

This presentation premiered at WaterSmart Innovations

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New American National Standards for Evaluating Water Reuse Treatment Technologies

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WaterSmart Innovations 2011

Outline

- **NSF International**
- **Consensus Standards Development**
- **Need for Onsite Reuse Treatment Systems**
- **Wastewater Treatment System Standards**
- **Drinking Water Treatment System Standards**
- **Water Reuse Treatment System Standards**

NSF Is A Global Leader In Public Health And Safety

- Accredited developer of over 70 national consensus standards
- Steadfast ties with key associations and govt. agencies
- A Collaborating Centre for the World Health Organization
- Service provider to over 12,000 companies in 100 countries



NSF Collaborations

- NSF is a World Health Organization Collaborating Centre for:
 - Food Safety
 - Water Safety
 - Drinking Water Quality Guidelines
 - Recreational Water Safety Guidelines
 - Indoor Environment
- Work closely with International, Federal State and Local Regulators:
 - FDA
 - USDA
 - EPA
 - U.S. Government/Legislature
 - And many more...



NSF Standards Development Process

Industry Representatives



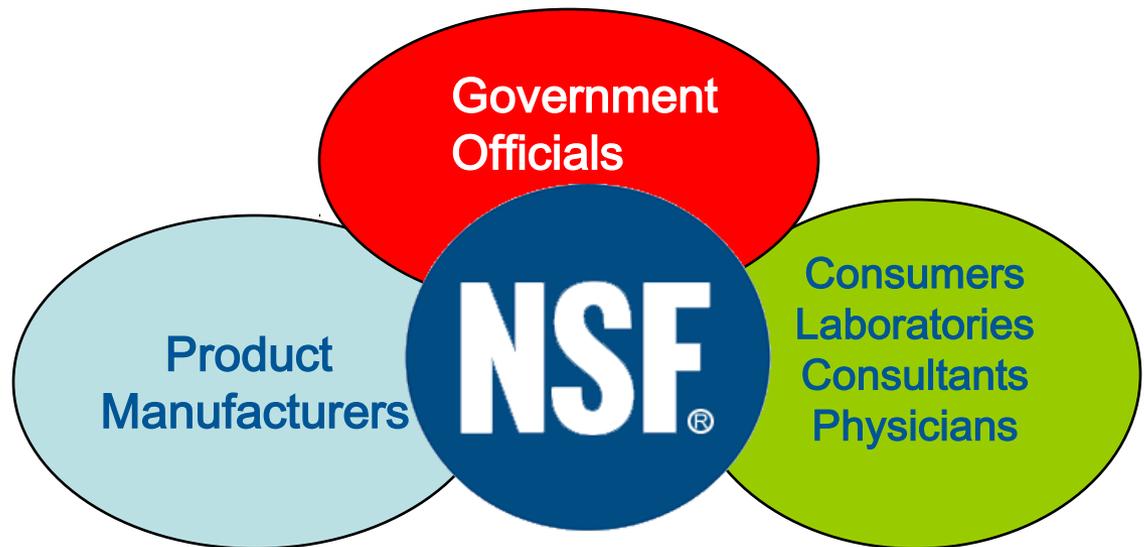
Consumers
Laboratories
Utilities
Consultants

Federal
State
Local



Broad Stakeholder Acceptance

- **Manufacturers**
- **Distributors**
- **Retailers**
- **Regulators**
- **Code Officials**
- **Engineers**
- **Architects**
- **Consumers**



What are the Water Supply Challenges of Today?

- **Current centralized infrastructure.**
 - Aging
 - Undersized
 - Expensive to repair and expand
 - Designed around one high level of treatment for drinking water quality
- **Available sources of water dwindling.**
- **Quality of available sources declining.**

What are the Barriers to Reuse?

- **Consumer perception with use of lower quality water.**
- **Inexpensive cost of potable water for many regions.**
- **Lack of residential plumbing infrastructure to accommodate partially treated water.**
- **Lack of enabling regulatory codes.**
- **Lack of product evaluation standards.**

What are the Opportunities?

- **Reuse of Water Onsite**
 - Water already available onsite; no more cost or energy needed to transport water.
 - Large percentage has modest level of contamination.
 - Treated onsite to meet final application needs.
 - Non-potable uses
 - Indoor or outdoor uses

Broad Scope of Available Water Sources

- **Nature generated**
 - Rainfall
 - Storm runoff
- **Human generated**
 - Graywater
 - Residential wastewater



How Much Water Do We Use?



