WaterWORKS

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NSF PUBLIC DRINKING WATER EQUIPMENT PERFORMANCE

By Bruce Bartley, Technical Manager NSF Drinking Water Treatment and Distribution Systems

AS A COMPLEMENTARY SERVICE to NSF's trusted health effects testing under NSF/ANSI Standard 60: *Drinking Water Treatment Chemicals–Health Effects,* and NSF/ANSI Standard 61: *Drinking Water System Components–Health Effects,* NSF offers performance testing and certification for drinking water treatment and other equipment for public drinking water distribution. This service gives confidence to water utilities and consulting engineers that the products they specify will perform according to manufacturer's claims.

NSF's Public Drinking Water Equipment Certification Program provides third-party testing to validate manufacturer's claims such as *Cryptosporidium* inactivation for ultraviolet (UV) systems or microbial and virus reduction for membrane filtration systems. The certification program includes validation testing to

U.S. Environmental Protection Agency's (EPA) Environmental Technology Verification (ETV) protocols, with the added benefit of recurring factory inspections by an accredited organization to ensure products meet established quality control requirements.

The program is based on the NSF Guideline for Public Drinking Water Equipment Performance (PDWEP).

NSF conducts regular factory inspections to ensure that products meet established quality control requirements.

This document establishes performance requirements in the treatment and production of drinking water and references performance requirements described in U.S. regulations such as the EPA's Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). This certification does not address the material health effects of these products because those are covered under NSF/ANSI Standard 61.

The NSF Certification PDWEP Guideline is divided into three sections and one annex:

Section 1: Certification Requirements

Section 2: Definitions

Section 3: Protocol and Procedures for Determining Performance

Annex A: Certification Policies for Public Drinking Water Equipment Performance

Certification details can be found at nsf.org/Certified/pdwe/Listings.asp.

For more information about the NSF Certification Guideline Public Drinking Water Equipment Performance, email pdwep@nsf.org or visit www.nsf.org/info/pdwep.

GETTING THE LEAD OUT: NEW AT-THE-TAP REQUIREMENTS

By Pete Greiner, Technical Manager NSF Drinking Water Treatment and Distribution Systems

TO REDUCE THE LEVEL OF LEAD at the tap, actions at the federal and state levels have toughened requirements aimed at reducing human exposure to lead.

Lead Extraction

Many states have current legislation or policies that require products to meet NSF/ANSI 61: *Drinking Water System Components–Health Effects* (NSF/ANSI 61). The standard restricts the intentional use of lead in any product to brass and bronze materials that meet the definition of "lead free" under the U.S. Safe Drinking Water Act (SDWA), and limits the amount of leachable contaminants from *all* drinking water products.

For lead, the acceptable leachable level in Annex F of NSF/ANSI 61 is due to be reduced by a factor of 3 on July 1, 2012. This date marks the end of a five-year implementation period that allowed manufacturers a reasonable time to re-engineer products to meet new requirements, have them tested, and make them available in the marketplace. Products not compliant with the new requirements will be removed from NSF Listings on July 1, 2012.

Lead Content

State and federal legislation has established a maximum weighted average lead content of 0.25 percent for pipe, pipe/plumbing fittings, and fixtures. The requirements became effective in California and Vermont on January 1, 2010. In Maryland, similar legislation is due to take effect on January 1, 2012. On January 4, 2011, President Obama signed legislation revising the definition for "lead free" in the U.S. Safe Drinking Water Act (SDWA), which extended the weighted average lead content requirement of 0.25 percent nationally. A 36-month implementation date takes effect in January 2014.

The acceptable leachable level of lead is due to be reduced by a factor of 3 on July 1, 2012.

Standards Development

NSF's Drinking Water Additives Joint Committee developed a new standard, NSF/ANSI 372: *Drinking Water System Components–Lead Content* (NSF/ANSI 372). The standard incorporates the lead content evaluation procedures in NSF/ANSI Standard 61, Annex G, except that products don't have to comply with the full requirements of NSF/ANSI 61. Standard 372 added minimum test requirements for verifying the lead content of materials.

A separate standard for lead content requirements allows its use across all product types, including some not covered by NSF/ANSI 61, such as point-of-use treatment systems and in-line coffee machines.

Annex G now references NSF/ANSI 372 and, when retired in late 2013, will continue as an NSF Certification Mark for products that meet lead extraction and lead content requirements.

