Society of Mechanical Engineers (ASME) standards--The standards of the ASME.

(5) American Water Works Association (AWWA) standards--The latest edition of the applicable standards as approved and published by the AWWA.

(6) Approved laboratory--A laboratory approved by the executive director to analyze water samples to determine their compliance with certain maximum or minimum allowable constituent levels.

(7) ASTM International standards--The standards of ASTM International (formerly known as the American Society for Testing and Materials).

(8) Auxiliary power--Either mechanical power or electric generators which can enable the system to provide water under pressure to the distribution system in the

event of a local power failure. With the approval of the executive director, dual primary electric service may be considered as auxiliary power in areas which are not subject to large scale power outages due to natural disasters.

(9) Bag filter--Pressure-driven separation device that removes particulate matter larger than 1 micrometer using an engineered porous filtration media. They are typically constructed of a non-rigid, fabric filtration media housed in a pressure vessel in which the direction of flow is from the inside of the bag to the outside.

(10) Baseline performance--In reference to a membrane treatment facility, the detailed assessment of observed operational conditions at the time the membrane facility is placed in service for the purpose of tracking changes over time and determining when maintenance or service is required. Examples of parameters where baseline performance data is collected include: net driving pressure, normalized permeate flow, salt rejection, and salt passage.

(11) Cartridge filter--Pressure-driven separation device that removes particulate matter larger than 1 micrometer using an engineered porous filtration media. They are typically constructed as rigid or semi-rigid, self-supporting filter elements housed in pressure vessels in which flow is from the outside of the cartridge to the inside.

(12) Certified laboratory--A laboratory certified by the commission to analyze water samples to determine their compliance with maximum allowable constituent levels. After June 30, 2008, laboratories must be accredited, not certified, in order to perform sample analyses previously performed by certified laboratories.

(13) Challenge test--A study conducted to determine the removal efficiency (log removal value) of a device for a particular organism, particulate, or surrogate.

(14) Chemical disinfectant--Any oxidant, including but not limited to chlorine, chlorine dioxide, chloramines, and ozone added to the water in any part of the treatment or distribution process, that is intended to kill or inactivate pathogenic microorganisms.

(15) Community water system--A public water system which has a potential to serve at least 15 residential service connections on a year-round basis or serves at least 25 residents on a year-round basis.

(16) Connection--A single family residential unit or each commercial or industrial establishment to which drinking water is supplied from the system. As an example, the number of service connections in an apartment complex would be equal to

the number of individual apartment units. When enough data is not available to accurately determine the number of connections to be served or being served, the population served divided by three will be used as the number of connections for calculating system capacity requirements. Conversely, if only the number of connections is known, the connection total multiplied by three will be the number used for population served. For the purposes of this definition, a dwelling or business which is connected to a system that delivers water by a constructed conveyance other than a pipe shall not be considered a connection if:

(A) the water is used exclusively for purposes other than those defined as human consumption (see human consumption);

(B) the executive director determines that alternative water to achieve the equivalent level of public health protection provided by the drinking water standards is provided for residential or similar human consumption, including, but not limited to, drinking and cooking; or

(C) the executive director determines that the water provided for residential or similar human consumption is centrally treated or is treated at the point of entry by a provider, a pass through entity, or the user to achieve the equivalent level of protection provided by the drinking water standards.

(17) Contamination--The presence of any foreign substance (organic, inorganic, radiological, or biological) in water which tends to degrade its quality so as to constitute a health hazard or impair the usefulness of the water.

(18) Cross-connection--A physical connection between a public water system and either another supply of unknown or questionable quality, any source which may contain contaminating or polluting substances, or any source of water treated to a lesser degree in the treatment process.

(19) Direct integrity test--A physical test applied to a membrane unit in order to identify and isolate integrity breaches/leaks that could result in contamination of the filtrate.

(20) Disinfectant--A chemical or a treatment which is intended to kill or inactivate pathogenic microorganisms in water.

(21) Disinfection--A process which inactivates pathogenic organisms in the water by chemical oxidants or equivalent agents.

(22) Distribution system--A system of pipes that conveys potable water from a treatment plant to the consumers. The term includes pump stations, ground and elevated storage tanks, potable water mains, and potable water service lines and all associated valves, fittings, and meters, but excludes potable water customer service lines.

(23) Drinking water--All water distributed by any agency or individual, public or private, for the purpose of human consumption or which may be used in the preparation of foods or beverages or for the cleaning of any utensil or article used in the course of preparation or consumption of food or beverages for human beings. The term "Drinking Water" shall also include all water supplied for human consumption or used by any institution catering to the public.

(24) Drinking water standards--The commission rules covering drinking water standards in Subchapter F of this chapter (relating to Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Systems).

(25) Elevated storage capacity--That portion of water which can be stored at least 80 feet above the highest service connection in the pressure plane served by the storage tank.

(26) Emergency operations--The operation of an affected utility during an extended power outage at a minimum water pressure of 35 pounds per square inch.

(27) Emergency power--Either mechanical power or electric generators which can enable the system to provide water under pressure to the distribution system in the event of a local power failure. With the approval of the executive director, dual primary electric service may be considered as emergency power in areas which are not subject to large scale power outages due to natural disasters.

(28) Extended power outage--A power outage lasting for more than 24 hours.

(29) Filtrate--The water produced from a filtration process; typically used to describe the water produced by filter processes such as membranes.

(30) Flux--The throughput of a pressure-driven membrane filtration system expressed as flow per unit of membrane area. For example, gallons per square foot per day or liters per hour per square meter.

(31) Groundwater--Any water that is located beneath the surface of the ground and is not under the direct influence of surface water.

(32) Groundwater under the direct influence of surface water--Any water beneath the surface of the ground with:

(A) significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium*;

(B) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions; or

(C) site-specific characteristics including measurements of water quality parameters, well construction details, existing geological attributes, and other features that are similar to groundwater sources that have been identified by the executive director as being under the direct influence of surface water.

(33) Health hazard--A cross-connection, potential contamination hazard, or other situation involving any substance that can cause death, illness, spread of

disease, or has a high probability of causing such effects if introduced into the potable drinking water supply.

(34) Human consumption--Uses by humans in which water can be ingested into or absorbed by the human body. Examples of these uses include, but are not limited to drinking, cooking, brushing teeth, bathing, washing hands, washing dishes, and preparing foods.

(35) Indirect integrity monitoring--The monitoring of some aspect of filtrate water quality, such as turbidity, that is indicative of the removal of particulate matter.

(36) Innovative/alternate treatment--Any treatment process that does not have specific design requirements in §290.42(a) - (f) of this title (relating to Water Treatment).

(37) Interconnection--A physical connection between two public water supply systems.

(38) International Fire Code (IFC)--The standards of the International Code Council.

(39) Intruder-resistant fence--A fence six feet or greater in height, constructed of wood, concrete, masonry, or metal with three strands of barbed wire extending outward from the top of the fence at a 45 degree angle with the smooth side of the fence on the outside wall. In lieu of the barbed wire, the fence must be eight feet in height. The fence must be in good repair and close enough to surface grade to prevent intruder passage.

(40) L/d ratio--The dimensionless value that is obtained by dividing the length (depth) of a granular media filter bed by the weighted effective diameter "d" of the filter media. The weighted effective diameter of the media is calculated based on the percentage of the total bed depth contributed by each media layer.

(41) Licensed professional engineer--An engineer who maintains a current license through the Texas Board of Professional Engineers in accordance with its requirements for professional practice.

(42) Log removal value (LRV)--Removal efficiency for a target organism, particulate, or surrogate expressed as $\log_{10}$ (i.e., $\log_{10}$ (feed concentration) - $\log_{10}$ (filtrate concentration)).

(43) Maximum daily demand--In the absence of verified historical data or in cases where a public water system has imposed mandatory water use restrictions within the past 36 months, maximum daily demand means 2.4 times the average daily demand of the system.

(44) Maximum contaminant level (MCL)--The MCL for a specific contaminant is defined in the section relating to that contaminant.

(45) Membrane filtration--A pressure or vacuum driven separation process in which particulate matter larger than one micrometer is rejected by an engineered barrier, primarily through a size-exclusion mechanism, and which has a measurable removal efficiency of a target organism that can be verified through the application of a direct integrity test; includes the following common membrane classifications microfiltration (MF), ultrafiltration (UF), nanofiltration (NF), and reverse osmosis (RO), as well as any "membrane cartridge filtration" (MCF) device that satisfies this definition.

(46) Membrane $LRV_{C\text{-}Test}$--The number that reflects the removal efficiency of the membrane filtration process demonstrated during challenge testing. The value is based on the entire set of log removal values (LRVs) obtained during challenge testing, with one representative LRV established per module tested.

(47) Membrane module--The smallest component of a membrane unit in which a specific membrane surface area is housed in a device with a filtrate outlet structure.

(48) Membrane sensitivity--The maximum log removal value that can be reliably verified by a direct integrity test.

(49) Membrane unit--A group of membrane modules that share common valving, which allows the unit to be isolated from the rest of the system for the purpose of integrity testing or other maintenance.

(50) Milligrams per liter (mg/L)--A measure of concentration, equivalent to and replacing parts per million in the case of dilute solutions.

(51) Monthly reports of water works operations--The daily record of data relating to the operation of the system facilities compiled in a monthly report.

(52) National Fire Protection Association (NFPA) standards--The standards of the NFPA.

(53) NSF International--The organization and the standards, certifications, and listings developed by NSF International (formerly known as the National Sanitation Foundation) related to drinking water.

(54) Noncommunity water system--Any public water system which is not a community system.

(55) Nonhealth hazard--A cross-connection, potential contamination hazard, or other situation involving any substance that generally will not be a health hazard, but will constitute a nuisance, or be aesthetically objectionable, if introduced into the public water supply.

(56) Nontransient noncommunity water system--A public water system that is not a community water system and regularly serves at least 25 of the same persons at least six months out of the year.

(57) Pass--In reference to a reverse osmosis or nanofiltration membrane system, stages of pressure vessels in series in which the permeate from one stage is further processed in a following stage.

(58) Peak hourly demand--In the absence of verified historical data, peak hourly demand means 1.25 times the maximum daily demand (prorated to an hourly rate) if a public water supply meets the commission's minimum requirements for elevated storage capacity and 1.85 times the maximum daily demand (prorated to an hourly rate) if the system uses pressure tanks or fails to meet the commission's minimum elevated storage capacity requirement.

(59) Plumbing inspector--Any person employed by a political subdivision for the purpose of inspecting plumbing work and installations in connection with health and safety laws and ordinances, who has no financial or advisory interest in any plumbing company, and who has successfully fulfilled the examinations and requirements of the Texas State Board of Plumbing Examiners.

(60) Plumbing ordinance--A set of rules governing plumbing practices which is at least as stringent and comprehensive as one of the following nationally recognized codes:

(A) the International Plumbing Code; or

(B) the Uniform Plumbing Code.

(61) Potable water customer service line--The sections of potable water pipe between the customer's meter and the customer's point of use.

(62) Potable water service line--The section of pipe between the potable water main to the customer's side of the water meter. In cases where no customer water meter exists, it is the section of pipe that is under the ownership and control of the public water system.

(63) Potable water main--A pipe or enclosed constructed conveyance operated by a public water system which is used for the transmission or distribution of drinking water to a potable water service line.

(64) Potential contamination hazard--A condition which, by its location, piping or configuration, has a reasonable probability of being used incorrectly, through carelessness, ignorance, or negligence, to create or cause to be created a backflow condition by which contamination can be introduced into the water supply. Examples of potential contamination hazards are:

(A) bypass arrangements;

(B) jumper connections;

(C) removable sections or spools; and

(D) swivel or changeover assemblies.

(65) Process control duties--Activities that directly affect the potability of public drinking water, including: making decisions regarding the day-to-day operations and maintenance of public water system production and distribution; maintaining system pressures; determining the adequacy of disinfection and disinfection procedures; taking routine microbiological samples; taking chlorine residuals and microbiological samples after repairs or installation of lines or appurtenances; and operating chemical feed systems, filtration, disinfection, or pressure maintenance equipment; or performing other duties approved by the executive director.

(66) psi--Pounds per square inch.

(67) Public drinking water program--Agency staff designated by the executive director to administer the Safe Drinking Water Act and state statutes related to the regulation of public drinking water. Any report required to be submitted in this chapter to the executive director must be submitted to the Texas Commission on

Environmental Quality, Water Supply Division, MC 155, P.O. Box 13087, Austin, Texas 78711-3087.

(68) Public health engineering practices--Requirements in this subchapter or guidelines promulgated by the executive director.

(69) Public water system--A system for the provision to the public of water for human consumption through pipes or other constructed conveyances, which includes all uses described under the definition for drinking water. Such a system must have at least 15 service connections or serve at least 25 individuals at least 60 days out of the year. This term includes: any collection, treatment, storage, and distribution facilities under the 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. Two or more systems with each having a potential to serve less than 15 connections or less than 25 individuals but owned by the same person, firm, or corporation and located on adjacent land will be considered a public water system when the total potential service connections in the combined systems are 15 or greater or if the total number of individuals served by the combined systems total 25 or greater at least 60 days out of the year. Without excluding other meanings of the terms "individual" or "served," an

individual shall be deemed to be served by a water system if he lives in, uses as his place of employment, or works in a place to which drinking water is supplied from the system.

(70) Quality Control Release Value (QCRV)--A minimum quality standard of a non-destructive performance test established by the manufacturer for membrane module production that ensures that the module will attain the targeted log removal value demonstrated during challenge testing.

(71) Reactor Validation Testing--A process by which a full-scale ultraviolet (UV) reactor's disinfection performance is determined relative to operating parameters that can be monitored. These parameters include flow rate, UV intensity as measured by a UV sensor and the UV lamp status.

(72) Resolution--The size of the smallest integrity breach that contributes to a response from a direct integrity test in membranes used to treat surface water or groundwater under the direct influence of surface water.

(73) Sanitary control easement--A legally binding document securing all land, within 150 feet of a public water supply well location, from pollution hazards. This document must fully describe the location of the well and surrounding lands and must

be filed in the county records to be legally binding. For an example, see commission Form 20698.

(74) Sanitary survey--An onsite review of a public water system's adequacy for producing and distributing safe drinking water by evaluating the following elements: water source; treatment; distribution system; finished water storage; pump, pump facilities, and controls; monitoring, reporting, and data verification; system management, operation and maintenance; and operator compliance.

(75) Sensitivity--The maximum log removal value (LRV) that can be reliably verified by a direct integrity test in membranes used to treat surface water or groundwater under the direct influence of surface water; also applies to some continuous indirect integrity monitoring methods.

(76) Service line--A pipe connecting the utility service provider's main and the water meter, or for wastewater, connecting the main and the point at which the customer's service line is connected, generally at the customer's property line.

(77) Service pump--Any pump that takes treated water from storage and discharges to the distribution system.

(78) Significant deficiency--Significant deficiencies cause, or have the potential to cause, the introduction of contamination into water delivered to customers. This may include defects in design, operation, or maintenance of the source, treatment, storage, or distribution systems.

(79) Stage--In reference to a reverse osmosis or nanofiltration membrane system, a set of pressure vessels installed in parallel.

(80) Transfer pump--Any pump which conveys water from one point to another within the treatment process or which conveys water to storage facilities prior to distribution.

(81) Transient noncommunity water system--A public water system that is not a community water system and serves at least 25 persons at least 60 days out of the year, yet by its characteristics, does not meet the definition of a nontransient noncommunity water system.

(82) Vessel--In reference to a reverse osmosis or nanofiltration membrane system, a cylindrical housing unit where membrane modules are placed in a series to form one unit.

(83) Wastewater lateral--Any pipe or constructed conveyance carrying wastewater, running laterally down a street, alley, or easement, and receiving flow only from the abutting properties.

(84) Wastewater main--Any pipe or constructed conveyance which receives flow from one or more wastewater laterals.

§290.39. General Provisions.

(a) Authority for requirements. Texas Health and Safety Code (THSC), Chapter 341, Subchapter C prescribes the duties of the commission relating to the regulation and control of public drinking water systems in the state. The statute requires that the commission ensure that public water systems: supply safe drinking water in adequate quantities, are financially stable and technically sound, promote use of regional and area-wide drinking water systems, and review completed plans and specifications and business plans for all contemplated public water systems not exempted by THSC, §341.035(d). The statute also requires the commission be notified of any subsequent material changes, improvements, additions, or alterations in existing systems and, consider compliance history in approving new or modified public water systems. Texas Water Code (TWC), §13.1395, prescribes the duties of the commission relating to standards for emergency operations of affected utilities. The statute requires that the commission ensure that affected utilities provide water service as soon as safe and practicable during an extended power outage following the occurrence of a natural disaster.

(b) Reason for this subchapter and minimum criteria. This subchapter has been adopted to ensure regionalization and area-wide options are fully considered, the inclusion of all data essential for comprehensive consideration of the contemplated project, or improvements, additions, alterations, or changes thereto and to establish minimum standardized public health design criteria in compliance with existing state statutes and in accordance with good public health engineering practices. In addition, minimum acceptable financial, managerial, technical, and operating practices must be specified to ensure that facilities are properly operated to produce and distribute safe, potable water.

(c) Required actions and approvals prior to construction. A person may not begin construction of a public drinking water supply system unless the executive director determines the following requirements have been satisfied and approves construction of the proposed system.

(1) A person proposing to install a public drinking water system within the extraterritorial jurisdiction of a municipality; or within 1/2-mile of the corporate

boundaries of a district, or other political subdivision providing the same service; or within 1/2-mile of a certificated service area boundary of any other water service provider shall provide to the executive director evidence that:

(A) written application for service was made to that provider; and

(B) all application requirements of the service provider were satisfied, including the payment of related fees.

(2) A person may submit a request for an exception to the requirements of paragraph (1) of this subsection if the application fees will create a hardship on the person. The request must be accompanied by evidence documenting the financial hardship.

(3) A person who is not required to complete the steps in paragraph (1) of this subsection, or who completes the steps in paragraph (1) of this subsection and is denied service or determines that the existing provider's cost estimate is not feasible for the development to be served, shall submit to the executive director:

(A) plans and specifications for the system; and

(B) a business plan for the system.

(4) Emergency Preparedness Plan for Public Water Systems that are Affected Utilities.

(A) Each public water system that is also an affected utility, as defined by §290.38 of this title (relating to Definitions), is required to submit to the executive director, receive approval for, and adopt an emergency preparedness plan in accordance with §290.45 of this title (relating to Minimum Water System Capacity Requirements) using either the template in Appendix G of §290.47 of this title (relating to Appendices) or another emergency preparedness plan that meets the requirements of this section. Emergency preparedness plans are required to be prepared under the direction of a licensed professional engineer when an affected utility has been granted or is requesting an alternative capacity requirement in accordance with §290.45(g) of this title, or is requesting to meet the requirements of TWC, §13.1395, as an alternative to any rule requiring elevated storage, or as determined by the executive director on a case-by-case basis.

(B) Each affected utility that supplies, provides, or conveys surface water to wholesale customers shall include in its emergency preparedness plan under subparagraph (A) of this paragraph provision for the actual installation and maintenance of automatically starting auxiliary generators or distributive generation facilities for each raw water intake pump station, water treatment plant, pump station, and pressure facility necessary to provide water to its wholesale customers.

(C) The executive director shall review an emergency preparedness plan submitted under subparagraph (A) of this paragraph. If the executive director determines that the plan is not acceptable, the executive director shall recommend changes to the plan. The executive director must make its recommendations on or before the 90th day after the executive director receives the plan. In accordance with commission rules, an emergency preparedness plan must include one of the options listed in §290.45(h)(1)(A) - (H) of this title.

(D) Each affected utility shall install any required equipment to implement the emergency preparedness plan approved by the executive director immediately upon operation.

(E) The executive director may grant a waiver of the requirements for emergency preparedness plans to an affected utility if the executive director determines that compliance with this section will cause a significant financial burden on customers of the affected utility. The affected utility shall submit financial, managerial, and technical information as requested by the executive director to demonstrate the financial burden.

(d) Submission of plans.

(1) Plans, specifications, and related documents will not be considered unless they have been prepared under the direction of a licensed professional engineer. All engineering documents must have engineering seals, signatures, and dates affixed in accordance with the rules of the Texas Board of Professional Engineers.

(2) Detailed plans must be submitted for examination at least 30 days prior to the time that approval, comments or recommendations are desired. From this, it is not to be inferred that final action will be forthcoming within the time mentioned.

(3) The limits of approval are as follows.

(A) The commission's public drinking water program furnishes consultation services as a reviewing body only, and its licensed professional engineers may neither act as design engineers nor furnish detailed estimates.

(B) The commission's public drinking water program does not examine plans and specifications in regard to the structural features of design, such as strength of concrete or adequacy of reinforcing. Only the features covered by this subchapter will be reviewed.

(C) The consulting engineer and/or owner must provide surveillance adequate to assure that facilities will be constructed according to approved plans and must notify the executive director in writing upon completion of all work. Planning materials shall be submitted to the Texas Commission on Environmental Quality, Water Supply Division, MC 159, P.O. Box 13087, Austin, Texas 78711-3087.

(e) Submission of planning material. In general, the planning material submitted shall conform to the following requirements.

(1) Engineering reports are required for new water systems and all surface water treatment plants. Engineering reports are also required when design or capacity deficiencies are identified in an existing system. The engineering report shall include, at least, coverage of the following items:

(A) statement of the problem or problems;

(B) present and future areas to be served, with population data;

(C) the source, with quantity and quality of water available;

(D) present and estimated future maximum and minimum water quantity demands;

(E) description of proposed site and surroundings for the water works facilities;

(F) type of treatment, equipment, and capacity of facilities;

(G) basic design data, including pumping capacities, water storage and flexibility of system operation under normal and emergency conditions; and

(H) the adequacy of the facilities with regard to delivery capacity and pressure throughout the system.

(2) All plans and drawings submitted may be printed on any of the various papers which give distinct lines. All prints must be clear, legible and assembled to facilitate review.

(A) The relative location of all facilities which are pertinent to the specific project shall be shown.

(B) The location of all abandoned or inactive wells within 1/4-mile of a proposed well site shall be shown or reported.

(C) If staged construction is anticipated, the overall plan shall be presented, even though a portion of the construction may be deferred.

(D) A general map or plan of the municipality, water district, or area to be served shall accompany each proposal for a new water supply system.

(3) Specifications for construction of facilities shall accompany all plans. If a process or equipment which may be subject to probationary acceptance because of limited application or use in Texas is proposed, the executive director may give limited approval. In such a case, the owner must be given a bonded guarantee from the manufacturer covering acceptable performance. The specifications shall include a statement that such a bonded guarantee will be provided to the owner and shall also specify those conditions under which the bond will be forfeited. Such a bond will be

transferable. The bond shall be retained by the owner and transferred when a change in ownership occurs.

(4) A copy of each fully executed sanitary control easement and any other documentation demonstrating compliance with §290.41(c)(1)(F) of this title (relating to Water Sources) shall be provided to the executive director prior to placing the well into service. Each original easement document, if obtained, must be recorded in the deed records at the county courthouse. For an example, see commission Form 20698.

(5) Construction features and siting of all facilities for new water systems and for major improvements to existing water systems must be in conformity with applicable commission rules.

(6) For public water systems using reverse osmosis or nanofiltration membranes, the engineering report must include the requirements specified in paragraph (1)(A) - (H) of this subsection, and additionally must provide sufficient information to ensure effective treatment. Specifically:

(A) Provide a clear identification of the proposed raw water source.

(i) If the well has been constructed, a copy of the State of Texas Well Report according to 16 TAC Chapter 76 (relating to Water Well Drillers and Water Well Pump Installers), a cementing certificate (as required by §290.41(c)(3)(A) of this title), and a copy of the complete physical and chemical analysis of the raw water from the well as required by §290.41(c)(3)(G) of this title; or

(ii) If the well has not been constructed, the approximate longitude and latitude for the new well and the projected water quality.

(B) Provide a description of the pretreatment process that includes:

(i) target water quality of the proposed pretreatment process;

(ii) constituent(s) to be removed or treated;

(iii) method(s) or technologies used; and

(iv) operating parameters, such as chemical dosages, filter loading rates, and empty bed contact times.

(C) The design of a reverse osmosis or nanofiltration membrane system shall be based on the standard modeling tools of the manufacturer. The model must be run for both new membranes and end-of-life membranes. All design parameters required by the membrane manufacturer's modeling tool must be included in the modeled analysis. At a minimum, the model shall provide:

(i) system flow rate;

(ii) system recovery;

(iii) number of stages;

(iv) number of passes;

(v) feed pressure;

(vi) system configuration with the number of vessels per stage, the number of passes (if applicable), and the number of elements per vessel;

(vii) flux (in gallons per square foot per day) for the overall system;

(viii) selected fouling factor for new and end-of-life membranes; and

(ix) ion concentrations in the feed water for all constituents required by the manufacturer's model and the projected ion concentrations for the permeate water and concentrate water.

(D) In lieu of the modeling requirements as detailed in subparagraph (C) of this paragraph, the licensed professional engineer may provide either a pilot study or similar full-scale data in accordance with §290.42(g) of this title (relating to Water Treatment). Alternatively, for reverse osmosis or nanofiltration units rated for flow rates less than 300 gallons per minute, the design specifications can be based on the allowable operating parameters of the manufacturer.

(E) Provide documentation that the components and chemicals for the proposed treatment process conform to American National Standards Institute/NSF International (ANSI/NSF) Standard 60 for Drinking Water Treatment Chemicals and ANSI/NSF Standard 61 for Drinking Water System Components.

(F) Provide the details for post-treatment and re-mineralization to reduce the corrosion potential of the finished water. If carbon dioxide and/or hydrogen sulfide is present in the reverse osmosis permeate, include the details for a degasifier for post-treatment.

(G) For compliance with applicable drinking water quality requirements in Subchapter F of this chapter (relating to Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Systems), provide the projected water quality at the entry point to the distribution system and the method(s) used to make the water quality projections.

(H) When blending is proposed, provide the blending ratio, source of the water to be blended, and the calculations showing the concentrations of regulated constituents in the finished water.

(I) Provide a description of the disinfection byproduct formation potential based on total organic carbon and other precursor sample results.

(J) Provide the process control details to ensure the integrity of the membrane system. The engineering report shall identify specific parameters and set points that indicate when membrane cleaning, replacement, and/or inspection is necessary.

(i) The parameters shall be based on one, or more of the following: increased salt passage, increased or decreased pressure differential, and/or change in normalized permeate flow.

(ii) Define the allowable change from baseline performance.

(7) Before reverse osmosis or nanofiltration membrane systems can be used to produce drinking water, but after the reverse osmosis or nanofiltration membrane system has been constructed at the water system, the licensed professional engineer must submit an addendum to the engineering report required by paragraph (6) of this subsection to the executive director for review and approval. The addendum shall include the following verification data of the full-scale treatment process:

(A) Provide the initial baseline performance of the plant. The baseline net driving pressure, normalized permeate flow, salt rejection (or salt passage) must be documented when the reverse osmosis or nanofiltration membrane systems are placed online.

(B) Provide the frequency of cleaning or membrane replacement. The frequency must be based on a set time interval or at a set point relative to baseline performance of the unit(s).

(C) If modeling is used as the basis for the design, provide verification of the model's accuracy. If the baseline performance evaluation shows that the modeling projection in the engineering report were inaccurate, the licensed professional engineer shall determine if the deviation from the modeled projections resulted from incorrect water quality assumptions or from other incorrect data in the model. The model shall be considered inaccurate if the overall salt passage or the required feed pressure is 10% greater than the model projection. For any inaccurate model, provide a corrected model with the addendum to the engineering report.

(D) Provide verification of plant capacity. The capacity of the reverse osmosis and nanofiltration membrane facility shall be based on the as-built configuration of the system and the design parameters in the engineering report with adjustments as indicated by the baseline performance. Refer to paragraph (6)(C) of this subsection and §290.45(a)(6) of this title for specific considerations.

(E) Provide a complete physical and chemical analysis of the water. The analyses shall be in accordance with §290.41(c)(3)(G) of this title for the raw water (before any treatment), the water produced from the membrane systems, and the water after any post-treatment. Samples must be submitted to an accredited laboratory for chemical analyses.

(8) The calculations for sizing feed pump(s) and chemical storage tank(s) must be submitted to demonstrate that a project meets chemical feed and storage capacity requirements.

(f) Submission of business plans. The prospective owner of the system or the person responsible for managing and operating the system must submit a business plan to the executive director that demonstrates that the owner or operator of the system has available the financial, managerial, and technical capability to ensure future operation of the system in accordance with applicable laws and rules. The executive director may order the prospective owner or operator to demonstrate financial assurance to operate the system in accordance with applicable laws and rules as specified in Chapter 37, Subchapter O of this title (relating to Financial Assurance for Public Drinking Water Systems and Utilities), or as specified by commission rule, unless the executive director finds that the business plan demonstrates adequate financial capability. A business plan shall include the information and be presented in a format prescribed by the executive director. For community water systems, the business plan shall contain, at a minimum, the following elements:

(1) description of areas and population to be served by the potential system;

(2) description of drinking water supply systems within a two-mile radius of the proposed system, copies of written requests seeking to obtain service from each of those drinking water supply systems, and copies of the responses to the written requests;

(3) time line for construction of the system and commencement of operations;

(4) identification of and costs of alternative sources of supply;

(5) selection of the alternative to be used and the basis for that selection;

(6) identification of the person or entity which owns or will own the drinking water system and any identifiable future owners of the drinking water system;

(7) identification of any other businesses and public drinking water system(s) owned or operated by the applicant, owner(s), parent organization, and affiliated organization(s);

(8) an operations and maintenance plan which includes sufficient detail to support the budget estimate for operation and maintenance of the facilities;

(9) assurances that the commitments and resources needed for proper operation and maintenance of the system are, and will continue to be, available, including the qualifications of the organization and each individual associated with the proposed system;

(10) for retail public utilities as defined by TWC, §13.002:

(A) projected rate revenue from residential, commercial, and industrial customers; and

(B) pro forma income, expense, and cash flow statements;

(11) identification of any appropriate financial assurance, including those being offered to capital providers;

(12) a notarized statement signed by the owner or responsible person that the business plan has been prepared under his direction and that he is responsible for the accuracy of the information; and

(13) other information required by the executive director to determine the adequacy of the business plan or financial assurance.

(g) Business plans not required. A person is not required to file a business plan if the person:

(1) is a county;

(2) is a retail public utility as defined by TWC, §13.002, unless that person is a utility as defined by that section;

(3) has executed an agreement with a political subdivision to transfer the ownership and operation of the water supply system to the political subdivision; or

(4) is a noncommunity nontransient water system and the person has demonstrated financial assurance under THSC, Chapter 361 or Chapter 382 or TWC, Chapter 26.

(h) Beginning and completion of work.

(1) No person may begin construction on a new public water system before receiving written approval of plans and specifications and, if required, approval of a business plan from the executive director. No person may begin construction of modifications to a public water system without providing notification to the executive director and submitting and receiving approval of plans and specifications if requested in accordance with subsection (j) of this section.

(2) The executive director shall be notified in writing by the design engineer or the owner before construction is started.

(3) Upon completion of the water works project, the engineer or owner shall notify the executive director in writing as to its completion and attest to the fact that the completed work is substantially in accordance with the plans and change orders on file with the commission.

(i) Changes in previously approved plans and specifications. Any addenda or change orders which may involve a health hazard or relocation of facilities, such as wells, treatment units, and storage tanks, shall be submitted to the executive director for review and approval.

(j) Changes in existing systems or supplies. Public water systems shall notify the executive director prior to making any significant change or addition to the system's production, treatment, storage, pressure maintenance, or distribution facilities. Significant changes in existing systems or supplies shall not be instituted without the prior approval of the executive director.

(1) Public water systems shall submit plans and specifications to the executive director for the following significant changes:

(A) proposed changes to existing systems which result in an increase or decrease in production, treatment, storage, or pressure maintenance capacity;

(B) proposed changes to the disinfection process used at plants that treat surface water or groundwater that is under the direct influence of surface water including changes involving the disinfectants used, the disinfectant application points, or the disinfectant monitoring points;

(C) proposed changes to the type of disinfectant used to maintain a disinfectant residual in the distribution system;

(D) proposed changes in existing distribution systems when the change is greater than 10% of the number of connections, results in the water system's inability to comply with any of the applicable capacity requirements of §290.45 of this title, or involves interconnection with another public water system; and

(E) any other material changes specified by the executive director.

(2) Public water systems shall notify the executive director in writing of the addition of treatment chemicals, including long-term treatment changes, that will impact the corrosivity of the water. These are considered to be significant changes that require written approval from the executive director.

(A) Examples of long-term treatment changes that could impact the corrosivity of the water include the addition of a new treatment process or modification of an existing treatment process. Examples of modifications include switching secondary disinfectants, switching coagulants, and switching corrosion inhibitor products. Long-term changes can include dose changes to existing chemicals if the system is planning long-term changes to its finished water pH or residual inhibitor concentration. Long-term treatment changes would not include chemical dose fluctuations associated with daily raw water quality changes.

(B) After receiving the notification, the executive director will determine whether the submittal of plans and specifications will be required. Upon request of the executive director, the water system shall submit plans and specifications in accordance with the requirements of subsection (d) of this section.

(3) Plans and specifications may not be required for changes that are specifically addressed in paragraph (1)(D) of this subsection in the following situations:

(A) Unless plans and specifications are required by Chapter 293 of this title (relating to Water Districts), the executive director will not require another state agency or a political subdivision to submit planning material on distribution line improvements if the entity has its own internal review staff and complies with all of the following criteria:

(i) the internal review staff includes one or more licensed professional engineers that are employed by the political subdivision and must be separate from, and not subject to the review or supervision of, the engineering staff or firm charged with the design of the distribution extension under review;

(ii) a licensed professional engineer on the internal review staff determines and certifies in writing that the proposed distribution system changes comply with the requirements of §290.44 of this title (relating to Water Distribution) and will not result in a violation of any provision of §290.45 of this title;

(iii) the state agency or political subdivision includes a copy of the written certification described in this subparagraph with the initial notice that is submitted to the executive director.

(B) Unless plans and specifications are required by Chapter 293 of this title, the executive director will not require planning material on distribution line improvements from any public water system that is required to submit planning material to another state agency or political subdivision that complies with the requirements of subparagraph (A) of this paragraph. The notice to the executive director must include a statement that a state statute or local ordinance requires the planning materials to be submitted to the other state agency or political subdivision and a copy of the written certification that is required in subparagraph (A) of this paragraph.

(4) Public water systems shall notify the executive director in writing of proposed replacement or change of membrane modules, which may be a significant change. After receiving the notification, the executive director will determine whether the submittal of plans and specifications will be required. Upon request of the executive director, the system shall submit plans and specifications in accordance with the requirements of subsection (d) of this section. In its notification to the executive director, the system shall include the following information:

(A) The membrane module make/type, model, and manufacturer;

(B) The membrane plant's water source (groundwater, surface water, groundwater under the direct influence of surface water, or other);

(C) Whether the membrane modules are used for pathogen treatment or not;

(D) Total number of membrane modules per membrane unit; and

(E) The number of membrane modules being replaced or changed for each membrane unit.

