National Institute of Standards and Technology • U.S. Department of Commerce

NIST-Gaithersburg Drinking Water

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1. PURPOSE

This suborder delineates requirements for maintenance and monitoring of the drinking water system at the NIST Gaithersburg site.[2]

2. BACKGROUND

Drinking water is supplied to the NIST Gaithersburg site by the Washington Suburban Sanitary Commission (WSSC), the agency that provides drinking water to Montgomery and Prince Georges Counties in Maryland. WSSC conducts a rigorous maintenance/monitoring program to ensure the drinking water meets the National Primary Drinking Water Regulations [40 Code of Federal Regulations (CFR) 141] promulgated by the U.S. Environmental Protection Agency (EPA). NIST maintains an on-site system of water supply piping and appurtenances. It is NIST's responsibility to ensure that the onsite water supply system conveys the drinking water safely to the employees, associates, and visitors at the NIST Gaithersburg site.

As classified by the U.S. EPA, the NIST-Gaithersburg drinking water system is considered a consecutive, non-transient, non-community system[3]. Other entities with this type of drinking water system include schools, factories, and office buildings. As a consecutive water system that meets the exemption requirements of 40 CFR 141.3, NIST Gaithersburg is exempt from the monitoring requirements included in the National Primary Drinking Water Regulations.

It is NIST policy to maintain the drinking water system at the NIST-Gaithersburg site in accordance with the International Plumbing Code, and to monitor the quality of drinking water at the Gaithersburg site annually.

[1] For revision history, see Appendix A.
[2] A separate suborder (NIST S 7301.05) addresses drinking water at the NIST Boulder site.
[3] Consecutive water systems are supplied all of their water by a public water agency, such as the WSSC. Non-transient, non-community water systems supply water to at least 25 of the same people for at least 6 months per year.

3. APPLICABILITY

This program applies to the drinking water system at the NIST Gaithersburg site.

4. REFERENCES

a. 40 CFR Part 141, National Primary Drinking Water Regulations

b. Code of Maryland (COMAR) Regulations 26.04.01, Quality of Drinking Water in Maryland

c. International Plumbing Code, International Code Council, 2015

d. Reduction of Lead in Drinking Water Act, Amendment to the Safe Drinking Water Act, 2011

e. EPA 816-R-03-002, Cross-Connection Control Manual, 2003

f. EPA 812-B-94-002, Lead in Drinking Water in Schools and Non-Residential Buildings, 1994

g. U.S. Department of Commerce Energy and Environmental Management Manual, 2012

h. NFPA 25, Inspection, Testing, and Maintenance of Water Based Fire Protection Systems

i. NFPA 291, Recommended Practice for fire Flow Testing and Marking of Hydrants

j. WSSC Plumbing and Fuel Gas Code, July1, 2015, Sections 502.3.4, 504.1, 504.2, 504.3, 504.5, 504.6, 504.7, 507.1, 507.2, 507.3, 508.1, 508.2, 508.4

5. APPLICABLE NIST DIRECTIVES

a. NIST S 7301.01: *Environmental Management System*

6. REQUIREMENTS

a. Maintenance of the NIST Gaithersburg Drinking Water System

(1) Maintenance of the drinking water system at NIST Gaithersburg shall be performed by the NIST Office of Facilities and Property Management (OFPM) in accordance with the International Plumbing Code.

(2) Maintenance of the drinking water system shall include the following:

(a) Development and implementation of written drinking water system maintenance procedures for the following:

i. Flushing (e.g., unidirectional, conventional) of the NIST system;

ii. Valve and hydrant exercise and maintenance in accordance with NFPA 25 and 291 and NIST Gaithersburg site requirements;

iii. Maintenance of a current water distribution map;

iv. Appropriate disinfection of pipelines after maintenance work is performed; and

v. Back flushing and maintenance of water filters installed by OFPM (e.g., whole building filters, drinking fountain filters) in accordance with manufacturers' requirements.

(b) Cross-Connection Surveys and Back Flow Prevention – Qualifications

i. All cross-connection surveys and back flow preventer testing, repair, and replacement shall be conducted by individuals meeting the following:

(i) Successful completion of a Maryland Certified Backflow/Cross Connection Training course of at least 32 hours, along with an 8-hour refresher course every three years after the initial training; or

(ii) Equivalent training certified by another state.

(c) Cross Connection Survey

i. A cross-connection survey of the NIST Gaithersburg Drinking Water System shall be conducted and updated as changes are made to the system. The following shall be included in the survey:

(i) All end uses of the system shall be surveyed.

(ii) All cross-connections shall be documented and evaluated for elimination.

