Item 3
Submitted by staff
at 11/4/15 meeting.

RESIDENTIAL GRAYWATER USE IN MONTEREY COUNTY

Plumbing Code Chapter 16

Treated Non-potable Gray Water may be used to supply water for such uses as water closets, urinals, trap primers for floor drains and floor sinks, above and below ground irrigation and other approved uses. Purple pipe is required with text indicating that the source is gray water.

- **If gray water is used to supply a toilet, urinal, or if it is sprayed or exposed, it must be disinfected.**
- Acceptable forms of disinfection include chlorination, ultraviolet sterilization, ozone or other approved methods.
- A 100 micron filter is required.
- Water must be treated to comply with NSF 350. R-1 and R-2 must meet CCR Title 22, 60301.230.
- Complete plumbing plans are required with data satisfactory to Mo Co Environmental Health.
- There can be no unprotected connection to a potable water supply: Air gap or backflow preventer is required.

Signage must be placed in all commercial, industrial institutional, and residential common use area restrooms using gray water for toilets or urinals. "TO CONSERVE WATER, THIS BUILDING USES ON-SITE TREATED NON-POTABLE GRAY WATER TO FLUSH TOILETS AND URINALS."

Equipment rooms must post a sign that reads "CAUTION ON-SITE TREATED NON-POTABLE GRAY WATER, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM."

The Presidio is currently working on a project to use graywater for toilet flushing in a 150 room dorm building.

Item 3
Submitted by staff at 11/4/15 meeting.

Nexus eWater

News Release

FOR RELEASE ON MARCH 13 – 8:00 A.M. EST

Nexus eWater is World's First Company to Obtain NSF/ANSI Certification for Residential Grey Water Treatment

Certification to the NSF/ANSI 350 Standard Enables Drought-Resilient Homes in Water-Scarce California

Homebuilders, Water & Sewer Agencies and Homeowners Have Unprecedented New Drought-Fighting Tool: On-Site Home Water Recycling

SAN DIEGO and LANCASTER, Calif. – March 13, 2015 – Nexus eWater, maker of the world's first home water and energy recycler, today announced that it is the first company ever to receive certification to the NSF/ANSI 350 global standard for residential grey water treatment for its 'NEXtreater' home water recycler.

The certification enables California builders, water & sewer agencies and homeowners to build drought-resilient homes by safely recycling two out of every three gallons in the home for non-potable, approved uses. The 2013 California Plumbing Code allows grey water treated to the stringent NSF/ANSI 350 standard to be reused in a wide range of applications.

"Certification of our NEXtreater is an historic milestone for residential water conservation and the War on Drought; the drought-resilient home has now arrived," said Mark Petroff, CEO of Nexus eWater. "Homes in California and other water scarce states can now safely and inexpensively recycle two out of every three gallons in their home. Despite California's declared Drought Emergency, there were no certified products on the market – until today. Safe, affordable and reliable home water recycling is here at last."

Grey water is drain water from showers, laundry and hand sinks and is the largest potential source of on-site water in homes. Typically, two-thirds of indoor water is grey water.

The potential water savings associated with in-home grey water recycling are unprecedented. Because the majority of indoor water is being reused a second time, it achieves four times the water savings of more efficient water fixtures. For example, current water-efficient homes with all EPA WaterSense fixtures save 10,000 gallons a year compared to standard homes. On-site recycling of grey water saves 40,000 gallons – four times as much. Existing homes could see savings of almost 80,000 gallons

The NSF/ANSI standard was jointly developed by Federal, State and local Health authorities, advocacy groups such as the NRDC, Alliance for Water Efficiency and others, as well as plumbing code bodies and leading water treatment companies.

Water and sewer agencies and the cities they serve can benefit by stretching scarce water resources considerably further.

R. Rex Parris, Mayor of the City of Lancaster in Los Angeles County, is a visionary proponent of on-site water reuse. Parris was instrumental in establishing the first demonstration of the Nexus system in his high-desert community.

"On-site water reuse is critical to maintaining California's economy and abundant lifestyle amid a number of increasingly challenging circumstances. The Nexus system is a stunning innovation to make this happen now," said Mayor Parris. "In the future, I believe every home will need to recycle water, which is why the City of Lancaster has established incentives for such systems to be installed in every new home."

