Table 8.1
Examples of mechanical devices

<table>
<tr><td>chemical feeders
— dry feeders (e.g., pellet droppers)</td><td rowspan="2">switches and sensors
(e.g., water level, pressure, temperature, pH)</td></tr>
<tr><td>pressure gas injection systems pumps</td></tr>
<tr><td>vacuum injection systems</td><td>valves and related fittings
fire hydrants
(transmission / distribution system)</td></tr>
<tr><td>disinfection / generators
— chlorine dioxide
— hypochlorite
— ozone
— ultraviolet</td><td rowspan="3">treatment devices used in water treatment facilities (excludes point-of-use (POU) devices)
— aeration technologies
— clarifiers
— electrodialysis technologies
— microfiltration technologies
— mixers
— point-of-entry (POE) drinking water treatment unit systems
— reverse osmosis technologies
— screens
— strainers
— ultrafiltration technologies</td></tr>
<tr><td>electrical wire
(e.g., submersible well pump wire)</td></tr>
<tr><td>pumps</td></tr>
<tr><td colspan="2">in-line devices – building distribution system
— backflow preventers
— building valves
— check valves
— compression fittings
— corporation stops
— curb stops
— expansion tanks
— meter couplings
— meter stops
— pressure regulators
— pressure tanks
— service saddles
— strainers
— valves and fittings
— manifolds
— water meters
in-line devices specifically excluded
— boiler feed valves
— drilling and tapping machines
— temperature and pressure relief valves
— valves with hose thread outlets
— water meter test benches</td></tr>
<tr><td colspan="2">example POE drinking water treatment systems for evaluation under this Standard
— water softeners
— iron filters
— whole house/building mechanical sediment filters
— whole house/building GAC chlorine reduction filters
— whole house UV systems</td></tr>
<tr><td colspan="2">example drinking water treatment units that shall not be evaluated as POE under this Standard
— faucet mount filters
— plumbed-in to separate tap
— pour-through pitchers
— refrigerator filters</td></tr>
</table>

9 Mechanical plumbing devices

9.1 Coverage

This Section covers mechanical plumbing devices, components, and materials that are typically installed within the last liter of the distribution system (endpoint devices) and are intended to dispense water for human ingestion. In-line devices are excluded from this Section. POU and POE water treatment devices are excluded.

9.1.1 Endpoint devices specifically included in the coverage of this Section are:

— remote chillers;

— lavatory faucets (e.g., centersets, widespread, mini-spread, and basin cocks), except as exempted in Section 9.1.2;

— bar faucets;

— kitchen faucets (e.g., top mounts and wall mounts);

— hot and cold water dispensers;

— drinking fountains, drinking fountain bubblers, and water coolers;

— glass fillers;

— residential refrigerator ice makers;

— flexible plumbing connectors and flexible risers intended for potable water applications;

— supply stops and endpoint control valves; and

— commercial kitchen devices (see Section 9.2.3), limited to the following:

  — pot and kettle fillers (see Section 9.2.7);
  — devices with extended standpipes or risers (see Section 9.2.5); and
  — prerinse assemblies that include an auxiliary spout or other outlet.

NOTE 1 — Only the commercial kitchen devices listed above shall be evaluated using the 18.9 L (5 gal) normalization.

NOTE 2 — The base device to which the prerinse component is added shall be considered a commercial kitchen device only if it meets the definition of either a pot and kettle filler (see Section 9.2.7) or a device with extended standpipes or risers (see Section 9.2.5).

9.1.2 Endpoint devices specifically exempted from the coverage of this Section are:

— bath and shower valves, shower heads of all types, and Roman tub valves;

— all drains;

— backflow prevention devices;

— flexible plumbing connectors and flexible risers not intended for potable water applications (e.g., washing machines, dishwashers, etc.);

— prerinse assemblies that do not include an auxiliary spout or other outlet; and

— all endpoint devices that are not specifically intended to dispense water for human consumption, for example:

  — utility, laundry, laboratory, bidet, and shampoo faucets;
  — faucets with a hose thread spout end or with a quick disconnect end;
  — faucets that are self-closing or metering;
  — electronically activated nonkitchen faucets; or
  — hand wash stations.