(k) Planning material acceptance. Planning material for improvements to an existing system which does not meet the requirements of all sections of this subchapter will not be considered unless the necessary modifications for correcting the deficiencies are included in the proposed improvements, or unless the executive director determines that reasonable progress is being made toward correcting the deficiencies and no immediate health hazard will be caused by the delay.

(l) Exceptions. Requests for exceptions to one or more of the requirements in this subchapter shall be considered on an individual basis. Any water system which requests an exception must demonstrate to the satisfaction of the executive director that the exception will not compromise the public health or result in a degradation of service or water quality.

(1) The exception must be requested in writing and must be substantiated by carefully documented data. The request for an exception shall precede the submission of engineering plans and specifications for a proposed project for which an exception is being requested.

(2) Any exception granted by the commission is subject to revocation.

(3) Any request for an exception which is not approved by the commission in writing is denied.

(4) The executive director may establish site-specific requirements for systems that have been granted an exception. The requirements may include, but are not limited to: site-specific design, operation, maintenance, and reporting requirements.

(5) Water systems that are granted an exception shall comply with the requirements established by the executive director under paragraph (4) of this subsection.

(m) Notification of system startup or reactivation. The owner or responsible official must provide written notification to the commission of the startup of a new public water supply system or reactivation of an existing public water supply system. This notification must be made immediately upon meeting the definition of a public water system as defined in §290.38 of this title.

(n) The commission may require the owner or operator of a public drinking water supply system that was constructed without the approval required by THSC, §341.035, that has a history of noncompliance with THSC, Chapter 341, Subchapter C or commission rules, or that is subject to a commission enforcement action to take the following action:

(1) provide the executive director with a business plan that demonstrates that the system has available the financial, managerial, and technical resources adequate to ensure future operation of the system in accordance with applicable laws and rules. The business plan must fulfill all the requirements for a business plan as set forth in subsection (f) of this section;

(2) provide adequate financial assurance of the ability to operate the system in accordance with applicable laws and rules. The executive director will set the amount of the financial assurance, after the business plan has been reviewed and approved by the executive director.

(A) The amount of the financial assurance will equal the difference between the amount of projected system revenues and the projected cash needs for the period of time prescribed by the executive director.

(B) The form of the financial assurance will be as specified in Chapter 37, Subchapter O of this title and will be as specified by the executive director.

(C) If the executive director relies on rate increases or customer surcharges as the form of financial assurance, such funds shall be deposited in an escrow account as specified in Chapter 37, Subchapter O of this title and released only with the approval of the executive director.

(o) Emergency Preparedness Plans for Affected Utilities.

(1) Each public water system that is also an affected utility and that exists as of November 1, 2011 is required to adopt and submit to the executive director an emergency preparedness plan in accordance with §290.45 of this title and using the template in Appendix G of §290.47 of this title or another emergency preparedness plan that meets the requirements of this subchapter no later than February 1, 2012. Emergency preparedness plans are required to be prepared under the direction of a licensed professional engineer when an affected utility has been granted or is requesting an alternative capacity requirement in accordance with §290.45(g) of this title, or is requesting to meet the requirements of TWC, §13.1395, as an alternative to any rule requiring elevated storage, or as determined by the executive director on a case-by-case basis.

(2) Each affected utility that supplies, provides, or conveys surface water to wholesale customers shall include in its emergency preparedness plan under this subsection provisions for the actual installation and maintenance of automatically starting auxiliary generators or distributive generation facilities for each raw water intake pump station, water treatment plant, pump station, and pressure facility necessary to provide water to its wholesale customers.

(3) The executive director shall review an emergency preparedness plan submitted under this subsection. If the executive director determines that the plan is not acceptable, the executive director shall recommend changes to the plan. The executive director must make its recommendations on or before the 90th day after the executive director receives the plan. In accordance with the commission rules, an emergency preparedness plan must include one of the options listed in §290.45(h)(1)(A) - (H) of this title.

(4) Not later than June 1, 2012, each affected utility shall implement the emergency preparedness plan approved by the executive director.

(5) An affected utility may file with the executive director a written request for an extension not to exceed 90 days, of the date by which the affected utility is required under this subsection to submit the affected utility's emergency preparedness

plan or of the date by which the affected utility is required under this subsection to implement the affected utility's emergency preparedness plan. The executive director may approve the requested extension for good cause shown.

(6) The executive director may grant a waiver of the requirements for emergency preparedness plans to an affected utility if the executive director determines that compliance with this section will cause a significant financial burden on customers of the affected utility. The affected utility shall submit financial, managerial, and technical information as requested by the executive director to demonstrate the financial burden.

§290.41. Water Sources.

(a) Water quality. The quality of water to be supplied must meet the quality criteria prescribed by the commission's drinking water standards contained in Subchapter F of this chapter (relating to Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Systems).

(b) Water quantity. Sources of supply, both ground and surface, shall have a safe yield capable of supplying the maximum daily demands of the distribution system during extended periods of peak usage and critical hydrologic conditions. The pipelines and pumping capacities to treatment plants or distribution systems shall be adequate for such water delivery. Minimum capacities required are specified in §290.45 of this title (relating to Minimum Water System Capacity Requirements).

(1) A retail public utility as defined by Texas Water Code, §13.002(19) and each entity from which the utility is obtaining wholesale water service for the utility's retail system shall report to the executive director when the utility or entity is reasonably certain that the water supply will be available for less than 180 days. The reporting must be accomplished by utilizing the online "PWS Drought Contingency Plan Reporting Form."

(2) If reporting cannot be accomplished in accordance with paragraph (1) of this subsection, then the retail public utility or entity from which the utility is obtaining wholesale water service may report to the executive director by United States Postal Service mail, program e-mail, or facsimile.

(c) Groundwater sources and development.

(1) Groundwater sources shall be located so that there will be no danger of pollution from flooding or from unsanitary surroundings, such as privies, sewage, sewage treatment plants, livestock and animal pens, solid waste disposal sites or

underground petroleum and chemical storage tanks and liquid transmission pipelines, or abandoned and improperly sealed wells.

(A) No well site which is within 50 feet of a tile or concrete sanitary sewer, sewerage appurtenance, septic tank, storm sewer, or cemetery; or which is within 150 feet of a septic tank perforated drainfield, areas irrigated by low dosage, low angle spray on-site sewage facilities, absorption bed, evapotranspiration bed, improperly constructed water well, or underground petroleum and chemical storage tank or liquid transmission pipeline will be acceptable for use as a public drinking water supply. Sanitary or storm sewers constructed of ductile iron or polyvinyl chloride (PVC) pipe meeting American Water Works Association (AWWA) standards, having a minimum working pressure of 150 pounds per square inch (psi) or greater, and equipped with pressure type joints may be located at distances of less than 50 feet from a proposed well site, but in no case shall the distance be less than ten feet.

(B) No well site shall be located within 500 feet of a sewage treatment plant or within 300 feet of a sewage wet well, sewage pumping station, or a drainage ditch which contains industrial waste discharges or the wastes from sewage treatment systems.

(C) No water wells shall be located within 500 feet of animal feed lots, solid waste disposal sites, lands on which sewage plant or septic tank sludge is applied, or lands irrigated by sewage plant effluent.

(D) Livestock in pastures shall not be allowed within 50 feet of water supply wells.

(E) All known abandoned or inoperative wells (unused wells that have not been plugged) within 1/4-mile of a proposed well site shall be reported to the commission along with existing or potential pollution hazards. These reports are required for community and nontransient, noncommunity groundwater sources. Examples of existing or potential pollution hazards which may affect groundwater quality include, but are not limited to: landfill and dump sites, animal feedlots, military facilities, industrial facilities, wood-treatment facilities, liquid petroleum and petrochemical production, storage, and transmission facilities, Class 1, 2, 3, 4, and 5 injection wells, and pesticide storage and mixing facilities. This information must be submitted prior to construction or as required by the executive director.

(F) A sanitary control easement or sanitary control easements covering land within 150 feet of the well, or executive director approval for a substitute authorized by this subparagraph, shall be obtained.

(i) The sanitary control easement(s) secured shall provide that none of the pollution hazards covered in subparagraphs (A) - (E) of this paragraph, or any facilities that might create a danger of pollution to the water to be produced from the well, will be located thereon.

(ii) For the purpose of a sanitary control easement, an improperly constructed water well is one which fails to meet the surface and subsurface construction standards for public water supply wells. Residential type wells within a sanitary control easement must be constructed to public water well standards.

(iii) A copy of the recorded sanitary control easement(s) shall be included with plans and specifications submitted to the executive director for review.

(iv) With the approval of the executive director, the public water system may submit any of the following as a substitute for obtaining, recording, and submitting a copy of the recorded sanitary control easement(s) covering land within 150 feet of the well:

(I) a copy of the recorded deed and map demonstrating that the public water system owns all real property within 150 feet of the well;

(II) a copy of the recorded deed and map demonstrating that the public water system owns a portion of real property within 150 feet of the well, and a copy of the sanitary control easement(s) that the public water system has obtained, recorded, and submitted to the executive director applicable to the remaining portion of real property within 150 feet of the well not owned by the public water system; or

(III) for a political subdivision, a copy of an ordinance or land use restriction adopted and enforced by the political subdivision which provides an equivalent or higher level of sanitary protection to the well as a sanitary control easement.

(v) If the executive director approves a sanitary control easement substitute identified in clause (iv)(I) or (II) of this subparagraph for a public water system and the public water system conveys the property it owns within 150 feet of the well to another person or persons, the public water system must at that time obtain, record, and submit to the executive director a copy of the recorded sanitary control easement(s) applicable to the conveyed portion of the property within 150 feet of the well, unless the executive director approves a substitute identified in clause (iv) of this subparagraph.

(2) The premises, materials, tools, and drilling equipment shall be maintained so as to minimize contamination of the groundwater during drilling operation.

(A) Water used in any drilling operation shall be of safe sanitary quality. Water used in the mixing of drilling fluids or mud shall contain a chlorine residual of at least 0.5 milligrams per liter (mg/L).

(B) The slush pit shall be constructed and maintained so as to minimize contamination of the drilling mud.

(C) No temporary toilet facilities shall be maintained within 150 feet of the well being constructed unless they are of a sealed, leakproof type.

(3) The construction, disinfection, protection, and testing of a well to be used as a public water supply source must meet the following conditions.

(A) Before placing the well into service, a public water system shall furnish a copy of the well completion data, which includes the following items: the Driller's Log (geological log and material setting report); a cementing certificate; the results of a 36-hour pump test; the results of the microbiological and chemical analyses required by subparagraphs (F) and (G) of this paragraph; a legible copy of the recorded deed or deeds for all real property within 150 feet of the well; a legible copy of the sanitary control easement(s) or other documentation demonstrating compliance with paragraph (1)(F) of this subsection; an original or legible copy of a United States Geological Survey 7.5-minute topographic quadrangle showing the accurate well location to the executive director; and a map demonstrating the well location in relation to surrounding property boundaries. All the documents listed in this paragraph must be approved by the executive director before final approval is granted for the use of the well.

(B) The casing material used in the construction of wells for public use shall be new carbon steel, high-strength low-alloy steel, stainless steel or plastic. The material shall conform to AWWA standards. The casing shall extend a minimum of 18 inches above the elevation of the finished floor of the pump room or natural ground surface and a minimum of one inch above the sealing block or pump motor foundation block when provided. The casing shall extend at least to the depth of the shallowest water formation to be developed and deeper, if necessary, in order to eliminate all undesirable water-bearing strata. Well construction materials containing more than 0.25% lead are prohibited.

(C) The space between the casing and drill hole shall be sealed by using enough cement under pressure to completely fill and seal the annular space between the casing and the drill hole. The well casing shall be cemented in this manner from the top of the shallowest formation to be developed to the earth's surface. The driller shall utilize a pressure cementation method in accordance with the most current AWWA Standard for Water Wells (A100), Appendix C: Section C.2 (Positive Displacement Exterior Method); Section C.3 (Interior Method Without Plug); Section C.4 (Positive Placement, Interior Method, Drillable Plug); and Section C.5 (Placement Through Float Shoe Attached to Bottom of Casing). The grouting mixture used to pressure cement the annular space shall be neat cement as specified in the most current AWWA Standard for Water Wells and to which a maximum of 6%, by dry weight, bentonite and 2%, by dry weight, calcium chloride may be added. The minimum annular space between the outside diameter of the casing pipe and the borehole shall be no less than 1 1/2 inches in radial thickness or three inches in net diametrical difference and the pressure grouting shall be from the bottom upward utilizing one of the methods listed in this subparagraph for all public water system groundwater well construction. Cementation methods other than those listed in this subparagraph may be used on a site-specific basis with the prior written approval of the executive director. A cement bonding log, as well as any other documentation deemed necessary, may be required by the executive director to assure complete sealing of the annular space.

(D) When a gravel packed well is constructed, all gravel shall be of selected and graded quality and shall be thoroughly disinfected with a 50 mg/L chlorine solution as it is added to the well cavity.

(E) Safeguards shall be taken to prevent possible contamination of the water or damage by trespassers following the completion of the well and prior to installation of permanent pumping equipment.

(F) Upon well completion, or after an existing well has been reworked, the well shall be disinfected in accordance with current AWWA standards for well disinfection except that the disinfectant shall remain in the well for at least six hours.

(i) Before placing the well in service, the water containing the disinfectant shall be flushed from the well and then samples of water shall be collected and submitted for microbiological analysis until three successive daily raw water samples are free of coliform organisms. The analysis of these samples must be conducted by a laboratory accredited by the Texas Commission on Environmental Quality.

(ii) Appropriate facilities for treatment of the water shall be provided where a satisfactory microbiological record cannot be established after repeated disinfection. The extent of water treatment required will be determined on the basis of geological data, well construction features, nearby sources of contamination and, perhaps, on the basis of quantitative microbiological analyses.

(G) A complete physical and chemical analysis of the water produced from a new well shall be made after 36 hours of continuous pumping at the design withdrawal rate. Shorter pump test periods can be accepted for large capacity wells producing from areas of known groundwater production and quality so as to prevent wasting of water. Samples must be submitted to an accredited laboratory for chemical analyses. Tentative approval may be given on the basis of tests performed by in-plant or private laboratories, but final acceptance by the commission shall be on the basis of results from the accredited laboratory. Appropriate treatment shall be provided if the analyses reveal that the water from the well fails to meet the water quality criteria as prescribed by the drinking water standards. These criteria include turbidity, color and threshold odor limitations, and excessive hydrogen sulfide, carbon dioxide, or other constituents or minerals which make the water undesirable or unsuited for domestic use. Additional chemical and microbiological tests may be required after the executive director conducts a vulnerability assessment of the well.

(H) Below ground-level pump rooms and pump pits will not be allowed in connection with water supply installations.

(I) The well site shall be fine graded so that the site is free from depressions, reverse grades, or areas too rough for proper ground maintenance so as to ensure that surface water will drain away from the well. In all cases, arrangements shall be made to convey well pump drainage, packing gland leakage, and floor drainage away from the wellhead. Suitable drain pipes located at the outer edge of the concrete floor shall be provided to collect this water and prevent its ponding or collecting around the wellhead. This wastewater shall be disposed of in a manner that will not cause any nuisance from mosquito breeding or stagnation. Drains shall not be directly connected to storm or sanitary sewers.

(J) In all cases, a concrete sealing block extending at least three feet from the well casing in all directions, with a minimum thickness of six inches and sloped to drain away at not less than 0.25 inches per foot shall be provided around the wellhead.

(K) Wellheads and pump bases shall be sealed by a gasket or sealing compound and properly vented to prevent the possibility of contaminating the well water. A well casing vent shall be provided with an opening that is covered with 16-mesh or finer corrosion-resistant screen, facing downward, elevated and located so as to minimize the drawing of contaminants into the well. Wellheads and well vents shall be at least two feet above the highest known watermark or 100-year flood elevation, if available, or adequately protected from possible flood damage by levees.

(L) If a well blow-off line is provided, its discharge shall terminate in a downward direction and at a point which will not be submerged by flood waters.

(M) A suitable sampling cock shall be provided on the discharge pipe of each well pump prior to any treatment.

(N) Flow-measuring devices shall be provided for each well to measure production yields and provide for the accumulation of water production data. These devices shall be located to facilitate daily reading.

(O) All completed well units shall be protected by intruder-resistant fences, the gates of which are provided with locks or shall be enclosed in locked, ventilated well houses to exclude possible contamination or damage to the facilities by trespassers. The gates or wellhouses shall be locked during periods of darkness and when the plant is unattended.

(P) An all-weather access road shall be provided to each well site.

(Q) If an air release device is provided on the discharge piping, it shall be installed in such a manner as to preclude the possibility of submergence or possible entrance of contaminants. In this respect, all openings to the atmosphere shall be covered with 16-mesh or finer, corrosion-resistant screening material or an acceptable equivalent.

(4) Pitless units may be desirable in areas subject to vandalism or extended periods of subfreezing weather.

(A) Pitless units shall be shop fabricated from the point of connection with the well casing to the unit cap or cover, be threaded or welded to the well casing, be of watertight construction throughout, and be of materials and weight at least equivalent and compatible to the casing. The units must have a field connection to the lateral discharge from the pitless unit of threaded, flanged, or mechanical joint connection.

(B) The design of the pitless unit shall make provisions for an access to disinfect the well, a properly designed casing vent, a cover at the upper terminal of the well that will prevent the entrance of contamination, a sealed entrance connection for electrical cable, and at least one check valve within the well casing. The unit shall have an inside diameter as great as that of the well casing up to and including casing diameters of 12 inches.

(C) If the connection to the casing is by field weld, the shop-assembled unit must be designed specifically for field welding to the casing. The only field welding permitted will be that needed to connect a pitless unit to the well casing.

(D) With the exception of the fact that the well was constructed using a pitless unit, the well must otherwise meet all of the requirements of paragraph (3) of this subsection.

(d) Springs and other water sources.

(1) Springs and other similar sources of flowing artesian water shall be protected from potential contaminant sources in accordance with the requirements of subsection (c)(1) of this section.

(2) Before placing the spring or similar source into service, completion data similar to that required by subsection (c)(3)(A) of this section must be submitted to the executive director for review and approval to the Texas Commission on Environmental Quality, Water Supply Division, MC 159, P.O. Box 13087, Austin, Texas 78711-3087.

(3) Springs and similar sources shall be constructed in a manner which will preclude the entrance of surface water and debris.

(A) The site shall be fine graded so that it is free from depressions, reverse grades, or areas too rough for proper ground maintenance in order to ensure that surface water will drain away from the source.

(B) The spring or similar source shall be encased in an open-bottomed, watertight basin which intercepts the flowing water below the surface of the ground. The basin shall extend at least 18 inches above ground level. The top of the basin shall also be at least two feet above the highest known watermark or 100-year flood elevation, if available, or adequately protected from possible flood damage by levees.

(C) In all cases, a concrete sealing block shall be provided which extends at least three feet from the encasement in all directions. The sealing block shall be at least six inches thick and be sloped to drain away from the encasement at not less than 0.25 inches per foot.

(D) The top of the encasement shall be provided with a sloped, watertight roof which prevents the ponding of water and precludes the entrance of animals, insects, and other sources of contamination.

(E) The roof of the encasement shall be provided with a hatch that is not less than 30 inches in diameter. The hatch shall have a raised curbing at least four inches in height with a lockable cover that overlaps the curbing at least two inches in a downward direction. Where necessary, a gasket shall be used to make a positive seal when the hatch is closed. All hatches shall remain locked except during inspections and maintenance.

(F) The encasement shall be provided with a gooseneck vent or roof ventilator which is equipped with approved screens to prevent entry of animals, birds, insects, and heavy air contaminants. Screens shall be fabricated of corrosion-resistant material and shall be 16-mesh or finer. Screens shall be securely clamped in place with stainless or galvanized bands or wires.

(G) The encasement shall be provided with an overflow which is designed to prevent the entry of animals, birds, insects, and debris. The discharge opening of the overflow shall be above the surface of the ground and shall not be subject to submergence.

(4) Springs and similar sources must be provided with the appurtenances required by subsection (c)(3)(L) - (Q) of this section.

(5) All systems with new springs or similar sources must monitor microbiological source water quality at the new springs or similar sources in accordance with §290.111 of this title (relating to Surface Water Treatment) on a schedule determined by the executive director. The system must notify the agency of the new spring or similar source prior to construction. The executive director may waive these requirements if the spring or similar source has been determined not to be under the direct influence of surface water.

(e) Surface water sources and development.

(1) To determine the degree of pollution from all sources within the watershed, an evaluation shall be made of the surface water source in the area of

diversion and its tributary streams. The area where surface water sources are diverted for drinking water use shall be evaluated and protected from sources of contamination.

(A) Where surface water sources are subject to continuous or intermittent contamination by municipal, agricultural, or industrial wastes and/or treated effluent, the adverse effects of the contamination on the quality of the raw water reaching the treatment plant shall be determined by site evaluations and laboratory procedures.

(B) The disposal of all liquid or solid wastes from any source on the watershed must be in conformity with applicable regulations and state statutes.

(C) Shore installations, marinas, boats and all habitations on the watershed shall be provided with satisfactory sewage disposal facilities. Septic tanks and soil absorption fields, tile or concrete sanitary sewers, sewer manholes, or other approved toilet facilities shall not be located in an area within 75 feet horizontally from the lake water surface at the uncontrolled spillway elevation of the lake or 75 feet horizontally from the 50-year flood elevation, whichever is lower.

(D) Disposal of wastes from boats or any other watercraft shall be in accordance with §§321.1 - 321.11 of this title (relating to Boat Sewage Disposal).

(E) Pesticides or herbicides which are used within the watershed shall be applied in strict accordance with the product label restrictions.

(F) Before approval of a new surface water source, the system shall provide the executive director with information regarding specific water quality parameters of the potential source water. These parameters are pH, total coliform, *Escherichia coli*, turbidity, alkalinity, hardness, bromide, total organic carbon, temperature, color, taste and odor, regulated volatile organic compounds, regulated synthetic organic compounds, regulated inorganic compounds, and possible sources of contamination. If data on the incidence of *Giardia* cysts and *Cryptosporidium* oocysts has been collected, the information shall be provided to the executive director. This data shall be provided to the executive director as part of the approval process for a new surface water source.

(G) All systems with new surface water intakes or new bank filtration wells must monitor microbiological source water quality at the new surface water intakes or new bank filtration wells in accordance with §290.111 of this title on a schedule determined by the executive director. The system must notify the agency of the new surface water intake or bank filtration well prior to construction.

(2) Intakes shall be located and constructed in a manner which will secure raw water of the best quality available from the source.

(A) Intakes shall not be located in areas subject to excessive siltation or in areas subject to receiving immediate runoff from wooded sloughs or swamps.

(B) Raw water intakes shall not be located within 1,000 feet of boat launching ramps, marinas, docks, or floating fishing piers which are accessible by the public.

(C) A restricted zone of 200 feet radius from the raw water intake works shall be established and all recreational activities and trespassing shall be prohibited in this area. Regulations governing this zone shall be in the city ordinances or the rules and regulations promulgated by a water district or similar regulatory agency. The restricted zone shall be designated with signs recounting these restrictions. The signs shall be maintained in plain view of the public and shall be visible from all parts of the restricted area. In addition, special buoys may be required as deemed necessary by the executive director. Provisions shall be made for the strict enforcement of such ordinances or regulations.

(D) Commission staff shall make an on-site evaluation of any proposed raw water intake location. The evaluation must be requested prior to final design and must be supported by preliminary design drawings. Once the final intake location has been selected, the executive director shall be furnished with an original or legible copy of a United States Geological Survey 7.5-minute topographic quadrangle showing the accurate intake location.

(E) Intakes shall be located and constructed in a manner which will allow raw water to be taken from a variety of depths and which will permit withdrawal of water when reservoir levels are very low. Fixed level intakes are acceptable if water quality data is available to establish that the effect on raw water quality will be minimal.

(F) Water intake works shall be provided with screens or grates to minimize the amount of debris entering the plant.

(G) Intakes shall not be located within 500 feet of a sewage treatment plant or lands irrigated with sewage effluent.

(3) The raw water pump station shall be located in a well-drained area and shall be designed to remain in operation during flood events.

(4) An all weather road shall be provided to the raw water pump station.

(5) The raw water pump station and all appurtenances must be installed in a lockable building that is designed to prevent intruder access or enclosed by an intruder-resistant fence with lockable gates.

§290.42. Water Treatment.

(a) Capacity and location.

(1) Based on current acceptable design standards, the total capacity of the public water system's treatment facilities must always be greater than its anticipated maximum daily demand.

(2) The water treatment plant and all pumping units shall be located in well-drained areas not subject to flooding and away from seepage areas or where the groundwater water table is near the surface.

(A) Water treatment plants shall not be located within 500 feet of a sewage treatment plant or lands irrigated with sewage effluent. A minimum distance of 150 feet must be maintained between any septic tank drainfield line and any underground treatment or storage unit. Any sanitary sewers located within 50 feet of any underground treatment or storage unit shall be constructed of ductile iron or polyvinyl chloride (PVC) pipe with a minimum pressure rating of 150 pounds per square inch (psi) and have watertight joints.

(B) Plant site selection shall also take into consideration the need for disposition of all plant wastes in accordance with all applicable regulations and state statutes, including both liquid and solid wastes, or by-product material from operation and/or maintenance.

(3) Each water treatment plant shall be located at a site that is accessible by an all-weather road.

(b) Groundwater.

(1) Disinfection facilities shall be provided for all groundwater supplies for the purpose of microbiological control and distribution protection and shall be in conformity with applicable disinfection requirements in subsection (e) of this section.

(2) Treatment facilities shall be provided for groundwater if the water does not meet the drinking water standards. The facilities provided shall be in conformance with established and proven methods.

(A) Filters provided for turbidity and microbiological quality control shall be preceded by coagulant addition and shall conform to the requirements of subsection (d)(11) of this section. Filtration rates for iron and manganese removal, regardless of the media or type of filter, shall be based on a maximum rate of five gallons per minute per square foot (gpm/sq ft).

(B) The removal of iron and manganese may not be required if it can be demonstrated that these metals can be sequestered so that the discoloration problems they cause do not exist in the distribution system.

(C) All processes involving exposure of the water to atmospheric contamination shall provide for subsequent disinfection of the water ahead of ground storage tanks. Likewise, all exposure of water to atmospheric contamination shall be accomplished in a manner such that insects, birds, and other foreign materials will be excluded from the water. Aerators and all other such openings shall be screened with 16-mesh or finer corrosion-resistant screen.

(D) If reverse osmosis or nanofiltration membrane systems are used, the design shall conform to the requirements in paragraph (9) of this subsection.

(3) Any proposed change in the extent of water treatment required will be determined on the basis of geological data, well construction features, nearby sources of contamination, and on qualitative and quantitative microbiological and chemical analyses.

(4) Appropriate laboratory facilities shall be provided for controls as well as to check the effectiveness of disinfection or any other treatment processes employed.

(5) All plant piping shall be constructed to minimize leakage.

(6) All groundwater systems shall provide sampling taps for raw water, treated water, and at a point representing water entering the distribution system at every entry point.

(7) Air release devices shall be installed in such a manner as to preclude the possibility of submergence or possible entrance of contaminants. In this respect, all openings to the atmosphere shall be covered with 16-mesh or finer corrosion-resistant screening material or an equivalent acceptable to the executive director.

(8) The executive director may require 4-log removal or inactivation of viruses based on raw water sampling results required by §290.116 of this title (relating to Groundwater Corrective Actions and Treatment Techniques).

(9) Reverse osmosis or nanofiltration membrane systems used for the treatment of primary and secondary contaminants defined in Subchapter F of this chapter (relating to Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Systems), must meet the design criteria in subparagraphs (A) - (L) of this paragraph.

(A) The design for all reverse osmosis and nanofiltration membrane systems must be in accordance with the findings of the engineering report. Variations from the engineering report must be explained and shall not compromise public health. Minimum engineering report requirements are found in §290.39(e)(1) and (6) of this title (relating to General Provisions).

(B) The reverse osmosis and nanofiltration membrane systems must be designed to ensure adequate cleaning of the membrane system.

(C) The reverse osmosis or nanofiltration membrane systems must be designed to operate at flux rates which assure effective filtration at all times based on at least one of the following:

(i) manufacturer's computer models for new and end-of-life membranes;

(ii) site-specific pilot study;

(iii) comparable design data from an alternative site; or

(iv) the manufacturer's allowable operating parameters, if the membrane unit's capacity is rated less than 300 gallons per minute (gpm).

(D) Pretreatment shall be provided such that the feed water quality to the membrane units shall meet the minimum allowable requirements of the membrane manufacturer. Pretreatment processes shall be sized correctly for the flow of the plant, and the components and chemicals used for pretreatment in contact with the water must conform to American National Standards Institute/NSF International (ANSI/NSF) Standard 60 for Drinking Water Treatment Chemicals or ANSI/NSF Standard 61 for Drinking Water System Components. Other pretreatment processes will be reviewed on an individual basis in accordance the innovative/alternate treatment requirements specified in subsection (g) of this section. Acceptable pretreatment techniques include:

(i) bags, cartridge filters or screens for particulate removal;

(ii) chemical addition that will not adversely affect the reverse osmosis or nanofiltration membrane;

(iii) filters for iron and manganese removal in accordance with paragraph (2)(A) of this subsection;

(iv) aeration or degasification; and

(v) ion exchange softening.

(E) The treatment plant must include post-treatment facilities for corrosivity control, re-mineralization and the removal of dissolved gases, such as carbon dioxide and hydrogen sulfide, if necessary to meet the system's water quality goals. The treatment must be sized correctly for the flow of the plant, and the components and chemicals used for treatment must conform to ANSI/NSF Standard 60 for Drinking

Water Treatment Chemicals or ANSI/NSF Standard 61 for Drinking Water System Components.

(F) Pipes and pipe galleries shall meet the minimum requirements specified in subsection (d)(12) and (13) of this section.

(G) Each reverse osmosis or nanofiltration membrane unit shall be equipped to measure conductivity or total dissolved solids in the feed and the permeate water.

(H) Chemical storage and chemical feed facilities shall comply with subsection (f) of this section.

(I) Provide cross-connection protection for common piping used for cleaning and normal production modes.

(J) Provide flow meters on the pipes for feed, permeate, and concentrate water. Additional metering devices shall be provided as appropriate to monitor the flow rate through specific treatment processes. Metering devices shall be located to facilitate use and to assist in the determination of chemical dosages, the accumulation of water production data, and the operation of plant facilities.

(K) The water system must provide pressure measuring and recording devices before and after each membrane stage.

(L) The water system must provide equipment to monitor the temperature of the water. The temperature of the water must be measured using a thermometer or thermocouple with a minimum accuracy of plus or minus 0.5 degrees Celsius.

(c) Springs and other water sources.

(1) Water obtained from springs, infiltration galleries, wells in fissured areas, wells in carbonate rock formations, or wells that do not penetrate impermeable strata or any other source subject to surface or near surface contamination of recent origin shall be evaluated for the provision of treatment facilities. Minimum treatment shall consist of coagulation with direct filtration and adequate disinfection. In all cases, the treatment process shall be designed to achieve at least a 2-log removal of *Cryptosporidium* oocysts, a 3-log removal or inactivation of *Giardia* cysts, and a 4-log removal or inactivation of viruses before the water is supplied to any consumer. The executive director may require additional levels of treatment in cases of poor source water quality. Based on raw water monitoring results, the executive director may require

additional levels of treatment for *Cryptosporidium* treatment as specified in §290.111 of this title (relating to Surface Water Treatment).

(A) Filters provided for turbidity and microbiological quality control shall conform to the requirements of subsection (d)(11) of this section.

(B) All processes involving exposure of the water to atmospheric contamination shall provide for subsequent disinfection of the water ahead of ground storage tanks. Likewise, all exposure of water to atmospheric contamination shall be accomplished in a manner such that insects, birds, and other foreign materials will be excluded from the water. Aerators and all other such openings shall be screened with 16-mesh or finer corrosion-resistant screen.

(2) Any proposed change in the extent of water treatment required will be determined on the basis of geological data, well construction features, nearby sources of contamination, and qualitative and quantitative microbiological and chemical analyses.

(3) Appropriate laboratory facilities shall be provided for controls as well as for checking the effectiveness of disinfection or any other treatment processes employed.

(4) All plant piping shall be constructed to minimize leakage. No cross-connection or interconnection shall be permitted to exist between a conduit carrying potable water and another conduit carrying raw water or water in a prior stage of treatment.

(5) All systems using springs and other water sources shall provide sampling taps for raw water, treated water, and at a point representing water entering the distribution system at every entry point.

(6) Return of the decanted water or sludge to the treatment process shall be adequately controlled so that there will be a minimum of interference with the treatment process and shall conform to the applicable requirements of subsection (d)(3) of this section. Systems that do not comply with the provisions of subsection (d)(3) of this section commit a treatment technique violation and must notify their customers in accordance with the requirements of §290.122(b) of this title (relating to Public Notification).

(7) Air release devices on treated waterlines shall be installed in such a manner as to preclude the possibility of submergence or possible entrance of contaminants. In this respect, all openings to the atmosphere shall be covered with 16-

mesh or finer corrosion-resistant screening material or an equivalent acceptable to the executive director.

(8) Reverse osmosis and nanofiltration membrane systems not provided for microbiological quality control shall conform to the requirements of subsection (b) of this section.

(d) Surface water.

(1) All water secured from surface sources shall be given complete treatment at a plant which provides facilities for pretreatment disinfection, taste and odor control, continuous coagulation, sedimentation, filtration, covered clearwell storage, and terminal disinfection of the water with chlorine or suitable chlorine compounds. In all cases, the treatment process shall be designed to achieve at least a 2-log removal of *Cryptosporidium* oocysts, a 3-log removal or inactivation of *Giardia* cysts, and a 4-log removal or inactivation of viruses before the water is supplied to any consumer. The executive director may require additional levels of treatment in cases of poor source water quality. Based on raw water monitoring results, the executive director may require additional levels of treatment for *Cryptosporidium* treatment as specified in §290.111 of this title.

(2) All plant piping shall be constructed so as to be thoroughly tight against leakage. No cross-connection or interconnection shall be permitted to exist in a filtration plant between a conduit carrying filtered or post-chlorinated water and another conduit carrying raw water or water in any prior stage of treatment.

(A) Vacuum breakers must be provided on each hose bibb within the plant facility.

(B) No conduit or basin containing raw water or any water in a prior stage of treatment shall be located directly above, or be permitted to have a single common partition wall with another conduit or basin containing finished water.

(C) Make-up water supply lines to chemical feeder solution mixing chambers shall be provided with an air gap or other acceptable backflow prevention device.

(D) Filters shall be located so that common walls will not exist between them and aerators, mixing and sedimentation basins or clearwells. This rule is not strictly applicable, however, to partitions open to view and readily accessible for inspection and repair.

(E) Filter-to-waste connections, if included, shall be provided with an air gap connection to waste.

(F) Air release devices on treated waterlines shall be installed in such a manner as to preclude the possibility of submergence or possible entrance of contaminants. In this respect, all openings to the atmosphere shall be covered with 16-mesh or finer corrosion-resistant screening material or an equivalent acceptable to the executive director.

(3) Return of the decanted water or solids to the treatment process shall be adequately controlled so that there will be a minimum of interference with the treatment process. Systems that do not comply with the provisions of this paragraph commit a treatment technique violation and must notify their customers in accordance with the requirements of §290.122(b) of this title.

