

# Reverse Osmosis/Nanofiltration Approval Process



Plan Review Team

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# REVERSE OSMOSIS/NANOFILTRATION



Step 1 and Step 2 Plan Review Checklists:

<http://www.tceq.state.tx.us/drinkingwater/udpubs.html>

➤ **Just Google “TCEQ Plan Review”**

# Design Rules of RO/NF

## §290.42(b)(9)



- Based on Findings of Engineering Report
- Design Flux Rates to Ensure Effective Filtration Based:
  - Manufacturer's computer models for new and end-of-life membranes;
  - Pilot Study or Alternate Site Data
  - Manufacturer's allowable operating parameters for units rated less than 300 gpm

# Design Rules of RO/NF

## §290.42(b)(9) Continued



- Must Provide Adequate Cleaning
- Must Provide Acceptable Pretreatment Techniques:
  - Must be ANSI/NSF 60 or 61
  - Bags, Cartridges, or Screens for Particulate
  - Chemicals for Scale, Foulants, Chlorine Removal
  - Filters for Iron and Manganese
  - Degasification (Aeration)
  - Ion-Exchange Softening

# Design Rules of RO/NF

## §290.42(b)(9) Continued



- Post-Treatment must be provided for:
  - Corrosivity Control
  - Removal of Dissolved Gases (Carbon Dioxide, Hydrogen Sulfide)
  - Matching Water Quality Goals
  - Must be ANSI/NSF 60 or 61
- Each RO/NF unit shall be equipped to measure conductivity or total dissolved solids in the feed and the permeate water
- Chemical storage and chemical feed facilities shall comply with standard treatment plant requirements

# Design Rules of RO/NF

## §290.42(b)(9) Continued



- Provide cross-connection protection for common piping used for cleaning and normal production modes:
  - Double Block and Bleeding Valve
  - Removable Spool System
  - Alternative Approved by Executive Director
- 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

# Design Rules of RO/NF

## §290.42(b)(9) Continued



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

# Two Approval Steps



- Step 1 Construction - Engineering Report and Design Documents
- Step 2 Use - Baseline Data and Chemical Results
  - Proposed wells may be submitted at the same time as Step 1
  - Well completion material can be submitted at same time as Step 2



# Step 1 – Approval for Construction



1. Engineering Plans and Specifications
2. Engineering Report:
  - a) Manufacturer's RO/NF Model
    - i. Flow Rate
    - ii. Recovery
    - iii. Number of Stages
    - iv. Number of Passes
    - v. # Vessels per Stage
    - vi. # Elements per Vessel
    - vii. Feed Pressure
    - viii. Flux
    - ix. Ion Concentrations of the Feed Water

➤ **Note: Flow rates less than 300 GPM design on manufacturer's allowable operating parameter**

# Step 1 – Approval for Construction Continued



- b) Clear Identification of the Proposed Raw Water Source
- c) Pretreatment Description
- d) NSF 60 and 61 Certification
- e) Post-Treatment/Blending
- f) Projected Water Quality
- g) DBP Formation Potential
- h) Membrane Integrity/Cleaning, Replacement and Cleaning

# Step 1 –Concurrent Exception RO Membrane Pressure Measuring Rule



- The water system is required to provide pressure measuring and recording devices before and after each membrane stage
- For small off-the-shelf systems with  $\leq 300$  gpm and sufficient alarms for Low pressure, High temperature, Increased conductivity
- Exception request to be submitted with Step 1 submittal for concurrent review

Exception will be contingent on:

- The PWS must measure the pressure at each available RO-membrane system inlet and outlet and record the pressure measurements in a log each day.
- The PWS must have standard operating procedures to acquire the daily pressure data required for the RO system log.

# Step 2 – Approval for Use



Step 2 required before the RO/NF system can be used to produce drinking water, i.e., for water to be sent to distribution

# Step 2 - Approval for Use Continued



## Addendum to Engineering Report:

- **Baseline Data:**
  - Net Driving Pressure
  - Normalized Permeate Flow
  - Salt Rejection or Salt Passage
- Set Trigger for Clean In Place (or Define Set Time Interval)
- Check Model's Accuracy
- Verify Plant Capacity

# Step 2 Approval for Use (continued)



Complete Chemical and Physical Analysis of Water (in accordance with §290.42(c)(3)(G)) for:

- Raw Water
- Permeate Water
- Finished Water (After All Post Treatment and Blending)

# Other RO/NF Rules



- §290.42(d)(17) - New rules can be used for surface water systems (but not for microbiological control)
- §290.45(a)(6) – RO/NF capacity must be sized in consideration of losses and wastes
- §290.46(e)(2)(D) – RO/NF Operators must have at least one TCEQ approved course or event
- §290.46(f)(3)(A)(iv) – Maintain records of each CIP event
- §290.46(f)(3)(B)(x) – Maintain records of conductivity (or TDS), pressure, temperature, and flow
- §290.46(s)(2)(G) and (H) – Calibration requirements for conductivity, pressure, and temperature instruments

# Questions?



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