9.1.3 Endpoint devices that are exempted from the scope of this Section shall be permitted to be evaluated at the option of the manufacturer. With the exception of exempted prerinse assemblies, all exempted devices shall be evaluated using the 1 L (0.26 gal) draw. Exempted prerinse assemblies shall be evaluated using the 18.9 L (5 gal) draw.

9.2 Definitions

9.2.1 cold mix volume adjustment factor (CMV): The cold water volume of a device divided by the total water volume of the device.

9.2.2 cold water volume: The volume of water contained within the portion of a device that is normally contacted by cold water (from inlet to outlet) when the device is connected to hot and cold water supplies under normal operating conditions. The volume excludes the volume of water contained within the portion of the device that is normally contacted only by hot water.

9.2.3 commercial kitchen device: An endpoint device whose sole application is the delivery of water for food preparation in commercial kitchens.

9.2.4 consumer-facing: The manner in which a product label feature is experienced, directed, or seen by a customer.

9.2.5 endpoint device: A single device typically installed within the last 1 L (0.26 gal) of the water distribution system of a building.

9.2.6 extended standpipe or riser device: An endpoint device that includes a vertical component having a minimum height of 41 cm (16 in) measured from the deck to the outlet of the endpoint device, and whose sole application is the delivery of water for food preparation in commercial kitchens.

9.2.7 in-line device: A device (used to measure or control the flow of water) installed on a service line or building distribution system downstream of the water main and upstream from endpoint devices.

9.2.8 pot and kettle filler: An endpoint device whose sole application is the delivery of water to fill pots and kettles in commercial kitchens.

9.2.9 prerinse assembly: An endpoint device with a hose and spray whose application is water delivery for the rinsing of tableware in commercial kitchens.

9.2.10 remote chiller: A device designed to deliver chilled water, typically installed in a remote location to enhance aesthetics, that is connected to the spigot(s) / spout(s) by pipe / tubing and is generally installed within the last 1 L (0.26 gal) of the water distribution system of a building.

9.2.11 water distribution system (building): A continuous system of piping, devices, and related fittings, beginning after the water meter and water meter setting equipment, that is intended to convey potable water in a building to points of usage.

9.3 Device, component, or material requirements

9.3.1 General

Devices, components, or materials shall be considered to have met the requirements of this Section if at least one of the following conditions is met:

— the devices, components, or materials covered under this Section are tested and evaluated according to procedures specified in Sections N-1.5 and N-1.8; or

— the devices, components, or materials meet the requirements of Section 9.3.2.

When all components or materials, or both, of a device meet the requirements of this Section, the device shall also meet the requirements of this Section. When all materials of a component meet the requirements of this Section, the component shall also meet the requirements of this Section.

9.3.2 Evaluation of devices, components, or materials tested to other sections of this Standard

Devices, components, or materials that have been tested to other sections of this Standard shall:

— be made of the same alloy(s), composition(s), or formula(s);

— have undergone analogous manufacturing processes;

— have been tested at a temperature that meets or exceeds the required exposure temperature in Section N-1.5;

— have been conditioned for a period of time not more than 19 d and exposed for a period of time not less than 16 h; and

— have the concentration(s) of the extracted contaminant(s) normalized to the requirements of Section N-1.8.

9.3.3 Metallic contaminants

When a device or component is qualified through the separate testing of two or more components, the normalized concentrations for each specific metallic contaminant from individual components shall be summed. The total of the normalized metallic contaminant concentrations shall meet the requirements of Section 9.5.

9.4 Exposure and normalization

Samples for testing shall be prepared and exposed, and the extractant water analyzed as required in Section N-1.5. The number of samples tested shall be determined as outlined in Section N-1.5.

Exposure of endpoint samples, except for hot water dispenser samples, shall be performed at 23 ± 2 °C (73 ± 4 °F).

For kitchen faucets with side spray components, the side spray component shall be prepared and exposed simultaneously with the remainder of the device. At the option of the manufacturer, a separate exposure may be performed for the side spray component.