Benefits of Both Requirements

Use of low-lead materials is expected to result in a reduction in levels of lead at the tap. However, compliance with the 0.25 percent weighted average lead content requirement doesn't always mean that a product meets NSF/ANSI 61 lead extraction requirements. More than 15 percent of the low-lead meters and valves containing brass materials NSF tested in 2010 failed to meet the lower lead extraction criteria due to take effect on July 1, 2012.

Maintaining both requirements assures the use of low-lead materials, which limits the potential lead release under a variety of water conditions, and product monitoring to ensure that they are not leaching lead or other contaminants in excess of drinking water standards. For more information about low-lead standards and regulations, visit www.nsf.org/info/lead.

NSF offers cost-effective, onsite verification of cement projects for drinking water applications.

CONCRETE SITE MIX EVALUATION FOR DRINKING WATER APPLICATIONS

By Theresa Bellish, Business Unit Manager, NSF Municipal Water Products Certification Program

NSF HAS CERTIFIED THE CONSTITUENTS of concrete (such as cement, admixtures, curing compounds, sand and gravel) for more than 15 years. However, at times, certified materials aren't available for use in construction projects due to a need to use locally sourced materials.

To address this issue, NSF launched its Concrete Site Mix Design Evaluation program to evaluate compliance of these concrete projects with NSF/ANSI Standard 61: *Drinking Water System Components–Health Effects.* The program addresses the evaluation of large concrete structures such as water storage tanks and pipelines.

The program can be used for mix designs using certified or non-certified materials. In the process of evaluating the concrete site mix, NSF will obtain details of the mix formulation, including the ingredients used and the formulation of any proprietary materials. The application will also provide details on the structure in which it will be used.

Testing Protocol

Testing is performed on concrete cylinders manufactured from the mix and includes analysis for the potential release of regulated metals, radionuclides, volatile organics as well as other analyses identified during the formulation review.

Upon satisfactory completion of testing, a compliance letter is issued along with the test report detailing the results of the evaluation.

Contaminant Leaching

When testing concrete cylinders, NSF often finds that contaminants directly associated with the individual components of the mix are leached into drinking water. The contaminants include regulated metals from inorganic components of the mix, organics associated with the grinding aids used during manufacture of the cement itself, or from the components of the admixtures.

Among the chemical contaminants that have caused NSF/ANSI 61 failures of cement and concrete materials over the past few years are:

- Chromium
- Strontium
- Ethanolamine
- Diethanolamine
- Diethylaminoethanol
- Dimethylpropanediol
- Quinoline
- Thiocyanate
- Toluenesulfonamide
- Methylacrylic acid.

Although many of these failures were resolved for the specific materials by overtime testing or size restrictions, they represent contaminants that may cause problems in the field when structures are built from unmonitored materials.

For more information on NSF's Concrete Site Mix Design Evaluation program, contact Theresa Bellish at 734-913-5773 or bellish@nsf.org.

HYPOCHLORITE SPECIFICATIONS FOR WATER TREATMENT CHEMICALS

By Blake Stark, Business Unit Manager, NSF Water Treatment Chemicals Certification Program

THE NSF JOINT COMMITTEE on Drinking Water Treatment Chemicals and the NSF Council of Public Health Consultants (CPHC) adopted three updates to NSF/ANSI Standard 60: *Drinking Water Treatment Chemicals–Health Effects* (NSF/ANSI 60) on the limits for trace contaminants in hypochlorite chemicals. These include a lower Single Product Allowable Concentration (SPAC) for bromate, as well as new acceptance criteria for perchlorate and chlorate as required test parameters for NSF/ANSI 60-compliant products.

New Bromate SPAC

On January 1, 2013, the bromate SPAC will be reduced from 5 ppb to 3 ppb. Hypochlorite chemicals, in addition to ozonation systems, are a known contribution source of bromate ion to drinking water. The EPA's Maximum Contaminant Level (MCL) for bromate is 10 ppb. Thus, the bromate SPAC will be reduced from 50 to 30 percent of the MCL. This reduction in the pass/fail limit for bromate gives water utilities, including those using a combination of ozone and hypochlorite chemicals, confidence that hypochlorite chemicals do not contribute to levels of bromate which approach the regulatory limit.

Until 2013, manufacturers may choose to adopt criteria for Low Bromate Hypochlorite Treatment Chemical Certification and have sodium and/or calcium hypochlorite products able to meet the 3 ppb SPAC evaluated and certified. NSF Listings in this category will appear in the NSF/ANSI 60 Listings database (www.nsf.org), under Water Treatment Chemicals, "Low Bromate Sodium Hypochlorite" or "Low Bromate Calcium Hypochlorite."