(A) Unless the executive director has approved an alternate recycling location, spent backwash water and the liquids from sludge settling lagoons, spent backwash water tanks, sludge thickeners, and similar dewatering facilities shall be returned to the raw waterline upstream of the raw water sample tap and coagulant feed point. The blended recycled liquids shall pass through all of the major unit processes at the plant.

(B) Recycle facilities shall be designed to minimize the magnitude and impact of hydraulic surges that occur during the recycling process.

(C) Solids produced by dewatering facilities such as sludge lagoons, sludge thickeners, centrifuges, mechanical presses, and similar devices shall not be returned to the treatment plant without the prior approval of the executive director.

(4) Reservoirs for pretreatment or selective quality control shall be provided where complete treatment facilities fail to operate satisfactorily at times of maximum turbidities or other abnormal raw water quality conditions exist. Recreational activities at such reservoirs shall be prohibited.

(5) Flow-measuring devices shall be provided to measure the raw water supplied to the plant, the recycled decant water, the treated water used to backwash the filters, and the treated water discharged from the plant. Additional metering devices shall be provided as appropriate to monitor the flow rate through specific treatment processes. Metering devices shall be located to facilitate use and to assist in the determination of chemical dosages, the accumulation of water production data, and the operation of plant facilities.

(6) Chemical storage facilities shall comply with applicable requirements in subsection (f)(1) of this section.

(7) Chemical feed facilities shall comply with the applicable requirements in subsection (f)(2) of this section.

(8) Flash mixing equipment shall be provided.

(A) Plants with a design capacity greater than 3.0 million gallons per day (MGD) must provide at least one hydraulic mixing unit or at least two sets of mechanical flash mixing equipment designed to operate in parallel. Public water systems with other surface water treatment plants, interconnections with other systems, or wells that can meet the system's average daily demand are exempt from the requirement for redundant mechanical flash mixing equipment.

(B) Flash mixing equipment shall have sufficient flexibility to ensure adequate dispersion and mixing of coagulants and other chemicals under varying raw water characteristics and raw water flow rates.

(9) Flocculation equipment shall be provided.

(A) Plants with a design capacity greater than 3.0 MGD must provide at least two sets of flocculation equipment which are designed to operate in parallel. Public water systems with other surface water treatment plants, interconnections with other systems, or wells that can meet the system's average daily demand are exempt from the requirement for redundant flocculation equipment.

(B) Flocculation facilities shall be designed to provide adequate time and mixing intensity to produce a settleable floc under varying raw water characteristics and raw water flow rates.

(i) Flocculation facilities for straight-flow and up-flow sedimentation basins shall provide a minimum theoretical detention time of at least 20 minutes when operated at their design capacity. Flocculation facilities constructed prior to October 1, 2000, are exempt from this requirement if the settled water turbidity of each sedimentation basin remains below 10.0 nephelometric turbidity units and the treatment plant meets with turbidity requirements of §290.111 of this title.

(ii) The mixing intensity in multiple-stage flocculators shall decrease as the coagulated water passes from one stage to the next.

(C) Coagulated water or water from flocculators shall flow to sedimentation basins in such a manner as to prevent destruction of floc. Piping, flumes, and troughs shall be designed to provide a flow velocity of 0.5 to 1.5 feet per second. Gates, ports, and valves shall be designed at a maximum flow velocity of 4.0 feet per second in the transfer of water between units.

(10) Clarification facilities shall be provided.

(A) Plants with a design capacity greater than 3.0 MGD must provide at least two sedimentation basins or clarification units which are designed to operate in parallel. Public water systems with other surface water treatment plants, interconnections with other systems, or wells that can meet the system's average daily demand are exempt from the requirement for redundant sedimentation basins or clarification units.

(B) The inlet and outlet of clarification facilities shall be designed to prevent short-circuiting of flow or the destruction of floc.

(C) Clarification facilities shall be designed to remove flocculated particles effectively.

(i) When operated at their design capacity, basins for straight-flow or up-flow sedimentation of coagulated waters shall provide either a theoretical detention time of at least six hours in the flocculation and sedimentation chambers or a maximum surface overflow rate of 0.6 gpm/sq ft of surface area in the sedimentation chamber.

(ii) When operated at their design capacity, basins for straight-flow or up-flow sedimentation of softened waters shall provide either a theoretical detention time of at least 4.5 hours in the flocculation and sedimentation chambers or a maximum surface overflow rate of 1.0 gpm/sq ft of surface area in the sedimentation chamber.

(iii) When operated at their design capacity, sludge-blanket and solids-recirculation clarifiers shall provide either a theoretical detention time of at least two hours in the flocculation and sedimentation chambers or a maximum surface overflow rate of 1.0 gpm/sq ft in the settling chamber.

(iv) A side wall water depth of at least 12 feet shall be provided in clarification basins that are not equipped with mechanical sludge removal facilities.

(v) The effective length of a straight-flow sedimentation basin shall be at least twice its effective width.

(D) Clarification facilities shall be designed to prevent the accumulation of settled solids.

(i) At treatment plants with a single clarification basin, facilities shall be provided to drain the basin within six hours. In the event that the plant site topography is such that gravity draining cannot be realized, a permanently installed electric-powered pump station shall be provided to dewater the basin. Public water systems with other potable water sources that can meet the system's average daily demand are exempt from this requirement.

(ii) Facilities for sludge removal shall be provided by mechanical means or by hopper-bottomed basins with valves capable of complete draining of the units.

(11) Gravity or pressure type filters shall be provided.

(A) The use of pressure filters shall be limited to installations with a treatment capacity of less than 0.50 MGD.

(B) Filtration facilities shall be designed to operate at filtration rates which assure effective filtration at all times.

(i) The design capacity of gravity rapid sand filters shall not exceed a maximum filtration rate of 2.0 gpm/sq ft. At the beginning of filter runs for declining rate filters, a maximum filtration rate of 3.0 gpm/sq ft is allowed.

(ii) Where high-rate gravity filters are used, the design capacity shall not exceed a maximum filtration rate of 5.0 gpm/sq ft. At the beginning of filter runs for declining rate filters, a maximum filtration rate of 6.5 gpm/sq ft is allowed.

(iii) The design capacity of pressure filters shall not exceed a maximum filtration rate of 2.0 gpm/sq ft with the largest filter off-line

(iv) Except as provided in clause (vi) of this subparagraph, any surface water treatment plant that provides, or is being designed to provide, less than 7.5 MGD must be able to meet either the maximum daily demand or the minimum required 0.6 gpm per connection, whichever is larger, with all filters on-line.

(v) Any surface water treatment plant that provides, or is being designed to provide, 7.5 MGD or more must be able to meet either the maximum daily demand or the minimum required 0.6 gpm per connection, whichever is larger, with the largest filter off-line.

(vi) Any surface water treatment plant that uses pressure filters must be able to meet either the maximum daily demand or the minimum required 0.6 gpm per connection, whichever is larger, with the largest filter off-line.

(C) The depth and condition of the media and support material shall be sufficient to provide effective filtration.

(i) The filtering material shall conform to American Water Works Association (AWWA) standards and be free from clay, dirt, organic matter, and other impurities.

(ii) The grain size distribution of the filtering material shall be as prescribed by AWWA standards.

(iii) The depth of filter sand, anthracite, granular activated carbon, or other filtering materials shall be 24 inches or greater and provide an L/d ratio, as defined in §290.38 of this title (relating to Definitions), of at least 1,000.

(I) Rapid sand filters typically contain a minimum of eight inches of fine sand with an effective size of 0.35 to 0.45 millimeter (mm), eight inches of medium sand with an effective size of 0.45 to 0.55 mm, and eight inches of coarse sand with an effective size of 0.55 to 0.65 mm. The uniformity coefficient of each size range should not exceed 1.6.

(II) High-rate dual media filters typically contain a minimum of 12 inches of sand with an effective size of 0.45 to 0.55 mm and 24 inches of anthracite with an effective size of 0.9 to 1.1 mm. The uniformity coefficient of each material should not exceed 1.6.

(III) High-rate multi-media filters typically contain a minimum of three inches of garnet media with an effective size of 0.2 to 0.3 mm, nine inches of sand with an effective size of 0.5 to 0.6 mm, and 24 inches of anthracite with an effective size of 0.9 to 1.1 mm. The uniformity coefficient of each size range should not exceed 1.6.

(IV) High-rate mono-media anthracite or granular activated carbon filters typically contain a minimum of 48 inches of anthracite or granular activated carbon with an effective size of 1.0 to 1.2 mm. The uniformity coefficient of each size range should not exceed 1.6.

(iv) Under the filtering material, at least 12 inches of support gravel shall be placed varying in size from 1/16 inch to 2.5 inches. The gravel may be arranged in three to five layers such that each layer contains material about twice the size of the material above it. Other support material may be approved on an individual basis.

(D) The filter shall be provided with facilities to regulate the filtration rate.

(i) With the exception of declining rate filters, each filter unit shall be equipped with a manually adjustable rate-of-flow controller with rate-of-flow indication or flow control valves with indicators.

(ii) Each declining rate filter shall be equipped with a rate-of-flow limiting device or an adjustable flow control valve with a rate-of-flow indicator.

(iii) The effluent line of each filter installed after January 1, 1996, must be equipped with a slow opening valve or another means of automatically preventing flow surges when the filter begins operation.

(E) The filters shall be provided with facilities to monitor the performance of the filter. Monitoring devices shall be designed to provide the ability to measure and record turbidity as required by §290.111 of this title.

(i) Each filter shall be equipped with a sampling tap so that the effluent turbidity of the filter can be individually monitored.

(ii) Each filter operated by a public water system that serves fewer than 10,000 people shall be equipped with an on-line turbidimeter and recorder which will allow the operator to measure and record the turbidity at 15-minute intervals. The executive director may allow combined filter effluent monitoring in lieu of individual filter effluent monitoring under the following conditions:

(I) The public water system has only two filters that were installed prior to October 1, 2000, and were never equipped with individual on-line turbidimeters and recorders; and

(II) The plant is equipped with an on-line turbidimeter and recorder which will allow the operator to measure and record the turbidity level of the combined filter effluent at a location prior to clearwell storage at 15-minute intervals.

(iii) Each filter operated by a public water system that serves at least 10,000 people shall be equipped with an on-line turbidimeter and recorder which will allow the operator to measure and record the turbidity at 15-minute intervals.

(iv) Each filter installed after October 1, 2000, shall be equipped with an on-line turbidimeter and recorder which will allow the operator to determine the turbidity at 15-minute intervals.

(v) Each filter unit that is not equipped with an on-line turbidimeter and recorder shall be equipped with a device to indicate loss of head through the filter. In lieu of loss-of-head indicators, declining rate filter units may be equipped with rate-of-flow indicators.

(F) Filters shall be designed to ensure adequate cleaning during the backwash cycle.

(i) Only filtered water shall be used to backwash the filters. This water may be supplied by elevated wash water tanks, by the effluent of other filters, or by pumps which take suction from the clearwell and are provided for backwashing filters only. For installations having a treatment capacity no greater than 150,000 gallons per day, water for backwashing may be secured directly from the distribution system if proper controls and rate-of-flow limiters are provided.

(ii) The rate of filter backwashing shall be regulated by a rate-of-flow controller or flow control valve.

(iii) The rate of flow of backwash water shall not be less than 20 inches vertical rise per minute (12.5 gpm/sq ft) and usually not more than 35 inches vertical rise per minute (21.8 gpm/sq ft).

(iv) The backwash facilities shall be capable of expanding the filtering bed during the backwash cycle.

(I) For facilities equipped with air scour, the backwash facilities shall be capable of expanding the filtering bed at least 15% during the backwash cycle.

(II) For mixed-media filters without air scour, the backwash facilities shall be capable of expanding the filtering bed at least 25% during the backwash cycle.

(III) For mono-media sand filters without air scour, the backwash facilities shall be capable of expanding the filtering bed at least 40% during the backwash cycle.

(v) The filter freeboard in inches shall exceed the wash rate in inches of vertical rise per minute.

(vi) When used, surface filter wash systems shall be installed with an atmospheric vacuum breaker or a reduced pressure principle backflow assembly in the supply line. If an atmospheric vacuum breaker is used, it shall be installed in a section of the supply line through which all the water passes and which is located above the overflow level of the filter.

(vii) Gravity filters installed after January 1, 1996, shall be equipped with air scour backwash or surface wash facilities.

(G) Each filter installed after October 1, 2000, shall be equipped with facilities that allow the filter to be completely drained without removing other filters from service.

(12) Pipe galleries shall provide ample working room, good lighting, and good drainage provided by sloping floors, gutters, and sumps. Adequate ventilation to prevent condensation and to provide humidity control is also required.

(13) The identification of influent, effluent, waste backwash, and chemical feed lines shall be accomplished by the use of labels or various colors of paint. Where labels are used, they shall be placed along the pipe at no greater than five-foot intervals. Color coding must be by solid color or banding. If bands are used, they shall be placed along the pipe at no greater than five-foot intervals.

(A) A plant that is built or repainted after October 1, 2000, must use the following color code. The color code to be used in labeling pipes is as follows:

Figure: 30 TAC §290.42(d)(13)(A) (No change to the figure as it exists in TAC.)

(B) A plant that was repainted before October 1, 2000, may use an alternate color code. The alternate color code must provide clear visual distinction between process streams.

(C) The system must maintain clear, current documentation of its color code in a location easily accessed by all personnel.

(14) All surface water treatment plants shall provide sampling taps for raw, settled, individual filter effluent, and clearwell discharge. Additional sampling taps shall be provided as appropriate to monitor specific treatment processes.

(15) An adequately equipped laboratory shall be available locally so that daily microbiological and chemical tests can be conducted.

(A) For plants serving 25,000 persons or more, the local laboratory used to conduct the required daily microbiological analyses must be accredited by the executive director to conduct coliform analyses.

(B) For plants serving populations of less than 25,000, the facilities for making microbiological tests may be omitted if the required microbiological samples can be submitted to a laboratory accredited by the executive director on a timely basis.

(C) All surface water treatment plants shall be provided with equipment for making at least the following determinations:

(i) pH;

(ii) temperature;

(iii) disinfectant residual;

(iv) alkalinity;

(v) turbidity;

(vi) jar tests for determining the optimum coagulant dose; and

(vii) other tests deemed necessary to monitor specific water quality problems or to evaluate specific water treatment processes.

(D) An amperometric titrator with platinum-platinum electrodes shall be provided at all surface water treatment plants that use chlorine dioxide.

(E) Each surface water treatment plant that uses sludge-blanket clarifiers shall be equipped with facilities to monitor the depth of the sludge blanket.

(F) Each surface water treatment plant that uses solids-recirculation clarifiers shall be equipped with facilities to monitor the solids concentration in the slurry.

(16) Each surface water treatment plant shall be provided with a computer and software for recording performance data, maintaining records, and submitting reports to the executive director. The executive director may allow a water system to locate the computer at a site other than the water treatment plant only if performance data can be reliably transmitted to the remote location on a real-time basis, the plant operator has access to the computer at all times, and performance data is readily accessible to agency staff during routine and special investigations.

(17) Reverse osmosis and nanofiltration membrane systems not provided for microbiological quality control shall conform to the requirements of subsection (b)(9) of this section.

(e) Disinfection.

(1) All water obtained from surface sources or groundwater sources that are under the direct influence of surface water must be disinfected in a manner consistent with the requirements of §290.110 of this title (relating to Disinfectant Residuals).

(2) All groundwater must be disinfected prior to distribution. The point of application must be ahead of the water storage tank(s) if storage is provided prior to distribution. Permission to use alternate disinfectant application points must be obtained in writing from the executive director.

(3) Disinfection equipment shall be selected and installed so that continuous and effective disinfection can be secured under all conditions.

(A) Disinfection equipment shall have a capacity at least 50% greater than the highest expected dosage to be applied at any time. It shall be capable of satisfactory operation under every prevailing hydraulic condition.

(B) Automatic proportioning of the disinfectant dosage to the flow rate of the water being treated shall be provided at plants where the treatment rate varies automatically and at all plants where the treatment rate varies more than 50% above or below the average flow. Manual control shall be permissible only if an operator is always on hand to make adjustments promptly.

(C) All disinfecting equipment in surface water treatment plants shall include at least one functional standby unit of each capacity for ensuring uninterrupted operation. Common standby units are permissible but, generally, more than one standby unit must be provided because of the differences in feed rates or the physical state in which the disinfectants are being fed (solid, liquid, or gas).

(D) Facilities shall be provided for determining the amount of disinfectant used daily and the amount of disinfectant remaining for use.

(E) When used, solutions of calcium hypochlorite shall be prepared in a separate mixing tank and allowed to settle so that only a clear supernatant liquid is transferred to the hypochlorinator container.

(F) Provisions shall be made for both pretreatment disinfection and post-disinfection in all surface water treatment plants. Additional application points shall be installed if they are required to adequately control the quality of the treated water.

(G) The use of disinfectants other than free chlorine and chloramines will be considered on a case-by-case basis under the exception guidelines of §290.39(l) of this title. If water containing chloramines and water containing free chlorine are blended, then a case-by-case review under §290.39(l) of this title will be required.

(4) Systems that use chlorine gas must ensure that the risks associated with its use are limited as follows.

(A) When chlorine gas is used, a full-face self-contained breathing apparatus or supplied air respirator that meets Occupational Safety and Health Administration (OSHA) standards for construction and operation, and a small bottle of fresh ammonia solution (or approved equal) for testing for chlorine leakage shall be readily accessible outside the chlorinator room and immediately available to the operator in the event of an emergency.

(B) Housing for gas chlorination equipment and cylinders of chlorine shall be in separate buildings or separate rooms with impervious walls or partitions separating all mechanical and electrical equipment from the chlorine facilities. Housing shall be located above ground level as a measure of safety. Equipment and cylinders may be installed on the outside of the buildings when protected from adverse weather conditions and vandalism.

(C) Adequate ventilation, which includes both high level and floor level screened vents, shall be provided for all enclosures in which gas chlorine is being stored or fed. Enclosures containing more than one operating 150-pound cylinder of chlorine shall also provide forced air ventilation which includes: screened and louvered floor level and high level vents; a fan which is located at and draws air in through the top vent and discharges to the outside atmosphere through the floor level vent; and a fan switch located outside the enclosure. Alternately, systems may install negative pressure ventilation as long as the facilities also have gas containment and treatment as prescribed by the current International Fire Code (IFC).

(5) Hypochlorination solution containers and pumps must be housed in a secure enclosure to protect them from adverse weather conditions and vandalism. The solution container top must be completely covered to prevent the entrance of dust, insects, and other contaminants.

(6) Where anhydrous ammonia feed equipment is utilized, it must be housed in a separate enclosure equipped with both high and low level ventilation to the outside atmosphere. The enclosure must be provided with forced air ventilation which includes: screened and louvered floor level and high level vents; a fan which is located at and draws air in through the floor vent and discharges through the top vent; and a fan switch located outside the enclosure. Alternately, systems may install negative pressure ventilation as long as the facilities also have gas containment and treatment as prescribed by the current IFC.

(7) Chloramine disinfection shall be performed in a manner which assures that the proper chlorine to ammonia (as nitrogen) ratio is achieved in order to maintain a monochloramine residual and limit nitrification.

(A) The order of chlorine and ammonia injection must be accomplished in a manner which allows inactivation of viruses and oxidation of cyanide.

(i) When chlorine is injected upstream of any other disinfectant, the ammonia injection point must be downstream of the chlorine injection point.

(ii) When chlorine and ammonia are added to distribution water that has a chloramine residual, ammonia should be added first.

(iii) When chlorine and ammonia are added to distribution water that has a free chlorine residual, chlorine should be added first.

(B) Mixing shall be provided to disperse chemicals.

(C) Sampling taps must be provided at locations that allow for chlorine and ammonia to be added to the water to form monochloramine as the primary chloramine species. These locations must be listed in the system's monitoring plan as described in §290.121 of this title (relating to Monitoring Plans). Sample taps must be provided as follows:

(i) upstream of the chlorine or ammonia chemical injection point, whichever is furthest upstream;

(ii) between the addition of the chloramine chemicals at chloramination facilities submitted for plan review after December 31, 2015. For these facilities, an installation without this sample tap may be approved if an acceptable technical reason is described in the plan review documents. Technical reasons, such as disinfection byproduct control, must be supported by bench scale sampling results. Other technical reasons, such as membrane integrity, must be supported by documentation; and

(iii) at a point after mixing to be able to measure fully-formed monochloramine levels.

(D) When using chloramines, the feed and storage must be designed as described in subsection (f) of this section, regardless of water source.

(E) When using chloramines, the public water systems shall provide equipment for making at least the following determinations for purposes of complying with the requirements in §290.110 of this title:

(i) free ammonia (as nitrogen);

(ii) monochloramine;

(iii) total chlorine;

(iv) free chlorine; and

(v) nitrite and nitrate (both as nitrogen). The public water systems must either obtain equipment for measuring nitrite and nitrate or identify an accredited laboratory that can perform nitrite and nitrate analysis and can provide results to the public water systems within 48 hours of sample delivery.

(f) Water treatment plant chemical storage and feed facilities.

(1) Chemical storage facilities shall be designed to ensure a reliable supply of chemicals to the feeders, minimize the possibility and impact of accidental spills, and facilitate good housekeeping.

(A) Bulk storage facilities at the plant shall be adequate to store at least a 15-day supply of all chemicals needed to comply with minimum treatment technique and maximum contaminant level (MCL) requirements. The capacity of these bulk storage facilities shall be based on the design capacity of the treatment plant. However, the executive director may require a larger stock of chemicals based on local resupply ability.

(B) Day tanks shall be provided to minimize the possibility of severely overfeeding liquid chemicals from bulk storage facilities. Day tanks will not be required if adequate process control instrumentation and procedures are employed to prevent chemical overfeed incidents.

(C) Every chemical bulk storage facility and day tank shall have a label that identifies the facility's or tank's contents and a device that indicates the amount of chemical remaining in the facility or tank.

(D) Dry chemicals shall be stored off the floor in a dry room that is located above ground and protected against flooding or wetting from floors, walls, and ceilings.

(E) Bulk storage facilities and day tanks must be designed to minimize the possibility of leaks and spills.

(i) The materials used to construct bulk storage and day tanks must be compatible with the chemicals being stored and resistant to corrosion.

(ii) Except as provided in this clause, adequate containment facilities shall be provided for all liquid chemical storage tanks.

(I) Containment facilities for a single container or for multiple interconnected containers must be large enough to hold the maximum amount of chemical that can be stored with a minimum freeboard of six vertical inches or to hold 110% of the total volume of the container(s), whichever is less.

(II) Common containment for multiple containers that are not interconnected must be large enough to hold the volume of the largest container with a minimum freeboard of six vertical inches or to hold 110% of the total volume of the container(s), whichever is less.

(III) The materials used to construct containment structures must be compatible with the chemicals stored in the tanks.

(IV) Incompatible chemicals shall not be stored within the same containment structure.

(V) No containment facilities are required for hypochlorite solution containers that have a capacity of 55 gallons or less.

(VI) On a site-specific basis, the executive director may approve the use of double-walled tanks in lieu of separate containment facilities.

(F) Chemical transfer pumps and control systems must be designed to minimize the possibility of leaks and spills.

(G) Piping, pumps, and valves used for chemical storage and transfer must be compatible with the chemical being fed.

(2) Chemical feed and metering facilities shall be designed so that chemicals shall be applied in a manner which will maximize reliability, facilitate maintenance, and ensure optimal finished water quality.

(A) Each chemical feeder that is needed to comply with a treatment technique or MCL requirement shall have a standby or reserve unit. Common standby feeders are permissible, but generally, more than one standby feeder must be provided due to the incompatibility of chemicals or the state in which they are being fed (solid, liquid, or gas).

(B) Chemical feed equipment shall be sized to provide proper dosage under all operating conditions.

(i) Devices designed for determining the chemical feed rate shall be provided for all chemical feeders.

(ii) The capacity of the chemical feeders shall be such that accurate control of the dosage can be achieved at the full range of feed rates expected to occur at the facility.

(iii) Chemical feeders shall be provided with tanks for chemical dissolution when applicable.

(C) Chemical feeders, valves, and piping must be compatible with the chemical being fed.

(D) Chemical feed systems shall be designed to minimize the possibility of leaks and spills and provide protection against backpressure and siphoning.

(E) If enclosed feed lines are used, they shall be designed and installed so as to prevent clogging and be easily maintained.

(F) Dry chemical feeders shall be located in a separate room that is provided with facilities for dust control.

(G) Coagulant feed systems shall be designed so that coagulants are applied to the water prior to or within the mixing basins or chambers so as to permit their complete mixing with the water.

(i) Coagulant feed points shall be located downstream of the raw water sampling tap.

(ii) Coagulants shall be applied continuously during treatment plant operation.

(H) Chlorine feed units, ammonia feed units, and storage facilities shall be separated by solid, sealed walls.

(I) Chemical application points shall be provided to achieve acceptable finished water quality, adequate taste and odor control, corrosion control, and disinfection

(g) Other treatment processes. Innovative/alternate treatment processes will be considered on an individual basis, in accordance with §290.39(l) of this title. Where innovative/alternate treatment systems are proposed, the licensed professional engineer must provide pilot test data or data collected at similar full-scale operations demonstrating that the system will produce water that meets the requirements of Subchapter F of this chapter. Pilot test data must be representative of the actual operating conditions which can be expected over the course of the year. The executive director may require a pilot study protocol to be submitted for review and approval prior to conducting a pilot study to verify compliance with the requirements of §290.39(l) of this title and Subchapter F of this chapter. The executive director may require proof of a one-year manufacturer's performance warrantee or guarantee assuring that the plant will produce treated water which meets minimum state and federal standards for drinking water quality.

(1) Package-type treatment systems and their components shall be subject to all applicable design criteria in this section.

(2) Bag and cartridge filtration systems or modules installed or replaced after April 1, 2012, and used for microbiological treatment, can receive up to 3.0-log *Giardia* removal credit, up to 2.0-log *Cryptosporidium* removal credit for individual bag or cartridge filters, and up to 2.5-log *Cryptosporidium* removal credit for bag or

cartridge filters operated in series only if the cartridges or bags meet the criteria in subparagraphs (A) - (C) of this paragraph.

(A) The filter system must treat the entire plant flow.

(B) To be eligible for this credit, systems must receive approval from the executive director based on the results of challenge testing that is conducted according to the criteria established by 40 Code of Federal Regulations (CFR) §141.719(a) and the executive director.

(i) A factor of safety equal to 1.0-log for individual bag or cartridge filters and 0.5-log for bag or cartridge filters in series must be applied to challenge testing results to determine removal credit.

(ii) Challenge testing must be performed on full-scale bag or cartridge filters, and the associated filter housing or pressure vessel, that are identical in material and construction to the filters and housings the system will use for removal of *Cryptosporidium* and *Giardia*.

(iii) Bag or cartridge filters must be challenge tested in the same configuration that the system will use, either as individual filters or as a series configuration of filters.

(iv) Systems may use results from challenge testing conducted prior to January 5, 2006, if prior testing was consistent with 40 CFR §141.719, submitted by the system's licensed professional engineer, and approved by the executive director.

(v) If a previously tested filter is modified in a manner that could change the removal efficiency of the filter product line, additional challenge testing to demonstrate the removal efficiency of the modified filter must be conducted and results submitted to the executive director for approval.

(C) Pilot studies must be conducted using filters that will meet the requirements of this section.

(3) Membrane filtration systems or modules installed or replaced after April 1, 2012, and used for microbiological treatment, can receive *Cryptosporidium* and *Giardia* removal credit for membrane filtration only if the systems or modules meet the criteria in subparagraphs (A) - (F) of this paragraph.

(A) The membrane module used by the system must undergo challenge testing to evaluate removal efficiency. Challenge testing must be conducted according to the criteria established by 40 CFR §141.719(b)(2) and the executive director.

(i) All membrane module challenge test protocols and results, the protocol for calculating the representative Log Removal Value for each membrane module, the removal efficiency, calculated results of Membrane $LRV_{C\text{-}Test}$, and the non-destructive performance test with its Quality Control Release Value (QCRV) must be submitted to the executive director for review and approval prior to beginning a membrane filtration pilot study at a public water system.

(ii) Challenge testing must be conducted on either a full-scale membrane module identical in material and construction to the membrane modules to be used in the system's treatment facility, or a smaller-scale membrane module identical in material and similar in construction to the full-scale module if approved by the executive director.

(iii) Systems may use data from challenge testing conducted prior to January 5, 2006, if prior testing was consistent with 40 CFR §141.719, submitted by the system's licensed professional engineer, and approved by the executive director.

(iv) If a previously tested membrane is modified in a manner that could change the removal efficiency of the membrane product line or the applicability of the non-destructive performance test and associated QCRV, additional challenge testing to demonstrate the removal efficiency of the modified membrane and determine a new QCRV for the modified membrane must be conducted and results submitted to the executive director for approval.

(B) The membrane system must be designed to conduct and record the results of direct integrity testing in a manner that demonstrates a removal efficiency equal to or greater than the removal credit awarded to the membrane filtration system approved by the executive director and meets the requirements in clauses (i) and (ii) of this subparagraph.

(i) The design must provide for direct integrity testing of each membrane unit.

(ii) The design must provide direct integrity testing that has a resolution of 3 micrometers or less.

(iii) The design must provide direct integrity testing with sensitivity sufficient to verify the log removal credit approved by the executive director. Sensitivity is determined by the criteria in 40 CFR §141.719(b)(3)(iii).

(iv) The executive director may reduce the direct integrity testing requirements for membrane units.

(C) The membrane system must be designed to conduct and record continuous indirect integrity monitoring on each membrane unit. The turbidity of the water produced by each membrane unit must be measured using the Hach FilterTrak Method 10133. The executive director may approve the use of alternative technology to monitor the quality of the water produced by each membrane unit.

(D) The level of removal credit approved by the executive director shall not exceed the lower of:

(i) the removal efficiency demonstrated during challenge testing conducted under the conditions in subparagraph (A) of this paragraph, or

(ii) the maximum removal efficiency that can be verified through direct integrity testing used with the membrane filtration process under the conditions in subparagraph (B) of this paragraph.

(E) Pilot studies must be conducted using membrane modules that will meet the requirements of this section.

(F) Membrane systems must be designed so that membrane units' feed water, filtrate, backwash supply, waste and chemical cleaning piping shall have cross-connection protection to prevent chemicals from all chemical cleaning processes from contaminating other membrane units in other modes of operation. This may be accomplished by the installation of a double block and bleed valving arrangement, a removable spool system or other alternative methods approved by the executive director.

(4) Bag, cartridge or membrane filtration systems or modules installed or replaced before April 1, 2012, and used for microbiological treatment, can receive up to a 2.0-log removal credit for *Cryptosporidium* and up to a 3.0-log removal credit for *Giardia* based on site-specific pilot study results, design, operation, and reporting requirements.

(5) Ultraviolet (UV) light reactors used for microbiological inactivation can receive *Cryptosporidium*, *Giardia* and virus inactivation credit if the reactors meet the criteria in subparagraphs (A) - (C) of this paragraph.

(A) UV light reactors can receive inactivation credit only if they are located after filtration.

(B) In lieu of a pilot study, the UV light reactors must undergo validation testing to determine the operating conditions under which a UV reactor delivers the required UV dose. Validation testing must be conducted according to the criteria established by 40 CFR §141.720(d)(2) and the executive director.

(i) The validation study must include the following factors: UV absorbance of the water; lamp fouling and aging; measurement uncertainty of on-line sensors; UV dose distributions arising from the velocity profiles through the reactor; failure of UV lamps and other critical system components; inlet and outlet piping or channel configuration of the UV reactor; lamp and sensor locations; and other parameters determined by the executive director.

(ii) Validation testing must be conducted on a full-scale reactor that is essentially identical to the UV reactor(s) to be used by the system and using waters that are essentially identical in quality to the water to be treated by the UV reactor.

(C) The UV light reactor systems must be designed to monitor and record parameters to verify the UV reactors operation within the validated conditions approved by the executive director. The UV light reactor must be equipped with facilities to monitor and record UV intensity as measured by a UV sensor, flow rate, lamp status, and other parameters designated by the executive director.

(h) Sanitary facilities for water works installations. Toilet and hand washing facilities provided in accordance with established standards of good public health engineering practices shall be available at all installations requiring frequent visits by operating personnel.

(i) Permits for waste discharges. Any discharge of wastewater and other plant wastes shall be in accordance with all applicable state and federal statutes and regulations. Permits for discharging wastes from water treatment processes shall be obtained from the commission, if necessary.

(j) Treatment chemicals and media. All chemicals and any additional or replacement process media used in treatment of water supplied by public water systems must conform to ANSI/NSF Standard 60 for Drinking Water Treatment Chemicals and ANSI/NSF Standard 61 for Drinking Water System Components. Conformance with these standards must be obtained by certification of the product by an organization accredited by ANSI.

(k) Safety.

(1) Safety equipment for all chemicals used in water treatment shall meet applicable standards established by the OSHA or Texas Hazard Communication Act, Texas Health and Safety Code, Chapter 502.

(2) Systems must comply with United States Environmental Protection Agency (EPA) requirements for Risk Management Plans.

(l) Plant operations manual. A thorough plant operations manual must be compiled and kept up-to-date for operator review and reference. This manual should be of sufficient detail to provide the operator with routine maintenance and repair procedures, with protocols to be utilized in the event of a natural or man-made catastrophe, as well as provide telephone numbers of water system personnel, system officials, and local/state/federal agencies to be contacted in the event of an emergency. If operating a reverse osmosis or nanofiltration membrane system, the manual must also include the system's configuration, baseline performance data, and any set point for membrane cleaning or replacement.

(m) Security. Each water treatment plant and all appurtenances thereof shall be enclosed by an intruder-resistant fence. The gates shall be locked during periods of darkness and when the plant is unattended. A locked building in the fence line may satisfy this requirement or serve as a gate.

(n) Corrosion control treatment. Systems must install any corrosion control or source water treatment required by §290.117(f) and (g) of this title (relating to Regulation of Lead and Copper), respectively. Such treatment must be designed and installed consistent with the requirements of this subchapter. The requirements of 40 CFR §141.82(i) and §141.83(b)(7) relating to EPA involvement in treatment determination are adopted by reference.

§290.43. Water Storage.

(a) Capacity. The minimum clearwell, storage tank, and pressure maintenance capacity shall be governed by the requirements in §290.45 of this title (relating to Minimum Water System Capacity Requirements).

(b) Location of clearwells, standpipes, and ground storage and elevated tanks.

(1) No public water supply elevated storage or ground storage tank shall be located within 500 feet of any municipal or industrial sewage treatment plant or any land which is spray irrigated with treated sewage effluent or sludge disposal.

(2) Insofar as possible, clearwells or treated water tanks shall not be located under any part of any buildings and, when possible, shall be constructed partially or wholly above ground.

(3) No storage tank or clearwell located below ground level is allowed within 50 feet of a sanitary sewer or septic tank. However, if the sanitary sewers are constructed of 150 pounds per square inch (psi) pressure-rated pipe with pressure-tested, watertight joints as used in water main construction, the minimum separation distance is ten feet.

(4) No storage tank or clearwell located below ground level is allowed within 150 feet of a septic tank soil absorption system.