The concentration of extracted contaminants shall be normalized to end use conditions according to the normalization procedure outlined in Section N-1.8 for endpoint devices, components, and materials. All endpoint devices, components, and materials other than commercial kitchen devices shall be evaluated using the highest surface area-to-volume product as the test sample, and shall be normalized using the

1 L (0.26 gal) first draw. Commercial kitchen devices shall be evaluated using the highest surface area-to-volume product as the test sample, and shall be normalized using the 18.9 L (5 gal) first draw.

9.5 Evaluation of normalized contaminant concentrations

9.5.1 Evaluation of lead

For endpoint devices other than commercial kitchen devices, supply stops, flexible plumbing connectors, and miscellaneous components, the lead test statistic *Q* shall not exceed 5 µg when normalized for the 1 L (0.26 gal) first draw sample. For commercial kitchen devices, the lead test statistic *Q* shall not exceed 5 µg when normalized for the 18.9 L (5 gal) first draw sample. For supply stops, flexible plumbing connectors, and miscellaneous components, the lead test statistic *Q* shall not exceed 3 µg when normalized for the 1 L (0.26 gal) first draw sample.

For kitchen faucets that have been exposed simultaneously with the side spray component, the lead test statistic *Q* value for the entire assembly shall not exceed 5 µg. When the kitchen faucet and the side spray component have been exposed separately, the lead test statistic *Q* value for the faucet and side spray shall be added and shall not exceed 5 µg.

9.5.1.1 Optional lower lead requirements

The following are optional evaluation criteria available for endpoint devices to demonstrate compliance with a lower lead leaching criteria. Product shall also comply with the full requirements of NSF/ANSI/CAN 61 to be deemed compliant to this Section.

9.5.1.1.1 Evaluation requirements

For endpoint devices other than supply stops, flexible plumbing connectors, and miscellaneous components, the test statistics *Q* or *R* calculated in accordance with Section N-1.8.9 shall not exceed 1 µg. For supply stops, flexible plumbing connectors, and miscellaneous components, the lead test statistic *Q* shall not exceed 0.5 µg.

9.5.1.1.2 Product labeling requirements

Attested compliance of product to the lower lead leaching criteria of this Section shall be noted in the certification listing. Consumer-facing product packaging or labeling shall also indicate this compliance by identifying the standard and *Q* level attested according to Section 9.5.1.1.1 (e.g., “NSF/ANSI/CAN 61: $Q \leq 1$” or “NSF/ANSI/CAN 61: $Q \leq 0.5$”).

9.5.2 Evaluation of nonlead contaminants

For endpoint devices other than commercial kitchen devices, the normalized concentration of a nonlead contaminant shall not exceed its SPAC (calculated in accordance with NSF/ANSI/CAN 600 (previously Annex A) when normalized for the 1 L (0.26 gal) first draw sample. For commercial kitchen devices, the normalized concentration of a nonlead contaminant shall not exceed its SPAC when normalized for the 18.9 L (5 gal) first draw sample.

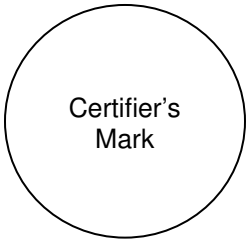
For kitchen faucets that have been exposed simultaneously with the side spray component, the normalized concentration of a nonlead metal contaminant for the entire assembly shall not exceed its SPAC. When the kitchen faucet and the side spray component have been exposed separately, the normalized concentration of a nonlead metal contaminant for the faucet and side spray shall be added and shall not exceed its SPAC.

10 Instructions and information

When product literature, instructions, or information for a POE drinking water treatment unit system shows conformance with the materials safety requirements of this Standard as attested by a certification agency, and when the POE treatment system is not likewise certified by that same agency for drinking water contaminant reduction performances, such literature, instructions, and information shall state in comparable proximity and with comparable prominence either:

— the name of the entity that has tested and substantiated the claimed contaminant reduction performances for that water treatment product; or

— that the product is not certified for contaminant reduction performance by the certification agency. The following is an example of an accepted option:



Point-of-Entry System Tested and Certified by [Name of Certifier] under NSF/ANSI/CAN 61 for Materials Safety Requirements Only. Not Certified for Contaminant Reductions or Structural Integrity by [Name of Certifier]

Normative Annex 1

Product / material evaluation

N-1.1 Background

Products / materials to be evaluated shall be prepared and exposed, and the extraction medium (e.g., water or chemical) analyzed, as described in this Annex. Examples of products / materials covered by this Annex are shown in Table N-1.1.