Home water recycling can have significant potential benefits for homebuilders, too. For example, compared to building conventional water-efficient homes, homes with water recycling could use almost half as much water, while generating only one-sixth the peak sewage. This could lead to lower fees for water rights and sewer tie-in fees for builders, while significantly stretching reduced water allocations.

"As an industry leader in utilizing state-of-the-art sustainable building practices, KB Home has taken many steps to make our homes more water and energy efficient," said Dan Bridleman, Senior Vice President of Sustainability, Technology and Strategic Sourcing for KB Home (NYSE: KBH). "We are proud to have been the first US homebuilder to introduce the NEXtreater grey water recycling system at our Double ZeroHouse 2.0 in Lancaster, California, in February 2014, and we look forward to offering this technology at KB Home communities in the future."

Environmental groups also welcomed news of the NSF/ANSI 350 certification. "California needs to ensure maximum water reuse cycles, and on-site water recycling is a very smart way forward," said Dennis Murphy, Chair, US Green Building Council, California. "The technologies, the products, the global standards and certifications such as NSF/ANSI are all right here, right now. Now our regulations and codes need to catch up with our resource conservation goals."

The rigorous NSF/ANSI 350 certification process involved:

- Six months of continuous, third-party testing with regularly scheduled sampling throughout;
- No routine service or maintenance of the appliance was allowed during the test period;
- Extensive stress testing; and
- A review of compliance with design specifications and literature.

"Our Australian engineering team did what many thought impossible," said Nexus eWater's Petroff. "We built a reliable, affordable home water recycling solution that could meet the highest applicable water quality standards over a grueling six-month test – and all without maintenance. Not only did our NEXtreater pass these stringent water quality tests, we passed with flying colors. The majority of the measurements were below the threshold of detection for Suspended Solids, e.coli and CBOD. The pH was spot on, and the turbidity was in the same range as typical tap water."

Additionally, a sister product, the NEXheater, is a low-cost add-on module that recycles the heat from grey water and generates as much energy in a new home as a standard 1.5 kW solar panel, at a fraction of the cost.

"Our full solution is essentially a 'triple play' for sustainability," said Petroff. "The Nexus system dramatically reduces three core sustainability components: water, sewage and energy".

About Nexus eWater, Inc.

Nexus eWater, Inc. is a US-Australian company that has developed the world's first practical, home Water and Energy Recycler for new and existing homes. Nexus is the leader in a new water/energy sustainability market that is expected to grow to more than $15 billion annually in the US. The patented solution is:

- The world's first practical in-home water recycler; and

- The world's only energy recycling, energy storage water heater – the most energy-efficient water heater on the market.

The Nexus solution can achieve unprecedented water and energy savings in single-family homes, by:

- Reducing city water into the home by up to 40%
- Reducing sewage from the home by 70%;
- Reducing water heating energy by 75%;
- Reducing home energy use by 15-25%
- Generating total savings of up to $50-$200 per month per home for water, sewer and electric bills; and
- Also harvesting rainwater.

For more information, see: www.nexusewater.com.

About the NEXtreater:

Nexus' water treatment system, called the NEXtreater, produces clean water using an innovative three-stage hybrid process that combines floatation, filtration and disinfection in an appliance-like package. Unlike chemical or biological alternatives, the appliance is inexpensive to maintain, produces recycled water that is completely safe and does not require the homeowner to change their water usage habits. The NEXtreater features:

- Pre-filtration and solids removal;
- A novel bubbling process to concentrate and separate contaminants; and
- Polishing and disinfection to make water "near potable."

Background on NSF/ANSI 350 Certification Standard: *'Onsite Residential and Commercial Reuse Treatment Systems' establishes criteria to improve awareness and acceptance of water reuse technologies that reduce impacts on the environment, municipal water and wastewater treatment facilities, and energy costs. Certifying a water reuse system to NSF/ANSI 350 also satisfies requirements for leading green building programs. Products certified to NSF/ANSI 350 also could satisfy grey water use strategies under the National Association of Home Builders (NAHB) National Green Building Certification program as an innovative practice.*

NSF/ANSI 350 establishes materials, design and construction, and performance requirements for onsite residential and commercial water reuse treatment systems and sets water quality requirements for the reduction of chemical and microbiological contaminants for non-potable water use. Treated grey water can be used for outdoor unrestricted water use, such as lawn irrigation, and restricted indoor water use, such as toilet flushing.

