ADDENDA

ASHRAE Addendum c to
ASHRAE Guideline 12-2020

Managing the Risk of Legionellosis Associated with Building Water Systems

Approved by ASHRAE on August 9, 2021.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the guideline. Instructions for how to submit a change can be found on the ASHRAE® website (https://www.ashrae.org/continuous-maintenance).

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FOREWORD

Guideline 12 Addendum c expands the explanation of supplemental disinfection alternatives used to treat building water systems in Section 5, "Potable Water Systems," and renumbers Table 2 in Section 7, "Heated Whirlpool Spas/Hot Tubs."

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum c to Guideline 12-2020

Modify Section 5 as shown. The remainder of Section 5 is unchanged.

5. POTABLE WATER SYSTEMS

[. . .]

5.3.2.1 *Supplemental Disinfection* Used to Treat *Building Water Systems*. The determination of a need to treat potable water, and the selection of any particular treatment, is a complex subject. Improper analysis may result in the use of *disinfectants* or treatments where they are not necessary. Inappropriate selection or improper application of *disinfectants* and treatments may be ineffective, may be harmful to building occupants, and may be damaging to building piping and to *building water system* components, controls, equipment, and fixtures.

If a decision is made to add a supplemental *disinfectant* or treatment to the water for *Legionella control*, the use of a number of commercially available *disinfectants* and *disinfection* treatments for this purpose (collectively referred to here as *supplemental disinfection* methods) are described in the scientific literature. ~~Examples include but are not limited to chlorine, chlorine dioxide, copper-silver ions, monochloramine, peracetic acid, hydrogen peroxide, ozone, and UV light.~~ The most commonly used *supplemental disinfection* methods are treatment with chlorine, chlorine dioxide, copper-silver ions, and monochloramine (refer to Section 5.3.2.2, "Disinfection Byproducts," and Table 2, "Supplemental Disinfection Methods Used to Treat Potable Water in Building Water Systems"). Other methods include, but are not limited to, peracetic acid, hydrogen peroxide, ozone, and UV light. This guideline does not promote or endorse any particular *supplemental disinfection* method. To evaluate the available options, consult available scientific or technical evidence supporting and challenging the overall impact of the *supplemental disinfection* method on the *building water systems*, on the building occupants, and on building operation and personnel. Factors that should be considered when evaluating *supplemental disinfection* options include but are not limited to the following:

a. What is the quality of the water supplied to the building, such as the amount of *disinfectant residual*, *microbial* activity, and the concentration and type of corrosion inhibitors?
b. What is the compatibility of the *disinfectant* in the water supplied to the building with the intended *supplemental disinfection* method?
c. What is the intended *disinfectant* concentration for the *supplemental disinfection* under consideration?
d. Can the intended parameters, such as *disinfectant* concentration at fixtures, be measured reliably in real time?
e. What is the effectiveness of the *supplemental disinfection* method under the intended *building water system* use conditions? Use conditions that should be considered include but are not limited to water temperature, *water age*, and water chemistry parameters, such as alkalinity, hardness, pH, and the type and concentration of corrosion inhibitors.
f. What is the available scientific or technical evidence supporting and challenging the reliability and effectiveness of the *supplemental disinfection* method?
g. What, if any, are the unintended consequences of the *supplemental disinfection* method, such as the potential for promoting *growth* of other microorganisms that may cause infection or disease,

Table 2 Supplemental Disinfection Methods Used to Treat Potable Water in Building Water Systems

Supplemental Disinfection Method	Manufacturer Recommended Control Range (Residual)	Associated Definition Byproducts and Chemical Contaminants
Chlorine	0.50 to 3.0	Haloacetic acids Trihalomethanes
Chlorine dioxide	0.10 to 0.80	Chlorite ion
Monochloramine	2.0 to 3.0	Ammonia/ammonium ion[2] Nitrate ion[2] Nitrite ion[2] *N*-Nitrosodimethylamine (NDMA)[3] Haloacetic acids Trihalomethanes
Copper-silver ions	Copper 0.20 to 0.80 Silver 0.01 to 0.08	Copper Silver

Notes:

1. Units are in milligrams per liter (mg/L), unless otherwise noted. Milligrams per liter in water are equivalent to parts per million (ppm).
2. Ammonia/ammonium ion, nitrate, and nitrite can be used as nutrients by certain microorganisms, including clinically significant *building water system*-associated pathogens, such as *Acinetobacter*, *Burkholderia*, *Elizabethkingia*, *Klebsiella*, Non-tuberculous *mycobacteria* (NTM), *Pseudomonas*, *Sphingomonas*, and *Stentrophomonas*. Because ammonia/ammonium ion, nitrate, and nitrite can be metabolized by these *pathogens*, these *disinfection byproducts* can promote their *growth*. *Legionella* are not known to metabolize ammonia/ammonium ion, nitrate, and nitrite. These *disinfection byproducts* are not known to promote *Legionella growth*.
3. USEPA. Toxicological Review of *N*-Nitrosodimethylamine (1987)

and the formation of toxic *disinfectant byproducts* in the *building water system*? (Refer to Section 5.3.2.2, "Disinfection Byproducts," and Table 2, "Supplemental Disinfection Methods Used to Treat Potable Water in Building Water Systems").

h. Is the *supplemental disinfection* method under consideration, when applied appropriately, likely to have a significant adverse impact on plumbing materials, equipment, or components, including metals and nonmetals, such as plastics and elastomers?

i. How and where is the *supplemental disinfection* method to be applied, *controlled*, and monitored to maintain the desired treatment level during normal and off-peak operating conditions?

j. What is the degree of complexity and technical skill necessary to confirm the intended *control limits* are being met—for example, the measurement of *disinfectant* concentration or water quality at the fixtures?

k. Does the person responsible for implementing the *supplemental disinfection* method have the technical skills, capability, and experience to safely and successfully complete the implementation, including preinstallation water chemistry evaluation, planning, installation, start-up, confirmation of post-treatment water chemistry and *disinfectant byproducts*, training, and support?

l. Do the authorities having jurisdiction have any requirements that pertain to the *supplemental disinfection* method under consideration, such as maximum allowable *disinfectant* and *disinfection byproduct* levels and possible permitting requirements? (See Appendix B, "Guidance for U.S. Regulations on Drinking Water Treatment and on Chemicals Used for Potable and Nonpotable Water Treatment.")

5.3.2.2 *Disinfection Byproducts.* *Disinfection byproducts*, including, but not limited to, those listed in Table 2, may occur when the associated *supplemental disinfection* method is used to treat potable water in a *building water system*. When *disinfection byproducts* occur, some may be at concentrations of concern. Factors that may influence the occurrence of *disinfection byproducts* in *potable water systems* include the following:

a. The physical and chemical characteristics of the water supplied to the building, such as temperature, pH, type and concentration of *disinfectant residual*, *turbidity*, *water age*, and *microbial* community structure

b. *Building water system* materials (pipes, fittings, seals), pipe diameters, and piping layout

c. The physical and chemical characteristics of the water in the *building water system*, such as temperature, pH, type and concentration of *disinfectant residual*, *turbidity*, *water age*, alkalinity, dissolved oxygen, natural organic matter, and *microbial* community structure

The type, concentration, and distribution of *disinfection byproducts* associated with different *supplemental disinfection* methods reported in the published literature vary significantly. The specific factors that determine the extent to which any or all of these *disinfection byproducts* occur are not fully known. The occurrence of these *disinfection byproducts* also is likely to be variable, because the characteristics of the water supplied to the building and of the water within the building are variable.

5.3.2.3 Rules, Regulations, and Guidance. When a *supplemental disinfection* method is used to treat potable water in a *building water system*, governmental rules and regulations may apply. In determining whether to use a *supplemental disinfection* method to treat potable water in a *building water system*, the *authority having jurisdiction* should be consulted to establish governmental rules, regulations, and reporting that must be followed.

Modify Section 7 as shown. The remainder of Section 7 is unchanged.

7. HEATED WHIRLPOOL SPAS/HOT TUBS

[. . .]

Table ~~2~~3 Recommended Control Limits [. . .]

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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8/21