Table N-1.2 in this annex outlines the various preparation and exposure methods for the products / materials covered by the Annex.

The analytical methods included are based on contaminants that are likely to be present when established methods of production are used and the materials are derived from known sources. Modifications to the analytical procedures shall be permitted when products / materials are created with alternate methods or have originated from alternate sources.

N-1.2 General evaluation requirements

N-1.2.1 General

The requirements described in this Section are general requirements and apply to all products / materials covered by NSF/ANSI/CAN 61, Annex N-1. N-1.3 to N-1.5 describe specific preparation, conditioning, and exposure sequences unique to individual product/material categories.

N-1.2.2 Quality assurance (QA) and quality control (QC) and safety

The methods included in Sections N-1.3 to N-1.5 have been written for trained chemical laboratory personnel. Appropriate QA procedures and safety precautions shall be followed.

N-1.2.3 Samples

N-1.2.3.1 Material evaluation

A representative sample of the material (in either material sample or finished product form) shall be exposed.

N-1.2.3.2 Finished product evaluation

— samples of the finished product (e.g., pipe, fitting, or device) shall be exposed except in the following specific instances:

— concrete cylinders, cubes, or other concrete surrogate samples shall be permitted to be evaluated on behalf of concrete lined pipes and other concrete-based products;

— coatings, applied to an appropriate substrate, shall be permitted to be evaluated on behalf of products whose entire water contact surface is covered by the coating; and

— finished products shall be permitted to be evaluated using material samples if finished product evaluation is impractical for one or more of the following reasons:

- an internal volume greater than 20 L (5.3 gal);
- a weight greater than 34 kg (75 lbs); or
- *in situ* manufacture of the finished product.

Material samples shall be permitted to be evaluated on behalf of a finished product if, and only if, no chemical or physical difference exists between the material sample and the material as represented in the finished product. All material samples shall be produced using all the same manufacturing processes as the finished product.

N-1.2.4 Washing

To remove any extraneous debris or contamination that occurred during shipping and handling, samples shall be rinsed with cold tap water prior to testing, followed by a rinse with reagent water meeting the requirements of Section N-1.9.2.1, unless the manufacturer's instructions direct otherwise. If the exterior of a product is exposed, any printed markings (e.g., ink markings) shall be removed.

N-1.2.5 Extraction waters

Samples shall be exposed, based on a formulation review and determination of the most severe condition(s), to the required extraction waters as detailed in Table N-1.3a, except for mechanical plumbing devices (see Section N-1.5.5). At the discretion of the manufacturer, the extraction waters detailed in Table N-1.3b shall be used as an alternate to those in Table N-1.3a. The characteristics and preparation of the waters are described in Section N-1.9.

The test water formulations as provided in Section N-1.9 shall be used without the addition of free available chlorine when testing high flow devices (or their components) exclusively used at public water treatment facilities and typically installed prior to chlorination.

NOTE — Some materials used in these devices may be damaged by chlorine and test waters that include chlorine would not be representative of field use conditions for this use type.

N-1.2.5.1 Exceptions

The manufacturer shall have the option specifically to request a change in the extraction water used, based on the intended application or the materials used in the device / product, provided that the manufacturer’s use instructions indicate the use limitations.

N-1.2.5.2 Mechanical devices used in contact with drinking water treatment chemicals

These devices and materials shall be exposed to the chemicals and chemical mixtures that have been specified by the manufacturer.

N-1.2.6 Product exposure

Samples shall be evaluated either "in-the-product / device” or in an exposure vessel.

N-1.2.6.1 Exposure in the product / device

When practical, products / devices shall be evaluated so that only the (exposed) wetted surface is exposed to extraction medium.