Source: American Water Works Association Research Foundation, "Residential End Uses of Water," 1999

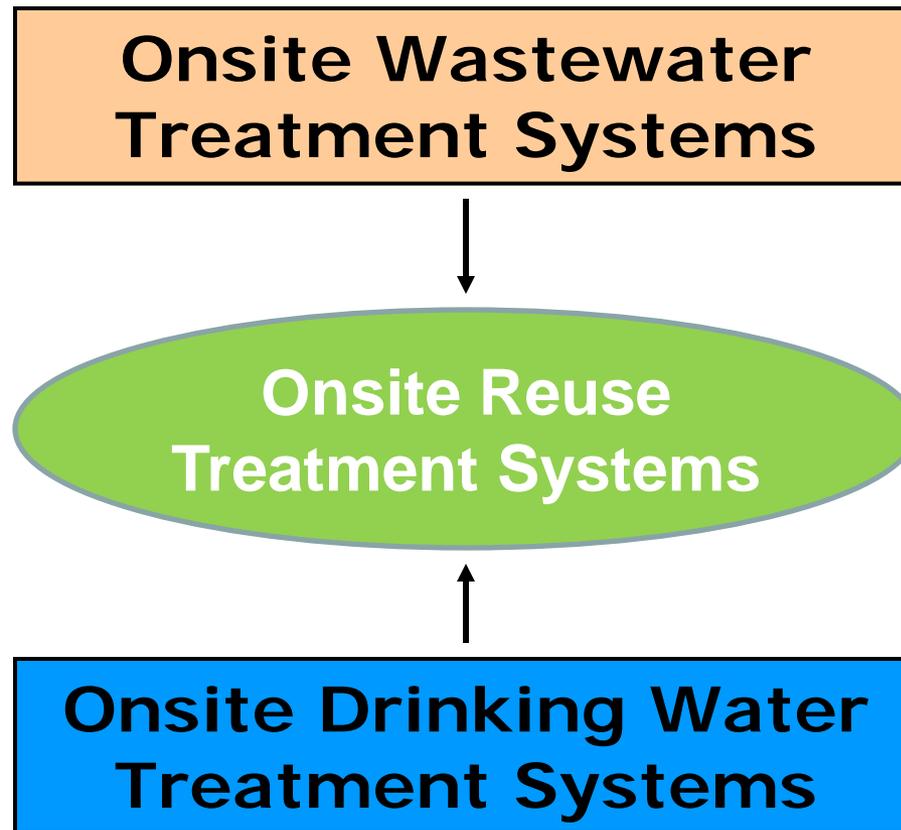


Broad Scope of Non-potable Reuse Applications

- **Use of treated effluent:**
 - Irrigation
 - Toilet/urinal flushing
 - Vehicle washing
 - Fire protection
 - Laundry
 - Fountains
 - Dust control
 - Construction



Leverage Existing Standards and Technologies



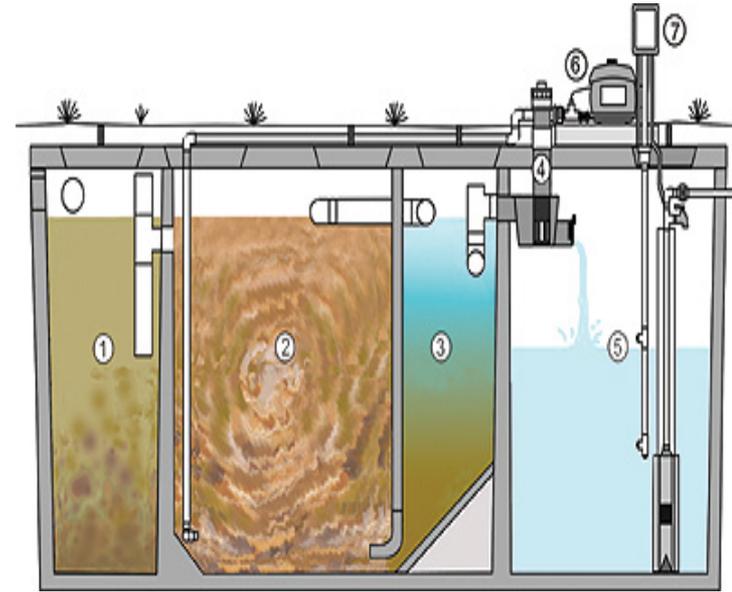
Current NSF/ANSI Onsite Wastewater Standards

- **Standard 41 (1978): *Non-Liquid Saturated Treatment Systems***
(compost toilets)
- **Standard 46 (1997): *Evaluation of Components and Devices Used in Wastewater Treatment Systems***
 - Septic tank filters
 - Pumps
 - Disinfection devices



Current NSF/ANSI Onsite Wastewater Standards

- **Standard 40 (1970):** Complete residential treatment system with a capacity of 400 to 1500 gpd; CBOD₅ and TSS reduction.
- **Standard 245 (2007):** Complete residential treatment system with a capacity of 400 to 1500 gpd; Nitrogen reduction.





