



# NSF/ANSI 53 and NSF/ANSI 58 Testing and Literature Requirements

Point-of-Use Nitrate Removal Products

By Amanda Fisher  
Product Certification Manager  
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# Three Main Types of Testing

NSF/ANSI 53 (Drinking Water Treatment Units – Health Effects) and NSF/ANSI 58 (Reverse Osmosis Drinking Water Treatment Systems) both require:

- Extraction
- Structural
- Performance



# Extraction (Overview)

- Testing scrutinizes materials in contact with drinking water to ensure they do not add harmful contaminants
- Test battery based upon a toxicological review of materials touching water
- Systems with adsorptive/absorptive media are tested both with and without media



# Extraction (Exposure Protocol)

- Install the test system/s on the test stand.
- Flush and condition with exposure water.
- Close the system outlet and maintain for 24 h.
- Empty the storage tanks, if applicable, and sample. (2L of sample required)
- Repeat steps 3 and 4 for a total of three sampling events.
- Composite the three 2L samples and analyze.



# Extraction (Exposure Water)

	NSF/ANSI 53	NSF/ANSI 58
Source Water	Tap	Tap
pH	6.75 +/- 0.25	6.75 +/- 0.25
TDS	50 +/-5 mg/L	50 +/-5 mg/L
Temperature	23+/-2 deg C	23+/-2 deg C
Free Available Chlorine	0.5 +/- 0.05 mg/L	Not Applicable



# Extraction (Results)

- Results compared to Maximum Contaminant Concentration (MCC) or Maximum Drinking Water Level (MDWL)
- If level does not exist, one may be established following standard requirements
- Unknowns extractants evaluated to determine identity



# Structural Testing

Testing to avoid home damage through leaks caused by pressure spikes.

Two types of structural integrity tests that are done:

- Hydrostatic
- Cycle



# Structural Testing (Hydrostatic)

Hydrostatic testing holds the system at a designated pressure for 15 minutes. Pressure depends on system.

- 1.5x maximum working pressure or 150 psi

Faucet Attached RO systems

Pumped RO systems

Filters with pressure vessels greater than or equal to 8 inches in diameter

Complete filter systems designed for open discharge

Complete portable filter systems pressurized by user

- Hydrostatic testing not required for gravity flow portable system

- 3x maximum working pressure or 300 psi

RO systems – non-faucet attached and without a pump

Filters with pressure vessels less than 8 inches



# Structural Testing (Cycle)

Cycling pressure through the system. Amount of cycles depend on type of system

- 100,000 cycles from 0 to 150 psi or max pressure  
RO Systems - non faucet attached and without a pump  
Filter systems with pressure vessels
- 10,000 cycles from 0 to 150 psi or max pressure  
RO faucet attached systems  
Filter systems designed for open discharge
- None  
Pumped RO systems  
Portable filter systems pressurized by user



# Performance Testing Requirements

Testing to confirm the system performs as expected

- NSF/ANSI 53 (Filters)

Performance Indication Device Verification

Minimum Service Flow at 30 psi

Rated Service Flow at 60 psi

Performance claim verification

- Optional, but a minimum of one performance claim is required



# Performance Testing Requirements

- NSF/ANSI 58 (Reverse Osmosis)

Storage Tank Capacity Test

Performance Indication Requirements

- Nitrate/nitrite monitor on the product water stream or
- Sampling kit for nitrate/nitrate with recommended frequency of analysis

TDS Reduction (75% reduction of 750+/-40 mg/L)

Recovery/Efficiency Rating

Daily Production Rate

Performance claim verification



# Performance Claim Verification

NSF/ANSI 53 and NSF/ANSI 58 include many optional contaminant reduction claims

- Chemical Reduction Claims
  - Organic/VOC
  - Inorganic (metals, nitrate/nitrite)
  - Radon
- Mechanical Reduction Claims
  - Asbestos
  - Cyst
  - Turbidity



# Nitrate/Nitrite Reduction Testing

## NSF/ANSI 53 (Filters) - Protocol

- Typical system is tested as follows
  - 50%-on/50%-off cycle for 16 hours
    - A 10%-on /90%-off cycle may be used upon request
  - Each cycle is 15-40 minutes
  - System rests for 8 hours under pressure
  - Systems with PID tested to 120% of capacity
    - Samples at 0%, 25%, 50%, 75%, 100%, and 120%
  - Systems without PID tested to 200% of capacity
    - Samples at 0%, 50%, 100%, 150%, 180%, and 200%