N-1.2.6.2 Exposure in vessels

Samples that are not evaluated as described in Section N-1.2.6.1 shall be exposed to the extraction medium in containers composed of a material that is inert to the exposure water and with polytetrafluoroethylene (PTFE) lined lids, with no headspace.

Products exposed in vessels shall be exposed so that the surface area-to-volume ratio described in the appropriate section (N-1.3 to N-1.5) shall be maintained.

N-1.2.6.3 Residual vinyl chloride monomer (RVCM)

Polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) pipe products / materials shall be evaluated for RVCM. RVCM shall be determined in the product wall, rather than by extraction, in accordance with Section N-1.7.

N-1.2.7 Material exposure

Materials shall be exposed according to the protocol outlined for the materials' specified end use(s). If a material is intended for use in the manufacture of products covered under more than one section of this Standard, the most stringent exposure condition shall be followed (e.g., temperature or surface area-to-volume ratio). Materials intended to be processed by more than one method (e.g., injection molding, extrusion, or stamping) shall be tested in each of the processed forms.

N-1.2.7.1 Exposure of a material sample

A materials manufacturer shall have the option to request that a material be tested as a material sample (e.g., plaque, sheet) if, and only if, there is no chemical or physical difference in the material characteristics between the material sample and the material as it is used in covered applications. If the material is intended to be used only for the manufacture of products falling under the scope of a single section of this Standard, the material shall be exposed under the conditions set forth in the corresponding section of this Annex. The normalized contaminant concentrations shall meet the requirements of NSF/ANSI/CAN 600 (previously Annex A).

N-1.2.7.2 Exposure in product form

A materials manufacturer shall have the option to request that a material be tested in the form of a finished product according to the protocol set forth in the appropriate section(s) of this Annex.

N-1.2.7.3 Surface area-to-volume ratio (s/v)

When a material is tested in the form of a material sample or in product form, the dimensions of the material or the product sample tested, and the extraction medium volume, shall be recorded and the laboratory tested surface area-to-volume ratio calculated. When necessary, laboratory extraction results shall be adjusted to reflect the difference between laboratory and field surface-to-area volume ratios.

N-1.2.8 Exposure conditions

Exposure begins immediately after washing or the appropriate conditioning.

N-1.2.8.1 Control samples

Exposure controls shall be prepared using the same extraction water and in the same manner as product samples, but no product shall be added. Any uncoated substrate or other nonproduct components or materials of test assemblies shall be included. Exposure controls shall be processed with all samples.

The control samples shall be evaluated for all target analysis as the product samples. The results for the control samples analysis shall be subtracted from the results for the correponding product sample analysis prior to normalization.

N-1.2.8.2 Sequential exposure

Tests for evaluation shall be conducted using a sequential exposure procedure. There shall be no significant time interval between exposures (decant, discard, fill, continue exposure). The products shall be exposed depending on the intended end use application, as described in the appropriate section (N-1.3 to N-1.5). Analyses shall be performed only on the final extraction medium, unless otherwise noted.

N-1.3 Joining and sealing materials

N-1.3.1 Sample requirements

Test samples of joining and sealing materials shall be prepared so that, upon exposure, a minimum surface area-to-volume ratio of 15 cm^2/L (8.8 in^2/gal) is obtained. Materials used at higher surface-to-volume ratios in the field shall be exposed at or above the actual use ratio. Test samples for the various types of joining and sealing materials are described in Table N-1.4.

N-1.3.2 Preparation

Samples shall be prepared so that the entire surface to be exposed is covered by extraction water. Products (as appropriate) shall be applied to a glass panel in a manner consistent with the manufacturer's published instructions. Products requiring a reactive substrate (i.e., where glass is inappropriate), shall be applied to an appropriate alternate substrate.

N-1.3.2.1 Gasket materials

Gasket materials shall be cut to the appropriate size as described in Section N-1.3.1.