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Item 3
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THE NEW NSF 350 AND 350-1

These American National Standards help in evaluating and approving water reuse treatment technologies.

BY TOM BRUURSEMA

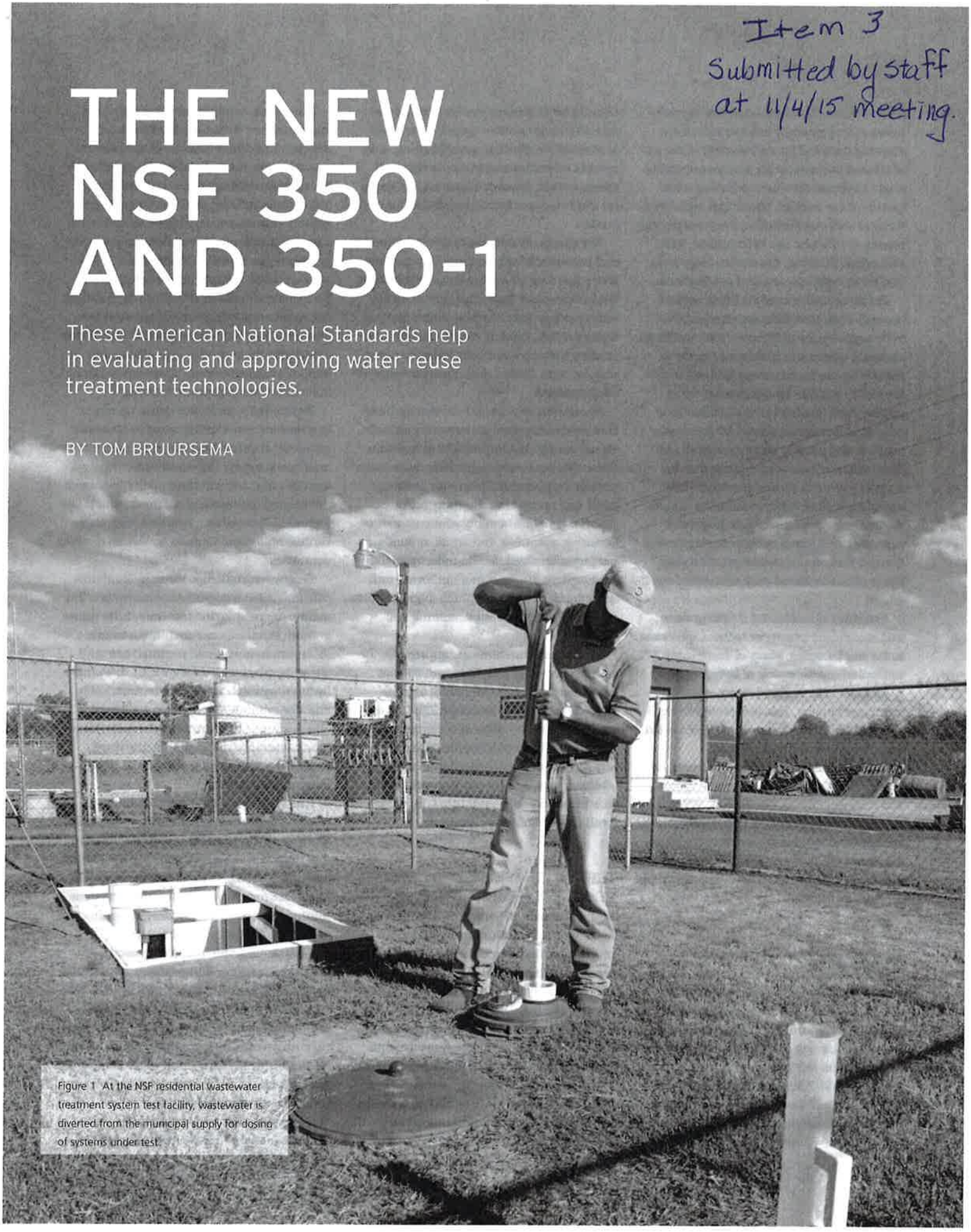


Figure 1 At the NSF residential wastewater treatment system test facility, wastewater is diverted from the municipal supply for dosing of systems under test.