NSF/ANSI 60 has a lower Single Product Allowable Concentration for bromate and new acceptance criteria for perchlorate and chlorate.

Perchlorate as a New Test Parameter

Pass/fail criteria for perchlorate as a required test parameter for sodium hypochlorite treatment chemicals will be added to NSF/ANSI 60, effective in 2012. This follows an EPA draft health advisory of 15 ppb for perchlorate in drinking water, and state regulatory limits in California (which has an MCL of 6 ppb) and Massachusetts (which has an MCL of 2 ppb). Beginning next year, all hypochlorite chemicals will be evaluated to a general SPAC of 5 ppb (one- third of the EPA Health Risk Advisory Level).

In addition, bleach manufacturers can have their products evaluated and certified to the California SPAC of 2 ppb (one-third of the CA MCL) and/or the Massachusetts SPAC of 0.7 ppb (one-third of the MA MCL).

Chlorate as a New Test Parameter

Pass/fail criteria for chlorate as a required test parameter for sodium hypochlorite treatment chemicals is currently being considered. The proposed chlorate SPAC is 200 ppb (0.2 ppm), which is 20 percent of the existing Health Canada Guideline of 1 ppm for chlorate.

The levels of perchlorate and chlorate in fresh samples of sodium hypochlorite are very low and it is expected that few, if any, certified product samples would fail the SPAC requirements of NSF/ANSI 60. However, as the concentration of perchlorate and chlorate in sodium hypochlorite have been shown to increase over time (as bleach is stored), a corresponding update to the labeling requirements in NSF/ANSI 60 will require a born-on date (original bleach manufacture date) and any

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The new requirements will be published in NSF/ANSI Standard 60 as Section 3.9, Product Security.

New Tamper-Evident Packaging for Water Treatment Chemicals

by Blake Stark, Business Unit Manager, NSF Water Treatment Chemicals Certification Program

THE NSF JOINT COMMITTEE on Drinking Water Treatment Chemicals and the NSF Council of Public Health Consultants (CPHC) adopted new tamper-evident requirements for packaging of drinking water treatment chemicals. The new requirements will be published in NSF/ANSI Standard 60 by the end of 2011 as Section 3.9, *Product Security.* Similar requirements have already been included in American Water Works Association (AWWA) standards for water treatment chemicals.

Under the new requirements, products certified under NSF/ANSI 60 must have reasonable, effective measures to control access to products at all points of the chemical manufacturing, storage, and distribution process, as well as to provide the chemical vendor and the purchaser/user of the product with the ability to detect tampering.

Tamper-evident packaging is defined as packaging that has one or more indicators or barriers to entry which, if breached or missing, can reasonably be expected to provide visible evidence that tampering has occurred. Its application for specific products is detailed below.

Packaged Products

Properly constructed, labeled, and sealed multi-wall containers such as bags and fiber drums constitute two forms of acceptable tamper-evident packaging.

Bags and Supersacks

Packages for product shipped with visible openings must be constructed and properly sealed to make opening or substitution obvious to the purchaser. Packages must display the company's name and employ seals that are destroyed upon opening, or that make resealing unlikely (such as serialized tags), or other equivalent tamper evident measures so that once opened, the tamper-evident feature of the packaging seal cannot be restored or readily duplicated.

Drums and Small Containers

Drums and small containers must be constructed and properly sealed to make opening or substitution obvious to the purchaser. Openings in the containers must be sealed with tamper-evident seals and the packages must display the company's name. Packages must employ seals that are destroyed upon opening, or that make resealing unlikely (such as ultrasonic seals), or other equivalent tamper-evident measures so that once opened, the tamper-evident feature of the seal cannot be restored nor readily duplicated.

Bulk Shipments

Bulk shipping containers must have tamper protection at all openings that can load or unload chemicals. Vents must have tamper protection unless they are protected by construction that makes them unable to receive chemicals. Bulk quantities of product must be secured during storage and distribution by employing **one or more of the following security measures.** These requirements apply to a single load delivered to one or multiple locations.

1. Tamper-Evident Seals

Bulk shipping containers may be sealed with a uniquely numbered, non-reusable, tamper-evident seal on each opening in the shipping container. If tamper-evident seals are used, the seals must remain in place until removed at the point of delivery.