(iii) If a cross-connection is required, an approved backflow preventer must be installed, inventoried, and maintained.

(d) Backflow Prevention

i. Non-potable water systems shall be isolated from the main potable water distribution system at the Gaithersburg site by either eliminating a cross-connection or installing a backflow preventer.

ii. The selection of backflow preventers shall be based on the hazard levels described in Table 1 below.

iii. Any cross connection between the chilled water system and the potable water system at the NIST-Gaithersburg site shall be considered "High Hazard" as described in Table 1 below.

Table 1. Backflow Preventer Requirements

Cross-Connection Hazard Level	Description	Types of Backflow Preventer Allowed
Low Hazard (Non-Health Hazard)	A cross-connection or potential cross-connection involving any substance that generally would not be a health hazard but would constitute a nuisance or be aesthetically objectionable if introduced into the potable water supply. The substance must be non-toxic and non-bacterial in nature with no significant health effect.	Testable backflow preventers rated for low-hazard applications, such as double-check backflow assemblies, should be considered whenever possible. Non-testable backflow preventers are allowed but must be replaced or rebuilt every 5 years. Backflow preventers suitable for high-hazard applications may also be used.
High Hazard (Health Hazard)	A cross-connection or potential cross-connection involving any substance that could, if introduced into the potable water supply, cause death or illness, spread disease, or have a high probability of causing such effects. The substance may be toxic to humans either from a chemical, bacteriological, or radiological standpoint.	Air-gap-separation or testable reduced-pressure-principle backflow preventers should be considered whenever possible. Air gaps must be at least the width of the supply pipe above the flood level of the receiving container or a minimum of one (1) inch, whichever is greater. Testable backflow preventers specified in the 2015 International Plumbing Code rated for high-hazard applications are also acceptable.

(e) Backflow Preventer Testing and Maintenance

i. All required backflow preventers shall be certified as operational by an individual meeting the qualifications in Section 6a(2)(b) in accordance with the following schedule:

(i) High-Hazard Applications – Testable Backflow Preventers:

[i] At least annually;

[ii] At installation;

[iii] After repair, relocation, or replacement;

[iv] Following any backflow incident;

[v] Prior to any reactivation of a water system from intermittent use; and

[vi] Repaired or replaced as needed.

(ii) Low-Hazard Applications – Testable Backflow Preventers: Follow same schedule as High-Hazard Applications.

(iii) Low-Hazard Applications – Non-Testable Backflow Preventers: Replace or rebuild every 5 years.

ii. All backflow preventers shall be tagged with testing, maintenance, and installation information.

iii. As a recommended practice, personnel who test backflow preventers should be separate from the personnel responsible for installing and maintaining the same devices.

iv. A current inventory shall be maintained of all backflow preventers at the NIST Gaithersburg site. The inventory shall include:

(i) The manufacturer recommended procedures for maintenance and repair; and

(ii) A schedule for routine inspections, testing, and maintenance in the first bullet in Section 6a(e) above.

v. High-hazard back flow preventers shall be maintained on the water mains servicing the NIST-Gaithersburg site. Annual test reports for these back-flow preventers shall be submitted to the WSSC. Any failure of these back-flow preventers shall be reported to the Environmental Management Group (EMG) in the NIST Office of Safety Health and Environment (OSHE) and to the WSSC.

b. Monitoring of the NIST Gaithersburg Drinking Water

(1) Routine monitoring of the drinking water at the NIST-Gaithersburg Site shall be performed by Maryland-certified drinking water samplers and a Maryland-certified drinking water testing laboratory. OFPM shall contract the drinking water sampling and laboratory analysis.

(a) Monitoring Locations
Drinking water samples shall be collected and analyzed from the following locations on the NIST-Gaithersburg Site:

i. Every drinking water fountain;

ii. Every kitchen sink; and

iii. Every water line connected to a refrigerator.

(b) Monitoring Frequency
The frequency of drinking water monitoring shall meet the following:

i. Each monitoring location, as described above, on the NIST-Gaithersburg Site shall be analyzed once every three years; and

ii. Annually, drinking water samples shall be collected and analyzed at one third of the monitoring locations on the NIST-Gaithersburg Site[4].

(c) Monitoring Parameters
Each drinking water sample shall be analyzed for the parameters listed in Table 2 below.

(d) Sampling Protocol Requirements

i. Drinking water samples shall be collected by Maryland-certified drinking water samplers.