Source water shortages and growing pressures on water supply infrastructure are creating the need for and interest in the use of treated wastewater for many nonpotable water applications where drinking water quality is not needed. Municipal reclaimed water is well established and represents one source of water for use in irrigation, toilet and urinal flushing, decorative fountains, and other nonpotable water applications.

The same concept now is being applied to small-scale treatment systems installed within residences and commercial buildings, enabling wastewater generated on-site to remain on-site for treatment and use within the same structure for nonpotable water applications. In addition to the benefits of a reduced burden on existing source water supplies and potable water treatment and distribution infrastructure, managing the recycling of water on-site provides other advantages. First, it allows isolation of individual source streams such as graywater, rainwater, and others to optimize treatment. Second, it allows for treatment to varying levels of quality based on the intended application.

A number of residential drinking water and wastewater treatment technologies exist in the market today. Many of these same technologies are capable of being applied to on-site residential and commercial reuse treatment systems. This is expected to facilitate and accelerate the availability of on-site reuse treatment technologies.

The acceptable quality of reuse water for on-site applications is determined by local and state regulations, not federal, which has created a range of varying criteria and product approval requirements across the country. The result has been a push for national standards of treatment quality and treatment product evaluation.

NEW AMERICAN NATIONAL STANDARDS

Following four years of consensus committee development, two new American National Standards were adopted in July for the evaluation of technologies intended to provide on-site treatment of wastewater for reuse. NSF/ANSI Standard 350: *On-site Residential and Commercial Water Reuse Treatment Systems* and NSF/ANSI Standard 350-1: *On-site Residential and Commercial Graywater Treatment Systems for Subsurface Discharge* provide detailed methods of evaluation, product specifications, and criteria related to materials, design and construction, product literature, wastewater treatment performance, and effluent quality.

The standards encompass both residential and commercial applications, divided into those that treat all the wastewater flow from the building and those that treat the graywater portion only. Further, within the graywater portion, systems can be evaluated for treating bathing water only, laundry water only, or both. Table 1 describes the scope of each standard.

Residential systems are defined as those that treat wastewater generated by an individual residence. Commercial systems are those that treat wastewater from 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.

While both standards are appropriate for nonpotable water use, Standard 350 has more restrictive effluent quality requirements than those of Standard 350-1. The result is a broader range of acceptable uses under 350. As the title implies, Standard 350-1 is for subsurface discharge only, whereas Standard 350 can be used for surface irrigation, toilet and urinal flushing, and similar nonpotable applications.

TESTING OF RESIDENTIAL WATER REUSE TREATMENT SYSTEMS

Both Standards 350 and 350-1 are based on 26 weeks of continuous testing with regularly scheduled sampling throughout, typically three days a week. The purpose of such a lengthy test with a high volume of sampling is to assess the reliability of the product over time, expanding a likely time interval between scheduled service and maintenance. A further requirement of the test related to the same measure of reliability over time is the inability to provide any routine service and maintenance of the system during the test period.

The dosing requirements prescribed in the standards, including the scheduled delivery and characteristics of the influent source water, are defined by the standards for all residential applications. Standard 350 defines influent characteristics for residential wastewater, and both Standards 350 and 350-1 define influent characteristics for graywater, as shown in Tables 2 and 3. The residential wastewater characteristics are consistent with those of NSF/ANSI Standard 40: *Residential Wastewater Treatment Systems* and NSF/ANSI Standard 24: *Wastewater Treatment Systems—Nitrogen Reduction,* both of which also apply to on-site residential wastewater treatment systems.

Residential wastewater reuse treatment systems are tested using actual wastewater generally diverted from a municipal influent treatment supply. The wastewater is delivered to a test site with the capability to meet the dosing requirements of the standard (see Figure 1). Several such test sites exist in the United States and Canada, as well as in other countries.