(c) Design and construction of clearwells, standpipes, ground storage tanks, and elevated tanks. All facilities for potable water storage shall be covered and designed, fabricated, erected, tested, and disinfected in strict accordance with current American Water Works Association (AWWA) standards and shall be provided with the minimum number, size and type of roof vents, man ways, drains, sample connections, access ladders, overflows, liquid level indicators, and other appurtenances as specified in these rules. The roof of all tanks shall be designed and erected so that no water ponds at any point on the roof and, in addition, no area of the roof shall have a slope of less than 0.75 inch per foot.

(1) Roof vents shall be gooseneck or roof ventilator and be designed by the engineer based on the maximum outflow from the tank. Vents shall be installed in strict accordance with current AWWA standards and shall be equipped with approved screens to prevent entry of animals, birds, insects and heavy air contaminants. Screens shall be fabricated of corrosion-resistant material and shall be 16-mesh or finer. Screens shall be securely clamped in place with stainless or galvanized bands or wires and shall be designed to withstand winds of not less than tank design criteria (unless specified otherwise by the engineer).

(2) All roof openings shall be designed in accordance with current AWWA standards. If an alternate 30-inch diameter access opening is not provided in a storage tank, the primary roof access opening shall not be less than 30 inches in diameter. Other roof openings required only for ventilating purposes during cleaning, repairing or

painting operations shall be not less than 24 inches in diameter or as specified by the licensed professional engineer. An existing tank without a 30-inch in diameter access opening must be modified to meet this requirement when major repair or maintenance is performed on the tank. Each access opening shall have a raised curbing at least four inches in height with a lockable cover that overlaps the curbing at least two inches in a downward direction. Where necessary, a gasket shall be used to make a positive seal when the hatch is closed. All hatches shall remain locked except during inspections and maintenance.

(3) Overflows shall be designed in strict accordance with current AWWA standards. If the overflow terminates at any point other than the ground level, it shall be located near enough and at a position accessible from a ladder or the balcony for inspection purposes. The overflow(s) shall be sized to handle the maximum possible fill rate without exceeding the capacity of the overflow(s). The discharge opening of the overflow(s) shall be above the surface of the ground and shall not be subject to submergence. The discharge opening shall be covered with a gravity-hinged and weighted cover, an elastomeric duckbill valve, or other approved device to prevent the entrance of insects and other nuisances. When the tank is not overflowing, the cover shall close automatically and fit tightly with no gap over 1/16 inch.

(4) All clearwells and water storage tanks shall have a liquid level indicator located at the tank site. The indicator can be a float with a moving target, an ultrasonic level indicator, or a pressure gauge calibrated in feet of water. If an elevated tank or standpipe has a float with moving target indicator, it must also have a pressure indicator located at ground level. Pressure gauges must not be less than three inches in diameter and calibrated at not more than two-foot intervals. Remote reading gauges at the owner's treatment plant or pumping station will not eliminate the requirement for a gauge at the tank site unless the tank is located at the plant or station.

(5) Inlet and outlet connections shall be located so as to prevent short-circuiting or stagnation of water. Clearwells used for disinfectant contact time shall be appropriately baffled.

(6) Clearwells and potable water storage tanks shall be thoroughly tight against leakage, shall be located above the groundwater table, and shall have no walls in common with any other plant units containing water in the process of treatment. All associated appurtenances including valves, pipes, and fittings shall be tight against leakage.

(7) Each clearwell or potable water storage tank shall be provided with a means of removing accumulated silt and deposits at all low points in the bottom of the

tank. Drains shall not be connected to any waste or sewage disposal system and shall be constructed so that they are not a potential agent in the contamination of the stored water. Each clearwell or potable water storage tank must be designed to drain the tank.

(8) All clearwells, ground storage tanks, standpipes, and elevated tanks shall be painted, disinfected, and maintained in strict accordance with current AWWA standards. However, no temporary coatings, wax grease coatings, or coating materials containing lead will be allowed. No other coatings will be allowed which are not approved for use (as a contact surface with potable water) by the United States Environmental Protection Agency, NSF International (NSF), or United States Food and Drug Administration. All newly installed coatings must conform to American National Standards Institute/NSF (ANSI/NSF) Standard 61 and must be certified by an organization accredited by ANSI.

(9) No tanks or containers shall be used to store potable water that have previously been used for any nonpotable purpose. Where a used tank is proposed for use, a letter from the previous owner or owners must be submitted to the executive director which states the use of the tank.

(10) Access manways in the riser pipe, shell area, access tube, bowl area or any other location opening directly into the water compartment shall be located in strict

accordance with current AWWA standards. These openings shall not be less than 24 inches in diameter. However, in the case of a riser pipe or access tube of 36 inches in diameter or smaller, the access manway may be 18 inches times 24 inches with the vertical dimension not less than 24 inches. The primary access manway in the lower ring or section of a ground storage tank shall be not less than 30 inches in diameter. Where necessary, for any access manway which allows direct access to the water compartment, a gasket shall be used to make a positive seal when the access manway is closed.

(d) Design and construction of pressure (hydropneumatic) tanks. All hydropneumatic tanks must be located wholly above grade and must be of steel construction with welded seams except as provided in paragraph (8) of this subsection.

(1) Metal thickness for pressure tanks shall be sufficient to withstand the highest expected working pressures with a four to one factor of safety. Tanks of 1,000 gallons capacity or larger must meet the standards of the American Society of Mechanical Engineers (ASME) Section VIII, Division 1 Codes and Construction Regulations and must have an access port for periodic inspections. An ASME name plate must be permanently attached to those tanks. Tanks installed before July 1, 1988, are exempt from the ASME coding requirement, but all new installations must meet this regulation. Exempt tanks can be relocated within a system but cannot be relocated to another system.

(2) All pressure tanks shall be provided with a pressure release device and an easily readable pressure gauge.

(3) Facilities shall be provided for maintaining the air-water-volume at the design water level and working pressure. Air injection lines must be equipped with filters or other devices to prevent compressor lubricants and other contaminants from entering the pressure tank. A device to readily determine air-water-volume must be provided for all tanks greater than 1,000 gallon capacity. Galvanized tanks which are not provided with the necessary fittings and which were installed before July 1, 1988 shall be exempt from this requirement.

(4) Protective paint or coating shall be applied to the inside portion of any pressure tank. The coating shall be as specified in subsection (c)(8) of this section.

(5) No pressure tank that has been used to store any material other than potable water may be used in a public water system. A letter from the previous owner or owners must be provided as specified in subsection (c)(9) of this section.

(6) Pressure tank installations should be equipped with slow closing valves and time delay pump controls to eliminate water hammer and reduce the chance of tank failure.

(7) All associated appurtenances including valves, pipes and fittings connected to pressure tanks shall be thoroughly tight against leakage.

(8) Where seamless fiberglass tanks are utilized, they shall not exceed 300 gallons in capacity.

(9) No more than three pressure tanks shall be installed at any one site without the prior approval of the executive director.

(e) Facility security. All potable water storage tanks and pressure maintenance facilities must be installed in a lockable building that is designed to prevent intruder access or enclosed by an intruder-resistant fence with lockable gates. Pedestal-type elevated storage tanks with lockable doors and without external ladders are exempt from this requirement. The gates and doors must be kept locked whenever the facility is unattended.

(f) Service pumps. Service pump installations taking suction from storage tanks shall provide automatic low water level cutoff devices to prevent damage to the pumps. The service pump circuitry shall also resume pumping automatically once the minimum water level is reached in the tank.

§290.44. Water Distribution.

(a) Design and standards. All potable water distribution systems including pump stations, mains, and both ground and elevated storage tanks, shall be designed, installed, and constructed in accordance with current American Water Works Association (AWWA) standards with reference to materials to be used and construction procedures to be followed. In the absence of AWWA standards, commission review may be based upon the standards of the American Society for Testing and Materials (ASTM), commercial, and other recognized standards utilized by licensed professional engineers.

(1) All newly installed pipes and related products must conform to American National Standards Institute/NSF International (ANSI/NSF) Standard 61 and must be certified by an organization accredited by ANSI.

(2) All plastic pipes for use in public water systems must also bear the NSF International Seal of Approval (NSF-pw) and have an ASTM design pressure rating of at least 150 pounds per square inch (psi) or a standard dimension ratio of 26 or less.

(3) No pipe which has been used for any purpose other than the conveyance of drinking water shall be accepted or relocated for use in any public drinking water supply.

(4) Water transmission and distribution lines must be installed in accordance with the manufacturer's instructions. However, the top of the waterline must be located below the frost line and in no case shall the top of the waterline be less than 24 inches below ground surface.

(5) The hydrostatic leakage rate shall not exceed the amount allowed or recommended by AWWA formulas.

(b) Lead ban. The following provisions apply to the use of lead in plumbing.

(1) The use of pipes and pipe fittings that contain more than 0.25% lead or solders and flux that contains more than 0.2% lead is prohibited in the following circumstances:

(A) for installation or repair of any public water supply; and

(B) for installation or repair of any plumbing in a residential or nonresidential facility providing water for human consumption and connected to a public drinking water supply system.

(2) This requirement will be waived for lead joints that are necessary for repairs to cast iron pipe.

(3) The following are exempt from prohibitions on the use of lead pipes, solder, and flux:

(A) pipes, pipe fittings, plumbing fittings, or fixtures, including backflow preventers, that are used exclusively for nonpotable services such as manufacturing, industrial processing, irrigation, outdoor watering, or any other uses where the water is not anticipated to be used for human consumption; or

(B) toilets, bidets, urinals, fill valves, flush-o-meter valves, tub fillers, shower valves, service saddles, fire hydrants or water distribution main gate valves that are two inches in diameter or larger.

(c) Minimum waterline sizes. The minimum waterline sizes are for domestic flows only and do not consider fire flows. Larger pipe sizes shall be used when the licensed professional engineer deems it necessary. It should be noted that the required sizes are based strictly on the number of customers to be served and not on the distances between connections or differences in elevation or the type of pipe. No new waterline less than two inches in diameter will be allowed to be installed in a public water system distribution system. These minimum line sizes do not apply to individual customer service lines.

Figure: 30 TAC §290.44(c) (No change to the figure as it exists in TAC.)

(d) Minimum pressure requirement. The system must be designed to maintain a minimum pressure of 35 psi at all points within the distribution network at flow rates of at least 1.5 gallons per minute per connection. When the system is intended to provide fire fighting capability, it must also be designed to maintain a minimum pressure of 20 psi under combined fire and drinking water flow conditions. The distribution system of public water systems that are also affected utilities must be designed to meet the requirements of §290.45(h) of this title (relating to Minimum Water System Capacity Requirements).

(1) Air release devices shall be installed in the distribution system at all points where topography or other factors may create air locks in the lines. Air release devices shall be installed in such a manner as to preclude the possibility of submergence or possible entrance of contaminants. In this respect, all openings to the atmosphere shall be covered with 16-mesh or finer, corrosion-resistant screening material or an acceptable equivalent.

(2) When service is to be provided to more than one pressure plane or when distribution system conditions and demands are such that low pressures develop, the method of providing increased pressure shall be by means of booster pumps taking suction from storage tanks. If an exception to this requirement is desired, the designing engineer must furnish for the executive director's review all planning material for booster pumps taking suction from other than a storage tank. The planning material must contain a full description of the supply to the point of suction, maximum demands on this part of the system, location of pressure recorders, safety controls, and other pertinent information. Where booster pumps are installed to take suction directly from the distribution system, a minimum residual pressure of 20 psi must be maintained on the suction line at all times. Such installations must be equipped with automatic pressure cut-off devices so that the pumping units become inoperative at a suction pressure of less than 20 psi. In addition, a continuous pressure recording device may be required at a predetermined suspected critical pressure point on the suction line in

order to record the hydraulic conditions in the line at all times. If such a record indicates critical minimum pressures, less than 20 psi, adequate storage facilities must be installed with the booster pumps taking suction from the storage facility. Fire pumps used to maintain pressure on automatic sprinkler systems only for fire protection purposes are not considered as in-line booster pumps.

(3) Service connections that require booster pumps taking suction from the public water system lines must be equipped with automatic pressure cut-off devices so that the pumping units become inoperative at a suction pressure of less than 20 psi. Where these types of installations are necessary, the preferred method of pressure maintenance consists of an air gapped connection with a storage tank and subsequent repressurization facilities.

(4) Each community public water system shall provide accurate metering devices at each residential, commercial, or industrial service connection for the accumulation of water usage data. A water system that furnishes the services or commodity only to itself or its employees when that service or commodity is not resold to or used by others is exempt from this requirement.

(5) The system shall be provided with sufficient valves and blowoffs so that necessary repairs can be made without undue interruption of service over any

considerable area and for flushing the system when required. The engineering report shall establish criteria for this design.

(6) The system shall be designed to afford effective circulation of water with a minimum of dead ends. All dead-end mains shall be provided with acceptable flush valves and discharge piping. All dead-end lines less than two inches in diameter will not require flush valves if they end at a customer service. Where dead ends are necessary as a stage in the growth of the system, they shall be located and arranged to ultimately connect the ends to provide circulation.

(e) Location of waterlines. The following rules apply to installations of waterlines, wastewater mains or laterals, and other conveyances/appurtenances identified as potential sources of contamination. Furthermore, all ratings specified shall be defined by ASTM or AWWA standards unless stated otherwise. New mains, service lines, or laterals are those that are installed where no main, service line, or lateral previously existed, or where existing mains, service lines, or laterals are replaced with pipes of different size or material.

(1) When new potable water distribution lines are constructed, they shall be installed no closer than nine feet in all directions to wastewater collection facilities.

All separation distances shall be measured from the outside surface of each of the respective pieces.

(2) Potable water distribution lines and wastewater mains or laterals that form parallel utility lines shall be installed in separate trenches.

(3) No physical connection shall be made between a drinking water supply and a sewer line. Any appurtenance shall be designed and constructed so as to prevent any possibility of sewage entering the drinking water system.

(4) Where the nine-foot separation distance cannot be achieved, the following criteria shall apply.

(A) New waterline installation - parallel lines.

(i) Where a new potable waterline parallels an existing, non-pressure or pressure rated wastewater main or lateral and the licensed professional engineer licensed in the State of Texas is able to determine that the existing wastewater main or lateral is not leaking, the new potable waterline shall be located at least two feet above the existing wastewater main or lateral, measured vertically, and at least four feet away, measured horizontally, from the existing wastewater main or lateral. Every effort shall be exerted not to disturb the bedding and backfill of the existing wastewater main or lateral.

(ii) Where a new potable waterline parallels an existing pressure-rated wastewater main or lateral and it cannot be determined by the licensed professional engineer if the existing line is leaking, the existing wastewater main or lateral shall be replaced with at least 150 psi pressure-rated pipe. The new potable waterline shall be located at least two feet above the new wastewater line, measured vertically, and at least four feet away, measured horizontally, from the replaced wastewater main or lateral.

(iii) Where a new potable waterline parallels a new wastewater main, the wastewater main or lateral shall be constructed of at least 150 psi pressure-rated pipe. The new potable waterline shall be located at least two feet above the wastewater main or lateral, measured vertically, and at least four feet away, measured horizontally, from the wastewater main or lateral.

(B) New waterline installation - crossing lines.

(i) Where a new potable waterline crosses above a wastewater main or lateral, the segment of the waterline pipe shall be centered over and must be perpendicular to the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. When crossing an existing wastewater main or lateral and it is disturbed or shows signs of leaking, the wastewater main or lateral shall be replaced for at least nine feet in both directions (18 feet total) with at least 150 psi pressure-rated pipe embedded in cement stabilized sand (see clause (v) of this subparagraph) for the total length of one pipe segment plus 12 inches beyond the joint on each end.

(I) The potable waterline shall be at least two feet above an existing, non-pressure rated wastewater main or lateral.

(II) The potable waterline shall be at least six inches above an existing, pressure-rated wastewater main or lateral.

(ii) Where a new potable waterline crosses a new, non-pressure rated wastewater main or lateral, the segment of the waterline pipe shall be centered over and shall be perpendicular to the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The potable waterline shall be at least two feet above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. The wastewater pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The wastewater main or lateral shall be embedded in cement stabilized sand (see clause (v) of this subparagraph) for the total length of one pipe segment plus 12 inches beyond the joint on each end. The materials and method of installation shall conform to one of the following options:

(I) Within nine feet horizontally of either side of the waterline, the wastewater pipe and joints shall be constructed with pipe material having a minimum pressure rating of at least 150 psi. An absolute minimum vertical separation distance of two feet shall be provided. The wastewater main or lateral shall be located below the waterline.

(II) All sections of wastewater main or lateral within nine feet horizontally of the waterline shall be encased in an 18-foot (or longer) section of pipe. Flexible encasing pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The encasing pipe shall be centered on the waterline and shall be at least two nominal pipe diameters larger than the wastewater main or lateral. The space around the carrier pipe shall be supported at five-foot (or less) intervals with spacers or be filled to the springline with washed sand. Each end of the casing shall be sealed with watertight non-shrink cement grout or a manufactured watertight seal. An absolute minimum separation distance of six inches between the encasement pipe and the waterline shall be provided. The wastewater line shall be located below the waterline.

(iii) When a new waterline crosses under a wastewater main or lateral, the waterline shall be encased as described for wastewater mains or laterals in clause (ii) of this subparagraph or constructed of ductile iron or steel pipe with mechanical or welded joints as appropriate. An absolute minimum separation distance of one foot between the waterline and the wastewater main or lateral shall be provided. When a new waterline crosses under a wastewater main, the procedures in §217.53(d) of this title (relating to Pipe Design) must be followed.

(iv) Where a new potable waterline crosses a new, pressure rated wastewater main or lateral, one segment of the waterline pipe shall be centered over and shall be perpendicular to the wastewater line such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the center line of the wastewater main or lateral. The potable waterline shall be at least six inches above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. The wastewater pipe shall have a minimum pressure rating of at least 150 psi. The wastewater main or lateral shall be embedded in cement stabilized sand (see clause (v) of this subparagraph) for the total length of one pipe segment plus 12 inches beyond the joint on each end.

(v) Where cement stabilized sand bedding is required, the cement stabilized sand shall have a minimum of 10% cement per cubic yard of cement stabilized sand mixture, based on loose dry weight volume (at least 2.5 bags of cement per cubic yard of mixture). The cement stabilized sand bedding shall be a minimum of six inches above and four inches below the wastewater main or lateral. The use of brown coloring in cement stabilized sand for wastewater main or lateral bedding is recommended for the identification of pressure rated wastewater mains during future construction.

(5) Waterline and wastewater main manhole or lateral manhole or cleanout separation. The separation distance from a potable waterline to a wastewater main manhole or lateral manhole or cleanout shall be a minimum of nine feet. Where the nine-foot separation distance cannot be achieved, the potable waterline shall be encased in a joint of at least 150 psi pressure class pipe at least 18 feet long and two nominal sizes larger than the new conveyance. The space around the carrier pipe shall be supported at five-foot intervals with spacers or be filled to the springline with washed sand. The encasement pipe shall be centered on the crossing and both ends sealed with cement grout or manufactured sealant.

(6) Location of fire hydrants. Fire hydrants shall not be installed within nine feet vertically or horizontally of any wastewater main, wastewater lateral, or wastewater service line regardless of construction.

(7) Location of potable or raw water supply or suction lines. Suction mains to pumping equipment shall not cross wastewater mains, wastewater laterals, or wastewater service lines. Raw water supply lines shall not be installed within five feet of any tile or concrete wastewater main, wastewater lateral, or wastewater service line.

(8) Proximity of septic tank drainfields. Waterlines shall not be installed closer than ten feet to septic tank drainfields.

(f) Sanitary precautions and disinfection. Sanitary precautions, flushing, disinfection procedures, and microbiological sampling as prescribed in AWWA standards for disinfecting water mains shall be followed in laying waterlines.

(1) Pipe shall not be laid in water or placed where it can be flooded with water or sewage during its storage or installation.

(2) Special precautions must be taken when waterlines are laid under any flowing or intermittent stream or semipermanent body of water such as marsh, bay, or

estuary. In these cases, the water main shall be installed in a separate watertight pipe encasement and valves must be provided on each side of the crossing with facilities to allow the underwater portion of the system to be isolated and tested to determine that there are no leaks in the underwater line. Alternately, and with the permission of the executive director, the watertight pipe encasement may be omitted.

(3) New mains shall be thoroughly disinfected in accordance with AWWA Standard C651 and then flushed and sampled before being placed in service. Samples shall be collected for microbiological analysis to check the effectiveness of the disinfection procedure. Sampling shall be repeated if contamination persists. A minimum of one sample for each 1,000 feet of completed waterline will be required or at the next available sampling point beyond 1,000 feet as designated by the design engineer.

(g) Interconnections.

(1) Each proposal for a direct connection between public drinking water systems under separate administrative authority will be considered on an individual basis.

(A) Documents covering the responsibility for sanitary control shall accompany the submitted planning material.

(B) Each water supply shall be of a safe, potable quality.

(2) Where an interconnection between systems is proposed to provide a second source of supply for one or both systems, the system being utilized as a second source of supply must be capable of supplying a minimum of 0.35 gallons per minute per connection for the total number of connections in the combined distribution systems.

(h) Backflow, siphonage.

(1) No water connection from any public drinking water supply system shall be allowed to any residence or establishment where an actual or potential contamination hazard exists unless the public water facilities are protected from contamination.

(A) At any residence or establishment where an actual or potential contamination hazard exists, additional protection shall be required at the meter in the form of an air gap or backflow prevention assembly. The type of backflow prevention assembly required shall be determined by the specific potential hazard identified in §290.47(f) of this title (relating to Appendices).

(B) At any residence or establishment where an actual or potential contamination hazard exists and an adequate internal cross-connection control program is in effect, backflow protection at the water service entrance or meter is not required.

(i) An adequate internal cross-connection control program shall include an annual inspection and testing by a licensed backflow prevention assembly tester on all backflow prevention assemblies used for health hazard protection.

(ii) Copies of all such inspection and test reports must be obtained and kept on file by the water purveyor.

(iii) It will be the responsibility of the water purveyor to ensure that these requirements are met.

(2) No water connection from any public drinking water supply system shall be connected to any condensing, cooling, or industrial process or any other system of nonpotable usage over which the public water supply system officials do not have sanitary control, unless the said connection is made in accordance with the

requirements of paragraph (1) of this subsection. Water from such systems cannot be returned to the potable water supply.

(3) Overhead bulk water dispensing stations must be provided with an air gap between the filling outlet hose and the receiving tank to protect against back siphonage and cross-contamination.

(4) All backflow prevention assemblies that are required according to this section and associated table located in §290.47(f) of this title shall be tested upon installation by a licensed backflow prevention assembly tester and certified to be operating within specifications. Backflow prevention assemblies which are installed to provide protection against health hazards must also be tested and certified to be operating within specifications at least annually by a licensed backflow prevention assembly tester.

(A) Backflow prevention assembly testers shall have completed an executive director-approved course on cross-connection control and backflow prevention assembly testing, pass an examination administered by the executive director, and hold a current license as a backflow prevention assembly tester.

(i) Backflow prevention assembly testers are qualified to test and repair assemblies on any domestic, commercial, industrial, or irrigation service.

(ii) Backflow prevention assembly testers may test and repair assemblies on firelines only if they are permanently employed by an Approved Fireline Contractor. The Texas Department of Insurance's State Fire Marshal's Office requires that any person performing maintenance on firelines must be employed by an Approved Fireline Contractor.

(B) Gauges used in the testing of backflow prevention assemblies shall be tested for accuracy annually in accordance with the University of Southern California's Manual of Cross-Connection Control or the AWWA's Recommended Practice for Backflow Prevention and Cross-Connection Control (AWWA Manual M14). Public water systems shall require testers to include test gauge serial numbers on the Backflow Prevention Assembly Test and Maintenance Report (commission Form 20700), and ensure testers have gauges tested for accuracy.

(C) A test report must be completed by the recognized backflow prevention assembly tester for each assembly tested. The signed and dated original must be submitted to the public water supplier for recordkeeping purposes. Any form which varies from the format specified in commission Form 20700 must be approved by the executive director prior to being placed in use.

(5) The use of a backflow prevention assembly at the service connection shall be considered as additional backflow protection and shall not negate the use of backflow protection on internal hazards as outlined and enforced by local plumbing codes.

(6) At any residence or establishment where there is no actual or potential contamination hazard, a backflow prevention assembly is not required.

(i) Water hauling. When drinking water is distributed by tank truck or trailer, it must be accomplished in the following manner.

(1) Water shall be obtained from an approved source.

(2) The equipment used to haul the water must be approved by the executive director and must be constructed as follows.

(A) The tank truck or trailer shall be used for transporting drinking water only and shall be labeled "Drinking Water." Tanks which have been used previously for purposes other than transporting potable liquids shall not be used for hauling drinking water.

(B) The tank shall be watertight and of an approved material which is impervious and easily cleaned and disinfected. Any paint or coating and any plastic or fiberglass materials used as contact surfaces must be approved by the United States Environmental Protection Agency, the United States Food and Drug Administration, or the NSF. Effective January 1, 1993, any newly installed surfaces shall conform to ANSI/NSF Standard 61 and must be certified by an organization accredited by ANSI.

(C) The tank shall have a manhole and a manhole cover which overlaps the raised manhole opening by a minimum of two inches and terminates in a downward direction. The cover shall fit firmly on the manhole opening and shall be kept locked.

(D) The tank shall have a vent which is faced downward and located to minimize the possibility of drawing contaminants into the stored water. The vent must be screened with 16-mesh or finer corrosion-resistant material.

(E) Connections for filling and emptying the tank shall be properly protected to prevent the possible entrance of contamination. These openings must be provided with caps and keeper chains.

(F) A drain shall be provided which will completely empty the tank for cleaning or repairs.

(G) When a pump is used to transfer the water from the tank, the pump shall be permanently mounted with a permanent connection to the tank. The discharge side of the pump shall be properly protected between uses by a protective cap and keeper chain.

(H) Hoses used for the transfer of drinking water to and from the tank shall be used only for that purpose and labeled for drinking water only. The hoses shall conform to ANSI/NSF Standard 61 and must be certified by an entity recognized by the commission. Hoses and related appurtenances must be cleaned and disinfected on a regular basis during prolonged use or before start-up during intermittent use. Hoses must be properly stored between uses and must be provided with caps and keeper chains or have the ends connected together.

(I) The tank shall be disinfected monthly and at any time that contamination is suspected.

(J) At least one sample per month from each tank shall be collected and submitted for microbiological analysis to one of the commission's approved laboratories for each month of operation.

(K) A minimum free chlorine residual of 0.5 milligrams per liter (mg/L) or, if chloramines are used as the primary disinfectant, a chloramine residual of 1.0 mg/L (measured as total chlorine) shall be maintained in the water being hauled. Chlorine or chlorine containing compounds may be added on a "batch" basis to maintain the required residual.

(L) Operational records detailing the amount of water hauled, purchases, microbiological sampling results, chlorine residual readings, dates of disinfection, and source of water shall be maintained.

(j) If a structure is connected to a public water supply system and has a rainwater harvesting system, the structure must have appropriate cross-connection safeguards in accordance with subsection (h)(1) of this section.

(1) A privately owned rainwater harvesting system with a capacity of more than 500 gallons that is connected to a public water system for a back-up supply shall have a backflow prevention assembly or an air gap installed at the storage facility for the harvested rainwater to ensure physical separation between the rainwater harvesting system and the public water system.

(2) At each residence or facility where water from a rainwater harvesting system is used for potable purposes and there is a connection to a public water system, the public water system shall ensure that the rainwater harvesting system is installed and maintained by a master plumber or journeyman plumber licensed by the Texas State Board of Plumbing Examiners and who holds an endorsement issued by the Texas State Board of Plumbing Examiners as a Water Supply Protection Specialist.

(3) A person who intends to connect a rainwater harvesting system to a public water system must give written notice of that intention to the municipality or the owner or operator of the public water system in which the rainwater harvesting system is located.

(4) The public water system used as a back-up supply for the rainwater harvesting system may be connected only to the water storage tank and may not be connected to the plumbing of a structure.

§290.45. Minimum Water System Capacity Requirements.

(a) General provisions.

(1) The requirements contained in this section are to be used in evaluating both the total capacities for public water systems and the capacities at individual pump stations and pressure planes which serve portions of the system that are hydraulically separated from, or incapable of being served by, other pump stations or pressure planes. The capacities specified in this section are minimum requirements only and do not include emergency fire flow capacities for systems required to meet requirements contained in §290.46(x) and (y) of this title (relating to Minimum Acceptable Operating Practices for Public Drinking Water Systems).

(2) The executive director will require additional supply, storage, service pumping, and pressure maintenance facilities if a normal operating pressure of 35 pounds per square inch (psi) cannot be maintained throughout the system, or if the system's maximum daily demand exceeds its total production and treatment capacity. The executive director will also require additional capacities for a system that is unable to maintain a minimum pressure of 20 psi during fire fighting, line flushing, other

unusual conditions, and systems that are required to provide fire flow as specified in §290.46(x) and (y) of this title.

(3) The executive director may establish additional capacity requirements for a public water system using the method of calculation described in subsection (g)(2) of this section if there are repeated customer complaints regarding inadequate pressure or if the executive director receives a request for a capacity evaluation from customers of the system.

(4) Throughout this section, total storage capacity does not include pressure tank capacity.

(5) The executive director may exclude the capacity of facilities that have been inoperative for the past 120 days and will not be returned to an operative condition within the next 30 days when determining compliance with the requirements of this section.

(6) The capacity of the treatment facilities shall not be less than the required raw water or groundwater production rate or the anticipated maximum daily demand of the system. The production capacity of a reverse osmosis or nanofiltration membrane system shall be the quantity of permeate water after post-treatment that can

be delivered to the distribution system. The amount available for customer use must consider:

(A) the quantity of feed water discharged to waste;

(B) the quantity of bypass water used for blending;

(C) the quantity of permeate water used for cleaning and maintenance; and

(D) any other loss of raw water or groundwater available for use due to other processes at the reverse osmosis or nanofiltration facility.

(7) If a public water system that is an affected utility fails to provide a minimum of 35 psi throughout the distribution system during emergency operations as soon as it is safe and practicable following the occurrence of a natural disaster, a revised emergency preparedness plan or justification regarding pressure drop shall be submitted for review and approval within 180 days of the date normal power is restored. Based on the review of the revised emergency preparedness plan, the executive director may require additional or alternative auxiliary emergency facilities.

(b) Community water systems.

(1) Groundwater supplies must meet the following requirements.

(A) If fewer than 50 connections without ground storage, the system must meet the following requirements:

(i) a well capacity of 1.5 gallons per minute (gpm) per connection; and

(ii) a pressure tank capacity of 50 gallons per connection.

(B) If fewer than 50 connections with ground storage, the system must meet the following requirements:

(i) a well capacity of 0.6 gpm per connection;

(ii) a total storage capacity of 200 gallons per connection;

(iii) two or more service pumps having a total capacity of 2.0 gpm per connection; and

(iv) a pressure tank capacity of 20 gallons per connection.

(C) For 50 to 250 connections, the system must meet the following requirements:

(i) a well capacity of 0.6 gpm per connection;

(ii) a total storage capacity of 200 gallons per connection;

(iii) two or more pumps having a total capacity of 2.0 gpm per connection at each pump station or pressure plane. For systems which provide an elevated storage capacity of 200 gallons per connection, two service pumps with a minimum combined capacity of 0.6 gpm per connection are required at each pump station or pressure plane. If only wells and elevated storage are provided, service pumps are not required; and

(iv) an elevated storage capacity of 100 gallons per connection or a pressure tank capacity of 20 gallons per connection.

(D) For more than 250 connections, the system must meet the following requirements:

(i) two or more wells having a total capacity of 0.6 gpm per connection. Where an interconnection is provided with another acceptable water system capable of supplying at least 0.35 gpm for each connection in the combined system under emergency conditions, an additional well will not be required as long as the 0.6 gpm per connection requirement is met for each system on an individual basis. Each water system must still meet the storage and pressure maintenance requirements on an individual basis unless the interconnection is permanently open. In this case, the systems' capacities will be rated as though a single system existed;

(ii) a total storage capacity of 200 gallons per connection;

(iii) two or more pumps that have a total capacity of 2.0 gpm per connection or that have a total capacity of at least 1,000 gpm and the ability to meet peak hourly demands with the largest pump out of service, whichever is less, at each pump station or pressure plane. For systems which provide an elevated storage capacity of 200 gallons per connection, two service pumps with a minimum combined capacity of 0.6 gpm per connection are required at each pump station or pressure plane. If only wells and elevated storage are provided, service pumps are not required;

(iv) an elevated storage capacity of 100 gallons per connection or a pressure tank capacity of 20 gallons per connection. If pressure tanks are used, a maximum capacity of 30,000 gallons is sufficient for up to 2,500 connections. An elevated storage capacity of 100 gallons per connection is required for systems with more than 2,500 connections. Alternate methods of pressure maintenance may be proposed and will be approved if the criteria contained in subsection (g)(5) of this section are met; and

(v) emergency power for systems which serve more than 250 connections and do not meet the elevated storage requirement. Sufficient emergency power must be provided to deliver a minimum of 0.35 gpm per connection to the distribution system in the event of the loss of normal power supply. Alternately, an emergency interconnection can be provided with another public water system that has emergency power and is able to supply at least 0.35 gpm for each connection in the combined system. Emergency power facilities in systems serving 1,000 connections or greater must be serviced and maintained in accordance with level 2 maintenance requirements contained in the current National Fire Protection Association (NFPA 110 Standard). Although not required, compliance with NFPA 110 Standard is highly recommended for systems serving less than 1,000 connections. Logs of all emergency power use and maintenance must be maintained and kept on file for a period of not less than three years. These records must be made available, upon request, for executive director review.

(E) Mobile home parks with a density of eight or more units per acre and apartment complexes which supply fewer than 100 connections without ground storage must meet the following requirements:

(i) a well capacity of 1.0 gpm per connection; and

(ii) a pressure tank capacity of 50 gallons per connection with a maximum of 2,500 gallons required.

(F) Mobile home parks and apartment complexes which supply 100 connections or greater, or fewer than 100 connections and utilize ground storage must meet the following requirements:

(i) a well capacity of 0.6 gpm per connection. Systems with 250 or more connections must have either two wells or an approved interconnection which is capable of supplying at least 0.35 gpm for each connection in the combined system;

(ii) a total storage of 200 gallons per connection;

(iii) at least two service pumps with a total capacity of 2.0 gpm per connection; and

(iv) a pressure tank capacity of 20 gallons per connection.