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IN-HOUSE CHLORINE RESISTANCE TESTING FOR PLASTIC PIPE

By Greta Houlahan, NSF Senior Communications Manager

AT NSF'S NEW CHLORINE resistance testing lab at its Ann Arbor, Michigan, headquarters, NSF engineers work with companies to meet their needs for chlorine resistance testing, R&D projects and pre-production testing. The lab has been automated to help plastic pipe manufacturers meet regulatory testing requirements with expedited turnaround times.

Plumbing codes and product standards require chlorine testing for piping such as PPR (Polypropylene Random Copolymer), cross-linked polyethylene (PEX) and PE-RT (polyethylene of raised temperature resistance).

The NSF laboratory evaluates all types of plastic piping and offers chlorine resistance testing against:

- **ASTM F2023:** Standard Test Method for Evaluating the Oxidative Resistance of PEX Tubing and Systems to Hot Chlorinated Water
- **ASTM F2263:** Standard Test Method for Evaluating the Oxidative Resistance of PE Pipe to Chlorinated Water

"NSF International has built the new chlorine resistance testing laboratory to expand our testing and R&D capabilities and provide faster turnaround times to support NSF Certification," said Nasrin Kashefi, General Manager, NSF International Plumbing Programs. "It is the only lab of its kind in the U.S that verifies performance claims of plastic pipes and evaluates long-term resistance to chlorinated water."

As with other NSF plastic pipe testing labs, the new lab is accredited by IAS (International Accreditation Service) to perform testing. Plumbing inspectors look for third-party certification to confirm that pipes have been tested and certified by an accredited laboratory.

"Adding this state-of-the-art laboratory significantly expands NSF's R&D services and offers companies the opportunity to work directly with NSF engineers on chlorine resistance projects," said Bob Frayer, director of NSF's Engineering Laboratory.

HYPOCHLORITE SPECIFICATIONS, continued from page 4

subsequent bleach repackaging dates to be shown. This enables operators to take steps to prevent accumulation of significant levels of chlorate and perchlorate in stocks of hypochlorite.

The Southern Nevada Water Authority completed an American Water Works Association (AWWA)/Water Research Foundation (WRF) sponsored study in 2009, *Hypochlorite–An Assessment of Factors that Influence the Formation of Perchlorate and Other Contaminants* (awwa.org/files/GovtPublicAffairs/PDF/HypochloriteAssess.pdf).

Recommendations for hypochlorites incorporated into AWWA Standard B300 include:

- Dilute hypochlorite solutions on delivery.
- Dilute a 15 percent solution by a factor of 2, which decreases perchlorate formation by a factor of 7.
- Reduce storage temperature. Each 5 degree reduction in temperature reduces the rate of decomposition by a factor of 2.
- Control pH between 11 and 13. Below pH 11, chlorate formation increases. Above pH 13, perchlorate formation increases. Onsite generators typically are between pH 9–10 and should be used within 1–2 days.
- Control the concentration of metal ions.
- Purchase filtered sodium hypochlorite solutions and use low metal ion concentration feed water for onsite generators.
- Use fresh hypochlorite solutions when possible.
- Use a low bromide salt in onsite generators to reduce the formation of bromate.

For more information, contact Blake Stark at stark@nsf.org. or 734-769-5480.

HEXAVALENT CHROMIUM UPDATE

www.nsf.org/Certified/DWTU

By Pete Greiner, Technical Manager NSF Drinking Water Treatment and Distribution Systems

ALTHOUGH THE U.S. ENVIRONMENTAL Protection Agency (EPA) has not separately regulated Hexavalent Chromium (Cr (VI)) from total Chromium, this contaminant is monitored through testing under both NSF/ANSI Standard 60 (treatment chemicals) and NSF/ANSI Standard 61 (treatment and distribution equipment and materials).

Testing is performed when either the analysis for total Chromium exceeds the acceptance criteria for Cr (VI) or when review of the product formulation or manufacturing processes indicates it might be present. The drinking water acceptance criteria under the standards consist of a "Total Allowable Concentration" (TAC) of 0.020 mg/L and a "Single Product Allowable Concentration" of 0.002 mg/L.

These values were derived from the 1998 oral RfD (Reference Dose) on the EPA IRIS (Integrated Risk Information System) database using a 20 percent relative source contribution for drinking water.