Graywater challenge water in Standards 350 and 350-1 is a synthetic wastewater. The recipe for creating the test water is the same in both standards and includes a variety of common household personal care and cleaning products (see Figure 2). They differ by bathing water only, laundry water only, and the combined graywater challenge. The resulting concentrations for individual parameters also differ among the three. Table 3 lists the resulting graywater challenge characteristics.

The standard specifies the loading requirements of the treatment system evaluation, both for individual daily loading and the overall 26-week test. Table 4 provides an example loading sequence of the complete 26 weeks for a graywater treatment system, noting periods of routine design loading and various additional stress events.

Each stress event includes prescribed steps to create conditions that mimic typical events in a residence that are likely to affect treatment performance. Extreme stress conditions, such as inappropriate additions of corrosive cleaning compounds, excessive hydraulic overloading, and other conditions that deviate from the manufacturer's recommended use are not evaluated.

Design loading is delivered at the manufacturer's claimed daily hydraulic capacity

TABLE 1 SCOPE OF NSF/ANSI STANDARDS 350 AND 350-1

NSF/ANSI Standard 350: On-site Residential and Commercial Water Reuse Treatment Systems	
Building Types	Residential, up to 1,500 gallons per day Commercial, more than 1,500 gallons per day and all capacities of commercial laundry water
Influent Types	Combined black and graywater Graywater Bathing water only Laundry water only
Effluent Uses	Nonpotable applications, such as surface and subsurface irrigation and toilet and urinal flushing
Ratings	Two classifications that vary slightly in effluent quality: • Class R: single-family residential • Class C: multifamily and commercial Systems are further described based on the type of influent (combined, graywater, bathing only, laundry only).
NSF/ANSI Standard 350-1: On-site Residential and Commercial Graywater Treatment Systems for Subsurface Discharge	
Building Types	Residential, up to 1,500 gallons per day Commercial, more than 1,500 gallons per day and all capacities of commercial laundry water
Influent Types	Combined black and graywater Graywater Bathing water only Laundry water only
Effluent Uses	Subsurface irrigation only
Ratings	Single effluent quality with no classifications Systems are further described based on the type of influent (graywater, bathing only, laundry only).

TABLE 2 RESIDENTIAL WASTEWATER TEST WATER CONCENTRATION (30-DAY AVERAGE)

Parameter	Required Range
Total suspended solids (TSS)	100–350 mg/L
Five-day biochemical oxygen demand (BOD_5)	100–300 mg/L

TABLE 3 GRAYWATER TEST WATER CONCENTRATION (COMBINED LAUNDRY AND BATHING WATER, 30-DAY AVERAGE)

Parameter	Required Range
Total suspended solids (TSS)	80–160 mg/L
Five-day biochemical oxygen demand (BOD_5)	130–180 mg/L
Temperature	25–35°C
pH	6.5–8
Turbidity	50–100 NTU
Total phosphorous - P	1–3 mg/L
Total Kjeldahl nitrogen – N	3–5 mg/L
Chemical oxygen demand	250–400 mg/L
Total organic carbon	50–100 mg/L
Total coliforms	10^3–10^4 cfu/100 mL
E. coli	10^2–10^3 cfu/100 mL

TABLE 5 DAILY LOADING OF WASTEWATER TO THE TREATMENT SYSTEM DURING THE PERFORMANCE EVALUATION

Time Frame	% Rated Daily Hydraulic Capacity
6:00 a.m. to 9:00 a.m.	Approximately 40
11:00 a.m. to 2:00 p.m.	Approximately 35
5:00 p.m. to 8:00 p.m.	Approximately 25

TABLE 4 SEQUENCE OF LOADING OF THE GRAYWATER TREATMENT SYSTEMS DURING THE FULL PERFORMANCE EVALUATION

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
Bathing only	×			×			×	×	×
Laundry only	×				×	×	×	×	×
Combined	×				×	×	×	×	×
Commercial		×	×				×	×	

of the system, in accordance with the daily loading schedule described in Table 5. The times are intended to mimic typical loading periods within a residence.

TESTING OF COMMERCIAL WATER REUSE TREATMENT SYSTEMS

For commercial systems, evaluations are performed under field conditions at an actual installation. The wastewater generated at the site is evaluated, and the resulting characteristics define the influent concentration. The dosing is not controlled, but likewise measured and reported. Sampling of the influent source water and treated effluent is performed consistent with that for the testing of residential treatment systems.