N-1.3.2.2 Caulks, greases, lubricants, and sealants

Caulks, greases, lubricants, and sealants shall be applied to a glass panel in such a manner that an even film, consistent with end use, is exposed and the surface area-to-volume ratio described in Section N-1.3.1 is maintained. The slides shall be allowed to air dry or cure according to the manufacturer's published instructions.

N-1.3.2.3 Adhesives and cements

N-1.3.2.3.1 Adhesives and cements intended for joining pipe and fittings shall be prepared as pipe and fittings joints assembled in accordance with the manufacturer’s use instructions. The joints shall be produced using $^1/_2$ in nominal diameter pipe (or tubing) and fittings, or the minimum size specified by the manufacturer, if that size is greater. Unless the manufacturer’s use instructions state otherwise, PVC pipe and fitting joints shall be assembled per ASTM D2855 and CPVC pipe and fitting joints assembled per Appendix XI of ASTM F493. If the manufacturer’s use instructions recommend the use of a primer, testing shall incorporate the use of a primer. Unless the manufacturer’s use instructions state otherwise, joints shall be allowed to air cure for 48 ± 2 h at room temperature prior to washing, conditioning, and exposure in-product.

N-1.3.2.3.2 Adhesives and cements not intended for joining pipes and fittings shall be prepared in a manner consistent with the manufacturer’s use instructions. These products shall be applied to glass panels (or the manufacturer’s intended substrate) so that an even film, consistent with end use, is exposed at a field surface area-to-volume ratio greater than or equal to that of a typical installation. Unless the

manufacturer's use instructions indicate otherwise, the slides shall be allowed to air cure for 48 ± 2 h at room temperature prior to washing, conditioning, and exposure in-vessel.

N-1.3.2.4 Solders

These products shall be prepared by placing the solder in a ceramic combustion boat (96 × 12 × 10 mm). The amount of solder used shall be sufficient to cover the bottom of the boat. The boat (with solder) shall then be placed in a muffle furnace that has been set to a temperature hot enough to melt the solder within 2 minutes). The boat shall be allowed to cool and the solder piece removed.

N-1.3.2.5 Fluxes

Fluxes shall be prepared by applying a thin film to a copper sheet of the appropriate size as described in Section N-1.3.1. The copper sheet shall then be placed on a hot plate that has been heated to 300 °C (572 °F) ± 15 °C. The copper sheet (with flux) shall be allowed to heat for 90 ± 5 s. The copper sheet shall be allowed to cool prior to exposure.

> NOTE — Placement of aluminum foil over the hot plate is recommended to minimize the potential for contamination during sample preparation. The foil should be placed carefully to not create creases or folds that might interfere with the heat transfer.

N-1.3.3 Conditioning for joining and sealing materials intended for joining pipe and fittings

After washing (see Section N-1.2.4), and prior to exposure, product / material samples shall be conditioned to simulate pre-use flushing and disinfection procedures. The samples shall be exposed for evaluation immediately after conditioning. Joining and sealing materials shall be conditioned at the temperature appropriate for the intended end use. The product samples shall be conditioned in accordance with Section 4.5.5 for single time point evaluations and Section 4.5.7 for multiple time point evaluations.

N-1.3.4 Conditioning for all other joining and sealing materials

After preparation, the test samples shall be washed as described in Section N-1.2.4.

N-1.3.5 Exposure for joining and sealing materials intended for joining pipe and fittings

Exposure shall begin immediately after conditioning. The samples shall be exposed to the appropriate extraction water according to Section N-1.2.5, based on end use or application. The product samples shall be exposed in accordance with Section 4.5.6 for single time point evaluations or in accordance with Section 4.5.7 for multiple time point evaluations. The extraction water shall be collected for analysis as described in Section N-1.6.

N-1.3.6 Exposure for all other joining and sealing materials

After conditioning, these materials shall be exposed in the appropriate extraction water (see Section N-1.2.5) in accordance with the intended end use application as described below. The extraction water samples shall be collected as described in Section N-1.6.

N-1.3.6.1 Cold application

Products to be evaluated for cold applications shall be exposed using the sequence in Table N-1.5.

N-1.3.6.2 Hot application samples

Products to be evaluated for hot applications shall be exposed using the sequence in Table N-1.6.