# Nitrate/Nitrite Reduction Testing

## NSF/ANSI 53 (Filters) – Test Criteria

### General Test Water – Public Water Supply

pH	7.5 +/- 0.5
temperature	20 +/- 2.5 deg C
total dissolved solids (TDS)	200-500 mg/L
total organic carbon (TOC)	>1.0 mg/L
turbidity	<1 NTU

### Reduction Requirements

Substance	Individual Influent Sample Point Limits	Average Influent Challenge	Maximum Effluent Concentration mg/L
Nitrate plus Nitrite (as N)	30+/- 20%	30+/-10% added as 27 mg/L NO <sub>3</sub> [as N] and 3 mg/L NO <sub>2</sub> [as N]	10*

\*No more than 1.0 mg/L shall be in the form of NO<sub>2</sub> as N.



# Nitrate/Nitrite Reduction Testing

## NSF/ANSI 58 (ROs) - Protocol

- Two systems conditioned to manufacturer's instructions
- Pre and post filters removed
- Test Pressure (30 or 50 psig)

Systems recommended for a minimum influent water system pressure between 20-40 psig shall be tested at 30 psig

Systems recommended for a minimum influent water system pressure of 40 psig or greater shall be tested at 50 psig



# Nitrate/Nitrite Reduction Testing

NSF/ANSI 58 (ROs) – Protocol (Continued)

Sampling (based upon a system with a storage tank and automatic shut off):

- Day 1\*:** 4 hours and 12 hours
- Days 2 – 4:** 5% of DPR every 6 hours
- Days 5 – 6:** stagnation period, system under pressure
- Day 7\*:** 144h point, and 4 hours later

TOTAL: 16 samples.

**\*The storage tank is emptied at each sample point.**

**\*\*Sampling varies for counter top systems with storage tanks, systems without storage tanks, and systems with no shut off provisions.**



# Nitrate/Nitrite Reduction Testing

## NSF/ANSI 58 (ROs) – Test Criteria

Test Water – Chlorine Free Deionized Water

turbidity	≤ 1 NTU
pH	7.5 ± 0.5
temperature	25 ± 1 °C (77 ± 2 °F)
conductivity	1 μS/cm
Chlorine	Chlorine-free
NaCl	750 ± 40 mg/L TDS (added last)

### Reduction Requirements

Contaminant	Individual Influent Sample Point Limits mg/L	Average Influent Challenge Level mg/L	Maximum Allowable Product Water Level mg/L
Nitrate plus Nitrite (as N)	30+/- 20%	30+/-10% added as 27 mg/L NO <sub>3</sub> [as N] and 3 mg/L NO <sub>2</sub> [as N]	10*



\*Arithmetic mean and 90% of individual samples must be less than this level. No more than 1.0 mg/L shall be in the form of NO<sub>2</sub> as N



# Literature Requirements

The product literature for the filter or reverse osmosis system must be reviewed against the criteria in the standards.

## **Manufacturers are required to provide:**

- Owner's Manual
- Performance Data Sheet
- Data Plate (Label)
- Replacement Component Literature / Packaging
- Product Packaging (where applicable)



# Literature Requirements (Nitrate/Nitrite)

- Performance Data Sheet:

For Filters and RO systems the performance Data Sheet nitrate/nitrite performance values must match test results.

- Manual Requirements:

For RO systems tested at 30 psig: "This system is acceptable for treatment of influent concentrations of no more than 27 mg/L nitrate and 3 mg/L nitrite in combination measured as N and is certified for nitrate/nitrite reduction only for water supplies with a pressure of 140 kPa (20 psig) or greater;"

For RO systems tested at 50 psig: "This system is acceptable for treatment of influent concentrations of no more than 27 mg/L nitrate and 3 mg/L nitrite in combination measured as N and is certified for nitrate/nitrite reduction only for water supplies with a pressure of 280 kPa (40 psig) or greater"



# Questions?

Contact Information:

Amanda Fisher

[afisher@wqa.org](mailto:afisher@wqa.org)