Figure 2 At the NSF residential water treatment system test facility, synthetic water challenges are produced for dosing of systems under test.

EFFLUENT QUALITY REQUIREMENTS

The effluent criteria are applied consistently to all treatment systems regardless of their size, application, and influent challenge water. Table 6 describes the effluent requirements of Standard 350, which has two separate criteria: one for the overall test average and another for individual samples established as a single maximum that no individual sample can exceed. Class R is applicable for single-family residential dwellings. Class C is applicable for multifamily residential units and commercial facilities.

Table 7 describes the effluent requirements of Standard 350-1, suitable for subsurface discharge only. The values are based on an overall test average of all samples.

AVAILABLE TREATMENT TECHNOLOGIES

Most existing drinking water and wastewater treatment equipment can be utilized to meet the need for graywater treatment. Systems are already being introduced to the North American market and have been available in foreign markets for some time. As in any market, the key is demand for the technology at an affordable cost. As the market develops, having product standards that enable acceptance and approval will be critical. The NSF standards will help address that need.

Some jurisdictions may elect to require the evaluation of water reuse treatment systems in accordance with Standard 350 or 350-1 as a condition of product approval or permitting. This is a common practice today for many residential drinking water and wastewater treatment systems. Others may use the standards as a basis for validating the performance of systems already design approved and installed, such as with commercial applications. Requirements for compliance may fall within the sewage treatment regulations or plumbing codes or both. Many agencies as well as the national plumbing code bodies already are considering adopting the standards. These are critical to facilitating the future use of reuse treatment systems rather than the barrier they may represent today.

Third-party testing and certifying agencies such as NSF will likely publish directories of treatment systems meeting the requirements of the new standards. These will often appear as a series of approved models differing in their gallons-per-day (gpd) rated treatment capacity. Both Standards 350 and

350-1 allow for the testing of one system that then can form the basis for approval of other models without any further testing. The additional models must be of similar design and specifications, varying only in size proportionality and rated treatment capacity.

Size ranges for residential reuse and graywater reuse systems where a single tested device can lead to approval of others are of two ranges: those up to 400 gpd and those from 400 to 1,500 gpd (see Figure 3). A 100-gpd tested system could qualify additional, proportionally larger systems up to 400 gpd without further testing. A separate test is required for bridging proportionally sized systems from 400 to 1,500 gpd.

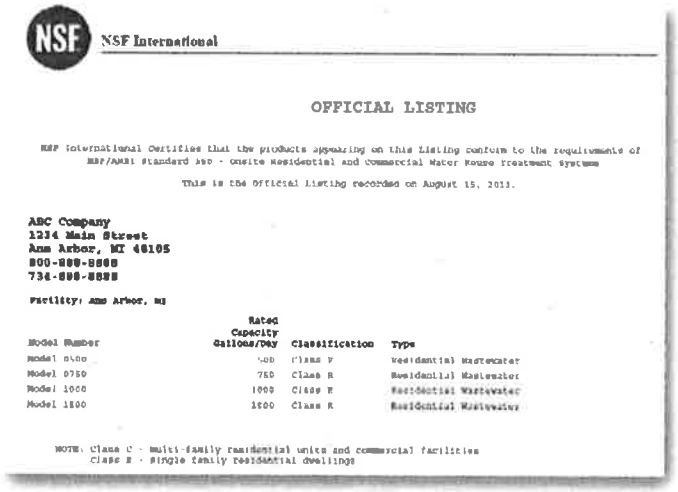
Commercial reuse systems can be proportionally sized in a similar way for flows above 1,500 gpd. However, in the case of commercial reuse systems it is important to note that testing is done at an existing installation.

