Membrane Construction Checklist (Step 1)

Texas Commission on Environmental Quality
Water Supply Division
Plan Review Team MC-159
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Public Water System I.D. No._____
TCEQ Log No. P-_____

The following list is a brief outline of the "Rules for Public Water Systems", 30 TAC Chapter 290 regarding proposed membrane treatment systems. Engineering report, sealed plans, and specifications meeting, but not limited to, the minimum requirements cited here shall be prepared under the supervision of a Texas licensed professional engineer and submitted to TCEQ for approval. This list is not a substitute for the rules and this checklist cannot be accepted in lieu of the required engineering submittals. Failure to submit the following items may delay project approval. Copies of the rules may be obtained from Texas Register, 1019 Brazos St, Austin, TX, 78701-2413, Phone: (512) 463-5561 or downloaded from the website: http://www.tceq.texas.gov/rules/indxpdf.html

Once all the information outlined in this checklist has been submitted, TCEQ will review. If construction approval is granted, the Public Water System may proceed with installation of the membrane but may not send water treated by the membrane to distribution. Completion data must be submitted to TCEQ – see the "Membrane Use Checklist (Step 2)".

For public water systems using reverse osmosis or nanofiltration membranes, the engineering report must include the requirements specified in 30 TAC §290.39(e)(1)(A) - (H) of this subsection, and additionally must provide sufficient information to ensure effective treatment. Specifically: [§290.39(e)(6) and §290.39(e)(8)]

1. ☐ Provide a clear identification of the proposed raw water source; [§290.39(e)(6)(A)]
2. ☐ Provide a description of the pretreatment process; [§290.39(e)(6)(B)]

Submittal must have either 3, 4 or 5:

3. ☐ The design of a reverse osmosis or nanofiltration membrane system shall be based on the standard modeling tools of the manufacturer [§290.39(e)(6)(C)]. The model must be run for both new membranes and end-of-life membranes. 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.
4. ☐ Instead of Model- a pilot study or similar full-scale data in accordance with §290.42(g); or [§290.39(e)(6)(D)]
5. ☐ For flow rates less than 300 gallons per minute, the design specifications can be based on the allowable operating parameters of the manufacturer; [§290.39(e)(6)(D)]

Membrane Construction Checklist (Step 1)

6. ☐ 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; [§290.39(e)(6)(E)]
7. ☐ 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; [§290.39(e)(6)(F)]
8. ☐ Provide the projected water quality at the entry point to the distribution system and the method(s) used to make the water quality projections; [§290.39(e)(6)(G)]
9. ☐ 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; [§290.39(e)(6)(H)]
10. ☐ Provide a description of the disinfection byproduct formation potential based on total organic carbon and other precursor sample results; [§290.39(e)(6)(I)]
11. ☐ Identify specific parameters and set points that indicate when membrane cleaning, replacement, and/or inspection is necessary; and [§290.39(e)(6)(J)]
12. ☐ 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. See Chemical Storage and Feed Facilities Checklist[§290.39(e)(8)]

Design Requirements:

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: [§290.42(b)(9)]

13. ☐ 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); [§290.42(b)(9)(A)]
14. ☐ The reverse osmosis and nanofiltration membrane systems must be designed to ensure adequate cleaning of the membrane system; [§290.42(b)(9)(B)]
15. ☐ 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: [§290.42(b)(9)(C)]

    (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.

Membrane Construction Checklist (Step 1)

16. ☐ 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: [§290.42(b)(9)(D)]
    - (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.
17. ☐ 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; [§290.42(b)(9)(E)]
18. ☐ Pipes and pipe galleries shall meet the minimum requirements specified in subsection (d)(12) and (13) of this section; [§290.42(b)(9)(F)]
19. ☐ Each reverse osmosis or nanofiltration membrane unit shall be equipped to measure conductivity or total dissolved solids in the feed and the permeate water; [§290.42(b)(9)(G)]
20. ☐ Chemical storage and chemical feed facilities shall comply with subsection §290.42(f) of this section; [§290.42(b)(9)(H)]
21. ☐ Provide cross-connection protection for common piping used for cleaning and normal production modes [§290.42(b)(9)(I)]. 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;
22. ☐ 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; [§290.42(b)(9)(J)]
23. ☐ The water system must provide pressure measuring and recording devices before and after each membrane stage; and [§290.42(b)(9)(K)]
24. ☐ 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. [§290.42(b)(9)(L)]