(2) Surface water supplies must meet the following requirements:

(A) a raw water pump capacity of 0.6 gpm per connection with the largest pump out of service;

(B) a treatment plant capacity of 0.6 gpm per connection under normal rated design flow;

(C) transfer pumps (where applicable) with a capacity of 0.6 gpm per connection with the largest pump out of service;

(D) a covered clearwell storage capacity at the treatment plant of 50 gallons per connection or, for systems serving more than 250 connections, 5.0% of daily plant capacity;

(E) a total storage capacity of 200 gallons per connection;

(F) a service pump capacity that provides each pump station or pressure plane with two or more pumps that have a total capacity of 2.0 gpm per connection or that have a total capacity of at least 1,000 gpm and the ability to meet peak hourly demands with the largest pump out of service, whichever is less. For systems which provide an elevated storage capacity of 200 gallons per connection, two service pumps with a minimum combined capacity of 0.6 gpm per connection are required at each pump station or pressure plane;

(G) an elevated storage capacity of 100 gallons per connection or a pressure tank capacity of 20 gallons per connection. If pressure tanks are used, a maximum capacity of 30,000 gallons is sufficient for systems of up to 2,500 connections. An elevated storage capacity of 100 gallons per connection is required for systems with more than 2,500 connections. Alternate methods of pressure maintenance may be proposed and will be approved if the criteria contained in subsection (g)(5) of this section are met; and

(H) emergency power for systems which serve more than 250 connections and do not meet the elevated storage requirement. Sufficient emergency power must be provided to deliver a minimum of 0.35 gpm per connection to the distribution system in the event of the loss of normal power supply. Alternately, an emergency interconnection can be provided with another public water system that has emergency power and is able to supply at least 0.35 gpm for each connection in the combined system. Emergency power facilities in systems serving 1,000 connections or greater must be serviced and maintained in accordance with level 2 maintenance requirements contained in the current NFPA 110 Standard. Although not required, compliance with NFPA 110 Standard is highly recommended for systems serving less than 1,000 connections. Logs of all emergency power use and maintenance must be maintained and kept on file for a period of not less than three years. These records must be made available, upon request, for executive director review.

(3) Any community public water system that is an affected utility shall have an emergency preparedness plan approved by the executive director and must meet the requirements for emergency operations contained in subsection (h) of this section. This includes any affected utility that provides 100 gallons of elevated storage capacity per connection.

(c) Noncommunity water systems serving transient accommodation units. The following water capacity requirements apply to noncommunity water systems serving accommodation units such as hotel rooms, motel rooms, travel trailer spaces, campsites, and similar accommodations.

(1) Groundwater supplies must meet the following requirements.

(A) If fewer than 100 accommodation units without ground storage, the system must meet the following requirements:

(i) a well capacity of 1.0 gpm per unit; and

(ii) a pressure tank capacity of ten gallons per unit with a minimum of 220 gallons.

(B) For systems serving fewer than 100 accommodation units with ground storage or serving 100 or more accommodation units, the system must meet the following requirements:

(i) a well capacity of 0.6 gpm per unit;

(ii) a ground storage capacity of 35 gallons per unit;

(iii) two or more service pumps which have a total capacity of 1.0 gpm per unit; and

(iv) a pressure tank capacity of ten gallons per unit.

(2) Surface water supplies, regardless of size, must meet the following requirements:

(A) a raw water pump capacity of 0.6 gpm per unit with the largest pump out of service;

(B) a treatment plant capacity of 0.6 gpm per unit;

(C) a transfer pump capacity (where applicable) of 0.6 gpm per unit with the largest pump out of service;

(D) a ground storage capacity of 35 gallons per unit with a minimum of 1,000 gallons as clearwell capacity;

(E) two or more service pumps with a total capacity of 1.0 gpm per unit; and

(F) a pressure tank capacity of ten gallons per unit with a minimum requirement of 220 gallons.

(3) A noncommunity public water system that is an affected utility shall meet the requirements of subsection (h) of this section.

(d) Noncommunity water systems serving other than transient accommodation units.

(1) The following table is applicable to paragraphs (2) and (3) of this subsection and shall be used to determine the maximum daily demand for the various types of facilities listed.

Figure: 30 TAC §290.45(d)(1) (No change to the figure as it exists in TAC.)

(2) Groundwater supplies must meet the following requirements.

(A) Subject to the requirements of subparagraph (B) of this paragraph, if fewer than 300 persons per day are served, the system must meet the following requirements:

(i) a well capacity which meets or exceeds the maximum daily demand of the system during the hours of operation; and

(ii) a minimum pressure tank capacity of 220 gallons with additional capacity, if necessary, based on a sanitary survey conducted by the executive director.

(B) Systems which serve 300 or more persons per day or serve fewer than 300 persons per day and provide ground storage must meet the following requirements:

(i) a well capacity which meets or exceeds the maximum daily demand;

(ii) a ground storage capacity which is equal to 50% of the maximum daily demand;

(iii) if the maximum daily demand is less than 15 gpm, at least one service pump with a capacity of three times the maximum daily demand;

(iv) if the maximum daily demand is 15 gpm or more, at least two service pumps with a total capacity of three times the maximum daily demand; and

(v) a minimum pressure tank capacity of 220 gallons with additional capacity, if necessary, based on a sanitary survey conducted by the executive director.

(3) Each surface water supply or groundwater supply that is under the direct influence of surface water, regardless of size, must meet the following requirements:

(A) a raw water pump capacity which meets or exceeds the maximum daily demand of the system with the largest pump out of service;

(B) a treatment plant capacity which meets or exceeds the system's maximum daily demand;

(C) a transfer pump capacity (where applicable) sufficient to meet the maximum daily demand with the largest pump out of service;

(D) a clearwell capacity which is equal to 50% of the maximum daily demand;

(E) two or more service pumps with a total capacity of three times the maximum daily demand; and

(F) a minimum pressure tank capacity of 220 gallons with additional capacity, if necessary, based on a sanitary survey conducted by the executive director.

(4) A noncommunity public water system that is an affected utility shall meet the requirements of subsection (h) of this section.

(e) Water wholesalers. The following additional requirements apply to systems which supply wholesale treated water to other public water supplies.

(1) All wholesalers must provide enough production, treatment, and service pumping capacity to meet or exceed the combined maximum daily commitments specified in their various contractual obligations.

(2) For wholesale water suppliers, minimum water system capacity requirements shall be determined by calculating the requirements based upon the number of retail customer service connections of that wholesale water supplier, if any, fire flow capacities, if required by §290.46(x) and (y) of this title and adding that amount to the maximum amount of water obligated or pledged under all wholesale contracts.

(3) Emergency power is required for each portion of the system which supplies more than 250 connections under direct pressure and does not provide an elevated storage capacity of at least 100 gallons per connection. If emergency power is required, it must be sufficient to deliver 20% of the minimum required service pump capacity in the event of the loss of normal power supply. When the wholesaler provides water through an air gap into the purchaser's storage facilities it will be the purchaser's responsibility to meet all minimum water system capacity requirements including emergency power.

(4) A wholesaler that is an affected utility must meet the requirements specified in subsection (h) of this section.

(f) Purchased water systems. The following requirements apply only to systems which purchase treated water to meet all or part of their production, storage, service pump, or pressure maintenance capacity requirements.

(1) The water purchase contract must be available to the executive director in order that production, storage, service pump, or pressure maintenance capacity may be properly evaluated. For purposes of this section, a contract may be defined as a signed written document of specific terms agreeable to the water purchaser and the water wholesaler, or in its absence, a memorandum or letter of understanding between the water purchaser and the water wholesaler.

(2) The contract shall authorize the purchase of enough water to meet the monthly or annual needs of the purchaser.

(3) The contract shall also establish the maximum rate at which water may be drafted on a daily and hourly basis. In the absence of specific maximum daily or maximum hourly rates in the contract, a uniform purchase rate for the contract period will be used.

(4) The maximum authorized daily purchase rate specified in the contract, or a uniform purchase rate in the absence of a specified daily purchase rate, plus the actual production capacity of the system must be at least 0.6 gpm per connection.

(5) For systems which purchase water under direct pressure, the maximum hourly purchase authorized by the contract plus the actual service pump capacity of the system must be at least 2.0 gpm per connection or provide at least 1,000 gpm and be able to meet peak hourly demands, whichever is less.

(6) The purchaser is responsible for meeting all production requirements. If additional capacity to meet increased demands cannot be attained from the wholesaler through a new or amended contract, additional capacity must be obtained from water purchase contracts with other entities, new wells, or surface water treatment facilities. However, if the water purchase contract prohibits the purchaser from securing water from sources other than the wholesaler, the wholesaler is responsible for meeting all production requirements.

(7) All other minimum capacity requirements specified in this section and §290.46(x) and (y) of this title shall apply.

(g) Alternative capacity requirements. Public water systems may request approval to meet alternative capacity requirements in lieu of the minimum capacity requirements specified in this section. Any water system requesting to use an alternative capacity requirement must demonstrate to the satisfaction of the executive director that approving the request will not compromise the public health or result in a degradation of service or water quality and comply with the requirements found in §290.46(x) and (y) of this title. Alternative capacity requirements are unavailable for groundwater systems serving fewer than 50 connections without total storage as specified in subsection (b)(1) of this section or for noncommunity water systems as specified in subsections (c) and (d) of this section.

(1) Alternative capacity requirements for public water systems may be granted upon request to and approval by the executive director. The request to use an alternative capacity requirement must include:

(A) a detailed inventory of the major production, pressurization, and storage facilities utilized by the system;

(B) records kept by the water system that document the daily production of the system. The period reviewed shall not be less than three years. The applicant may not use a calculated peak daily demand;

(C) data acquired during the last drought period in the region, if required by the executive director;

(D) the actual number of active connections for each month during the three years of production data;

(E) description of any unusual demands on the system such as fire flows or major main breaks that will invalidate unusual peak demands experienced in the study period;

(F) any other relevant data needed to determine that the proposed alternative capacity requirement will provide at least 35 psi in the public water system except during line repair or during fire fighting when it cannot be less than 20 psi; and

(G) a copy of all data relied upon for making the proposed determination.

(2) Alternative capacity requirements for existing public water systems must be based upon the maximum daily demand for the system, unless the request is submitted by a licensed professional engineer in accordance with the requirements of

paragraph (3) of this subsection. The maximum daily demand must be determined based upon the daily usage data contained in monthly operating reports for the system during a 36 consecutive month period. The 36 consecutive month period must end within 90 days of the date of submission to ensure the data is as current as possible.

(A) Maximum daily demand is the greatest number of gallons, including groundwater, surface water, and purchased water delivered by the system during any single day during the review period. Maximum daily demand excludes unusual demands on the system such as fire flows or major main breaks.

(B) For the purpose of calculating alternative capacity requirements, an equivalency ratio must be established. This equivalency ratio must be calculated by multiplying the maximum daily demand, expressed in gpm per connection, by a fixed safety factor and dividing the result by 0.6 gpm per connection. The safety factor shall be 1.15 unless it is documented that the existing system capacity is adequate for the next five years. In this case, the safety factor may be reduced to 1.05. The conditions in §291.93(3) of this title (relating to Adequacy of Water Utility Service) concerning the 85% rule shall continue to apply to public water systems that are also retail public utilities.

(C) To calculate the alternative capacity requirements, the equivalency ratio must be multiplied by the appropriate minimum capacity requirements specified in subsection (b) of this section. Standard rounding methods are used to round calculated alternative production capacity requirement values to the nearest one-hundredth.

(3) Alternative capacity requirements which are proposed and submitted by licensed professional engineers for review are subject to the following additional requirements.

(A) A signed and sealed statement by the licensed professional engineer must be provided which certifies that the proposed alternative capacity requirements have been determined in accordance with the requirements of this subsection.

(B) If the system is new or at least 36 consecutive months of data is not available, maximum daily demand may be based upon at least 36 consecutive months of data from a comparable public water system. A licensed professional engineer must certify that the data from another public water system is comparable based on consideration of the following factors: prevailing land use patterns (rural versus urban); number of connections; density of service populations; fire flow obligations; and socioeconomic, climatic, geographic, and topographic considerations as well as other factors as may be relevant. The comparable public water system shall not exhibit any of the conditions listed in paragraph (6)(A) of this subsection.

(4) The executive director shall consider requests for alternative capacity requirements in accordance with the following requirements.

(A) For those requests submitted under the seal of a licensed professional engineer, the executive director must mail written acceptance or denial of the proposed alternative capacity requirements to the public water system within 90 days from the date of submission. If the executive director fails to mail written notification within 90 days, the alternative capacity requirements submitted by a licensed professional engineer automatically become the alternative capacity requirements for the public water system.

(B) If the executive director denies the request:

(i) the executive director shall mail written notice to the public water system identifying the specific reason or reasons for denial and allow 45 days for the public water system to respond to the reason(s) for denial;

(ii) the denial is final if no response from the public water system is received within 45 days of the written notice being mailed; and

(iii) the executive director must mail a final written approval or denial within 60 days from the receipt of any response timely submitted by the public water system.

(5) Although elevated storage is the preferred method of pressure maintenance for systems of over 2,500 connections, it is recognized that local conditions may dictate the use of alternate methods utilizing hydropneumatic tanks and on-site emergency power equipment. Alternative capacity requirements to the elevated storage requirements may be obtained based on request to and approval by the executive director. Special conditions apply to systems qualifying for an elevated storage alternative capacity requirement.

(A) The system must submit documentation sufficient to assure that the alternate method of pressure maintenance is capable of providing a safe and uninterrupted supply of water under pressure to the distribution system during all demand conditions.

(i) A signed and sealed statement by a licensed professional engineer must be provided which certifies that the pressure maintenance facilities are sized, designed, and capable of providing a minimum pressure of at least 35 psi at all points within the distribution network at flow rates of 1.5 gpm per connection or greater. In addition, the engineer must certify that the emergency power facilities are capable of providing the greater of the average daily demand or 0.35 gpm per connection while maintaining distribution pressures of at least 35 psi, and that emergency power facilities powering production and treatment facilities are capable of supplying at least 0.35 gpm per connection to storage.

(ii) The system's licensed professional engineer must conduct a hydraulic analysis of the system under peak conditions. This must include an analysis of the time lag between the loss of the normal power supply and the commencement of emergency power as well as the minimum pressure that will be maintained within the distribution system during this time lag. In no case shall this minimum pressure within the distribution system be less than 20 psi. The results of this analysis must be submitted to the executive director for review.

(iii) For existing systems, the system's licensed professional engineer must provide continuous pressure chart recordings of distribution pressures maintained during past power failures, if available. The period reviewed shall not be less than three years.

(iv) A public water system that is an affected utility must conduct the modeling requirements contained in clauses (i) - (iii) of this subparagraph using the requirements specified in subsection (h) of this section.

(B) Emergency power facilities must be maintained and provided with necessary appurtenances to assure immediate and dependable operation in case of normal power interruption. A public water system that is an affected utility must meet the requirements specified in subsection (h) of this section.

(i) The facilities must be serviced and maintained in accordance with level 2 maintenance requirements contained in the current NFPA 110 Standard and the manufacturers' recommendations.

(ii) The switching gear must be capable of bringing the emergency power generating equipment on-line during a power interruption such that the pressure in the distribution network does not fall below 20 psi at any time.

(iii) The minimum on-site fuel storage capacity shall be determined by the fuel demand of the emergency power facilities and the frequency of fuel delivery. An amount of fuel equal to that required to operate the facilities under-load for a period of at least eight hours must always be maintained on site.

(iv) Residential rated mufflers or other means of effective noise suppression must be provided on each emergency power motor.

(C) Battery-powered or uninterrupted power supply pressure monitors and chart recorders which are configured to activate immediately upon loss of normal power must be provided for pressure maintenance facilities. These records must be kept for a minimum of three years and made available for review by the executive director. Records must include chart recordings of all power interruptions including interruptions due to periodic emergency power under-load testing and maintenance.

(D) An emergency response plan must be submitted detailing procedures to be followed and individuals to be contacted in the event of loss of normal power supply.

(6) Any alternative capacity requirement granted under this subsection is subject to review and revocation or revision by the executive director. If permission to

use an alternative capacity requirement is revoked, the public water system must meet the applicable minimum capacity requirements of this section.

(A) The following conditions, if attributable to the alternative capacity requirements, may constitute grounds for revocation or revision of established alternative capacity requirements or for denial of new requests, if the condition occurred within the last 36 months:

(i) documented pressure below 35 psi at any time not related to line repair, except during fire fighting when it cannot be less than 20 psi;

(ii) water outages due to high water usage;

(iii) mandatory water rationing due to high customer demand or overtaxed water production or supply facilities;

(iv) failure to meet a minimum capacity requirement or an established alternative capacity requirement;

(v) changes in water supply conditions or usage patterns which create a potential threat to public health; or

(vi) any other condition where the executive director finds that the alternative capacity requirement has compromised the public health or resulted in a degradation of service or water quality.

(B) If the executive director finds any of the conditions specified in subparagraph (A) of this paragraph, the process for revocation or revision of an alternative capacity requirement shall be as follows, unless the executive director finds that failure of the service or other threat to public health and safety is imminent under subparagraph (C) of this paragraph.

(i) The executive director must mail the public drinking water system written notice of the executive director's intent to revoke or revise an alternative capacity requirement identifying the specific reason(s) for the proposed action.

(ii) The public water system has 30 days from the date the written notice is mailed to respond to the proposed action.

(iii) The public water system has 30 days from the date the written notice is mailed to request a meeting with the agency's public drinking water program personnel to review the proposal. If requested, such a meeting must occur within 45 days of the date the written notice is mailed.

(iv) After considering any response from or after any requested meeting with the public drinking water system, the executive director must mail written notification to the public drinking water system of the executive director's final decision to continue, revoke, or revise an alternative capacity requirement identifying the specific reason(s) for the decision.

(C) If the executive director finds that failure of the service or other threat to public health and safety is imminent, the executive director may issue written notification of the executive director's final decision to revoke or revise an alternative capacity requirement at any time.

(h) Affected utilities. This subsection applies to all affected utilities and is in addition to any other requirements pertaining to emergency power requirements found in this subchapter.

(1) Affected utilities must provide one of the following options of sufficient power to meet the capacity requirements of paragraph (1) or (2) of this subsection,

whichever is applicable, and in accordance with the affected utility's approved emergency preparedness plan:

(A) the maintenance of automatically starting auxiliary generators;

(B) the sharing of auxiliary generator capacity with one or more affected utilities;

(C) the negotiation of leasing and contracting agreements, including emergency mutual aid agreements with other retail public utilities, exempt utilities, or providers, or conveyors of potable or raw water service, if the agreements provide for coordination with the division of emergency management in the governor's office;

(D) the use of portable generators capable of serving multiple facilities equipped with quick-connect systems;

(E) the use of on-site electrical generation or electrical distributed generation facilities;

(F) hardening of the electric transmission and electric distribution system against damage from natural disasters during an extended power outage;

(G) for existing facilities, the maintenance of direct engine or right angle drives; or

(H) any other alternative determined by the executive director to be acceptable.

(2) Each affected utility that supplies, provides, or conveys surface water to wholesale customers shall install and maintain automatically starting auxiliary generators or distributive generation facilities for each raw water intake pump station, water treatment plant, pump station, and pressure facility necessary to provide water to its wholesale customers.

(3) Emergency generators used as part of an approved emergency preparedness plan must be maintained, tested, and operated in accordance with the manufacturer's specifications.

(4) An affected utility may adopt and is encouraged to enforce limitations on water use while the utility is providing emergency operations.

(5) As soon as safe and practicable following the occurrence of a natural disaster, an affected utility must operate in accordance with its approved emergency preparedness plan, which may include using elevated storage. An affected utility may meet the requirements of Texas Water Code, §13.1395, including having a currently approved emergency preparedness plan, in lieu of any other rules regarding elevated storage requirements, provided that, under normal operating conditions, the affected utility continues to meet the pressure requirements of §290.46(r) of this title and the production, treatment, total storage and service pump capacity requirements of this subchapter.

(6) An affected utility must maintain on-site, or make readily available during emergency operations, an amount of fuel necessary to operate any required emergency power equipment necessary to maintain emergency operations.

§290.46. Minimum Acceptable Operating Practices for Public Drinking Water Systems.

(a) General. When a public drinking water supply system is to be established, plans shall be submitted to the executive director for review and approval prior to the construction of the system. All public water systems are to be constructed in conformance with the requirements of this subchapter and maintained and operated in accordance with the following minimum acceptable operating practices. Owners and operators shall allow entry to members of the commission and employees and agents of the commission onto any public or private property at any reasonable time for the purpose of inspecting and investigating conditions relating to public water systems in the state including the required elements of a sanitary survey as defined in §290.38 of this title (relating to Definitions). Members, employees, or agents acting under this authority shall observe the establishment's rules and regulations concerning safety, internal security, and fire protection, and if the property has management in residence, shall notify management or the person then in charge of his presence and shall exhibit proper credentials.

(b) Microbiological. Submission of samples for microbiological analysis shall be as required by Subchapter F of this chapter (relating to Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Systems). Microbiological samples may be required by the executive director for monitoring purposes in addition to the routine samples required by the drinking water standards. These samples shall be submitted to an accredited laboratory. (A list of the accredited laboratories can be obtained by contacting the executive director.) The samples shall be submitted to the executive director in a manner prescribed by the executive director.

(c) Chemical. Samples for chemical analysis shall be submitted as directed by the executive director.

(d) Disinfectant residuals and monitoring. A disinfectant residual must be continuously maintained during the treatment process and throughout the distribution system.

(1) Disinfection equipment shall be operated and monitored in a manner that will assure compliance with the requirements of §290.110 of this title (relating to Disinfectant Residuals).

(2) The disinfection equipment shall be operated to maintain the following minimum disinfectant residuals in each finished water storage tank and throughout the distribution system at all times:

(A) a free chlorine residual of 0.2 milligrams per liter (mg/L); or

(B) a chloramine residual of 0.5 mg/L (measured as total chlorine) for those systems that distribute chloraminated water.

(e) Operation by trained and licensed personnel. Except as provided in paragraph (1) of this subsection, the production, treatment, and distribution facilities at the public water system must be operated at all times under the direct supervision of a water works operator who holds an applicable, valid license issued by the executive director.

(1) Transient noncommunity public water systems are exempt from the requirements of this subsection if they use only groundwater or purchase treated water from another public water system.

(2) All public water systems that are subject to the provisions of this subsection shall meet the following requirements.

(A) Public water systems shall not allow new or repaired production, treatment, storage, pressure maintenance, or distribution facilities to be placed into service without the prior guidance and approval of a licensed water works operator.

(B) Public water systems shall ensure that their operators are trained regarding the use of all chemicals used in the water treatment plant. Training programs shall meet applicable standards established by the Occupational Safety and

Health Administration or the Texas Hazard Communication Act, Texas Health and Safety Code, Chapter 502.

(C) Public water systems using chlorine dioxide shall place the operation of the chlorine dioxide facilities under the direct supervision of a licensed operator who has a Class "C" or higher license.

(D) Effective September 1, 2016, reverse osmosis or nanofiltration membrane systems must have operators that have successfully completed at least one executive director-approved training course or event specific to the operations and maintenance of reverse osmosis or nanofiltration membrane treatment.

(3) Systems that only purchase treated water shall meet the following requirements in addition to the requirements contained in paragraph (2) of this subsection.

(A) Purchased water systems serving no more than 250 connections must employ an operator who holds a Class "D" or higher license.

(B) Purchased water systems serving more than 250 connections, but no more than 1,000 connections, must employ an operator who holds a Class "C" or higher license.

(C) Purchased water systems serving more than 1,000 connections must employ at least two operators who hold a Class "C" or higher license and who each work at least 16 hours per month at the public water system's treatment or distribution facilities.

(4) Systems that treat groundwater and do not treat surface water or groundwater that is under the direct influence of surface water shall meet the following requirements in addition to the requirements contained in paragraph (2) of this subsection.

(A) Groundwater systems serving no more than 250 connections must employ an operator with a Class "D" or higher license.

(B) Groundwater systems serving more than 250 connections, but no more than 1,000 connections, must employ an operator with a Class "C" or higher groundwater license.

(C) Groundwater systems serving more than 1,000 connections must employ at least two operators who hold a Class "C" or higher groundwater license and who each work at least 16 hours per month at the public water system's production, treatment, or distribution facilities.

(5) Systems that treat groundwater that is under the direct influence of surface water must meet the following requirements in addition to the requirements contained in paragraph (2) of this subsection.

(A) Systems which serve no more than 1,000 connections and utilize cartridge or membrane filters must employ an operator who holds a Class "C" or higher groundwater license and has completed a four-hour training course on monitoring and reporting requirements or who holds a Class "C" or higher surface water license and has completed the Groundwater Production course.

(B) Systems which serve more than 1,000 connections and utilize cartridge or membrane filters must employ at least two operators who meet the requirements of subparagraph (A) of this paragraph and who each work at least 24 hours per month at the public water system's production, treatment, or distribution facilities.

(C) Systems which serve no more than 1,000 connections and utilize coagulant addition and direct filtration must employ an operator who holds a Class "C" or higher surface water license and has completed the Groundwater Production course or who holds a Class "C" or higher groundwater license and has completed a Surface Water Production course. Effective January 1, 2007, the public water system must employ at least one operator who has completed the Surface Water Production I course and the Surface Water Production II course.

(D) Systems which serve more than 1,000 connections and utilize coagulant addition and direct filtration must employ at least two operators who meet the requirements of subparagraph (C) of this paragraph and who each work at least 24 hours per month at the public water system's production, treatment, or distribution facilities. Effective January 1, 2007, the public water system must employ at least two operators who have completed the Surface Water Production I course and the Surface Water Production II course.

(E) Systems which utilize complete surface water treatment must comply with the requirements of paragraph (6) of this subsection.

(F) Each plant must have at least one Class "C" or higher operator on duty at the plant when it is in operation or the plant must be provided with continuous turbidity and disinfectant residual monitors with automatic plant shutdown and alarms to summon operators so as to ensure that the water produced continues to meet the commission's drinking water standards during periods when the plant is not staffed.

(6) Systems that treat surface water must meet the following requirements in addition to the requirements contained in paragraph (2) of this subsection.

(A) Surface water systems that serve no more than 1,000 connections must employ at least one operator who holds a Class "B" or higher surface water license. Part-time operators may be used to meet the requirements of this subparagraph if the operator is completely familiar with the design and operation of the plant and spends at least four consecutive hours at the plant at least once every 14 days and the system also employs an operator who holds a Class "C" or higher surface water license. Effective January 1, 2007, the public water system must employ at least one operator who has completed the Surface Water Production I course and the Surface Water Production II course.

(B) Surface water systems that serve more than 1,000 connections must employ at least two operators; one of the required operators must hold a Class "B" or higher surface water license and the other required operator must hold a Class "C" or higher surface water license. Each of the required operators must work at least 32 hours per month at the public water system's production, treatment, or distribution facilities. Effective January 1, 2007, the public water system must employ at least two operators who have completed the Surface Water Production I course and the Surface Water Production II course.

(C) Each surface water treatment plant must have at least one Class "C" or higher surface water operator on duty at the plant when it is in operation or the plant must be provided with continuous turbidity and disinfectant residual monitors with automatic plant shutdown and alarms to summon operators so as to ensure that the water produced continues to meet the commission's drinking water standards during periods when the plant is not staffed.

(D) Public water systems shall not allow Class "D" operators to adjust or modify the treatment processes at surface water treatment plant unless an operator who holds a Class "C" or higher surface license is present at the plant and has issued specific instructions regarding the proposed adjustment.

(f) Operating records and reports. Water systems must maintain a record of water works operation and maintenance activities and submit periodic operating reports.

(1) The public water system's operating records must be organized, and copies must be kept on file or stored electronically.

(2) The public water system's operating records must be accessible for review during inspections and be available to the executive director upon request.

(3) All public water systems shall maintain a record of operations.

(A) The following records shall be retained for at least two years:

(i) the amount of chemicals used:

(I) Systems that treat surface water or groundwater under the direct influence of surface water shall maintain a record of the amount of each chemical used each day.

(II) Systems that serve 250 or more connections or serve 750 or more people shall maintain a record of the amount of each chemical used each day.

(III) Systems that serve fewer than 250 connections, serve fewer than 750 people, and use only groundwater or purchased treated water shall maintain a record of the amount of each chemical used each week;

(ii) the volume of water treated and distributed:

(I) Systems that treat surface water or groundwater under the direct influence of surface water shall maintain a record of the amount of water treated and distributed each day.

(II) Systems that serve 250 or more connections or serve 750 or more people shall maintain a record of the amount of water distributed each day.

(III) Systems that serve fewer than 250 connections, serve fewer than 750 people, and use only groundwater or purchase treated water shall maintain a record of the amount of water distributed each week.

(IV) Systems that serve 250 or more connections or serve 750 or more people and also add chemicals or provide pathogen or chemical removal shall maintain a record of the amount of water treated each day.

(V) Systems that serve fewer than 250 connections, serve fewer than 750 people, use only groundwater or purchase treated water, and also add chemicals or provide pathogen or chemical removal shall maintain a record of the amount of water treated each week.

(iii) the date, location, and nature of water quality, pressure, or outage complaints received by the system and the results of any subsequent complaint investigation;

(iv) the dates that dead-end mains were flushed;

(v) the dates that storage tanks and other facilities were cleaned;

(vi) the maintenance records for water system equipment and facilities. For systems using reverse osmosis or nanofiltration, maintain records of each clean-in-place process including the date, duration, and procedure used for each event; and

(vii) for systems that do not employ full-time operators to meet the requirements of subsection (e) of this section, a daily record or a monthly summary of the work performed and the number of hours worked by each of the part-time operators used to meet the requirements of subsection (e) of this section.

(B) The following records shall be retained for at least three years:

(i) copies of notices of violation and any resulting corrective actions. The records of the actions taken to correct violations of primary drinking water regulations must be retained for at least three years after the last action taken with respect to the particular violation involved;

(ii) copies of any public notice issued by the water system;

(iii) the disinfectant residual monitoring results from the distribution system;

(iv) the calibration records for laboratory equipment, flow meters, rate-of-flow controllers, on-line turbidimeters, and on-line disinfectant residual analyzers;

(v) the records of backflow prevention device programs;

(vi) the raw surface water monitoring results and source water monitoring plans required by §290.111 of this title (relating to Surface Water Treatment) must be retained for three years after bin classification required by §290.111 of this title;

(vii) notification to the executive director that a system will provide 5.5-log *Cryptosporidium* treatment in lieu of raw surface water monitoring;

(viii) except for those specified in subparagraphs (C)(iv) and (E)(i) of this paragraph, the results of all surface water treatment monitoring that are used to demonstrate log inactivation or removal;

(ix) free and total chlorine, monochloramine, ammonia, nitrite, and nitrate monitoring results if chloramines are used in the water system; and

(x) the records of treatment effectiveness monitoring for systems using reverse osmosis or nanofiltration membranes. Treatment effectiveness monitoring includes the parameters for determining when maintenance is required. Examples of parameters to be monitored include conductivity (or total dissolved solids) on each membrane unit, pressure differential across a membrane vessel, flow, flux, and water temperature. At a minimum, systems using reverse osmosis or nanofiltration membranes must monitor the conductivity (or total dissolved solids) of the feed and permeate water once per day.

(C) The following records shall be retained for a period of five years after they are no longer in effect:

(i) the records concerning a variance or exemption granted to the system;

(ii) Concentration Time (CT) studies for surface water treatment plants;

(iii) the Recycling Practices Report form and other records pertaining to site-specific recycle practices for treatment plants that recycle; and

(iv) the turbidity monitoring results and exception reports for individual filters as required by §290.111 of this title.

(D) The following records shall be retained for at least five years:

(i) the results of microbiological analyses;

(ii) the results of inspections (as required in subsection (m)(1) of this section) for all water storage and pressure maintenance facilities;

(iii) the results of inspections (as required by subsection (m)(2) of this section) for all pressure filters;

(iv) documentation of compliance with state approved corrective action plan and schedules required to be completed by groundwater systems that must take corrective actions;

(v) documentation of the reason for an invalidated fecal indicator source sample and documentation of a total coliform-positive sample collected at a location with conditions that could cause such positive samples in a distribution system;

(vi) notification to wholesale system(s) of a distribution coliform positive sample for consecutive systems using groundwater;

(vii) Consumer Confidence Report compliance documentation;

(viii) records of the lowest daily residual disinfectant concentration and records of the date and duration of any failure to maintain the executive director-approved minimum specified disinfectant residual for a period of more than four hours for groundwater systems providing 4-log treatment; and

(ix) records of executive director-specified compliance requirements for membrane filtration, records of parameters specified by the executive director for approved alternative treatment and records of the date and duration of any failure to meet the membrane operating, membrane integrity, or alternative treatment operating requirements for more than four hours for groundwater systems. Membrane filtration can only be used if it is approved by the executive director and if it can be properly validated.

(E) The following records shall be retained for at least ten years:

(i) copies of Monthly Operating Reports and any supporting documentation including turbidity monitoring results of the combined filter effluent;

(ii) the results of chemical analyses;

(iii) any written reports, summaries, or communications relating to sanitary surveys of the system conducted by the system itself, by a private consultant, or by the executive director shall be kept for a period not less than ten years after completion of the survey involved;

(iv) copies of the Customer Service Inspection reports required by subsection (j) of this section;

(v) copy of any Initial Distribution System Evaluation (IDSE) plan, report, approval letters, and other compliance documentation required by §290.115 of this title (relating to Stage 2 Disinfection Byproducts (TTHM and HAA5));

(vi) state notification of any modifications to an IDSE report;

(vii) copy of any 40/30 certification required by §290.115 of this title;

(viii) documentation of corrective actions taken by groundwater systems in accordance with §290.116 of this title (relating to Groundwater Corrective Actions and Treatment Techniques);

(ix) any monitoring plans required by §290.121(b) of this title (relating to Monitoring Plans); and

(x) records of the executive director-approved minimum specified disinfectant residual for groundwater systems providing 4-log treatment, including wholesale, consecutive, and mixed systems, regulated under §290.116(c) of this title.

(F) A public water system shall maintain records relating to lead and copper requirements under §290.117 of this title (relating to Regulation of Lead and Copper) for no less than 12 years. Any system subject to the requirements of §290.117 of this title shall retain on its premises original records of all sampling data and analyses, reports, surveys, letters, evaluations, schedules, executive determinations, and any other information required by the executive director under §290.117 of this title. These records include, but are not limited to, the following items: tap water monitoring results including the location of each site and date of collection; certification of the volume and validity of first-draw-tap sample criteria via a copy of the laboratory analysis request form; where residents collected the sample; certification that the water system informed the resident of proper sampling procedures; the analytical results for lead and copper concentrations at each tap sample site; and designation of any substitute site not used in previous monitoring periods.

(G) A public water system shall maintain records relating to special studies and pilot projects, special monitoring, and other system-specific matters as directed by the executive director.

(4) Water systems shall submit routine reports and any additional documentation that the executive director may require to determine compliance with the requirements of this chapter.

(A) The reports must be submitted to the Texas Commission on Environmental Quality, Water Supply Division, MC 155, P.O. Box 13087, Austin, Texas 78711-3087 by the tenth day of the month following the end of the reporting period.

(B) The reports must contain all the information required by the drinking water standards and the results of any special monitoring tests which have been required.

(C) The reports must be completed in ink, typed, or computer-printed and must be signed by the licensed water works operator.

(5) All public water systems that are affected utilities must maintain the following records for as long as they are applicable to the system:

(A) An emergency preparedness plan approved by the executive director and a copy of the approval letter.

(B) All required operating and maintenance records for auxiliary power equipment, including periodic testing of the auxiliary power equipment under load and any associated automatic switch over equipment.

(C) Copies of the manufacturer's specifications for all generators that are part of the approved emergency preparedness plan.

(g) Disinfection of new or repaired facilities. Disinfection by or under the direction of water system personnel must be performed when repairs are made to existing facilities and before new facilities are placed into service. Disinfection must be performed in accordance with American Water Works Association (AWWA) requirements and water samples must be submitted to a laboratory approved by the executive director. The sample results must indicate that the facility is free of microbiological contamination before it is placed into service. When it is necessary to return repaired mains to service as rapidly as possible, doses may be increased to 500 mg/L and the contact time reduced to 1/2 hour.