NSF POU/POE Drinking Water Standards

NSF/ANSI 42 Filters - Aesthetic Claims

NSF/ANSI 53 Filters - Health Claims

NSF/ANSI 58 Reverse Osmosis (RO)

NSF/ANSI 44 Softeners

NSF/ANSI 62 Distillation

NSF/ANSI 55 Ultraviolet (UV)

NSF/ANSI 177 Shower Filters



POU/POE Test Laboratory



New Product Standards

NSF 350 Onsite residential and commercial reuse treatment systems

and

NSF 350-1 Onsite residential and commercial graywater treatment systems for subsurface discharge

NSF Committee

- **Initiated in 2007**
- **Members:**
 - Drinking water and wastewater treatment industry
 - Plumbing component manufacturers
 - Public health officials (EPA, state, local)
 - Other interested parties (NRDC, AWE, several trade associations)

New Product Standards

NSF 350 Onsite residential and commercial reuse treatment systems

Scope: Standard 350

- **Residential and commercial treatment systems**
- **Sources; graywater and combined wastewater**
 - Graywater: laundry and bathing, excluding toilet and kitchen.
 - Combined: blackwater and graywater.
- **Non-potable effluent uses**
 - Indoor; toilet and urinal flushing.
 - Outdoor; surface and subsurface irrigation.

System Sizes: Standard 350

- **Residential wastewater; Up to 1500 gpd**
 - Laboratory testing with actual wastewater.
- **Graywater; Up to 1500 gpd**
 - Laboratory testing with synthetic wastewater; bathing, laundry, or both
 - Exception; commercial laundry water
- **Systems exceeding 1500 gpd, and commercial laundry**
 - Field evaluation using actual building wastewater.

Commercial Facilities

“Businesses such as lodging establishments, business parks and campuses, shopping facilities, places of public assembly where no manufacturing, assembly, industrial or food processing is involved, and laundering facilities for hospitals, hotels, rental uniforms, and other facilities likely to handle high amounts of soiling or high strength commercial cleaners.”

Overall Test Requirements: Standard 350

- **Requirements for:**
 - Water tightness
 - Noise levels
 - Access ports
 - Failure sensing and signaling
 - Mechanical and electrical
 - High water
 - Bypass protection; malfunction, overflow
 - Product literature; owner, installation, operation, troubleshooting and repair manuals
 - Performance (effluent quality) evaluation

Performance Evaluation: Standard 350

- **Residential wastewater treatment systems; tested with actual wastewater**
 - BOD₅: 100 mg/L - 300 mg/L
 - TSS: 100 mg/L - 350 mg/L



Performance Evaluation: Standard 350

- **Graywater treatment systems; tested with synthetic challenge water:**
 - 52% Laundry; liquid detergent and softener, dirt.
 - 46% Bathing; shampoo, conditioner, deodorant, toothpaste, soap, cleaner.
 - 2% as secondary treated residential wastewater; source of total coliforms and E. coli

Graywater Influent Test Water: Standard 350

Parameter	Required range
TSS	80-160 mg/L
CBOD ₅	130-180 mg/L
Temperature	25-35 C
pH	6.5-8.0
Turbidity	50-100 NTU
Total phosphorous	1.0-3.0 mg/L
Total nitrogen	3.0-5.0 mg/L
Total coliforms	10 ³ -10 ⁴ CFU/100mL
E. coli	10 ² -10 ³ CFU/100mL

Product Test Conditions: Standard 350

- **Installed per manufacturer's instructions.**
- **No restriction for seasons.**
- **Operated in accordance with manufacturer's instruction.**
- **Minimum six month evaluation.**
- **No service or maintenance during entire test.**
- **All test data reported.**
- **No allowance for discard of any data, except if test facility fails to provide an acceptable test.**

Graywater Dosing Schedule: Standard 350

System design	Design loading					Stress tests				
	First 16 weeks	First 20 weeks	Last 4 weeks	Last 3.5 weeks	Last 2.5 weeks	Wash-day surge	Power/equipment failure	Vacation	Water Efficiency	Cleaning solution
R–Bathing only	x			x			x	x	x	
R–Laundry only	x				x	x	x	x	x	
R–Combined	x				x	x	x	x	x	
C–Bathing only		x	x				x	x		
C–Laundry only		x	x				x	x		
C–Combined		x	x				x	x		x

Parameter	Sample type	Sample location	
		Raw influent	Treated effluent
BOD ₅	24 h composite	X	
CBOD ₅	24 h composite		X
Total suspended solids	24 h composite	X	X
pH	Grab	X	X
Temperature (°C)	Grab	X	
E. coli	Grab	X	X
Turbidity	24 h composite	X	X
TKN	24 h composite	X	
NO ₂ /NO ₃	24 h composite	X	
Total phosphorous	24 h composite	X	
COD	24 h composite	X	
Total coliforms	Grab	X	
TOC	24 h composite	X	
Surfactants	24 h composite	X	
Fats, oil and grease	24 h composite	X	
Iron	24 h composite	X	

