A GLOBAL LEADER
IN PUBLIC HEALTH & SAFETY

NSF INTERNATIONAL
789 N. Dixboro Road, Ann Arbor, Michigan 48105 USA
OVERVIEW

WHO WE ARE
AND WHAT WE DO

CERTIFICATION PROCESS
HOW ITS DONE

NSF/ANSI 53
LEAD REDUCTION TESTING

CURRENT ASSESSMENT
FILTERS IN THE FIELD AND NEXT STEPS
NSF International is an independent, not-for-profit, non-governmental public health and safety organization. Our mission and focus have always been protecting and improving human health.

NSF HELPS PEOPLE LIVE SAFER.

STANDARDS
Facilitating the development of standards to protect food, drinking water, indoor air, dietary supplements, consumer products and environmental safety

TESTING
Testing products to these and other standards

CERTIFICATION
Certifying products to these standards

AUDITING
Conducting safety and quality audits for a wide range of industries

ADVISORY
Providing strategic and technical consulting for the dietary supplement, pharmaceutical, medical device, food and beverage industries

TRAINING
Developing training and education programs

Separate from certification
AN INTRODUCTION

NSF AROUND THE GLOBE

NSF provides services in 175+ countries with 58 office and laboratory locations and over 2,800 experienced professionals.
WHAT GOES INTO GETTING CERTIFIED?
## DRINKING WATER TREATMENT UNIT STANDARDS

<table>
<thead>
<tr>
<th>Year</th>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>NSF/ANSI 42</td>
<td>Filters - Aesthetic Claims</td>
</tr>
<tr>
<td>1980</td>
<td>NSF/ANSI 53</td>
<td>Filters - Health Claims</td>
</tr>
<tr>
<td>1981</td>
<td>NSF/ANSI 58</td>
<td>Reverse Osmosis</td>
</tr>
<tr>
<td>1987</td>
<td>NSF/ANSI 44</td>
<td>Water Softeners</td>
</tr>
<tr>
<td>1989</td>
<td>NSF/ANSI 62</td>
<td>Distillation</td>
</tr>
<tr>
<td>1991</td>
<td>NSF/ANSI 55</td>
<td>Ultraviolet</td>
</tr>
<tr>
<td>2004</td>
<td>NSF/ANSI 177</td>
<td>Shower Filters</td>
</tr>
<tr>
<td>2014</td>
<td>NSF/ANSI 401</td>
<td>Emerging Compounds</td>
</tr>
<tr>
<td>2015</td>
<td>NSF P477/NSF 53</td>
<td>Microcystin Reduction*</td>
</tr>
<tr>
<td>2016</td>
<td>NSF P473/NSF 53</td>
<td>PFOS/PFOA Reduction*</td>
</tr>
<tr>
<td>2018</td>
<td>NSF/ANSI 244</td>
<td>Supplemental Microbiological Water Treatment - Filtration</td>
</tr>
</tbody>
</table>

*Included under NSF/ANSI 53

### Municipal Standards

<table>
<thead>
<tr>
<th>Year</th>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>NSF/ANSI 419</td>
<td>Public Drinking Water Equipment - EPA LT2 Rule for Cyst Reduction</td>
</tr>
</tbody>
</table>
NSF Joint Committee

- **Industry**: Manufacturers of drinking water treatment systems, components, and parts. Only one representative per corporate. 11 Members
- **Regulators**: USDA, EPA, FDA, and International, National, State, Local Government Agencies. 11 Members
- **Consumers**: Educators, Consultants, Consumer Groups, labs, and other certification organizations. 11 Members

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ANSI-Based Consensus Process

Issue paper submission → Joint Committee → Balloting → CPHC Ballot

- Joint Committee
- Technical Committee
- Public Comment

Recommended Action → Task Group

Council of Public Health Consultants
CERTIFICATION PROCESS

WHAT YOU CAN EXPECT WHEN GETTING CERTIFIED

- **APPLICATION**: Your company submits an application.
- **SUBMISSION**: You provide product formulation, toxicity and product use information.
- **REVIEW**: Our technical team reviews formulations and/or port lists.
- **ON-SITE AUDIT**: We perform an on-site audit of the production facility and collect/ request samples.
- **TESTING**: Our laboratory conducts testing.
- **TECHNICAL EVALUATION**: We complete a final technical evaluation.
- **CERTIFICATION**: NSF certification is granted (and maintained annually).
NSF/ANSI 53 – HEALTH CLAIMS

A summary of the Lead Reduction Test Method

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NSF/ANSI 53 – REQUIREMENTS

> Scope of the standard covers POU & POE systems for health reduction performance claims

> Minimum Requirements

• Material Safety conformance
• Structural integrity (if pressurized)
• At least 1 reduction claim, for example Lead Reduction
  • For any heavy metal reduction testing, two pH levels are tested, pH 6.5 and pH 8.5
> Contaminant Concentration Determination-
   - Influent:
     - Based on 95th % of occurrence or 3X the regulated level
     - Rationale: Health contaminants
     - 150 ppb for lead
       - *When the Standard was originally published, the action level was 50ppb*
   - Maximum Allowable Treated Water:
     - Based on Regulated Levels (USEPA MCLs, Health Canada MACs)
     - Rationale: Health contaminants
     - 10 ppb for lead
       - Soon to be lowered to 5 ppb in accordance with new Health Canada MAC
Test End Point and Sampling