(h) Calcium hypochlorite. A supply of calcium hypochlorite disinfectant shall be kept on hand for use when making repairs, setting meters, and disinfecting new mains prior to placing them in service.

(i) Plumbing ordinance. Public water systems must adopt an adequate plumbing ordinance, regulations, or service agreement with provisions for proper enforcement to insure that neither cross-connections nor other unacceptable plumbing practices are permitted (See §290.47(b) of this title (relating to Appendices)). Should sanitary control of the distribution system not reside with the purveyor, the entity retaining sanitary control shall be responsible for establishing and enforcing adequate regulations in this regard. The use of pipes and pipe fittings that contain more than 0.25% lead or solders and flux that contain more than 0.2% lead is prohibited for installation or repair of any public water supply and for installation or repair of any plumbing in a residential or nonresidential facility providing water for human consumption and connected to a public drinking water supply system. This requirement may be waived for lead joints that are necessary for repairs to cast iron pipe.

(j) Customer service inspections. A customer service inspection certificate shall be completed prior to providing continuous water service to new construction, on any existing service either when the water purveyor has reason to believe that cross-connections or other potential contaminant hazards exist, or after any material improvement, correction, or addition to the private water distribution facilities. Any customer service inspection certificate form which varies from the format found in commission Form 20699 must be approved by the executive director prior to being placed in use.

(1) Individuals with the following credentials shall be recognized as capable of conducting a customer service inspection certification.

(A) Plumbing Inspectors and Water Supply Protection Specialists licensed by the Texas State Board of Plumbing Examiners (TSBPE).

(B) Customer service inspectors who have completed a commission-approved course, passed an examination administered by the executive director, and hold current professional license as a customer service inspector.

(2) As potential contaminant hazards are discovered, they shall be promptly eliminated to prevent possible contamination of the water supplied by the public water system. The existence of a health hazard, as identified in §290.47(f) of this title, shall be considered sufficient grounds for immediate termination of water service. Service can be restored only when the health hazard no longer exists, or until the health hazard has been isolated from the public water system in accordance with §290.44(h) of this title (relating to Water Distribution).

(3) These customer service inspection requirements are not considered acceptable substitutes for and shall not apply to the sanitary control requirements stated in §290.102(a)(5) of this title (relating to General Applicability).

(4) A customer service inspection is an examination of the private water distribution facilities for the purpose of providing or denying water service. This inspection is limited to the identification and prevention of cross-connections, potential contaminant hazards, and illegal lead materials. The customer service inspector has no authority or obligation beyond the scope of the commission's regulations. A customer service inspection is not a plumbing inspection as defined and regulated by the TSBPE. A customer service inspector is not permitted to perform plumbing inspections. State statutes and TSBPE adopted rules require that TSBPE licensed plumbing inspectors perform plumbing inspections of all new plumbing and alterations or additions to

existing plumbing within the municipal limits of all cities, towns, and villages which have passed an ordinance adopting one of the plumbing codes recognized by TSBPE. Such entities may stipulate that the customer service inspection be performed by the plumbing inspector as a part of the more comprehensive plumbing inspection. Where such entities permit customer service inspectors to perform customer service inspections, the customer service inspector shall report any violations immediately to the local entity's plumbing inspection department.

(k) Interconnection. No physical connection between the distribution system of a public drinking water supply and that of any other water supply shall be permitted unless the other water supply is of a safe, sanitary quality and the interconnection is approved by the executive director.

(l) Flushing of mains. All dead-end mains must be flushed at monthly intervals. Dead-end lines and other mains shall be flushed as needed if water quality complaints are received from water customers or if disinfectant residuals fall below acceptable levels as specified in §290.110 of this title.

(m) Maintenance and housekeeping. The maintenance and housekeeping practices used by a public water system shall ensure the good working condition and general appearance of the system's facilities and equipment. The grounds and facilities shall be maintained in a manner so as to minimize the possibility of the harboring of rodents, insects, and other disease vectors, and in such a way as to prevent other conditions that might cause the contamination of the water.

(1) Each of the system's ground, elevated, and pressure tanks shall be inspected annually by water system personnel or a contracted inspection service.

(A) Ground and elevated storage tank inspections must determine that the vents are in place and properly screened, the roof hatches closed and locked, flap valves and gasketing provide adequate protection against insects, rodents, and other vermin, the interior and exterior coating systems are continuing to provide adequate protection to all metal surfaces, and the tank remains in a watertight condition.

(B) Pressure tank inspections must determine that the pressure release device and pressure gauge are working properly, the air-water ratio is being maintained at the proper level, the exterior coating systems are continuing to provide adequate protection to all metal surfaces, and the tank remains in watertight condition. Pressure tanks provided with an inspection port must have the interior surface inspected every five years.

(C) All tanks shall be inspected annually to determine that instrumentation and controls are working properly.

(2) When pressure filters are used, a visual inspection of the filter media and internal filter surfaces shall be conducted annually to ensure that the filter media is in good condition and the coating materials continue to provide adequate protection to internal surfaces.

(3) When cartridge filters are used, filter cartridges shall be changed at the frequency required by the manufacturer, or more frequently if needed.

(4) All water treatment units, storage and pressure maintenance facilities, distribution system lines, and related appurtenances shall be maintained in a watertight condition and be free of excessive solids.

(5) Basins used for water clarification shall be maintained free of excessive solids to prevent possible carryover of sludge and the formation of tastes and odors.

(6) Pumps, motors, valves, and other mechanical devices shall be maintained in good working condition.

(7) Reverse osmosis or nanofiltration membrane systems shall be cleaned, or replaced, in accordance with the allowable operating conditions of the manufacturer and shall be based on one or more of the following: increased salt passage, increased or decreased pressure differential, and/or change in normalized permeate flow.

(n) Engineering plans and maps. Plans, specifications, maps, and other pertinent information shall be maintained to facilitate the operation and maintenance of the system's facilities and equipment. The following records shall be maintained on file at the public water system and be available to the executive director upon request.

(1) Accurate and up-to-date detailed as-built plans or record drawings and specifications for each treatment plant, pump station, and storage tank shall be maintained at the public water system until the facility is decommissioned. As-built plans of individual projects may be used to fulfill this requirement if the plans are maintained in an organized manner.

(2) An accurate and up-to-date map of the distribution system shall be available so that valves and mains can be easily located during emergencies.

(3) Copies of well completion data such as well material setting data, geological log, sealing information (pressure cementing and surface protection),

disinfection information, microbiological sample results, and a chemical analysis report of a representative sample of water from the well shall be kept on file for as long as the well remains in service.

(o) Filter backwashing at surface water treatment plants. Filters must be backwashed when a loss of head differential of six to ten feet is experienced between the influent and effluent loss of head gauges or when the turbidity level at the effluent of the filter reaches 1.0 nephelometric turbidity unit (NTU).

(p) Data on water system ownership and management. The agency shall be provided with information regarding water system ownership and management.

(1) When a water system changes ownership, a written notice of the transaction must be provided to the executive director. When applicable, notification shall be in accordance with Chapter 291 of this title (relating to Utility Regulations). Those systems not subject to Chapter 291 of this title shall notify the executive director of changes in ownership by providing the name of the current and prospective owner or responsible official, the proposed date of the transaction, and the address and phone number of the new owner or responsible official. The information listed in this paragraph and the system's public drinking water supply identification number, and any

other information necessary to identify the transaction shall be provided to the executive director 120 days before the date of the transaction.

(2) On an annual basis, the owner of a public water system shall provide the executive director with a written list of all the operators and operating companies that the public water system employs. The notice shall contain the name, license number, and license class of each employed operator and the name and registration number of each employed operating company (See §290.47(d) of this title).

(q) Special precautions. Special precautions must be instituted by the water system owner or responsible official in the event of low distribution pressures (below 20 pounds per square inch (psi)), water outages, microbiological samples found to contain *Escherichia coli* or fecal coliform organisms, failure to maintain adequate chlorine residuals, elevated finished water turbidity levels, or other conditions which indicate that the potability of the drinking water supply has been compromised.

(1) Boil water notifications must be issued to the customers within 24 hours using the prescribed notification format as specified in §290.47(c) of this title. A copy of this notice shall be provided to the executive director. Bilingual notification may be appropriate based upon local demographics. Once the boil water notification is no

longer in effect, the customers must be notified in a manner similar to the original notice.

(2) The flowchart found in §290.47(e) of this title shall be used to determine if a boil water notification must be issued in the event of a loss of distribution system pressure. If a boil water notice is issued under this section, it shall remain in effect until water distribution pressures in excess of 20 psi can consistently be maintained, a minimum of 0.2 mg/L free chlorine residual or 0.5 mg/L chloramine residual (measured as total chlorine) is present throughout the system, and water samples collected for microbiological analysis are found negative for coliform organisms.

(3) A boil water notification shall be issued if the turbidity of the finished water produced by a surface water treatment plant exceeds 5.0 NTU. The boil water notice shall remain in effect until the water entering the distribution system has a turbidity level below 1.0 NTU, the distribution system has been thoroughly flushed, a minimum of 0.2 mg/L free chlorine residual or 0.5 mg/L chloramine residual (measured as total chlorine) is present throughout the system, and water samples collected for microbiological analysis are found negative for coliform organisms.

(4) Other protective measures may be required at the discretion of the executive director.

(r) Minimum pressures. All public water systems shall be operated to provide a minimum pressure of 35 psi throughout the distribution system under normal operating conditions. The system shall also be operated to maintain a minimum pressure of 20 psi during emergencies such as fire fighting. As soon as safe and practicable following the occurrence of a natural disaster, a public water system that is an affected utility shall maintain a minimum of 35 psi throughout the distribution system during an extended power outage.

(s) Testing equipment. Accurate testing equipment or some other means of monitoring the effectiveness of any chemical treatment or pathogen inactivation or removal processes must be used by the system.

(1) Flow-measuring devices and rate-of-flow controllers that are required by §290.42(b) and (d) of this title (relating to Water Treatment) shall be calibrated at least once every 12 months. Well meters required by §290.41(c)(3)(N) of this title (relating to Water Sources) shall be calibrated at least once every three years.

(2) Laboratory equipment used for compliance testing shall be properly calibrated.

(A) pH meters shall be properly calibrated.

(i) Benchtop pH meters shall be calibrated according to manufacturers specifications at least once each day.

(ii) The calibration of benchtop pH meters shall be checked with at least one buffer each time a series of samples is run, and if necessary, recalibrated according to manufacturers specifications.

(iii) On-line pH meters shall be calibrated according to manufacturer specifications at least once every 30 days.

(iv) The calibration of on-line pH meters shall be checked at least once each week with a primary standard or by comparing the results from the on-line unit with the results from a properly calibrated benchtop unit. If necessary, the on-line unit shall be recalibrated with primary standards.

(B) Turbidimeters shall be properly calibrated.

(i) Benchtop turbidimeters shall be calibrated with primary standards at least once every 90 days. Each time the turbidimeter is calibrated with primary standards, the secondary standards shall be restandardized.

(ii) The calibration of benchtop turbidimeters shall be checked with secondary standards each time a series of samples is tested, and if necessary, recalibrated with primary standards.

(iii) On-line turbidimeters shall be calibrated with primary standards at least once every 90 days.

(iv) The calibration of on-line turbidimeters shall be checked at least once each week with a primary standard, a secondary standard, or the manufacturer's proprietary calibration confirmation device or by comparing the results from the on-line unit with the results from a properly calibrated benchtop unit. If necessary, the on-line unit shall be recalibrated with primary standards.

(C) Chemical disinfectant residual analyzers shall be properly calibrated.

(i) The accuracy of manual disinfectant residual analyzers shall be verified at least once every 90 days using chlorine solutions of known concentrations.

(ii) The accuracy of continuous disinfectant residual analyzers shall be checked at least once every seven days with a chlorine solution of known concentration or by comparing the results from the on-line analyzer with the result of approved benchtop method in accordance with §290.119 of this title (relating to Analytical Procedures).

(iii) If a disinfectant residual analyzer produces a result which is not within 15% of the expected value, the cause of the discrepancy must be determined and corrected and, if necessary, the instrument must be recalibrated.

(D) Analyzers used to determine the effectiveness of chloramination in §290.110(c)(5) of this title shall be properly verified in accordance with the manufacturer's recommendations every 90 days. These analyzers include monochloramine, ammonia, nitrite, and nitrate equipment used by the public water system.

(E) Ultraviolet (UV) light disinfection analyzers shall be properly calibrated.

(i) The accuracy of duty UV sensors shall be verified with a reference UV sensor monthly, according to the UV sensor manufacturer.

(ii) The reference UV sensor shall be calibrated by the UV sensor manufacturer on a yearly basis, or sooner if needed.

(iii) If used, the UV Transmittance (UVT) analyzer shall be calibrated weekly according to the UVT analyzer manufacturer specifications.

(F) Systems must verify the performance of direct integrity testing equipment in a manner and schedule approved by the executive director.

(G) Conductivity (or total dissolved solids) monitors and pressure instruments used for reverse osmosis and nanofiltration membrane systems shall be calibrated at least once every 12 months.

(H) Any temperature monitoring devices used for reverse osmosis and nanofiltration shall be verified and calibrated in accordance with the manufacturer's specifications.

(t) System ownership. All community water systems shall post a legible sign at each of its production, treatment, and storage facilities. The sign shall be located in plain view of the public and shall provide the name of the water supply and an emergency telephone number where a responsible official can be contacted.

(u) Abandoned wells. Abandoned public water supply wells owned by the system must be plugged with cement according to 16 TAC Chapter 76 (relating to Water Well Drillers and Water Well Pump Installers). Wells that are not in use and are non-deteriorated as defined in those rules must be tested every five years or as required by the executive director to prove that they are in a non-deteriorated condition. The test results shall be sent to the executive director for review and approval. Deteriorated wells must be either plugged with cement or repaired to a non-deteriorated condition.

(v) Electrical wiring. All water system electrical wiring must be securely installed in compliance with a local or national electrical code.

(w) Security. All systems shall maintain internal procedures to notify the executive director by a toll-free reporting phone number immediately of the following events, if the event may negatively impact the production or delivery of safe and adequate drinking water:

(1) an unusual or unexplained unauthorized entry at property of the public water system;

(2) an act of terrorism against the public water system;

(3) an unauthorized attempt to probe for or gain access to proprietary information that supports the key activities of the public water system;

(4) a theft of property that supports the key activities of the public water system; or

(5) a natural disaster, accident, or act that results in damage to the public water system.

(x) Public safety standards. This subsection only applies to a municipality with a population of 1,000,000 or more, with a public utility within its corporate limits; a municipality with a population of more than 36,000 and less than 41,000 located in two counties, one of which is a county with a population of more than 1.8 million; a municipality, including any industrial district within the municipality or its extraterritorial jurisdiction (ETJ), with a population of more than 7,000 and less than 30,000 located in a county with a population of more than 155,000 and less than 180,000; or a municipality, including any industrial district within the municipality or its ETJ, with a population of more than 11,000 and less than 18,000 located in a county with a population of more than 125,000 and less than 230,000.

(1) In this subsection:

(A) "Regulatory authority" means, in accordance with the context in which it is found, either the commission or the governing body of a municipality.

(B) "Public utility" means any person, corporation, cooperative corporation, affected county, or any combination of these persons or entities, other than a municipal corporation, water supply or sewer service corporation, or a political subdivision of the state, except an affected county, or their lessees, trustees, and receivers, owning or operating for compensation in this state equipment or facilities for the transmission, storage, distribution, sale, or provision of potable water to the public or for the resale of potable water to the public for any use or for the collection, transportation, treatment, or disposal of sewage or other operation of a sewage disposal service for the public, other than equipment or facilities owned and operated for either purpose by a municipality or other political subdivision of this state or a water supply or sewer service corporation, but does not include any person or corporation not otherwise a public utility that furnishes the services or commodity only to itself or its employees or tenants as an incident of that employee service or tenancy when that service or commodity is not resold to or used by others.

(C) "Residential area" means:

(i) an area designated as a residential zoning district by a governing ordinance or code or an area in which the principal land use is for private residences;

(ii) a subdivision for which a plat is recorded in the real property records of the county and that contains or is bounded by public streets or parts of public streets that are abutted by residential property occupying at least 75% of the front footage along the block face; or

(iii) a subdivision a majority of the lots of which are subject to deed restrictions limiting the lots to residential use.

(D) "Industrial district" has the meaning assigned by Texas Local Government Code, §42.044, and includes an area that is designated by the governing body of a municipality as a zoned industrial area.

(2) When the regulatory authority is a municipality, it shall by ordinance adopt standards for installing fire hydrants in residential areas in the municipality. These standards must, at a minimum, follow current AWWA standards pertaining to fire hydrants and the requirements of §290.44(e)(6) of this title.

(3) When the regulatory authority is a municipality, it shall by ordinance adopt standards for maintaining sufficient water pressure for service to fire hydrants adequate to protect public safety in residential areas in the municipality. The standards specified in paragraph (4) of this subsection are the minimum acceptable standards.

(4) A public utility shall deliver water to any fire hydrant connected to the public utility's water system located in a residential area so that the flow at the fire hydrant is at least 250 gallons per minute for a minimum period of two hours while maintaining a minimum pressure of 20 psi throughout the distribution system during emergencies such as fire fighting. That flow is in addition to the public utility's maximum daily demand for purposes other than fire fighting.

(5) When the regulatory authority is a municipality, it shall adopt the standards required by this subsection within one year of the effective date of this subsection or within one year of the date this subsection first applies to the municipality, whichever occurs later.

(6) A public utility shall comply with the standards established by a municipality under both paragraphs (2) and (3) of this subsection within one year of the date the standards first apply to the public utility. If a municipality has failed to comply with the deadline required by paragraph (5) of this subsection, then a public utility shall comply with the standards specified in paragraphs (2) and (4) of this subsection within two years of the effective date of this subsection or within one year of the date this subsection first applies to the public utility, whichever occurs later.

(y) Fire hydrant flow standards.

(1) In this subsection:

(A) "Municipal utility" means a retail public utility, as defined by Texas Water Code (TWC), §13.002, that is owned by a municipality.

(B) "Residential area" means an area used principally for private residences that is improved with at least 100 single-family homes and has an average density of one home per half acre.

(C) "Utility" includes a "public utility" and "water supply or sewer service corporation" as defined by TWC, §13.002.

(2) The governing body of a municipality by ordinance may adopt standards set by the executive director requiring a utility to maintain a minimum sufficient water flow and pressure to fire hydrants in a residential area located in the municipality or the municipality's ETJ. The municipality must submit a signed copy of the ordinance to the executive director within 60 days of the adoption of an ordinance by its governing body.

(3) In addition to a utility's maximum daily demand, the utility must provide, for purposes of emergency fire suppression:

(A) a minimum sufficient water flow of at least 250 gallons per minute for at least two hours; and

(B) a minimum sufficient water pressure of at least 20 psi.

(4) If a municipality adopts standards for a minimum sufficient water flow and pressure to fire hydrants, the municipality must require a utility to maintain at least the minimum sufficient water flow and pressure described by paragraph (3) of this subsection in fire hydrants in a residential area located within the municipality or the municipality's ETJ. If the municipality adopts a fire flow standard exceeding the minimum standards set in paragraph (3) of this subsection, the standard adopted by the municipality must be based on:

(A) the density of connections;

(B) service demands; and

(C) other relevant factors.

(5) If the municipality owns a municipal utility, it may not require another utility located in the municipality or the municipality's ETJ to provide water flow and pressure in a fire hydrant greater than that provided by the municipal utility as determined by the executive director.

(6) If the municipality does not own a municipal utility, it may not require a utility located in the municipality or the municipality's ETJ to provide a minimum sufficient water flow and pressure greater than the standard established by paragraph (3) of this subsection.

(7) An ordinance under paragraph (2) of this subsection may not require a utility to build, retrofit, or improve infrastructure in existence at the time the ordinance is adopted.

(8) A municipality with a population of less than 1.9 million that adopts standards under paragraph (2) of this subsection or that seeks to use a utility's water for emergency fire suppression shall enter into a written memorandum of understanding with the utility.

(A) The memorandum of understanding must provide for:

(i) the necessary testing of fire hydrants; and

(ii) other relevant issues pertaining to the use of the water and maintenance of the fire hydrants to ensure compliance with this subsection.

(B) The municipality must submit a signed copy of the memorandum of understanding to the executive director within 60 days of the execution of the memorandum of understanding between its governing body and the utility.

(9) A municipality may notify the executive director of a utility's failure to comply with a standard adopted under paragraph (3) of this subsection.

(10) On receiving the notice described by paragraph (9) of this subsection, the executive director shall require a utility in violation of a standard adopted under this subsection to comply within a reasonable time established by the executive director.

(z) Nitrification Action Plan (NAP). Any water system distributing chloraminated water must create a NAP . The system must create a written NAP that:

(1) contains the system-specific plan for monitoring free ammonia, monochloramine, total chlorine, nitrite, and nitrate levels;

(2) contains system-specific action levels of the above monitored chemicals where action must be taken;

(3) contains specific corrective actions to be taken if the action levels are exceeded; and

(4) is maintained as part of the system's monitoring plan in §290.121 of this title.

§290.47. Appendices.

(a) Appendix A. Recognition as a Superior or Approved Public Water System.

Figure: 30 TAC §290.47(a) (No change to the figure as it currently exists in TAC.)

(b) Appendix B. Sample Retail Service Agreement.

Figure: 30 TAC §290.47(b)

Appendix B: Sample Retail Service Agreement

I. PURPOSE. The NAME OF WATER SYSTEM is responsible for protecting the drinking water supply from contamination or pollution which could result from improper system construction or configuration on the retail connection owner's side of the meter. The purpose of this service agreement is to notify each customer of the restrictions which are in place to provide this protection. The public water system enforces these restrictions to ensure the public health and welfare. Each retail customer must sign this agreement before the NAME OF WATER SYSTEM will begin service. In addition, when service to an existing retail connection has been suspended or terminated, the water system will not re-establish service unless it has a signed copy of this agreement.

II. RESTRICTIONS. The following unacceptable practices are prohibited by State regulations.

A. No direct connection between the public drinking water supply and a potential source of contamination is permitted. Potential sources of contamination shall be isolated from the public water system by an air-gap or an appropriate backflow prevention device.

B. No cross-connection between the public drinking water supply and a private water system is permitted. These potential threats to the public drinking water supply shall be eliminated at the service connection by the installation of an air-gap or a reduced pressure-zone backflow prevention device.

C. No connection which allows water to be returned to the public drinking water supply is permitted.

D. No pipe or pipe fitting which contains more than 0.25% lead may be used for the installation or repair of plumbing at any connection which provides water for human use.

E. No solder or flux which contains more than 0.2% lead can be used for the installation or repair of plumbing at any connection which provides water for human use.

III. SERVICE AGREEMENT. The following are the terms of the service agreement between the NAME OF WATER SYSTEM (the Water System) and NAME OF CUSTOMER (the Customer).

A. The Water System will maintain a copy of this agreement as long as the Customer and/or the premises is connected to the Water System.

B. The Customer shall allow his property to be inspected for possible cross-connections and other potential contamination hazards. These inspections shall be conducted by the Water System or its designated agent prior to initiating new water service; when there is reason to believe that cross-connections or other potential contamination hazards exist; or after any major changes to the private water distribution facilities. The inspections shall be conducted during the Water System's normal business hours.

C. The Water System shall notify the Customer in writing of any cross-connection or other potential contamination hazard which has been identified during the initial inspection or the periodic reinspection.

D. The Customer shall immediately remove or adequately isolate any potential cross-connections or other potential contamination hazards on his premises.

E. The Customer shall, at his expense, properly install, test, and maintain any backflow prevention device required by the Water System. Copies of all testing and maintenance records shall be provided to the Water System.

IV. ENFORCEMENT. If the Customer fails to comply with the terms of the Service Agreement, the Water System shall, at its option, either terminate service or properly install, test, and maintain an appropriate backflow prevention device at the service connection. Any expenses associated with the enforcement of this agreement shall be billed to the Customer.

CUSTOMER'S
SIGNATURE:____

DATE:____

(c) Appendix C. Boil Water Notification.

Figure: 30 TAC §290.47(c)

Appendix C: Boil Water Notification

Due to conditions which have occurred recently in the water system, the Texas Commission on Environmental Quality has required the water system to notify all customers to boil their water prior to consumption.

To ensure destruction of all harmful bacteria and other microbes, water for drinking, cooking, and ice making should be boiled and cooled prior to consumption. The water should be brought to a vigorous rolling boil and then boiled for two minutes.

In lieu of boiling, you may purchase bottled water or obtain water from some other suitable source.

When it is no longer necessary to boil the water, water system officials will notify you.

If you have questions regarding this matter you may contact <**Water System Official(s)**>at <**Official's Telephone Number(s)**>.

Instructions:
1. List more than one water system official and phone number.

2. Do not list the commission as the primary contact.

3. If a customer wishes to call the Texas Commission on Environmental Quality, please have them call (512) 239-4691.

(d) Appendix D. Operator and/or Employment Notice.

Figure: 30 TAC §290.47(d)

Section 290.46(p)(2), Data on water system ownership and management, requires the owner of a public water system to annually provide the executive director with a list of all the water works operators and operating companies that the public water system employs. The following form may be used to facilitate compliance with this requirement. This notice should be submitted to the Texas Commission on Environmental Quality, Water Supply Division, MC-155, P.O. Box 13087, Austin, Texas 78711-3087 or provided to the executive director during on-site inspections.

Appendix D: Operator and/or Employment Notice

Name of Operator or Operating Company	For Operators		For Companies
	License No.	Class of License	Registration No.
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

____

Signature of Water System Owner or Responsible / Official Date

____

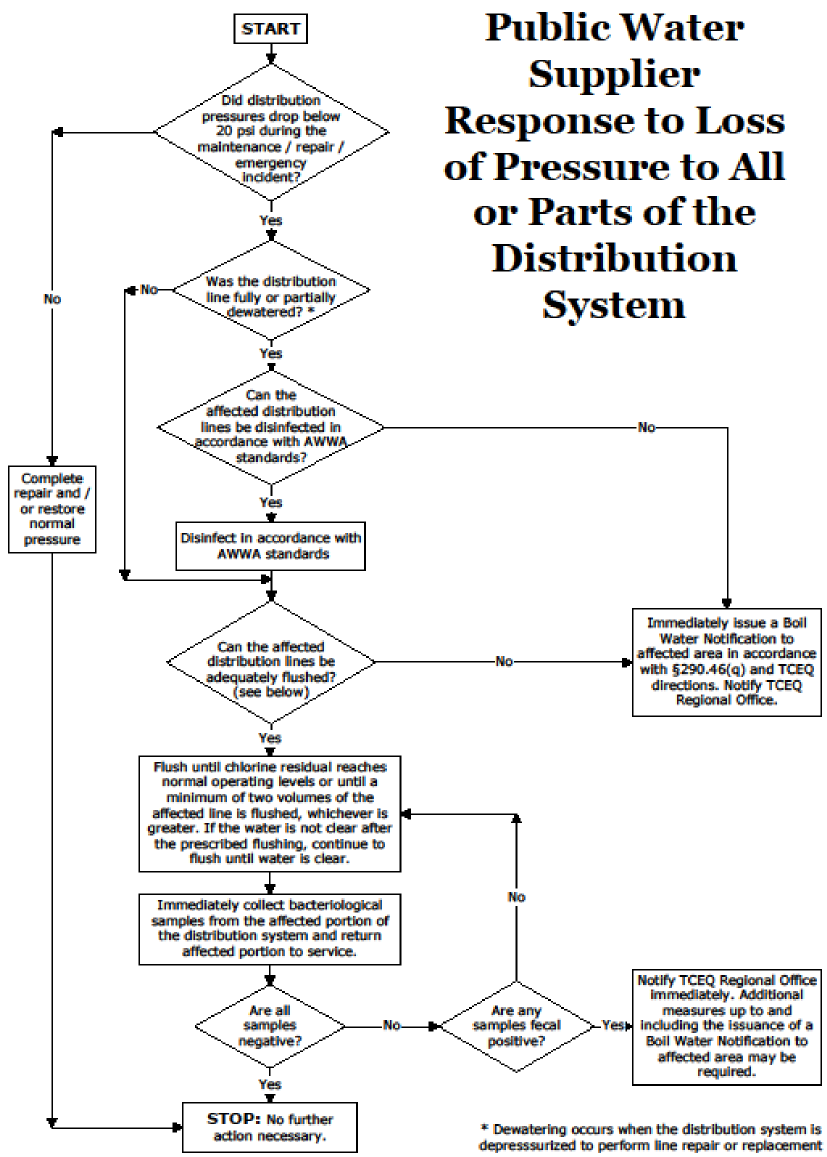
Name of Water System Owner or Responsible Official / Title of Owner or Responsible Official

(e) Appendix E. Special Precautions.

Figure: 30 TAC §290.47(e)

Appendix E: Special Precautions

Figure: 30 TAC §290.47(e)



(f) Appendix F. Assessment of Hazards and Selection of Assemblies.

Figure: 30 TAC §290.47(f)

Appendix F: Assessment of Hazards and Selection of Assemblies

The following table lists many common hazards. It is not an all-inclusive list of the hazards which may be found connected to public water systems.

Premises Isolation: Description of Premises	Assessment of Hazard	Required Assembly
Aircraft and missile plants	Health	RPBA or AG
Animal feedlots	Health	RPBA or AG
Automotive plants	Health	RPBA or AG
Breweries	Health	RPBA or AG
Canneries, packing houses and rendering plants	Health	RPBA or AG
Commercial car wash facilities	Health	RPBA or AG
Commercial laundries	Health	RPBA or AG
Cold storage facilities	Health	RPBA or AG
Connection to sewer pipe	Health	RPBA or AG
Dairies	Health	RPBA or AG
Docks and dockside facilities	Health	RPBA or AG
Dye works	Health	RPBA or AG
Food and beverage processing plants	Health	RPBA or AG
Hospitals, morgues, mortuaries, medical clinics, dental clinics, veterinary clinics, autopsy facilities, sanitariums, and medical labs	Health	RPBA or AG
Metal manufacturing, cleaning, processing, and fabrication plants	Health	RPBA or AG
Microchip fabrication facilities	Health	RPBA or AG
Paper and paper products plants	Health	RPBA or AG
Petroleum processing or storage facilities	Health	RPBA or AG

Photo and film processing labs	Health	RPBA or AG
Plants using radioactive material	Health	RPBA or AG
Plating or chemical plants	Health	RPBA or AG
Pleasure-boat marinas	Health	RPBA or AG
Private/Individual/Unmonitored wells	Health	RPBA or AG
Rainwater harvesting system	Health	RPBA or AG
Reclaimed water systems	Health	RPBA or AG
Restricted, classified or other closed facilities	Health	RPBA or AG
Rubber plants	Health	RPBA or AG
Sewage lift stations	Health	RPBA or AG
Sewage treatment plants	Health	RPBA or AG
Slaughter houses	Health	RPBA or AG
Steam plants	Health	RPBA or AG
Tall buildings or elevation differences where the highest outlet is 80 feet or more above the meter	Nonhealth	DCVA

Internal Protection - Description of Cross-Connection	Assessment of Hazard	Required Assembly
Aspirators	Nonhealth†	AVB
Aspirator (medical)	Health	AVB or PVB
Autoclaves	Health	RPBA
Autopsy and mortuary equipment	Health	AVB or PVB
Bedpan washers	Health	AVB or PVB
Connection to industrial fluid systems	Health	RPBA
Connection to plating tanks	Health	RPBA
Connection to salt-water cooling systems	Health	RPBA
Connection to sewer pipe	Health	AG
Cooling towers with chemical additives	Health	AG

Cuspidors	Health	AVB or PVB
Degreasing equipment	Nonhealth†	DCVA
Domestic space-heating boiler	Nonhealth†	RPBA
Dye vats or machines	Health	RPBA
Fire-fighting system (toxic liquid foam concentrates)	Health	RPBA
Flexible shower heads	Nonhealth†	AVB or PVB
Heating equipment		
Commercial	Nonhealth†	RPBA
Domestic	Nonhealth†	DCVA
Hose bibs	Nonhealth†	AVB
Irrigation systems		
with chemical additives	Health	RPBA
without chemical additives	Nonhealth†	DCVA, AVB, or PVB
Kitchen equipment - Commercial	Nonhealth†	AVB
Lab bench equipment	Health or Nonhealth†	AVB or PVB
Ornamental fountains	Health	AVB or PVB
Swimming pools		
Private	Nonhealth†	PVB or AG
Public	Nonhealth†	RPBA or AG
Sewage pump	Health	AG
Sewage ejectors	Health	AG
Shampoo basins	Nonhealth†	AVB
Specimen tanks	Health	AVB or PVB
Steam generators	Nonhealth†	RPBA
Steam tables	Nonhealth†	AVB
Sterilizers	Health	RPBA
Tank vats or other vessels containing toxic substances	Health	RPBA
Trap primers	Health	AG
Vending machines	Nonhealth†	RPBA or PVB
Watering troughs	Health	AG or PVB

NOTE: AG = air gap; AVB = atmospheric vacuum breaker; DCVA = double check valve backflow prevention assembly; PVB = pressure vacuum breaker; RPBA = reduced-pressure principle backflow prevention assembly.

*AVBs and PVBs may be used to isolate health hazards under certain conditions, that is, back siphonage situations. Additional area of premises isolation may be required.

†Where a greater hazard exists (due to toxicity or other potential health impact) additional area protection with RPBAs is required.

(g) Appendix G. Emergency Preparedness Plan Template.

Figure: 30 TAC §290.47(g)

Appendix G: Emergency Preparedness Plan Template

This appendix contains information to assist an affected utility in preparing an emergency preparedness plan. A comprehensive guide and shell form, TCEQ Form No. 20536, for preparing a plan is available from the executive director upon request. A cover letter containing the name of the affected utility; the affected utility representative's name, title, and contact telephone number; and, if applicable, the public water system's identification number (PWS ID) and district number must be included with the plan submittal.

Information provided by an affected utility relating to its emergency preparedness plan is confidential and is not subject to disclosure under Texas Government Code, Chapter 552.

Rules. All of 30 TAC Chapter 291, Subchapter L applies to affected utilities that are not public water systems. The following commission rules apply to affected utilities that are public water systems:

Definitions: §290.38

General Provisions: §290.39(c)(4)(A) - (E) and (o)(1) - (5)

Water Distribution: §290.44(d)

Minimum Water System Capacity Requirements: §290.45(a)(7), (b)(3), (c)(3), (d)(4), (e)(4), (g)(5)(A)(iv), (g)(5)(B), and (h).

Minimum Acceptable Operating Practices for Public Drinking Water Systems: §290.46(f)(5) and (r).

Plan Options. A submitted emergency preparedness plan must include one of the following:

(1) Auxiliary generators equipped with automatic starting generators and switch over equipment. This equipment must have the ability to detect the failure of normal power from the electric grid; automatically start the generator; isolate necessary water equipment from the normal power grid; and switch the running generator's power to power the necessary water equipment to maintain the required minimum pressure.

(2) Two or more affected utilities may propose the sharing of auxiliary generator power. Necessary electrical and/or water connections equipped with automatic switch over and opening valves must be presented in the plan to demonstrate how one or more affected utilities will be able to maintain the required minimum pressure. Describe which equipment will share the auxiliary generator power and which equipment, if any, would receive power from only a single affected utility's auxiliary power equipment.