Effluent Criteria: Standard 350

Parameter	Class R (single family)	Class C (multi-family and commercial)
CBOD₅	Avg. 10 mg/L; single sample max 25 mg/L	Avg. 10 mg/L; single sample max 25 mg/L
TSS	Avg. 10 mg/L; single sample max 30 mg/L	Avg. 10 mg/L; single sample max 30 mg/L
Turbidity	Avg. 5 NTU; single sample max 10 NTU	Avg. 2 NTU; single sample max 5 NTU
E. coli	Avg. 14 MPN/100 mL; single sample max 240	Avg. 2.2 MPN/100 mL; single sample max 200
pH	6.0 – 9.0	6.0 – 9.0
Chlorine	0.5 - 2.5 mg/L	0.5 - 2.5 mg/L

New Product Standards

NSF 350-1 Onsite residential and commercial graywater treatment systems for subsurface discharge

Scope: Standard 350-1

- **Residential and commercial treatment systems**
- **Source; graywater only**
 - Graywater: laundry and bathing, excluding toilet and kitchen.
- **Non-potable effluent use**
 - Outdoor; subsurface discharge.

System Sizes: Standard 350-1

- **Graywater; Up to 1500 gpd**
 - Laboratory testing with synthetic wastewater; bathing, laundry, or both
 - Exception; commercial laundry water
- **Systems exceeding 1500 gpd, and commercial laundry**
 - Field evaluation using actual building graywater.

Test Procedure: Standard 350-1

- **Identical to Standard 350**
 - Loading
 - Duration
 - Graywater characteristics
 - Sampling

Effluent Criteria: Standard 350-1

Parameter	Criteria
CBOD₅	Avg. 25 mg/L
TSS	Avg. 30 mg/L

NSF Published Test Report

A Final Report of the complete test is published with the following:

- **All data collected in accordance with the testing and evaluations specified within this Standard;**
 - Shows actual system performance
- **Copy of the current edition of the Owner's Manual; and process description and detailed dimensioned drawings of the tested system.**

A supplemental report shall be prepared for any system(s) approved under the performance classification option, including process description(s) and dimensioned drawing(s).

Approval of Alternate Sizes

- **Systems of similar design and specifications varying only in size proportionality and rated treatment capacity.**
- **Testing of one system can qualify a series of systems.**
 - Residential; (1) below 400 gpd and (2) 400 to 1500 gpd
 - Graywater; (1) below 400 gpd and (2) 400 to 1500 gpd
 - Commercial; 1500 gpd and larger
 - Wastewater characteristics
 - Loading conditions

Certification

- **Complete evaluation of treatment system(s) in accordance with the Standard.**
 - Requalification every seven years
 - Review and approval of all system modifications
- **Audit of the manufacturing facility and service providers**
 - Initial and annual
- **Enforcement action for non-compliance**
- **Complaint investigation policies**



Certified to NSF/ANSI
Standard 350



OFFICIAL LISTING

NSF International Certifies that the products appearing on this Listing conform to the requirements of
NSF/ANSI Standard 350 - Onsite Residential and Commercial Water Reuse Treatment Systems

This is the Official Listing recorded on August 15, 2011.

ABC Company
1234 Main Street
Ann Arbor, MI 48105
800-888-8888
734-888-8888

Facility: Ann Arbor, MI

Model Number	Rated Capacity Gallons/Day	Classification	Type
Model 0500	500	Class R	Residential Wastewater
Model 0750	750	Class R	Residential Wastewater
Model 1000	1000	Class R	Residential Wastewater
Model 1500	1500	Class R	Residential Wastewater

NOTE: Class C - Multi-family residential units and commercial facilities
Class R - Single family residential dwellings



NSF International

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NSF International Certifies that the products appearing on this Listing conform to the requirements of NSF/ANSI Standard 350 - Onsite Residential and Commercial Water Reuse Treatment Systems

This is the Official Listing recorded on August 15, 2011.

XYZ Company
6789 Main Street
Ann Arbor, MI 48105
800-999-9999
734-999-9999

Facility: Ann Arbor, MI

Model Number	Rated Capacity Gallons/Day	Classification	Type
Model 2500 ^[1]	2,500	Class C	Graywater
Model 5000 ^[1]	5,000	Class C	Graywater
Model 10000 ^[1]	10,000	Class C	Graywater

[1] System performance tested and evaluated at a residential apartment building.

NOTE: Class C - Multi-family residential units and commercial facilities
Class R - Single family residential dwellings

Summary

- **New NSF Standards will provide the proper testing and criteria to enable recognition and acceptance of reuse treatment technologies.**
- **Standards are one piece of a series of steps necessary to enable full use of reuse technologies, but a critical step in creating product safety and public health protection.**

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