- Chemical Reduction
  - *Chemical reduction definition*: The removal of a chemical contaminant contained in the influent water by a water treatment system or process
  - This is usually adsorption
  - Adsorptive medias have treatment capacities limiting the useful life of the media
  - Chemical reduction tests under NSF/ANSI 53 are conducted to an end point based on manufacturer’s rated capacity

- NSF/ANSI 53
  - 200% of rated capacity, or 120% if PID is present
  - Rationale: A safety margin is provided for health effects contaminants. Less safety margin is required if a PID is present. The PID must activate by 110%.
Test End Point and Sampling

- Sampling
  - Samples of influent and treated water are collected at multiple points based on rated capacity throughout the test to assure performance

  - Without PID: start-up, 50%, 100%, 150%, 180%, 200%
  - With PID: start-up, 25%, 50%, 75%, 100%, 120%
    - Rationale: Collecting sufficient samples over life of replacement element to establish breakthrough pattern of contaminant and end of life of replacement element
> PID (Performance Indication Device)

- A device that warns the user to change the replacement element
- Audible or visible alarm, or both
- Based on volume of water treated
- Must be automatic except for manually resetting when filter is changed
- Must activate between 80% - 110% of rated capacity
> Test Method

• Two units are tested simultaneously
• Flow control for plumbed-in systems
  Flow is not controlled by the laboratory. Flow is the highest flow rate achieved with 60 psig dynamic pressure
  • Rationale: NSF/ANSI 53 addresses health effects. Testing at highest achievable flow rate provides added assurance of product function under use conditions
  • The product certified flow rate is the highest achieved flow from all NSF 53 performance testing conducted (assuming more than 1 performance claim)

• Flow control for pitcher/gravity fed systems
  • No pressure, flow is controlled by the system design and gravity
  • Tested to a daily production rate specified by the manufacturer
> Test Water Quality
  • Metals Reduction
    • Testing for heavy metals reduction at pH 6.5 and pH 8.5
    • Rationale: Metals exist in different forms at low vs. high pH (Pourbaix Diagrams)
    • Media may have different adsorptive capabilities for different forms of metals

Figure 1.2. A simplified Pourbaix diagram for chromium species at 150 °C and [Cr(III)]_0=10^{-9} (Source: Ball and Nordstrom 1998, Richard and Bourg 1991, Nieboer and Jusys 1988).
> Test Water Quality

- **Lead**
  - pH 8.5 test water specifically formulated to include 30% particulate lead in addition to soluble lead
    - Rationale: Lead can enter drinking water as particles through abrasion of lead pipes or fittings
  - pH 6.5 test water includes only soluble lead
- Reference NSF/ANSI 53 7.4.3
> Test Water Quality, pH 6.5 Lead Reduction Test using a Public Water Supply

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity (as CaCO₃)</td>
<td>10 – 30 mg/L</td>
</tr>
<tr>
<td>Hardness (as CaCO₃)</td>
<td>10 – 30 mg/L</td>
</tr>
<tr>
<td>pH</td>
<td>6.5 ±0.25</td>
</tr>
<tr>
<td>Polyphosphate (as P)</td>
<td>&lt; 0.5 mg/L</td>
</tr>
<tr>
<td>TDS</td>
<td>&lt; 100 mg/L</td>
</tr>
<tr>
<td>Temperature</td>
<td>20 ±2.5 C</td>
</tr>
<tr>
<td>Turbidity</td>
<td>&lt; 1 NTU</td>
</tr>
</tbody>
</table>
Test Water Quality, pH 8.5 Lead Reduction Test using a RO/DI water

<table>
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<tbody>
<tr>
<td>Alkalinity (as CaCO₃)</td>
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</tr>
<tr>
<td>Hardness (as CaCO₃)</td>
<td>100 mg/L</td>
</tr>
<tr>
<td>pH</td>
<td>8.5</td>
</tr>
<tr>
<td>Temperature</td>
<td>20 ±2.5 C</td>
</tr>
<tr>
<td>Total Chlorine</td>
<td>0.5 mg/L</td>
</tr>
</tbody>
</table>

Water to be adjusted using reagent grade chemicals

Add:
- Magnesium Solution, Calcium solution, Bicarbonate solution, Bleach solution
- Add soluble lead stock, followed by insoluble lead stock
Sampling
- During Lead pH 8.5, analysis will be performed to calculate:
  - Total lead
  - Total % particulate
  - % fine particulate (cannot exceed 20%)
    - Particles between 0.1 and 1.2 microns
- Sample results must meet the 10ppb or lower criteria for two test units at every sample point
FILTER EFFECTIVENESS

How are the filters performing in non-laboratory settings?
> The field data collected by EPA indicate that the use of distributed Brita and Pur point-of-use faucet filters, when installed and maintained properly, are effective at removing lead. The resulting average concentration of filtered water is less than 1 ppb.

> ATSDR reports that consuming filtered water at these lead levels would not cause significantly increased blood lead levels.

> ATSDR continues to support the multi-agency recommendation to use filtered water for cooking and drinking.
Despite initial media reports based on a small sample size, filters, when properly used, reduced lead levels effectively.

https://www.newarkleadserivceine.com/updates/20191121-filter-study-announcement
CURRENT ASSESSMENT

> Filters are meeting the requirements of the standard when used correctly

> In many cases the filters are outperforming their capabilities (>150 ppb influents)

> What Are Next Steps?

  • Joint Committee is evaluating the standard to determine if changes to the test method are warranted, such as:
    • Higher lead influent challenge
    • Addition of treatment chemicals such as orthophosphate
    • Pass/fail criteria is being lowered to 5ppb