(3) Copies of negotiated leasing and contract agreements for emergency power equipment and any necessary fuel. This includes mutual aid agreements with other retail public utilities, exempt utilities, or providers or conveyors of potable or raw water service if the agreements provide for coordination with the division of emergency management in the governor's office. Consideration must be given to the location of where the other water supplier(s) are located as they may also be affected by the same natural disaster. In addition, when entering into a contract for leasing of emergency power equipment and necessary fuel, the contractual commitments of the supplier to other water suppliers and businesses within an area subject to the same natural disaster event must be taken into consideration.

(4) Use of portable generators capable of serving multiple facilities. The portable generator(s) and the necessary water equipment must be pre-equipped with quick-connect, mating electrical connectors to facilitate the rapid implementation of the emergency preparedness plan. The plan must address whether there is an adequate number of portable generators to operate all of the necessary water equipment in order to maintain the required minimum pressure in multiple pressure plans or at multiple systems, if affected by the same natural disaster event.

(5) In lieu of generators, alternative on-site electrical generation, or distributed electrical generation facilities, may be used. This may include the use of wind, solar or other power as a means of providing sufficient emergency power to operate the necessary water equipment to maintain the required minimum pressure.

(6) Hardening of the electric transmission and distribution system serving the affected utility. One alternative is to relocate electric transmission lines for the system from overhead to underground and protect them from flooding. Another alternative is to

replace overhead transmission lines, poles, and related appurtenances with ones that can withstand historical hurricane-force wind velocities, and trim or remove any trees next to and above the overhead transmission lines. Either alternative must include documentation on the ability of applicable power plant(s) and station(s) to withstand hurricane-force winds.

(7) Engines equipped with direct or right angle drives can be used as auxiliary power sources. Each pump or other equipment must be equipped with appropriate mechanical fittings to facilitate the use of engines. The plan must address the operation of chemical feed pumps using a generator(s).

(8) Any other alternative determined by the executive director to be acceptable.

Plan Contents. An emergency preparedness plan must provide for any applicable production, treatment, transfer and service pumps at an adequate flow rate and at a minimum pressure of 35 pounds per square inch in the far reaches of an affected distribution system, including multiple pressure planes. If applicable, provide the following information:

□ Contact information, including names, emergency telephone and pager numbers, and e-mail addresses.

□ List all ground, surface, and purchased water sources, with locations and individual capacities.

□ List all interconnections with other water providers; whether normally open or closed; size; whether wholesale, purchase, or both; available capacity; and any other pertinent information. Include the names of each interconnection and their contact information, including names, titles, telephone and pager numbers, and e-mail addresses.

□ List the capacity and power requirements of all treatment equipment.

□ For each chemical, list the type of storage, volume, and volume required per day during emergency operations.

□ Provide a copy of all water distribution and transmission piping maps.

□ Provide the maximum and average daily demands. If the emergency preparedness plan is for a proposed affected utility, the minimum specified capacities in §290.45 of this subchapter shall be used for the maximum daily demand.

□ List all primary electrical power sources.

□ List all equipment necessary to provide water to customers at the required minimum pressure and adequate flow rate, and the power requirements for each piece of equipment.

□ List the size, location and fuel requirement in gallons per hour at the load necessary to maintain emergency operations for all on-site manual and automatic auxiliary power equipment, and provide information as to how the affected utility determined the necessary fuel quantity.

□ Provide documentation as to how the affected utility will ensure that it maintains an adequate supply of fuel during emergency operations.

□ List the size, location, fuel requirement in gallons per hour at the load necessary to maintain emergency operations, and the name of the system sharing the equipment for all shared auxiliary power equipment. Include the other system's contact persons with their emergency telephone and pager numbers and e-mail addresses.

□ Provide a copy of any leasing and contracting agreements, including mutual aid agreements with other retail public utilities, exempt utilities, or providers or conveyors of potable or raw water service, if the agreements provide for coordination with the division of emergency management in the governor's office. If leasing, include the vendor's name, location, and contact information.

□ List all portable generators' power, phase, type of quick-connect, fuel type, and fuel demand in gallons per hour.

□ Provide specifications, a description, and detailed capacity information for all on-site electrical generation or distributive generation equipment. Include all fuel demands for this equipment.

□ List all direct or right angle drive emergency power equipment with the name, type of engine, fuel type, and fuel demand in gallons per hour.

□ Provide details for any other proposed alternative.

□ For each fuel tank, provide the location, volume, name of fuel suppliers, contact names, titles, telephone and pager numbers, and e-mail addresses.

□ List all local and state emergency responders and their emergency contact telephone and pager numbers. Include medical facilities.

□ List all priority water users, such as hospitals and nursing homes, and their emergency contact names, titles, telephone and pager numbers, and e-mail addresses.

□ List any bulk water haulers that could be used, including contact names, telephone and pager numbers, and e-mail addresses.

□ Provide the system's designated media spokesperson with a list of local media contact names, titles, type of media, telephone and pager numbers, and e-mail addresses.

□ Provide the water restrictions that the system will implement during an emergency response.

□ Provide a proposed time frame for full implementation of the emergency preparedness plan.

(h) Appendix H. Sample Language for Notification Upon Changing from Free Chlorine to Chloramines.

Figure: 30 TAC §290.47(h)

Appendix H: Sample Language for Notification Upon Changing from Free Chlorine to Chloramines

A public water system (PWS) must notify its customers, in writing, at least 14 days before starting to use chloramines. This notification must contain the Sample Language for Notification Upon Changing from Free Chlorine to Chloramines included below. The notification should be provided to the news media, renal disease facilities, dialysis clinics, hospitals, physicians, local health departments, pet stores, zoos, and any other facilities that may be impacted by the change.

Sample Language for Notification Upon Changing from Free Chlorine to Chloramines

"On <**Date**>, the <**Water System Name**> will be changing the disinfectant that we use from chlorine to chloramines. This change is intended to benefit our customers by reducing the levels of disinfection byproducts in the system, while still providing protection from waterborne disease.

However, the change to chloramines can cause problems to persons dependent on dialysis machines. A condition known as hemolytic anemia can occur if the disinfectant is not completely removed from the water that is used for the dialysate. Consequently, the pretreatment scheme used for the dialysis units must include some means, such as a charcoal filter, for removing the chloramine prior to this date. Medical facilities should also determine if additional precautions are required for other medical equipment. In addition, chloraminated water may be toxic to fish. If you have a fish tank, please make sure that the chemicals or filters that you are using are designed for use in water that has been treated with chloramines. You may also need to change the type of filter that you use for fish tanks."

Optional: "When the chloraminated water first flushes out the chlorinated water there may be a slight taste and odor, and possibly discoloration for a short period of time. This will not compromise the safety of the water."

Important notes:
1. The PWS may not begin using chloramines prior to the date shown in the notice.

2. The Texas Commission on Environmental Quality does not require the PWS to include the name or contact telephone number of a PWS employee that the customers can contact if they have questions; however, several PWSs have included this information as a courtesy to its customers.

SUBCHAPTER F: DRINKING WATER STANDARDS GOVERNING DRINKING WATER QUALITY AND REPORTING REQUIREMENTS FOR PUBLIC WATER SYSTEMS

§§290.110, 290.111, 290.116

Statutory Authority

The amendments are adopted under Texas Water Code (TWC), §5.102, which establishes the commission's general authority necessary to carry out its jurisdiction; TWC, §5.103, which establishes the commission's general authority to adopt rules; TWC, §5.105, which establishes the commission's authority to set policy by rule; Texas Health and Safety Code (THSC), §341.031, which allows the commission to adopt rules to comply with standards established by the United States Environmental Protection Agency pursuant to the federal Safe Drinking Water Act, 42 United States Code, §§300f to 300j-6; and, THSC, §341.0315, which requires public water systems to comply with commission rules adopted to ensure the supply of safe drinking water.

The adopted amendments implement TWC, §§5.102, 5.103, and 5.105, and THSC, §341.031 and §341.0315.

§290.110. Disinfectant Residuals.

(a) Applicability. All public water systems shall properly disinfect water before it is distributed to any customer and shall maintain acceptable disinfectant residuals within the distribution system.

(b) Minimum and maximum acceptable disinfectant concentrations. Public water systems shall provide the minimum levels of disinfectants in accordance with the provisions of this section. Public water systems shall not exceed the maximum residual disinfectant levels (MRDLs) provided in this section.

(1) The disinfection process used by public water systems must ensure that water has been adequately disinfected before it enters the distribution system.

(A) The disinfection process used by public water systems treating surface water sources or groundwater sources that are under the direct influence of surface water must meet the requirements of §290.111(d) of this title (relating to Surface Water Treatment).

(B) The executive director may require the disinfection process used by public water systems treating groundwater sources that are not under the direct influence of surface water to meet the requirements of §290.116 of this title (relating to Groundwater Corrective Actions and Treatment Techniques).

(C) The disinfection process at other types of treatment plants shall provide the level of disinfection required by the executive director.

(2) The residual disinfectant concentration in the water entering the distribution system shall be at least 0.2 milligram per liter (mg/L) free chlorine or 0.5 mg/L chloramine (measured as total chlorine).

(3) The chlorine dioxide residual of the water entering the distribution system shall not exceed an MRDL of 0.8 mg/L.

(4) The residual disinfectant concentration in the water within the distribution system shall be at least 0.2 mg/L free chlorine or 0.5 mg/L chloramine (measured as total chlorine).

(5) The running annual average of the free chlorine or chloramine residual (measured as total chlorine) of the water within the distribution system shall not exceed an MRDL of 4.0 mg/L.

(c) Monitoring requirements. Public water systems shall monitor the performance of the disinfection facilities to ensure that appropriate disinfectant levels are maintained. All monitoring conducted pursuant to the requirements of this section must be conducted at sites designated in the public water system's monitoring plan.

(1) Entry point compliance monitoring for surface water and groundwater under the direct influence of surface water. Public water systems that treat surface water or groundwater under the direct influence of surface water must verify that they meet the disinfection requirements of subsection (b)(2) of this section.

(A) Public water systems that treat surface water or groundwater under the direct influence of surface water and sell treated water on a wholesale basis or serve more than 3,300 people must continuously monitor and record the disinfectant residual of the water at each entry point. If there is a failure in the continuous monitoring equipment, grab sampling every four hours may be conducted in lieu of continuous monitoring, but for no more than five working days following the failure of the equipment.

(B) Public water systems that treat surface water or groundwater under the direct influence of surface water, serve 3,300 or fewer people and do not sell treated water on a wholesale basis must monitor and record the disinfectant residual of the water at each entry point with either continuous monitors or grab samples.

(i) If a system uses grab samples, the samples must be collected on an ongoing basis at the frequency prescribed in the following table.

Figure: 30 TAC §290.110(c)(1)(B)(i) (No change to the figure as it exists in TAC.)

(ii) The grab samples cannot be taken at the same time and the sampling interval is subject to the executive director's review and approval.

(iii) Treatment plants that use grab samples and fail to detect an appropriate disinfectant residual must repeat the test at four-hour or shorter intervals until compliance has been reestablished.

(C) Continuous monitors must record the disinfectant residual of the water every 30 minutes.

(2) Entry point compliance monitoring for groundwater and purchased water. Public water systems that treat groundwater or that purchase and resell treated water must, upon the request of the executive director, verify that they meet the disinfection requirements of subsection (b)(2) of this section.

(A) A system that uses free chlorine must measure free chlorine.

(B) A system that has a chloramine residual must measure total chlorine.

(3) Chlorine dioxide compliance monitoring. Each treatment plant using chlorine dioxide must monitor and record the chlorine dioxide residual of the water entering the distribution system at least once each day. If the chlorine dioxide residual in the water entering the distribution system exceeds the MRDL contained in subsection (b)(3) of this section, the treatment plant must conduct additional tests.

(A) If the public water system does not have additional chlorination facilities in the distribution system, it must conduct three additional tests at the service connection nearest the treatment plant where an elevated chlorine dioxide residual was detected. The first additional test must be conducted within two hours after detecting an elevated chlorine dioxide residual at the entry point to the distribution system. The two subsequent tests must be conducted at six-hour to eight-hour intervals thereafter.

(B) If the public water system has additional chlorination facilities in the distribution system, it must conduct an additional test at the service connection nearest the treatment plant where an elevated chlorine dioxide residual was detected, an additional test at the first service connection after the point where the water is rechlorinated, and an additional test at a location in the far reaches of the distribution system. The additional test at the location nearest the treatment plant must be conducted within two hours after detecting an elevated chlorine dioxide residual at the entry point to the distribution system. The two other tests must be conducted at six-hour to eight-hour intervals thereafter.

(4) Distribution system compliance monitoring. Public water systems shall monitor the disinfectant residual at various locations throughout the distribution system.

(A) Public water systems that use groundwater or purchased water sources only and serve fewer than 250 connections and fewer than 750 people daily, must monitor the disinfectant residual at representative locations in the distribution system at least once every seven days.

(B) Public water systems that serve at least 250 connections or at least 750 people daily, and use only groundwater or purchased water sources must monitor the disinfectant residual at representative locations in the distribution system at least once per day.

(C) Public water systems using surface water sources or groundwater under the direct influence of surface water must monitor the disinfectant residual tests at least once per day at representative locations in the distribution system.

(D) All public water systems must monitor the residual disinfectant concentration each time that a bacteriological sample is collected, as specified in §290.109 of this title (relating to Microbial Contaminants).

(E) All public water systems with a chloramine residual must monitor the total chlorine residual downstream of any chlorine and ammonia injection points, in conjunction with the chloramine effectiveness sampling in paragraph (5)(C) of this subsection, in the distribution system weekly and whenever the chemical dose is changed.

(5) Chloramine effectiveness sampling. Public water systems with a chloramine residual shall monitor to ensure that monochloramine is the prevailing chloramine species and that nitrification is controlled. Sample sites and procedures used for chloramine effectiveness sampling must be documented in the system's nitrification action plan (NAP) required by §290.46(z) of this title (relating to Minimum Acceptable Operating Practices for Public Drinking Water Systems). Sample results determined by monitoring required under this paragraph will not be used to determine compliance

with the maximum contaminant levels, MRDLs, action levels, or treatment techniques of this subchapter.

(A) Source water. Public water systems must monitor source water (including raw and treated purchased water) to establish baseline ammonia, nitrite, and nitrate levels (all as nitrogen) at least once to determine the availability of ammonia for chloramine formation and to provide a reference for downstream nitrite and nitrate levels that may indicate nitrification. If any source has more than 0.5 mg/L free ammonia (as nitrogen) in the initial sample, then raw water ammonia (as nitrogen) shall be monitored monthly for six months to determine the baseline free ammonia level.

(B) Water entering distribution system. Public water systems that have chloramines present shall perform sampling to represent the water entering the distribution system.

(i) Total chlorine, free ammonia (as nitrogen) and monochloramine shall be monitored weekly at all entry points to the distribution system or at a location before the first customer.

(ii) Nitrite and nitrate (as nitrogen) levels at the first customer shall be monitored monthly for at least six months to determine baseline nitrite and nitrate levels in the water prior to consumption. Nitrite and nitrate samples collected at the first customer will not be used for compliance with §290.106 of this title (relating to Inorganic Contaminants).

(iii) Nitrite and nitrate (as nitrogen) shall be monitored quarterly at the first customer after establishing the baseline. Nitrite and nitrate samples collected at entry points for compliance with §290.106 of this title may be used for these quarterly samples.

(C) Treatment sampling. Public water systems that inject chlorine at any location to form chloramines or to convert from chloramines to free chlorine must monitor to ensure that chemical addition is effective and the proper chlorine to ammonia (as nitrogen) ratio is achieved. Samples must be collected and analyzed weekly and whenever the chemical dosage is changed.

(i) Sampling must be performed upstream of the chlorine or ammonia chemical injection point, whichever is furthest upstream.

(ii) Sampling must be performed downstream of all the chlorine and ammonia chemical injection points.

(iii) The residual of the chemical injected upstream must be determined to properly dose the downstream chemical where sample taps are present or required under §290.42(e)(7)(C)(ii) of this title (relating to Water Treatment).

(iv) The total chlorine, ammonia (as nitrogen), and monochloramine residuals must all be monitored if the treatment occurs before the entry point.

(v) The ammonia (as nitrogen) and monochloramine residuals must all be monitored if the treatment occurs in the distribution system. The monitoring must occur at the same time as a compliance sampling required under paragraph (4)(E) of this subsection.

(D) Distribution system. Public water systems that distribute water and have a chloramine residual must ensure the efficacy of disinfection within the distribution system.

(i) Monochloramine and free ammonia (as nitrogen) must be monitored weekly at the same time as a compliance sample required under paragraph (4) of this subsection.

(ii) Nitrite and nitrate (as nitrogen) must be monitored quarterly.

(d) Analytical requirements. All monitoring required by paragraphs (1) and (2) of this subsection must be conducted at a facility approved by the executive director and using methods that conform to the requirements of §290.119 of this title (relating to Analytical Procedures). All monitoring for chloramine effectiveness required by paragraphs (3) - (6) of this subsection must be analyzed to the accuracy provided therein.

(1) The free chlorine or chloramine residual (measured as total chlorine) must be measured to a minimum accuracy of plus or minus 0.1 mg/L. Color comparators may be used for distribution system samples only. When used, a color comparator must have current reagents, an unfaded and clear color comparator, a sample cell that is not discolored or stained, and must be properly stored in a cool, dark location where it is not subjected to conditions that would result in staining. The color comparator must be used in the correct range. If a sample reads at the top of the range, the sample must be diluted with chlorine-free water, then a reading taken and the resulting residual calculated.

(2) The chlorine dioxide residual must be measured to a minimum accuracy of plus or minus 0.05 mg/L using one of the following methods:

(A) the amperometric titration method using a titrator with platinum-platinum electrodes;

(B) the spectrophotometric Lissamine Green B method; or

(C) with the written permission of the executive director, the DPD-glycine method using a colorimeter or spectrophotometer.

(3) The free ammonia level must be measured to a minimum accuracy of plus or minus 0.1 mg/L.

(4) The monochloramine level must be measured to a minimum accuracy of plus or minus 0.15 mg/L using a procedure that has the ability to distinguish between monochloramine and other forms of chloramine.

(5) The nitrate (as nitrogen) level must be measured to a minimum accuracy of plus or minus 0.1 mg/L.

(6) the nitrite (as nitrogen) level must be measured to a minimum accuracy of plus or minus 0.01 mg/L.

(e) Reporting requirements. Any owner or operator of a public water system subject to the provisions of this section is required to report to the executive director the results of any test, measurement, or analysis required by this section.

(1) Systems exceeding the MRDL for chlorine dioxide in subsection (b)(3) of this section must report the exceedance to the executive director within 24 hours of the event.

(2) Public water systems that use surface water sources or groundwater sources under the direct influence of surface water must submit a Surface Water Monthly Operating Report (commission Form 0102C), a Surface Water Monthly Operating Report (commission Form 0102D) for alternative technologies, or a Surface Water Monthly Operational Report for Plants That Do Not Have a Turbidimeter on Each Filter (commission Form 0103) each month.

(3) Public water systems that use chlorine dioxide must submit a Chlorine Dioxide Monthly Operating Report (commission Form 0690) each month.

(4) Public water systems that use purchased water or groundwater sources only must complete a Disinfection Level Quarterly Operating Report (commission Form 20067) each quarter.

(A) Community and nontransient noncommunity public water systems must submit the Disinfection Level Quarterly Operating Report each quarter, by the tenth day of the month following the end of the quarter.

(B) Transient noncommunity public water systems must retain the Disinfection Level Quarterly Operating Reports and must provide a copy if requested by the executive director.

(5) Systems that use chloramines must retain their NAP required under §290.46(z) of this title and must provide a copy upon request by the executive director.

(6) Monthly and quarterly reports required by this section must be submitted to the Water Supply Division, MC 155, Texas Commission on Environmental Quality, P.O. Box 13087, Austin, Texas 78711-3087 by the tenth day of the month following the end of the reporting period.

(f) Compliance determinations. Compliance with the requirements of this section shall be determined using the following criteria.

(1) All samples used for compliance must be obtained at sampling sites designated in the monitoring plan.

(A) All samples collected at sites designated in the monitoring plan as microbiological and disinfectant residual monitoring sites shall be included in the compliance determination calculations.

(B) Samples collected at sites in the distribution system not designated in the monitoring plan shall not be included in the compliance determination calculations.

(2) A public water system that fails to conduct the monitoring tests required by this section commits a monitoring violation.

(3) A public water system that fails to report the results of the monitoring tests required by this section commits a reporting violation.

(4) A public water system that uses surface water sources or groundwater sources under the direct influence of surface water and fails to meet the requirements of subsection (b)(2) of this section for a period longer than four consecutive hours commits a nonacute treatment technique violation. A public water system that fails to conduct the additional testing required by subsection (c)(1)(B)(iii) of this section also commits a nonacute treatment technique violation.

(5) A public water system that uses chlorine dioxide and exceeds the level specified in subsection (b)(3) of this section violates the MRDL for chlorine dioxide.

(A) If a public water system violates the MRDL for chlorine dioxide and any of the three additional distribution samples exceeds the MRDL, the system commits an acute MRDL violation for chlorine dioxide.

(B) If a public water system violates the MRDL for chlorine dioxide and fails to collect each of the three additional distribution samples required by subsection (c)(3) of this section, the system commits an acute MRDL violation for chlorine dioxide.

(C) If a public water system violates the MRDL for chlorine dioxide but none of the three additional distribution samples violates the MRDL, the system commits a nonacute MRDL violation for chlorine dioxide.

(6) A public water system that fails to meet the requirements of subsection (b)(4) of this section, in more than 5.0% of the samples collected each month, for any two consecutive months, commits a nonacute treatment technique violation. Specifically, the system commits a nonacute violation if the value "V" in the following formula exceeds 5.0% per month for any two consecutive months:

Figure: 30 TAC §290.110(f)(6)

$$V = \frac{b \times 100}{a}$$

Where:

a = number of instances where the residual disinfectant concentration is measured during the month; and

b = number of instances during the month where the residual disinfectant concentration is measured but is detected at less than 0.2 milligrams per liter (mg/L) free chlorine or less than 0.5 mg/L chloramine (measured as total chlorine).

(7) A public water system violates the MRDL for chlorine or chloramine (measured as total chlorine) if, at the end of any quarter, the running annual average of monthly averages exceeds the level specified in subsection (b)(5) of this section.

(8) Notwithstanding the MRDLs listed in subsection (b) of this section, operators shall increase residual disinfectant levels of chlorine or chloramines, measured as total chlorine, (but not chlorine dioxide) in the distribution system to a level and for a time necessary to protect public health to address specific microbiological contamination problems caused by circumstances such as distribution line breaks, storm runoff events, source water contamination, or cross-connections.

(9) If a public water system's failure to monitor makes it impossible to determine compliance with the MRDL for chlorine or chloramines (measured as total chlorine), the system commits an MRDL violation for the entire period covered by the annual average.

(10) A public water system that fails to issue a required public notice or certify that it has issued that notice commits a violation.

(g) Public notification requirements. The owner or operator of a public water system that violates the requirements of this section must notify the executive director and the people served by the system.

(1) A public water system that fails to meet the requirements of subsection (b)(3) of this section, shall notify the executive director within 24 hours of the event and

the customers in accordance with the requirements of §290.122 of this title (relating to Public Notification).

(A) A public water system that has an acute violation of the MRDL for chlorine dioxide must notify the customers in accordance with the requirements of §290.122(a) of this title.

(B) A public water system that has a non-acute violation of the MRDL for chlorine dioxide must notify the customers in accordance with the requirements of §290.122(b) of this title.

(2) A public water system that uses surface water sources or groundwater sources under the direct influence of surface water and fails to meet the minimum disinfection requirements of subsection (b)(2) of this section shall notify the executive director by the end of the next business day and the customers in accordance with the requirements of §290.122(b) of this title.

(3) A public water system that fails to meet the requirements of subsection (b)(4) of this section in more than 5.0% of the samples collected each month for two consecutive months must notify its customers.

(A) A public water system that uses surface water or groundwater under the direct influence of surface water must notify its customers in accordance with the requirements of §290.122(b) of this title.

(B) A public water system that uses only groundwater or purchased water must notify its customers when it issues its annual consumer confidence report.

(4) A public water system that fails to meet the requirements of subsection (b)(5) of this section shall notify the executive director by the end of the next business day and the customers in accordance with the requirements of §290.122(b) of this title.

(5) A public water system which fails to conduct the monitoring required by subsection (c)(1) - (4) of this section must notify its customers of the violation in accordance with the requirements of §290.122(c) of this title.

(6) A public water system that uses chloramines shall notify their retail and wholesale customers of the use of chloramines.

(A) This notification must contain the exact wording included in Appendix H of §290.47 of this title (relating to Appendices).

(B) Prior to initially providing the chloraminated water to its existing customers, the water system must provide notification by mail or direct delivery at least 14 days before the change.

(C) Additionally, the notification must be provided to the news media, hospitals, renal disease facilities, dialysis clinics, physicians, local health departments, and entities which maintain live fish directly by letter, e-mail, or hand delivery.

(D) New customers must also be notified before they begin receiving water from the water system.

(E) Where appropriate, the notice must be multilingual.

§290.111. Surface Water Treatment.

(a) Applicability. A public water system that treats surface water or groundwater under the direct influence of surface water must comply with the requirements of this section.

(1) A public water system that treats surface water must comply with the requirements of this section beginning on the effective date of the rule.

(2) A public water system that treats groundwater under the direct influence of surface water must comply with the requirements of this section beginning on a date specified by the executive director. This compliance date shall not exceed 18 months from the date that the executive director first notifies the system that the groundwater source is under the direct influence of surface water.

(3) A public water system that treats both surface water and groundwater under the direct influence of surface water must meet the compliance date in paragraph (1) of this subsection at plants that treat any surface water and must meet the compliance date in paragraph (2) of this subsection at plants that treat only groundwater under the direct influence of surface water.

(b) Raw surface water monitoring. A public water system that treats surface water or groundwater under the direct influence of surface water must conduct at least two rounds of special raw surface water monitoring at each surface water intake and at each well producing groundwater under the direct influence of surface water for the purpose of establishing minimum treatment technique requirements for *Cryptosporidium* and other pathogens. The executive director may waive the raw surface water monitoring requirements for an intake or a well if the combination of pathogen removal and disinfection processes used to treat the raw water achieves at least a 5.5-log total removal and inactivation of *Cryptosporidium parvum*.

(1) Raw water monitoring plans. A system must submit a proposed raw surface water monitoring plan when requested by the executive director. The proposed plan must identify all of the system's intakes and wells; provide the location of each raw water sampling point; include the parameters that will be monitored and the frequency and dates that samples will be collected; and specify the laboratories that will perform the analyses. Raw surface water monitoring must be conducted in accordance with a monitoring plan that has been approved by the executive director. The executive director shall not approve a raw surface water monitoring plan unless it indicates that the system will meet the requirements of 40 Code of Federal Regulations (CFR) §§141.701 - 141.707.

(2) Sampling location. A system must collect each raw water sample at a location approved by the executive director. Samples must be collected from the raw water line prior to any treatment and before the first point where a recycled stream is returned to the treatment process.

(3) Sampling parameters and frequency. A system must collect raw water samples at a frequency approved by the executive director.

(A) Unless the executive director approves an alternate sampling regimen, a system must monitor turbidity, *Escherichia coli* (*E. coli*), and *Cryptosporidium* levels in the raw water at least once each month for a period of not less than 24 consecutive months if the system:

(i) serves at least 10,000 people; or

(ii) is part of combined distribution system in which one or more systems serve at least 10,000 people and the system with the well or intake regularly provides water to another public water supply.

(B) A system that is not required to monitor under subparagraph (A) of this paragraph must either monitor in accordance with the requirements of subparagraph (A) of this paragraph or monitor *E. coli* levels in their raw water at least once every two weeks for a period of not less than 12 consecutive months. A system that does not initially monitor for *Cryptosporidium* and has elevated *E. coli* levels must conduct additional raw water monitoring.

(i) A system must conduct additional monitoring if the average *E. coli* level exceeds 100 colony-forming units per 100 milliliters in the raw water produced by a surface water intake located on a river or flowing stream or the raw water from a well producing groundwater under the direct influence of surface water located closest to a river or flowing stream.

(ii) A system must conduct additional monitoring if the average *E. coli* level exceeds 100 colony-forming units per 100 milliliters in the raw water from a surface water intake not located on a river or flowing stream or the raw water produced by a well producing groundwater under the direct influence of surface water not located on a river or flowing stream.

(iii) A system that must conduct additional monitoring must monitor *Cryptosporidium* levels in the raw water at least twice each month for a period of not less than 12 consecutive months, or at least once each month for a period of not less than 24 consecutive months.

(C) The executive director may approve an alternate sampling frequency for intakes and wells that operate only part of the year.

(4) Sampling schedule and dates. A system must collect raw water samples in accordance with a schedule approved by the executive director.

(A) Except as provided in subparagraph (B) of this paragraph, a system must begin each round of raw source water monitoring no later than the date shown in the following table titled "Raw Source Water Monitoring Schedule."

Figure: 30 TAC §290.111(b)(4)(A) (No change to the figure as it exists in TAC.)

(B) If a system installs a new well or intake after the date the first round of raw source water monitoring must begin, the system must:

(i) submit a proposed monitoring schedule for the first round of special raw surface water monitoring no later than three months after first placing the new source in operation; and

(ii) begin the second round of special raw surface water monitoring no later than six years after initial bin classification.

(C) A system must collect a raw water sample no sooner than two days before the date approved by the executive director and no later than two days after the approved date, unless an extreme condition or situation exists that poses a danger to the sample collector.

(D) A system which is unable to collect a sample within this five-day period must collect the sample as close as possible to the approved date and must notify the executive director in writing why the sample was not collected on the approved date.

(5) Replacement samples. If, for any reason, the laboratory is unable to report a valid analytical result for a scheduled sample, the system must submit a replacement sample on a date approved by the executive director.

(6) Analytical requirements. Raw water samples collected pursuant to this subsection must be analyzed at an United States Environmental Protection Agency (EPA) approved or a Texas Commission on Environmental Quality accredited laboratory.

(A) *Cryptosporidium* samples must be analyzed using one of the methods approved in 40 CFR §141.704(a) and by a laboratory that is approved under

EPA's Laboratory Quality Assurance Evaluation Program for Analysis of *Cryptosporidium* in Water.

(B) *E. coli* samples must be analyzed using one of the methods approved in 40 CFR §136.3(a) for the enumeration of *E. coli* in source water and by a laboratory that is accredited by the executive director.

(i) Systems must ensure that samples are maintained between 0 degrees Celsius and 10 degrees Celsius during storage and transportation to the laboratory.

(ii) The time between sample collection and the initiation of the analysis may not exceed 30 hours without the prior approval of the executive director.

(iii) The executive director may allow up to 48 hours between sample collection and the initiation of the analysis if the analysis is conducted by the Colilert reagent version of Standard Method 9223B.

(C) Turbidity samples must be analyzed using a method and at a laboratory approved by the executive director.

(7) Reporting requirements for raw surface water sample results. The owner or operator of a public water system must provide to the executive director with a copy of the results of any test, measurement, or analysis required by this subsection.

(A) Results must be submitted using the Raw Surface Water Sampling Report (commission Form 20358) or in another format that is approved by the executive director and contains the information required by 40 CFR §141.706(e).

(i) If the sample was not collected within the five-day window described in paragraph (4)(C) of this subsection, the result must be accompanied by the information required in paragraph (4)(D) of this subsection.

(ii) If the laboratory report indicates that a valid analytical result could not be reported, the laboratory report must be accompanied by a request to collect a replacement sample.

(B) The results must be submitted within ten days of their receipt by the public water system and no later than ten days after the end of the first month following the month that the sample was collected.

(C) The results and any additional information must be mailed to the Water Supply Division, MC 155, Texas Commission on Environmental Quality, P.O. Box 13087, Austin, Texas 78711-3087.

(c) Treatment technique requirements. A system that treats surface water or groundwater under the direct influence of surface water must meet minimum treatment technique requirements before the water reaches the entry point to the distribution system.

(1) The combination of pathogen removal and disinfection processes used by a public water system must achieve at least a 4.0-log removal/inactivation of viruses.

(2) The combination of pathogen removal and disinfection processes used by a public water system must achieve at least a 3.0-log removal/inactivation of *Giardia lamblia*.

(3) A public water system that is required by subsection (b) of this section to conduct raw surface water monitoring must comply with the requirements of this paragraph.

(A) The average *Cryptosporidium* level and bin classification shall be determined in accordance with the requirements established by 40 CFR §141.710.

(i) For systems that collect a total of at least 48 *Cryptosporidium* samples, the average concentration is equal to the arithmetic mean of all sample concentrations.

(ii) For systems that collect a total of at least 24 samples, but not more than 47 *Cryptosporidium* samples, the average concentration is equal to the highest arithmetic mean of all sample concentrations in any 12 consecutive months during which *Cryptosporidium* samples were collected.

(iii) For systems that serve fewer than 10,000 people and monitor for *Cryptosporidium* for only one year (i.e., collect 24 samples in 12 months), the average concentration is equal to the arithmetic mean of all sample concentrations.

(iv) For systems with plants operating only part of the year that monitor fewer than 12 months per year under 40 CFR §141.701(e), the bin concentration is equal to the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

(v) If the monthly *Cryptosporidium* sampling frequency varies, systems must first calculate a monthly average for each month of monitoring. Systems must then use these monthly average concentrations, rather than individual sample concentrations, in the applicable calculation for bin classification in paragraphs.

(B) Unless otherwise specified in this paragraph, the combination of pathogen removal and disinfection processes must achieve the removal/inactivation of *Cryptosporidium parvum* specified in the following table titled "Treatment Technique Requirements for *Cryptosporidium*," beginning 36 months after being assigned a bin classification by the executive director.

Figure: 30 TAC §290.111(c)(3)(B) (No change to the figure as it exists in TAC.)

(i) A system that conducts the first round of special raw surface water monitoring according to the schedule contained in subsection (b)(4)(A) of this section must comply with the requirements of this paragraph no later than the date shown in the following table, titled "Compliance Date for Existing Sources."

Figure: 30 TAC §290.111(c)(3)(B)(i) (No change to the figure as it exists in TAC.)

(ii) A system that conducts the first round of special raw surface water monitoring according to the schedule contained in subsection (b)(4)(B)(i) of this section must comply with the requirements of this paragraph no later than six years after beginning the first round of monitoring on the new source.

(iii) The executive director may allow a system making capital improvements an additional two years to comply with the treatment requirement of this paragraph.

(C) A system that has been assigned to Bin 3 or Bin 4 must achieve at least 1.0-log removal/inactivation of *Cryptosporidium* using one or a combination of the following: bag filters, cartridge filters, chlorine dioxide, membranes, ozone, or ultraviolet light (UV).

(D) Prior to the effective date of subparagraph (B) of this paragraph, the combination of disinfection and filtration processes used by a public water system to treat for *Cryptosporidium* must achieve at least a 2.0-log removal/inactivation of *Cryptosporidium parvum*.

(4) The combination of disinfection and filtration processes at plants that do not monitor each source in accordance with the requirements of subsection (b) of

this section must achieve at least a 5.5-log removal /inactivation of *Cryptosporidium parvum*.