[4] Assuming the NIST Gaithersburg Site has 264 sampling locations, each year 88 samples shall be collected and analyzed.

ii. All drinking water sampling shall follow applicable Maryland or EPA protocols and methodologies.

iii. Proper sampling location preparation and sample collection shall be followed.

iv. Sample storage (holding times) shall follow the current EPA testing methods specifications.

v. Chains of custody shall be completed for all samples analyzed.

Table 2. Annual Drinking Water Analyses

Parameter	EPA Method[5]
Total Coliform Bacteria (if Total Coliform is positive, E. Coli will be tested for)	SM 9223B
Aluminum	EPA 200.8
Copper	EPA 200.8
Lead	EPA 200.8
Cadmium	EPA 200.8
Zinc	EPA 200.8

(2) Management of Drinking Water Analysis Results

(a) Analytical results from the contracted laboratory shall be provided by OFPM to EMG upon receipt.

(b) The analytical results shall be reviewed by EMG.

c. Corrective Actions

(1) If it is determined by EMG that drinking water analysis results do not meet National Primary Drinking Water Standards, OFPM and EMG shall take the following actions:

[5] Analysis shall be conducted by a Maryland State Certified (code of Maryland Regulations 26.08.05) Drinking Water Laboratory that is specifically certified for the methods listed in Table 2. EPA-approved analytical methods other than those noted may be acceptable if approved by EMG.

(a) Ensure that signs are posted immediately at the designated fountains and sinks to indicate that they are "out of service". (OFPM)

(b) Communicate the findings to NIST management, the Public Affairs Office, and potentially affected NIST employees, associates, and visitors. (EMG in consultation with OFPM)

(c) Resample the affected drinking water source(s) and analyze for the contaminant(s) of concern. (EMG)

(d) Seek to provide bottled water to affected NIST employees, associates, and visitors if necessary (see Section (5) below). (OFPM)

(e) Investigate the drinking water non-compliance immediately to identify the root cause and necessary corrective actions, e.g., equipment repairs; cleaning/disinfection of affected pipes, valves, and other appurtenances; flushing the affected systems. (OFPM in consultation with EMG)

(f) After corrective actions have been implemented, re-sample the drinking water and analyze for the contaminants of concern. (EMG)

(g) If the sampling results do not confirm the success of the corrective actions in addressing the drinking water non-compliance, start the above actions again.

(h) If the sampling results do confirm the success of the corrective actions, place the drinking water system back in service. (OFPM)

(i) If the sampling results confirm the success of the corrective actions, issue follow-up communications to NIST management, the Public Affairs Office, and potentially affected NIST employees, associates, and visitors. (EMG in consultation with OFPM and NIST management)

(2) For any analytical results indicating contaminant concentrations greater than one half of the Primary Drinking Water Standard or suspected to originate from NIST Gaithersburg activities, the Chief Facilities Management Officer and the Chief Safety Officer shall be consulted and potential corrective actions shall be considered.

d. Purchase of Bottled Drinking Water Using Appropriated Funds

In accordance with U.S. Comptroller General Decision B-247871 on the Purchase of Bottled Drinking Water (1992), appropriated funds may be used to purchase bottled drinking water only upon a showing of necessity. Necessity shall be established prior to any purchase of bottled water

using appropriated funds, in consultation with EMG. All purchases of bottled water shall be approved by the NIST Office Acquisitions and Agreements Management. Necessity is established, for example, where the available drinking water has been analyzed by appropriate authorities and found to pose a health risk. Practically this translates to any exceedance of a Primary Drinking Water Standard.

e. Safe Drinking Water Considerations in Design and Construction

(1) Design and construction projects involving potable and non-potable water systems shall be carried out in accordance with the International Plumbing Code and other applicable requirements or regulations.

(2) Drinking water treatment/filtration systems shall not be installed OFPM unless they will be maintained by OFPM. Improperly maintained treatment/filtration systems can become a source of drinking water contamination.

f. Communications

(1) All drinking water monitoring results and corrective actions shall be made readily available to NIST management and staff by EMG.

(2) The following actions shall be performed annually by EMG:

(a) Obtain WSSC's annual consumer confidence and tap water analysis reports;

(b) Review the reports to determine if any water quality deterioration is occurring;

(c) Amend the reports with information on testing conducted at NIST Gaithersburg; and

(d) Post the reports on the Drinking Water Program web page.

(3) Communications of monitoring results and amended WSSC annual reports shall encourage the NIST staff to report drinking water concerns to OFPM.

g. Internal Compliance Assessments

(1) Internal compliance assessments shall be conducted by EMG at least once per calendar year to verify ongoing compliance with the requirements of this suborder.