TABLE 6 SUMMARY OF DRAFT NSF STANDARD 350 EFFLUENT CRITERIA FOR INDIVIDUAL CLASSIFICATIONS

Parameter	Class R		Class C	
	Overall test average	Single sample maximum	Overall test average	Single sample maximum
$CBOD_5$ (mg/L)	10	25	10	25
TSS (mg/L)	10	30	10	30
Turbidity (NTU)	5	10	2	5
E. coli[2] (MPN/100 mL)	14	240	2.2	200
pH (SU)	6–9	NA[1]	6–9	NA
Storage vessel disinfection (mg/L)[3]	≥0.5–≤2.5	NA	≥0.5–≤2.5	NA
Color	MR[4]	NA	MR	NA
Odor	Non-offensive	NA	Non-offensive	NA
Oily film and foam	Non-detectable	Non-detectable	Non-detectable	Non-detectable
Energy consumption	MR	NA	MR	NA

[1] NA = Not applicable
[2] Calculated as geometric mean
[3] As chlorine. Other disinfectants can be used.
[4] MR = Measured and reported only

Figure 3 Example certification listing of residential water reuse treatment systems meeting the requirements of NSF/ANSI 350 for residential wastewater
Figure 4 Example certification listing of commercial water reuse treatment systems meeting the requirements of NSF/ANSI 350 for graywater treatment



NSF International

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

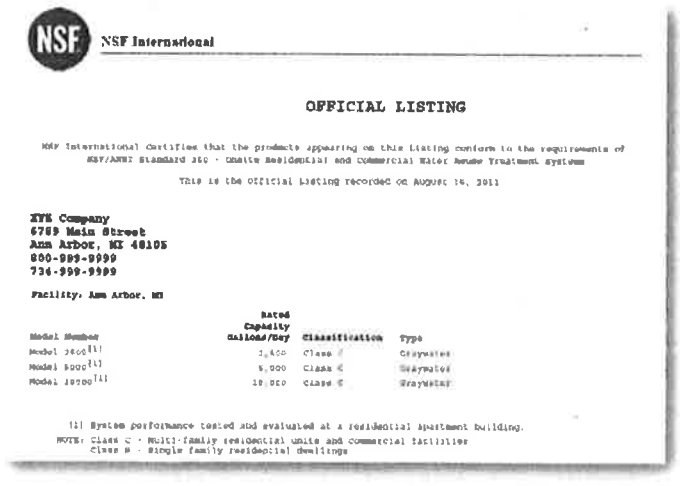
This is the Official Listing recorded on August 15, 2011.

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 0400	400	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

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

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 3600[1]	3,600	Class C	Graywater
Model 8000[1]	8,000	Class C	Graywater
Model 18000[1]	18,000	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

TABLE 7 SUMMARY OF DRAFT NSF STANDARD 350-1 EFFLUENT CRITERIA FOR INDIVIDUAL CLASSIFICATIONS

Parameter	Test Average
$CBOD_5$ (mg/L)	25 mg/L
TSS (mg/L)	30 mg/L
pH (SU)	6–9
Color	MR[1]
Odor	Non-offensive
Oily film and foam	Non-detectable
Energy consumption	MR

[1]MR = Measured and reported only

Characteristics other than product design and proportionality need to be considered, such as the wastewater characteristics and the loading conditions at the tested location. The example NSF listing for commercial systems includes the following statement "System performance tested and evaluated at a residential apartment building" (see Figure 4). The same system may not perform if applied to significantly different loading conditions or wastewater characteristics. Conversely, a larger capacity system for an apartment building that may produce twice the volume of reuse water than the tested system would be expected to perform at a similar level if the system is sized proportionally larger for the additional volume.

The new NSF Standards 350 and 350-1 fill a growing need for detailed, comprehensive test methods and criteria for reuse treatment technologies. These standards ensure that product manufacturers have a consistent basis against which their products will be evaluated and target levels of effluent quality performance to achieve recognition and acceptance of their technology in the market. Standards are one piece of a series of steps necessary to enable full use of reuse technologies, but they are a critical step in creating product safety and public health protection. **PSD**

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REFERENCES

1. NSF/ANSI Standard 40: *Residential Wastewater Treatment Systems*, NSF International, 2010.
2. NSF/ANSI Standard 245: *Wastewater Treatment Systems—Nitrogen Reduction*, NSF International, 2010.
3. NSF/ANSI Standard 350: *On-site Residential and Commercial Water Reuse Treatment Systems*, NSF International, 2011.
4. NSF/ANSI Standard 350-1: *On-site Residential and Commercial Graywater Treatment Systems for Subsurface Discharge*, NSF International, 2011.

All NSF standards are available at techstreet.com/nsfgate.html.