(5) The executive director may require additional levels of treatment in cases of poor source water quality.

(6) The executive director may establish minimum design, operational, and reporting requirements for watershed control programs and treatment processes used to meet the treatment technique requirements of this subsection.

(d) Microbial inactivation requirements. A system that treats surface water or groundwater under the direct influence of surface water must meet minimum disinfection requirements before the water is supplied to any consumer.

(1) Inactivation table. The disinfection process must achieve the minimum microbial inactivation levels shown in the following table.

Figure: 30 TAC §290.111(d)(1) (No change to the figure as it exists in TAC.)

(A) The disinfection process at treatment plants not described in the Microbial Inactivation Requirements table must provide the level of disinfection required by the executive director.

(B) The executive director may require additional levels of treatment in cases of poor source water quality.

(C) The executive director may reduce the inactivation requirement for plants that meet the individual filter effluent performance criteria contained in subsection (g)(1) of this section and have been assigned a Bin 1 classification under the provisions of subsection (c)(3) of this section.

(D) A system that fails to meet the inactivation requirements of this section for a period of longer than four consecutive hours commits a nonacute treatment technique violation. A system that fails to conduct the additional testing required by paragraph (2)(C) of this subsection also commits a nonacute treatment technique violation.

(E) A system that has a plant assigned a Bin 2, 3, or 4 classification under the provisions of subsection (c)(3) of this section and uses UV disinfection facilities to meet the treatment technique requirements for *Cryptosporidium* must meet the inactivation requirements of this subsection in at least 95% of the water treated each month.

(2) Monitoring requirements for chemical disinfectants. Public water systems must monitor the performance of the disinfection facilities to ensure that appropriate disinfectant levels are maintained. All monitoring conducted pursuant to the requirements of this subsection must be conducted at sites designated in the public water system's monitoring plan.

(A) The disinfectant residual, pH, temperature, and flow rate of the water in each disinfection zone must be measured at least once each day during a time when peak hourly raw water flow rates are occurring.

(B) Disinfection contact time will be based on tracer study data or a theoretical analysis submitted by the system owner or their designated agent and approved by the executive director and the actual flow rate that is occurring at the time that monitoring occurs.

(C) Treatment plants that fail to demonstrate an appropriate level of treatment must repeat these tests at four-hour or shorter intervals until compliance has been reestablished.

(3) Monitoring requirements for UV disinfection facilities. Public water systems must monitor the performance of the UV disinfection facilities.

(A) A system must continuously monitor and record UV intensity as measured by a UV sensor, lamp status, the flow rate through the unit, and other parameters prescribed by the executive director to ensure that the units are operating within validated conditions.

(B) A system with a plant that has been assigned a Bin 2, 3, or 4 classification under the provisions of subsection (c)(3) of this section must also monitor and record the amount of water treated by each UV unit each month and the amount of water produced each month when the unit was not operating within validated conditions.

(4) Analytical requirements. All monitoring required by this subsection must be conducted at a facility approved by the executive director and using methods that conform to the requirements of §290.119 of this title (relating to Analytical Procedures).

(A) The pH analysis must be conducted using a pH meter with a minimum accuracy of plus or minus 0.1 pH units.

(B) The temperature of the water must be measured using a thermometer or thermocouple with a minimum accuracy of plus or minus 0.5 degrees Celsius.

(C) The free chlorine or chloramine residual (measured as total chlorine) must be measured to a minimum accuracy of plus or minus 0.1 milligrams per liter (mg/L). Color comparators may be used for distribution system samples only. When used, a color comparator must have current reagents, an unfaded and clear color comparator, a sample cell that is not discolored or stained, and must be properly stored in a cool, dark location where it is not subjected to conditions that would result in staining. The color comparator must be used in the correct range. If a sample reads at the top of the range, the sample must be diluted with chlorine-free water, then a reading taken and the resulting residual calculated.

(D) The chlorine dioxide residual must be measured to a minimum accuracy of plus or minus 0.05 mg/L using one of the following methods:

(i) Amperometric titrator with platinum-platinum electrodes; or

(ii) Lissamine Green B.

(E) The ozone residual must be measured to a minimum accuracy of plus or minus 0.05 mg/L using the Indigo Method and using a colorimeter or spectrophotometer.

(F) The UV dose must be measured by a calibrated sensor approved by the executive director.

(e) Filtration requirements for conventional filters. A system that uses granular media filters to treat surface water or groundwater under the direct influence of surface water must meet minimum filtration requirements before the water is supplied to any consumer.

(1) Treatment technique requirements for combined filter effluent. Treatment plants using conventional media filtration must meet the following turbidity requirements.

(A) The turbidity level of the combined filter effluent must never exceed 1.0 nephelometric turbidity unit (NTU).

(B) The turbidity level of the combined filter effluent must be 0.3 NTU or less in at least 95% of the samples tested each month.

(2) Performance criteria for individual filter effluent. The filtration techniques must ensure the public water system meets the following performance criteria.

(A) The turbidity from each individual filter effluent should never exceed 1.0 NTU.

(B) At a public water system that serves 10,000 people or more, the turbidity from each individual filter effluent should not exceed 0.5 NTU at four hours after the individual filter is returned to service after backwash or shutdown.

(3) Routine turbidity monitoring requirements. A system must monitor the performance of its filtration facilities.

(A) A system that serves fewer than 500 people and continuously monitors the turbidity level of each individual filter must measure and record the turbidity level of the combined filter effluent at least once each day that the plant is in operation.

(B) A system that serves at least 500 people and continuously monitors the turbidity level of each individual filter must measure and record the turbidity level of the combined filter effluent at least every four hours that the system serves water to the public.

(C) Except as provided in subparagraph (D) of this paragraph, a system must continuously monitor the filtered water turbidity at the effluent of each individual filter and record the turbidity value every 15 minutes.

(D) A system that serves fewer than 10,000 people and monitors combined filter effluent turbidity in lieu of individual filter effluent turbidity under the provisions of §290.42(d)(11)(E)(ii) of this title (relating to Water Treatment) must:

(i) continuously monitor the turbidity of the combined filter effluent and record the turbidity value every 15 minutes; and

(ii) measure and record the turbidity level at the effluent of each filter at least once each day the plant is in operation.

(4) Special investigation requirements. A system which fails to produce water with acceptable turbidity levels must investigate the cause of the problem and take appropriate corrective action. The executive director can waive these special monitoring requirements for systems that have a corrective action schedule approved by the executive director.

(A) A public water system that fails to meet the turbidity criteria specified in paragraph (2) of this subsection must conduct additional monitoring.

(i) Each time a filter exceeds an applicable filtered water turbidity level specified in paragraph (2) of this subsection for two consecutive 15-minute readings, the public water system must either identify the cause of the exceedance or produce a filter profile on the filter within seven days of the exceedance.

(ii) Each time a filter exceeds the filtered turbidity level specified in paragraph (2)(A) of this subsection for two consecutive 15-minute readings on three separate occasions during any consecutive three-month period, the public water system must conduct a filter assessment on the filter within 14 days of the third exceedance.

(iii) Each time the filtered water turbidity level for a specific filter or any combination of individual filters exceeds 2.0 NTU on two consecutive 15-minute readings during two consecutive months, the public water system must participate in a third-party comprehensive performance evaluation (CPE). If the system serves at least 10,000 people, the CPE must be conducted within 90 days of the first exceedance in the second month. If the system serves fewer than 10,000 people, the CPE must be conducted within 120 days of the first exceedance in the second month.

(B) A system that serves fewer than 10,000 people, monitors combined filter effluent turbidity in lieu of individual filter effluent turbidity, and fails to meet the turbidity criteria in paragraph (1)(A) of this subsection must conduct additional monitoring. The executive director may waive these special monitoring requirements for systems that have a corrective action schedule approved by the executive director.

(i) Each time the combined filter effluent turbidity level exceeds 1.0 NTU for two consecutive 15-minute readings, the public water system must either identify the cause of the exceedance or complete a filter profile on the combined filter effluent within seven days of the exceedance.

(ii) Each time the combined filter effluent turbidity level exceeds 1.0 NTU for two consecutive 15-minute readings on three separate occasions during any consecutive three-month period, the public water system must conduct a filter assessment on each filter within 14 days of the third exceedance.

(iii) Each time the combined filter effluent turbidity level exceeds 2.0 NTU on two consecutive 15-minute readings during two consecutive months, the public water system must participate in a third-party CPE within 120 days of the first exceedance in the second month.

(5) Analytical requirements for turbidity. All monitoring required by this subsection must be conducted by a facility approved by the executive director and using methods that conform to the requirements of §290.119 of this title. Equipment used for compliance measurements must be maintained and calibrated in accordance with §290.46(s) of this title (relating to Minimum Acceptable Operating Practices for Public Drinking Water Systems).

(A) Turbidity must be measured with turbidimeters that use one of the following methods:

(i) EPA Method 180.1 and Standard Method 2130B;

(ii) Great Lakes Instruments Method 2; or

(iii) Hach FilterTrak Method 10133.

(B) A system monitoring the performance of individual filters with on-line turbidimeters and recorders may monitor combined filter effluent turbidity levels by either continuously monitoring turbidity levels with an on-line turbidimeter or measuring the turbidity level in grab samples with a bench-top turbidimeter.

(C) Continuous turbidity monitoring must be conducted using a continuous, on-line turbidimeter and a device that records the turbidity level reading at least once every 15 minutes.

(i) Turbidity data may be recorded electronically by a supervisory control and data acquisition system (SCADA) or on a strip chart. The recorder must be designed so that the operator can accurately determine the turbidity level readings at 15-minute intervals.

(ii) If there is a failure in the continuous turbidity monitoring equipment at a system serving 10,000 people or more, the system must conduct grab sampling every four hours in lieu of continuous monitoring, but for no more than five working days following the failure of the equipment.

(iii) If the continuous turbidity monitoring equipment at a system serving fewer than 10,000 people malfunctions, the system must conduct grab sampling every four hours in lieu of continuous monitoring, but for no more than 14 working days following the failure of the equipment.

(D) A system that monitors combined filter effluent turbidity in lieu of individual filter effluent turbidity under §290.42(d)(11)(E)(ii) of this title must monitor the performance of individual filters using a bench-top turbidimeter.

(f) Filtration requirements for other filters. A system that uses cartridge filters, membrane filters, or other unconventional filtration systems to treat surface water or groundwater under the direct influence of surface water must meet minimum filtration requirements before the water is supplied to any consumer.

(1) Treatment technique requirements. A system that uses unconventional filtration technologies such as membrane filters or cartridge filters must meet treatment technique requirements prescribed by the executive director.

(A) The filtration facilities must meet combined filter effluent and individual filter effluent turbidity limits established by the executive director.

(B) The filtration facilities must be operated and maintained in accordance with requirements that the executive director determines are needed to demonstrate the amount of *Giardia* and *Cryptosporidium* removal achieved.

(2) Monitoring requirements. A system must monitor the performance of its filtration facilities.

(A) A system that serves fewer than 500 people and continuously monitors the turbidity level of each individual cartridge or membrane unit must measure and record the turbidity level of the combined effluent at least once each day that the plant is in operation.

(B) A system that serves at least 500 people and continuously monitors the turbidity level of each individual cartridge or membrane unit must measure and record the turbidity level of the combined effluent at least every four hours that the system serves water to the public.

(C) A system using membranes must use a method approved by the executive director to continuously monitor the quality of the water produced by each membrane unit and record the monitoring results at least once every five minutes. The executive director may approve monitoring parameters other than turbidity and decrease the frequency to once every 15 minutes if the approved operating parameters will allow consecutive readings to be obtained between backwash or backflush cycles.

(D) A system using membranes must conduct direct integrity testing on each membrane unit using a procedure approved by the executive director.

(i) Direct integrity tests must be conducted in a manner that will detect a membrane defect of 3 microns or smaller and demonstrates a removal efficiency equal to or greater than the removal credit awarded to the membrane filtration process by the executive director.

(ii) Direct integrity test method must calculate the log removal value for a 3-micron size particle and establish an upper control limit which assures that the unit is capable of meeting the removal credit approved by the executive director.

(iii) A system that has been assigned a Bin 1 classification under the provisions of subsection (c)(3)(B) of this section must conduct direct integrity tests at least once every seven days. The executive director may reduce the testing requirements for other membrane units.

(iv) A system that has been assigned a Bin 2, 3, or 4 classification under the provisions of subsection (c)(3)(B) of this section must conduct direct integrity tests at least once each day that the membrane unit is used for filtration. The executive director may approve less frequent testing, based on demonstrated process reliability, the use of multiple barriers effective for *Cryptosporidium* removal or inactivation, or reliable process safeguards.

(v) A system must immediately conduct a direct integrity test on any membrane unit that produces filtered water with turbidity level above 0.15 NTU on two consecutive readings. The executive director must establish alternate site-specific control limits for systems that use other approved technology in lieu of turbidimeters to continuously monitor the performance of membrane units.

(vi) A system must immediately remove any membrane unit that fails a direct integrity test from service until the membrane modules in that unit are inspected and, if necessary, repaired. A membrane unit that has been removed from service may not be returned to service until it has passed a direct integrity test.

(E) A system that uses cartridge filters must continuously monitor the performance of the filtration process in a manner approved by the executive director.

(3) Analytical requirements. All monitoring required by this subsection must be conducted by a facility approved by the executive director and using methods that conform to the requirements of §290.119 of this title. Equipment used for compliance measurements must be maintained and calibrated in accordance with §290.46(s) of this title.

(A) Turbidity of the combined effluent must be measured with turbidimeters that meet the requirements of subsection (e)(5)(A) of this section.

(B) The turbidity of the water produced by each membrane unit must be measured using the Hach FilterTrak Method 10133. The executive director may approve the use of alternative technology to monitor the quality of the water produced by each membrane unit.

(C) A system continuously monitoring the performance of individual cartridges or membrane units may monitor combined effluent turbidity levels by either continuously monitoring turbidity levels with an on-line turbidimeter, or by measuring the turbidity level in grab samples with a bench-top turbidimeter.

(D) Data collected from on-line instruments may be recorded electronically by a SCADA system or on a strip chart recorder. The recorder must be designed so that the operator can accurately determine the value of readings at the monitoring interval approved by the executive director.

(i) If there is a failure in the continuous monitoring equipment at a system serving 10,000 people or more, the system must conduct grab sampling every four hours in lieu of continuous monitoring, but for no more than five working days following the failure of the equipment.

(ii) If there is a failure in the continuous monitoring equipment at a system serving fewer than 10,000 people, the system must conduct grab sampling every four hours in lieu of continuous monitoring, but for no more than 14 working days following the failure of the equipment.

(E) A system that uses cartridge filters and does not continuously monitor the turbidity of each filter unit must monitor the performance of individual filters at least once each day using a bench-top turbidimeter.

(g) Other treatment credits for systems in Bins 2 through 4. The executive director may grant additional pathogen removal and inactivation credit to systems that meet enhanced design, operational, maintenance, and reporting requirements.

(1) Individual filter effluent. The executive director may approve an additional 1.0-log removal credit for *Giardia* and *Cryptosporidium* to a treatment plant that uses conventional granular media filters.

(A) The executive director will approve the additional credit for a plant if:

(i) the system continuously monitored the filtered water turbidity at the effluent of each individual filter and recorded the turbidity value every 15 minutes that the filter was sending water to the clearwell;

(ii) the turbidity level at each individual filter effluent is less than or equal to 0.15 NTU in at least 95% of the measurements recorded during the month; and

(iii) no individual filter produced water with turbidity level above 0.3 NTU in two consecutive 15-minute readings.

(B) The executive director may also approve the additional credit for a plant that does not meet the requirements of subparagraph (A) of this paragraph if:

(i) the executive director determines that the failure to meet the requirements of subparagraph (A) of this paragraph could not have been prevented through optimizing plant operations, design, or maintenance; and

(ii) the system has experienced no more than two such failures within the most recent 12 months.

(2) Combined filter effluent. The executive director may approve an additional 0.5-log removal credit for *Cryptosporidium* to a treatment plant that uses conventional granular media filters if:

(A) the system continuously monitored the filtered water turbidity at the effluent of each individual filter and recorded the turbidity value every 15 minutes that the filter was sending water to the clearwell;

(B) the turbidity level at the combined filter effluent is less than or equal to 0.15 NTU in at least 95% of the measurements recorded during the month; and

(C) the plant does not receive additional treatment credit under paragraph (1) of this subsection.

(3) Second stage filtration. The executive director will approve an additional 0.5-log removal credit for *Giardia* and *Cryptosporidium* to a treatment plant that uses a second, separate stage of conventional granular media filters if:

(A) the filters in both stages meet minimum design criteria approved by the executive director;

(B) all of the water produced by the plant passes through both stages of filtration;

(C) the system continuously monitored the filtered water turbidity at the effluent of each individual filter in the first stage of filtration and recorded the turbidity value every 15 minutes that the filter was sending water to the clearwell; and

(D) no individual filter in the first stage of filtration produced water with turbidity level above 1.0 NTU in two consecutive 15-minute readings.

(4) Other pathogen control strategies. The executive director may approve an additional removal or inactivation credit for other pre-filtration, filtration, or post-filtration strategies that can demonstrate effective, consistent levels of enhanced pathogen control.

(A) The alternative strategy must achieve a quantifiable reduction in the risk of waterborne disease in all of the treated water produced by the plant.

(B) The alternative strategy must conform to any applicable requirement of 40 CFR §§141.715 - 141.720.

(C) The executive director may establish minimum site-specific design, operational, maintenance, and reporting requirements for any alternative strategy used to meet minimum treatment technique requirements of subsection (c) of this section.

(D) The executive director may not approve additional removal credit under the provisions of this paragraph to any strategy that includes a treatment process has been assigned additional removal or inactivation credit under any other provision of this subsection.

(h) Reporting requirements. Public water systems must properly complete and submit periodic reports to demonstrate compliance with this section.

(1) A system that has a turbidity level exceeding 1.0 NTU in the combined filter effluent must consult with the executive director within 24 hours.

(2) A system that treats surface water sources or groundwater sources under the direct influence of surface water must submit a Surface Water Monthly Operating Report each month for each plant.

(A) A system that uses alternative treatment technologies or has been assigned a Bin 2, Bin 3, or Bin 4 classification under subsection (c)(3)(B) of this section must submit a Surface Water Monthly Operating Report (commission Form 0102D) for alternative technologies.

(B) A system that continuously monitors the performance of individual filters, but is not required to submit commission Form 0102D, must submit a Surface Water Monthly Operating Report (commission Form 0102C).

(C) A system that is allowed by the executive director to submit combined filter effluent turbidity in lieu of individual filter effluent turbidity under §290.42(d)(11)(E)(ii) of this title must submit a Surface Water Monthly Operational Report for Plants That Do Not Have a Turbidimeter on Each Filter (commission Form 0103) each month for each plant that treats surface water or groundwater under the direct influence of surface water.

(3) A system that must complete the additional monitoring required by subsection (e)(4)(A)(i) or (B)(i) of this section must submit a Filter Profile Report for Individual Filters (commission Form 10276) with its Surface Water Monthly Operating Report.

(4) A system that must complete the additional monitoring required by subsection (e)(4)(A)(ii) or (B)(ii) of this section must submit a Filter Assessment Report for Individual Filters (commission Form 10277) with its Surface Water Monthly Operating Report.

(5) A system that must complete the additional monitoring required by subsection (e)(4)(A)(iii) or (B)(iii) of this section must submit a Comprehensive Performance Evaluation Request Form (commission Form 10278) with its Surface Water Monthly Operating Report.

(6) A system must submit any additional reports required by the executive director to verify the level of pathogen removal or inactivation achieved by the system's treatment plants.

(7) A system must submit its *Cryptosporidium* bin classification.

(8) A system must submit reports required by subsection (b)(7) of this section.

(9) Periodic reports required by this section must be submitted to the Water Supply Division, Texas Commission on Environmental Quality, MC 155, P.O. Box

13087, Austin, Texas 78711-3087 by the tenth day of the month following the end of the reporting period.

(i) Compliance determination. Compliance with the requirements of this section must be determined using the criteria of this subsection.

(1) A public water system that fails to complete source water monitoring or conduct the routine monitoring tests and any applicable special investigations required by this section commits a monitoring violation.

(2) A public water system that fails to submit a report required by subsection (h) of this section commits a reporting violation.

(3) A public water system using conventional filters that has a turbidity level exceeding 5.0 NTU in the combined filter effluent commits an acute treatment technique violation.

(4) A public water system using membrane filters that has a turbidity level exceeding 1.0 NTU in the combined filter effluent commits an acute treatment technique violation.

(5) Except as provided in paragraphs (3) and (4) of this subsection, a public water system that violates the requirements of subsections (c), (d)(1), (e)(1), and (f)(1) of this section commits a nonacute treatment technique violation.

(6) A system that fails to request a bin classification within six months of completing a round of source water monitoring commits a treatment technique violation.

(7) A system that fails to correct the performance-limiting factors identified in a comprehensive performance evaluation conducted under the requirements of subsection (e)(4)(A)(iii) or (B)(iii) of this section commits a violation.

(8) A system that fails to properly issue a public notice required by subsection (j) of this section commits a violation.

(j) Public notification. The owner or operator of a public water system that violates the requirements of this section must notify the executive director and the people served by the system.

(1) A public water system that commits an acute treatment technique violation must notify the executive director and the water system customers of the acute

violation within 24 hours in accordance with the requirements of §290.46(q) of this title and §290.122(a) of this title (relating to Public Notification).

(2) A public water system that has a turbidity level exceeding 1.0 NTU in the combined filter effluent must consult with the executive director within 24 hours of the violation.

(A) Based on the results of the consultation, the executive director will determine whether the water system must notify its customers in accordance with the requirements of §290.122(a) or (b) of this title.

(B) A water system that fails to consult with the executive director as required by this paragraph must notify its customers in accordance with the requirements of §290.122(a) of this title.

(3) Except as provided in paragraphs (1) and (2) of this subsection, a public water system that fails to meet the treatment technique requirements of subsections (c), (d)(1), (e)(1), or (f)(1) of this section must notify the executive director by the end of the next business day and the water system customers in accordance with the requirements of §290.122(b) of this title.

(4) A public water system that fails to conduct the monitoring required by this section must notify its customers of the violation in accordance with the requirements of §290.122(c) of this title.

§290.116. Groundwater Corrective Actions and Treatment Techniques.

(a) Applicability. All groundwater public water systems, including such systems that use surface water or groundwater under the direct influence of surface water (mixed systems), must comply with one or more of the treatment techniques and corrective actions of this section if a raw groundwater source sample was positive for fecal indicators, if a significant deficiency was identified, or if the system is not required to conduct raw groundwater source monitoring because it provides at least 4-log treatment of viruses at each groundwater source.

(1) A groundwater system must provide written notification to the executive director that it is not required to meet the raw groundwater source monitoring requirements under §290.109(c)(4) of this title (relating to Microbial Contaminants) because it provides at least 4-log treatment of viruses for the specified groundwater source and must begin compliance monitoring in accordance with subsection (c) this section. The notification must include engineering, operational, and other information required by the executive director to evaluate the submission. If the executive director

determines and documents in writing that 4-log treatment of viruses is no longer necessary for a specified groundwater source or if the system discontinues 4-log treatment of viruses before the first connection for any groundwater source, the system must document this in writing and conduct raw groundwater source sampling as required under §290.109(c)(4) of this title.

(2) A groundwater system that places a groundwater source in service after November 30, 2009, that is not required to meet the raw source monitoring requirements under §290.109(c)(4) of this title because the system provides at least 4-log treatment of viruses for a specified groundwater source must begin compliance monitoring within 30 days of placing the source in service in accordance with subsection (c) of this section. The system must provide written notification to the executive director that it provides at least 4-log treatment of viruses before the first connection for the specified groundwater source. The notification must include engineering, operational, and other information required by the executive director to evaluate the submission. The system must conduct triggered source monitoring under §290.109(c)(4) of this title until the executive director provides written approval of the system's request to provide the 4-log treatment. If the system discontinues 4-log treatment of viruses before the first connection for a groundwater source, the system must conduct raw groundwater source sampling as required under §290.109(c)(4) of this title.

(b) Groundwater corrective action plan. All public water systems using groundwater must submit a corrective action plan and implement corrective action if a raw groundwater source sample was positive for fecal indicators or if a significant deficiency was identified.

(1) If a groundwater source sample was found to be fecal indicator positive or if a significant deficiency was identified, the system must consult with the executive director regarding appropriate corrective action and have an approved corrective action plan in place within 30 days of receiving written notification from a laboratory of the fecal indicator positive source sample collected under §290.109(c)(4) of this title or within 30 days of receiving written notification from the executive director of the identification of a significant deficiency.

(2) Within 120 days of receiving written notification from a laboratory of the fecal indicator positive source sample or receiving written notification from the executive director of a significant deficiency, the system must have completed corrective action or be in compliance with an approved corrective action plan and schedule.

(3) Any changes to the approved corrective action plan or schedule must be approved by the executive director.

(4) The executive director may require interim measures for the protection of public health pending approval of the corrective action plan. The system must comply with these interim measures as well as with any schedules specified by the executive director.

(5) Systems that are required to complete corrective action must implement one or more of the procedures in this paragraph and the details of the implementation must be specified in the approved corrective action plan.

(A) The system may disinfect the groundwater source where the fecal indicator positive source sample was collected following the American Water Works Association (AWWA) standards for well disinfection and start monthly fecal indicator sampling at that source within 30 days after well disinfection. The executive director may discontinue the monthly source sampling requirement if corrective action is sufficient.

(B) The system may eliminate the groundwater source that was found to be fecal indicator positive and provide an alternate groundwater source if necessary. Eliminated groundwater sources must be disconnected from the distribution system until the contamination is corrected and the executive director approves it for use.

(C) The system may identify and eliminate the source of fecal contamination followed by well disinfection according to AWWA well disinfection standards and begin monthly fecal indicator sampling within 30 days after well disinfection. The executive director may allow the system to discontinue the monthly source sampling requirement after making a determination that corrective action is sufficient.

(D) The system may provide treatment that reliably achieves at least 4-log treatment of viruses using inactivation, removal or an executive director-approved combination of inactivation and removal before the first connection of the groundwater source.

(E) Correct all significant deficiencies.

(F) Assessment source monitoring for a period of 12 months or a time period specified by the executive director from the raw groundwater source in accordance with §290.109(c)(4)(E) of this title.

(c) Microbial inactivation requirements. A system that treats groundwater in response to a fecal indicator positive source sample, significant deficiency, or in lieu of the raw groundwater source monitoring shall meet minimum disinfection requirements demonstrating at least 4-log treatment of viruses before the water is distributed to the first connection of the specified groundwater source.

(1) Monitoring requirements for chemical disinfectants. Groundwater systems shall monitor the performance of the disinfection facilities to ensure that appropriate disinfectant levels are maintained every day the specified source serves the public. All monitoring conducted pursuant to the requirements of this section must be conducted at sites designated in the system's monitoring plan in accordance with §290.121 of this title (relating to Monitoring Plans).

(A) Groundwater systems serving a population greater than 3,300 must continuously monitor the residual disinfectant concentration in accordance with the analytical methods specified in 40 Code of Federal Regulations (CFR) §141.74(a)(2) at a location approved by the executive director and must record the lowest residual disinfectant concentration every day the groundwater source serves the public.

(i) The groundwater system must maintain the executive director-approved minimum specified disinfectant residual every day the groundwater system serves water from the specified groundwater source to the public. If there is a failure in the continuous monitoring equipment, the groundwater system must conduct grab sampling every four hours until the continuous monitoring equipment is returned to service.

(ii) The system must resume continuous residual disinfectant monitoring within 14 days.

(B) Groundwater systems serving a population of 3,300 or fewer must monitor the disinfectant residual in accordance with the analytical methods specified in 40 CFR §141.74(a)(2) in each disinfection zone at least once each day that water from the specified groundwater source is served to the public during either a time when peak hourly raw water flow rates are occurring or at another time specified by the executive director. The system must record and maintain the disinfectant residual every day the system serves water from the groundwater source to the public. The system must collect a daily grab sample during the hour of peak flow or at another time specified by the executive director. If any daily grab sample measurement falls below the executive director-approved minimum specified disinfectant residual, the groundwater system must collect follow-up samples every four hours until the residual disinfectant concentration is restored to the executive director-approved level. Alternatively, a groundwater system that serves 3,300 or fewer people may monitor the residual disinfectant concentration continuously and meet the requirements of subparagraph (A) of this paragraph.

(C) Disinfection contact time will be based on tracer study data or a theoretical analysis submitted by the system owner or their designated agent and approved by the executive director.

(D) Groundwater treatment plants that fail to demonstrate an appropriate level of treatment must repeat these tests at four-hour or shorter intervals until compliance has been reestablished.

(2) Monitoring and operating requirements for commission-approved alternative treatment, including ultraviolet light (UV) disinfection facilities and other methods that can obtain 4-log inactivation of viruses and can be properly validated. Public water systems shall monitor the UV intensity as measured by a UV sensor, lamp status, the flow rate through the unit, and other parameters prescribed by the executive director as specified in §290.42(g)(5) of this title (relating to Water Treatment) to ensure that the units are operating within validated conditions.

(3) Analytical requirements. All monitoring required by this section must be conducted at a facility approved by the executive director and using methods that conform to the requirements of §290.119 of this title (relating to Analytical Procedures).

(A) The pH analysis must be conducted using a pH meter with a minimum accuracy of plus or minus 0.1 pH units.

(B) The temperature of the water must be measured using a thermometer or thermocouple with a minimum accuracy of plus or minus 0.5 degrees Celsius.

(C) The free chlorine or chloramine residual (measured as total chlorine) must be measured to a minimum accuracy of plus or minus 0.1 milligrams per liter (mg/L). Color comparators may be used for distribution system samples only. When used, a color comparator must have current reagents, an unfaded and clear color comparator, a sample cell that is not discolored or stained, and must be properly stored in a cool, dark location where it is not subjected to conditions that would result in staining. The color comparator must be used in the correct range. If a sample reads at the top of the range, the sample must be diluted with chlorine-free water, then a reading taken and the resulting residual calculated.

(D) The chlorine dioxide residual must be measured to a minimum accuracy of plus or minus 0.05 mg/L using one of the following methods:

(i) Amperometric titrator with platinum-platinum electrodes; or

(ii) Lissamine Green B.

(E) The ozone residual must be measured to a minimum accuracy of plus or minus 0.05 mg/L using an indigo method that uses a colorimeter or spectrophotometer.

(4) Recordkeeping requirements for microbial inactivation treatment. Groundwater systems, including wholesale, consecutive, and mixed systems, regulated under this subsection must comply with §290.46 of this title (relating to Minimum Acceptable Operating Practices for Public Drinking Water Systems).

(d) Reporting requirements. Groundwater systems conducting 4-log treatment in lieu of the raw groundwater source monitoring or required to conduct corrective action in response to a fecal indicator positive source sample, or a significant deficiency, must report to the executive director in accordance with this subsection.

(1) A groundwater system required to conduct compliance monitoring for chemical disinfectants must complete a Groundwater Treatment Monthly Operating

Report (commission Form 20362) for groundwater disinfection facilities monthly. Groundwater systems must maintain the reports on site and make them available to the executive director upon request.

(2) A groundwater system must provide written notification to the executive director that it is not required to meet the raw groundwater source monitoring requirements under §290.109(c)(4) of this title because it provides at least 4-log treatment of viruses for a specified groundwater source and must begin compliance monitoring in accordance with subsection (c) of this section. The notification must include engineering, operational, and other information required by the executive director to evaluate the submission.

(3) A groundwater system required to complete corrective action under subsection (b) of this section must notify the executive director within 30 days of completing the corrective action.

(4) If a groundwater system is subject to the triggered source monitoring requirements of §290.109(c)(4)(A) of this title and does not conduct source monitoring, the system must provide written documentation that it was providing 4-log treatment of viruses for the specified groundwater source or that it met the criteria set out in

§290.109(c)(4)(D) of this title within 30 days of the positive distribution coliform sample.

(5) A groundwater system conducting compliance monitoring under subsection (a) of this section must notify the executive director any time the system fails to meet any executive director-specified requirements (including, but not limited to, minimum residual disinfectant concentration, and alternative treatment operating criteria) if the operation in accordance with the criteria or requirements is not restored within four hours. The system must notify the executive director as soon as possible, but no later than the end of the next business day.

(e) Compliance determination. In accordance with this subsection, the executive director shall determine compliance for groundwater systems required to conduct corrective action within 120 days, or pursuant to a groundwater corrective action plan.

(1) A groundwater system is in violation of the treatment technique requirement if it does not complete corrective action in accordance with the executive director-approved corrective action plan or any interim measures required by the executive director.

(2) A groundwater system is in violation of the treatment technique requirement if it is not in compliance with the executive director-approved corrective action plan and schedule.

(3) A groundwater system subject to the requirements of subsection (c) of this section that fails to maintain at least 4-log treatment of viruses is in violation of the treatment technique requirement if the failure is not corrected within four hours. The groundwater system must notify the executive director as soon as possible but no later than the next business day if there is a failure in maintaining the 4-log treatment for more than four hours.

(4) A groundwater system that fails to conduct the disinfectant monitoring required under subsection (c) of this section commits a monitoring violation.

(5) A groundwater system that fails to report the results of the disinfectant monitoring required under subsection (c) of this section commits a reporting violation.

(6) A groundwater system that fails to issue a required public notice or certify that the public notice has been performed commits a public notice violation.

(f) Public notification. A groundwater system that commits a treatment technique, monitoring, or reporting violation or situation as identified in this section must notify its customers of the violation in accordance with the requirements of §290.122 of this title (relating to Public Notification).

(1) Special notice to the public of significant deficiencies or source water fecal contamination for community systems. In addition to the applicable public notice requirements of §290.122(a) of this title, a community groundwater system that receives notice from the executive director of a significant deficiency or notification of a fecal indicator-positive groundwater source sample that is not invalidated under §290.109(d)(2) of this title must inform the public served by the water system of the fecal indicator-positive source sample or of any significant deficiency that has not been corrected in its Consumer Confidence Report as specified in §290.272(g)(7) and (8) of this title (relating to Content of the Report).

(2) Special notice to the public of significant deficiencies or source water fecal contamination for noncommunity systems. In addition to the applicable public notice requirements of §290.122(a) of this title, a noncommunity groundwater system that receives notice from the executive director of a significant deficiency or notification of a fecal indicator-positive groundwater source sample that is not invalidated under §290.109(d)(2) of this title must inform the public served by the water system of any

significant deficiency that has not been corrected within 12 months of being notified by the executive director, or earlier if directed by the executive director. The system must continue to inform the public annually until the significant deficiency is corrected. The information must include:

(A) posting the notice in conspicuous locations throughout the distribution system frequented by persons served by the system, or by mail or direct delivery to each customer and service connection; and

(B) any other method reasonably calculated to notify other persons served by the system, if they would not normally be notified by the methods set out in subparagraph (A) of this paragraph. Such persons may include those who may not see a posted notice because the notice is not in a location they routinely frequent. Other methods may include publication in a local newspaper, newsletter, or e-mail; or, delivery of multiple copies in central locations (e.g., community centers).

(C) If directed by the executive director, a noncommunity groundwater system with significant deficiencies that have been corrected must inform its customers of the significant deficiencies, how deficiencies were corrected, and the dates of correction.