The EPA is conducting a review of the scientific basis supporting the human health hazard and dose-response assessment of Hexavalent Chromium. Once completed, the final assessment will be posted on the IRIS database. If this action results in a change to criteria used to establish the current requirements of the NSF standards, new criteria will be established to commensurate with the information released.

For consumers concerned about trace levels of Hexavalent Chromium in drinking water, NSF recommends point-of-use treatment devices that have been NSF-certified to reduce CR (VI) concentrations. Listings of products certified by NSF for specific contaminant reduction capabilities are available at: http://www.nsf.org/Certified/DWTU/.

TAMPER-EVIDENT PACKAGING, continued from page 5

Seal numbers must be recorded and disclosed on shipping documents provided to the purchaser at the time of delivery and kept available for review by the certification body.

2. Chain of Custody

A continuous chain of custody may be used to document secure distribution of product. Maintaining a continuous chain of custody requires that the product is under the control of responsible individuals, that direct access to the product is restricted to those individuals, and that the shipping container is sealed or locked at all times during shipping. If chain of custody is used, a copy of a completed, signed chain of custody form showing continuous and secure custody between the certification holder and purchaser must be provided to the purchaser at the time of delivery and kept available for review by the certification body.

3. Alternative Method May Be Used

An alternative method or methods, agreed upon by the certification holder and the purchaser, may be used for bulk shipments if the alternative method provides protection against tampering that is equivalent to this standard. If alternative methods are used, the agreement with the purchaser and description of the alternative methods must be in written form and kept available for review by the certification body.

The final section of the Product Security requirements covers Tamper-Evident Integrity. This section specifies that tamper-evident features on all final product packaging, seals, and bulk shipping containers must be designed to remain intact when handled in a reasonable manner during manufacturing, storage, shipment, and delivery to the purchaser.

For an advance copy of the new tamper-evident/product security requirements, contact Blake Stark, Business Unit Manager, Water Treatment Chemicals, at stark@nsf.org or 734-769-5480.

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Kevan P. Lawlor
President and CEO

Dave Purkiss, General Manager
NSF Drinking Water Treatment and Distribution Systems
734.827.6855

Bruce Bartley, Technical Manager
NSF Drinking Water Treatment and Distribution Systems
734.769.5148

Pete Greiner, Technical Manager
NSF Drinking Water Treatment and Distribution Systems
734.769.5517

Theresa Bellish
Business Unit Manager
NSF Municipal Water Products Certification Program
734.913.5773
standard61@nsf.org

Blake Stark, Business Unit Manager
NSF Water Treatment Chemicals Certification Program
734.769.5480
standard60@nsf.org

Jeremy Brown, Code and Regulatory Manager, NSF Regulatory Affairs

Greta Houlahan, Editor/
Senior Communications Manager

NSF International
789 N. Dixboro Road
Ann Arbor, MI 48105 USA
800. NSF.MARK
734.769.8010
Fax: 734.769.0109
www.nsf.org

Drinking Water Treatment: What Consumers Want to Know

By Cheryl Luptowski, NSF Consumer Affairs Officer

NSF'S CONSUMER AFFAIRS OFFICE receives inquiries worldwide from consumers who are concerned about public health and safety issues, including the quality of their drinking water supply.

Many consumer inquiries relate to treatment options that address specific contaminants. In 2010, the top drinking water concerns related to reducing detectable levels of lead, arsenic, cysts, hardness and fluoride. In the first quarter of 2011, lead issues still topped the list, but consumers began expressing more concern about radioactive contaminants such as Iodine 131 and Chromium 6.

One-quarter of drinking water-related calls are referrals from government agencies, including EPA's safe drinking water hotline. NSF also gets referrals from state and local utilities as well several cities in Canada. Although some public water utilities have concerns about the use of home treatment devices, more utilities are encouraging consumers planning to buy a home treatment device.to look for NSF-listed products.

NSF's Consumer Affairs Office also helps consumers become more educated about home water treatment products (www.nsf.org/consumer/drinking_water).

In addition, the office is a resource for plumbing products. Over the past year, NSF has seen an increase in inquiries from consumers concerned about lead content as well as the potential leaching of impurities from plumbing products, many of which are covered by NSF/ANSI 61.

For a fact sheet that explains the most common certification codes on plumbing products, go to nsf.org/consumer/newsroom/fact_safer_plumbingproducts.asp.

NSF International
P.O. Box 13140
Ann Arbor, MI 48113-0140 USA

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