(2) Internal compliance assessments shall include:

(a) A review of the drinking water system maintenance procedures and records for cross-connection control, backflow prevention, valve exercise, hydrant flushing, and disinfection practices during all water main repairs; and

(b) A review of water quality monitoring results, including any non-compliances and corrective actions.

h. Records

(1) The following records shall be maintained by OFPM for the periods of time indicated and shall be made available upon request:

(a) Cross-connection inspection records – 5 years

(b) Backflow preventer testing and maintenance records – 10 years

(2) The following records shall be maintained by EMG for the periods of time indicated:

(a) Bacteriological monitoring results – 5 years

(b) Aluminum, lead, copper, cadmium, and zinc testing results – 12 years

(c) All other chemical monitoring results – 10 years

(d) Actions taken to correct non-compliances – 3 years after the actions have been completed

(e) Consumer confidence reports – 5 years

(f) Internal compliance assessments – 5 years

7. DEFINITIONS

a. Air Gap – The unobstructed vertical distance through free atmosphere between the lowest effective opening from any pipe or faucet conveying water or waste to a tank, plumbing fixture, receptor, or other assembly and the flood level rim of the receptacle. These vertical, physical separations must be at least twice the effective opening of the water supply outlet, never less than 1 inch above the receiving vessel flood rim.

b. Backflow – An unwanted flow of potable water in the reverse direction, often caused by siphonage or backpressure of water due to a water main break or loss of pressure.

c. Backflow Preventer – A device used to protect potable water distribution lines from contamination due to backflow.

d. Backpressure – A pressure, higher than the supply pressure, caused by a pump, elevated tank, boiler, air/steam pressure, or any other means, which may cause backflow.

e. Community Water System – A community water system is a public water system that serves at least 15 service connections used by year-round residents, or regularly serves at least 25 year-round residents.

f. Consecutive Public Water System – A water system that has no water production or source facility of its own, obtains all of its water from another water system, and meets the definition of a public water system.

g. Consecutive Water System – A water system that obtains some or all of its water from another water system. Often a consecutive water system has no water production or source facility of its own. NIST Gaithersburg is classified as a consecutive water system.

h. Consumer Confidence Report – A consumer confidence report is an annual report that provides water quality information. The report must contain certain mandatory information and be delivered to customers annually by July 1. This deadline applies to the WSSC, as the public water utility.

i. Cross-Connection – A connection or potential connection between any part of a potable water system and any other environment containing other substances in a manner that, under any circumstances, would allow such substances to enter the potable water system. Other substances may be gases, liquids, or solids, such as chemicals, water products, steam, water from other sources (potable or non-potable), or any matter that may change the color of or add odor to the water. Bypass arrangements, jumper connections, removable sections, swivel or changeover assemblies, or any other temporary or permanent connecting arrangement through which backflow may occur are considered to be cross-connections.

j. NIST Gaithersburg Drinking Water Program Manager – An OSHE staff member appointed by the Chief Safety Officer who carries out OSHE's assigned roles and responsibilities for the Drinking Water Program at NIST Gaithersburg.

k. Non-Transient, Non-Community Water System – A public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year. Examples of entities having such systems include schools, factories, office buildings, and hospitals.

l. Public Water System – A system for the provision of water for human consumption through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals at least 60 days out of the year.

m. Service Connection – A service connection is the opening, including all fittings and appurtenances, at the water main through which water is supplied to the user.

n. Washington Suburban Sanitary Commission (WSSC) – The local water utility that supplies all of NIST Gaithersburg's potable water.

8. ACRONYMS

a. CFR – Code of Federal Regulations

b. COMAR – Code of Maryland Regulations

c. EMG – Environmental Management Group, OSHE

d. EPA – U.S. Environmental Protection Agency

e. OSHE – Office of Safety, Health, and Environment

f. OU – Operational Unit

g. WSSC – Washington Suburban Sanitary Commission

9. RESPONSIBILITIES

The roles and responsibilities specific to this suborder are as follows:

a. Chief Facilities Management Officer:

(1) Ensuring that the requirements applicable to OFPM in Section 6 of this suborder are met.

b. EMG Leader:

(1) Ensuring that the requirements applicable to EMG in Section 6 of this suborder are met; and

(2) Serving as NIST's principal point of contact with WSSC, Maryland Department of the Environment, and EPA regarding drinking water issues, or designating another member of EMG to do so.

10. AUTHORITIES

None

11. DIRECTIVE OWNER

Chief Safety Officer

12. APPENDICES

A. Revision History

Appendix A. Revision History

Revision No.	Approval Date	Responsible Person	Brief Description of Change; Rationale
0			None – Initial Document
1	1/12/2021	April Camenisch	Updated NIST suborder links.